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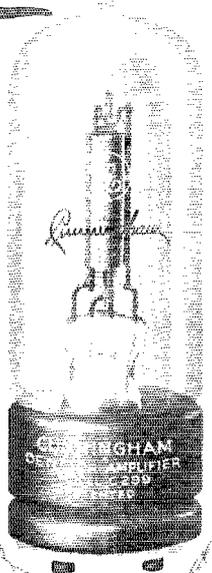
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JULY 1924

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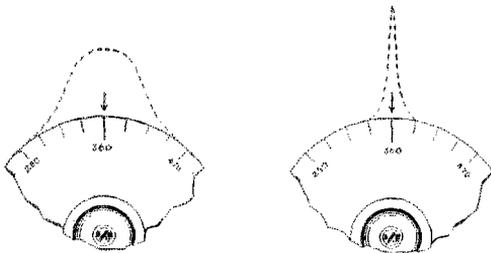
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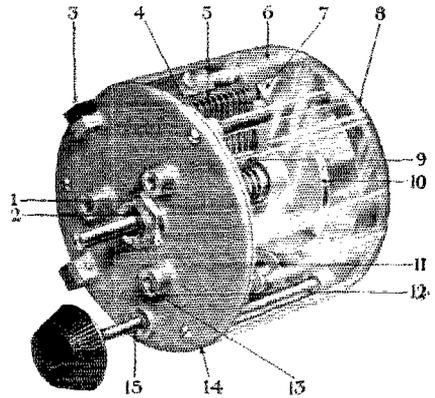


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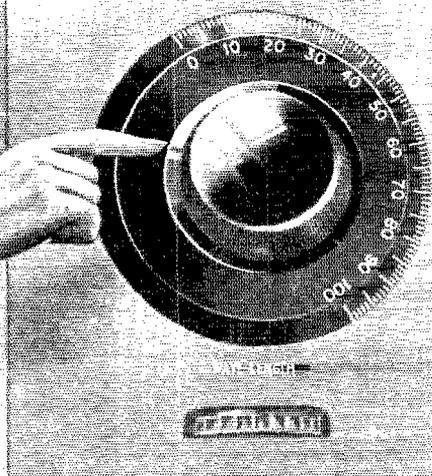
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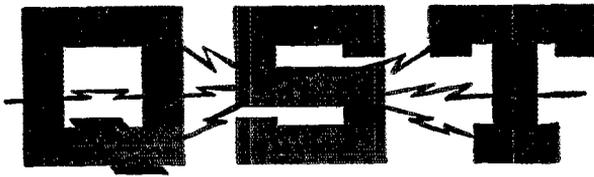
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The Official Organ of the A.R.R.L.

VOLUME VII

JULY, 1924

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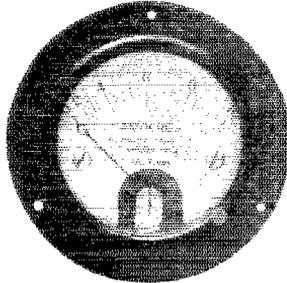
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EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



The Visit of G2NM

THE visit to America during the middle May of Mr. Gerald M. Marcuse, British 2NM, was one of those very pleasant occasions which Amateur Radio has made possible and one which our growing international relations promise to make a more frequent occurrence. "Two En Emer," one of England's most prominent DXperts, is the first British ham to visit us. He is the honorary secretary of the Transmitters Section of the R.S.G.B., and British delegate to the I.A.R.U.

Landing at Montreal, he made his way first to the Maritime Division, where many of our best transatlantic stations are located. There Major Bill Borrett and his gang made him a member of the Rotab's, with fitting ceremony. The next week he visited A.R.R.L. Headquarters in Hartford, together with Major Borrett, and a very happy little dinner was given in their honor by the local crew. It is not only pleasant but positively inspiring thus to meet our friends of the air. It provides a concrete example of the marvelous progress worldwide amateur radio is making.

We had planned the annual outing of our Staff to coincide with the visit of our distinguished guests, and NM and the Major were to teach us how to play cricket (how's that for an international touch, you baseball fans!) but rain QRMd the program and Mr. Marcuse was obliged to depart on his flying trip across Canada to the Pacific, visiting prominent Canadian amateur stations enroute. By the time this issue appears he should be safely back in England, recounting his experiences in the land of six-shooters and fearful QRM.

Incidentally, we had our cricket game—e1DD went to our picnic and taught us how.

Note to British hams: Ask Emer about that report of his sigs from FL. Hi!

The White Bill

THE White Bill has been amended in accordance with testimony given at the hearings before the House Committee on the Merchant Marine & Fisheries, and in our opinion it is now a much more nearly acceptable document than any previously-proposed radio bill.

The amending has not taken form of a reconstructed H.R. 7357 but came about thru a rather complicated maneuver based on the passage of the Howell Bill, S.2930, by the Senate on April 8th. The Howell

Bill is the short bill which in ponderous phraseology reaffirms that the ether is the inalienable possession of the nation and its people, etc. When it passed the Senate it went to the House and was referred to the MM&F Committee. This Committee on May 13th reported out the bill, with an amendment, and recommended its passage. The amendment takes the form of striking out the entire text of the original Howell Bill and substituting therefor what is virtually an amended White Bill. Thus the White Bill in the House now becomes S.2930 instead of H.R.3753, altho the latter is still pending and may itself be reported out. On the same date, May 13th, Congressman White introduced a resolution, H.Res.311, calling for the early consideration of S.2930, but it did not get past the Committee on Rules and now Congress has adjourned until December without acting in the matter. None of the bills dies, however; they will have attention when the Congress reforms in the fall.

The amended S.2930 provides for an appeal against unfavorable decisions of the Department of Commerce in the issuing of licenses, and the wide discretionary powers of the former draft have been limited in a manner which appeals to us, at this writing, as being satisfactory. The amateur is mentioned frequently thru the bill, establishing the fact that the bill contemplates that there shall be amateurs, and our specific requests have been met in several other places in the draft.

There is no chance for action now until fall. We will have more to say about the matter in our columns as that time approaches.

Our "Inkslingers"

FOR more than a year a select group of the League's membership has been carrying on work of vital concern to all transmitting amateurs. They were given a special mission to perform and, now that it is in a fair way of being accomplished, we feel it is time to crow about them. We refer to those already known to many of us as the Inkslingers, the A.R.R.L. Publicity Department. From a handful of amateurs at the start the membership has now grown to approximately 300. There are Division Publicity Managers, Assistants and City Correspondents. These fellows valued the game so much that they unselfishly contributed a part of their time to a work which they knew was important

if the amateur body as whole was to be understood and its merits recognized.

Every one of you recall the abuse which the amateurs were receiving a few months back, not from sources that were intentionally malicious, but from those ignorant of the amateur's potential value to his country and in the development of the radio science. The difficulty of controlling this situation entirely from Headquarters quickly became apparent, for as soon as trouble was settled in one section of the country it was stirred up anew in another. At times a wave of it would spread through an entire state. Direct personal contact with newspaper editors was needed to prove to a majority that a comparatively small minority of radio men were in the right, and to this cause the Inkslingers pledged and have given their support.

We see in their work another startling demonstration of that intangible thing which we call amateur spirit. We challenge you to find it in any other organization of the kind. Those of us who have seen this really threatening condition come and pass down into history owe them a debt of gratitude. While the crisis is over, they still have an important job before them. They have set out to make the name of the A.R.R.L. known in every city and town in the United States and Canada. There may be some way in which you can help.

Some time ago the question was asked: "Who Will Save the Amateur?" The amateur needed no one; he went out and did the job himself. And our Inkslingers did a big part of the job.

Short Wave Tests

THERE has been a remarkable increase in interest in the shorter waves, all over the civilized world, since last fall when amateurs first started working transocean by means of their use. Commercial companies, experimenters, governments, have experienced a new and intense interest in the higher frequencies since the IXAM-1MO-SAB group first demonstrated their possibilities in amateur work. It is not surprising that these governments should invite us to cooperate in their investigations, for the American amateur is always eager to help and hungry for more experiences. We can feel highly complimented, however, that our A.R.R.L. has been requested by the governments of the United States, Canada, France and Italy to participate in short-wave tests.

All of these tests are experimental in nature, designed to increase the world's knowledge of the behavior and possibilities of the shorter waves. The U.S. Navy is putting a 100-meter set on the *Shenandoah* and their station NKF at Bellevue, D.C., is arranging short-wave experimental schedules for two-way working with many amateurs. The

Canadian government has equipped its steamer *Arctic* with a 120-meter set and is sending it up into the long Arctic daylight this summer to see if the short waves will solve the problem of communication in a land where the sun does not set for months—they want us to help. General Ferrie arranged with Mr. Maxim, when the latter was in France recently, for a series of short-wave transmissions from the Eiffel Tower, FL—the French government wants us to listen to their transmissions and report. They are most interesting, running all the way down to 25 meters, and with lots of punch behind the signals. And now comes word from Italian "ACD" that he has been commissioned by the navy of his country to take charge of experimental short-wave radio on an early cruise of several fast ships going on a friendly mission to South America—and he asks the amateurs of both Americas to participate.

We'll be glad to help in all of these tests, sure thing, for not only will it be good sport, but who is more interested in learning about these short waves than we of the A.R.R.L.? Unfortunately, except in the case of WDM (see page 12) it has been impossible to get schedules for any of these transmissions arranged sufficiently in advance to publish them in *QST*. They come into Headquarters just a short while in advance and the tests are over before the magazine can be printed. There is a way around that difficulty, however: we can mail the information to interested members and it will also be incorporated in the A.R.R.L. broadcasts. Every amateur who has a short-wave tuner and who is interested in the many important tests scheduled for this summer and fall should drop a line to the Traffic Manager and ask to be put on the mailing list for all short-wave schedules. We'll see that you get the dope.

The New Quiet Hours

AS forecast in our last issue, the extension of quiet hours came, the Bureau of Navigation specifying a silent period from 7 P.M. to 10:30 P.M. standard time for the daylight-saving period ending October 1st. On June 7th, at the recommendation of the Supervisors of the Sixth and Seventh Districts and of the A.R.R.L., the quiet hours in these two districts were restored to the original figures, as the Sixth and Seventh occupy an entire time zone in which daylight-saving time is practically unknown and where virtually no embarrassment can come from following the old hours. The rest of us, however, are asked to observe the extra hour of silence.

This is election year and much of the campaigning will be done by radio. Elaborate arrangements are being made to link up dozens of broadcasting stations in chains for simultaneous broadcasting, not only of

the convention deliberations but of the campaign speeches, and public interest in the matter is running high. Without the extension in the quiet hours the conflict in times would give the public a smaller protected period than contemplated, at a time when they want it badly, and amateur radio might get a black eye. It is just as well, then, that we try it this summer.

It is regrettable that there is such a lack of uniformity in the time plan used thruout our country in summer, but the government obviously can not make exceptions in favor of each small area based on its own particular brand of time, and the League in endorsing the general principle of extending the quiet period for an hour during this summer has been actuated by the policy of greatest good to the greatest number of amateurs.

The I.A.R.U. Congress, 1925

WHEN President Maxim met with representative amateurs from France, England, Belgium, Spain, Luxembourg, Italy and Switzerland in Paris in March and proposed that there be an international organization of radio amateurs, everyone present agreed on its desirability. A committee was formed of the

representatives of each of these countries, to study in what manner such an organization might be set up, and meeting on the 14th of March it organized, electing Mr. Maxim its president and Dr. Corret, FSAE, its secretary, and adopting for its name "Provisional Committee for the organization of an international union of radio amateurs."

The opinion of the Committee, after study of a project submitted by the A.R.R.L., was that the definite establishment of an international body of radio amateurs should be proposed for discussion by an international congress, to be convened in Paris during the Easter holidays of 1925. The Committee is now at work on plans for the Paris gathering.

On to Paris, fellows! We want to take over a big gang of North American hams next spring. Who's going?? Altho of course only the duly accredited representatives of national amateur societies will have voting power in the deliberations of the Congress, there will be many amateurs-at-large there and the affair will take on many of the aspects of an international brasspounders convention, the very first in the world. Meeting from all over the world, won't we have a *time!* Save your money and watch for further announcements.

QST's Employment Service

FREQUENTLY we have inquiries from members asking if we know where they can get a position in radio work in some form or another, and every so often some manufacturer writes us to inquire if we can put him in touch with a qualified amateur who would be interested in joining his staff to do certain radio work. Although we have done out best with these cases as they arise, it has occurred to us that there is an opportunity for A.R.R.L. and QST to be of further service to our membership by a modest expansion of these facilities.

Firms having openings for amateurs in radio work, particularly manufacturers, are invited to make their desires known to us, giving in as much detail as possible the necessary qualifications of the man or men wanted, the probable salary, etc. Members of the A.R.R.L. who desire positions in radio work should write us a letter giving full particulars, stating age, general education, business experience, technical education, technical or radio experience, nature of position sought, availability, salary desired, etc. We will keep these applications on file and when requests are received from em-

ployers we will endeavor to bring the two together.

Our facilities will not permit the acknowledgment of such applications nor will we be able to engage in correspondence affecting them, except in the actual work of acquainting employers and applicants with the propositions of the other. All correspondence should be addressed to QST Employment Bureau, care of American Radio Relay League, 1045 Main Street, Hartford, Conn.

Notice to Our Newsstand Readers

As announced in recent issues, The Traffic Department Report and the "Calls Heard" Department have been eliminated from the newsstand edition of QST because our non-member readers in general are not particularly interested in them. This results in a saving in expense which makes possible the publication of a larger and better QST.

These two departments are included in the edition supplied to members of the A.R.R.L. If you are interested in them, it is proof positive that you ought to be a member of the League. May we not direct you to the handy application blank appearing on page 83 of this issue?

A South American Does It!

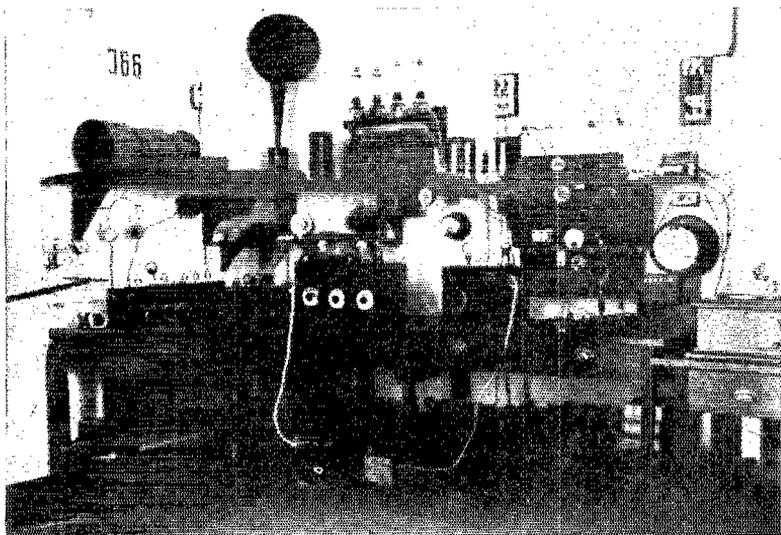
Argentine CB8 Captures World's DX Record by Working New Zealand 2AC; Also Works Three U.S. Hams.

ANOTHER world's record went to smash on May 22d when, without prearranged schedule, Argentine CB8 and New Zealand 2AC held two-way communication for over two hours? This is the first time the signals of a South American amateur have been heard across the Pacific, and it also gives 2AC the distinction of being the first New Zealand amateur to work two-way with either of the Americans.

Carlos Braggio, operating station CB8 (former call "366") at Bernal, near Buenos Aires, had spent most of the night of May 22d transmitting in the Pan-American Tests,

The previous two-way DX record was between 6CEU, Hawaii, and WNP, Refuge Harbor, Greenland, 4600 miles.

To CB8 also goes the distinction of being the first South American amateur to work North America, that station having worked 3BWJ in Collingswood, N.J., on May 30th and having exchanged signals with 1XW on May 31st and with 1XC-1ER on June 2d. 3BWJ says that for about ten minutes following 4 A.M. on May 30th he heard CB8 calling CQ, and so he tuned his transmitter to the same wave and called him until 4:15. CB8 came right back with



The Star of the Pan-Americans, Argentine CB8

then in progress. About four in the morning he was amazed, upon switching over to the receiver, to hear 2AC, operated by J. H. O'Meara at Gladstone Road, Gisborne, New Zealand, calling him. The ensuing conversation lasted until well after six o'clock, when Braggio told O'Meara he had been up all night and wanted to go to bed. Later the same day a congratulatory cablegram, confirming the conversation, was received by Mr. Braggio from the New Zealand amateur. The distance between Buenos Aires and Gisborne is about 6400 miles, part of it over the Andes mountains.

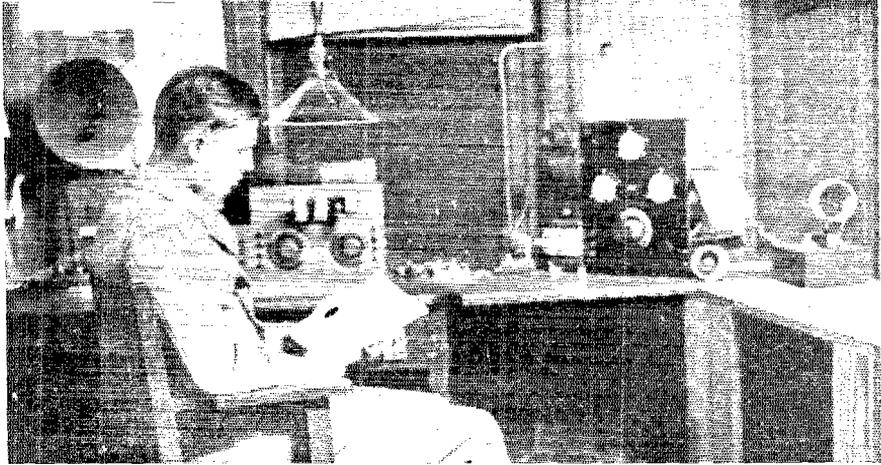
"GM GREETINGS AND CONGRATULATIONS QRZ QRK?". 3BWJ gave him some Spanish: "SALUDO AMIGO DE AMERICA DEL SUD QRK"; but nothing further was heard as it was then about 4:30 at 3BWJ and getting towards daylight. 3BWJ used two UV-202's with an input of but 70 watts, with 1.8 amperes in a small antenna only 30 feet high, wave 120 m.

CB8 is a star station, having been reported up to this writing by eleven U.S. amateurs, one Canadian, and four British. A message to Reinartz, 1XAM, conveying greetings from Argentine amateurs to their

northern brothers was copied solid at 200 and reported to us. Carlos Braggio and his son, Juan Carlos, A.R.R.L. members, are two of the foremost amateurs in the Argentine Republic. Their station has been heard throuth the southern part of South America and stations in Chile have been worked. They were among the first, if not the first, to hear U.S. broadcasting in Argentine. Most of their work was done on phone until recently, when the news of the Trans-

wave very steady, good fist. CB8 uses a straight regenerative receiver with one stage of audio.

Mr. J. H. O'Meara is a New Zealand experimenter who, like his many friends, has heard many U.S. amateurs. His transmitter is one of the best in New Zealand and most of the apparatus is home-made. The transmitter uses one 50-watt Cunningham tube in a reversed-feedback circuit with series feed, supplied by a 1000-volt 300-watt Esco



3BWJ, Collingswood, N. J., First North American To Work South America

atlantic amateur work inspired them to put in a good C.W. set and try their luck in the Pan-American Tests. There are several sets at CB8 but the one probably used in the recent work is a set having four Telefunken RS5 tubes in parallel, supplied with plate current at 1000 volts and

generator. The antenna, total length 75 feet, consist of two parallel cages, each 5 inches diameter and of 5 wires, in which 4.5 amperes is obtained at 190 meters. The December issue of *N.Z. Wireless News* says his receiver consists of two stages of r.f. amplification, detector, and three stages of a.f. We strongly suspect, however, that he was using a haywire "low-loss" tuner and one tube when he worked CB8, for it seems records are nearly always made on one-tube sets.

Truly, U.S. amateurs must look to their laurels if they expect to be leaders in long distance work on amateur wavelengths. While we have been waiting for New Zealand signals to come our way for over a year so we could communicate across the Pacific, the feat has actually been accomplished by Mr. Braggio and Mr. O'Meara. More power to them!

But how about getting that DX record back in this country?

—H.F.M.



Carlos Braggio and his son Juan Carlos, operators at rCB8

putting 4 amperes into the antenna. The successful wave length is 121 meters, and the U.S. stations hearing it report the note as D.C. with a 25 to 40-cycle ripple on it,

At last we have the complete routing on President Coolidge's holiday-greetings message to MacMillan: 10A, 8APT, 9CP, 9AIM, 9ZT, e5GO, e9BF, WNP.

The "Arctic" Sails

Canadian Government Arctic Expedition Carries Powerful Short-Wave Transmitter For Work With Hams Listen For VDM On 120 Meters

By C. P. Edwards*

THE Canadian Government Steamer "Arctic," under the Northwest Territories Branch of the Department of the Interior, will proceed from Quebec about the first of July on her annual trip to Baffin Bay and the Canadian Arctic Islands. Mr. J. D. Craig, M.E.I.C., will again be the Officer in Charge of the expedition, and the Master of the vessel will be Capt. Bernier, the famous Canadian Arctic explorer.

This year the "Arctic" in addition to her two regular radio equipments, consisting of a standard 600-meter 2-k.w. spark equipment and a long-wave continuous wave transmitter working on 2100 meters, with which communication is maintained with the long-wave ship station at Louisburg, N.S., will carry a short-wave I.C.W. outfit which will transmit on wavelengths between 100 and 150

meters. The installation of this short-wave equipment is for the purpose of carrying on tests with Canadian and U.S. amateurs, with a view to ascertaining how short wave signals come through from the far north, during the all-daylight period in those latitudes. The coöperation of all amateur transmitters in North America in assisting in these tests is accordingly requested by the Radio Branch of the Department of Marine, which looks after the radio equipment in the "Arctic" for the Department of Interior.

A par-boiled dyed-in-the-wool "ham," Bill Choat, late 3CO, Toronto, has been appointed operator for the voyage and is now engaged in familiarizing himself with his equipment and getting everything pre-

pared to carry on some good work with the amateur stations.

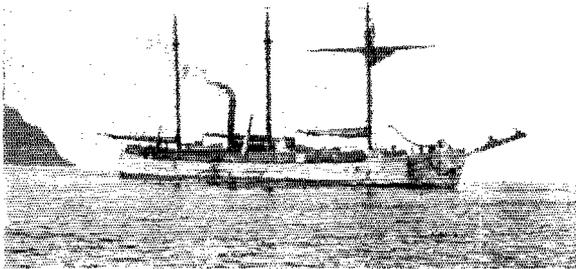
Steam will not be available in the "Arctic" until a couple of weeks before she sails, and as tests cannot be run on the equipment until the main dynamos are running it is difficult to say, at the moment, what will be her most efficient wavelength for the short-wave work. It has therefore been decided to adjust the transmitter to 120 meters for the time being, with the proviso that if experience demonstrates that some

other wavelength is more desirable, arrangements will be made to change the same duly notifying all amateurs through their radio publications.

It may come as a surprise to the many amateurs interested in the "Bowdoin" to know that the Canadian Government steamer "Arctic" proceeds as far north as

Etah every year, and last year on her arrival in this harbor found the "Bowdoin" there. The cut which we produce is a photograph of the "Bowdoin" taken from the "Arctic," last fall, the "Bowdoin" then being a few miles from the position in which she was finally frozen in for the winter. If she is still there this summer, Bill will have the pleasure of shaking hands with Mix and telling him how his transmissions have been coming through all winter.

The "Arctic" is a ship of 762 tons gross and has three masts 80 ft. high. She is built of wood, and she carries sails in addition to her engines, she is not regarded as an ideal ship for radio work, it being impossible to insulate the heavy guys which hold the masts and the losses in them are considerable. Nevertheless, by installing as much power as is practicable it is hoped to offset this to a certain extent. Her



The C.G.S. "ARCTIC", sailing in July for the Far North with a powerful short-wave I.C.W. set operated by Choat of 3CO. The Canadian Government requests the co-operation of American amateurs in the endeavor to get thru the Arctic daylight on short waves.

*Director, Radio Branch, Department of Marine and Fisheries, Canadian Government, Ottawa.

ground connection consists of about 200 sq. ft. of copper plate secured to the side of the ship and one of the vicissitudes of an "Arctic" operator is the fact that the first of the many ice flows she encounters may strip off all the sheathing, leaving the unfortunate "op" with only the engine propeller for a ground and incidentally increasing the resistance of the antenna about five hundred per cent.

The short wave watches which Bill will maintain are as follows:

**C.G.S. "Arctic"—Call VDM
Wavelength 120 meters**

**Schedule in Eastern Standard Time:
Daily except Wednesdays and Saturdays:
11 P.M. to midnight. No transmissions on
Wednesdays. Saturdays only: 11 P.M. to
3 A.M. Add one hour to these figures to
give "daylight saving" time.**

All Canadian licensed amateur stations are specially authorized by the Radio Branch of the Department of Marine to use the wavelength 120 meters during the above hours, for the purpose of communicating with VDM. This wavelength, however, must not be used for any other communication.

The test transmitter will comprise 2 Admiralty T4A or 2 Marconi MT6 tubes, operating on 10,000 volts on the plate with an input rating of approximately 2 k.w. In order to make the transmission distinctive, no filter system will be used and the mellow 480-cycle note will enable amateurs to place VDM immediately they hear his note, even if they do not get his call. Further details will be announced soon.

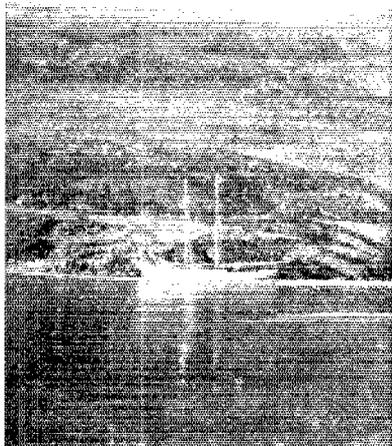
9ZT and 6CGS Work WNP

OUR contact with WNP has not improved since our last report, in spite of the fact that 9ZT worked WNP on May 9th for a few minutes. No messages were sent or received. 6CGS also worked WNP for a few minutes on May 28th. Both stations report WNP QRZ and QSS badly. We have tried repeatedly to get enough dope up to Mix to have him come down to about 100 meters, but apparently he knows nothing about short-wave work. The A.R.R.L. wishes to emphasize this point very strongly—if by any chance you hook up with WNP, make a concerted effort to get word to him to get down on 100 meters both with his transmitter and receiver. We feel confident that we can maintain far better communication with him on the short waves.

Every indication is that all but a very

short period of the day finds WNP in complete daylight and this adds to the difficulty in working him, yet the short waves may be part of the solution.

Another possibility of contact is through the Canadian government vessel *Arctic*,



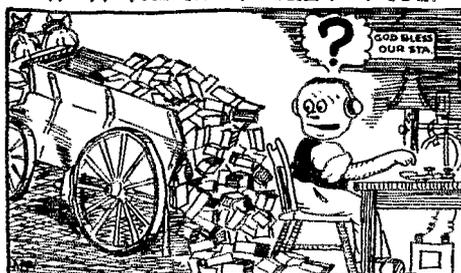
The "BOWDOIN" (WNP), Dr. MacMillan's vessel, in harbor at Etah, Greenland, photographed from the "Arctic" when the two vessels met there during the summer of 1923. (Photo courtesy Canadian Dept. of Marine & Fisheries).

which expedition is reported in another part of this magazine.

The following additional reports have been received at A.R.R.L. Headquarters of stations hearing WNP: May 1st, 7GR; 3d, 9AVO; 4th, 8ATR; 11th, 2EB—BeeP of ex-1HX; 15th, 8DAE; 17th, 6CAL; 21st, 9CSA; 24th, 6LV; 31st, 1TT. 6EB reports WNP on April 15th.

—F.H.S.

IF IT WERE REALLY TRUE.



"YA COME IN LIKE A TON OF BRICKS, OM."

Building Superheterodynes That Work

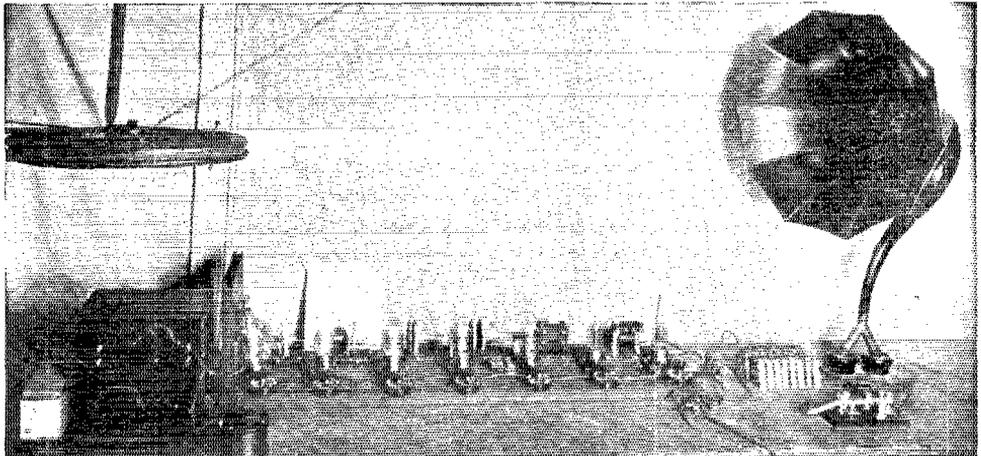
Part II

Edited by S. Kruse*

THE first article of this series appeared in the June issue of *QST*. It explained the idea on which the superheterodyne is built and described a neutrodyne-superheterodyne. In this installment a considerable number of sets are described, some for general use, having air-core transformers, some especially intended for amateur work. The third article will deal with iron-core

tunately also the popularization of the super has taken place at the very time when "radio junk" is passing over so that most of the kits are good and are getting better.

Just one suggestion—don't expect the superheterodyne you build from a kit of purchased parts to work perfectly unless you follow the directions *absolutely*. After the set has once begun to work there is plenty of time to add original kinks—don't



The Very Satisfactory Superheterodyne at 9RY, Described in This Article

transformers, with "trouble shooting" and with especially compact "supers".

Superheterodyne Parts and "Kits"

Our readers have begun to insist that we must name for them the good superheterodyne parts and "kits". To do this would probably result in injustices to some makers and it is better to give a few general rules that everyone can apply for himself.

First of all, look at the apparatus and the kind of advertising that goes with it. There is very little trouble in recognizing the good apparatus and the sincere advertiser. For-

let your originality get loose too early in the game.

When it comes to such things as condensers, rheostats, resistances, potentiometers, one only has to depend on the kinds that have proven good in other sets. Be sure, tho, that your variable condensers are equipped with good vernier adjustments, ones that will let you get the same capacity every time the dial stands at the same point.

It Isn't All True

A good bit of nonsense has been written and printed about the range of a superheterodyne when used with a small loop. It is perfectly true that at times very fine work can be done in this way; witness the transatlantic broadcast reception of Mr. McLaughlin, which was mentioned in our first installment, likewise the work mentioned in this section. However, there is absolutely no foundation for statements like "I can hear broadcasting from the other coast whenever I want to". This is not

*Acknowledgment—In addition to the already considerable list of contributors mentioned in Part I the editor wishes to acknowledge contributions and assistance from the following:

Don. C. Wallace, 9ZT-9XAX, Hoover Cup 1923; Harold Harvey, 3XAQ-3TE-3DN; Francis R. Ehle of Durham & Co., Philadelphia; Dr. O. S. Kelley, 5OG; Victor Greif, author of the "Superheterodyne Manual"; Dr. Elliott Adams White, 1XAV-1YB; The Engineering Dept. of the Rauland Mfg. Co.; Albert P. MacDowell, 3AR. Ballantine's "Radio-telephony for Amateurs" has also been drawn upon very freely.

true. Anyone who feels doubtful about this has only to consider that there has recently appeared in a well-known wireless magazine an article entitled "Increasing the Range of your Super-heterodyne". This article suggests giving the pick-up loop a lift by means of an antenna coupled to it.

While speaking of the unpleasant side one may as well do a complete job, for several other things have been claimed for the "super."

The amplifier of a superheterodyne is an excellent receiver for the long wave transatlantic and transpacific stations, such as WSO (Marion, Mass.), NPL (San Diego), NAT (New Orleans), etc. They and many other high-power stations work at just the waves for which super-heterodyne amplifiers are designed and quite naturally they will come in unless the amplifier is *very thoroly* shielded.

This may be made more impressive by saying that at the editor's home in Kansas it is perfectly possible to hear NPL in California and NSS in Maryland with such an amplifier having nothing but the batteries connected to it—in fact this can be done out in the middle of a vacant lot.

This is where a large part of superheterodyne interference comes from. Sometimes it shows up as bad audio quality; at other times it shows up as actual signals in good continental code, whereupon the code man identifies it and *shields* while the non-code man swears at the *nearest* telegraphic station—never suspecting that this particular "QRM" started three states away.

