

An Amateur Wireless Magazine

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**The American Radio
Relay League**



FOR THE MONTH OF FEBRUARY
NINETEEN HUNDRED AND SIXTEEN

ZENNECK'S Wireless Telegraphy

"The Book You Have Been Looking For"

By J. ZENNECK, Professor of Experimental Physics at the "Technische Hochschule," Munich. Translated by A. E. SEELIG, Mem. A. I. E. E., formerly General Manager, Atlantic Communication Co. 428 pages, 6x9, 461 illustrations, 13 tables, \$4.00 net, postpaid.

CHAPTER HEADINGS

I. The Natural Oscillations of Condenser Circuits. II. Open Oscillators. III. The High Frequency Alternating-Current Circuit. IV. Coupled Circuits. V. Resonance Curves. VI. The Antenna. VII. Transmitters of Damped Oscillations. VIII. High Frequency Machines for Undamped Oscillations. IX. Undamped Oscillations by the Arc Method. X. Propagation of the Waves Over the Earth's Surface. XI. Detectors. XII. Receivers. XIII. Directive Telegraphy. XIV. Wireless Telephony. Development of Wireless Telegraphy During the Years 1909-1912. Tables—22 Pages of Useful Tables. Bibliography and Notes on Theory. Index.



EVERY amateur operator and every student of wireless owes a debt to Mr. Seelig who has translated Dr. Zenneck's "Lehrbuch der drahtlosen Telegraphie." This book has been a standard in Germany and now it is brought to America and translated for us. The book carefully covers all phrases of wireless telegraphy, from the fundamental principles to finished commercial apparatus. In the technical part you will find explanations which clear up every hazy point. Among the interesting features are the illustrations and photographs of dampened sparks. You can find out all about decrement. You see exactly how the ether waves travel. Once you read the book, you wonder how you did without it.

This text is of such great importance to the LEAGUE members that the Secretary has made arrangements to supply the book. Write for it today. There was never a book worth more. You need it: send to the Secretary.

The American Radio Relay League, Inc.
Hartford, Connecticut

CONTENTS.

Practical Relaying by Hiram Percy Maxim	19
Map of Proposed Relay Trunk Lines (Ill.)	21
Apparatus Arrangement by a League Member (Ill.)	22
Honolulu Station Gets War Dispatch from Nauen, Prussia	23
Long Distance Amateur Wireless Work, R. S. Miner	24
"American Radio Relay Station, IVN" (Ill.)	25
The Reward is Given!	25
Station and Pole of Mr. P. W. Patch, Dubuque, Ia. (Ill.)	28
Q S T	29
A Very Neat Station (Ill.)	30
Radio Communications by the Amateurs	31
3 AEP (Ill.)	32
Radio Station of Ralph Batcher, Toldeo, Ia. (Ill.)	33
A Western Station (Ill.)	35
Latest List of Additions to American Radio Relay League Stations	36
Exchange, For Sale and Wanted "Second Hand Apparatus"	39
General Notice	41
Coupon Page	42

Issued by Hiram Percy Maxim and Clarence D. Tuska
 Hartford, Conn

ANNOUNCEMENT

¶ Q S T is published by and at the expense of Hiram Percy Maxim and Clarence D. Tuska.

¶ Its object is to help maintain the organization of the American Radio Relay League and to keep the Amateur Wireless Operators of the country in constant touch with each other.

¶ Every Amateur will help himself and help his fellows by sending in \$1 for a 12 months' subscription.

THE PUBLISHERS OF Q S T

February Radio Relay Bulletin

PRACTICAL RELAYING

By Hiram Percy Maxim.

THE idea of a citizen of Portland, Maine, being able to send a message to a citizen in Portland, Oregon, by wireless, and without cost, is of course very wonderful and extremely attractive. Nothing like it has ever been possible before in the history of the world. The co-operation of a few unknown but nevertheless kindred spirits between Portland, Maine and Portland, Oregon, by means of which the message is handed on, adds a touch to the whole scheme and makes it almost Utopian.

It is the history of human affairs however, that it is a far carry between a good idea and the practical working out of this idea. While it might be possible for the gentleman down in Maine to get a message through to his friend on the coast on some special occasion, yet it is quite a different matter for the former to communicate with the latter at any time that the spirit moves. It is just here where a Relay League either meets its Waterloo or grows into a great National institution.

It has been said in this magazine, the only mouthpiece of the practical operating amateurs of the country, that after one year's experience, it is still impossible to get a message through without great delay. To overcome this, the leaders of the relay organization have, after studying the problem, recommended that each large city and town send out a QRU? at a given hour every evening, and thereby notify the rest of the country that they are on duty and ready to receive. This sounds like a good idea at first. It certainly will help the linking up of stations which would otherwise never get together, and it would also release a great many msgs. which might otherwise be held up. But, would it accomplish that important thing which experience has found so necessary? Would it "prove up" all stations and demonstrate

which ones were always on the job and which ones were almost never on the job?

If a land telegraph company or a telephone company never ran any proof tests, to make sure that communication could be established, they would find when they wanted to get into communication, that there would be a hitch somewhere. Just so with a fire department. At twelve o'clock and at six o'clock, the bell rings every day in the week, just to determine if every fire station can be reached if necessary. Would not this plan be a good one to follow, in modified form, in a Radio Relay League? And would it not be a good thing to add to the QRU? practice?

Again, and before we lay down any detailed plan for running proof tests:— Must we not realize that from a practical standpoint, there are a great many amateurs

who lack the nerve or whatever else it is, to break in and send out a general QRU?. There is something akin to standing up before the crowd and making a speech, in sending a general call. Some people would rather take a thrashing than touch their key for the purpose. They feel that they cannot send well enough, or that they will become rattled or that something will happen in the form of a come back, which will disclose the awful fact that they cannot receive well. These people never entirely get over this feeling and many of them have station equipment which in the hands of an operator with more nerve, could do wonders. For this reason, any plan which calls for initiative on the part of all stations in a voluntary organization such as the Relay League, is bound to be only partially effective.

The next question in undertaking to grasp the practical necessities, is that of regular trunk lines. In order to have system in either traffic in messages or traffic in trans-



portation, it is necessary that there shall be established routes. If our friend in Portland, Maine wants to send a msg. to Portland, Oregon, it should be understood by everybody connected with the handling of this msg. just how it was to be routed under ordinary circumstances, and just what alternative routes must be taken if the circumstances are extraordinary. Therefore, it becomes essential that the Relay League have at least a few regular established trunk lines. Certainly such would have to be the case if the Relay League were to be called upon by the Government for assistance, as has been suggested in these pages.

In laying out trunk lines, a reasonable point of view should be taken and no elaborate or unnecessary system be undertaken in the beginning. Only enough should be laid out to handle the regular test msgs. Later, as traffic grows, additional trunk lines, can be established. For the purposes of forming a nucleus, the following trunk lines have been worked out by the writer and they are respectfully recommended for adoption, it being understood that only enough cities are mentioned in each to indicate the general route.

Trunk Line A.

Portland, Me.
Boston, Mass.
Albany, N. Y.
Buffalo, N. Y.
Cleveland, O.
Toledo, O.
Detroit, Mich.
Chicago, Ills.
Minneapolis, Minn.
Fargo, N. D.
Helena, Mont.
Spokane, Wash.
Seattle, Wash.

Trunk Line B.

Chicago, Ills.
Peoria, Ills.
St. Louis, Mo.
Kansas City, Kans.
Omaha, Neb.
Denver, Colo.
Salt Lake City, Utah.
Reno, Nev.
San Francisco, Cal.

Trunk Line C.

Boston, Mass.
Hartford, Conn.
New York, N. Y.
Philadelphia, Pa.
Baltimore, Md.
Washington, D. C.
Richmond, Va.
Raleigh, N. C.
Charleston, S. C.
Savannah, S. C.
Jacksonville, Fla.

Trunk Line D.

Philadelphia, Pa.
Harrisburg, Pa.
Pittsburg, Pa.
Columbus, O.
Cincinnati, O.
Louisville, Ky.
Nashville, Tenn.
Birmingham, Ala.
Montgomery, Ala.
Mobile, Ala.
New Orleans, La.

Trunk Line E.

St. Louis, Mo.
Memphis, Tenn.
Little Rock, Ark.
Guthrie, Okla.
Dallas, Tex.
Houston, Tex.
San Antonio, Tex.
El Paso, Tex.
Globe, Ariz.
Phoenix, Ariz.
Los Angeles, Cal.

Trunk Line F.

Vancouver, Canada.
Seattle, Wash.
Portland, Ore.
Sacramento, Cal.
San Francisco, Cal.
Los Angeles, Cal.
San Diego, Cal.

tions for the next issue of the List of Stations book.

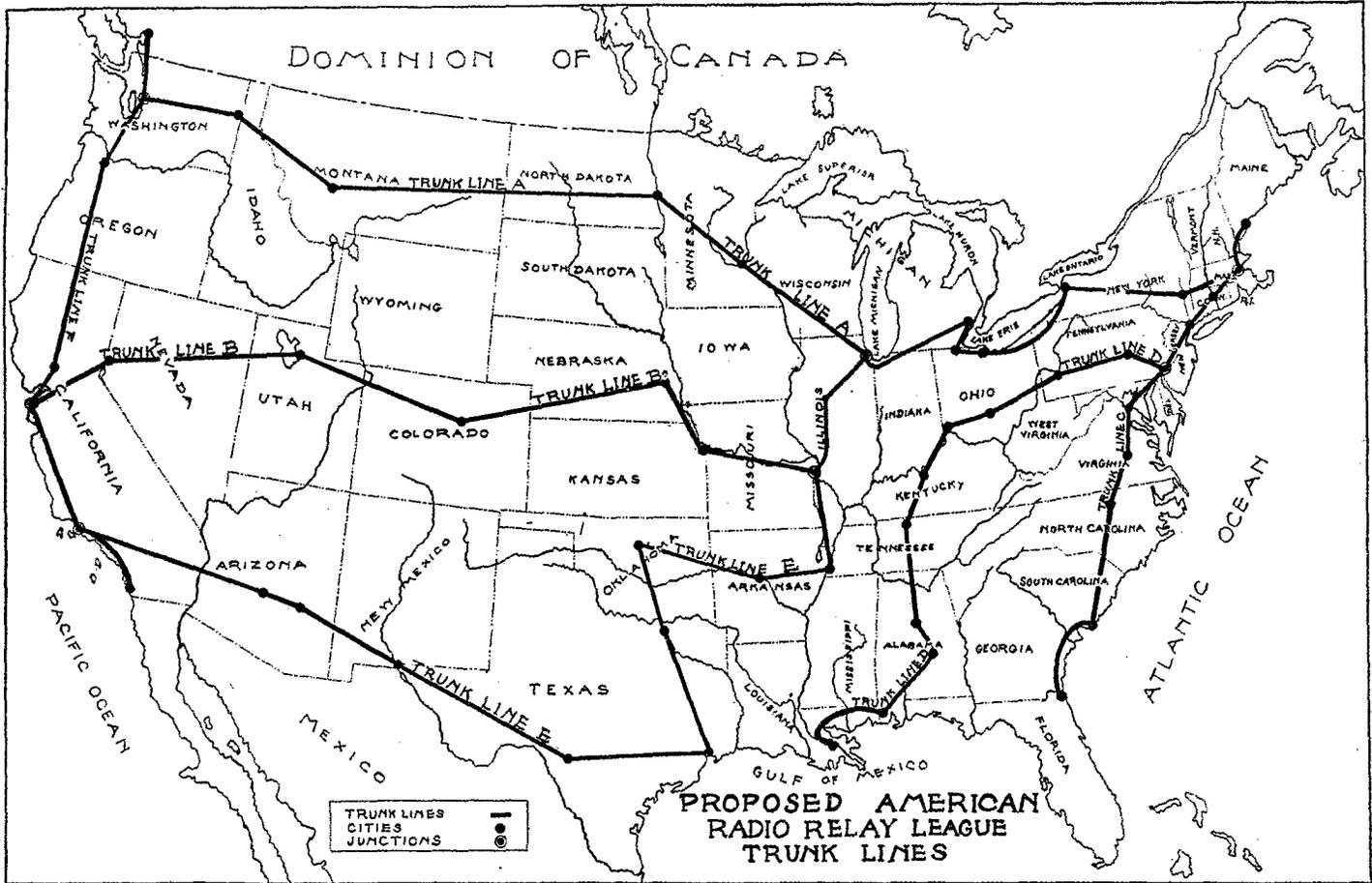
If it were possible to relay from point to point along these trunk lines, there would be a practical traffic established to most of the principal points in the country. Msgs. could be routed via AF to go from Boston to San Diego, or via ABF or via ABEF. These Msgs. would be limited strictly to each trunk line. If each trunk line were kept open by daily test, any combination of them is naturally also open.

Supposing, now, that districts were selected as the headquarters for each trunk line and each of these districts organized themselves to run a test msg. out and back every Sunday, Tuesday and Friday, at 9:30 p. m. Central time, and reported by mail each test to headquarters at Hartford. The result would soon be that main headquarters would see just where the weak points in the links were and could take steps to re-appoint stations. It would not be long before the better stations would automatically develop themselves on each line and the weak ones would be weeded out. And it is also a safe thing to predict that these better stations would become Star Stations and would quickly be those to receive

If certain well equipped and regularly operated stations can be appointed along each of these trunk lines, it would be possible to establish regular test signalling and unquestionably materially assist in making long distance relaying possible. Moreover, it would serve as a very good basis for the re-appointment of Star Sta-

Special Licenses.

To the writer, who has given this subject a great deal of thought and study, it seems that what should be done is for every amateur located along any of the above mentioned trunk lines to send in to main headquarters his name, address, and call letters. Main headquarters would then



appoint district headquarters and turn over to each of these the stations on their lines. Each district headquarters could then begin the work of developing the best stations. The rest would follow naturally, and if there are enough amateur stations in the

country to make relaying possible, it would not be long before a practical Relay League would be established. Then we amateurs would have something of which we all could be justly proud.

(To be Continued.)

APPARATUS ARRANGEMENT

By a League Member

A friend, thirty miles from my radio station, had installed a half kilowatt transmitting set, but was unable to communicate with me. He had been asking me to come out and look his station over; he felt quite sure that everything was O. K., but wanted me to suggest improvements. One snowy afternoon in December I took the ——— Railroad to his town which was located in the southern part of New York State. It was a one-horse town which boasted of a wireless station but no trolley cars. As my friend had no car, I was compelled to plow my way through no less than six inches of snow, but I finally reached his home and was no sooner inside the door than he unceremoniously dragged me off to see his set.

"Well, Brother, what do you think of this? I've got it arranged pretty nicely; haven't I?"

I gazed around and the first thing that attracted my attention was an oscillation transformer fastened on the ceiling. Two long, straggly wires came down from this to a condenser on the operating table. Six more straggly wires drew my attention to a porcelain tube in the floor.

"Where do those go?" I inquired, pointing at the wires.

"Oh yes, that is a clever little idea of my own. You see, this plaguery rotary is such a confoundedly noisy affair that I put it down cellar with the transformer," explained the genius.

"Yes! I suppose your aerial switch is on the roof so you can have it near the aerial," I snorted in disgust.

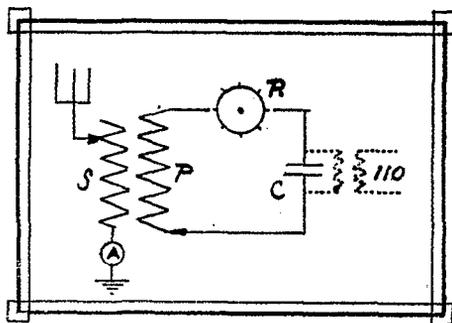
"Well, what's the matter, you old Grouch? Anyway, the receiving set is all right; isn't it?"

"Yes, because fortunately it's all in one unit and you didn't have a chance to scatter the instruments around as your fancy dictated. Of course, I suppose, if you had had the opportunity, you would have put the audion bulb out on the front door so that people might know you have a wireless station. But, all joking aside, I really believe I shall have to give you a short talk

on the fundamental principles of wireless," I said, as I thought out my lecture.

"Ga, Ga, ———," he signed.

"Well, in the first place, you have a condenser which is charged from your high voltage transformer. This condenser discharges through your rotary gap and primary inductance of your oscillation transformer. By adjusting the condenser and primary inductance, you can obtain your two hundred meter wave length." (Fig. 1)

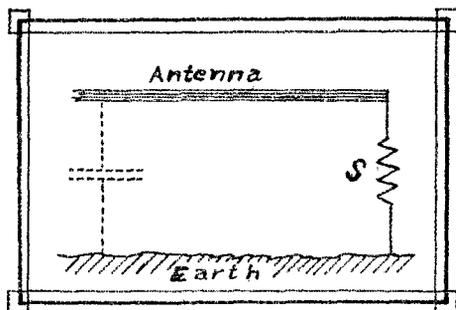


"Just how much condenser and inductance must I have," broke in my listener.

Cautioning him about the QRM I remarked, "If you have twelve glass photograph plates, eight inches by ten inches, coated with six by eight inch tinfoil, and a loop of inductance about eight and one-half inches in diameter, you will get a two hundred meter wave. Now the object of this primary circuit is to stow up energy in the condenser and then make it flow through the inductance. The longer you make your inductance, the greater will be your wave. This means, if you have a great many long leads connecting the condenser, spark gap, and oscillation transformer, you will build up the wave and will lose energy in the long conductors instead of centering it in the primary of your oscillation transformer.

"Next, the primary inductance must readily give up its energy to the secondary, but the secondary must not re-act back on the

primary. This means a fairly large degree of coupling between the primary and secondary of the oscillation transformer. Too close coupling will make your decrement high and this is hardly desirable. To make the secondary circuit absorb the greatest amount of energy, you must make its wave length equal to the wave length of the primary circuit. You see, it's a very neat little arrangement. The primary circuit is nothing but a condenser, gap, and inductance. The secondary circuit is very similar to the primary; you have the secondary inductance and the condenser effect is obtained between the aerial and ground as shown by the dotted line in Fig. 2.



"Now I can probably begin to argue about the arrangement of your apparatus. You can see how important it is to have the leads short that you may not lose energy. By short, I mean about a foot for each connector. In your case, the leads are probably five feet long on an average. If you had placed your oscillation transformer, gap, and condenser close together, it would have been possible to cut the length of the connections down to two feet. Suppose you had placed the oscillation transformer directly above the condenser and near the side of the condenser there would be room for the rotary."

"Well if I do that, I'll have that noisy thing up in my room. Besides, it will litter up my table," objected the listener.

"Well, of course, if you are fixing up your set to look at, have your own way,

but if you want to talk with somebody, take my advice and arrange your apparatus not for looks but for short leads. Try it in several positions and find out which works best. Then you should connect it with wire of respectable size; perhaps, No. 8 instead of 18. Copper ribbon is very good, but stranded wire is better. As to the noise, why don't you put your rotary in a box, or buy some kind of a quenched gap?

All these things which I have suggested in regard to your sending apparatus apply to the receiver. In your case, the receiving set seems fairly efficient as you have purchased it in a complete unit. Just let me give you a bit of general advice concerning your operating table. You work your station right-handed. I am also right-handed and I have always found it a good plan to have the receiving apparatus on the left with the aerial switch, then the key and finally the sending. That gives you a chance to change quickly from sending to receiving. You will find it very convenient.

"I suppose we might even improve your aerial," I suggested. "You might raise it a few feet to clear some general obstruction, and again you might help things a great deal by straightening your lead-in and using a large wire or a better ground. I'm sorry that it's so dark tonight, but some time I'll come out earlier and we can look over your aerial. For the time being, I guess you will be busy enough looking over your set and trying to get the right arrangement. As it is now, I don't suppose you are sending ten miles, but fix it up and you will be able to talk with me."

Then, we had dinner and after receiving his many thanks and numerous blessings, I started out on my mile walk through the one horse town and seven inches of snow. I was convinced that this visit had been a help to my friend. If I only had the time, I should like to visit several hundred other amateur stations which need improvement.

MORAL: Arrange your apparatus in an efficient way; make the leads short; use copper ribbon or stranded wire; work for the best combination.

HONOLULU STATION GETS WAR DISPATCH FROM NAUEN, PRUSSIA.

A New World's Record 9,000 Miles.

Honolulu, Nov. 29th.—A new world's record was made last night, when an operator of the Federal Wireless Telegraph Company picked up signals transmitted from Nauen, Prussia, to Tuckerton, N. J., a distance of approximately 9,000 miles. The German operator was sending war dispatches and the signals were very clear in Honolulu. This remarkable transmission

about reaches the limit on the earth as when 12,000 miles are covered no one can tell from which direction the messages come. That is, we can only receive messages from half way around the earth. It is peculiar to note that many of the long distance records have been made at Honolulu. The best previous performance in long distance wireless communication was 6,000 miles.

LONG DISTANCE AMATEUR WIRELESS WORK

R. S. Miner.

The following list of amateur stations have been copied this fall, prior to December 15th, at 1 V, N, Hartford, Connecticut:

Call Letters	Location	Operator	Power	Distance
* 1IZ	Great Barrington, Mass.	Robert T. St. James	$\frac{3}{4}$ Kw.	60 Miles
* 1ZR	Rockland, Me.	E. L. Norton	1 Kw.	200 "
* 1ZW	Worcester, Mass.	W. H. Allison	$\frac{1}{2}$ Kw.	75 "
2AGI	Peekskill, N. Y.	Walter Grumbacher		90 "
2BO	Montclair, N. J.	H. F. Schermerhorn	$\frac{1}{4}$ Kw.	120 "
* 2DA	Poughkeepsie, N. Y.	A. H. Winn	$\frac{1}{2}$ Kw.	65 "
2DN	Little Falls, N. J.	H. M. Warner	$\frac{3}{4}$ Kw.	130 "
2IB	Yonkers, N. Y.	W. Feeney	$\frac{3}{4}$ Kw.	110 "
2JD	New York, N. Y.	A. R. Boeder	1 Kw.	110 "
* 2KK	Westfield, N. J.	H. B. Day	$\frac{3}{4}$ Kw.	150 "
* 2SX	New Rochelle, N. Y.	G. C. Cannon	1 Kw.	95 "
* 2ZP	Portchester, N. Y.	J. W. Hubbard	$\frac{1}{2}$ Kw.	80 "
* 3NB	Vineland, N. J.	M. Frye, Jr.	$\frac{3}{4}$ Kw.	250 "
3SS	Bethlehem, Pa.	E. B. Brany	1 Kw.	200 "
* 3ZS	St. Davids, Pa.	C. H. Stewart	1 Kw.	200 "
* 8ADB	Youngstown, Ohio.	T. J. Bray, Jr.	$\frac{1}{2}$ Kw.	450 "
8AEZ	Lima, Ohio			460 "
8ER	Columbus, Ohio	L. W. Elias	$\frac{1}{2}$ Kw.	550 "
8IF	Buffalo, N. Y.	R. G. Urban	$\frac{1}{2}$ Kw.	350 "
* 8YC	Ithaca, N. Y.	Cornell University	1 Kw.	400 "
8YL	Lima, Ohio	J. E. Collins	1 Kw.	460 "
8ZM	Springfield, Ohio	R. McGregor	1 Kw.	600 "
* 8ZW	Wheeling, W. Va.	J. C. Stroebel, Jr.	1 Kw.	450 "

NOTES.

* An American Radio Relay League Station.

Power in Koliwatts and Distance in Miles is only approximate.

Many other stations have been heard at 1VN, but the space in "QST" is becoming so valuable that they could not be given in tabulated form. Here is a list of a few more calls. 2MA, 2PH, 2PV, 2SZ, 3UF, 3VX, 3WN, 8ALE, 8BD, 8CO, 8GT, 8LD, 8LG, 8PC, 8RD, 8VI, 8YO, 8ZK, 9WO.