Short-wave interference—that is, interference by stations within the tuning-range of the set—can be blamed on a tuner that is not up to the job or else on an oscillator that is being "crowded".

The tuner question was discussed in Part I. As for the oscillator, any tube that is being run on excessive plate voltages will manufacture a variety of harmonics and therefore increase the chances of beating with some incoming signal in such a fashion as to throw it into the range of the long-wave amplifier.

By rather careful test we were able to establish the fact that an oscillator with 20-volt plate supply was freer from this sort of thing than one run at 40 volts—and quite a lot freer than one run on 60 volts.

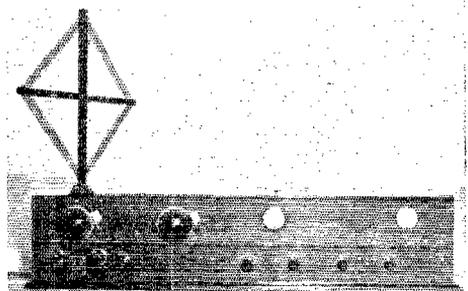
Superheterodynes as "Interference Factories"

The superheterodyne is one of the most capable interference factories ever devised. Usually the oscillator is supplied with an entirely senseless plate voltage—40 or 60 instead of the 20 that is needed, and to make matters worse the oscillator is tightly coupled to a secondary that is overly close to the primary or antenna coil.

Perfectly good two-way communication can be carried on for 20 miles with an oscillator used in this fashion and the effect upon the next-door neighbor can be imagined, especially when several such badly-handled supers begin quarreling for the same station.

The cure is—

- 1—Keep the oscillator power down to what is really needed, 20 volts on the plate.
- 2—If it will not oscillate with 20 volts on the plate loosen its coupling to the tuner; your tuning will be sharper and the signals at least as good.
- 3—Keep the coupling to the antenna very loose.
- 4—If you really want to do things right, put in a radiation-preventing tube. (This will be discussed next month.)



A Set Using The Adams Air-Core Transformers. (Photo by 3AR)

The above relates to radiation, which some of our magazines still insist on calling "re-radiation".

Types of Coupling in the Amplifier

Resistance-coupled long-wave amplifiers require more B battery, take more stages to get the same results, need noise-filters to make them quiet and each tube has a chance to become a detector because it is equipped with a grid condenser and leak.

On the other hand such amplifiers can be made quite compact, they do not try to oscillate, and they are extremely dependable if good resistances are used.

An excellent arrangement is shown in Fig. 1 which is taken from Ballantine's ever-helpful "Radio Telephony for Amateurs".

More amplification can be gotten per stage by using chokes in place of the resistance R, leaving the resistance R¹ and the rest of the circuit as before. The chokes will need to be tuned to the working wave, preferably by their own capacity.

However, nothing real has been gained—each tube still has a grid condenser and leak; therefore each one can still act as a detector. The real thing is to go to transformers.

The general circuit for all air-core long-wave amplifying transformers is shown in Fig. 2, also taken from Ballantine. As to the particular transformer to be used, that is up to the maker of the set; he is given

station that is not wanted. When a shorter wave is used in the amplifier this does not happen; the other wave is far enough off so that the tuner or loop is sharp enough to keep it out—it is not there to be heterodyned.

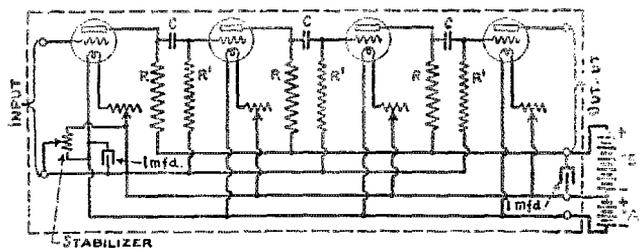


Fig. 1—4-Stage 3000-Meter Resistance-Coupled Amplifier. (Ballantine) R—100,000 Ohms. These must carry plate current, hence grid-leak resistances may not answer. "Lavite" resistors are excellent and compact. R1—1 megohm grid leaks. C—.01 ufd., mica or good grade of paper.

"Another highly important point is that at the lower waves the set is not so noisy. The reason for this is that the lower impedance of the coils does not permit much audio-frequency drop across them and hence the noises are not repeated thru the amplifier."

The fashion in which a long-wave amplifier can be made to work satisfactorily by the use of sharply tuned input and output circuits is explained later—but some of the objections raised here are certainly important.

plenty of choice in the transformers described in the rest of this article.

Again—The Best Wave

Whatever the theory may say, practice seems to indicate that there is wide choice as to the wavelength for the intermediate-frequency amplifier. One can come down to 2000 meters without any startling drop in amplification and one can go up to 6,000 or so before there is much trouble with broadness of tuning or noise coming thru the amplifier. An opinion for the shorter

About "Filters"

Before going further it is well to get a clear understanding of the exceedingly un-clear way in which superheterodyne designers have begun to use the word "filter". As the present Editor sees it, a "filter" is a thing whose main business is to let some frequencies thru and to keep others back. However, the authors of a number of superheterodyne descriptions choose to use the word as meaning "a sharply tuned transformer" which seems incorrect. Such a thing is first of all a transformer—and

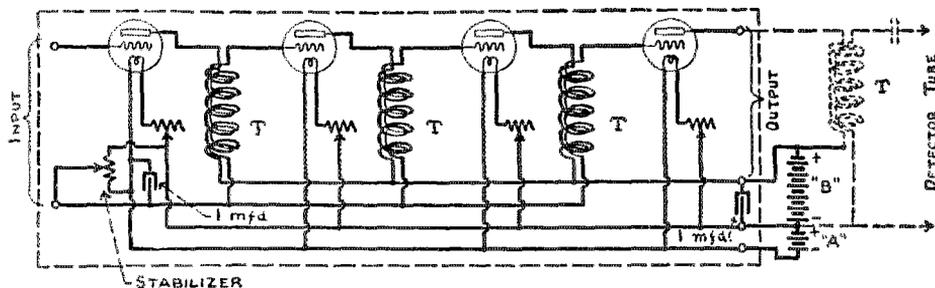


Fig. 2—General Circuit For Air-Core Transformers (Ballantine)

waves is expressed as follows by A. J. Haynes of the Haynes-Griffin Radio Service:

"I strongly recommend the use of 2000-3000 meters as the wave for the long-wave amplifier, rather than 10,000 meters. As the wavelength is made shorter the two points at which the same station is heard move farther apart and finally they get so far apart that they are no longer heard at the same time. If a very-long-wave amplifier is used they will both get thru the amplifier and be heard. This makes for unnecessary interference, especially as the second point may often fall on some other

where is one to draw the line between sharp and broad tuning?"

Let us take the different sort of so-called "filters" in turn.

Because most long-wave amplifiers are very broad it is an advantage to have a sharply-tuned circuit somewhere along the system. One naturally thinks of putting it at the front of the system, whereupon it becomes an "input transformer", which is just like the others down the line, excepting that it has fewer turns in the primary and is shunted by a condenser.

This makes it tune more sharply—but why call it a “filter”?

The other possible place to use the sharply-tuned transformer is at the last of the long-wave amplifier. It is then called an “output transformer” but the same transformer can be used as before and there does not seem to be any particular reason for labeling it a “filter”.

Different types of input and output transformers can be used, some with tuned secondary as well as primary and others that are only tuned chokes. These will be described later.

When the signals have gone thru the long-wave amplifier and thru the second detector there is a chance that some long-wave radio has come thru without being detected in the second detector tube. In telegraph work this does little harm but in radiophone work the result may be had audio quality. At this place there can be used a thing that can *properly* be called a filter, and such a circuit is described later in this article.

BALLANTINE'S 3000-METER AMPLIFIER

For standard-size tubes such as the UV-201 and the UV-201A (not UV-199 and DeForest DV) the amplifier of Fig. 2 will work on 3000 meters. With other tubes it will work at slightly different waves but will be just as effective.

The transformers are made as in Fig. 3. The slot is filled by a winding that con-

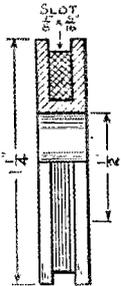


Fig. 3—3000-Meter Air-Core Transformer. (Ballantine). This is used in the circuit of Fig. 2. The winding consists of 1600 “double turns” as described in the text.

sists of 1600 “double turns” of No. 36 single-silk-covered wire. By “double turns” is meant the winding of two wires together so that when the winding is finished one wire can be used as a primary and the other as a secondary. Connect the primary into the plate circuit in the usual fashion and then make tests to see which way the secondary should be connected for best results. To do this connect one of the inside ends to the B battery and the outer end of this *same* winding (this is important) to the plate. Now connect the remaining outside end to the ground of the next tube and the remaining inside end to the filament of

that same tube. There are times when it is possible to get better results by reversing connections to all of the transformers or to every second one. This must be found out by trial.

It will be noticed that the windings of the transformer have high resistance. This is put in purposely to aid in preventing oscillations.

A LONG-WAVE AIR-CORE TRANSFORMER OF IMPROVED DESIGN

By H. J. Adams¹

Diversity of opinion has been expressed among radio fans as to the suitability of the air-core transformer for long wave amplification. Many people argue that such a transformer is not suitable because it is sharply tuned to one given frequency. Such a statement is pure bunk. A transformer designed to handle frequencies of the order of thirty to sixty kilocycles is usually not sharply tuned at all. The

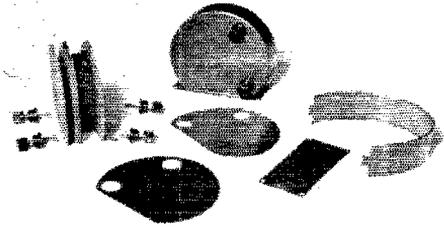


Fig. 4—Assembled and “Exploded” Adams Transformers. (Photo by 3AR).

transformer shown in connection with this article will amplify over the entire band of frequencies from thirty to sixty kilocycles and is at the same time of air-core construction. I will not take up the electrical problems involved in the design of these transformers but will mention a few points concerning them. Patents are pending on this design.

There is a popular impression that long waves (low frequencies) are not critical and that tubes or unshielded transformers in an amplifier do not have to be properly spaced or wired to prevent coupling and oscillation. Again I feel certain from experiences in laboratory work that more bunk is being handed to the public. In an amplifier which I use in an eight-tube superheterodyne set unshielded transformers do couple and the result is the worst yowling imaginable. As space is a factor in a large receiving set I naturally wanted my tubes and transformers as close together as possible. After trying many

¹Captain, Signal Corps, U.S.A.

commercial transformers I became disgusted and tried various designs of my own. Those described here are the result of a good many trials and they work efficiently no matter how close they are placed to each other in the circuit. The matter of *tubes* was another thing. I found that at frequencies of the order named that they could not be placed closer than about four inches, center to center. The problem then was to make a transformer that could sit in between the tubes with its windings in the same plane as those of a similar transformer in the next stage and only about two inches between the two transformers. Shielding was of course the first thought. Again the cry of the experts was that I would lose efficiency. As it actually worked out, efficiency was gained. To use a separate shield would make an unsightly job so the case of the transformer, Fig. 4, was designed of brass or copper to serve as a shield as well as a good case. A shield to be of any use must be grounded; for that reason all cases are connected to the ground wire of the set. The arrangement of binding posts was the next consideration. The objection to most transformers is that it is difficult to wire them in an amplifier and keep good separation between the leads. With binding posts located as shown it is possible to keep all leads separated at least two inches and at the same time keep plate and grid leads less than one-half inch long. Suppose panel-mount sockets are used or that regular sockets are used set up on a shelf. A glance will show that the wiring of an amplifier will be a very simple matter, comparatively speaking, by first spacing the tube sockets and then placing the transformers between them. All battery wires are then down out of the way and greatly separated from the more sensitive leads. This overcomes perhaps the greatest obstacle of the amateur builder of a radio-frequency amplifier, that of feed-back action which causes his tubes to oscillate. As much as five volts negative grid bias may be placed on 201-A or 301-A tubes in an amplifier with these transformers without causing oscillation.

Construction

Now as to actual construction. The winding forms, Fig. 5, are of natural grey fibre which is baked to remove any moisture and then dipped in a hot mixture of beeswax, paraffine wax, and rosin. This effectively seals it and prevents moisture being absorbed later. The forms are about four inches in diameter. The primary winding is one-fourth inch wide and the secondary five-eighths of an inch wide. The spacing between windings is one-eighth inch. There are 750 turns of wire on the primary and 2250 turns on the secondary. The wind-

ings are both of No. 30 D.S.C. wire. As the wire is wound on the form, a space is left between turns equal to the thickness

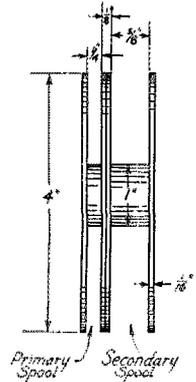


Fig. 5—Winding Forms of the Adams Transformer.

of the wire. One the return trip the wire is laid in the space left. This of course causes a hump where the transpositions are made. On the next layer however the transpositions are made a fraction of an inch in rear of the first ones and this process continues, thus making a symmetrical winding. There is no necessity to impregnate the completed coils altho this may be done if desired. Silk is not hygroscopic as is cotton insulation and in the case there is no need of further protection. It requires good material to obtain good results and the day of junk is rapidly passing in radio.

Shielding Transformers

Just a word concerning shielding. Any filter or long wave transformer should be shielded, yet there are only a very few in which this important matter has been given consideration. Many people using unshielded transformers and filters have unjustly blamed the amateur for telegraphing on the broadcast wave lengths and during silent hours. These people cannot copy code and no doubt would be inclined to think one was lying to them if told that the signals they heard were from high power commercial stations transmitting at from 3000 to 10000 meters, depending at what frequency their "filter" happened to be tuned to. A good superheterodyne receiver to be operating most efficiently must have its intermediate frequency amplifier just under oscillation or slightly oscillating. In even a weak oscillating condition it will act as a separate heterodyne and continuous wave telegraphic stations can be heard. In fact I know of no better receiver for C.W. over great distances than an oscillating superheterodyne. Try it some time on real DX work.

HAYNES AIR-CORE TRANSFORMER

There is shown in Fig. 6 a transformer

that resonates at about 2300 meters when used with 201-A tubes. The completed coils should be put into the circuit of Fig. 7.

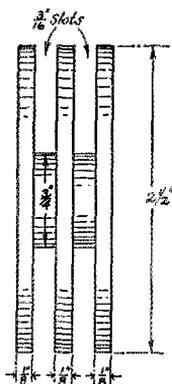


Fig. 6—Haynes Air-Core 2300-Meter Transformer.—First Transformer—325 turns primary shunted by 500 micromicrofarad (.0005 microfarad), 1000 turns secondary.
Other Transformers—850-Turn primary, 1000-turn secondary. All windings of No. 32 D. S.C.
 Note—This is not the transformer now sold by Haynes-Griffin.

not be wound in layers. If several stages are to be used the coils should be made as nearly alike as possible.

In general, the higher the resistance of the coils, the broader the tuning. If the transformers were made of heavier wire they would tune more sharply and then they would have to be made exactly alike or else variable condensers used across the windings, which would be expensive and inconvenient.

About the best thing so far for a tuned input transformer (so-called "input filter") is a double honeycomb coil mounting with a pair of 1250-turn honeycomb coils, each shunted by a 1000 μ fd. (.001 microfarad) variable condenser.

In the last stage an ordinary Radio Corporation UV-1716 is as good as anything. However, a tuned transformer consisting of a 200-turn primary wound of No. 24 wire and a 1500-turn secondary wound with No. 36 wire has been used. The primary can be tuned by a variable condenser or by a fixed condenser of the right value.

Using a super of this general type something like 60 amateurs were logged at 7ZU—mostly very QSA on loud speaker—on the night of Feb. 11, none of them were from the 7th District. That is another way of saying that none of them were within 200 miles, and even after that stations are pretty scarce until one gets out about 600 miles.

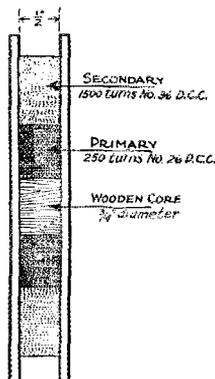


Fig. 8—West's Transformer

The wave may be found by using a buzzer on the wavemeter, or else by the click method. Turns are then removed until the wave reaches 2300 meters. The different transformers need not be exactly alike but should at least come within 100 meters of each other.

The first transformer (sometimes called the "input filter") has a slightly different

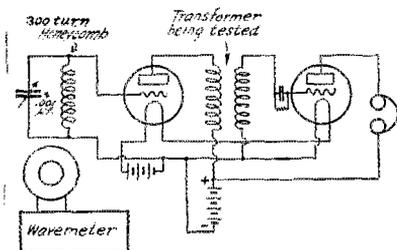


Fig. 7—Tuning Transformers by the Haynes Method.

winding as shown in under Figure 6. The shunting condenser across the primary may be a 500 μ fd. (.0005 microfarad) variable of the ordinary type or it may be a mica compression condenser such as the "grid-condenser" or the "vari-grid" if one of sufficiently large capacity is at hand. Fixed condensers may be used but the so-called 500 μ fd. size usually is not up to rating and it is necessary to add another .0001 or .0002 in parallel to get the tuning right.

WEST'S TRANSFORMERS*

A satisfactory home-made transformer is shown in Fig. 8. The primary is wound of 250 turns of No. 26 D.C.C. wire, then a thin layer of paper is put on and 1500 turns of No. 36 D.C.C. wound in. The secondary should be wound smoothly so as to keep the size of the coil down but should

CONTROLLING THE LONG-WAVE AMPLIFIER

In the MacLaughlin neutrodyne-super-heterodyne of last month, oscillation was prevented by balancing out each stage separately, using the Hazeltine "neutrodyne" scheme. This can be done with ordinary transformers as well, connecting the small condensers in exactly the same fashion as shown in our Fig. 6, page 16, of the June issue.

Another scheme is to use a so-called "stabilizer" potentiometer. This is the same thing that we call a "losser" and it is connected in just the same fashion as we have shown it in past issues for short-wave amplifiers. It is again shown in Figs. 1 and 2 and in some of the other diagrams in this series. The principle is simply to make the grids of the amplifier somewhat positive; they will then waste enough power to prevent oscillation.

*Glen E. West of 7ZU

Stopping Feedbacks

Before beginning to waste power with lossers it is a good idea to make sure that all the needless feed-backs have been removed. Of course one cannot get rid of the feed-back thru the tube capacity but one can get rid of some of the things that cause external feedback.

The main things to be watched are inter-stage coupling thru the batteries and between the various wires. One very neat and remarkably effective scheme is the large brass wire conduit shown in Captain Adam's set. Another useful scheme is to connect a 1- μ f. condenser from the negative side of the A battery to the grid-return of the amplifier as shown in Figs. 1 and 2. It is well to connect another such condenser across the B battery. A large amount of excellent additional advice may be found in Ballantine's section 86, page 262.

"FILTERS" FOR USE IN THE AMPLIFIERS OF THE SUPERHETERODYNE RECEIVERS

By Captain H. J. Adams

First of all any well-built transformer for long-wave radio frequency amplification, no matter whether of the air-core or iron-core type, is capable of efficiently amplifying radio signals at more than one

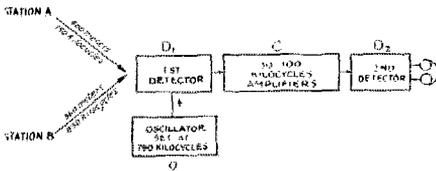


Fig. 9—Why a "Filter" Is Needed Before (or After) the Long-wave Amplifier.

frequency. This is particularly true of those designed to operate at frequencies of the order of 30 to 100 kilocycles. It is this band of frequencies that is used in various types of transformers now on the market for use in the superheterodyne circuits. It is in this band that the super-audible beat note or frequency difference between the locally-generated continuous waves at the set and the modulated continuous waves from the distant station, are generally amplified.

This means that some sort of sharply-tuned circuit is needed somewhere in the amplifier system. Usually this takes the form of one sharply-tuned transformer or choke-coil which it has become customary to call a "filter". If no filter is used it is entirely possible that two stations which are sending at different frequencies can be heard at the same time, thus spoiling the reception from both.

Let us take the following example. In Fig. 9, A and B represent two stations that are transmitting on 400 meters (750 k.c.) and 360 meters (830 k.c.) respectively. Suppose that the local oscillator C in the set is tuned to 790 kilocycles. A beat note of 40 kilocycles is then produced and station A is plainly heard. Station B is also plainly heard as it too is sending on a frequency that is 40 kilocycles from that of the oscillator. To remedy this situation it is only necessary to tune C to 710 kilocycles, and only station A will be heard, as the difference between B and C is no

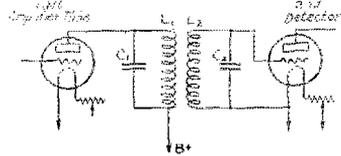


Fig. 10—A "Filter" Transformer With Condenser-Tuned Primary and Secondary.

longer 40 but is 120 kilocycles which might very easily pass thru the long-wave amplifier but will be *very effectively stopped by the "filter"*, whether it be placed at the in put or output end of the long-wave amplifier.

This would be more noticeable the closer B is to C. The effect would not be as great at the frequencies used here as at others, since transformers would hardly amplify as well at 120 k.c. as at 40 k.c. Furthermore there are nearly always a number of troublesome harmonics from nearby broadcasting stations which produce beat notes to which the ordinary transformer in the intermediate frequency amplifier would respond as readily as to the station the operator was attempting to receive.

Filter Design

Assuming that the need of a filtering system is conceded, it is necessary to select one which will give the best results. I will

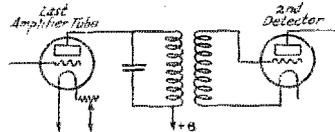


Fig. 11—A "Filter" Transformer With Only the Primary Condenser-Tuned.

touch on only three types of filters here as they are those that are the most practicable and generally used. To be efficient it is of course essential that the filter or oscillatory circuit be sharply tuned. It must not, however, be so sharply tuned that it will not permit the voice or music to pass.

¹Captain, Signal Corps, U.S.A.

It is a nice job to get this circuit tuned for best results.

Figure 10 shows a type of filter now on the market. The windings consist of a great many turns of fine wire and are of the same number of turns. Both are tuned with very small fixed condensers. The windings is very high and the co-efficient of coupling is low. It is very broad and in my opinion is more of a "losser" than a filter, particularly when placed at the input of an intermediate amplifier. A weak signal from a distant broadcasting station

coil are low. The filter circuit proper is of course C_1 and L . C_2 and C_3 provide a non-metallic path for the grid and grid return, at the same time they prevent the voltage of the "B" battery being impressed on the grid of the detector tube or from connecting with the negative "B" battery through the "A" battery.

As I mentioned before it is quite a little job to match C_1 and L properly, and requires laboratory equipment. If L is too large, the filter will be too broad. If C_1 is too large, it will be too sharp and there will not be much volume in the output from the detector. There must be rather a flat top to the curve of this filter in order that the voice and music range can be covered correctly and permitted to pass. The curve should, however, be of great amplitude. The entire filter is housed in a brass case and connected in the circuit in the same manner as the other transformers. The accompany-



Top view of the Adams Super. Going from right to left, the first compartment contains the low-loss three-circuit tuner, next comes the shielded oscillator, next the long-wave amplifier and second detector, last the audio amplifier. Note that the three longwave transformers and the tuned choke are all shielded and the shields grounded. Note also the short leads to the tubes. (Photo by 3AR).

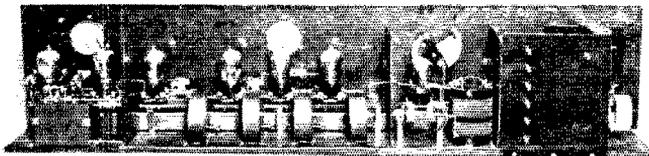
can far better withstand the losses encountered in a filter after it has been built up in signal strength through several stages of radio frequency amplification than it can before it is amplified. It makes no difference what the transformers amplify as long as it is possible to select from them the particularly frequency that is wanted. There is only a minute quantity of energy received from a distant broadcasting station at best, so why waste most of it at the start in an inefficient trap?

A Simpler Type

Figure 11 shows a type that can be fairly sharply tuned if it has a low resistance primary winding and a relatively large fixed condenser shunted across it. The co-efficient of coupling is still low, however.

I personally believe that the filter shown in Figure 12 is by far the best type that it is possible to use.

C_1 is a large fixed condenser, C_2 is a by-pass condenser of the order of .005 $\mu\text{fd.}$, and C_3 is the usual grid condenser of .0005 $\mu\text{fd.}$ capacity. R is a grid leak of about $2\frac{1}{2}$ megohms and L is an inductance of heavy wire and with turns transposed. The coefficient of coupling in this case is unity. Losses are at a minimum as the resistance and distributed capacity of the



Back view of the Adams Super. The long-wave transformer farthest to the left is the tuned auto-transformer (also called tuned choke or "filter"). In both pictures the square brass wiring tube can be seen just under the tube shelf. All low-voltage wiring is run in this tube to prevent trouble from feed-backs. This plan does not work unless the tubing is large so as to have low inductance and resistance. Don't save at this point. In the long-wave amplifier the fourth transformer is the tuned auto-transformer or tuned choke which feeds the second detector. (Photo by 3AR)

ing pictures show the filter in place in a complete set, it being the last transformer to the left.

FILTERS AFTER THE SECOND DETECTOR

By Francis R. Ehle¹

In a superheterodyne there is frequently distortion in the audio output, even when no audio amplifier is used. Long-wave radio from the amplifier accidentally gets by the second detector, or else super-audio oscillations occur in the second detector itself or the audio amplifier, causing audio distortion.

¹Durham and Co., Radio Engineers.

A very satisfactory method of removing this trouble is shown in Fig. 13. This circuit is connected between the second detector and the phones or audio amplifier.

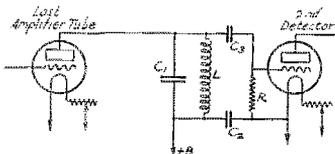


Fig. 12—A "Filter" of the Tuned-Choke Type.
 C1—Large fixed mica condenser.
 C2—.005 microfarad mica condenser.
 C3—.0005 microfarad mica condenser.
 L1—Choke coil of heavy wire wound so as to reduce losses.

Almost any irregular winding will do, but straight layers must not be used.
 R—2½ megohm grid leak.
 The size of C1 and L1 will depend on the wave at which the long-wave amplifier must be worked.
 The size of C1 and L1 will depend on the wave.
 This circuit should be used in Fig. 6, page 16, June QST where an incorrect connection is given.

The 500 µfd. (.0005 microfarad) condenser and the two high-resistance coils tend to damp out all high-frequency oscillations, while the choke coil and its series condenser form a series-tuned circuit which is tuned approximately to the amplifier

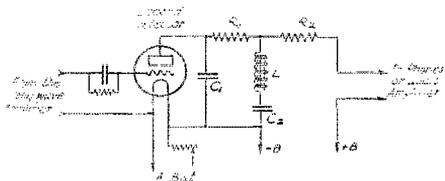


FIG. 13—SECOND DETECTOR FILTER

- C1—.005 microfarad mica.
- C2—.0001 microfarad mica.
- L—100 millihenrys, iron core.
- R1 & R2—12,000 ohms each.

frequency and damps out any undetected long-wave radio currents from the amplifier. This method has proved extremely useful.

KIMBALL'S SUPERHETERODYNE⁵

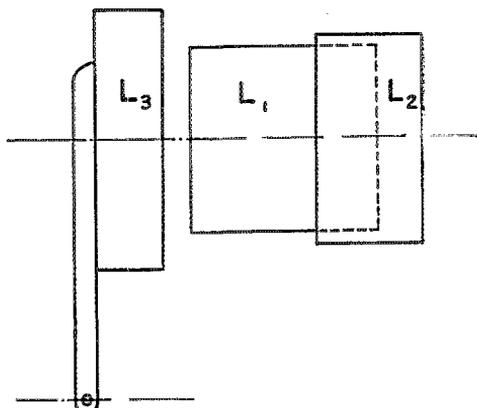
After all the articles that have been printed about the super-heterodyne it is interesting that one of the very best is still the story we printed in our April, 1923, issue, six months before the "super-heterodyne campaign" began.

This particular set was never used with an antenna; the loop proved considerably more than sufficient as a pick-up. Therefore the loop was mounted up permanently above the set with an airplane wheel to turn it by. This wheel can be seen in the upper left corner of the photograph.

The loop frame was 4 feet square and was found with 4 turns of No. 18 wire.

⁵O. A. Kimball, 9RY.

Altho the entire set was below the ground level stations on both coasts were copied every night with the loud-speaker. It didn't make much difference what sort of stations they were—amateur, broadcast or ship, all of them "tore the house down".



Arrangement of Heterodyne and Pickup Coils

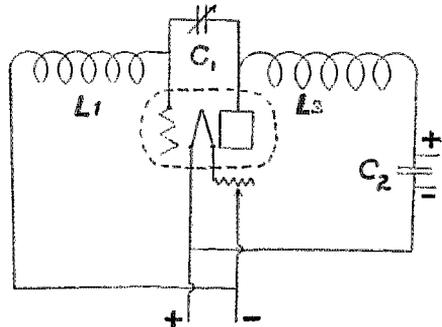


FIG. 15—THE HETERODYNE OSCILLATOR CIRCUIT

- C1—.0005 microfarad variable.
- C2—.001 microfarad mica or paper.
- L1—2 5/8" diameter, wound of No. 20 S.C.C.
- L2—2 3/8" diameter, also wound with No. 20 S.C.C.

Number of turns as follows:

Wave Range	Turns L1	Turns L2
100—220	6	8
180—450	18	25
220—550	27	36

Suggestion: L1, 30 turns tapped at 25, 20, 10 and 5.
 L2, 40 turns tapped at 35, 25, 15 and 7.

The circuit is shown in Fig. 14. There is nothing peculiar about it and no detailed explanation is needed.

The separate heterodyne is connected as shown in Fig. 15. The position of the grid coil is changed until the tube oscillates smoothly over the tuning range. The best oscillators were found to be the Western Electric "J" tube and the UV-200 Radiotron, but the UV-201-A (which was not available then) will be even better.

The long-wave amplifier of this set is unusual in two ways—in its construction and in the fact that it never failed to work after once being properly adjusted.

The coils for the long-wave transformers were wound in the former shown in Fig. 16. The part marked "1" is a removable

only necessary to find the wave at which it responds to the wavemeter-buzzer and then to remove turns until this point moves to 1600 meters, which is a good working wave. It was found by experiment that the plate coils should be tuned to 810 meters which will make them tune to 1600

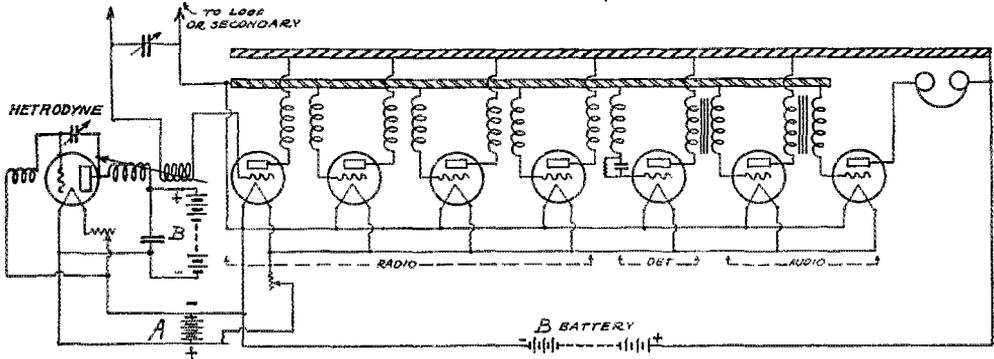


Fig. 14—Circuit of the Kimball Superheterodyne

core which comes out with the finished coil, a new disc being put in for the next coil. For the plate (or primary) coils these discs are $\frac{1}{8}$ " thick and an inch in diameter and are wound with 400 turns of No. 33 A.W.G. (B.&S.) double-cotton-

as soon as they are put into the plate circuits of the finished set. The socket and tube used in this test *must* be the same sort that will be used in the finished set later on.

Pairs of the coils are now slipped onto the long $\frac{1}{4}$ " glass rod which runs above the tubes as shown in the photo.

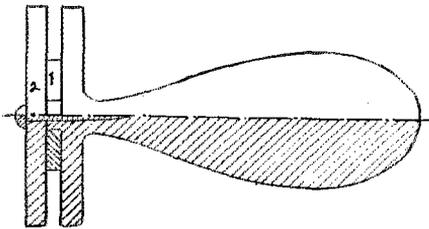


Fig. 16—Winding Form for the Kimball Transformers

covered wire. For the secondary, or grid, coils the discs are also an inch in diameter but $\frac{3}{8}$ " thick and are wound with 750 turns of the same wire. After a coil is wound the wood screw is carefully taken out of the end of the former, the disc "2" lifted off and the exposed side of the coils carefully "doped" with airplane dope or better with clean celluloid dissolved in amyl-acetate. The coil is then placed in a warm oven for 30 minutes, when it is ready for another coat all over. Three coats will make the coil rigid and waterproof.