No doubt some of you will be surprised to see your call in this list. How many of you keep a record of the stations you hear. If you do not, try it. Look up each call and some times stop and wonder how an amateur with one Kw. or less, covers such remarkable distances.

I have been asked to give some of the characteristics of these successful stations. First of all, let us consider the pitch or tone. Of all the stations I hear, 75% have a high pitch, and you may be sure they are much easier to read. 8IF, Buffalo, N. Y., has about 120 cycle tone, and although he is loud it has been hard to copy him through the QRN; while 8ZW way down in West Virginia, can be copied with ease on account of his five hundred cycle pitch. 3ZS and 1ZR come in fine with their high tones. Occasionally we notice a station fade away when his rotary reaches high speed.

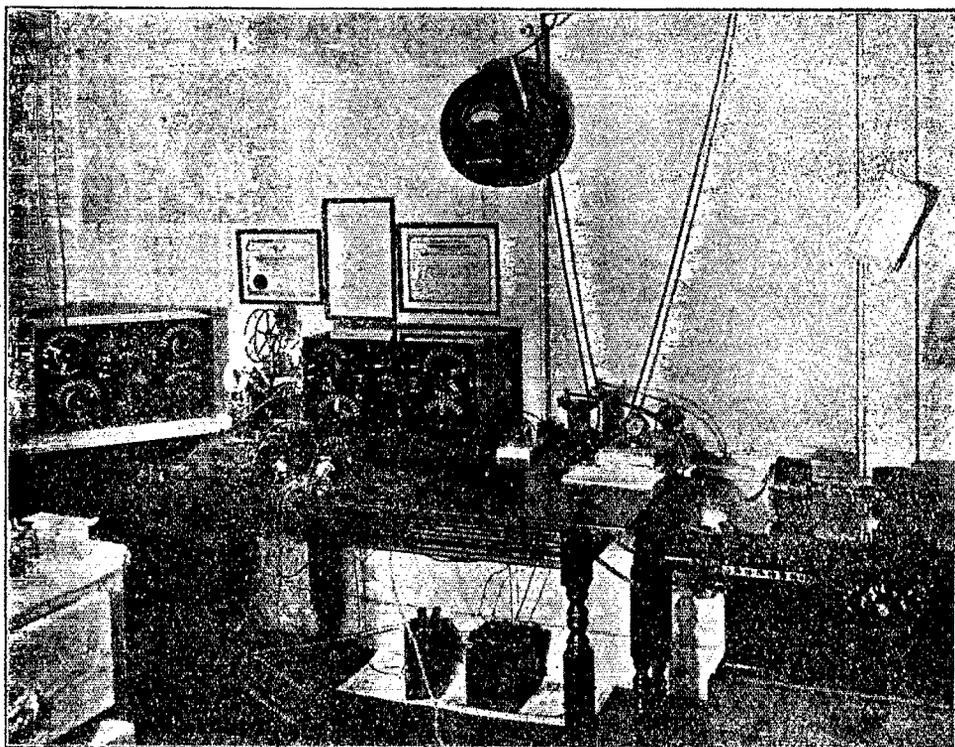
This is generally caused by using too much condenser for the high spark frequency. Sending condensers should be variable in small steps and a great deal of care should be used in tuning your station to make sure that the right capacity is used. The smaller the capacity of your condenser, the higher your spark frequency may be and the more turns of inductance may be used in the primary of the oscillation transformer to maintain a certain wave length. This alone is of great advantage as it allows the use of closer coupling. Thus the radiation of the secondary or open circuit is increased while still maintaining a sharp wave.

I believe that most of our transmitting sets are efficient, but I have my doubts about a great many receiving sets. The audion is the only detector capable of this long distance work. I do not use an audion for I find they cause too much QRM. If you can not read a station through QRM with a good audion bulb, you will never read him with all the amplifiers in existence. I find to get the best results, the audion must be constantly adjusted. The high tension batteries must be variable, one cell at a time, and the constant variation of these batteries cutting in or out a cell or two will often allow a high pitch station to be read through a low pitch or vice versa. It is not advisable to burn the

filament bright enough to make the bulb hiss. Then too, you must not adjust your audion to maximum loudness of signals from a very strong station and think it is adjusted for best results from a weak station; for often this is not the case. A series condenser in the antenna lead is almost a necessity, as it permits the use of more inductance on the primary of the loose coupler and a corresponding amount of closer tuning. The insulation is also very important, not only on high voltage

transmitters but on the receiving sets. Summing it all up, we might say that although the amateur is limited to one Kw., his output is only limited to his patience, ability and the quality of his instruments.

When you receive a distant station, drop the owner a postal and tell him so. It won't cost you much and it will encourage the other fellow to work harder, and will go a long way towards stimulating the interest in the most wonderful of all pastime.



"American Radio Relay Station, 1VN"

THE REWARD IS GIVEN!

Many letters are received in answer to Kathis Kathan's queries.

IN the December issue of "QST" the following Japanese letter was published, and the Secretary offered to pay \$5.00 for the best answer:

Hynacus, Japan

To Honorable Mr. Radio Secretary Tuska,
Honorale Relay League, America

I ask to know. When condenser made separators of glass we know dielectrics much pressed by electricity. This much sure, why, tests made show it. Honorable writers of English make tests and demonstration that metal can be vanished and all the same when new metal comes to condenser, yet discharge comes too the same.

Why thus we see plain that dielectric heart of condenser.

Then now. I ask to know if air I use no glass for important dielectric does it obtain pressed? Like glass? Honorable American teachers tell me yes. Air—glass—mica all same without difference among them.

Then now again how? Suppose I have air variable condenser and I the air vanish blowing by breath. Goes away quickly the air. How goes my electricity charge? Goes it too? I think me not. Then how charge gets back?

Explanation me Honorable Radio Secretary for which accept my assurances most distinguished consideration.

KATHIS KATHKAN,

Japanese Radio Student,

P. O. Box 1155, Hynacus, Japan

S. P. Why this write typewriter, you Japanese write mostly not know.
K. K.

A great many letters were received and we are sorry that we cannot publish all of them. We are printing the best letters. Two of the writers seem tied for first place. The judges were unable to decide just who sent in the best letter. They were all very close together so it was finally decided to divide the five dollars between Mr. Felix and Mr. Wolfe. The others were so close behind that they really deserve a reward and the publishers of "QST" have entered their names for a year's subscription.

Mr. Felix answered the questions directly. His letter was short, technical, and humorous. Our friend, 3AFM, certainly wrote his letter in a humorous style, with a laugh to a line and several grins thrown in. Mr. Wolfe did not give much of an explanation, but he certainly "takes the cake" for humor.

ONE OF THE WINNERS.

Norristown, Pa.

Dec. 4, 1915.

To Kathis Kathkan,
Hynacus, Japan.

My Friend:

It certainly looks to me as if you had been a victim of one of those confounded "self-taught English" systems, and if such is the case you sure have done well with the material at hand. For looking over your communication, we're compelled to admit that every word you have used is an English word, and your spelling, on the whole, is good. But Kathis, old top, you've got the words in the wrong bins. Your construction sure beatser-is very bad. If it costs you as much effort to write that thing as it has cost us to read it, there's been enough energy wasted to get a press message from pole to pole and at that, I don't believe we quite get you.

Now Kathis, (Hang it! Every time I come near calling you Hasheesh). I'm no scientific sharp nor expert mathematician, but I'm going to have a shy at the Sec's. five. I gather that you have been tampering with that interesting chunk of apparatus, the condenser, and it's got you up a bamboo, so to speak. (Notice the delicate handling of sidewalk English to meet local conditions) and let me say right here, Hasheesh—er—Kathis, that if you try one experiment you mention, you're very liable to get knocked clean out of that bamboo. This "vanishing" of metal plates from off a condenser after they have been "pressed" by electricity isn't all it's cracked up to be. It's very much like interfering with lightning which is hurrying to keep an appointment. If you've got a couple of two quart Leydens, with a fairly decent transformer doing the "pressing"—beware! And after that, beware some more. And if you really must try the experiment, let your German assistant or your mother-in-law "vanish" those jar coatings. The best thing to do is to avoid "vanishing" the plates. Take the "Honorable writer of English's" word that it can be done.

Then now, Kathis, (pardon plagiarism, old top) it looks to us as if your ideas of dielectrics are a little hazy. Kind of foggy, so to speak. Suppose you give your honorable writer of English another battle. Tune him in fine, hash—Kathis, and copy him carefully, and see if he tells you that dielectrics are "all the same without difference among them." Get a line on what a dose of castor oil will do to a poor little .0015 receiving variable which has been struggling along with air as a dielectric. The now again, Kathis, old fellow, I think you're a good skate, and if I were you, I wouldn't waste any time "vanishing" the air dielectric by "blowing by breath." After you have "vanished" the plates, and wonder "how goes my electricity charge" I assure you, old pal, that in spite of the fact that you "think you not" your electricity charge "goes it too," and darned quick.

Just one word more, Kathis, old kid. It's blamed hard under the circumstances to "explanation you." It may be that you have gotten a condenser confused with a storage cell. Under certain conditions it is possible to "vanish" the electrolyte from a storage cell and put in an entirely new batch. In that case, your electricity charge "goes it not." See?

So long, old can. My call is 3AFM, and if you ever solve the secret of freak transmission, give me a wail. These days of amplifiers it's possible to hear Jerusalem on a clear, cold night, anyway.

Yours,

(Signed) CHARLES S. WOLFE.

A POETICAL ONE.

Oh, Kathis Kathkan, Wireless Jap,
 Explanations you need certainly sure;
 Your education, I think, it lacks.
 Why should you a radio student ask:
 Where goes the charge in a chunk of air?
 The charge it stays when the metal is near;
 Blowing admits of no avail,
 But remove the plates, now where the
 charge?

Charge has scattered far and wide
 Nothing to hold it; why should it stay?
 The more it scatters the weaker it grows,
 Weaker and weaker as the distance squared.
 Finally it vanishes and disappears.
 So goes the charge of a chunk of air.

ANOM.

ANOTHER PRIZE WINNER, WHICH
DESERVES THE REWARD.

New York, United States.

To Honorable Kathis Kathkan,
 Distinguished Radio Student,
 In Care of the Honorable Post Office Box
 1155,
 High Hyancus, Excellent Japan.

You aks know; I write tell. When charge
 condenser, dielectrics pressed much of elec-
 tricity.

Air—glass—mica dielectrics; all same, no
 difference, dielectrics much pressed when
 charge condenser. So much sure.

Electrons one side condenser try jump
 other side.

Air, glass, mica, all same. Always try
 jump.

One side too few electrons: Then, now,
 other side too much. Suppose air, I have
 variable, I air vanish, all the some, con-
 denser much pressed. Electrons from side
 with too many try hop side of too not
 enough.

Vanish I air quickly, I blow, charge stay,
 electrons try yet jump. Charge no never
 go. You think you not—you think just.

EDGAR FELIX,
 528 Riverside Drive,
 New York.

Mister Radio Secretary
 The Headquarters
 At Connecticut

Egyptian radio am me all same for rail-
 road and war and me want race for Japan-
 ese ask to know condenser electricity where
 goes if blow its air by breath way me
 say yes sure away away blow but not elec-
 tricity charge of condenser dielectric all
 same blow no certification not cause
 given good books why condenser charge
 he lives by the space and him is
 ions what you call english words so
 no man him blow he breath away space
 impossibly so all same now you send me
 five dollars if you please from

respectfully

MURAD BEY ALLID,
 Egyptian Radio Operator.

Count Murad Bey Allid neglected to give
 his address. The Count is evidently quite
 a radio expert.

A SERIOUS ANSWER TO K. K.

By E. E. House, Battlecreek, Mich.

In speaking of a condenser, the dielectric
 is a very important factor, but no more so
 than the metal plates which are the other
 part of this instrument. Yes, under cer-
 tain circumstances, the dielectric of a con-
 denser is very hard pressed, even to the
 point of puncture after which a condenser
 is useless.

If the dielectric is glass, the pressure on
 the glass is equal to the applied voltage, the
 area of the surface receiving the charge,
 and the time of charging. Using 20,000
 volts as a unit and applied to a small con-
 denser, we find this voltage in the normal
 air pressure of 15 pounds per square inch
 will break down the air between two points
 which are the opposite sides of potential,
 and one inch apart.

If the 20,000 volts are applied to a small
 condenser, and a gap of one inch is placed
 across the same, we find the condenser will
 charge and discharge several hundred times
 per second. Taking the pressure from a
 60 cycle or 120 frequency per second, it
 will discharge several times per period.
 Open up the gap and the discharge will be
 less frequent, while the condenser voltage
 will run up to about thirty thousand. The
 discharge will be prominent of the 120
 frequency of the applied power. Then close
 gap to one-half inch and the discharge
 will increase to several hundred thousand
 and just hiss.

This condition, of changes in the dis-
 charge frequency, may be developed by
 changing the area of the condenser. Mak-
 ing the condenser large requires a longer
 period to charge and a less frequent dis-
 charge will be the result. It is possible to
 make a condenser so large that it will ab-
 sorb practically all of the applied E. M. F.

The thickness of the dielectric, for a
 given pressure depends on its insulating
 quality. Mica and glass rank high, while
 air is low. The thickness of the dielectric
 also depends on the area of the condenser,
 the time of charging, and discharging in
 proportion to the applied potential.

Yes, air can be used as a dielectric, but
 is of little value in its natural condition.
 By pumping air into a tank which holds the
 condenser plates, we can use it as a dielec-
 tric, because its insulating qualities in-
 crease with pressure. Arlington uses con-
 densers insulated by air at 250 pounds
 pressure per square inch. If I am not mis-
 taken, a potential of 18,000 volts is applied

to this condenser.

The insulating qualities of air are reduced by heating of the condenser plates and by reductions in the air pressure. If the plates are put in a vacuum, there is practically no dielectric between them.

In speaking of the vanishing metal, I think Kathis Kathkan referred to the light tinfoil in a condenser which is sometimes eaten away by the brushing of too high a voltage. Copper, brass, or aluminum will not eat away like the foil.

P. S. The typewriter is used by Americans because it is considered a much neater form of letter writing. Most men are not good penmen when in a hurry, so the typewriter is much faster than handwriting. I may also add that the hand writing of different men shows much of the character of the man and this is objectionable in some lines of business.

MR. ALLEN'S SOLUTION OF KATHKAN'S PROBLEM.

When a condenser is charged, one set of plates is charged positively and the other negatively. This fact gives rise to a tendency for a spark to pass between the plates and thus equalize the charge. The dielectric, however, prohibits the passage of a spark. Hence, there is a great pressure or stress on the dielectric.

Contrary to general opinion, the seat of the charge of a condenser is not in the

plates. It is in the dielectric. This fact may be shown by the following experiment:

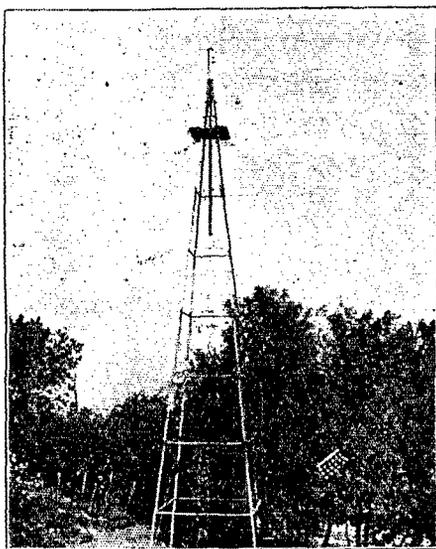
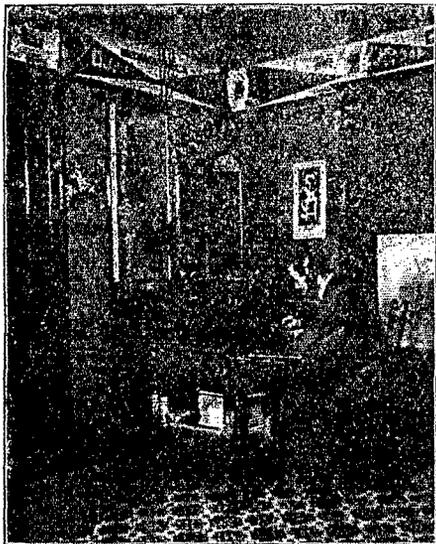
Charge a Leyden jar, made with movable coatings, and set it on an insulating stand. Lift out the inner coating and then, taking the top of the glass vessel in one hand, remove the outer coating with the other. Test the coatings with an electro-scope and no charge will be found. Bring the glass vessel near a pile of pith-balls. They will be attracted to it, showing that the glass is electrified. Now build up the Leyden jar by putting the parts together. The jar may be discharged in the usual manner. This experiment shows conclusively that the seat of charge is in the dielectric. The same is true of any dielectric whether glass, mica, air, oil or paper. All dielectrics act similarly and so they are all subjected to a stress whenever a condenser is charged.

It would be impossible "to vanish" the air from a variable air dielectric condenser by blowing through it. Hence, there will always be some dielectric present. Since the dielectric contains the charge it is evident that the condenser will remain charged. If the condenser were placed in a vacuum, somewhat different results would take place, but it would require too much valuable space to explain these.

EDWIN B. ALLEN,

Westerly, R. I.

STATION AND POLE OF MR. P. W. PATCH, DUBUQUE, IA.



In this aerial pole, Mr. Patch has a structure which has defied a great many winds. At present, as shown in the picture, the top section of the pole and the aerial itself are lowered for repairs.



TWO very practical operating articles are "Practical Relaying" and "Apparatus Arrangement" to which we give prominent space in this issue. Every amateur, whether in the League or not, should read them. In Mr. Maxim's suggestion, we have what seems to be a practical working method of maintaining a constant communication. That this is an absolute necessity has been demonstrated clearly during the past year. Messages from points in the Middle West and destined for points on the Atlantic Coast, are frequently delayed as much as two weeks, principally because of the fact that some entirely new stations had to be depended upon. By new, we mean stations which had never previously worked each other. It is true that this delay did not always occur, but nevertheless, it is probably safe to say that the only messages which were not delayed were those which happened to call for transmission between stations which had by accident come to be acquainted with each other.

If a fixed set of trunk lines were laid down and those on these lines kept at it until they could run a test message out to the end of the line and back at certain stated times, it would mean that delayed messages would be enormously reduced.

For the good of the cause, it distinctly is up to those amateurs who are any where nearly along the different lines which have been laid out, to send in their names, addresses and call letters immediately and state what line or lines they believe they could be a part of. As soon as these are in, the Directors could appoint District Headquarters and each of these District Headquarters would then take up the organization of their respective trunk lines. It certainly looks to be a good scheme and let everybody come along and help. Never mind whether you are in the League or not, if you have a good station and want to enjoy the full pleasure of wireless and want to be up at the front, send in your name and give as much information as you think will be of value.

And don't put this off. Attend to it right away and before the season is over, may be we can handle some big public message from Washington to the Coast and back.

EDITORIAL.

"Apparatus Arrangement," in this issue, hits most of us pretty hard. From our experience, some ninety per cent. of the amateurs of the country feel that their equipment has several bad spots in it which they know should be improved in order to obtain the sending and receiving ranges which they ought to have. For some reason or other, these weak spots are allowed to go, and something big usually has to happen before enough excitement can be worked up to get at the job of fixing things up. What is said in "Apparatus Arrangement" may be just what is needed to give the inspiration to a lot of us to get busy and fix the insulation on that lead in, or get better ground connections, or lift that aerial that additional fifteen feet which it ought to have.

This number of QST certainly indicates the big possibilities which our American Radio Relay League has within it. The remarkable distances which some stations can easily make, and the very practical plan suggested for running proof tests on regular trunk lines, all indicate the fast approaching importance of a Relay League. There is one point, however, which is not touched upon by any of these able writers, but which the over-worked management of the League struggle with continually. This is the question of MONEY.

It costs money to handle a big correspondence and keep it properly filed, buy supplies, pay for printing and postage stamps. Without this money, the best scheme in the world for establishing trunk lines, running proof tests, advising regarding apparatus arrangement, and organizing District Headquarters, all get no farther than appearing on a printed page. To raise the money to get them off the printed page and into the realm of actual performance, and at the same time avoid all criticism for graft is some job. Up to the present time, the financial resources have been limited to the sale of the List of Stations book, and the Station Appointment Certificate. The sale of these has not made it difficult to invest the income, to say the least. QST is hoped to help in this matter by serving to carry the word along, and it is hoped that it will be successful. With this issue, three

numbers have been printed and distributed very widely without cost, so that the earnest effort could be demonstrated. Somebody has told us that QST will only serve to plunge us still further in debt since the amateurs of the country will not support anything. We do not believe it, however, and have bet the cost of printing for four issues, that by the time these four issues are out, the amateurs will have come forward and ordered enough List of Stations books, Appointed Certificates and subscriptions to QST, and that the manufacturers of wireless goods will also have co-operated by advertising.

Success is assured if there is enough of this come forward business. Have you done your coming forward?

VIOLATIONS OF RADIO LAW.

An indication of what may be expected if amateurs persist in operating a sending set without first taking out a Government license, or if a wave length in excess of 200 meters is used without Special License, the following actions taken on the Pacific Coast are of great interest:—

Each of these amateurs has been referred to the United States District Attorney for

prosecution.

Hadys Hancock, Venice Pier, Venice, Calif. was found to be using a wave length in excess of 200 meters. Maximum penalty \$100.

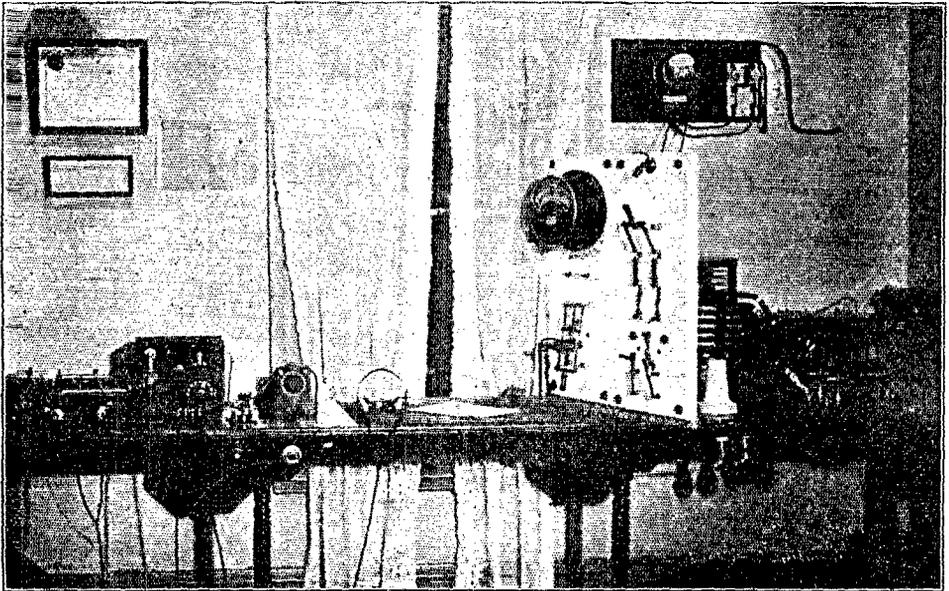
Richard White, 435 Oakland Ave., Pasadena, Cal. operating an amateur station without a license and using improper call letters; maximum penalty, \$100 fine and imprisonment for not more than two months.

Ernest Underwood, 903 Commercial St., Inglewood, Cal., using a wave length in excess of 200 meters; maximum penalty, \$100.

George Vodra, 211 South Avenue, Los Angeles, Cal., using an amateur sending station without either station or operator's license; maximum penalty, \$100 and imprisonment for not more than two months.

Stuart Dalton, 121 E. Twenty-third St., Los Angeles, Cal., using a wave length exceeding 200 meters; penalty, \$100.