Tuning the Transformers

It was found convenient to tune the transformers as shown in Fig. 17. When a grid coil is being tested in this way it is

Adjusting the Amplifier

Care must be taken to connect the coils

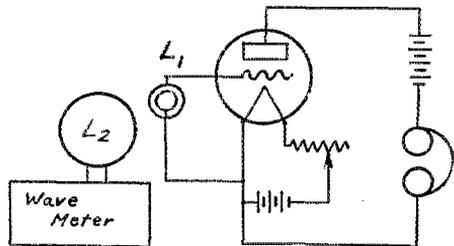


FIG. 17—TUNING THE R.F. COILS

- L1—The coil that is being tuned.
- L2—Wavemeter coil.

Note—Keep distance between wavemeter and coil the same. If no buzzer is handy the "click" method can be used to find the tune.

the same as when testing them; that is, the outer end of the plate (primary) coil to the plate and the inner end to the B battery, also the outer end of the grid coil (secondary) to the grid and the inner end to the filament. *This is important.*

When all connections have been made the buzzer-driven wavemeter is set up 25 feet from the receiving loop and final adjust-

ment made by sliding the primary and secondary of each transformer together or apart—also by sliding the transformers bodily along the glass rod. This should be done clear thru the set and when a rough adjustment has been made the whole thing should be done over again. It is impossible to do this too carefully; after many hours of work there will still be improvement when the adjustments are repeated.

The Results

As has been said, no antenna was ever used; the entire set was in a cellar in Topeka, Kansas, yet signals from both coasts were tremendous—vastly better than those produced by most of the present-day "supers". The headset was never worn, yet amateurs from every district were heard all over the neighborhood, KDKA was audible two blocks from the horn and spark signals from 1200 miles away were recorded on an Ediphone dictating machine. But this was the final result—it was not secured without many days of painstaking adjustment of the amplifier.

AMATEUR RECEIVING WITH THE SUPERHETERODYNE

Amateur work is mainly done with continuous waves, therefore the superheterodyne must be somewhat changed to make the signals readable. The scheme is as follows.

The first oscillator and first detector are used in the regular way to make the short-wave signal into a long-wave signal that is amplified by the long-wave amplifier. In effect this gives a long-wave C.W. signal which cannot be heard. Therefore a *second* oscillator is needed, and since we now have a long-wave signal we must of course have a long-wave oscillator.

Signals *can* be heard by simply letting the long-wave amplifier oscillate but the set is noisy and erratic, also the signal-strength and the sensitivity drop badly.

THE C.W. SUPERHETERODYNE AT 3XAQ-3TE-3DN."

The construction of this set is so beautifully shown by the photographs that not very much needs to be said. See Figs. 18, 19 and 20.

The tuner L_1 is wound on a $3\frac{7}{8}$ " tube. The secondary has 20 turns of No. 18 D.C.C. wire. The primary is separated from the secondary by strips of empire cloth and has 4 turns of the same wire, both windings being then secured into place with non-metallic sealing wax laid on in stripes. The secondary shunting condenser C_1 is a General Radio type 247 of .00025 capacity.

To make the tuning sharper and to prevent radiation there is a one-step short-wave radio amplifier. The tuned r.f. trans-

former, L_2 , is exactly the same as the first tuner. See Fig. 20.

The first oscillator uses separate batteries, and therefore can use a single coil

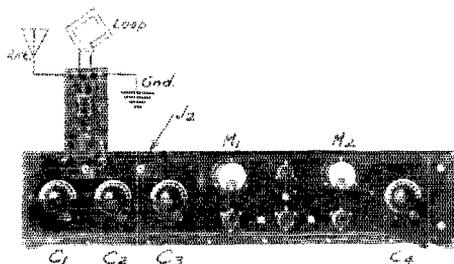


Fig. 18—Short-Wave Super-Heterodyne at 3XAQ. (Photo by 3XAQ)

Small upper panel carries the transfer switch for going from antenna to loop; tuner is on the back of this panel.

Going across main panel from left to right:

C_1 —Secondary tune, C_2 —tune first long-wave transformer, C_3 —tune first oscillator, C_4 —tune second oscillator.

M_1 —Filament voltmeter on first oscillator tube.

M_2 —Filament voltmeter for all detector and amplifier tubes.

J_2 —Plate-circuit jack permits measuring current in plate of first detector tube—also permits use of phones at this point.

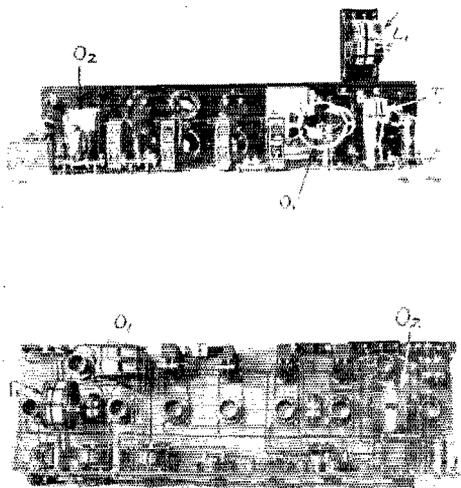


Fig. 19—Rear and Top Views Showing Arrangement. Note special mountings for the "DX" transformers, type DX-2H. (Photo by 3XAQ).

of twenty turns of No. 20 D.C.C. wire on a $3\frac{7}{8}$ " tube. A tap is brought off at the center turn as shown in the diagram, Fig. 22. The pick-up coil is hung inside the oscillator coil and has only two turns. See Fig. 20. The filament voltage of this tube

is shown by M1 (see Figs. 18 and 22). This first oscillator is calibrated—therefore the need of keeping the filament voltage steady. Only the variable condenser of the first oscillator is shielded, altho it has been a help to shield the batteries. The

oscillator condenser is a General Radio 250 μ fd.

The amplifying transformers are Radio Instrument Co.'s DX-2H, excepting the first one which is their type DX-O, having a condenser-tuned primary. These transformers have been found to work very quietly and to amplify very well.

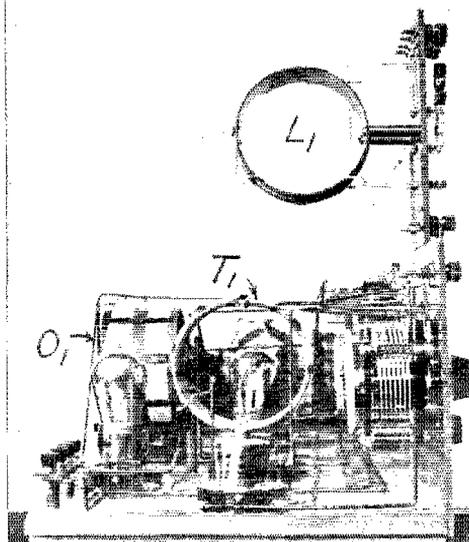
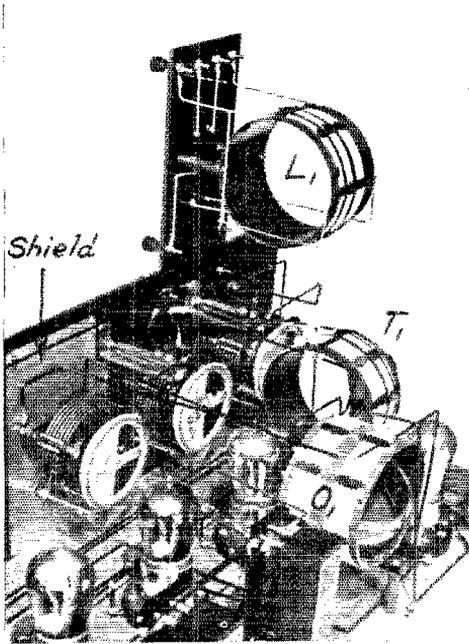


Fig. 20—Tuner and First Oscillator. (Photo by 3XAO).

- L1—Tuner.
- L2—Tuned short-wave r.f. transformer, made just like the first tuner L1.
- O1—First oscillator tube and coils.

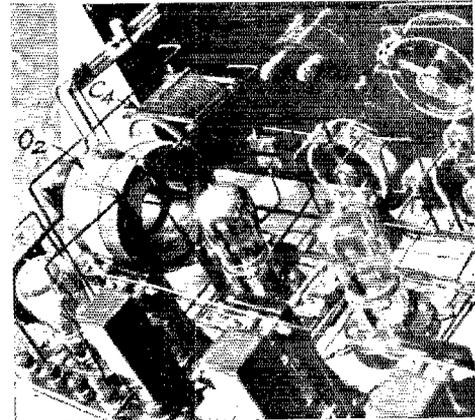
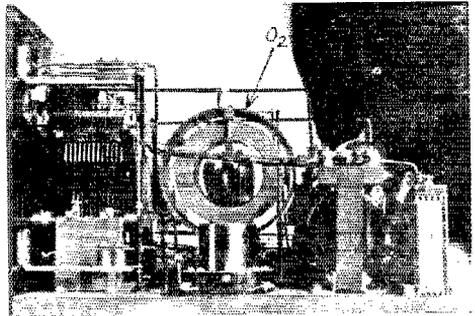


Fig. 21—Second Oscillator. (Photos by 3AR)

The second oscillator also uses its own batteries. This was found necessary to get satisfactory operation. The second oscillator uses two 400-turn duo-lateral coils hung inside a 3 $\frac{3}{8}$ " tube, around the outside of which is wound the pick-up coil of TWO turns—the photo shows 10 but this has been reduced. This pick-up coil is connected in the plate coil of the second detector. It works better there than in the grid, where it would usually be placed (see Fig. 21).

UV-201-A tubes are used thruout.

Performance

At first the tuning was somewhat broader than on other receivers; this was corrected by adding the single step of tuned short-wave r.f. Reception is done on the loop or antenna. With either one it is possible to hear transcontinental amateur signals

noises. Aluminum may be used instead of brass but is not as good because the joints cannot be soldered and are consequently much poorer. To get equal results the shield must be somewhat heavier and the flanges be very wide and fitted as carefully as possible. Better stick to brass or copper. 1/32 inch or thicker is preferred.

Changing from Antenna to Loop

It is suggested that a telephone jack could be arranged so that one might plug in the loop and cut out the regular tuning unit at the same time. This is bad business for two reasons. In the first place it puts into the tuned circuit a small but very poor condenser, that is to say, the telephone jack and plug. In the second place the loop then feeds directly to the first tube and the tuning is quite broad. A much better method is shown by Mr. Harvey of 3XQAQ.

Rheostats

A good way to group the tubes on the rheostat is as follows: audio amplifier on one rheostat (why does anyone use an audio amplifier on a superheterodyne?), first detector on one rheostat, second detector on another rheostat, intermediate frequency amplifier on still another rheostat and the oscillator on still another one. If fewer than this are desired it is suggested that the audio amplifier and oscillator be operated with a fixed resistance. When a potentiometer is used on the intermediate frequency amplifier it also may be operated with a fixed filament resistance. This leaves only the detector rheostat.

Plate Voltage

There seems to be an uncalled-for uncertainty as to the correct B battery voltage in the superheterodyne. There is no particular reason why freakish voltages should be used; given the same tube the ordinary voltages are perfectly satisfactory. Just what these voltages are will depend upon the tube; the label on the box in which the tube comes will give the necessary information.

Amplifier Wavelength

In the McLaughlin neutrodyne-superheterodyne the wavelength of the intermediate amplifier can be adjusted. It is normally operated in the neighborhood of 1500 meters which gives good amplification without taking off a portion of a radio-telephone side band. When receiving telegraphic signals a longer wave may be used as the additional sharpness does no harm.

Choosing Tubes

Although the Radiola superheterodyne uses UV-199 tubes there seems to be a general agreement amongst our contributors to the effect that these tubes are not

the best ones for the purpose. The favorite seems to be the General Electric UV-201-A.

Bank Windings

Mr. John Magee of Hartford suggests the following method of making banked windings without the usual amount of grief.

"Wind the tube with a single layer of wire, using care to stretch the wire and to wind very firmly and closely. Put on winding which will cover the distance to be occupied by the bank winding and a little more besides. Dope this winding and bake it. Then dope and bake again.

Break the wire three or four turns from the end and unwind five turns. Fill in the space vacated in this way with five turns of single layer coil which will be the start of the bank winding and serve as a foundation at the starting end.

Then start the bank winding, stripping off the single layer coil turn by turn as you proceed. In this way the original single layer coil serves to keep the bank winding from spreading at the bottom and makes it possible to wind the bank winding tight from end to end without any dope.

After the bank winding is done, end it with three layers of single winding and dope this short end.

Now remove what is left of the original single layer winding. This will give a permanent bank-wound coil without dopping."

Making Adjustment Easier

Mr. R. T. Anderson of Lakewood, Ohio, suggests that the McLaughlin neutrodyne-superheterodyne, described in our June issue, can be equipped with neutralizing controls that come through the front of the panel so as to make the neutralization possible without the laborious business of opening and closing the lid of the set many times. This could be done by mounting Chelton midget vernier condensers inside and providing them with extension *insulating* shafts that would come through the casing.

Correction

In the Figure 6 on page 16 of the June issue there is an extra wire that "does not belong to the lodge." The lower end of C₃ is shown connected to the lower end of R. This would connect the +B battery, which is wrong. The correct connections are shown in Fig. 12, page 22 of this issue.

Our Next Article

In the next article of this series we will discuss iron-core transformers, special superheterodyne circuits, trouble-shooting in superheterodynes, and special uses of the super. A particularly compact superheterodyne, suited to various wave-ranges, will be shown.

Pan-American Tests Succeed

INFORMATION received to date bears pleasant surprises for those interested in the Pan-American tests just ended. The greatest of surprises of course was the astonishing work by Argentine CB8, described elsewhere in this issue. This is not all, however; many other amateurs did good work in contributing to the success of the Tests.

Many North American signals were heard in S.A., according to *Revista Telegrafica*, and CB8 cables that he alone bagged fifty, but the only list received so far is a badly garbled press despatch and we will have to wait for the mails—see next issue of QST.

CB8 is the only S.A. station reported heard at this writing, but he alone has done beautiful work. The following amateurs report reception of CB8 between May 21st and June 4th: British 2OD, 5KO, 2UV, and A. H. Fielding, Birkdale, Lancashire; Canadian 1BQ (CB8 has heard him too); U.S. 30Q (first N.A. amateur to report a S.A. station), 1XC (exchanged calls), 1CL, 1DZ, 1XAW, 1AAC-1ZO, 1ALX, 1CQK, 1BIG, 3BWJ (worked him), 1XW (exchanged calls), and C. A. Service, jr., Glastonbury, Connecticut.

One of the most remarkable of the Pan-American stunts was the transmission of a message of greetings by the redoubtable John Reinartz, from 1XAM, which was simultaneously copied by Major R. Raven-Hart at Los Andes, Chile, Mr. C. Braggio at Argentine CB8, and Mr. J. Johotskoff, a prominent experimenter of Rio de Janeiro, Brazil. This message, addressed to Major Raven-Hart, read as follows:

THE AMERICAN AMATEURS EXTEND GREETINGS TO THEIR BROTHER AMATEURS IN SO AMERICA.

REINARTZ

Major Raven-Hart has been doing excellent reception in Chile, having copied on April 16th the first amateur message ever received in that country from the U.S. (and probably the first received in South America), being an acknowledgement from 1XAM of a cable report of sigs heard. For many months past he has been logging N.A. hams, the list including 1XAM, 1XAH, 1MO-1XW, 1AJP, 2CXL, 3MB, 4XC, 5MI, 9XAX (about the most consistent), 9CF, (Canadian?), Canadian 1AR and 9AL, and numerous of the higher-powered short-wave commercials. At least one Chilean amateur transmitter was on the air for the tests, CAF, operated by Mr. Falkenberg as Santiago, using two 50-watters on waves between 100 and 125 meters.

Mr. Johotskoff in Rio reports not only 3XAO, 2RK and other American calls but French 8AB and other Europeans, including

the 94-meter transmission from Poldhu. Montevideo reports 2DX and 9NX.

Letters from various South American countries show that great enthusiasm is being displayed by amateurs there in getting into the short-wave game. This is particularly true of reception; it is interesting to note that the reception of the short-wave telephony from KDKA and WGY is commonly used as the mark of a good receiver for amateur work. The South American amateurs are now definitely on the air with us. We welcome them, and congratulate them on the great success they are having.

—K.B.W.

Concerning Transcons

IT looks as if we started something when we claimed 1ER had done about the speediest job of working a lot of transcontinental stations.

First comes 8GZ with a claim that he "rates" the record for working six West Coast stations in 86 minutes on one morning. His log proves it, too.

Next is 1CMP who says that on December 13th in 25 minutes he worked 6ALV, 6BPF, 6CHL and 6AWT.

Now then 1ER has the floor.

"You sure stirred up something with that piece in 'Strays' but I'm afraid that maybe you went too far. That letter from 8GZ had my record slightly bettered, although I don't exactly call Columbus, Ohio the East Coast.

I don't know how you happened to guess 100 minutes because I think that when I told you I said two hours. But the really funny thing about it was that when I looked up my log I found it *exactly 100 minutes time*.

Here is a copy from my log for the morning of December 16th, 1923:

5:20 AM EST—Wrkd 6ZAH—
(Called me after I cid another stn.)
5:35 AM EST—Wrkd 6ZBK—
(Called me after I cid another stn.)
5:50 AM EST—Wrkd 6AAK—
(Raised on a CQ)
6:10 AM EST—Wrkd 6XAD—
(Called him on his CQ)
6:35 AM EST—Wrkd 6AWT—
(Called him on his CQ)
7:00 AM EST—Wrkd 6CKR—
(Called him on his CQ)

Sincerely,

P. F. Hadlock, 1ER."

My Key Thump

By 5XV

IT is in the depths of despair that I begin this chronicle. Yet the truth must be told; I cannot die knowing that my name and my call will be an anathema to all self-respecting hams.

I ask for clemency for the foolishness of youth that does not reck of the consequences—but I am waxing incoherent as I realize that I must sacrifice myself to undo the evil I have accomplished. Let me begin with the story.

It started with so incoherent a device as a Western Electric "J" tube used for C.W. transmission. It started because I used a battery supply for the sake of its wonderfully clear note. As I write this I am seized with a desire to scream—to throw the ink-well violently; I am near insanity and only by a great effort am I able to keep to the train of thought. Judge accordingly if this record wanders.

As time went on the output of my station increased and with it my infant key-click gradually became more pronounced and more evident, though it was but in the infantile stage. I did not realize the malicious thing I had saddled myself and my town with and determined to use D.C. on the plates of my new and larger set or die in the attempt. How fate mocks me—now I must in truth die in the attempt.

For a time the new set used an A.C. supply and the key click went to nothing. But opportunity came sooner than I expected in the way of a relatively good price on a fine little 500-volt motor-generator set. I took it—Heaven forgive me.

My key click was now weak from lack of exercise but unwittingly I did everything in my power to increase it.

The first evidence of my success came from a friend who brought over a pair of strangely twisted telephone diaphragms—my key click had punched them completely thru the hole in the receiver caps. We laughed over them and I accepted his words of praise at the power I was putting out. Truly pride goes before a fall.

The next night the last tube in a nearby broadcast receiver popped out of the socket and broke itself thoroly against the nearby wall. Following this, accidents happened regularly until I thot things had reached a climax on the evening when a new neutrodyne leaped from the table crashed itself into bits against the phonograph.

I (and others) knew the causes of these things—my key-click, which had now grown so that it was called a key-THUMP!

So it came that I had to confine my transmission hours to the early morning when the great mob of B.C.L.'s would not be

listening and could not be damaged. I did it, though the local radio store offered me a commission to keep on wrecking sets.

The next incident of note came from 5PPP, another local ham. He had been off the air while my click grew to a thump and when he came back to the key he was amazed to find that he could not hold his fones down on the table. With characteristic ingenuity he attached a long cord to the headset and every morning took setting-up exercises by wrestling with the leaping headset.

One morning 5PPP was found lying near the radio set he loved. He was quite dead, his neck was broken.

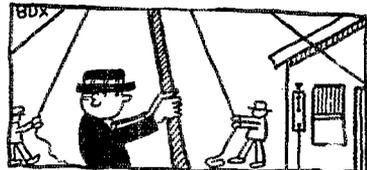
There were no marks on him and everyone ascribed it to a weak heart, assuming that he had fallen off his chair. But I knew better—I had before me a vision of the dread activity of the headset when my key-thump was in tune—and I had transmitted that morning.

You may imagine the days of terror that I spent with the horror of discovery hanging over me. No one realized the truth but there was no prophecying when it would come out. This was my accomplishment, my own fault.

However, now things reached a conclusion. I have built a duplicate of my antenna—ostensibly for experimental purposes but actually to capture my keying-thump and to destroy it. At first I did not realize the strength of that which I had developed. My first attempt resulted in a two-week's stay in the local hospital and the complete destruction of one side of the shack through which I had been violently propelled.

I have now improved my equipment and I shall go violently into the unknown (and last) adventure with the surety that I shall take my key-thump with me.

I have arranged a Packard transformer to put its entire voltage through me at the instant the key-thump attacks and I feel positive that the 13,200 volts will completely destroy both of us. With a free conscience I give my friends of the air an adieu and 73. Perhaps also I can say "CUL," though this is problematical for I go as a martyr. Be warned.



Oscillating Crystals

By H. S. Shaw*

Can you imagine a transmitter that never shifts its wave even a hundredth of a meter? Can you imagine making a schedule for 96.38 meters and knowing that you will be right on that wave and know that the other man will be tuned right to you? And can you imagine getting from the receiving operator a report that during hours of operation the beat note in his phones never changed even a particle? These things are possible with the oscillating crystal.—Technical Editor.

ANYONE who has listened to short-wave transmitters will realize that the "dial acrobatics" needed to follow the beat-note do anything but aid reception.

The necessity of frequency control has been well shown by Dr. A. Hoyt Taylor in his article "The Navy's Work on Short Waves" in the May issue of *QST*. In the same issue there was an article on "Sta-

tions at the receiver, must be kept constant. It is the purpose of this article to indicate a way in which this may be done.

Crystal Resonators

Certain crystals, notably Rochelle Salts and Quartz, have the peculiar property of becoming charged electrically when they are compressed or stretched in certain directions. On the other hand, they change their shape slightly when they are placed in an electrical field. If such a crystal is vibrated mechanically it will produce an alternating voltage. If it is put into an alternating electrical field it will, of course, vibrate. These actions are called "Piezo-Electric Effects".

Piezo-electric crystals have been used experimentally in various ways, such, for example, as for telephone transmitters and receivers and for under-water signalling, but the thing which is of most interest to us here is the fact that quartz crystals may be made to vibrate at *radio* frequencies.



Dr. W. G. Cady, Wesleyan University, Who Did Some of the Earliest Work With Crystal Oscillators at Radio Frequencies.

tion Efficiency" by S. Kruse in which the advantages of constant frequency are mentioned. Its attainment is far from easy, however, as will be realized when we stop to think that at 2000 kc. (150 meters) a 1/10% frequency variation means a change of 2000 cycles in the beat note at the receiver. Swinging antennas and changes in plate voltage are almost sure to cause such changes. (Anyone doubting that such changes are at all scarce is asked to try copying on a windy night from a station using direct current plate supply.—Tech. Ed.)

Frequency changes are quite different from "fading," which is a variation of the energy received from a distant station. Fading is very little understood and almost entirely beyond our control. Frequency shifts (what we amateurs call "swinging") are understood and can be eliminated. This means, of course, that the frequency of the transmitter, and also of the local oscil-

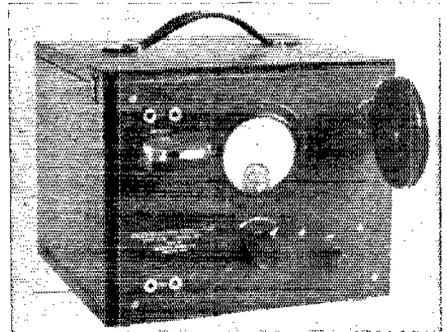


Fig. 1

For an account of early work with quartz crystals, particularly as "resonators" or radio frequency standards, the reader is referred to an article by Dr. W. G. Cady in the April, 1922, issue of the Proceedings of the I. R. E. Later Dr. G. W. Pierce of Harvard University worked on the development of quartz-crystal oscillators, publishing a paper on the subject in the Proceedings of the American Academy of Arts and Sciences, October, 1923. On January 25, 1924, he sent messages from 1XJ, at Harvard, to his house in Cambridge and to a nearby town.

*Treasurer, General Radio Co.

*See Nicoison, Transactions A.I.E.E., XXXVIII, 1467.

A Standard Frequency Oscillator

Up to about this time the principal interest in crystal oscillators lay in their use as frequency (wavelength) standards, for which they are almost ideal, because they are so permanent and so little affected by temperature or other changes. Fig. 1 shows a laboratory frequency standard which has been developed by the General Radio Co., using a receiving tube, which gives plenty of output for this purpose. The crystal element is mounted in a holder which may be seen plugged into the panel at the upper left hand side, with a coupling coil at the right. While the word "crystal" has been employed a number of times above, it is generally only a small portion of a crystal which is actually used in an oscillator, this portion usually consisting of a thin slice cut out of the crystal in a plane parallel to the optical axis, and carefully ground and polished. The form used in the laboratory instrument mentioned above is a disc about an inch and a quarter in diameter and a sixteenth of an inch thick. The uncut crystals vary greatly in size, from very small ones to those which weigh

is supplied by the plate circuit. From this it will be seen that the action in a crystal oscillator is similar in principle to an ordinary oscillator except that in the latter the crystal is replaced by a tuned circuit, which determines the frequency. This is where the trouble with the ordinary oscillator comes in, because anything which may change the tuning of this circuit, as, for example, a swinging antenna, will change the frequency. Changes in filament or plate voltage are also likely to change the frequency because of their effect on the impedance of the tube, which is in parallel with the tuned circuit.

The beauty of a crystal oscillator is that the frequency is determined entirely by the dimensions of the crystal, so that it is possible, (within limits which will be mentioned later), to make all sorts of adjustments to the set and to the antenna,

without having any effect whatever on the frequency. It is a novel and certainly a satisfying experience to operate a set and be able to turn a condenser or two, change the coupling to the antenna, and do various other things with the knowledge that if there are any oscillations at all, they are always of the same frequency, and that nothing is changing except the output or the efficiency.

It has been stated above that adjustments may be made "within certain limits" without changing the frequency, the reason for this statement being that most crystals can be made to oscillate at either of two (or more) frequencies, it being possible to select the desired one by properly proportioning the circuit. Fortunately the frequencies of any particular crystal are usually well separated, as for example 1176 and 121.3 KC. (about 255 and 2475 meters) in one case, so there need be little difficulty on this account.

1XAU's Crystal Transmitter

About the first of April of this year I decided to build a crystal transmitter to see how it would work at high frequencies (short waves) where I knew that constant frequency was particularly important. This transmitter, which is shown in Fig. 4, consists of a wooden framework and shelves, on which various parts may be conveniently mounted in experimental work. In this case it set up with two 5-watt tubes, using a

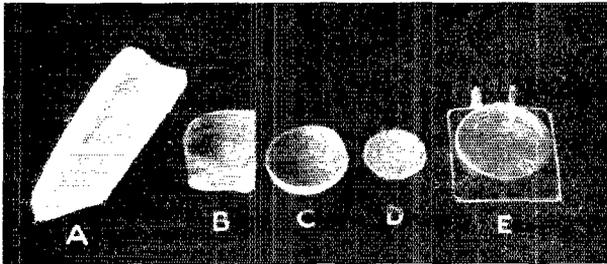


Fig. 3. Stages in the Finishing of a Quartz Crystal. A—Rough Crystal; B—Oscillator Blank; C—Low Frequency Oscillator; D—High Frequency Oscillator; E—Mounted Crystal.



Fig. 2—A Mounted Crystal

many pounds. It is necessary to use crystal quartz, the fused variety being inactive.

How Crystal Oscillators Work

In a piezo-electric oscillator the crystal is placed in the grid circuit of a tube. The variations in the potential of the grid (which are necessary to sustain oscillations) are produced by the alternating E.M.F. of the crystal. The vibrations of the crystal are maintained by energy which

circuit which was suggested to me by Dr. J. M. Miller and which is shown in schematic form in Fig. 5. Most of the parts are exactly the same as would be used in an ordinary set and therefore do not require any comment. In experimental work it is important to have enough meters and in this case there are four—filament voltmeter, plate voltmeter, plate milliammeter and antenna ammeter. An R.F. choke is placed in series with the grid leak and is apparently quite essential. The crystal is mounted between two parallel brass plates, about an inch and a quarter in diameter, which in this case are adjustable as to spacing, to allow for the use of crystals of different thicknesses. The adjustment of these plates is usually not critical when a crystal is used in a low-power set, as with a receiving tube, it being necessary merely to allow a clearance of a few thousandths of an inch, so that the crystal can vibrate freely. With a 5-watt tube, however, there is usually a troublesome brush discharge, and sometimes a force which tends to make the crystal shoot out from between the electrodes, which makes it necessary to provide means for holding the crystal in position. Most of my experience with crystals and 5-watt tubes has been at frequencies in the neighborhood of 3000 KC. (100 meters), and such crystals seem to work best when there is actually a slight pressure on them.

It will be noticed that in the diagram of Fig. 5 the output circuit of the tube is tuned, and it is the adjustment of this circuit which selects the frequency and determines the power output. Starting at a point above the resonant frequency, if the capacity in the circuit is gradually increased the output increases, *without change of frequency*, until at a point close to resonance the oscillations stop rather abruptly. If the capacity is still further increased it may be possible to start oscillations at the lower frequency of the crystal but, as stated above, the frequencies are apt to be rather widely spaced, in which case it would be necessary to use another coil of considerably larger inductance. When the right adjustment of this output circuit is once found, which is an easy matter, it may be left alone, with the

assurance that whatever else is done the frequency will remain the same if there are any oscillations at all. The only way to change the wavelength is to grind down the crystal. The only other adjustments, aside from filament and plate voltages, etc. are the tuning of the antenna and the coupling, both of which should be made for maximum antenna current. At this point I should like to say that I believe that amateurs (and others as well) should be encouraged to use coupled circuits in their transmitters, thus minimizing the effects of key-clicks and harmonics. The latter are particularly in evidence in the region from 3000 KC. up (100 meters down) which is infested with harmonics of broadcasting and amateur stations.

In the case of most crystals which I have tried, a very appreciable time is required for the oscillations to build up, so that it is necessary to let the crystals oscillate continuously, which means that it is not possible to key the set in the usual way; but I found that in my low-power set it was perfectly

satisfactory to place the key in the antenna. One of my crystals, however, required such a small fraction of a second to build up that it was possible to key it in the plate circuit, although I think that this is unusual, most of the crystals having a time lag of perhaps half a second or more.

Transmission Tests

Soon after completing my transmitter I had an opportunity of trying it out under adverse conditions, in some tests which I had arranged with 1XAQ (S. Kruse) near Hartford, Conn., a distance of about 85 miles from my station (1XAU) at Newton Centre, Mass. Conditions for transmission between the vicinity of Boston and many points in southern New England have long been known to be unfavorable, and they proved to be so in this case, for signals from 1XAQ, using two 50-watt tubes on about 6000 KC. (50 meters) were not any too easy to read above a rather severe background of static. Likewise the signals from my crystal transmitter on about 3150 KC. (95 meters), with an output of about 5-watts from the two 5-watt tubes, were very weak at Hartford. Notwithstanding this, and bad fading, tests were carried on for three consecutive nights. On May 20

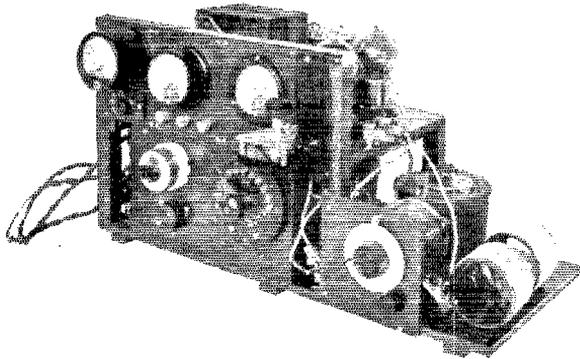


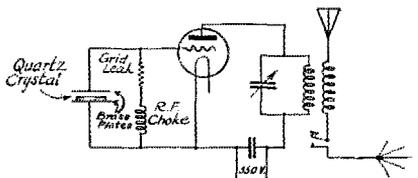
Fig. 4

a 49-word message, to be forwarded to NKF, was handled. This message probably bears the distinction of being the first to be transmitted by crystal oscillator over a distance of more than a few miles, those of Dr. Pierce, referred to above, being quite local in character.