Harry Blodgett, 1953 Bonsallo Ave., Los Angeles, Cal., using a transmitting station for some time without station or operator's license; maximum penalty, \$100 fine and imprisonment for two months.



A Very Neat Station.

This shows how extremely neat a radio station may be arranged. Mr. Kleindienst of Webster, Mass. has spared no pains to make his station an efficient one. It is one of the neatest arrangements the Editor has ever seen. We are looking forward to the time when we will have more stations of this type. Everything about the station has a "man-size look" and is done in a "Man-size" way. Take some suggestions from this picture.

RADIO COMMUNICATIONS BY THE AMATEURS

183 Drake Ave.,
New Rochelle, N. Y.

Mr. Hiram Percy Maxim.

Dear Mr. Maxim:

After our telephone conversation last evening I received the message from Davenport, Iowa, just as you relayed it. I got your signals very strong and clear and as you proceeded they even increased in intensity.

As the test you sent out by wireless differed slightly from that I got over the phone I used the wired text and retransmitted it at 12.22 A. M.

There was a lull in local QRM here just after midnight and I was very pleasantly surprised at the intensity of your work. I got an acknowledgement at 1.15 from WHB, the N. Y. Herald, of receipt of the message and I asked him QSA? He came back with a QSA very, and the Brooklyn Navy Yard also told me my spark was very heavy, so I trust it carried well at a distance.

The Herald had a pleasant little notice in today's issue about the test and I have also delivered mag. to The Mayor here.

Most of the local amateurs kept out nicely, but there were three stations, 2SO, 2GJ, 2NG, that kept jamming me from eleven ten, also later 2PV, (about 11.55 to 12.05) held his key down continuously. Altogether these stations broke things so that I was unable to get only very small snatches of the relay mag. until you came in strong at 12.16.

I have recently worked many 8 stations, every time I attempted it, such as:—SYC, 8GT, 8ZO, 8ER, 8AEZ, 8XA and 3HH and 1ZL in about an hour, 10.30 to 11.30 one evening.

I get 1ZL very well indeed, but at present his spark is a little uncertain, strong one minute and fades the next, but I get him strong part of the time every evening.

With sincere wishes for a prosperous year for "QST," the Relay League and Seasonable greeting to yourself,

Cordially yours,

(Signed) GEO. C. CANNON,

Dear Mr. Maxim:

Just a line to let you know I got through to Washington, D. C. direct. My relay received by 3DS and he deliver about 1.00 A. M. January 1st, as specified. My spark must have been working well that night for he got me on Galena; "Clear, musical,

strong, rotary."

I think you will be glad to know the above. Article about it published in the Washington Herald, morning of January 1st. I have written to Mr. Kirwan.

Yours hastily,

(Sgd.) GEO. C. CANNON.

Editor's note: This means that the message relayed from Hartford, Conn., at 12.15 A. M. went through to Washington, D. C., by a single relay at New Rochelle, N. Y., and was delivered in Washington at 1.00 A. M., a good example of what can be done.

Philadelphia, Pa.

January 1, 1916.

American Radio Relay League,
Hartford, Conn.

Gentlemen:

I wish to acknowledge receipt of the December and January issues of your valued publication and desire to thank you for the same.

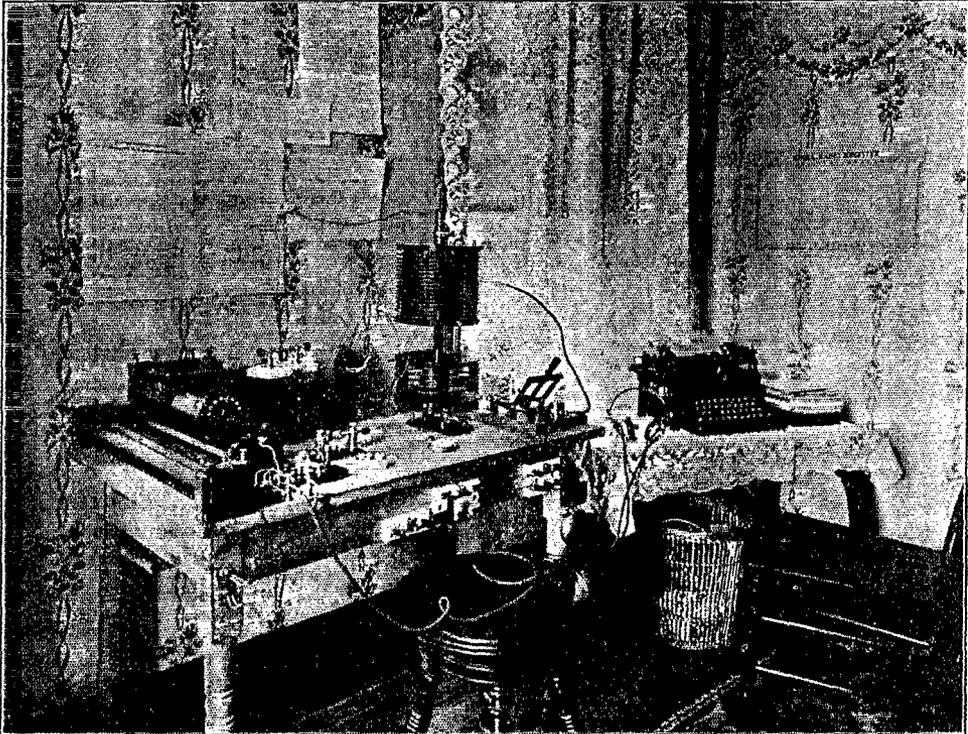
In these days when scientific plagiarism seems to be so much in vogue and our leading publications are filled with contentions and disputes regarding the priority of development of radio apparatus, it is somewhat of a relief to be able to turn to your modest publication and read some accounts of real sympathetic work. The fact that some people who are now enjoying notoriety in radio engineering circles, have not yet realized the extreme detrimental effect on the art and development of radio science, of jealousy and opposition, seems to indicate that in spite of their superior technical ability, they have not yet acquired the common-sense philosophy of the ordinary amateur. The key-note of this philosophy as evinced by the articles and contributions to "QST" seems to be "HANG TOGETHER." It is an old adage which said that opposition never got anywhere.

In reference to the matter of binding the amateurs into an integral body in the form of a national organization, it seems to me that the AMERICAN RADIO RELAY LEAGUE has the right ideals and is in a fair way to attain them. The attitude of the men at the head of this project is very evident and may be somewhat paradoxically described as disinterestedly sincere. Disinterested, in the sense that they are seeking no financial gain and sincere regarding their purpose.

As in all other pursuits, there are fakirs in the wireless business, and every now and then, we may expect to hear of a new amateur organization being started. Quite a number have been advertised in my limited experience, but their career was short because they lacked these two fundamentals principles. We can readily understand why a wireless corporation or a business house should endeavor to engage the attention of the amateur field and frequently attain results from an unsuspecting few, but in general their career may

could only get into the spirit of the thing and place their barriers of reserve against a few other of these widely advertised "gold bricks," we might all be better off radiographically as well as financially.

In conclusion, I might add that in my eight years of experience, this is the first hopeful sight on the horizon, and I hope and have every reason to believe that it will not be a disappointment. We must also bear in mind the possibility of Congress doing some unannounced legislating



3 AEP.

3 AEP has a very efficient station. The extremely large coupling shows that Mr. Rau has a sharp wave and does not interfere. Despite the fact that such a large coupling is used, the sending range is eighteen miles. Can you do as well?

be likened to that of a damped oscillation—a big splash and it's all over.

My impressions of the LEAGUE warrant me in believing from its steady growth that neither Mr. Maxim or any other of the Officers are selling anything or have anything in mind except the building up of an efficient relay association, and in spite of a conservatism produced by noting the careers of other projects, I think they deserve the hearty support of every sincere amateur in the country. If the amateurs

in radio matters, and as our first great electrician, Benjamin Franklin, said, "We had better hang together or we shall all hang separately." This applies to telegraphy as well as conspiracy.

Wishing the AMERICAN RADIO RELAY LEAGUE and its "QST" greatest success, I am

Very truly yours,

(Sgd.) CHAS. L. BALLENTINE.

4810 Germantown Avenue,
Philadelphia, Pa.

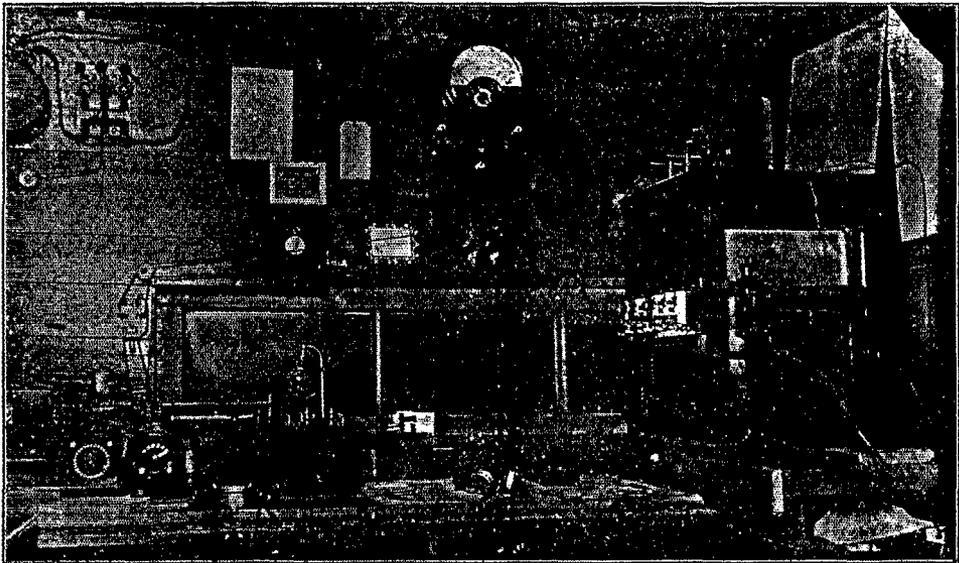
This letter of Mr. Ballentine expresses beyond comment the feeling of the Officers of THE AMERICAN RADIO RELAY LEAGUE. The policy of the LEAGUE has never been brought forth more clearly. A FREAK.

Mr. G. E. Chamberlain of Sawtelle, Cal. has sent us in a little data about "A Radio Ghost." He copied WMI very well all the way down the Pacific Coast and up to 2,080 miles south. She was disabled and after having returned to within seven hundred miles, came in very loud one evening. In fact, almost as loud as most of the boats' clearance to KPJ.

where in southern California in the fall of 1916.

Long before the dissolution of the United Wireless Company I operated the station "WA" and "NY" under supervision of the operators in charge; two summers train wire work on the Pennsylvania Railroad, and about eight years of operating amateur stations. My stations have always been in Yonkers, N. Y. Last winter my call was 2ABG. The apparatus contained in this station was a 1KW Hytone, quenched rotary type and with it I was able on one occasion "to raise" Kane, Pa., and Wheeling, W. VA. However, my aerial was inadequate and better work should have been done.

I enclose \$25 which I hope will be ac-



Radio Station of Ralph Batcher, Toldeo, Ia.

This is a photograph of a LEAGUE station which has done some remarkable long distance work. The most prominent thing in Mr. Batcher's station is his condenser. Notice how thoroughly he has arranged it.

"At 9.20 P. M. 'WMI' was coming as loud as 'KPH.' At 9.22 P. M. 'WMI' had faded entirely. I could not hear her and neither could 'KPJ.' This may sound like a common occurrence, the way I put it, but I have heard 'ghosts' but never one like this."

Can anyone explain this?

2024 Canyon Drive,
Hollywood, Cal.
Dec. 30, 1915.

American Radio Relay League, Inc.,
Hartford, Conn.
Gentlemen:

I wish to enter my name for consideration to the officers of the LEAGUE pending the erection of an A1 station some-

cepted by the Officers in the spirit in which it is given—in hearty support of an organization which I wish had been founded years ago.

Yours very truly,
(Signed) C. R. RUNYON, JR.