Quoting from a letter from 1XAQ he says: "The receiving conditions have so far quite uniformly been the worst I have ever encountered, even in New England. The only thing that made it at all possible to copy your signals was their absolute steadiness. Given the same signal strength and the same amount of interference it would have been perfectly impossible to copy you, had you been using any other sort of signal."

In order to realize the full advantage of quartz crystal transmission a crystal should be used at the receiver as well as at the transmitter and this may easily be done in cases where it is not necessary for

considered and that is: When and where will crystals be obtainable, and what will they cost? It is impossible at present to give definite answers to these questions, but it is hoped that in the not far distant future



Circuit used at 1XAU for operation with 5-watt tubes
FIG 5

crystals, properly mounted and calibrated, will be available to experimenters at a reasonable price.

Judging only from my very limited experience I believe that the most satisfactory and dependable form of crystal transmitter will be one in which the crystal is used at low power, probably with a receiving tube, the output of which is amplified, as in the usual master-oscillator arrangement. Another promising line of development, however, is the use of the crystal merely as a stabilizer or governor, to control the frequency of an ordinary oscillating circuit, in which case it should be possible to handle more power than could be done with the crystal alone. It is realized that much development work must still be done before a thoroughly satisfactory crystal transmitter is produced.

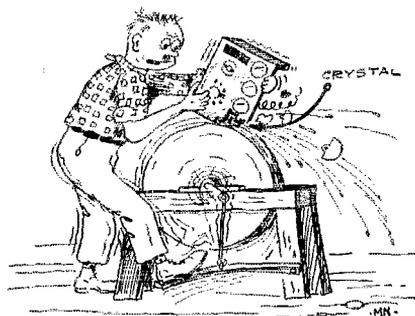
From a technical point of view, this article is, perhaps, premature, but I have

RECEIVED FROM MEMBER, ADDRESS CITY OF RESIDENCE TELEPHONE		P. O. ADDRESS, PHONE NUMBER		S. O. NUMBER TELEPHONE	
THE AMERICAN RADIO RELAY LEAGUE					
HARTFORD, CONN. RADIO STATION 1XAO					
RADIOGRAM					
Received	FROM STATION	CLASS OF STATION	DATE	TIME	CLASSIFICATION
No.	1XAO	Station, Center, Mass.	July 20, 1924	7:26 P. M.	1. Q.
FROM	1XAO		DATE	JUL 20	VIA
TO	AFF.				
Thanks for letter of 17th. Much improvement in operation of frequency since our test. Both waves heard well today, hard to say which was better. No apparent change in SW when 75 was cut off. This message sent with quartz crystal oscillator from 1XAO to 1XAO direct in 14 seconds.					
Send	BY AIR	LOCAL AT	DATE	TIME	CLASSIFICATION
SECTION TO ADDRESS: The station accepting this message will be pleased to forward your reply unless advised otherwise.					

the tuning of the receiver to be continuously variable. Take, for example, two amateur stations which work with each other more or less regularly. If one station were supplied with a crystal of say 1500 KC. (200 meters), and the other with one of perhaps 1501 KC., each crystal could be used both for transmitting and as a separate heterodyne for receiving, so that each station would, of course, have a 1000 cycle beat-note with the other, which would certainly be a great advantage. I have often thought how nice it would have been if the "Bowdoin" (WNP) could have been equipped with a set of crystals adjusted to the wave lengths on which it was intended to transmit, so that listeners might have supplied themselves with crystals to beat against these and thus *feel sure that they were correctly tuned*, and that if they did not hear WNP it was for some other reason, thus eliminating one of the big uncertainties of reception.

Problems for Experimental Work

A very practical point remains to be con-



.....to change the wavelength.....grind down the crystal

written it in self-defence to protect myself from the onslaughts of the Technical Editor who has been on my trail for some time for the story.

Experimenters Section Report

ENROLLMENT in the Section has again increased during the past month. Several men have given as the reason for enrolling that they are anxious to learn some of the things that Australian amateurs use to secure such effective transmission with low power. An even more popular reason is the desire to find out what really goes on in a transmitter working at short wavelengths.

The response to our sheet suggesting methods of logging experiments was immediate and enthusiastic, only a few members failing to respond. It is presumed that they will get around to it eventually.

The information on the Experimenters Section is being sent to the secretaries of all of the Affiliated Clubs. Club members are asked to see that their particular secretary is given full cooperation. If the club has a technical committee or a technical chairman his attention should be asked.

Audio Transformers Again

Our last request for information on the design of 1000-cycle transformers to use in "maximum distortion" amplifiers at code stations fell pretty flat. Most of our other inquiries have gone over in great style but this particular one has received one lone-some answer.

What's the matter?

Underground Communication

Mr. J. J. Jakosky, Assistant Engineer at the Bureau of Mines Experiment Station in Pittsburgh, Pa., has been in charge of underground communication experiments by different methods. Included in the program are tests by radio, by wired wireless on the underground wiring, trolley wires, rails and air piping. Some work will also be done with T.P.S. the French Army variety of Dutchen telegraphy.

The report of the work already done can be found in technical paper No. 277, "Application of the Geophone to Mining Operations" and report of investigations No. 2407, October, 1922. These can probably be obtained from the Bureau or from the Government Printing Office at Washington.

Mr. Jakosky would like to hear from all others who have done underground communication work. Work in receiving radiophone broadcasting underground will of course bear on the subject. In a report of this kind it is very essential to give the information in good detailed form, distances, wavelengths, power and the like being given as exactly as possible.

Mr. Jakosky is primarily interested in a portable transmitter and receiver having a total weight of about 50 pounds. The power supply will probably have to be of the storage battery variety and must be included within the 50-pound limit.

Short-Wave Wave Meters

The very great demand for short-wave wave meters is at last beginning to be stilled. The General Radio Company is ready to extend the range of their meters downward on special order, also they supply a short-wave coil for the type 247W wavemeter at \$3.00. This coil goes down to 50 meters and should be very useful in the work of X stations.

We believe that the Jewell Electrical Instrument Company also supplies its special amateur wavemeter with a short wave range.

Amateur Interference

The members of this section are asked to comment on the causes of amateur interference with broadcast reception. The Editor of the section has become convinced that alternating current plate supply causes very little of the difficulty and that it is mainly due to keying thumps. Carefully-made observations and experiments are invited.

Radiation

Opinions and experiments are invited on a good practical method of determining antenna field intensity with simple and inexpensive apparatus. Several ideas have come to us and will be presented later.

Tubes and Sockets

From several sources we have received letters stating that detectors operate much more effectively at short wavelengths if no socket is used; the leads being soldered



WHICH BATTERY SYMBOL ?



PRESENT

SUGGESTED

CONDENSER SYMBOLS

directly to the pins of the tube. Mr. John Miller, Engineer of the Jewell Electrical Instrument Company, especially, has noticed increased signal strength as a result.

The suggestion has been made that another small increase might be obtained by removing the tube base and soldering the

loose wires directly to the tuning system as was done with the old audiotron.

We will very much appreciate careful tests and measurements on this. It may have an influence on our future tuners.

The Battery and Condenser Symbols

Having noticed that we and most other radio magazines seemed to be in the dark as to the correct use of the battery symbol we have asked the American Institute of Electrical Engineers, which is the final authority in such matters, about it. Their committee on standardization informs us that the symbol should be used as shown below. This seems tail foremost to use but the A.I.E.E. is the final authority and it stands.

We have never been pleased with the symbol for the variable condenser and have not been overly happy about the one used for fixed condensers. Comment is invited on the suggestions herewith.

Concerning Harmonics

Anyone who receives on amateur wavelengths does not need to be told what an infernal pest the harmonics from broadcasting stations are. Many of them can be heard considerably further than the main wave. Naturally enough our own transmitters produce the same thing and as we go down into the lower wavelengths the harmonics from 200 meter stations are beginning to be very troublesome.

There is great need for a tremendous amount of work on getting rid of these things in a definite fashion.

The schemes that immediately occur to one are of course the use of the Meissner circuit, rejectors in the antenna system and more moderate use of plate voltage. All of these schemes have their weakness and therefore need investigating. This is a really live problem and one that should be tackled at once by as many of us as possible.

The Everlasting L/C Ratio

There seems to be no end to this controversy about the proper size of secondary tuning condensers. Here is a splendid opportunity for someone to do some real measurement and test work. Such work would be classic in amateur radio and would serve an additional useful purpose in shutting off all the windy and pointless arguments that are being staged about it.

—S.K.

General Attention!

SO many conflicting reports have come to us regarding various local situations on transmitting tubes that we would like to have as many A.R.R.L. men as possible write us as follows.

1. Address your letter "Concerning Tubes," American Radio Relay League, 1045 Main Street, Hartford, Connecticut.

2. Please discuss the transmitting tube supply situation as you know it, giving exact dates, exact names of people and firms, also precise number and type of tubes involved.

3. Please do not discuss any other matter in this letter so that this file may be kept clear.

4. Please sign your letter in full; do not make us go to the Call Book for the rest of the information.

The purpose of this questionnaire is to clear up the tube situation for the mutual benefit of ourselves and the manufacturers. Please answer *promptly*; if possible have your answer in the mail within 24 hours of the time that you receive QST.

Thank you!

Ham Conventions

TWENTY-FIVE A.R.R.L. men in Ft. Wayne have taken upon themselves the responsibility of breaking the ice and putting across the First Annual Hoosier State A.R.R.L. Convention, which will convene in that city on July 17th and continue for three days.

Among the many features planned are trips thru the plant of the General Electric Co. and the Dudlo Mfg. Co. (makers of magnet wire), a big traffic meeting, an extra big banquet and, to make things complete, the R.O.W.H. initiation.

All Hoosier Hams should rally to the support of the gang at Ft. Wayne. Convention Headquarters will be at the Anthony Hotel. All correspondence in connection with the meet should be addressed to A. H. Barnett, corresponding secretary, 202½ Masterton Ave., Ft. Wayne, Ind.

Northern New York Get-Together

On Sunday, May 25th, at the Hotel Hulbert, Boonville, N.Y., A.R.R.L. members of northern New York to the number of 42 from Utica, Rome, Gouverneur, Watertown and Boonville held their first annual assembly. F. H. Schnell, traffic manager, and A. A. Hebert, treasurer, from Headquarters, addressed the gathering after the banquet. Great credit is due Ray Schweinsberg



(8ADD) for getting the "gang" together and for the success of the meeting.

First District Annual Big Success

Gathered in the Walker Memorial Building at the Massachusetts Institute of Technology in Cambridge on Saturday evening, May 17th, some two hundred amateurs, BCL's and others enjoyed the usual fine First District banquet and get-together. In arranging this year's program the M.I.T. Radio Society was assisted by the Commonwealth Radio Assn., Boston's big club.

The evening's program was opened with a code speed contest conducted by "Ted" McElroy, champion code man of the First, and was won at a speed of 39 w.p.m. by "Billy" Halligan, IUL, A.R.R.L. D.P.M. for New England, who carried away a beautiful silver cup.

The banquet was all dolled up with radio names that sounded right familiar. By the way, a considerable gang from A.R.R.L. Headquarters was in attendance. After the spread Mr. A. V. Getchell, president of the C.R.A., instructed the toastmaster, Joe Toye, not truly a radio man but a Boston newspaper feature writer who has done considerable broadcasting and who has a wicked "line", and presented him with a Wouff Hong for his protection. Not knowing the Wouff from the Hong, Joe grabbed the thing at the nodal point and started activities. The speakers included K. B. Warner, A.R.R.L. secretary and editor of *QST*; H. W. Lamson of the General Radio Co., who described the quartz oscillator; Traffic Manager Schnell; Major W. C. Boretz, c1DD, manager of the Maritime Division of the A.R.R.L.; Lt. Comdr. Stanley M. Mathes, U.S.N.; Prof. A. E. Kennelly of Technology and Harvard, Ted McElroy and Billy Halligan; A.R.R.L. Treasurer A. A. Hebert; and Mr. Getchell.

Stunts and movies rounded out six hours of fun, and then the banquet, the big annual event of the First, was over.

The Illinois Convention

By Beverly Dudley

On May 31st, 165 Illinois amateurs ate their dinners in relays because Wheaton, Illinois, was not fixed for that kind of a mob. When they got all through the second annual Illinois convention opened.

Talks by 9AAW, 9CA, 9ZN and 9XBA followed. No use naming these men, as all of you know them by their calls.

During the afternoon an initiation was held for the Rummy Order of Suckers (purely Illinois outfit) but no one got arrested because the Wheaton police (both of them) are off after twelve o'clock on Saturday. Only one sad thing occurred, the outfit did not have a bible on which to swear in the initiates and had to use a Ford coil which was swiped during the proceedings.

After that the gang walked around the

town five times and then lined up again. But the feed was sure 'B.

Talks followed by Flewelling and by "WO" of 9ZN and also by 9XBA who used to be "FJ" at 9ZN. Marco asked for a sock to clean the blackboard with because he didn't care to use his handkerchief.

9DWX got first prize in the liar's contest and then the gang QSS'd out with high hopes for the next convention. "It started in the Central Division".

NKF-1XAM Schedules

MUCH interest is being displayed in the short wave schedules of NKF and 1XAM, who are doing pioneer work on the waves below 100 meters. These stations have transcontinental range and on these waves can be heard at least two-thirds of the way across the country at noon. The following schedules run until September.

11:15 to 11:50 A.M., Eastern Standard; NKF on 51½ or 52 meters, working with 1XAM, which will be on some wave below 40 meters.

1XAM also has a schedule 7:00 to 8:00 P.M., E.S.T., with 8XC, who will be on 56 meters; and with 2EB from 6:00 to 7:00 A.M., E.S.T.; 1XAM using some wave below 40 meters in all cases. 2EB has applied for an X and will also drop to low waves if it is secured.

The Royal Order of Transatlantic Brasspounders

THE Maritime Division of the A.R.R.L. has given birth to a new order, the Royal Order of Trans-Atlantic Brasspounders. The idea started when one of the Maritime stations, 1BQ, became well known for his transatlantic work. It was not long before four more stations situated in Halifax and Dartmouth (which are really the same city, being separated but one mile by Halifax Harbor) were pounding brass across the Atlantic. Having five stations in the same city working Europe, out of ten in operation, it was decided (as none belonged to the R.O.W.H.) that at the annual convention, to cause some fun and give the successful ones a mark of distinction and show appreciation for their good work, 1BQ, 1DQ, 1DD, 9BL and 1AR should be duly initiated into the R.O.T.A.B. The initiation, carried out by "The Old Man," was the hit of the convention. The remaining members of the Division, which numbers some sixty-five thruout the three Maritime Provinces, were green with envy, and the honored five were not long allowed to strut around

alone in glory. 1BV was reported by PCTT and was heard and called by g2OD, but unfortunately missed the call and since has been away on a business trip, missing a sure chance to qualify. 1DT next came into fame and worked g2OD, closely followed by 1DJ,

gang were going strong. Another distinction that Halifax holds is that every transmitting ham is an A.R.R.L. man. Every Halifax station has done the transatlantic trick with an *input* of less than 100 watts, too.

The R.O.T.A.B. held a special session when British 2NM made a visit to Halifax in May, for the purpose of initiating him and 1DT, 1DJ, 1EB and 1EF. G2NM is now able to initiate all Britishers who have worked across, and it is hoped the order will further the good feeling existing between European and North American hams. C1DD and g2NM on a recent visit to Hartford, incidentally, initiated Traffic Manager Schnell and Editor Warner as the first U.S. members of the order.

To qualify for membership in the R.O.T.A.B. one must first be a member of the A.R.R.L.; secondly, one must have worked a station across the Atlantic. Major Wm. C. Borrett, of c1DD, who is Keeper of Ye Records, would like to hear from all U.S.A. and Canadian hams who are qualified for membership, stating what station they worked transatlantic, date, etc., so that data may be accumulated with a view to making them members when opportunity offers.



Then 1EB connected, and last but not least, the boy wonder of 1EF worked 2OD, making a novel record for Halifax, which now holds the unique distinction of having 100% of her stations reported from Europe and nine out of ten worked, and without the slightest doubt that this would have been 100% too if 1BV had not been forced to leave town at a time when the rest of the

“P R R”

By A. L. Budlong*

ON the night of May 17-18, despite some of the most severe weather conditions experienced for months, a hard-working crew of A.R.R.L. stations, located along the lines of the Pennsylvania Railroad System, delivered *correctly* 45 out of 50 messages from the four Pennsylvania regional headquarters at Philadelphia, Pittsburgh, Chicago and St. Louis to the main division points in the system. Ninety per cent delivery! All credit to the men who during that night performed a heart-breaking task under the worst traffic conditions imaginable, and thereby proved the value of the operating amateur and the A.R.R.L. as a means of emergency communication.

The story starts last fall. Every O.R.S. in the country was asked to fill out a questionnaire, giving information that would enable railroads to use amateur radio for emergency communication. At the request of Mr. J. C. Johnson, Supt. of Telegraphs of the Pennsylvania Railroad System, all of the offices of that road were supplied with a list of those O.R.S. along

the lines who had returned their questionnaires.

During a severe storm in the early part of February, when telegraphic communication was interrupted, attempts on the part of the Pennsylvania Railroad to transmit orders by amateur radio were a *dismal failure*. Only one message—from Chicago to Pittsburgh—got through. It was immediately determined to weed out dead material and then run a test with what was left.

The first act was to send out a short form letter to all the stations on the original list furnished the Pennsylvania system, stating that only those who answered the letter would be included in further emergency work, unless specifically asked. *Only about 60 stations responded to the call*—yes, that is meant to be sixty—but these showed a sincere desire to work and an unquenchable enthusiasm to put over the job for the A.R.R.L., and with them forming what is known as the “PRR gang” the plans for the test went on.

In April the writer attended a conference in Philadelphia, called by Supt. of Telegraphs Johnson for the purpose of

*Secretary, A.R.R.L. Railroad Emergency Service Committee.

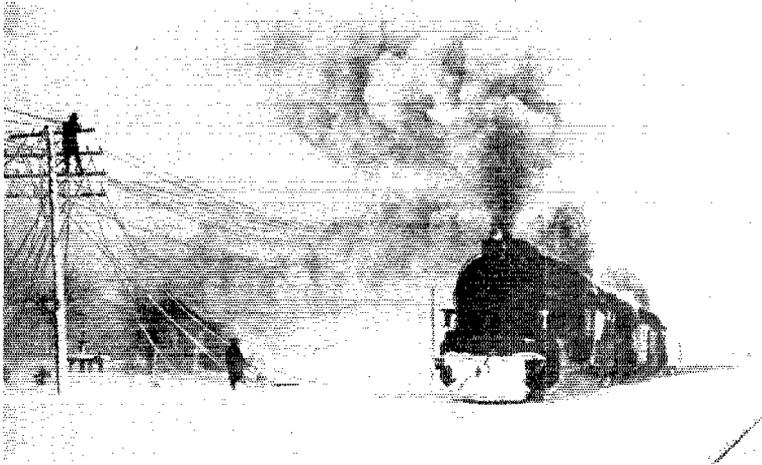
making final arrangements, and at this meeting, attended by representatives from each of the four Pennsylvania regions, it was decided to hold a test on May 17.

On that day messages were started from the four regional headquarters offices, at Philadelphia, Pittsburgh, Chicago and St. Louis, addressed to, in all, 26 divisional or regional headquarters offices.

The messages were mostly in the form of regular train orders, included numbers for accuracy checks, and *required an immediate answer in each case.* A typical message ran as follows:

Southwestern Region—St. Louis: Six messages for transmission. Five transmitted, and three answers returned. Power leak gets the blame for the non-delivery of one of the original messages. One of the lost answers is accounted for by the fact that 9ES, at Terre Haute, lost his mast just after receiving his message. Average for the region, 8 out of a possible 12—66.66%.

More messages were started, and more were delivered, than in the famous Presidents-Governors Relay in 1922. In addition, only one night was used on the Pennsyl-



When The Railroads Need Amateur Help.

"Phila. Pa. May 17, 1924.

J. E. Rothe, Divn. Operator
Care Supvr. Train Service PRR
3ADE Phone Hbg 1400 Extension 181

Refer to Paragraph 446 page 167 Phila Divn time table number 9 of April 27 1924. Advise how this paragraph reads in your reply.

J. D. Jones, Supt Telegraph & Signals PRR."

The test officially started at 11:30 P.M. E.S.T., May 17, and those located in the sections of the country mentioned may remember the very bad QRN, lightning and high winds that maintained over most of the region that night. In addition, practically all of the stations west of Harrisburg, Pa., were handicapped by a power-leak which was so terrific that in some cases reception was impossible except in spurts. The final score is as follows:

Eastern Region—operating out of Philadelphia: Eight messages sent, 7 answered, 93.75%.

Central Region—Pittsburgh: Five messages sent and 5 answered, 100%.

Northwestern Region—Chicago: Seven messages for transmission. Six transmitted, and six answers returned. The missing message was to Crestline, where no station existed. 85.7%.

vania test.

Of course not all of the Pennsylvania "gang" could participate. Many of the hardest workers were not directly concerned. However, most of the "reserves" were on deck and ready to be of use, and these men deserve credit also for untiring work.

Organization

There are no "official" appointments of any kind. A station is listed only so long as the owner makes sincere efforts to do his best. No arguments are used to persuade a man to keep in the work; if he lags he is *automatically dropped.*

While the emergency work is a branch of the Traffic Department, the emergency committee has been functioning independently. There has been some talk to the effect that traffic officials were not consulted in the appointment of stations for the Pennsylvania test. The answer to this is, first, that *there are no appointments, and probably will be none.* Second, it must be remembered that *every O.R.S. had a chance to volunteer for emergency work but many*

never even returned the original questionnaires. A great many of those who filled out the first form did not answer the form letter sent out with especial reference to the Pennsylvania test. It was plainly stated in this form letter that if no reply was received the man would be dropped. It was impossible to waste time corresponding with a man persuading him to come in when he had shown no interest.

The following are the stations at present in the Pennsylvania emergency work:

Eastern Region: 3BSS, 3BWT, 3OQ, 3OE, 3RWJ, 3ABX, 3HJ, 3AKI, 3AEN, 3GC, 3CCU, 3ADQ, 3ADE, 3ANJ, 3ZM, 3ARP, 3BQ, 3BDI, 3XE, 3BFE, 3QV, 3CCK, 3FK.

Central Region: 3AXN, 3QB, 3DAJ, 3SR, 3AMR, 3ATR, 3CT, 3WY, 3AJD, 3BFR, 3CRC, 3AL, 3VT, 3ODC, 3GU, 3BYL, 3OC, 3CEO, 3BRC, 3CEI, 3BVR, 3LW, 3AUE, 3ASE.

Northwestern Region: 9AAW, 9AAV, 9BBF, 9DJZ, 9AFY, 9MN, 9AKD, 9DVK, 9BON, 9EM, 9VT, 9BWR, 9ZAG, 9BN, 9UQ, 9GA, 9CIE.

Southwestern Region: 9AAU, 9PW, 9EIS, 9DQU, 9LF, 9BJR, 9BW, 9ES, 9WU, 9ANB, 9GZ, 9BYN, 9EB, 9CNR, 9BTJ, 9ZC, 9NH.

Other Roads

This Pennsylvania test is a mark for others to shoot at. Work will be carried on during the summer, and it is hoped that next winter, in the event of an emergency, the A.R.R.L. can duplicate the performance of this preliminary Pennsylvania official test. Work is now going ahead on other roads, although at this writing no report as to progress has been received. In this emergency communication work lies the chance for every transmitting ham to prove his worth. How are you going to show up?

Stopping The Key Thump

How To Get Rid Of The Thing That Causes 99% Of All Amateur Interference

By James H. Turnbull, 2XQ*

CONSIDERABLE interference is caused by the so-called "key thump" but what may interest amateurs more is the fact that whenever there is a keying thump there is a great strain on the tube which may reduce its life by as much as 50%.

These "thumps" are caused by building up the antenna voltage too suddenly when the key is closed (and also to some extent by improper phase relations in the circuit). Experiments show that with an average amateur antenna there will be a noticeable "thump" if the full antenna voltage is reached in less than 1/30 of a second after the key is closed.

A short test was run to show the increased interference from a station operating with a keying thump. The strength of the antenna field was measured at different waves on each side of the main wave. Curve A of Fig. 1 was gotten when keying in the grid circuit with a very large filter condenser and no filter choke. Curve B was secured when keying in the grid by means of a tube as suggested later in this article. Both curves were taken while an automatic key was making 10 breaks per second.

(This does not represent the worst effects possible—not by a long ways. For really vile interference nothing seems to be equal to the popular stunt of keying in the center tap of the filament transformer. This is a thing that should be outlawed—along with direct-coupled transmitters.—Tech. Ed.)

*Union College, Schenectady, N. Y., Department of Physics.

The problem is to find some way to slow down the rise of current. To those mathematically inclined I give two references, Chapters XI and XIV of "Electricity and Magnetism," by S. G. Starling, and various sections of "Alternating Current Pheno-

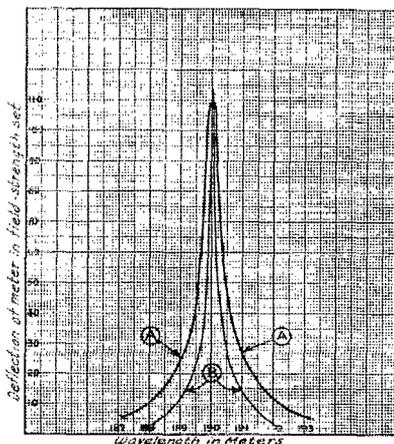


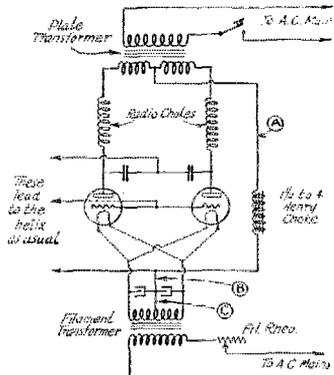
FIG. 1 KEY-THUMP INTERFERENCE

mena," by C. P. Steinmetz. While the problem can be carried thru mathematically no general case can be developed.

A.C. Plate Supply

In the first case I shall consider the methods where transformer supply is used, assuming that separate plate and filament transformers are used.

Probably 25% of the sets using transformers are using "raw A.C." or "self rectified" supply. If an iron-core choke is inserted in the mid-tap lead and the key put into the plate transformer primary as shown in Fig. 2 keying troubles will be eliminated. We now have the reactance of the transformer and of the iron-core to delay the building up of the voltage on the plates of the tubes. The time of the



NOTE: Be sure to key where shown *not* at A, B or C
A "SELF RECTIFYING" SET THAT IS FREE FROM KEY THUMP

FIG. 2

growth of the current cannot be calculated readily since we have a change in the plate impedance with a change in plate voltage. Experience shows that inductances of 1½ to 4 henrys are useful. (Such chokes may be obtained from Acme Apparatus Co. and

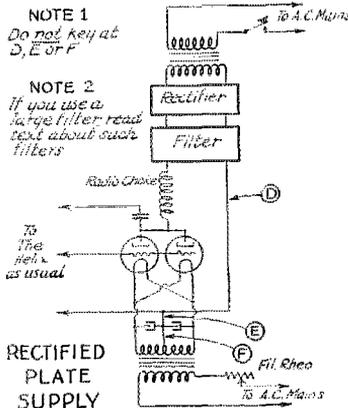


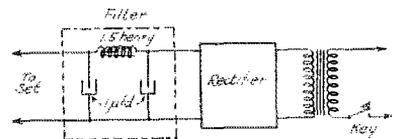
FIG. 3

Thordarson Electric Mfg. Co. or may be built as described on page 21 of our August, 1923, issue and also in the last few chapters of "The Amateur Builder" department of QST.—Tech. Ed.)

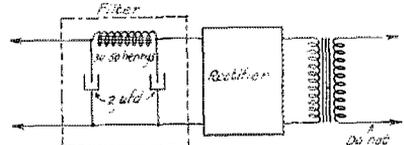
It is possible to key the circuit of Fig. 2 in the mid-tap of the transformer (back of the choke at A) but this tends to strain the transformer insulation. In all A.C. plate supply systems keep away from keying in the grid circuit. Usually this will not cause any objectionable thump but will throw huge voltages on the grid of the tube. The grid method of keying A.C. outfits is recommended in texts but experience shows that the average amateur does not use proper circuit constants to have correct phase relations in the grid circuit for keying there. See "Vacuum Tubes as Power Oscillators," by D. C. Prince, Proceedings I.R.E.; recent issues.

Rectified Plate Supply

Chemical (electrolytic) and heated cathode (kenotron) rectifiers will be considered together. When no filter, or a small filter, is used they are best keyed in the primary of the plate transformer as in Fig. 3. (Note the exception given below).



*Small filter, very bad note
 Can be keyed in transformer primary without thump*



*Large filter, good note
 Can not be keyed in transformer primary - use the keying system of Fig 3*

FIG. 4. WHICH WAY TO KEY WHEN USING A FILTER

These two rectifier systems can also be keyed by the methods which will be suggested for motor-generator sets.

Keying with Large Filters

Keying in the transformer primary will work with 90% of our rectifier-and-filter systems—because they do not filter. If a real filter, such as the Ballantine "brute force" type, is used this plan will not work. The reason is that there is too much out along with the A.C. ripple. When this smoothing effect, and the keying is filtered happens the dots and dashes no longer start and stop cleanly but have "tails" which make them hard to read. This is one of the signs of a good filter—but it means a change to the keying methods of Fig. 5. (However, don't think you have

a good filter just because your signals wobble.—Tech. Ed.)

"S" Tubes

The point-and-plane, or "S" tube, can be considered along with motor-generator supply, for it takes an appreciable time to lower its rectifying impedance when plate voltage is applied to it. The suggestions in Fig. 5 apply to "S" tubes as well as motor-generators.

Motor-Generator Sets

In keying a set supplied from a motor-generator we have a two-fold object. The first is the same as before, to keep "thumps" from the oscillating circuit and the antenna; the second is to prevent high voltages being fed back into the generator.

Let me say here that I have never see a machine that could be keyed successfully in the field circuit, despite claims that this is the ideal way to key.

For voltages up to 1000 it is entirely satisfactory to key in the plate circuit. If

Tubes as Grid Leaks

An ideal scheme, from the standpoint of key-thump elimination, involves the use of a tube as a grid leak. This takes considerably more apparatus but allows all sorts of flexibility in the grid circuit, and permits the easy use of I.C.W. and a sort of phone modulation that is nearly complete, altho imperfect.

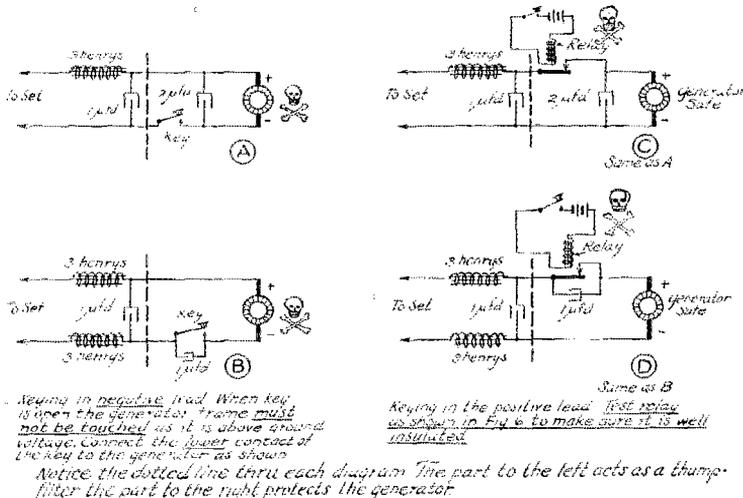
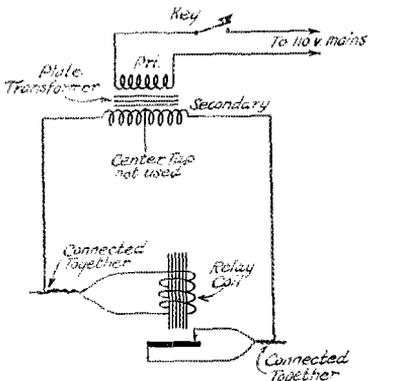


FIG. 5 KEYING GENERATORS

The circuits are given in Fig. 7. Below is a table giving proper sizes of tubes to pass the normal grid currents of oscillator tubes. In probably half of the stations in operation the grid current exceeds these values but it should not be so. The values given provide enough grid excitation and for a given output the tubes will run cooler than with larger grid currents. Incidentally, with small grid currents the harmonics seem to be much less prevalent. I cannot justify this on theoretical grounds.



NOTE: Work key rapidly. If there is a flashover the relay is unsafe. Transformer voltage should be 2-5 times your plate voltage.

FIG. 6 TESTING RELAY INSULATION

this is done a pure capacity filter is not enough; a choke coil must be used as part of the filter system. Satisfactory schemes are shown in Figure 5. These schemes, of course, will also work with rectified supply.