This contribution of Mr. Runyon is one of the things which occasionally arise and show the Officers of the LEAGUE there is some one who sufficiently appreciates their honest efforts. The Officers cannot thank the donor in words. It is a gift which can only be accepted and thanked in spirit. When the President and Secretary realize that someone thinks so highly of the organization, it makes them feel that their efforts have not been in vain.

Mr. William A. Nash of Biddeford, Me., writes to us that the article "Pictured Electro-magnetic Waves" in the December issue of "QST" is not exactly clear to him. He asks these questions:

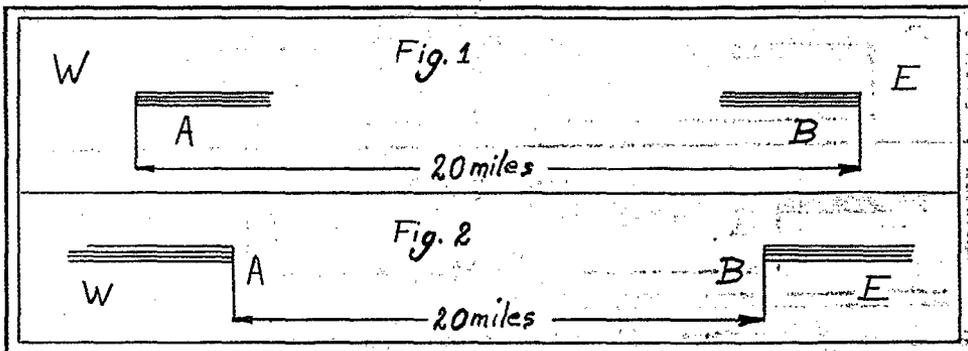
1. What is meant by having the lead at the higher end of the aerial?

2. As shown in the sketch, which is the more efficient arrangement, Fig. 1 or Fig. 2?

3. Just when are the signals received strongest between two stations? When the aerials are pointed toward each other or away from each other?

4. In sketch No. 1 aerial B transmitting, are the stronger signals toward the east or west?

Ans. 1. If in the aerial proper, one end is higher than the other and the lead-in is connected to either end, we speak of the lead as being connected to either the high or low end, as the case may be.



Ans. 2. With A and B communicating the arrangement shown in Fig. 2 would be the more efficient.

Ans. 3. The signals will be stronger in case two. This is purely a theoretical case; in practice trees, houses, telephone lines, and all objects would affect the waves. Even in theory the difference might not be very marked, perhaps three or four percent, depending upon the conditions.

Ans. 4. In Fig. 1 B transmitting the signals are stronger toward the East. E-East. W-West.

Columbus, Ga.

Dec. 6, 1915.

Mr. Hiram Percy Maxim, Chairman,
American Radio Relay League,
Hartford, Conn.

Dear Sir:

I have just received the December issue of "QST" de The American Radio Relay League and wish to thank you for same—being very much interested in wireless as an amateur am naturally interested in what this publication contains.

Up to October first I had a small station and had been working on the various parts necessary to the construction of a one Kw. stations, however, on that date I moved my residence and am now living next door to the telephone exchange in this city. My move put me out of business from a wireless standpoint. The Telephone Company has continuously running a small rotary converter, 1/4 H.P., 16 cycle, 80 volt, for the purpose of converting the city's 110 volt lighting current into their direct ringing current.

In my previous location (about a block from the exchange) I could hear this machine but not loud enough to annoy me seriously; however, since moving next door am unable to drown out or tune out the loud singing noise made in my receivers by this machine, and for this reason have had to abandon my wireless altogether.

Can you suggest a remedy, by which I might get rid of this singing noise without

getting rid of everything else, and get back into the amateur wireless field?

Any suggestions will be very much appreciated by,

Yours very truly,
(Sgd.) S. G. BRANNON,

Here's Something Which Interests Everyone
Stop the False Signaling

Philadelphia, Pa.

Dec. 17, 1915.

Mr. C. D. Tuska,
Hartford, Conn.

Dear Sir:

Enclosed please find 25 cents for "QST" as per December issue.

In answer to K. Kathkan's query permit me to say that it has been suggested that Mr. K. being a Japanese has no business to ask such a question that upsets the laws of our society.

Have enclosed application blank for A. R. R. L.

May I suggest that it be obligatory on the part of special license stations to have

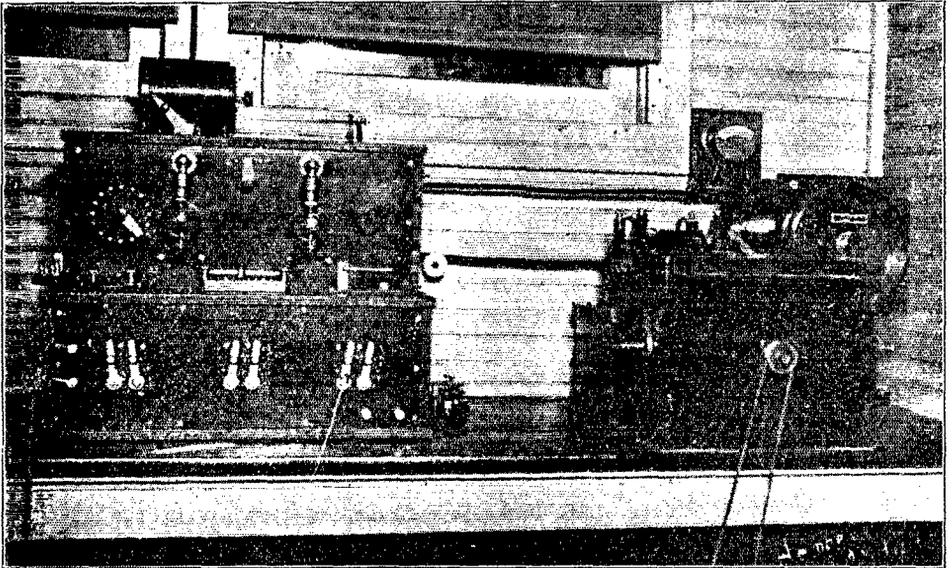
some definite hours i.e. same as the commercial or public service. Have this time specified as one hour or any other number but adhere to it.

Under suggestions I refer to false signs. On Nov. 26th I copied 8WO and 8JD perfectly for long time. However, both deny knowing of the other's existence or working with each other. Something fishy here. I had excellent receiving and thought the work genuine at first. I did do good work that night and have verified some. But the

false signing is the bane of our crowd. Many refuse to try to do what I know they can do because they don't want to be fooled.

Yours very truly,
(Sgd.) LLOYD M. KNOLL,
Central High School.

Editor's Note: The amateurs should realize how serious a matter it is to send false signals. Several amateurs on the Pacific coast have been punished by the Federal authorities for violations of the law.



A Western Station.

Mr. W. C. Reinhardt of Omaha, Neb., has sent us a photo of his station. There are no stray wires and everything is neatly arranged. The rotary gap is built in a box and run by a belt drive. This rotary is not as noisy as some. Is your station as well equipped?

PROGRESS.

'Twas just two years ago today
Since it rained and stormed a fright;
The dam gave way and water
Rushed through the town all night.

Next day the phone was on the hog,
I went down town to wire,
But telegraph was just as bad,
And a horse I had to hire.

My business was rushing
And my wife was waiting lunch,
But it seems as though our trouble
Comes a floating in a bunch.

Three miles from town I halted
For the river bridge was down;
I couldn't swim a doggone stroke,
And I wasn't keen to drown.

The horse went lame and had to stop,—
I hoofed it back to town;
I was so tired I didn't know
If my name was Smith or Brown.

But now our business doesn't fail
If any kind of pest
Comes floating 'round,—Say! I'm surprised
How our little town's progressed.

There's a little house out on the hill,—
Now let the phone line bust,—
We go out to the little house—
'Taint a syndicate nor trust.

Now we don't have to wade through mud,—
We hire our new colleague,
For he's a member of our great
American Radio Relay League.

(G. E. Chamberlain).

Latest List of Additions to American Radio Relay League Stations

CALIFORNIA

Acampo	Paul Nesbit		6PN
Alhambra	Forrest Wallace	120 S. Monterey St.	6VV
Bakersfield	Lindley Winsler	200 22nd St.	6VZ
Los Angeles	A. L. McFern	1652 Berendo St.	6TO
Los Angeles	Herbert Turner	1703 So. Berendo St.	6ABR
Monterey	Harry A. Greene, Jr.	313 Lighthouse Ave.	6GC
San Francisco	Clyde Hemenway	1407 Vermont St.	6AAB
San Francisco	Edw. M. Sargent	2235 Lake St.	6SC
San Jose	Elmer C. Lundy	592 N. 17th St.	6CY
San Rafael	Wm. A. Strong	695 Petaluma Ave.	6WG

CONNECTICUT

Hartford	Fobian E. Johnson	34 Forest St.	1FJ
Stamford	Verner Hendrickson	38 Maple Ave.	FO

DELAWARE

Georgetown	Dr. Page P. A. Chesser		3AHP
Wilmington	LaFrantz Jones	923 French St.	3NP
Wilmington	Howard Phillips	121 Monroe St.	3AIL

DISTRICT OF COLUMBIA

Washington	M. G. Mastin	1438 Meridian Pl. N.W.	3AIV
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ILLINOIS

Chicago	Gustav Lov	3746 Giddings St.	9CH
Chicago	Charles Miller, Jr.	2856 N. Racine Ave.	CM
Glencoe	Jirah D. Cole, Jr.	810 Vernon Ave.	9IF
Mattoon	L. A. Kern	3208 Western Ave.	9GY

INDIANA

Anderson	Herbert D. Norviel	521 Jackson St.	9RK
Indianapolis	James M. Sommer	2338 N. Talbott Ave.	9JI

IOWA

Davenport	Wm. H. Kirwan	Box 374	9XE
Des Moines	Gerald Jewett	2105 High St.	9QR
Des Moines	Cummins Rawson	2105 High St.	9QR
Marengo	Peter A. Stover	Box 106	9LP

KANSAS

Topeka	Safford D. Thacher	310 Polk St.	9QV
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MASSACHUSETTS

Chelsea	Albert E. Snow	30 Cary Ave.	1JF
Lynn	C. M. MacLeod	11 St. Stephen's Ct.	1RE
Lynn	Cecil Arthur Tucker	21 Church St.	1TA
Lynn	Gustave A. F. Werner	73 Hollingsworth St.	1PH
Medford	Ed. E. Farmer	15 Catting St.	1JT
Newton	E. E. Hayward, Jr.	4 Pembroke St.	1SZ
Somerville	Malcolm P. Bergmann	50 Jaques St.	1HO
Wakefield	George W. Butterfield	14 Birch Hill Ave.	1IR
Webster	Alfred F. Kleindienst	Turn Hall	KZ

MAINE

Houlton	H. B. McIntyre	65 Court St.	1FH
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MISSOURI

St. Louis	Otto Meyer	1109 St. Clair Ave.	9QZ
St. Louis	Charles H. Sparks	5431 Bartmer St.	9LT
St. Louis	Robert C. Sparks	5431 Bartmer St.	9LT
St. Louis			

MONTANA

Bozeman	Earl Dawes		7ED
Bozeman	Harold P. Sheard	Y. M. C. A.	HS

NEVADA

Carson City	Harold H. Vonderhill	211 S. Carson St.	6VN
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NEW JERSEY

Anglesea	Thomas W. Braidwood	205 New Jersey Ave.	3UZ
Keyport	Gifford H. Poling	Beerst	2ACC
New Brunswick	F. R. Shield	23 Second Ave.	2CG
Upper Montclair	James K. Gannon	517 Park St.	2UP