Oscillators	Proper Size of Tube to Use as Oscillator Grid Current	Grid-leak tube
1-4	C-302 or UV-202 5 m.a. per tube	One C-301A or UV-201A
1-3	C-303 or UV-203 15-18 m.a. per tube	One C-302 or UV-202
1-2	C-204 or UV-204 35-45 m.a. per tube	One C-302 or UV-202

The filament of the keying tube can be heated by a battery, a separate transformer, or a separate winding on the regular filament transformer. Whatever is used it must be insulated for at least the peak plate voltage and must be protected by chokes

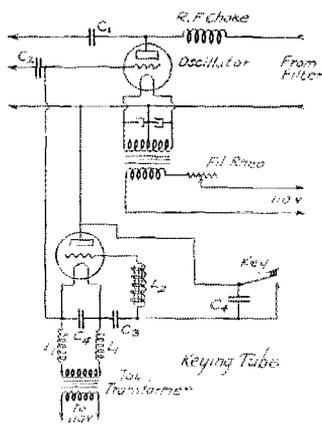
made of 250 turns of No. 16 wire wound on 3½ to 4 inch tubes. If a two-layer bank winding is used about 150 turns will suffice. One choke is in each filament lead.

As a hybrid adaptation of this a kenetron may be tried with the cutoff (impedance increase) attained by the use of a magnetic field.

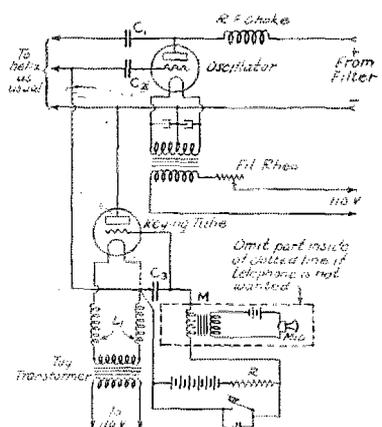
I should be very glad to hear from anyone experiencing trouble or noting unusual results.

Battery Plate Supply

When battery supply is used it is possible to get thump-less keying by the methods given for motor-generator supply.



- C₁ & C₂ - Regula or plate and grid condensers
- C₃ - 600µfd (500µmfd) mica condenser
- C₄ - 1 mm. tapered paper condenser
- L₁ - Heavy R.F. Chokes as described in the article
- L₂ - ½ henry choke
- R - 5000 ohm non-inductive resistance, such as graphite potentiometer segment or a "Bradley"



- Another scheme which can also be used to telephone

FIG. 7 CLICKLESS KEYING WITH TUBES AS GRID LEAKS

Read also "Why Inflict Keying Thumps on Your Neighbors?" in QST for July, 1923.

The Language of International Radio

By Henry W. Hetzel*

RADIO, the latest and most wonderful of all the children of Science, having outgrown its swaddling clothes, has almost overnight spanned oceans, leaped geographical boundaries and joined continents together. The rapid advances being made in wireless transmission and reception will doubtless soon put all parts of the civilized world into close and intimate contact with one another. While we now possess the mechanical means for the instantaneous handling of messages, we still lack one very important thing—the universal adoption of some international language to be used in that intercommunication. The ideal in radio is one language understood by all within wave reach, no matter in what country the transmitting station may be. Those interested in radio naturally regard a world speech as an indispensable instrument to the full use of radio.

Whether we like it or not, all must admit that the peoples of the world are coming into contact—even an enforced one—with one another more than ever before. Great movements, philosophic, ethical, and eco-

nomie, are becoming as much at home in one country as in another. Problems of state-craft, education, social relations, science and industry are arising which only the cooperating intelligence of all mankind can solve. The increasing number and intensity of international communications—in travel, commerce, diplomacy and the spread of culture—are fast making an international language an absolute necessity. The new era into which we are emerging and whose watch-words are interdependence and cooperation, finds the linguistic barriers increasingly annoying and discouraging to real progress.

Thus the question of a world speech for radio, big as it is, is only a phase of a larger problem—that of an international language in general. It is inconceivable that the world will listen to separate solutions in connection with the spoken, the printed, the written and the broadcast word. All interested in the use of radio will therefore naturally wish to acquaint themselves somewhat with what is generally known as the "I.A.L. (International Auxiliary Language) Movement".

Latin was, centuries ago, the common vehicle for European culture, but even the

*Secretary, Philadelphia Esperanto Society.

most case-hardened classicist will admit that, in order to adapt it to modern needs, Latin must undergo some changes. If it is to be the world speech of tomorrow, as has so often been proposed, and especially if to get there it must win against its simpler and more logical competitors, it must submit to such a wholesale alteration of its grammar and extension of its vocabulary that none of the friends of such a "Latin" would dare to propose that it take the place of Caesar and Virgil in our schools.

To take one of the existing national tongues, say French or English, would involve us in nearly or quite as much difficulty, and such a tongue would have the further disadvantage of being decidedly unneutral—too much tinctured with the national characteristics, psychology, and even prejudices of the countries where it is native. Its adoption would confer so great a diplomatic, commercial, political and cultural advantage on one certain group of nations as to make such a proposition absolutely intolerable to others. The "world democracy" will insist upon neutrality even in its choice and use of a vehicle of thought.

The problem of finding or evolving a simple, logical, easily learned and neutral language—not to displace existing national tongues, but to serve as "a second language for all", for international purposes solely—has given rise to many projects to meet the growing world need. At least a hundred have been brought forth within the last two centuries. With the exception of two or three, all of these have remained only projects, attracting a brief attention as linguistic curiosities merely.

Without doubt the best known of these exceptions is Esperanto, given to the world in 1887 by Dr. L. L. Zamenhof of Warsaw. It at once attracted an interest that was more than academic and in a few years it had far outdistanced its competitors both as to the extent of its literature and the number of its adherents. Twenty years later appeared "Ido" (literally, "an offspring"), the work of several linguists and scientists representing (or claiming to represent) a number of learned societies and universities of Europe, and who favored certain changes in Esperanto. The differences between this "reformed" and the "primitive Esperanto" cannot be touched upon in this brief article; the interested reader is referred to the recent book by Prof. A. L. Guérard, "A Short History of the International Language Movement". Ido claims to be simpler and more international in its orthography, more logical in its choice of root words and more precise in its grammar. Esperantists do not admit these claims generally, and while perhaps less insistent upon the linguistic perfection

of Esperanto they have centered their activities more upon putting the international tongue into immediate and intensive use, believing that its successful functioning makes for it the strongest argument. They do not deny that improvements in the language are possible; they have, on the contrary, always professed a willingness to submit to the judgment of a properly constituted body of world experts, but only after the language shall have been, in principle, accepted by the highest international authority—let us say, the League of Nations—and the verdict approved by the civilized world generally. Even Dr. Zamenhof himself held this view until his death a few years ago.

The average person of intelligence needs no argument to show that a simple, neutral language for international use is desirable; he is only skeptical of its practicality. For the person who admits the possibility of a world speech only for some far-in-the-future Utopia, there is abundant convincing evidence in the use already attained by one of these. An international language is possible because at least one of them already is with us, and functioning too. Here we must speak of Esperanto, for, whatever may be the linguistic superiorities of Ido or any other project, the former has attained by far the greater degree of actual use. To be sure, any accepted synthetic language with a sufficient number of users would have done as well, given, of course, the same measure of idealism which has always characterized the Esperanto movement.

Tourists have found Esperanto of considerable help. This may not sound significant to the reader who can "get along in Europe on English alone". He can "get along", but the person who can merely do this must limit his conversation to waiters, ticket sellers and porters. Thousands of travellers, knowing no tongue but their own and Esperanto, have visited other countries, finding that to the Esperantist alone belongs the joy of meeting foreigners (as many as one has time to meet in any journey or in any visited city, and intelligent, well-educated folks, too) with whom they may converse with a linguistic equality that is never experienced when any national tongue is the medium. In at least a dozen big cities of Europe there are Esperantist policemen, specially trained to be of service to the traveller. The stay-at-home, particularly the student, finds Esperanto a means of broadening his acquaintance with the whole world. Correspondence, all the way from stamp collecting and the exchange of illustrated post-cards up to highbrow discussions of philosophy, scientific matters and world politics, is quite extensive, as may be seen by anyone glancing thru the correspondence columns of the journals—

now about one hundred and twenty regularly published in the language in all parts of the world. Of original works and translations, many of them from the masterpieces of every civilized tongue, there are several thousands. Instruction books and dictionaries have appeared in at least thirty-eight languages.

In addition to its already demonstrated utility for general commercial purposes, Esperanto has a special field for advertising the fairs and expositions, which, in spite of the ravages of the recent war and the blunders of diplomats, are doing a great service in bringing together the business men of Europe. To name only a few recent examples, the fairs at Paris, Lyons, Frankfurt, Breslau, Leipzig, Padua, Helsingfors, Prague, Reichenberg, Genoa, and Valencia have extensively employed Esperanto.

International Congresses for professional, religious, scientific or diplomatic purposes, have felt the diversity of tongues to be a serious handicap. Compared to the usual gathering of this kind with its inevitable division into mutually uncomprehending groups and its restriction to two or three "official" languages, a Congress of Esperantists stands out in refreshing contrast. There have been fifteen of these since 1905 attended by as high as five thousand delegates from as many as forty-three different countries, representing nearly as many national tongues. Here, in the international language entirely, and therefore with no interpreters, is carried on the entire week's program and this includes all the formal addresses, chance discussion and unprepared remarks. There is usually a play and a musical evening, perhaps an opera and even a vaudeville show—to say nothing of many excursions and informal social gatherings—and not a word from any national tongue heard thru it all! During the week, too, there have been held a dozen or more "side Congresses" of teachers, editors, Red Cross nurses, physicians, vegetarians, railway employees, socialists, religious groups—to name only a part of the list—each group having its own meetings. Here the delegates "talk shop", with no uncomprehending auditor, with perfect geysers of technical terms too, and with a vigor and a naturalness that are only paralleled where everyone speaks the same mother tongue.

Naturally radio users will ask, "Can a synthetic language be so constructed that national peculiarities of pronunciation will not show themselves? Will there not be inevitably a French, a German and a Spanish accent? Here the testimony of actual experience is unanimous and emphatic. Even the chance visitor to an Esperantists or an Idist Congress is struck with the remarkable uniformity with which the words are pronounced. It is absolutely true that as far as speech is any indication

you cannot tell the Englishman from the Italian, or either from the Russian, and the laughable mistakes that are made in such guesses at nationality are among the commonplaces at gatherings of this kind.

However, before formally adopting any international tongue the world will naturally inquire how easily one may learn it. Let us take, for example, the Commercial Congress which met in Venice in April of last year. Here were over two hundred official delegates from twenty-three different countries, representing eighty-nine Chambers of Commerce, thirty tourist associations, twenty-one national fairs and over sixty industrial federations—business men,



you see, and not visionaries—conducting its three-days' program entirely in Esperanto. Now the point of this paragraph is that several of the speakers and other participating delegates obtained their whole knowledge of the language on the journey thither! Many a person has learned the whole grammar in an hour.

The benefits of a universally adopted auxiliary language are incalculable, and the world is beginning to recognize the extent to which the I.A.L. movement has progressed. The Report of the League of Nations (1922) on the extent to which Esperanto is already used, taught and given official approval is an interesting document. Peace Associations, the International Red Cross, the International Women's Suffrage Alliance and dozens of similar organizations have already taken action; in most cases—as with the French, Italian and British Associations for the Advancement of Science and the radio associations of at least three countries—the endorsement being given to Dr. Zamenhof's creation. But the scientists, scholars, business men and humanitarians who are giving this broad

subject their serious study will not be stamped by the success, however, remarkable, of any project. As to linguistic details, there is still room for discussion. One thing seems certain, however; an In-

ternational language, everywhere in use, will be one of the realities of the very near future. Naturally the world of radio will be keenly interested in the movement and its outcome.

The Receiving Experimenter



CONDUCTED BY S. KRUSE, TECH. ED.

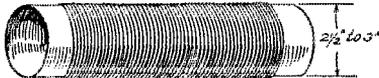
The Telephone By-Pass

We are constantly besieged with diagrams of receiving sets that refuse to oscillate because the builder has entirely neglected to provide a telephone by-pass condenser. Such a condenser should always be provided, should have a capacity of at least .001 microfarads, and had better be of mica. This last is not very important, however. It also helps to put a condenser across the B battery. In this case the condenser should be large, one microfarad or more. Be sure to use a good condenser because leakage here will ruin the B battery.

The Choke Coil in a Reinartz Tuner

The Reinartz tuner is frequently accused of not working correctly when nothing is wrong but the lack of a radio frequency choke. It must be remembered that the Reinartz tuner uses shunt feed

Wind with D.C.C. or S.C.C., any size from No. 28 to No. 36 250 turns - one layer or "scrambled"



CHOKE FOR REINARTZ AND OTHER SHUNT-FEED TUNERS

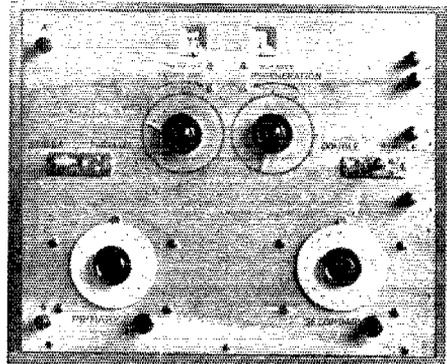
and that it is necessary for the radio frequency current to go through one path while the direct current of the B battery goes through another path. The direct current is kept out of the plate coil very satisfactorily by the plate condenser but most tuners make no decent provision for keeping the radio frequency current out of the phone circuit. It is *not* satisfactory to depend on the telephone receivers

because they are shunted by the capacity of the telephone cord.

The dimensions for the choke which are given need not be followed very closely; in fact almost any single-layer coil with plenty of fine wire in it will do. Honeycomb coils are usually quite worthless for this purpose.

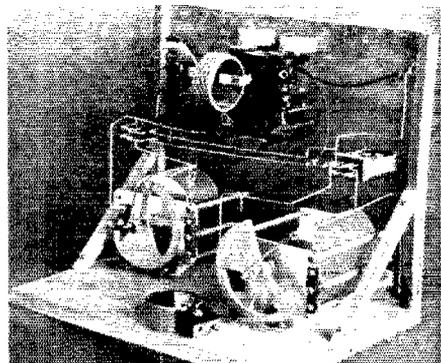
When the Receiver Howls

Many receiving sets howl on the slightest provocation. This is almost always due to excessive inductance in the plate circuit. In the case of a set using a tickler the cure is to remove turns. When using a variometer one can remove turns from both the rotor and the stator or use



EXPERIMENTAL TUNER OF H. M. McCLURE, ANN ARBOR, MICH.

Note especially the absolute accessibility of everything in the set.



a rotor that does not fit the stator so closely.

Excessive resistance in the secondary circuit will almost always cause a set to go in and out of oscillation very violently. In such cases the "howling point" is always close to the oscillating point and the set becomes very unpleasant to handle. The cure is to lower the resistance of the secondary circuit by using a good coil and a good condenser and coupling it loosely to the antenna. After that the necessary shunting condenser should be put into the plate circuit as indicated in another paragraph in this series.

The Size of the Secondary Variable Condenser

For broadcasting reception, in fact for all the ordinary uses of citizen radio, the .001 microfarad condenser is too large. If it is used the secondary coil must be made too small or else all of the tuning will be done at the first part of the scale, which means that everything is crowded together.

For broadcast reception the most generally useful condenser is the .0005 microfarad condenser but this is too large for amateur work unless the plates are partly cut away at the lower end of the scale, or rather at their entering edges. The method of doing this cutting was shown in "Low-Loss Tuners" in our February issue. If it is desired to cover only the range from 150 to 220 meters this can be done very nicely with a .00025 without the necessity of tapping the coil. Since this condenser is cheaper it should certainly be used.

Still smaller condensers can be used very conveniently in amateur work as has been shown by several articles published recently.

The Size of the Antenna Tuning Condenser

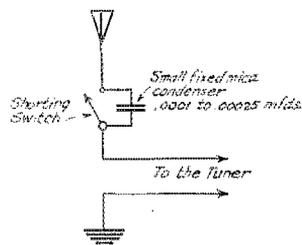
In single circuit tuners or in coupled tuners having an antenna tuning condenser, we generally find that a needlessly large and expensive condenser has been used. No very great tuning effect is obtained until the capacity of this condenser is made as small as that of the antenna. Practically this means that a .00025 microfarad condenser is about the largest that should be used. If the primary coil has taps and a switch, an ordinary three-plate vernier is about the right thing to use. However, make sure that the use of such a small condenser does not leave gaps which cannot be reached with the switch in any position.

The advantage of using a small series condenser is that it enables you to use more of the primary, which results in sharper tuning. In addition to this, the

tuning is spread over the condenser scale instead of being bunched at the lower end.

"Blank Places" on Your Tuner

Very frequently we hear the complaint that a tuner will not work at one particular wavelength although it will work both above and below that wave. The reason for this is almost always that the dead wavelength is the natural wavelength of



CURING A TUNER THAT HAS "DEAD PLACES"

the antenna circuit. The difficulty can be gotten around by changing the primary tuning or else loosening the coupling of the antenna to the secondary. When a tuner is provided with a coupling adjustment having *plenty* of range, nothing else is required. In a tuner with fixed coupling the result may be gotten by cutting in a small fixed condenser. One of the little "postage stamp" condensers will do very nicely. The capacity to be used must be found by experiment and will be somewhere around .0002 microfarads. The effect is simply to shift the dead wavelength to some other point where it is not annoying at the moment.

High Resistances

Special attention is invited to the many possible uses of several new types of resistances, especially the variable resistance called the "Bradleyohm" and the very excellent fixed "Lavite" resistance sold by the Crescent Radio Supply Company, and finally to the "Cartridge" resistances manufactured by the Daven Radio Company.

Each type has its advantages. Such units are useful as coupling resistances in a resistance amplifier, as audio transformer shunts, for regeneration control, and a lot of other purposes that will be thought of.

The Bradleyohm can also be used as a variable grid leak resistance in a small transmitter.

Tilted Antennas

About a dozen different folks have made to us the claim that they can get a directional effect by tipping the top of an antenna by means of ropes connected to the ends of the spreader. This performance is supposed to eliminate one station and

bring in another when that thing cannot be done with the tuning controls. Frankly we do not believe a word of it. Can anyone give us a real instance?

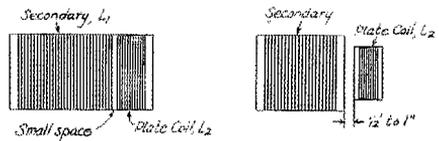
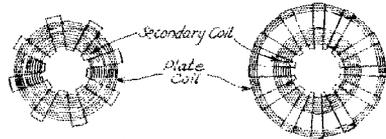
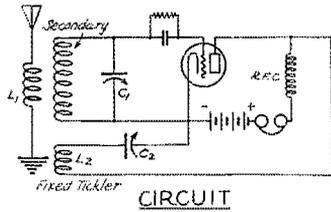
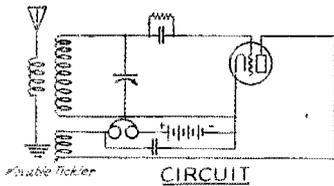
Regeneration Control

It is pretty generally admitted now that Ballantine was correct in stating that tickler regeneration is superior to the use of a variometer in the plate circuit. The reason for his claims are very beautifully set down in Section 73 of his book which all live members of A.R.R.L. have by now.

One of the main advantages of the tickler is that the regeneration can be changed without shifting the tune all over the lot.

The Size of the Tickler

Almost every set that we have ever met has more tickler than is really needed, probably because the maker of it was



ORDINARY ARRANGEMENT
Feed-back condenser has some tuning effect

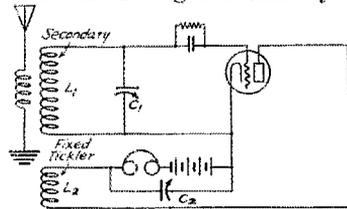
ARRANGEMENT
in which feed-back condenser has little tuning effect

THE WEAGANT-REINARTZ ARRANGEMENT

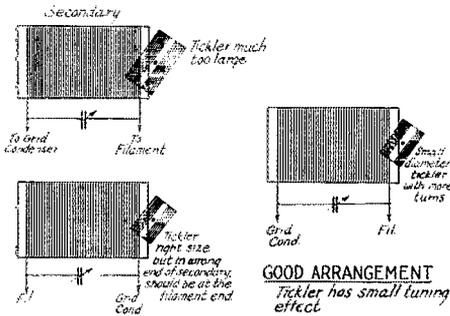
Fixed tickler-shunt feed. Feed-back controlled by variable feed-back condenser.

Large or Small Tickler

It is evident enough that a big tickler moved to and from the secondary will change the tuning. It is possible to cut this effect down a great deal by using a



Normal Throttling Condenser System



BAD ARRANGEMENTS
Tickler has large tuning effect

GOOD ARRANGEMENT
Tickler has small tuning effect

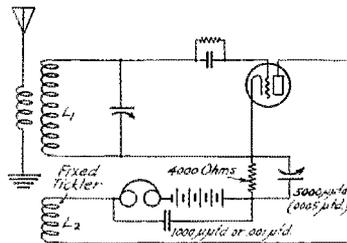
ORDINARY TICKLER-SERIES FEED

FEED BACK CONTROLLED BY MOVING THE TICKLER.

"scared to death" that he could not make it oscillate at all times. The results is that the tickler control is tricky, especially on the lower wavelengths. The cure is to reduce the number of tickler turns until the tickler has to be turned nearly to the end of its range to get oscillation at the upper wavelengths.

Tickler coils need not be wound with heavy wire unless the tuner is used for C.W. reception.

The tube on which a tickler is wound should always be small enough to miss the inside of the secondary tube by half an inch or better. This results in smoother control and in much less tuning effect on the secondary circuit.



Throttling Condenser System Suggested by IAEI

THROTTLING CONDENSER SYSTEMS

Fixed tickler, series feed. Feed-back controlled by variable feed-back condenser. Coil arrangements same as for Weagant-Reinartz.

tickler that is not nearly as big around as is the secondary coil. This was well explained in "Short Wave Tuner Design" on page 37 of our December issue. This idea is used in the Zenith receiver and also in Schnell's low loss tuner described in our February issue. A tickler about one-half as large in diameter as the secondary seems to be nearly right. It will probably take a few turns more than would a large tickler but will bother the tuning much less.

Fixed Ticklers

Another way of getting rid of the tuning effect of changing regeneration is by using a tickler that does not move and controlling the regeneration in some other fashion. The best known form of this arrangement is the Weagant-Reinartz combination in which shunt feed is used. This scheme gives much less detuning effect that does anything but a very small movable tickler. It can be still further improved if the tickler is placed half an inch or so away from the secondary as shown in the 1HX tuner in the February issue. With this tuner it was possible to move the regeneration condenser from maximum down to the point at which the tube stopped oscillating without losing the sharpest C.W. signal. Very few tuners will do this.

Still another arrangement is the use of a throttling condenser, two arrangements of which are shown.

How Many Turns?

Mr. Hassel's very excellent article in the December number accomplished many

things for amateur, and commercial, radio. Most important of these was his complete success in pointing out the generally low-grade standard of tuners then in use on amateur and broadcast waves.

Since that there has been a complete stampede toward better coils and better condensers.

This has brought with it a lot of uncertainty as to the proper number of tickler turns, for a good secondary circuit.

As soon as one of these good secondary circuits is put into a tuner there follows a cat chorus—the old tickler is far too large. The remedy is to take off turns until the set can *barely be made to oscillate at the top of its tuning range*, when the tickler is turned clear over to the end of its travel. More turns than that will make the set howl at the shorter waves, especially when a moving tickler is being used.

We believe that almost without exception the regenerative tuners on the general market have twice the necessary number of tickler turns, making them cranky and unsteady on the lower waves. When it comes to amateur tuners we are *sure* that at least 90% of them have *three* times the necessary tickler turns. Some of the alleged short-wave tuners that our gang has been making recently can be handled by a juggler only—because they put in a tickler big enough to work at 400 meters and then try to go down to 20 meters with it. This had better not be tried—use a tapped tickler as described by McLaughlin in the May QST. If that does not strike your fancy it is



BEFORE AND AFTER

Above, Hon. D. B. Carson, Commissioner of Navigation, taking a last look at the Department of Commerce "Hoover Cup" for 1923 before its shipment to the winner, Mr. Don C. Wallace of 9ZT-9XAX. (International Newsreel photo.) Right, Pictorial evidence that the cup got there all right: Wallace and It.



possible to use a honeycomb coil-mounting into which different ticklers are plugged. These coils can be half as big across as

the secondary and use about $1\frac{1}{2}$ times as many turns, which means a 7 turn tickler for the short waves—around 30 meters.

The 4-Coil Meissner Transmitter at 7ADQ-7NT

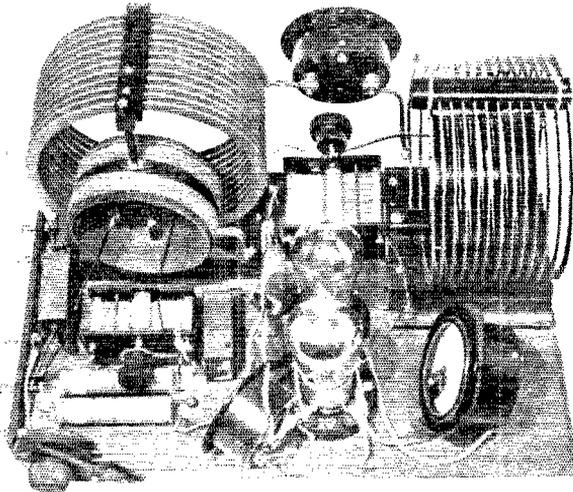
THE 4-coil form of the Meissner sending circuit handles rather more easily than the 3-coil form. For that reason it was recommended by Mr. I. V. Iversen in his article "The Meissner Transmitting Circuit."* Mr. Iversen practices what he preaches, as evidenced by his own set at 7ADQ, a photograph of which is here shown.

The two helices, L_1 and L_2 , are the halves of a Radio Corporation helix, type UL-1008, which has been cut in two. The parts are placed at right angles to reduce coupling between them. The two parts are connected by the antenna ammeter, altho it may as well be placed above them as shown in the diagram.

The grid coil L_3 is the rotating coil inside of the left-hand helix. This coil has 18 turns of annunciator wire wound on a tube several inches smaller than the inside of the helix. Just in front of the grid coil is the grid-coil condenser C_3 , which is used in the fashion described in Mr. Iversen's article. It is *not* a tuning condenser in the usual sense. In front of the grid-coil condenser are the grid leaks R , and to the right is the fixed grid condenser C_4 . Between the tubes and this grid condenser are the grid chokes. These are small coils connected in the separate grid leads to keep the tubes from generating very short wave "parasites" which do not put any power into the antenna. Usually 10 turns of small wire on a 1" tube will do.

The positive plate-power lead is connected to the binding post farthest back. From this post a lead goes behind the left helix and then comes forward across the center of the set to the plate milliammeter which is at the center-front, next to the tubes. The return lead from this meter is twisted

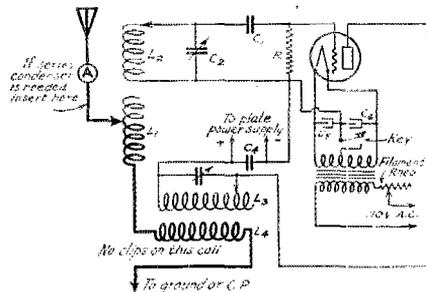
around the first one and goes back by the same route as far as the plate-coil variable condenser. Here it connects with the moving plates and then goes on to the plate coil, L_4 , which is inside of the right-hand helix. The other side of the plate coil is connected to the fixed plates of the variable condenser and from there the plate lead can be seen coming forward to the tube sockets. The



THE SENDING SET AT 7ADQ-7NT

plate coil has 18 turns.

These connections will be understood more easily if traced with the help of the diagram.

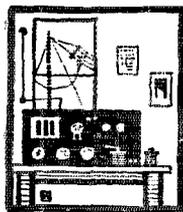


4 COIL MEISSNER CIRCUIT

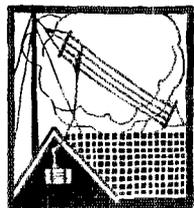
(Concluded on page 54)

*"The Meissner Transmitting Circuit," p. 18, May QST.

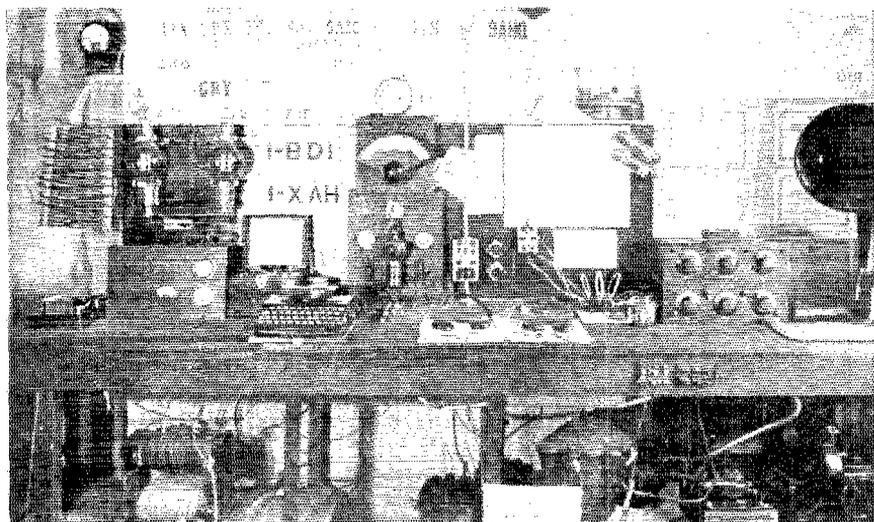
The author's name was incorrectly given as I. V. Iverson; the correct spelling is Iversen.



Amateur Radio Stations



1BDI-1XAH, Orono, Maine



This station is an example of what a poor location with a poor antenna can do when the man behind the key knows what he is doing and makes the best of the circumstances.

Communication has been established many times with stations in every district of the U.S. and in the last few months special effort has been made to keep in consistent touch with foreign amateurs. Foreigners worked, in order of their audibility by countries are: British 2SZ, 2NM, 2OD, 2KF, 5KO, 5RY, 5NN, 5BV, 2SH, 2WJ, 5LF, 2KW, 5FS; French 8AB, 8CT, 8BM, 8BF; Dutch PCIL, PA9. Signals have been reported with good audibility at Danish 7QF, Hawaiian 6ZY, and WNP. British 2NM, 2SZ and 2KF have each been worked about 30 or 40 times with traffic. The calendar on the wall has every date crossed out when Europe was worked; and from February 7th to March 7th not a single night was missed with the exception of February 23rd, when the operator overslept.

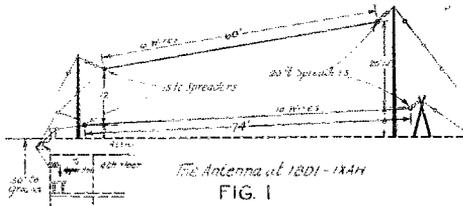
The set is installed in a dormitory room

on the fourth floor of the Hannibal Hamlin Hall at the University of Maine, at Orono. It is owned and operated by Mr. F. E. Handy, under the auspices of the University. Referring to the photograph, the transmitter helices are seen on the left. The two 250-watt tubes come next, with meters mounted below on a maple panel. To the right of the transmitter is a heterodyne wavemeter, calibrated from WWV's signals. To the right of the typewriter is a bulb type battery charger, working from the filament transformer for the transmitter. The filament transformer as well as the plate transformer and accessories are under the table.

The self-supporting coils of the short wave regenerative receiver are seen just to the left of the Amrad broadcast set. The primary coil has 5 tuners, the secondary 18 turns, and the tickler 8 turns. The secondary tuning condenser for this short wave receiver is an 8 plate condenser with a long extension shaft fastening to the knob to facilitate fine adjustments. The

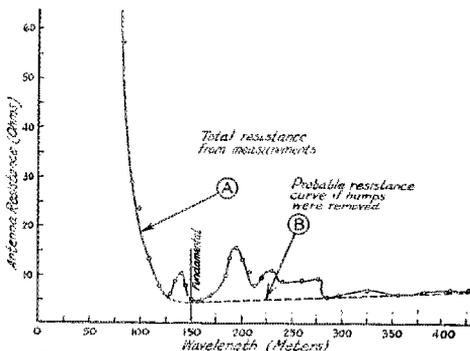
Amrad detector and two stage audio cabinet is used for both amateur and broadcast work. The receiving antenna is a 32-foot single wire.

The transmitting antenna and counterpoise are on top of a four story building having a metal roof. As evident from Fig.



the average distance between the antenna and counterpoise is less than 17 feet. No. 14 tinned copper wire is used thruout the antenna system. The fundamental wave length is 150 meters.