NEW YORK

Brooklyn	Charles A. Porter	1700 Ditmas Ave.	2RJ
Elmira	Joel Young	717 West Gray St.	8ALK
Middletown	L. Mortimer Hulse	9 James St.	2ABT
Monticello	Harold I. Stecher	15 Bedford Ave.	8DY
New Rochelle	Etienne S. Donovan	255 Circuit Rd.	2ML
New York City	R. B. Austrian	49 St. Nicholas Ter.	2NW
New York City	A. S. deCalahorra	146 West 65th St.	2ACJ
Pelham	S. E. G. Rupert	107 6th Ave.	2AHT
Rochester	Elmer Koepke	26 Joseph Ave.	8AJM
Schenectady	C. F. Oudin	7 Union St.	2AFT
Troy	E. M. Williams	1627 Seventh Ave.	2AGN
Rochester	Conway L. Todd	62 Berkeley St.	8ADE

OHIO

Columbus	H. F. Grosse	346 Germania St.	8ABM
Columbus	Wm. F. Justus	273 S. Monroe Ave.	8AKV
Cleveland	Martin Rich	2259 E. 85th St.	8TJ
Hamilton	Robert J. Dougherty	628 Main St.	8FM
Ironton	H. Herman Staab	217 N. 4th St.	8ACT
Marion	R. Wolfinger	716 S. State St.	8AHM
Steubenville	B. F. Collins, M. D.	152 N. Fourth St.	8IM
Xenia	W. Lyon Galloway	110 W. Main St.	8AEM

OREGON

Falls City	Eugene Starr		7RS
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PENNSYLVANIA

Bellevue	W. H. Hoobler	Lincoln Ave.	BRC
Bristol	Lewis T. Dunbar	R. F. D. No. 1	3LT
Bristol	Ralph B. Scheffey	346 Lafayette St.	3EW
Edgewood Park	John B. Coleman	328 Locust St.	8FG
Grove City	Lot Alexander	537 Center St.	8ALE
Grove City	Hodge Alexander	537 Center St.	8ALE
Grove City	Herbert F. Harmon	418 Poplar St.	CO
New Castle	Wm. R. Fullwood	1017 Pollock Ave.	8AV
Philadelphia	Rodney Beck	4833 Pulaski Ave.	3AGI
Philadelphia	Lloyd M. Knoll	3260 Chestnut St.	3IQ
Philadelphia	L. M. Markham	5108 Baltimore Ave.	3MH
Philadelphia	Robt. Williamson	Pulaski Ave.	3AGF
Pittsburgh	A. R. Altman	6710 Hudson Place	8RN
Pittsburgh	George C. Calvert	5309 Ellsworth Ave.	8VR
Pittsburgh	Louis Schlesinger	1842 Centre Ave.	8AFA
Pittsburgh	Paul B. Sutton	302 Zara St.	8GB
Pittsburgh	Wm. K. Thomas	400 Minton St.	8DE
Pittsburgh	B. P. Williams	2321 Perrysville Ave.	8IL

UTAH

Murray	Russell Moebius	63 North St.	6RC
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VERMONT

Franklin	Paul Hayden Gates		1BF
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WASHINGTON

Seattle	H. R. Andrews	2105 45th Ave.	7HA
Tacoma	Richard H. Graff	714 N. D.	7MG
Tacoma	Jack Keyes	1004 No. K. St.	7JC

WEST VIRGINIA

Martinsburg	H. E. Burns	113 W. John St.	8AGH
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WISCONSIN

Bayfield	Gerald T. Andreas		9MB
Ellsworth	Orville R. Tomann	108 Chestnut St.	9EB
Milwaukee	Grant Diehl, Jr.	699 27th St.	9UD
Sheboygan	Albert Korthals	1607 N. 13th St.	9PA

"SELECT WIRELESS APPARATUS,"

the new booklet just issued by C. Brandes, Inc., 32 Union Square, New York, covers the installation and selection of wireless apparatus in a very readable and helpful manner. The beginner will find complete instructions for constructing a station and

the advanced amateur will find many hints on how to increase the efficiency of his apparatus. This is one of those desirable booklets that give much information in a very few pages. Booklet will be mailed to anyone sending 4c in stamps to Room 822.

Exchange, For Sale and Wanted

"Second Hand Apparatus"

In order to facilitate the exchange and sale of second hand apparatus, "QST" will print, free of charge, want and for sale ads. up to a reasonable number of words. The publishers reserve the right to withhold any ad. which is against the policy of this department

FOR SALE: Amplifier panel set, detector and two steps, equipped with modern amplifying transformers and special bulbs. Quartered oak cabinet with fine finish, 18" x 12" x 8" deep, Bakelite front 16" x 10". All conveniences, phone jacks, provision for Armstrong inductances. Photos on request. Woodcock, 496 West Ferry St., Buffalo, N. Y.

WANTED: Splitdorff coil in exchange for helix in perfect condition wound with 24' of copper wire, extra large size Magic Lantern with over 100 pictures or No. 2 Brownie camera in perfect working order but showing signs of use. Will either give one or all of the above articles in exchange, according to condition of coil. E. B. White, Lincolnville Ave., Belfast, Me.

WANTED: Variable cond. Audion Detector or type AA Crystaloi Detector. Sydney Rosenthal, 116 E. Tupper St., Buffalo, N. Y.

FOR SALE: 2 new DeForest audions. Lawrence W. Porter of 104 Greenridge Ave., White Plains, N. Y.

FOR SALE: 8-60 storage battery with 2 lugs to each cell, \$10.00. Receiving set consisting of loose-coupler, variable condenser, detector, fixed condenser, 15" loading coil, shunt, in a mahogany finished cabinet 12" x 20" x 9" when closed; like small suit case with handle on side, \$12.50— $\frac{1}{4}$ Kw. new Winger Transformer, \$10.00. First class articles in every way. W. Slifer, 6th below Rockland St., Philadelphia, Pa. 3WK or Bell phone.

FOR SALE OR EXCHANGE: Good as new, 2000 Ohm head-set; one 1-inch and one $\frac{1}{2}$ -inch spark coil; 1 K. W. Oscillation Transformer mounted in wood fibre (home made) triple pole, double throw quick action Aerial Switch; also buzzers, switches and accessories. Can use old Audion bulb or variable Condensers, Blitzen preferred. Write me what you need. Paul W. Hare, Fredericktown, Ohio.

FOR SALE OR EXCHANGE: Pair of E. I. Co.'s 2000 ohm receivers for a good variable, 43 plate type: 60 ft. of copper ribbon $\frac{3}{4}$ " x $\frac{1}{64}$ ", valued at 4c. a ft.; 9 glass plates 18" x 18" x $\frac{3}{32}$ " with foil: brass switch points, lacquered, $\frac{1}{4}$ " x $\frac{1}{4}$ " with 8-32 thread, fine for rotary gaps. Frederick Gamble, 2412 Putnam St., Toledo, Ohio.

FOR SALE: Entire sending set including one-half Kw. Blitzen transformer, one-half Kw. condenser, \$5.00 key, oscillation transformer, Murdock type, Murdock rotary gap, \$45.00. First good offer takes all. F. Lamb, 623 Elmer St., Vineland, N. J.

FOR SALE AND WANTED: Audion Grid and Plate suitable for exchange. Three coils, silk wire, tapped suitable for oscillating audion or as loading tune up to 16,000 metres. Make offers. Any reputable make of navy type tuner, no sliders. State condition and lowest price. Will buy Multi-Audi-Phone. Name price. Or make exchange and cash for above. Edgar Felix, 528 Riverside Drive, New York

FOR SALE OR EXCHANGE: One inch spark coil. First class home-made plate glass condenser for a two-inch coil; one pair Brandes 2000 ohm phones (superior); one pair Murdock solid receivers 2000 ohms each with head band and good home made loose coupler and perikon detector. Wm. Waite, 2907 Fairhill, Philadelphia, Pa.

FOR SALE: The best text book of wireless telegraphy. Written by Dr. Zenneck. The book is noted for its wonderful illustrations and is an authority on the subject. The Officers of the League can recommend no better book. Price, \$4.00. The Secretary AMERICAN RADIO RELAY LEAGUE, Hartford, Conn.

FOR SALE: I have for sale one 1/20th H.P. Emerson Induction motor, 1760 R.P.M. Operates on 110-60 cycles. Is in first-class condition; has just been overhauled, and looks like new. Will sell for reasonable price. Geo. B. Ruddell, 721 Main Street, Hartford, Conn.

MISCELLANEOUS**Growth of League**

Since the publication of "QST," there has been a most wonderful growth in the AMERICAN RADIO RELAY LEAGUE. Hundreds of stations were added during the last two months and many stations are waiting to be listed. The membership is now 961. We have already started to list these names in a new call book. If you have any corrections to make or want to get your name on the list, write to the Secretary today.

CORRESPONDENCE

Along with the rapid growth came a flood of correspondence. The Secretary is overwhelmed. No sooner does he make an impression on his pile of letters than another flood comes in. He makes a special request that the members bear in mind their orders and inquiries will be attended to as promptly as possible. If your letter is delayed three or four days, don't get impatient; realize there are hundreds of others in the same position. Steps are being taken to increase the office force and in a few days everything will be running smoothly. All this costs money and we call your attention to the notice on another page.

CENTRAL RADIO ASSOCIATION OF CONNECTICUT RECENTLY FORMED.

This club was formed in Nov., 1915, and is growing rapidly, having at present fifteen members. The officers are: Harry H. Hicks, President; Philip A. Bailey, Vice-President; Arthur Johnson, secretary and Treasurer; Robert Quirk, Assistant Secretary and Treasurer. The club will install a sounding board so that members who are



not very well acquainted with the code can learn by "listening in." At every meeting they give readings and lectures with the aid of a stereopticon lantern. One of their members made the club seal which is shown above. We expect big things from this Association in the near future.

YOU WILL FIND

the audion detector in the best amateur wireless stations.

A combination audion detector and amplifier set will assure you of results which are impossible with any other detector. It's superiority over anything else to be had is easily proven to your own satisfaction, and it's extreme sensitiveness will delight you. There is great satisfaction in knowing that each time you are through transmitting you will hear the distant station with the same intensity — by merely moving a switch.

We have a booklet which explains the audion amplifiers which we would like to send you. If you will send us your name and address we will forward a copy to you at once.

We carry in stock at all times a complete line of audion detectors; renewal bulbs, etc., and can usually make shipments the same day your order is received.

We manufacture many other good instruments, and full information and literature will be sent anyone upon request.

The Wireless Mfg. Co. - Canton, Ohio

General Notice!

To the Licensed Amateurs of the U. S.

HEADQUARTERS:

Hartford, Conn., Jan. 24th, 1916.

On the first of December, the League membership numbered 635. On the tenth of January, it numbered 961. This indicates the favorable attitude of the amateurs of the country toward an operating organization for relay work and for the mutual distribution of information. If this interest continues to grow, we can count upon being able to number ourselves among the strong organizations of the country.

The amateurs of the country by this time are probably confident that the officers in charge of the American Radio Relay League are sincere in their efforts to make the transmitting of long distance amateur messages by relay a success, and that there is no money making scheme connected with the matter in any way. Hundreds of letters received since "QST" has been published indicate this very clearly. Unfortunately, however, it requires money in addition to hard work in order to answer the large correspondence from a membership of nearly one thousand and as many more amateurs who are not in the League, but want to enter. This money can only be obtained through voluntary subscriptions, of which there have been several, and the sale of STATION APPOINTMENT CERTIFICATES, LIST OF STATIONS BOOK, and QST MAGAZINE. We have no other source of income, and the success of our organization depends upon all of us coming forward and buying these three things. Every amateur should understand this, and do his share, both by ordering himself and also exerting his influence to see that his friends who are interested in wireless do the same.

It is not as though the three things ordered are not necessary. They are not to be compared with a pennant or a button or a pin. Every one of them is a help toward improving a station and assisting in carrying on relay work. The STATION APPOINTMENT CERTIFICATE insures an orderly and systematic appointment method whereby relay stations are indicated. The LIST OF STATIONS BOOK shows the call letters, location, and all the details regarding every other relay station in the country. "QST" keeps every one informed on successful amateur station operating. These three things, therefore, constitute three honest and legitimate necessities, and the officers have worked hard to produce them. Now that they are produced, and the hardest part of the work done, we only have to support them in order to make our scheme a success.