Because the antenna system is of the condenser type the radiation resistance is low and a large current must be obtained in the circuit to get much radiation. Difficulties presented themselves when it was attempted to get good results from the commoner circuits. Loose-coupled circuits were tried with the result that the wave was sharpened and bad harmonics that were theretofore noticed within a ten mile radius were reduced. An inductance of 1/4 inch copper tubing on a wooden form proved just the thing for the grid and plate circuits. A similar inductance, only of larger diameter, fits over the other inductance as the antenna coil. At first a master oscillator power amplifier circuit was used, but the extra tube did not seem worthwhile



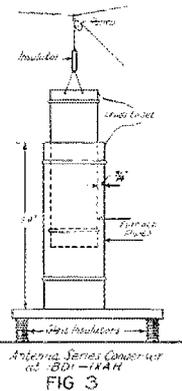
from the standpoint of economy. The circuit now used is the Meissner. The antenna circuit determines the wave length of the station. Because of the high capacity and low resistance of the antenna system this

is done with success, though the antenna and counterpoise wires had to be stretched tight to prevent their swaying and changing the wave.

Raw A.C. is used on the plates, as the aluminum in the 60-quart rectifier went bad a while back. Plate power is obtained from the 60-cycle mains, separate circuits being used for plate and filament supply, thus greatly reducing the drop in filament voltage occasioned by keying. The 1-K.W. pole transformers provide secondary voltages of 1100, 2200, 3300, or 4400 volts and their turns ratio may be easily changed to give the desired voltage. As constructed, the station represents a maximum in the way of results for the outlay of apparatus used.

Best Operating Wavelength

Tests were made to determine the best operating wavelength. Accurate measurements of total resistance were made using the substitution and variation methods. The results are given in Fig. 2. Curve A



is the measured resistance. Curve B is the probable curve that would be had if nearby circuits and metal objects did not cause bad absorption on certain wavelengths. The humps in the curve of measured resistance that show bad absorption on certain wavelengths limit the best practical operating waves to 125 and 155 meters (below, and practically at the fundamental). Experiments have shown no way to get rid of these humps, which check with repeated measurements day after day. As shown by the curve this antenna is worthless for operation on 200 meters and attempts at such operation have checked this experimental work.

As shown by the above experience an amateur's antenna may prove the limiting factor in the range of his station, no matter

(Concluded on page 58)

³See "How to Measure Antenna Resistance and Capacity" by A. F. Murray, page 18, May, 1923. QST. Obtainable through our Circulation Department at the regular price.



European Activity Increasing

Amateur radio in Europe has progressed to where a monthly report of activities, such as our Traffic Department Report, is needed to keep everyone informed. *Experimental Wireless* has seen this need and publishes a complete report, by districts, of experimental amateur work in England. Though no really outstanding work has been done lately, many interesting items are included in the latest report.

2KF and 2OD remain the stars as far as transatlantic work is concerned. 2UV cast aside the handicap of having no power mains available for supplying his transmitter, and rigged up a hand generator for plate supply. He got across all right! (F.B., OM. Wish we could supply 'em to our CQ fiends). Several have tried to see how much they could reduce their power and still be heard on this side of the Atlantic. 2KW did it with 12.7 watts to the plate and .4 ampere in the antenna, which isn't half bad.

In Europe, where transmission is formally prohibited in many places, mystery stations crop up from time to time, operate for a few days and then disappear. A42 is one of these. He has been worked several times from England. 1JW and LzeroAA are working in Luxembourg, both QSO England, as are also Belgian 4AA, 4ZZ, 4GG, P2, W2, and 4C2. XY and XZ are two new Swiss stations. PCRR is a new Dutch station. Danish 7EC is going strong. Dutch PA9 has closed down as he received so many cards and letters from the U.S.A. reporting him QSA that it took all of the joy out of working DX. American amateurs have been logged by an Edinburgh amateur using a one-tube set on a two-foot loop.

English amateurs are convinced that shorter waves are better than those around 200 meters for transatlantic work. The best time for working across, they find, is from one hour before sunrise to one hour after sunrise in England. Static has interfered a good deal with transocean work during the past month, however.

New Regulations for British Amateurs

Regulations governing the use of ama-

teur experimental transmitting apparatus in England have been recently modified as follows. All licenses for experimental spark transmission have been withdrawn, thus abolishing the spark transmitter. Amateur experimental transmission on 440 meters has been prohibited during broadcasting hours, and in its place permission is granted to use the band of wave lengths from 115 to 130 meters for amateur work in cases where the Post Master General is satisfied that *bona fide* research work is carried on and that the circumstances justify the concession. This is distinctly a step in the right direction, for amateurs for a considerable time have remained quiet on the 440-meter wave during broadcasts, and the opening of the lower band of wave lengths is a concession which amateurs have been looking forward to for a long time. Before an amateur license is issued in England, the applicant must show reason why it is necessary that he should have a transmitting license. He must outline the experimental work he plans to do when applying for a license; merely describing his station will not get him a license.

Unscrambling a Few Abbreviations

Many have been puzzled by symbols such as A4, O-V-1, R3, etc., appearing on cards from English stations. These are symbols used to denote the audibility of the received signals and the type of receiver used. There are two systems, the A system, and the R system, which are as follows:

A1, just readable with difficulty; A2, comfortably readable but not strong; A3, good strong consistent signals; A4, very strong.

R1, very weak, undistinguishable; R2, dots and dashes just intelligible; R3, almost readable; R4, readable when no QRM; R5, fairly comfortably readable; R6, comfortably readable; R7, strong; R8, very strong; R9, colossal strength.

Signals such as O-V-1 and so forth, indicate the number of tubes in the receiver and how they are used. The first figure is the number of radio frequency amplifiers used, the V denotes a "valve"

detector, and the latter figure is the number of audio frequency amplifiers in the set. In this way, 2-V-1 would indicate a set having two stages of radio, a detector, and one stage of audio amplification.

British 6XX

By Philip R. Coursey, B. Sc., F. Inst. P.

In the Transatlantic Tests of last year 6XX took a prominent part, its code word having been logged over eighty times in America. More recently this station has been transmitting on schedule for reception in Australia. Before the station was put into operation, a special permit had to be obtained from the British Post Office to use more transmitting power than the customary 10 watts. This permit was issued in the name of the writer for the Radio Society of Great Britain. The power allowed by this special permit was one kilowatt input to the valves. The station was built and operated on behalf of the Society, and may be taken as an example of "the best" in English amateur experimental stations.

After several trials the circuit found most satisfactory was the loose-coupled Hartley. Two valves, each rated at an anode dissipation of 450 watts, were used in parallel as oscillators. Two similar valves were used as kenotron rectifiers. The main advantage of the loose coupling between the aerial and oscillation circuit is that the aerial has less control of the wavelength than when direct coupling is used. With this arrangement it was found that the wave remained very steady, giving a much more readable signal.

The anode supply to the valve rectifiers was from a 600-cycle motor generator. At times a filter was used and because of the high initial frequency not much trouble was had in obtaining a substantially D.C. supply. Keying of the transmitter was accomplished by placing the key in the primary lead to the plate transformer. The only disadvantage of this method is

that there occurs a slight change in wavelength as the smoothing condenser charges up and discharges—this produced a rather unsteady note.

The arrangement of the valve can be seen from the photograph. The three leads on the left near the ceiling are the grid, anode, and filament leads from the valves to the oscillation circuit. They are run overhead on porcelain insulators for the full length of the bench on the left. This permits most any sort of experimental circuit to be clipped on to the valves at will. Series feed for the H.T. supply seemed,

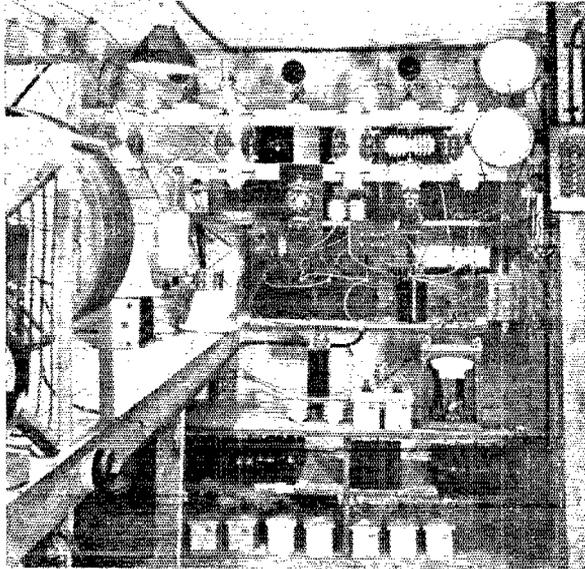
in our case, to give better results than parallel or shunt feed. Dubilier condensers were used throughout the installation, and the apparatus was erected by that company for the use of the Radio Society, the coils and some other parts being made in the Company's works.

The aerial used for transmitting is a six-wire cage, on seven-foot spreaders, supported at one end by a 60-foot mast and at the other by a brick chimney stack of about the same height. The

length of the top part of the aerial is about 75 feet, and the down-leads about 40 feet. The down-leads are small six-wire cages.

A six-wire counterpoise extending for the full length of the aerial span and somewhat beyond its end was used; also an earth connection to the nearest water main. The average aerial current is eight amperes.

Australian amateurs are trying to communicate with their friends in South Africa. Australia can already work New Zealand, and New Zealand 2AC has worked South American CB8. The South Americans are now arranging tests with South Africa. First thing we U. S. amateurs know, these fellows in the Southern Hemisphere will be working clear around the world, breaking all records, and leaving



TRANSMITTING APPARATUS AT BRITISH 6XX. The large copper tubing inductance and a part of the antenna ammeter are seen on the left.

us the leaders only in creating QRM and calling CQ. Whatsay, fellows?

It may amount to what some call "shooting at the moon", but, confident of their success sooner or later, several British amateurs have been transmitting on schedule for reception in Australia and New Zealand. Some Sydney and Melbourne experimenters already claim to have heard English 5AT, and English 5WS has also been reported heard in Australia. 6XX, the station of the Radio Society of Great Britain, is one of those endeavoring to reach Australia direct.

The Fate of PCII.

Amateurs throughout the world have anxiously awaited news regarding the consequences of the closing, by Dutch authorities a few months ago, of station PCII, the well known amateur experimental station at Leiden, Holland. The story of the trial has now come to light, the main points of which are given below. We are indebted to the Dutch magazine "Radio Wereld" for the information.

When the station was closed the apparatus was confiscated and Mr. H. J. Jesse, Jr., was charged with having installed and used a radio telephone and telegraph station without having obtained the proper authority.

On the opening of the trial it was shown that radio telephone had never been used by PCII and that the government monopoly over commercial radio business had not been violated because PCII did not handle messages on a commercial basis. Furthermore, PCII operated on short wavelengths with low power and at no time interfered with government or commercial stations.

As far as the actual use of transmitting apparatus was concerned, it was pointed out that a receiving set can also be made to transmit by making the tube oscillate. Other things such as X-ray machines also transmit radio waves. If radio transmission is to be formally prohibited it would be necessary to also close down all receiving sets, X-ray machines, and such. The fact that the apparatus at PCII was continually being modified according to the results of tests and a good deal of experimentation was necessary to get a set into operation that would communicate with America showed that it was not a regular commercial station.

It was asked why no permit was obtained. The defense answered that it was practically impossible to use a permit as outlined in the law for their purpose; even the official Radiola broadcasting station at The Hague had to get along with a license that did not fit their needs and

which was issued to the Technical High School at Delft in the name of their school.

After the hearing of evidence was completed the clerk of the open ministry began his summing up of the case by congratulating Mr. Jesse on his success in communicating with America. At this point the prosecutor arose and objected. The clerk added, however, that the words of the law did not apply to the case in question and the matter could only be considered from the possibility of using the station for spy communication. As the results of the tests were published in the press, however, it was plain that no attempt was made to deceive the government. The clerk further suggested an early judgment, a levy of a fine of 5 goulden (about \$2.) and the restoration of the confiscated apparatus.

The attorney for the defense thanked the open ministry for the very lenient decision and remarked that it was not often that the court addressed the accused with a good-luck wish. He also said how bad it would appear if, while France gave a gold medal to the first French amateur to work across the Atlantic, the Netherlands brought its amateurs into court and hindered scientific progress and experimentation in radio. It was decided that the defendant had not transgressed the law and the case was dismissed.

The above is of great interest to all of us for it shows that at least one country where amateur transmission was heretofore more or less formally prohibited has adopted a more open-minded attitude and has been shown that it is beneficial rather than harmful to permit the operation of amateur experimental radio stations under government supervision. The A.R.R.L has addressed a communication to the Dutch authorities congratulating them on the decision made in this case. We hope that we may soon again have the pleasure of hearing the signals of PCII on the air.

4-COIL MEISSNER TRANSMITTER AT 7ADQ-7NT

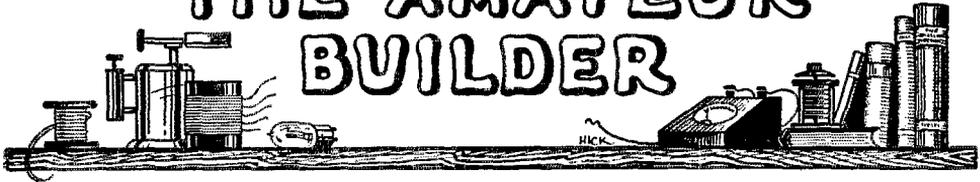
(Concluded from page 49)

The fixed condenser next the terminal strip at the left is across the plate supply; in other words, this is C4.

The rheostat is in the filament circuit as usual, altho an improvement is suggested in the diagram. The remaining meter at the right-front is the filament voltmeter.

Details as to the operation of this set were given very clearly in Mr. Iversen's article, which should be read in connection with this description.

THE AMATEUR BUILDER



A HANDY CALIBRATED OSCILLATOR

By N. J. Buckeye, ex-8AJE

MUCH has been said and written about the amateur's wavemeter. One for measuring the wave length of his transmitter is rather easily built, but a wavemeter for measuring received signals with a good degree of accuracy is a difficult matter. The method generally used is to place the wavemeter near the oscillating receiving set and vary the wavemeter condenser until a click is heard in the phones. To accomplish this the wavemeter must be placed close to the receiving set and the tuning of the set is distributed by the presence of the wavemeter. As a result the measured wave is not of the same length as that sent out by the distant transmitter. The alternative is to use a wavemeter that is excited by a buzzer, but such a broad wave is produced as to be useless when dealing with C.W. signals.

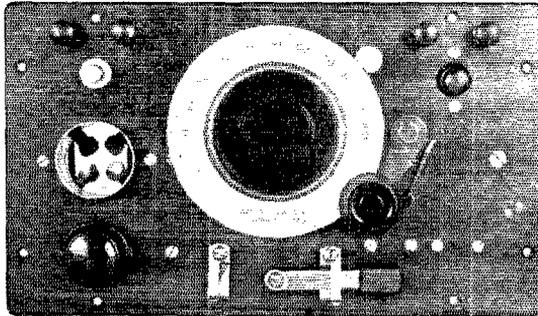
A very accurate way of adjusting two circuits to the same frequency is to cause both circuits to oscillate by suitably connecting a vacuum tube to each. Then, with a pair of phones connected in the plate circuit of one of the tubes, vary one of the tuning condensers until a "receiver squeal" is heard. This is the beat note between the two oscillators. Further careful adjustment of the tuning condenser will reduce the beat note to zero. The two circuits are then exactly in resonance.

This is the principle used in the wavemeter developed by Mr. I. M. Chambers, ex-8AJX, which is about to be described. This principle is not new, by any means, but a wavemeter built for use in this manner is very different from the usual

amateur wavemeter consisting of a coil, a condenser, and a flashlight lamp. The oscillating wavemeter consists essentially of a coil and a variable condenser connected to a vacuum tube as shown in the diagram. All of the apparatus is mounted on a panel as a single unit. When the filament is heated the circuit radiates at a frequency that can be varied by turning the condenser dial. The frequency occurring at the various dial settings may be marked directly on it, or may be recorded on a piece of cross-section paper.

The instrument is thus a calibrated oscillator.

The main advantages of the oscillating wavemeter are; first, that because it works on the "zero beat" principle it is easy to adjust to exact resonance with the receiving set when measuring received signals; second, the wave-



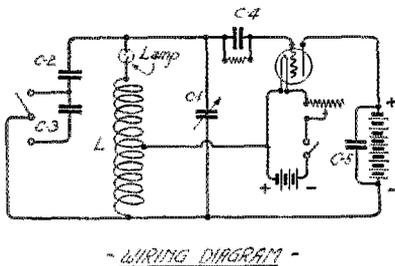
meter does not have to be placed close to the receiving set, anywhere in the room will do. It does have the disadvantage, however, that changing tubes, moving batteries, and so forth, affects the accuracy of the meter. The extent to which the accuracy is affected by these changes is told later. If suggestions given for calibration and operation are followed, however, these changes may be neglected by the amateur in the course of ordinary use.

Construction

A general idea of the arrangement of the component parts may be had from the photographs. The panel is three-sixteenths of an inch thick and measures 6 by 10 inches. As described, most of the apparatus is mounted on the under side of the panel. The tube socket, flashlight lamp receptacle, rheostat, and the inductance may be mounted on the top of the panel in the position indicated if desired, however.

The actual oscillator shown in our photographs and the drawings thereof made by H. F. Mason, QST Department Editor.

The inductance coil, L , is 22 turns of No. 20 D.C.C. wire wound in a single layer on a three-inch-diameter tube of cardboard or bakelite, the length of the tube being two inches. A tap is taken off at the center turn by poking a loop of the wire through a small hole in the tube and bringing the loop to a binding post placed at the edge of the winding. The coil should be given a coat of collodion to insure permanence. The coil is suspended from the panel by two pieces of quarter inch brass rod three-fourths of an inch long, drilled and tapped



with a 6-32 thread at each end. The ends of the winding are connected to the mounting posts by placing them under the heads of the mounting screws. With this construction the inductance can be changed for one giving a different wave length range in about fifteen seconds without having to unsolder any connections.

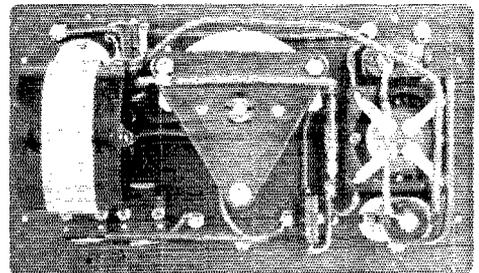
The variable condenser, C-1 in the diagram, is a General Radio type 247 condenser, having a maximum capacity of about 450 $\mu\text{fd.}$ (.00045 $\mu\text{fd.}$) and movable plates shaped to give nearly constant wavelength increase. The dial is a four-inch General Radio with geared vernier. The pinion is held in mesh with the large gear on the under side of the dial by a spring, this spring being a part of the vernier attachment. Any other type of good condenser may be used with equal results. The condenser should be one that is rigidly constructed and one in which there is no danger of the calibration being destroyed by the plates slipping or getting out of line. It should have good insulation and good bearings. Instead of the geared vernier described a hard rubber extension handle about a foot long may be fastened to the main knob at right angles to the condenser shaft for use in making fine adjustments.

Condensers C-2 and C-3 are each Micadon "postage stamp" condensers having a capacity of 250 $\mu\text{fd.}$ (.00025 $\mu\text{fd.}$). They are connected across the variable condenser and coil to give additional wavelength ranges. The range without these condensers is from 80 to 220 meters; with the two condensers in series across the variable condenser it is from 200 to 280 meters; and with one condenser across the variable condenser it is from 270 to 330 meters. The switch is

a Fabnestock battery switch that has been removed from its moulded composition base and mounted directly on the panel. C-4 is a 500 $\mu\text{fd.}$ (.0005 $\mu\text{fd.}$) grid condenser, also of the Micadon type, and across it is connected a one-megohm grid leak. The grid leak mounting can be seen just to the left of the tube socket in the panel layout. The plate battery is shunted with a 5000 $\mu\text{fd.}$ (.005 $\mu\text{fd.}$) condenser which serves as a radio frequency by-pass and incidentally keeps the plate battery from affecting the accuracy of the instrument as much as it otherwise would.

The plate and filament batteries can be incorporated in the cabinet if a UV-199 tube is used, in which case the four binding posts on the panel may be omitted. The plate batteries may be inside the case and binding posts for only the filament battery may be mounted on the panel, if the builder desires.

Referring to the panel layout, the filament switch, tube socket, rheostat, and filament battery binding posts are mounted at the right hand end of the panel. A Cutler-Hammer switch, Eria socket, and Filkostat were used in the instrument shown in the picture. At the other end of the panel are mounted the inductance, miniature porcelain receptacle for the flashlight lamp, plate battery binding posts, and



the two fixed condensers that are used for different wavelength ranges. The variable condenser and condenser switch are mounted near the center of the panel.

After the parts are mounted, the oscillator is completed by wiring it with No. 12 or 14 copper wire, making the wiring as rigid as possible, for any changes are likely to influence the calibration.

A useful accessory for use with any wavemeter having a flashlight lamp in the oscillatory circuit is a short-circuiting plug for insertion in the lamp receptacle. This plug may be made from a burned out lamp by removing all of the glass and filling the metal shell with melted solder, setting a short length of threaded rod in the solder. When cool, a small moulded binding post top should be screwed on the projecting threaded rod, thus completing the plug.

Removing the lamp and inserting the plug will lower the resistance of the tuned cir-

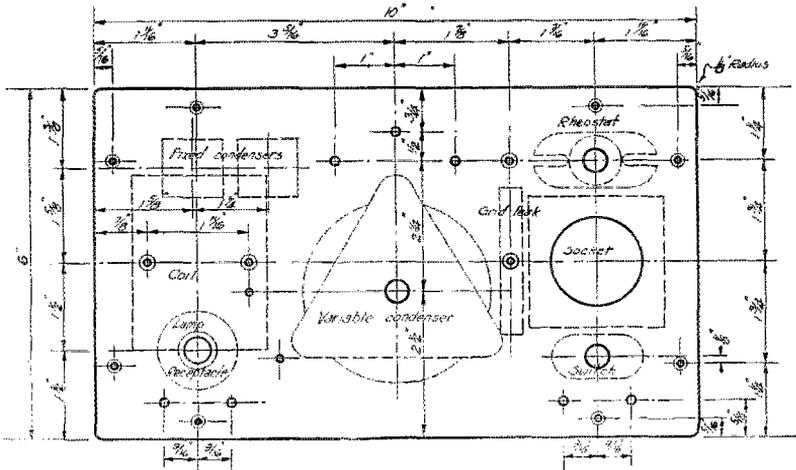
cuit materially. This will make oscillation easier when the circuit is connected to the vacuum tube. It will also give better readings when the click method is used. The lamp is used only when measuring the wave of a transmitting set.

Calibration

Before attempting to calibrate the instrument the builder should read the wave-meter articles by Mr. Kruse in the February and April issues of *QST* for there is much in those articles that applies to the instrument we are building.

The oscillator may best be calibrated by means of the standard-frequency transmissions from WWV. The schedules of this station appear in *QST* each month. If you are sure you are out of range of these signals, the meter can be calibrated by reference to the carrier waves of the following broadcast stations: WWJ, WCAP, WRC,

The oscillator is calibrated by first tuning in the signal to be measured on your regular receiver. Let the receiver oscillate and carefully adjust the tuning dial until the "zero beat" condition occurs. Now start the oscillator and carefully adjust it until a "receiver squeal" is heard in the phones, which are still connected to the receiver. This squeal is the beat note caused by the heterodyning of the oscillator and receiver. The oscillator should now be adjusted until the "zero beat" condition again obtains. The distant station, your receiving set, and the oscillator are all now exactly in resonance. The position of the dial on the oscillator and the wavelength of the transmitting station should now be recorded. When making these adjustments the oscillator need not be coupled closely to the receiving set; all that is necessary is that it be in the same room with the receiver.



whole range from 80 to 330 meters with only a few definitely known waves scattered around the upper part of the range as a basis. The only trouble that may be had in calibrating it in this way is in getting the harmonics mixed such as mistaking the 3rd for the 4th, etc. If the points are plotted on a curve as the work proceeds an error will always show up by being out of line with the rest of the points. Curve sheets should be carefully prepared showing the wave lengths corresponding to the previous settings of the oscillator dial. There will be three curves; one with the single pole double throw switch in the open position, one with it on one point, and one with it thrown in the other direction. This gives three wavelength ranges.

Accuracy

Now that you have the oscillator built the question arises, "Is this instrument accurate enough for my work?" The answer depends on several things. First of all, no matter how carefully a wavemeter is built or how well constructed, it cannot possibly be more accurate than the source from which it is calibrated. If your meter is not carefully calibrated from WWV's signals, or by a reliable laboratory, you will have to allow something for inaccuracy in its calibration to begin with. For use in the average station, extreme accuracy is not necessary, nor can it even be attained with wavemeters constructed in the ordinary fashion. An accuracy of within one half of one percent is sufficient for most amateur work. This means that on 200 meters a wavemeter may read 200 when the wavelength is really anywhere between 199 and 201 meter.

Use

To use the calibrated oscillator in measuring the wave length of a distant transmitting station, tune in the station with your receiver oscillating, adjusting for zero beat. Next start the oscillator and adjust the oscillator until it heterodynes the receiver and creates a zero beat note. The oscillator is now tuned to the same wavelength as the transmitting station. It will be well to have a general idea of what the wave length is you are measuring at the start because it is perfectly possible to adjust one of the oscillator harmonics to zero beat note with the receiver the same as if it were fundamental. In this case the measured wave will be a fraction, such as $1/2$, $1/3$, or $1/4$ of the real wave of the transmitting station.

To measure the wave length of your transmitter, all that is necessary is to bring the instrument near the antenna lead and rotate the dial until the flashlight bulb lights, having previously substituted the bulb for the dummy plug. The wavemeter should be held as far away from the set as possible and still allow the light to glow dimly when in exact resonance. This will

not only prevent burning out the bulb but will let you measure the wavelength more accurately than if the light were made to glow brightly.

The oscillator will also find many other uses around the laboratory and amateur station. It can be used as a separate oscillator in connection with a super-heterodyne set. It can also be used as a miniature transmitter for use in testing receiving sets.

After this wavemeter was made, calibrated and checked, several amateurs were heard telling each other their wavelengths. For instance, one said he was on 190 meters; the wavemeter said 198. One Eighth District station said he was on 150 meters; the wavemeter said 162. One Third District station said he was on 200 meters; the wavemeter said 212. From this it can be seen that there really is a keen need in every station for a wavemeter that is quite accurate. This instrument, simple, fairly cheap, and accurate enough for all purposes, should prove a boon to amateur radio.

1BDI-1XAH, ORONO, MAINE

(Concluded from page 51)

how good the apparatus inside the station. In 1XAH's location the metal roof, lighting circuits without number in the building, a metal fire escape near the lead-in; all of these make up the resonant circuits that cause the humps in the resistance curve and absorb much of the energy that would otherwise be radiated. Only careful measurement and months of operation to back up the results of the measurements can show the best wavelength to use for a given antenna, especially where an antenna is handicapped by a very unsuitable location. A few weeks of *proper experiment* is certain of being a big improvement to some of the haphazard stations that we see.

The Antenna Series Condenser

Because the radiating system is of the condenser type it has a low resistance and high current flow must be had in order to get the desired radiation. Because of the low resistance and high current there will of necessity be a high voltage drop across the series condenser.

Great difficulty was experienced in obtaining a series condenser that would meet the requirements. The final result is the queer looking arrangement shown in Fig 3. It is cumbersome and not handsome, but it works very well, has good insulation and never breaks down.

After June tenth 1BDI-1XAH will be no more, as its owner is graduating from the University of Maine this year. As a station, it conclusively shows what can be done in the face of many difficulties.

Strays



BOARD MEETING COMING Your Chance To Be Represented

The first meeting of the new Board of Directors of the A.R.R.L. will be held in Hartford on July 25th. These Directors are your representatives, elected by you to speak for you in the government of League affairs. If you have any suggestions, comment or criticism, and particularly if you have any helpful ideas that will improve Amateur Radio, write immediately to your Director, so he can speak for you at the coming meeting.

All Canadian amateurs should address the Canadian General Manager, A. H. K. Russell, at 234 Westmount Drive, Toronto, Ont.

In the U.S.A. there is a Director from each Division, their addresses being as follows:

ATLANTIC: Geo. L. Bidwell, 1245 Evarts St., N.E., Washington, D. C.

CENTRAL: Clyde E. Darr, 137 Hill Ave., Highland Park, Detroit, Mich.

DAKOTA: Prof. Cyril M. Jansky, Jr., (present temporary address) c/o Camp Alfred Vail, N. J.

DELTA: Benj. F. Painter, 424 Hamilton Natl. Bank Bldg., Chattanooga, Tenn.

EAST GULF: Harry F. Dobbs, c/o Dobbs & Wey Co., Atlanta, Ga.

MIDWEST: L. Boyd Laizure, 30th & Mercier Sts., R.F.D.1, Kansas City, Mo.

NEW ENGLAND: Geo. L. Finney, 84 Prospect St., South Manchester, Conn.

NORTHWESTERN: Karl W. Weingarten, 3219 No. 24th St., Tacoma, Wash.

PACIFIC: Allen H. Babcock, 65 Market St., San Francisco, Calif.

ROANOKE: W. Tredway Gravely, 503 Main St., Danville, Va.

ROCKY MOUNTAIN: Paul M. Segal, 2518 Race St., Denver, Colo.

WEST GULF: Frank M. Corlett, 2515 Catherine St., Dallas, Texas.

The Westinghouse Electric and Manufacturing Company recently brought suit against the Tri-City Radio Electric Supply Company, makers of Tresco apparatus, for alleged breach of contract in using the Armstrong radio circuits in their apparatus. The opinion of Judge Wade, dictated in court, was that there was no violation of the contract and that the Westinghouse Company had no right to ask the court to cancel the license of the Tresco Company. The case will undoubtedly be appealed, attorneys for the Westinghouse Company stated. This case is of more than passing interest to the amateur as the manager of

the Tri-City Radio Electric Supply Company is Mr. W. H. Kirwan, old 9XE.

Amateurs in Lockport, New York, have been given a ruling on a question affecting amateur radio that is quite important. The Lockport Light Heat and Power Company recently changed the local supply from 60 to 25 cycles. "As we had a 100-watt transmitting station, and as the local company refused to substitute equipment which would operate on the new 25-cycle current, I was obliged to make complaint to the Public Service Commission, requesting replacement of the apparatus rendered inoperative by the change in supply frequency," says Mr. F. P. James of 8CBB, in a recent letter. "The question was referred to the Electrical Expert for the State Commission and a ruling made which required the Lockport Company to learn from the General Electric Company what equipment would be needed to make the set perform on 25-cycle current, and to order all such equipment so recommended. Within the past few days the apparatus has actually been delivered to us, thus closing the incident."

For the information of those who are interested in obtaining some of the filter condensers advertised on page 75 of the May QST, the Westinghouse Electric and Manufacturing Company wishes to advise prospective purchasers to get in touch with their local power companies, ordering the condensers through them.

About the best test for identifying pure aluminum is to place a piece of it in a hot lye solution, and if on taking the aluminum out and washing it, the surface has a matted silver appearance, the aluminum is good. If the surface appears streaked with occasional black spots, the aluminum is useless for a rectifier. These spots indicate impurities, and the film will not form at these points. The softness of the aluminum is not much of an indication of purity as the softness depends on the degree of annealing.

Bradford Hearn of Shreveport, La., puts forth the suggestion that in future call books, amateur stations be listed according to the town in which they are located

as well as by the name of the owner and the call of the station. This would be very helpful to amateurs who tour the country in the summertime. At present if you wish to know if there is an amateur in a certain town you must sit down and patiently search through all of the names in the district, having first picked the district from the map; unless, of course you happen to know the name of the man. In the present government call books stations are listed by call and by the owner's name only; those in each district being listed separately. Of the three methods of listing, which do you think are most useful? Let us know if you would like to see the calls listed by towns in addition to or instead of one of the present ways of listing.

Away down at St. Croix, in the Virgin Islands in the Caribbean Sea, there is a newly-established amateur station run by the two young sons of a U. S. government official stationed at the island. The receiver is a Reinartz and the old transmitter says "7OE" on it. Stanley Mathes, ex-7OE, south on maneuvers with the fleet, encountered these lads who wanted to learn the code and he real amateurs, so he lent them his old equipment until they can get some of their own. Attaboy!

On May 27th there convened in Mexico City an Inter-American Electrical Communications Conference, to discuss Pan-American radio relations. The three representatives of the United States consist of Congressman Wallace H. White, of White Bill fame, our American consul at Mexico City, and Mr. Allen H. Babcock, of San Francisco, Pacific Division Director of our A.R.R.L. The appointment of Mr. Babcock was a tribute to A.R.R.L. as well as a recognition of Mr. Babcock's unusual ability.

Credit was accidentally given the wrong paper for the cartoon depicting the activities of 3ZO-3XW which appeared on page 25 of the June issue. We are sorry, and take this opportunity to correct the error and to thank the Baltimore American, to whom the credit should have gone, for the cartoon.

Amateurs rendered an important service to shipping recently when messages were relayed by amateurs from ships caught in the ice in Lake Superior outside the entrance to Duluth harbor, to the Cleveland steamship offices. The old station at Duluth, which has not been in operation for over a year, was the only one that could handle traffic from ships in this vicinity, therefore the responsibility rested entirely with the amateur for the handling of traffic in this instance.