TO MAKE IT EASY, coupons of four different combinations have been printed and every amateur is urged to send in one of them properly filled in, and not delay doing it.

COUPON PAGE

These coupons are meant to make it easy to do your share. REMEMBER--To keep this League going every one of us must do his bit

AMERICAN RADIO RELAY LEAGUE,
Hartford, Conn.
Gentlemen:

Enclosed please find \$2.00 for which kindly send me my Certificate of Appointment, the 1915 List of Stations book, one pad of message blanks, and "QST" for one year.

Name

Street

City and State

(cut off here)

AMERICAN RADIO RELAY LEAGUE,
Hartford, Conn.
Gentlemen:

Enclosed please find \$.50 for which send me by return mail the List of Stations book and a three months trial subscription to "QST."

Name

Street

City and State

(cut off here)

AMERICAN RADIO RELAY LEAGUE,
Hartford, Conn.
Gentlemen:

Kindly enter my name for a year's subscription to "QST"; I am enclosing \$1.00.

Name

Street

City and State

(cut off here)

AMERICAN RADIO RELAY LEAGUE,
Hartford, Conn.
Gentlemen:

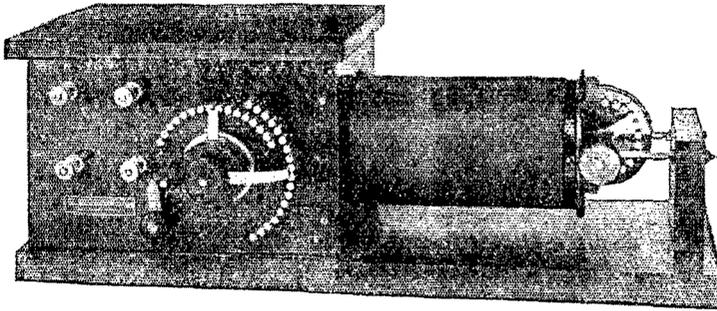
I am enclosing \$5 for which kindly send me by return mail Zenneck's Wireless Telegraphy, and enter my name for a year's subscription to "QST."

Name

Street

City and State

Silver Plated Receiving Specialties



The
"Original"
Model 5
and 5-A

The Silver plating feature introduced two years ago by our designers can not be emphasized too strongly as it insures perfect contact at all times with very slight tension exerted on contact blades which naturally prolongs the life of the heavy silver plate, indefinitely.

The cabinets are solid Mahogany, hand rubbed and present a beautiful satin finish similar to that of a Victrola. The secondary moves with greatest ease. The contacts are shouldered and evenly surfaced.

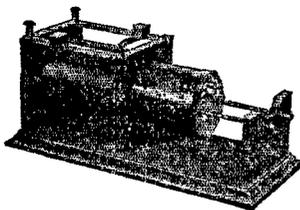
Model 5A Heavily Silver Plated\$23.00 Model 5 Nickel Plated\$18.00

We construct loading coils and large inductances of superior quality for use in the reception of undamped signals, also long wave tuners, get our quotations. Our catalogue 5c.

The Radio Apparatus Co.,

POTTSTOWN, PA., U. S. A.

Our Standard Loose Coupler



The greatest thing out. 7 in. high, 7 in. wide, 15 in. over all. Wound with Enameled wire (secondary with silk, if desired), has double slide and eight taps, with heavy rheostat handle. Woodwork mahogany finished. Price, \$7.00. Also have a new one, 6 in. high, 6 in. wide, 14 in. over all, wound with same wire, but with single slide. Only \$4.50.

F. B. CHAMBERS & CO.
2046 Arch Street
Philadelphia, Pa.

"Mignon - System"

The Last Word in Radio Signal Receiving
Apparatus for Commercial and
Amateur Use



Unapproached Selectivity
Sensitiveness and Durability

WRITE FOR CATALOG

Dept. A

Mignon Wireless Corp.

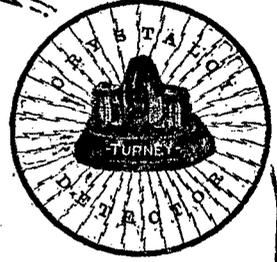
Specialists in
Radio Receiving Apparatus

Elmira - N. Y.



FROM
Hawaii to Richmond, Va.
 5000 miles with
CRYSTALOI

"On Dec. 23 I made what I believe to be a new record for the Crystalloi Detector. About 11 p m. I heard the station at Lahaina, Hawaiian Is., a distance of 5000 miles. Heard the station four different times. (Signed) R. J. Robey, 3314 Floyd Ave., Richmond, Va."



We guarantee every claim made for
CRYSTALLOI
 The highly sensitive, permanent
WIRELESS DETECTOR

WHAT IT IS

Crystalloi offers a large surface of highly sensitive mineral, which is brought into contact with a finely divided alloy, thus giving innumerable contact points. By rotating the cylinder the most sensitive spot is found immediately.

WHAT IT DOES

Crystalloi will work under the heaviest static conditions, will not burn out, and with proper use will last a lifetime. With it every message will come in strong and clear.

3 TYPES CRYSTALLOI

- Type 00—Dimensions $2\frac{1}{4} \times 1\frac{1}{8}$ in. Price, \$3.50
- Type AA—Equipped with a cohering inductance, dimensions $4 \times 3\frac{1}{2}$ in. Price, \$6.00
- Type BB—Equipped with cohering inductance, fixed condenser, buzzer, test, batteries and control. Dimensions $7\frac{1}{2} \times 5\frac{1}{2} \times 3\frac{1}{2}$ in. Price, \$12.00

Send 5c in stamps for catalog "D" fully describing Crystalloi and all our other High Class Receiving Apparatus

Eugene T. Turney Co., Inc.

2595 THIRD AVENUE
 NEW YORK CITY

Brandes Radio Headsets

SUPERIOR TYPE, \$5.00

Made for Long Distance Reading

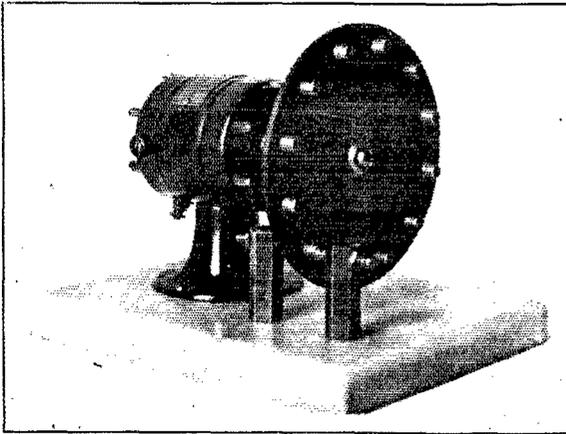


Send 4c in stamps for our new Catalog "F" of select Wireless Apparatus

C. Brandes, Inc. 32 Union Square, Room 821 **New York**

Klitzen Apparatus

means Efficiency



Klitzen Rotary
complete

\$12.00

Marble base, Bakelite Disc,
Universal Motor, operates
on 110-130 volts AC-DC.
25-60 cycles. 6000 r.p.m.

Motor only, \$6.50
Disc complete, \$2.50

Klitzen Wireless Apparatus Company

1123 Herrick Avenue, Racine, Wisconsin

Radio Telegraph and Telephone Engineering

A LARGE CATALOG on Radio Telephone and Telegraph Instruments; Steel Towers and Masts; High and Low Frequency Motor-Generators; Rotary Converters; Switch-boards and Parts; High Tension Insulators; Storage Batteries and a complete line of Radio Construction Material: now ready for distribution. Please remit ten cents to cover postage. Our specially designed and manufactured apparatus is giving a high state of satisfaction throughout the country, as we have eminent radio engineers in our service. We solicit your inquiries for information or quotations.

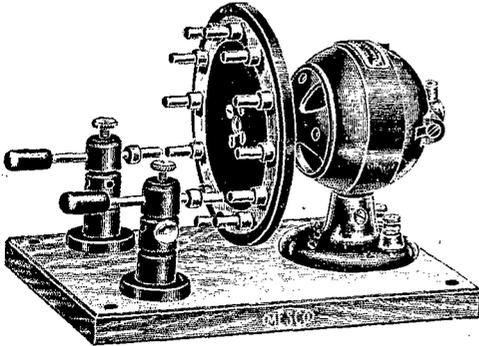
Stations, Antennae, Instruments Designed and Constructed

Eastern Scientific Apparatus Co.
West Roxbury, Boston, Mass.

New Mesco Radio Apparatus

ROTARY SPARK GAP

A Rotary Spark Gap is required in every transmitting station by the Federal authorities, for the reason that this type of gap produces a pure wave of low damping decrement. It also increases the efficiency of any transmitting station from 20 to 30 per cent.



This Rotary Spark Gap emits a high musical note, more audible to the human ear, can be heard at greater distances than the note from the stationary type, and cannot be mistaken for static or other atmospheric disturbances, a fault common with the stationary gap due to its low frequency note.

The rotating member has twelve sparking points mounted on a hard rubber disk and is carried on the motor shaft.

Also fitted with two stationary electrodes with special adjusting devices.

The Gap can be successfully used on any of our spark coils or transformers up to and including 1 K. W. capacity.

Our standard Globe Motor is used, which will operate on 110 A. C. or D. C. circuits and attains a speed of 4,500 R.P.M. Also made with our

Globe Battery Motor, which can be operated on a six-volt circuit.

List. No.		Price
222	Mesco Rotary Spark Gap, 6 volt	\$12.00
223	Mesco Rotary Spark Gap, 110 v., A. C. or D. C.	13.00
216	Rotary Unit only, with two Stationary Electrodes, 1 8/16 in. shaft	5.00

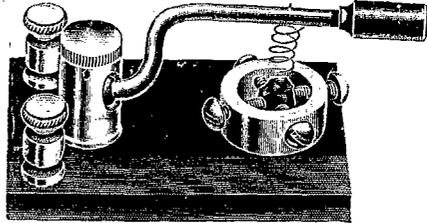
UNIVERSAL DETECTOR STAND

This Stand has a heavy brass cup, with four binding screws, capable of holding crystals up to and including 3/4 in. diameter.

A hollow standard encloses a brass ball. Through an opening in the wall, a brass arm with hard rubber handle is secured fast to the ball, making a ball and socket joint, allowing it to be adjusted at any angle or used in any position.

A hole for the introduction of different size wires extends through the arm. A set screw in the side of the arm binds the wire.

Supplied with two binding posts. All mounted on a heavy genuine hard rubber base 2 1/4 x 4 1/4 x 3/8 in. All metal parts nickel plated. A spring rests on the ball in the hollow standard and sets into a cup under the adjusting screw, so that varying pressures can be had as circumstances require. Remains permanently in adjustment under jars and vibrations of every description.



List. No.		Price
248	Universal Detector Stand	\$3.00

SEND FOR OUR NEW CATALOG H28

It is pocket size, 8x4 1/2 inches, contains 248 pages, with over 1,100 illustrations, and describes in plain, clear language all about Bells, Push Buttons, Batteries, Telephone and Telegraph Material, Electric Toys, Burglar and Fire Alarm Contrivances, Electric Call Bells, Electric Alarm Clocks, Medical Batteries, Motor Boat Horns, Electrically Heated Apparatus, Battery Connectors, Switches, Battery Gauges, Wireless Telegraph Instruments, Ignition Supplies, Etc.

There exist a thousand and one ways where electrical devices may be used, and to know what is best for your purpose you need this catalog. It costs you nothing.

SEND FOR OUR NO. 17 MANUAL WIRELESS TELEGRAPHY

You should have it even if only superficially interested. Around about you every day you read of some marvelous occurrence in which wireless played a distinguished part. It may not be entirely clear to you. The Manual will explain it. To the student of Wireless Telegraphy, the Manual contains much that is indispensable to a proper understanding of the art. A good portion of this is now published for the first time.

We ask ten cents (\$.10) for it—give you a coupon receipt which can be applied on any order amounting to One Dollar (\$1) or more.

Send your name and address now, and get one of the most complete, comprehensive and reliable wireless pamphlets published.

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