We have received a copy of the new wireless catalog of Messrs. Burndept, Ltd., of London, one of the leading British houses. It is excellently got up and gives one a good insight into British practice in the radio business. Burndept have an amazing variety and number of complete sets and units of every description—"a set for every purse" sure applies here. We were particularly intrigued by their policy of equipping the filament circuit of all sets with a "screw holder", resembling a miniature lamp receptacle, into which a "shorting plug" is normally screwed, but for which an inexpensive fixed resistor may be substituted to take care of different varieties of valves or batteries. The resistors consist of fibre rods wound with resistance wire and equipped at one end with a screw base, and are available in various resistances from .3 to 55 ohms. American manufacturers might well profit by this example—it is a beautiful way of accomodating either UV-199 or UV-201-A tubes, or any new tube which may come out, in the same set. Burndept have a line of rugged "low-loss" variable condensers built up of thick die-cast plates each of which is provided with cast projections, thus eliminating spacing washers. Among their loud-speakers we found one which was distinctly unusual, a deluxe model made in the form of a large Greek vase, 37 inches high, of solid mahogany, with antique brass fittings, weighing 40 lbs. total. "Most loud-speakers are unavoidably obvious", the text reads, but this one "would never be taken for a loud-speaker, as it looks what it is—a very fine piece of furniture capable of standing in any room no matter how handsomely furnished".

7SC's longest DX on a 50-watt tube is 2 minutes. Then the tube got up and left.

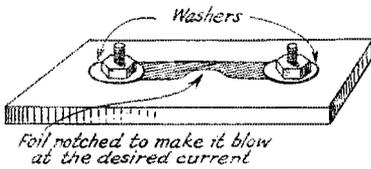
Weird Superstitions of Amateur Radio

- That a honeycomb coil makes a good R.F. choke.
- That a series condenser ruins a sending set.
- That all antenna wires must have the same length but it does not matter at all in the counterpoise.
- That the antenna and counterpoise meters must read the same—even when one is 15 feet further from the nodal point.
- That a water pipe is always a good ground connection.
- That nobody (except the other fellow) has a poor tone.
- That a 1 mfd. condenser and baby choke make a filter.
- That direct current generators do not need filters.
- That a rectifier turns out direct current.

That one's own oscillating receiver makes no QRM.
 That "my set won't work below 200 meters."
 That a "thermo couple ampere" is different from a "hot wire ampere"
 That it is necessary to call local stations "3 & 3"—or more.
 That only the other fellow has key clicks.
 That a CQ hound has any excuse for living.

Simple Home-made Fuse*

A fuse of almost any capacity can be made from a strip of metal foil. Tinfoil is

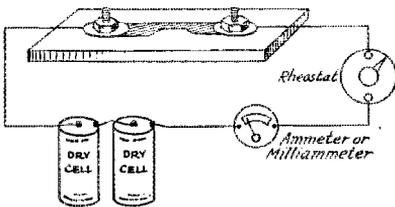


more permanent than lead foil and aluminum foil is best of all. However, lead melts rather easily and it is easy to make fuses of it that will blow at very small currents. None of the foils are very strong and it is a good idea to clamp them as shown in the cut rather than to run the nuts down directly on the foil, which generally tears it.

When starting out with a fresh piece of foil connect as shown and set the rheostat so as to get a bit more current than you want the fuse to carry; then whittle away one side of the strip with a razor blade or a pair of scissors until the strip "blows." You now have the right width and can make up a bunch of these strips for future use.

Naturally these fuses, like any others, ought to be mounted on a fireproof base, asbestos board or slate being good for this purpose.

Aluminum foil such as is used by sign painters makes good fuses for small cur-



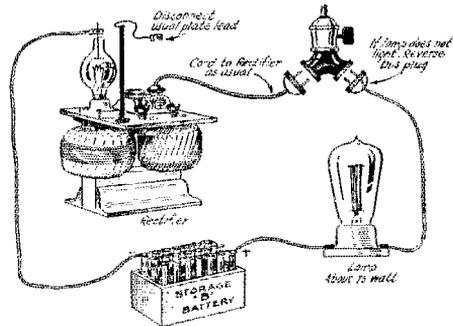
rents but it is pretty fragile and has to be cut between sheets of paper. Light tinfoil or leadfoil comes next and for still heavier currents it is best to use standard fuses; the home-made ones are dangerous when over a few amperes are being handled.

By the way—none of these home-made fuses are approved and cannot be used in the house wiring. They are good for filament circuits, "B" battery circuits, and the plate supply circuits in your transmitter, however.

—S.K.

9BGA saw a R.O.W.H. pin on one of the bunch just back from the National Convention. He then asked if he, too, could become a member of the "Royal Order of Women Haters."

The two-ampere battery charging outfit described on page 46 of last month's QST can be used for charging storage B batteries by connecting it as shown in the accompanying cut. The charging rate, which should never exceed a quarter of an ampere, is determined by the size of lamp



connected in series with the battery and the voltage of the battery being charged. For charging a 45-volt battery a 75-watt lamp can be used. It will light at about half brilliancy when charging.

If you're not convinced that hams take their sets with them when they depart this life, look up 3BTW in the call book.

Your electrolytic rectifier can be made to work much better by putting one-half teaspoonful of 26% ammonia (obtainable from your corner drugstore) in each rectifier jar. Do not use the ordinary household ammonia, however, as it forms "soap" on the plates.

While one of the neighborhood's future brasspounders was listening in with 9CXT, a fone came in calling CQ as though he meant it, and the little boy proudly said, "CQ is at Decatur; I have heard lots of stations calling him." Wonder if 9DQU knows anything about this.

Canadian 3OD was arrested for bootlegging the other day. When returning home from 3JE's station late at night he

was accosted at a dark corner by a policeman who wanted to know what he had in the big black bag he was carrying. "Rectifier jars", was the answer, but the officer understood not. 3OD was taken to the station and there was much explaining to do. It was only after 3JE himself came down and told how he had loaned the jars to 3OD that everyone was satisfied. Hi!

Here's another: Canadian 3SX went into a radio store and told the clerk he wanted to buy a key. "We only handle radio supplies;" was the answer, "you'll find a locksmith about three doors down the street."

N & K phones, made by Neufeldt and Kuhne of Germany, and which are appearing in the United States, are phones that are good both for the broadcast listener and the code man. A metal ring is furnished with each phone, which if placed beneath the diaphragm causes the phone to give exceptionally good quality on broadcast reception. By removing this ring, or placing it on top of the diaphragm the quality is impaired but the sensitivity to weak signals is increased, thus making the receiver better from the standpoint of the code man.

A large papier mache A.R.R.L. emblem, 18 inches high, in black and gold, has been added to the list of "A.R.R.L. Apparatus." This emblem is just the thing for hanging on the wall of your station. It can also be used by affiliated radio clubs, radio conventions, and is fine for use in decorating your club booth at the radio show. You will find these large emblems advertised in June QST.

"Twelve years ago the amateur boasted to his friends of his communications over a few hundred miles. To-day our amateurs, to whom much of our radio progress is justly due, nightly send messages across the Atlantic ocean". — Herbert Hoover, Secretary of Commerce, addressing the House Committee on Merchant Marine & Fisheries, at the opening of hearings on the White Bill.

Book Review

By S. Kruse, Technical Editor

"Annuaire De La T. S. F.", edited by Etienne Chiron, 40 Rue de Seine, Paris, France.

A French year-book modeled much along the same lines as the Marconi year-book. The first two sections deal respectively with the International agreements of 1912 and the various laws governing radio communications. The usual international callbook is included in about as good form as we have ever seen it. The section of radio formulas is unusually large and com-

plete. The thing we most appreciate about it is that the author has throughout stated the units with which he works and the meaning of the symbols given in the formulas. As we have said in other reviews, this makes the difference between a useful handbook and one that had better not be purchased. The book also includes a short section in which 357 radio terms are given in French, English, German, Italian and Spanish. A further short section lists various radio associations and publications of many different nations. A number of large commercial transmitting stations, mainly French, are described in great detail. There is a large advertising section almost solely occupied by French advertisements but supplemented by a table of manufacturers which includes a few foreign makers, mostly European.

Altogether the book is one that makes us wish for a better reading knowledge of French.

"Radio News Amateur's Handbook", reprinted from past editions of *Radio News*. Experimenter Publishing Co., Inc., New York City, 210 pages.

The man who enjoys constructing apparatus will find this book worth while even if only because of the great volume of different ideas presented. Anyone about to build a tuner will enjoy reading the first 80 pages or so although he cannot help noticing at the same time that tuner articles usually become somewhat obsolete in the time that it takes to make them into a book. This is perhaps best illustrated by the repeated appearance of the super-regenerative receiver (in excellent shape it is true) at a time when such receivers are mostly totally out of use. We are also inclined to take issue with the editor of the book in his claim that the first tuner described is in any way "a typical amateur receiver".

The present reviewer cannot effectively criticise the first article on wavemeters because he helped to write it for the Bureau of Standards from whose letter-circular the article is taken without any credit being given. Of the second wavemeter article, one has only to say that it is the worst of bad practice to attempt using the same curve for different wavemeters, even if they are built alike.

The transmitting articles vary widely in quality, ranging from a good article by Everitt W. Thatcher in which he describes his own station to an article which is written around the idea that a transmitting set must be good for amateur work if the General Electric Company built it. The author of this latter article cheerfully ignores the fact that this design was handicapped by aircraft requirements and makes matters worse by supplying several incorrect diagrams.

The latter half of the book deals with radio theory in various ways and on the whole we like it, those things on which we feel doubtful being in the field of opinion rather than definite fact. Just before the rear cover one arrives at a short section on the making of coils which we can praise without reservation; it contains a variety of thoroughly good ideas.

Taken as a whole the Amateur's Handbook ranks well up in its class and is worth purchasing and using.

"The Super-heterodyne Manual", by Victor Greif, E.E. The Receptrad Press, 57 Bank St., New York City.

For those about to construct a super-heterodyne or those wanting to know if they *should* construct a super-heterodyne this book is heartily recommended. It presents in turn, and very clearly, the principle on which the "super" works, a wealth of detail as to the various modifications of the circuit and finally some working drawings for the construction of a particular type.

Although written to a certain extent around the "Receptrad" products, the book by no means confines itself to them but discusses with frankness and fairness the correct design of the different parts of a "super," as well as the popular variations of the fundamental circuit.

We can recommend the book unhesitatingly and only wish that the author had not said "re-radiation" when he meant "radiation."

"Radio Handbook", by International Correspondence Schools, Scranton, Pennsylvania. \$1.00 postpaid.

The International Correspondence School Handbook on Radio has been reviewed by us before. The first edition has now been revised and in the fiftieth thousand we have about as pleasing and as generally satisfactory a handbook as one could wish for.

"Experimental Radio", by Professor R. R. Ramsey, Dept. of Physics, Indiana University. Publishers, Edwards Brothers, Ann Arbor, Mich. For sale by University Book Store, Bloomington, Indiana, or the QST Book Department, \$2.00.

"Experimental Radio" in its first edition has previously been reviewed in QST. Now, as then, we recommend it very strongly to the radio experimenter. In the revised edition the book has been enlarged until it presents a series of 85 very excellent experiments. To this has been added a brief but excellent list of reference books, some valuable notes on the construction of laboratory apparatus and some notes for suggested experiments on the oscillating arc, the resonance coil, the Tesla coil and the Lecher wires.

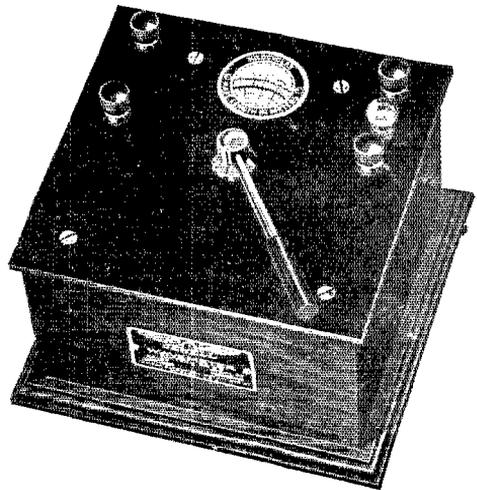
The entire manual is built on the idea that the experimenter will not be wealthy and will not have a great deal of apparatus, hence it should appeal to the amateur. Certainly we will guarantee that even a hurried reading of the book will suggest to him several dozens things that he does not know and wants to know.

"The Radio Manual" by Orrin E. Dunlap, Jr., B.S., Houghton-Mifflin Company, Boston and New York. Price \$2.50.

The overnight radio expert is passing out, the man who really knows is coming into his own.

No better illustration of this can be thought of than the disappearance of the wild books that we were reading two years ago and the arising in their place of such books as *The Radio Manual*. Mr. Dunlap is not only writing an interesting story, he is dealing in facts and he is keeping those facts in splendid proportion to each other. This is what one would expect from a man who has had varied experience in the Marconi Service, the Navy Service, and now as Radio Editor of *The New York Times*.

It is an unusual radio amateur who will not get both pleasure and profit in reading this book from "The Birth of Radio" to "Radio Dictionary".



A Real Amateur Wave-meter, Range 140-230 Meters, One Meter Division Scale. Also Reads in Kilocycles.

AT the request of a number of prominent amateurs, we have developed a special amateur range wavemeter, which is equipped with a special condenser arrangement whereby the scale is broadened, enabling accurate readings to be made with considerable ease. The one meter divisions are approximately one millimeter wide.

D. C. Wallace of 9ZT-9XAX winner of the 1923 Hoover Cup, made a test of this wavemeter against the most elaborate standards available, showing the instrument to be far more accurate than would be expected from its low price. The experiences and statements of other prominent amateurs show this special amateur wavemeter to be quite accurate and so built that the accuracy will be retained.

Jewell Pattern No. 90 amateur range wavemeter, price \$25.00. Range, 140-230 meters.

BROADCAST RANGE

TO cover the broadcast range, there is a wavemeter similar to the above with a range of 150-625 meters, as well as a special type equipped with a self-contained buzzer and dry cell for checking receiving sets and having a range of 200-625 meters.

The instrument for checking transmitting sets is priced at \$20.00 and the wavemeter complete with buzzer and dry cell at \$30.00.

JEWELL ELECTRICAL INSTRUMENT CO.
1640 WALNUT STREET CHICAGO

Manufacturers of the Jewell complete line of miniature switchboard instruments, Jewell radio test set, wavemeters, etc.



De Luxe Socket

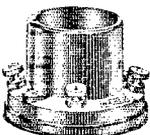
The laminated phosphor bronze contacts of the Na-aid De Luxe Sockets press firmly on both the ends and sides of tube prongs, keeping the surface clean and insuring clear reception. Moulded of genuine Bakelite this socket expresses the very highest quality in appearance and workmanship.

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Largest Makers of Radio Sockets and Dials in the world.

Springfield, Mass.
Dept. M 52 Willow St.



De Luxe Contact



Na-aid De Luxe No. 400

FREE

YOUR OWN Name, Address and Station Printed



FREE & RADIOGRAMS

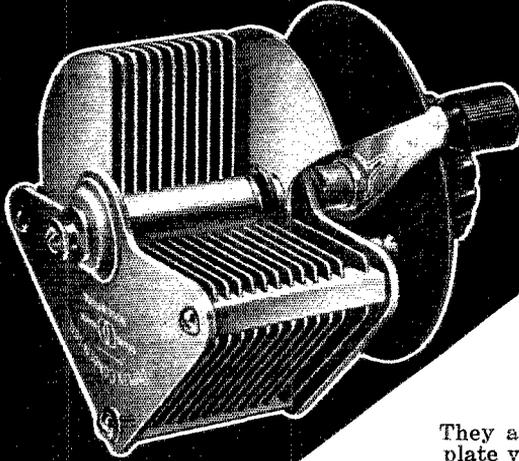
ARRL Emblem added if requested.
Cards: Red call, black printing.
High quality, latest design. 100-\$1.75;
200-\$2.75; 300-\$3.60. POSTPAID.
Radiograms: Bond paper, 100-\$1.55;
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SERIES "DR" Compact Precision Condensers

This series has been designed to meet the demand for an excellent commercial reasonably priced condenser. Its compact size makes it desirable for mounting where weight and small size is an important factor.

They are made in all sizes from 3 plate up to 43 plate vernier.

The 23 plate has a maximum to minimum Capacity Ratio of 60/1. We use no washers in our rotor or stator assemblies. The rotor shaft is moulded around the plate. We have reduced insulating material to the necessary minimum.

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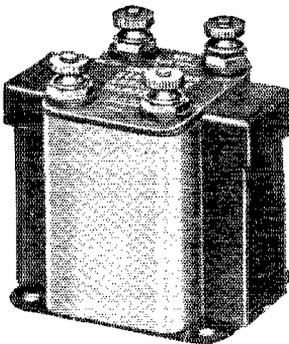
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2:1 RATIO TRANSFORMER

(audio frequency)

UNEXCELLED

FOR MUSICAL REPRODUCTION



2:1 ratio \$5.00

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it will bear the name Thordarson.

Built by Transformer Experts.

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ENJOY A RADIO SUMMER

RADIO will play a wonderful part in your summer pleasures. At home or vacationing — seashore — north woods or mountain nook, radio will be a friendly, convenient companion.

Music from far distant hotel orchestras will play for your dances and beach parties. Through head phones and loud speakers will crash the roar of the ball game. Religious services from metropolitan churches will add to your further enjoyment of the Sabbath. During and after the presidential conventions the

countries foremost orators will address you.

Broadcasting stations are increasing their sending power. The bugaboo of summer static is no longer feared. And so remarkable has been the improvement and simplification of receiving sets that you will find their cost much lower than you might expect.

Give thought *now* to summer radio. Replace your worn out batteries with Burgess 'A,' 'B' and 'C's, which are recognized by expert and amateur alike as the best obtainable.



"Ask Any Radio Engineer"

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BRANCHES

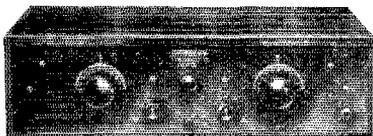
NEW YORK BOSTON KANSAS CITY MINNEAPOLIS
WASHINGTON PITTSBURGH ST. LOUIS NEW ORLEANS

IN CANADA

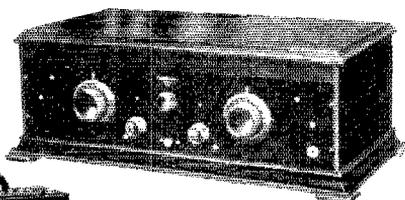
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Crosley Trirdyn 3R3, \$65.00



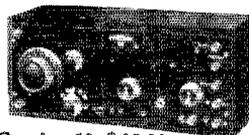
Crosley Trirdyn 3R3 Special, \$75.00



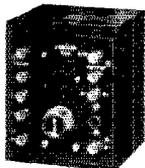
Crosley 51, \$18.50



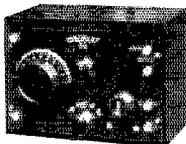
Crosley 51-P Portable, \$25.00



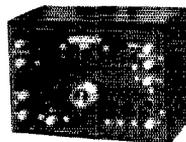
Crosley 52, \$30.00



Crosley 51-A, \$14.00



Crosley 50, \$14.50



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**One of these Crosley Models
will satisfy every pocketbook,
every purpose and every taste**

Read the next page carefully, you will find the Radio Receiver to please you. Your satisfaction is guaranteed by the fact that Crosley manufactured and sold more Radio Receiving Sets, in the past year, than any other manufacturer in the world.

For Sale by Good Dealers Everywhere

Write for descriptive circular

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Guaranteed Satisfaction at a Reasonable Price

CROSLEY 50 A new one tube Armstrong Regenerative Receiver. We believe this to be the most efficient one tube receiver ever put on the market. Like our present Model V, which it supersedes, it will bring in, under average conditions, on headphones, broadcasting stations at a distance of one thousand miles or more. Uses any standard storage battery or dry cell vacuum tube. Price \$14.50.

CROSLEY 50-A A new two stage Audio Frequency Amplifier to match the new Model 50 receiver. This unit is equipped with a filament switch for shutting off the current from the "A" and "B" Batteries. When used in connection with the Crosley Model 50 Receiver, it gives the equivalent of a three tube regenerative receiver. Price \$18.00.

CROSLEY 51 In twenty-four days this receiver became the biggest selling radio receiving set in the world and it holds that position today. It uses two standard storage battery or dry cell tubes, regenerative detector and one stage of audio frequency amplification. Will bring in local stations on the loud speaker at all times, and under average conditions will also bring in distant stations on the loud speaker. Price \$18.50.

CROSLEY 51-A A new one stage Audio Frequency Amplifier to match the Model 51 receiver. When used in connection with the Crosley Model 51 Receiver it gives the equivalent of a three tube regenerative receiver. Price \$14.00.

CROSLEY 52 A new three tube Armstrong Regenerative Receiver, has phone jack to plug in on two tubes and filament switch to turn off the "A" and "B" Batteries. It is unusually efficient, will provide loud speaker volume on distant stations under practically all conditions, and is in every way an ideal receiver for the home. Price \$30.00.

CROSLEY 51-P This is our new portable set. It is the Crosley Model 51 two tube receiver mounted in a leatherette covered carrying case, has a compartment for a pair of headphones and one to hold an ample power plant for the popular dry cell vacuum tubes. This receiver can be used as a stationary set in the home or as a portable. Price \$25.00.

CROSLEY TRIRDYN 3R3 This three tube receiver gives the efficiency and volume of a five tube receiver. Incorporating Radio Frequency Amplification, Regenerative Detector with one stage of Reflexed and one stage of straight Audio Frequency Amplification. Can be calibrated accurately—stations logged and returned to at will. Used on outdoor or short indoor antenna and is, we believe, the most efficient and sharpest tuning receiver on the market at any price for bringing in long distance stations. Price \$65.00.

CROSLEY TRIRDYN 3R3 Special. This receiver is exactly the same as the Trirdyn 3R3 except the solid mahogany cabinet is larger, and more handsomely designed to harmonize with the most beautiful furniture settings. There is sufficient space inside for all the "A" and "B" Batteries required when standard dry cell tubes are used. Price \$75.00.

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The **CROSLEY RADIO CORPORATION**

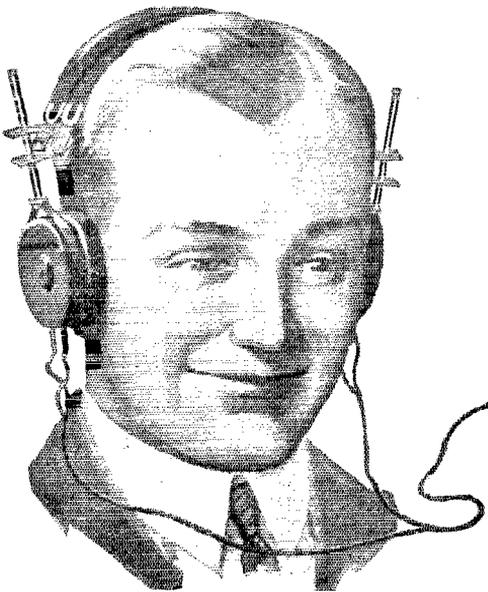
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Be good to your ears

THE enjoyment you get from relay work depends greatly upon the headphones you use. If they are inferior—the results will be unsatisfactory.

Murdock Radio Phones are designed to give the utmost satisfaction under all conditions of radio reception. Powerful magnets and sensitive diaphragms—correctly seated and clamped—make them unsurpassed for dx work. The new improved head-band gives you comfort for the hours you spend at relaying.

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Gentlemen: Please send me, without obligation, your free booklet—"The Ears of Radio,"—which contains important data on headphones.

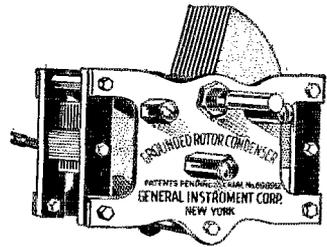
Name.....

Address.....

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Greater Distance and Volume

Than Is Possible with the Average
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CHARLES SREBKOFF, operator and owner of station 2BHY writes, "You can use my name in your advertisements so that other amateurs may profit by my experience with your Low Loss Grounded Rotor Condenser. There is no other condenser to equal yours and I can honestly say that my station is entirely free from any condenser losses since using your GROUNDED ROTOR CONDENSER. Amateurs can call me any night between 11 p. m. and 1 a. m. on 180 meters—three operators always on watch."

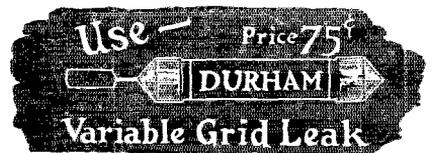
	Minimum	Maximum	
Type 46X .11 Plate	5 mmfd	.00025 mfd	\$4.50
Type 46A .13 Plate	6 mmfd	.0003 mfd	4.50
Type 46D .21 Plate	9 mmfd	.0005 mfd	5.00
Type 46F .43 Plate	15 mmfd	.001 mfd	5.50

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GENERAL INSTRUMENT CORPORATION

423 Broome Street, New York City



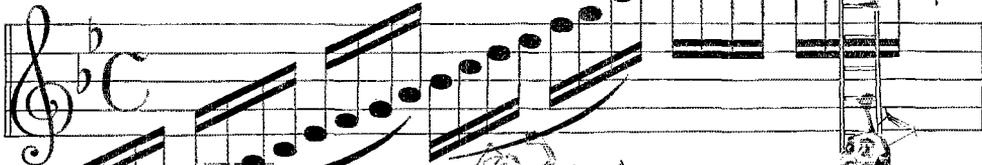
At dealers, or postpaid
Durham & Co., 1936 Market St., Phila.

RADIO MASTS

When you buy a Whittlesey Self-Supporting Standard Steel Mast you buy a mast-head pulley, raising cable, and hoisting reel as well. This is the Whittlesey System. Patents pending. Never climb up except for painting, then "use the elevator." These masts are solid, stiff, rigid and beautiful. 50-75-100-125 feet.

THE WHITTLESEY ENGINEERING CO.
Cleveland, Ohio

Clarity and Tone Range with Kellogg Transformer.



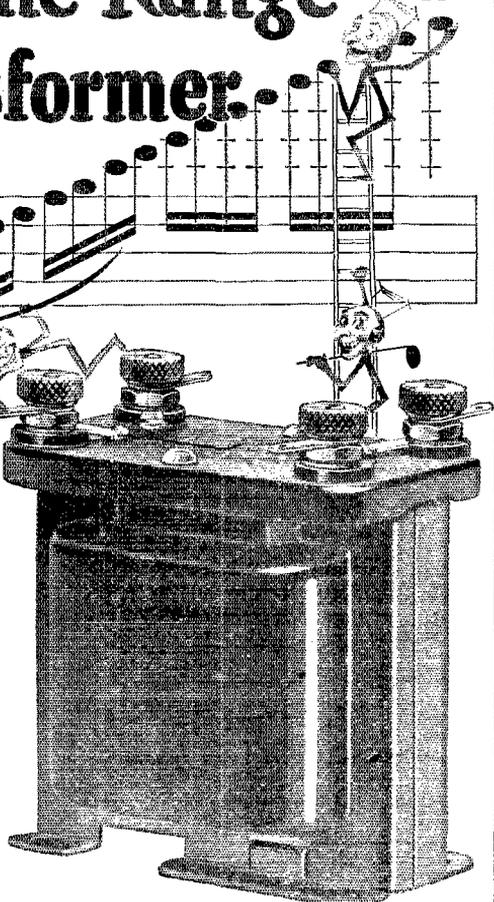
Say the Radio Bugs

THE reproduction of the highest tones as well as those of the lower extreme of the scale, with faithful, pure quality is essentially the spirit of Kellogg transformer design.

The lover of better music searches for a rendition simulating the original orchestra. The ringing tones of brass, the mellowness of wood, the shrill of wind and the fan fare of reed, all in their individual expression.

The Kellogg transformer accomplishes this to a wonderful degree because of its perfect magnetic properties accomplished with the silicon steel laminations without punched holes.

This feature, distinctly Kellogg, eliminates losses to a greater degree than could be otherwise obtained. A transformer is as good as its absence of losses.



Plainly marked terminals, brass shielding, moulded Bakelite tops, perfect finish, are further quality and design expressions.

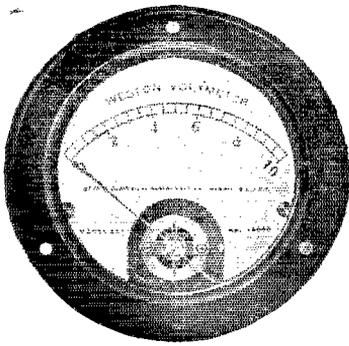
Amplify your pleasure with perfect amplifiers

USE—Is the Test

No. 501—4½ to 1 } Equally efficient. Price \$4.50.
No. 502—3 to 1 }

KELLOGG SWITCHBOARD & SUPPLY COMPANY
1066 WEST ADAMS STREET, CHICAGO, ILL.

Facts that help A.R.R.L. men in picking reliable radio instruments



Filament Voltmeter Weston Stands Alone

The Weston Electrical Instrument Company has pioneered in the development and manufacture of electrical indicating instruments for 35 years in every branch of the electrical industry.

WESTON Electrical Indicating Instruments are the World's standard. This fact is admitted without argument by practically everyone in the electrical industry. Weston meters are used as standards by the makers of most other instruments. They are to be found in scientific laboratories everywhere.

Every Weston meter is better than any other meter of the same class. A Weston meter is always satisfactory or returnable at full value. Many meters are correct at zero and at full scale. The Weston

meter is correct at all parts of the scale.

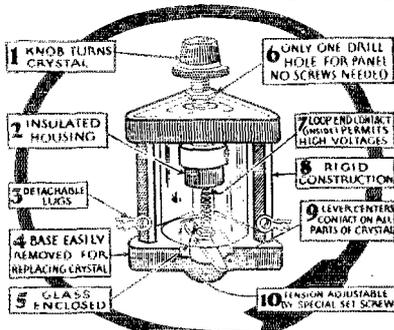
In the field of power generation and distribution, in the laboratory, in the central station or industrial plant, and in the field of portable instruments, Weston meters are recognized as the standard. Moreover, the line is complete. Weston radio instruments have the same fine qualities as all other Weston meters. Booklet J describes these instruments and will be sent free on request. If your dealer cannot supply you with Weston instruments write direct to the company.

WESTON ELECTRICAL INSTRUMENT CO., 158 Weston Ave., Newark, N. J.

Electrical
Indicating
Instrument
Authorities
Since 1888

WESTON

STANDARD - The World Over



Best Crystal Ever Designed!

Freshman Double Adjustable Crystal Detector for panel or base use complete **\$1.50**
Freshman Super Crystal with Non-Metallic Housing . . . 50c

At your dealers or send purchase price and you will be supplied postpaid.

FREE: Write for building plans and hook-ups of Super-Heterodyne, B-flex and other popular circuits. Ask for list L-111.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Ave., New York City

*Write for
a copy
today*

A new twenty-four page booklet will be sent, gratis, to those interested in building their own receiving sets.

A simplified method of construction is described. Illustrations and diagrams.

On Request

EISEMANN MAGNETO CORPN.
WILLIAM N. SHAW, President
165 BROADWAY, NEW YORK

Stop Amplifying Static!

GET good radio results all summer! Take advantage of the better receiving sets—of the better broadcasting.

And use N & K Imported Phones.

Because N & K Phones, used with detector unit alone, bring in the entire range of broadcasting—both high and low tones—with utmost clearness, without exaggeration of interfering noises.

Recent laboratory tests made with N & K Phones showed a *maximum audibility over the wide range of 300 to 6000 cycles*. We believe this to be the widest range of any phone made.

Most radio users this summer will *stop amplifying static* by giving their loud speakers a rest. If they use N & K Phones, the amazing clearness of N & K reception will permit them to suppress static and get the full effect of the broadcasting.

Take home a pair of N & K Phones today and be your own judge. Any authorized N & K dealer will sell you a pair on our money-back guarantee basis. If your dealer is not yet supplied, order from us direct.

N & K Head Set—Model D

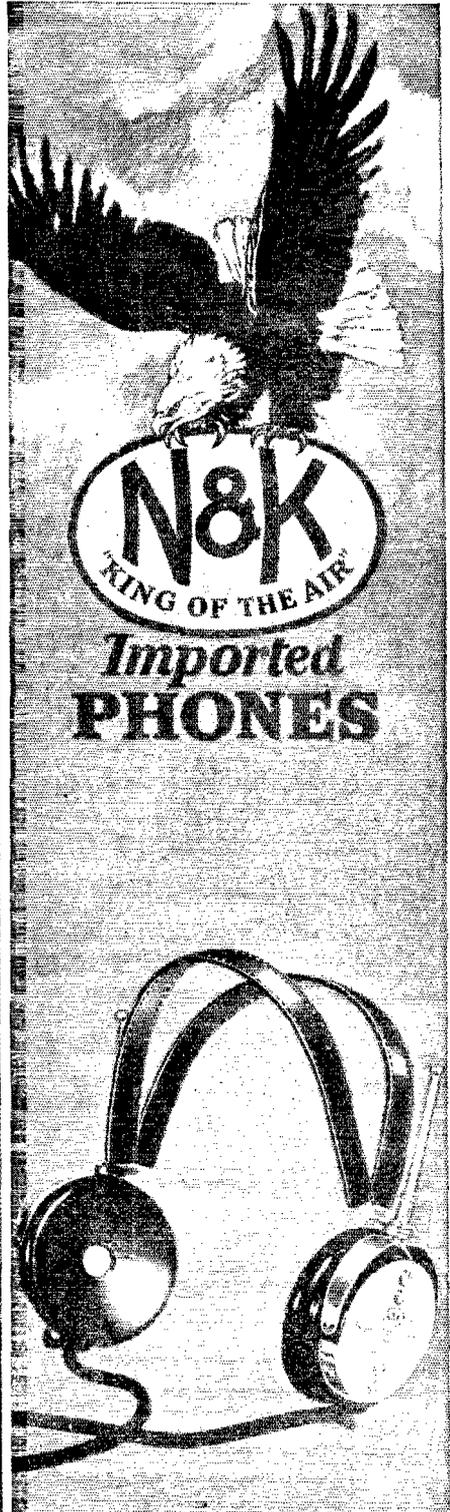
4000 ohms, has extra large diaphragms, which give greater clearness and greater comfort. Neat, leather-covered head bands. Six foot cord. Sold under Guarantee: "Your money back if N & K Phones do not give clearer, mellower, more natural tone and fit more comfortably." Price \$8.50. Send for free folder—"The Phones the Fans Are All Talking About."

DEALERS:

Put an N & K Head Set into the customer's hands and tell him to try it. N & K will do the rest! N & K is backed by widespread advertising which goes direct to radio fans all over America. Display N & K Phones and you cannot fail to cash in on this advertising. Packed in cartons of ten. Ask your jobber.

TH. GOLDSCHMIDT CORP.

Dept. Q7 15 William Street New York



Takes the MYSTERY out of RADIO!

Just one book answers every question about this modern miracle



**50,000 SOLD
514 PAGES**

Compiled by
HARRY F. DART, E.E.

Formerly with the
Western Electric
Co., and U. S.
Army Instructor of
Radio.

Technically Edited by F. H. Doane

BE A RADIO expert—it's easy for the 50,000 who own this compact, complete Radio Handbook. Written in good, plain, understandable language. Cramped full of facts, every one useful and important. Explains how receivers and transmitters work, how to build and operate them. Wherever you or your friends want to know, it's here. Will save you many times its small cost.

TELLS ALL ABOUT: Electrical terms and circuits, antennas, batteries, generators and motors, electron (vacuum) tubes, every receiving hook-up, radio and audio frequency amplification, broadcast and commercial transmitters and receivers, super-regeneration, codes, license rules. Many other features.

Nothing else like it. Make this extraordinary book your radio library—just this one little giant is all you need. Everything in one index, under one cover, in one book, for one dollar. The biggest dollar's worth in radio to-day. Combines the knowledge of many expensive works. Buy this and save the difference. Stop experimenting in the dark. Before you spend another cent on parts or even touch a dial, sign and mail the coupon below and get this unique guide to successful radio.

Send \$1 to-day and get this 514-page I. C. S. Radio Handbook—the biggest value in radio to-day. Money back if not satisfied.

TEAR OUT HERE
INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6135-B, Scranton, Penna.

I enclose One Dollar. Please send me—post-paid—the 514-page I. C. S. Radio Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

Name.....

Address.....

TRI-JACK

TRI-JACK is the most notable improvement that has ever been made in radio jacks! Put TRI-JACK on your radio set and you will eliminate all those little annoyances which are so common to ordinary jacks.

TRI-JACK is super-compact, being moulded of solid Bakelite 1"x1". It is dustproof, solderless, and combines a single and a double circuit jack in one. And it is the nearest to Zero Capacity so far produced!

Insist upon TRI-JACK. Your set needs them for good results!



**BROOKLYN
METAL
STAMPING Corp.**

718 Atlantic Avenue, Brooklyn N.Y.

"Built First - Coto - to Last"

**INSIST ON THE SILVER
PLATED AIR CONDENSER
FOR YOUR RADIO SET.**

Marle Transformers

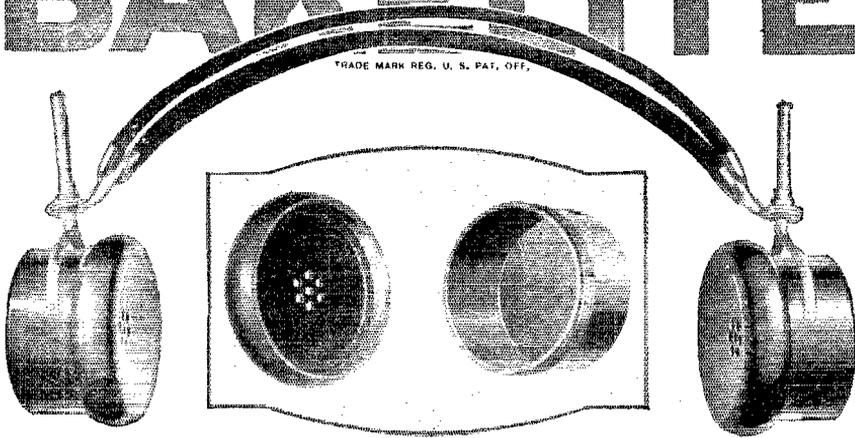
The Heart of a Good Receiver

Marle Engineering Co.

Orange

New Jersey

BAKELITE



Baldwin and Bakelite

The clear tone of this popular headset, made by Nathaniel Baldwin, Inc., of Salt Lake City, has been developed by careful experimentation in every phase of its manufacture, from the selection of raw materials to the final testing of the completed instrument.

Bakelite is used for the receivers because it is strong, and light in weight. After years of service

under varying atmospheric conditions, Bakelite shows no signs of deterioration. Its color does not fade and its fine finish is impervious to oils, acids and moisture.

"The Material of a Thousand Uses" possesses many valuable properties which make it peculiarly suitable for use in radio equipment.

Send for a copy of Booklet C.



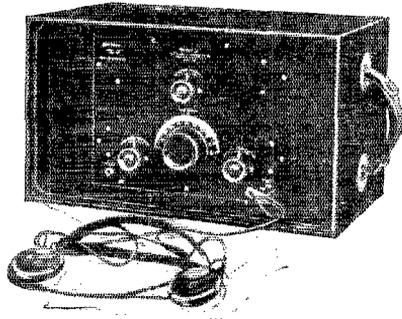
Send for our Radio Map

The Bakelite Radio Map lists the call letters, wave length and location of every broadcasting station in the world. Enclose 10 cents to cover the cost and we will send you this map. Address Map Department.

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22d Street

THE MATERIAL OF A THOUSAND USES



Federal No. 102 Special Set is " CONVERTIBLE "

"Convertible" is the only word that even nearly describes the Federal No. 102 Special Receiver. It is a complete "portable" set, with dry batteries, head phones, etc., ready for immediate camp or road use.—PLUS the capacity for quick and easy changing to wet battery for city or country "home" use. True to Federal standards, the No. 102 Special incorporates exceptional tone beauty, selectivity and distance range. Federal flexibility pervades throughout,—the No. 102 Special will operate perfectly on any tube interchangeably.

Ask any Federal Dealer for a demonstration of the Federal #102 Special Set.
FEDERAL TELEPHONE AND TELEGRAPH CO.
Buffalo, N. Y.



Federal

Standard RADIO Products

Boston, New York, Philadelphia, Chicago, Pittsburgh,
San Francisco, Bridgeburg, Canada, London, England

Look for this sign



NOW IS THE TIME, AMATEURS !

To Do Your Experimental Work on Your Receivers in anticipation of
Better "DX" This Winter

Parts of every description and at prices that are right to rebuild or add to your present equipment.

You Will Work EUROPE THIS WINTER
With A Good Set—

Look over a few of the items worth while.

Variometers
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Condensers
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Formica Panels
Jacks
Plugs

ROSE RADIO and ELECTRICAL SUPPLIES

129 CAMP STREET,

Pioneers in the Radio Field.

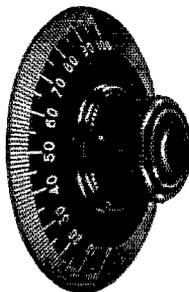
NEW ORLEANS, LA.

NA-AID

When phonographs were first made they were square boxes without ornamentation. Likewise the first dials, turned out in a laboratory,—had hard straight lines for shape. Beauty is a later development. Na-aid dials have soft, graceful lines which makes them very pleasing to the eye. They lead in both beauty and quality. They have the right grip for delicate, exact tuning.

ALDEN MANUFACTURING CO.

Largest makers of Radio
Sockets and Dials in the world
Springfield, Mass.
Dept. M 52 Willow St.



3 inch
No. 3003—4
35c, 3 for \$1.00



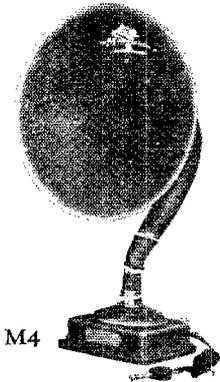
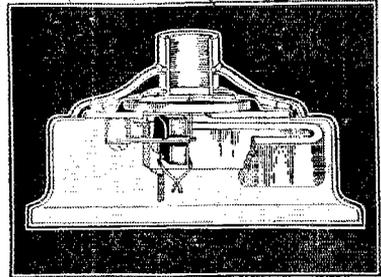
Use HOMMEL
SERVICE
to build your radio
business

By aligning yourself with the Hommel Organization you have access to ample stocks of the leading lines of radio equipment at all times, and can serve your customers promptly without the necessity of tying up your own working capital.

Write for
Hommel's illustrated Encyclopedia #246T.
LUDWIG HOMMEL & CO.
Wholesale Jobbers Exclusively
929 Penn Avenue, Pittsburgh, Penna.



THE mechanical principles of Magnavox Reproducers are as marvelous as the vocal chords of a great singer.



M4

The latest Magnavox Reproducer; beautifully finished. Requires no battery.

\$25.00

The Reproducer Supreme with a Human Throat

The semi-dynamic mechanism of the new Magnavox M4 Reproducer, shown above, insures utmost clearness of tone—a remarkable advance over the ordinary instrument requiring no battery. There is a Magnavox for every type of receiving set.

Magnavox Reproducers—R3 and R2 electro-dynamic with Volume Control; M4 and M1 semi-dynamic, requiring no battery \$25.00 to \$50.00

Magnavox Combination Sets—the only instruments combining electro-dynamic Reproducer and Power Amplifier in one unit \$59.00, \$85.00

Magnavox Power Amplifiers—the most efficient audio-frequency Amplifiers; one, two and three stage \$27.50 to \$60.00

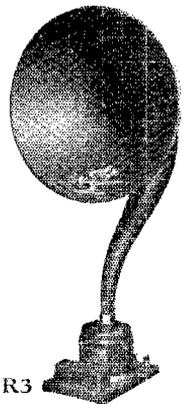
To obtain the fullest usefulness and enjoyment from your receiving set, equip it with Magnavox—for sale at good dealers everywhere.

THE MAGNAVOX CO., OAKLAND, CALIF.

New York Office: 350 West 31st Street

Canadian Distributors:

Perkins Electric Limited, Toronto, Montreal, Winnipeg

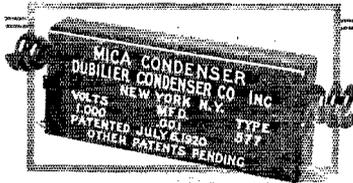


R3

New Model with Volume Control

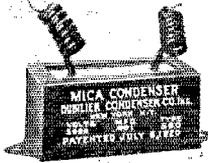
The famous electro-dynamic Reproducer; operates soft, medium or loud as desired.

\$35.00



Type 580 is designed for low-power continuous-wave telephone and telegraph transmission. It is used also as a tuning or coupling condenser, as a series or tuning condenser in the antenna circuit, or as a grid condenser.

Type 577 designed for use in radio and audio frequency circuits; for receiving equipment (especially super-heterodyne); self-rectifying circuits; d.e. and other tube transmitters up to 100 watts. An excellent grid, plate by-pass and antenna series condenser.



Dubilier Condensers

for efficient Amateur
Transmission

Dubilier Condensers Types 577 and 580 are preferred where low losses and accurate capacity condensers are required.

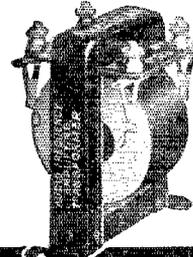
The Dubilier patented method of manufacture embodied in these condensers assures permanent capacity under all service conditions. They are suitable for use as laboratory standards in precision circuits and for low power C.W. transmitters.

Type 577		Type 580	
Capacity in mfd.	Voltage	Capacity in mfd.	Voltage
.00025	1000	.001	5000
.0005	1000	.002	5000
.001	1000	.005	2500
.002	1000	.01	2500
.005	1000	.02	2500
.0075	1000	.0003	} These 3 capacities combined in one condenser { 5000
.01	1000	.0004	
		.0005	

Other transmitting condensers are made to your specifications for broadcasting purposes.

Complete information will be supplied on request.

Dubilier Condenser & Radio Corp.
42-50 West Fourth Street, New York



Improve your
set with an
AmerTran
and enjoy radio
this summer as
never before.

AMERTRAN

TRADE MARK REG. U.S. PAT. OFF.

TYPE AF-7 is now offered as a companion transformer to AF-6 (Turn ratio 5), for second or third stage amplification. In this use AF-7 decreases the tendency to overload the last amplifying tube on loud signals.

Henceforth, then, it is possible to obtain a low ratio AmerTran which insures perfect tone quality and full amplification of low notes when used with AmerTran AF-6 in the first stage.

Price, either type, \$7., at your Dealer's

American Transformer Co.

Designers and builders of radio transformers for over 23 years.

176 Emmet Street, Newark, N. J.



Use a Celoron panel
The high dielectric strength of a Celoron Panel helps you get the best results from your instruments.

Celoron, a bakelite material is approved by the U.S. Navy and Signal Corps. Leading radio manufacturers mount their parts on Celoron bases.

Ask your dealer for a Celoron panel. These panels come in nine standard sizes, in black, mahogany or oak. Other sizes cut to order.

DIAMOND STATE FIBRE COMPANY

Bridgeport, Pennsylvania

Branches in Principal Cities

Toronto, Canada

London, England

The HAM

—vs.—

The B.C.L.

RADIO BROADCAST
DOUBLEDAY, PAGE & CO.
GARDEN CITY, NEW YORK



Dear O.M.:

There's no "versus" about it—though a lot of misguided chaps with chips on their shoulders would have us believe so. Too many amateurs are making their livings supplying the wants of the BCL, running his stns, editing his papers, making, selling and improving his apparatus. Neither can do without the other and we both know it!

You may picture us down here at **Radio Broadcast** as old fogies who think that 73 is a patent medicine. You'd change your mind if you could hear us dah-dit-dahing over the telephone when our private lines brass on voice! Arthur Lynch, our editor, pounded brass long before stns sined off in a Boston accent. Willis Wing, associate, is pre-war 8UF. Our laboratory editor, Zeh Bouck, can still work **morse** and does so occasionally from his stn, 2PI. You can generally find his corn-cob pipe in our lab photos. **And you bet we all read QST!**

And now the BCL has turned the trick, and has done something for the amateur, paying him back in his own cash. The BCL has been instrumental in developing a wonderfully efficient receiver for our own waves, from 95 to 230 meters. It is an adaptation of the new famous Roberts circuit worked out for amateur purposes in the R. B. Lab. It combines and re-flexed audio. Two tubes! **and what is most important on the very high frequencies,** there is no radiation, when the detector is oscillating. Really, O.M., this all about it in our August number. We are telling you something you can't afford to miss.

Perhaps you've already passed over something of vital interest to you! With genuine amateurs at the helm, it is inevitable that no issue of R. B. runs through the press without containing something that the ham should read! Look over the attached coupon. Pse check it O. M., and get acquainted.

73

THE STAFF

GET RID OF THAT SQUEAL ON 3000 KILO-CYCLES!



COUPON

Radio Broadcast
Garden City, N. Y.

O.M.: I enclose fifty cents.

Please send me the copy of R.B. containing the item which I have checked and in which I am especially interested. Also, reserve me the August number containing the dope on the Roberts set worked out for short waves by 2PI.

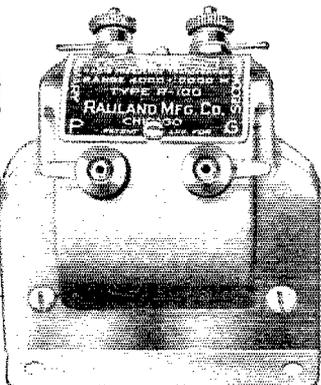
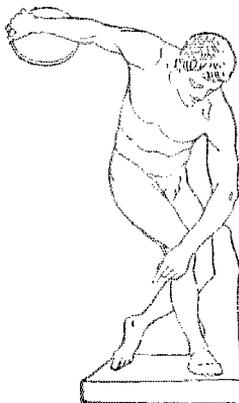
- IS THE AMATEUR AT FAULT?
- THE 2nd HARMONIC SUPER (by Armstrong)
- A BEGINNER'S C.W. TRANSMITTER
- A RECORD MAKING 20 WATT TRANSMITTER
- GENERAL SQUIER'S NEW CODE

Signed:

Name

Address

The MASTERPIECE OF AMPLIFICATION



Especially vital to success in Super Heterodyne, Ultradyne and all straight radio frequency and reflex circuits is distortionless and yet powerful amplification of weak signals. This problem has been incomparably mastered in All-American Long Wave Radio Frequency Transformers, as the most exhaustive and all-inclusive tests have shown. Not only are these latest All-Americans supreme value at six dollars. They are the best long wave transformers that can be purchased at any price!

Watch for the new All-American Low Wave Radio Frequency Transformers.



ALL-AMERICAN

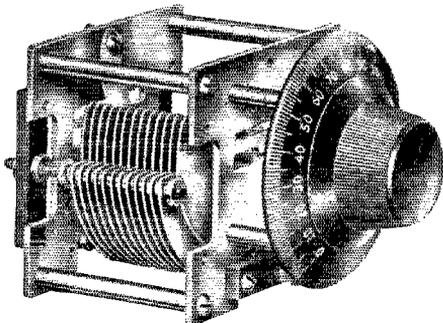
AMPLIFYING TRANSFORMERS

Largest Selling Transformers in the World

RAULAND MFG. CO., 2642 Coyne Street, Chicago

SPECIAL OFFER
Just out! New All-American booklet, "Hook-Ups and Hints"-32 pages of up-to-the-minute radio information. Tells you how to hear farther and better. Send 10c. coin or stamps. Worth a dollar.

The NATIONAL Perfect Vernier Condenser TYPE DX



A Vernier Condenser, that operates with no back lash and with a touch of "velvet smoothness".

Its mechanical and electrical characteristics have justified its commendation by a number of the country's prominent radio engineers.

Excellent results have been obtained when used in combination with Reflex, RADIO FREQUENCY, NEUTRODYNE and SUPER-HETRODYNE circuits.

Sizes:	.001	.0005	.00035	.00025
Prices	7.00	6.00	5.75	5.50

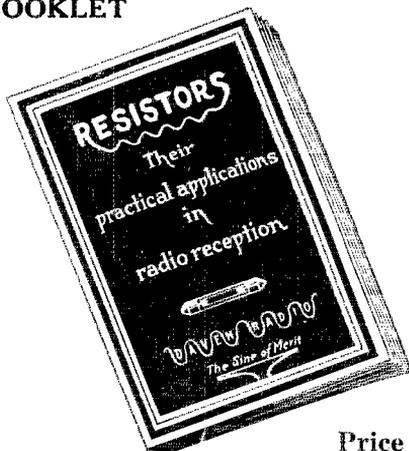
Write for Bulletin #104 A

Made by NATIONAL COMPANY, Inc.

Estab. 1914

Engineers & Manufacturers Cambridge 39, Mass.

EVERY RADIO
FAN SHOULD
HAVE THIS
BOOKLET



Price 15c

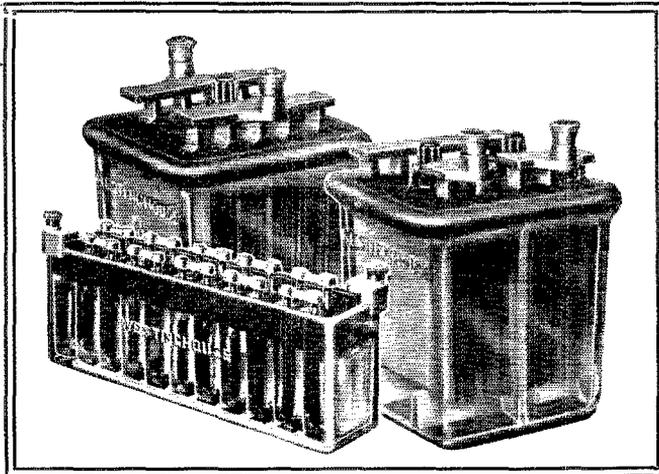
When buying "Grid Leaks" do not say "Give me a Grid Leak" but rather specify DAVEN RESISTORS. DAVEN RESISTORS are individually calibrated and guaranteed. They are accurate, noiseless and always superior in quality.

DAVEN RADIO CORP.

Resistor Specialists

11-13 Campbell St.,

Newark, N. J.



MAIL COUPON
for interesting facts
about batteries

WHEN Westinghouse places an article on the market you can depend on it for highest efficiency. Westinghouse Radio Batteries are made with the most careful consideration of every factor that enters radio broadcast transmission and reception. Built for full-powered and even-powered current delivery; for long sustained voltage; for ample capacity; for utmost quiet; for long life; for economy. Nothing but the very best is good enough in the construction or equipment of an instrument so sensitive as a radio set. Don't be satisfied with anything less than Westinghouse Radio Batteries.

Westinghouse **CRYSTAL CASE** Radio Batteries have one-piece clear glass cases. Solid glass cell partitions and high glass plate rests. Thoroughly insulated against current leakage. They hold their charge long. Last indefinitely and can be easily recharged innumerable times. "A" Batteries in 2, 4 and 6 volt sizes. "B" Batteries in 22-volt units. Regular type 22-MG-2; quadruple capacity 22-LG-2. "C" Batteries in 6-volt units.

WESTINGHOUSE UNION BATTERY CO.
Swissvale, Pa.

WESTINGHOUSE

RADIO "A," "B" and "C" BATTERIES

Westinghouse Union Battery Co.
Swissvale, Pa.

Send me Westinghouse Radio Battery
Folder A-3-D.

.....
.....
.....

A Boon to D-X Fans!



TRADE

MARK

RADIO PANELS

can be bought at any good
Radio Dealer's Store

At 25 to 50% Less
than any other standard panel

With these panels the surface-leakage and power-loss is reduced to the minimum—hence the *volume* of your set will be *that much greater*.

A good panel deserves proper handling—therefore, to get the best results, use a *sharp* drill with *slight* pressure.

ELECTRASOTE is one of the "Sote" products of world-wide fame introduced by THE PANTASOTE Co., INC.

All Standard Sizes

JOBBERS AND DEALERS:

Write for our interesting proposition.

M. M. FLERON & SON, INC.

Exclusive Sales Agents for Electrasote Radio Panels

Trenton, New Jersey

A Buffalo Radio Fan

Gets London with the

help of a **KIC-O**

Mr. E. C. Lewis on March 18th heard Mr. Marconi's voice on a Model 10 Atwater Kent Set. He said it would have been impossible without a KIC-O Battery. Improve your set with a KIC-O. Our guarantee protects you.

GUARANTEE

Your money back on any KIC-O Battery if not satisfied within 30 days' trial.

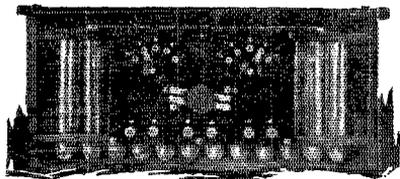
Write for full information on "A" and "B" Batteries.

Volts	Price Plain	With Panels
22	\$5.50	\$
32	7.25	11.75
48	9.50	14.00
68	12.50	17.00
100	17.50	22.50
145	23.50	28.50

KIMLEY ELECTRIC CO., Inc.

2666 Main St.,

Buffalo, N. Y.



100 Volt Type

BRISTOL

TRADE MARK

AUDIOPHONE

REG. U. S. PAT. OFFICE

LOUD SPEAKER

This is known everywhere as the Loud Speaker with the quality tone. Not only is the tone natural and without mechanical distortion, but is sufficiently big in volume to be easily heard in a large room or all through the house. Comes to you ready to use—no auxiliary batteries are required.

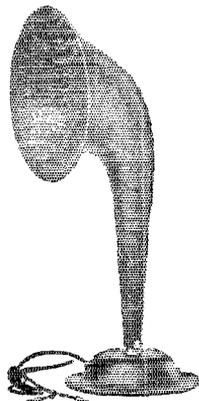
Made in three models:

Audiophone Senior
Price \$30.00

Audiophone Junior
Price 22.50

Baby Audiophone
Price 12.50

Bulletin AX-3014 describes these Loud Speakers.



This is the Baby Audiophone equipped with the Fiber Horn which is now standard and supersedes the metal flare previously used. Price \$12.50

THE BRISTOL COMPANY
WATERBURY, CONN.

WM. JUSTICE LEE
JACKSONVILLE, FLORIDA
P. O. BOX 378

March 7th, 1924.

The Electric Specialty Co.,
Stamford, Conn.

Gentlemen:

You will be interested to hear of the results obtained from the type 11-A 1000 volt, 300 watt motor generator set purchased from you thru the Chase Co. Jacksonville.

This little generator operating at Radio 4XE, has furnished the plate current for 2-way communication with amateur stations in Canada, Porto Rico, France and Holland. When you consider that such a distance of over 5000 miles can be spanned with a power supply of actually 300 watts, (10% overload) and that this motor generator set does the work in first class manner, it seems quite remarkable.

We believe the Esco generator to be the best and most conservatively rated of any we have used to date.

You may use this letter if you please.

Yours truly,

Cooper and Lee
Owners of Experimental Station 4XE

WJL/MP

By [Signature]

TRADE "ESCO" MARK
Quality always Supreme
ELECTRIC SPECIALTY COMPANY
STAMFORD, CONN., U. S. A.

RADIO TUBE EXCHANGE

We Repair All Standard Makes of Tubes, Including

W.D. 11 or 12
U.V. 199 or C299
U.V. 301A or C301A
C. 11 or 12
D.V. 1 or D.V. 2
U.V. 200 or 201
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\$2.50



All tubes guaranteed to do the work.

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All Mail Orders Given Prompt Attention
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SOLDER LUGS—BUS BARS STAMPINGS

Solder lugs of pure copper, tinned to give better soldering results.

\$2.25 per M., P. P. Prepaid
Discounts to Jobbers and Dealers

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"WARRANTED"

Audio Transformer

MTD. \$2.00, UNMTD. \$1.45

10 Days Money Back Guarantee
Dealers Write

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22 Sturges Ave.
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RED-HEAD PHONES

Used and Praised the World Over

3000 Ohm \$6.50. 2000 Ohm \$5.00.

Complete with Cord and Headband

At your dealer's, or sent direct

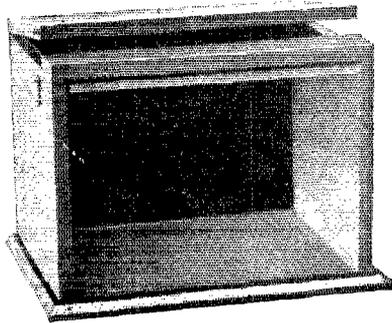
The Newman-Stern Co., Newman-Stern Bldg.,
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SIGNAL RADIO CABINETS

Signal radio cabinets have been purchased by the big majority of set builders. Built by radio engineers, they have all the elements that appeal to the average builder and meet all his requirements.

Ask your dealer.



SIZES AND PRICES Type "B" Cabinet

Height	Width	Depth	Regular List Price
7	10½	7	\$3.39
7	12	7	3.57
7	14	7	3.83
7	18	7	4.33
7	21	7	4.71
7	24	7	5.09
7	28	8	5.56
7	30	8	5.94

SIGNAL Electric Mfg. Co.

Factory and General Offices:
1915 Broadway
Menominee, Mich.

Los Angeles Chicago Minneapolis New York San Francisco Pittsburg St. Louis
Boston Philadelphia Seattle Montreal Toronto Winnipeg Havana, Cuba

You'll find our local address in your Telephone Directory

TWO NEW AND INTERESTING ROLLER-SMITH BULLETINS

Fill in the card at the bottom, tear out this ad and mail it to us. These Bulletins will be sent you promptly.

No. AG-10. 3-½" instruments for all radio receiving and transmitting sets. A new and very useful voltmeter is shown on page 5.

No. AG-40. Radio PV voltmeter. Small, compact, accurate and durable. For testing all A, B and C batteries.

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Offices in principal cities in U.S. and Canada

Roller-Smith Company:
Please send me new Bulletins
AG-10 and AG-40.

Name

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The Tube's The Thing! New Improved



MYERS TUBES

Guarantee Perfect Reception

Hear without noise or tube hiss. Myers Tubes give much greater amplification. They add 50% to the efficiency of your set because they reduce internal interference.

TWO TYPES: Myers Dry Battery Tube 2½ Volts—¼ Ampere. Myers Universal operates on either 3 Dry Cells or storage batteries, \$5.00 each. Ready to mount. No extra equipment needed.

(½ size)

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At your Dealer—otherwise send purchase price and you will be supplied Postpaid.

Sole Manufacturers

F. B. Myers Co. Ltd.

Radio Vacuum Tubes

240 Craig Street, West

MONTREAL,

CANADA

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

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only national amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have the membership edition of *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1924

American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose \$2 in payment for one year's dues. This entitles me to receive *QST* for the same period. Please begin my subscription with the.....issue. Mail my Certificate of Membership and send *QST* to the following name and address.

.....

.....

.....

Station call, if any.....

Grade Operator's license, if any.....

Radio Clubs of which a member.....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write to him about the League?.....

.....Thanks.



The voice from a thousand miles away!

There's an immense field of radio enjoyment in summer, (the best political orators in America are on programs)—but you must have extremely sensitive reception apparatus to get good results.

Stromberg-Carlson

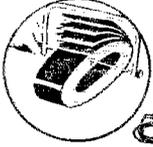
HEAD SETS and LOUD SPEAKERS

have powerful magnets, the sensitivity of which gives them wide range, bringing in the fainter signals with volume and clearness.

They also have layer wound and layer insulated coils—an exclusive Stromberg-Carlson type of construction—which will stand up under the high plate voltages now used.

Ask your dealer
Stromberg-Carlson Telephone Mfg. Co.
Rochester, N. Y.

Powerful Magnets


Layer Wound and Layer Insulated

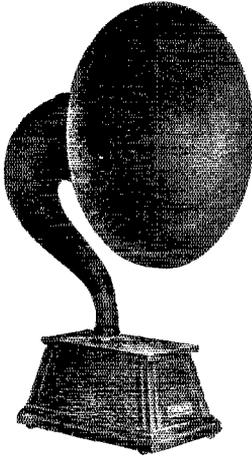
THOROPHONE

TRADE MARK REG. U.S. PAT. OFFICE

Makes distant Stations LOUDER

High
Power
Type

Model
S-5
\$45.00



"The THOROPHONE'S capacity to amplify makes it possible to bring in on the loud speaker distant stations that would otherwise have to be received on the head set," says W. D. Lect, Chicago, Ill.

The THOROPHONE uses a powerful solenoid, whose intense force is added to that of the signals, giving maximum volume of tone.

Second only to the THOROPHONE is the new THOROLA, just introduced to meet the demand for an instrument which does not require a storage battery, but which is built with the same precision as the THOROPHONE. Here you have the same controlled mica diaphragm which gives the finest possible shadings of tone.

Due to the exclusive method of adjustment found only on the THOROLA, together with the Double Push and Pull Principle of amplification, this instrument will reproduce at highest volumes with the same accurate fidelity as at lowest volumes.

THOROLA Three, 12 inch bell horn, \$20.00
THOROLA Four, 14½ inch bell horn, \$25.00

Ask your dealer about THOROPHONE and THOROLA—each the best of its type—or write for booklet

WINKLER-REICHMANN COMPANY
1725 West 74th Street Chicago, Ill.

"Rolls Royce" Radio Tubes



Like their name, significant of quality. Durable and powerful. Bring in distance with a maximum of volume and clearness.
Type 200... 5 volts, 1 Ampere
Detector Tube.
Type 201A... 5 Volts, .25 Ampere
Amplifier and Detector.
Type 199... 3-4 Volts, .06 Ampere
Amplifier and Detector.
Type 199... 3-4 Volts, .06 Ampere
With Standard Base.
Amplifier and Detector.
Type 12... 1½ Volts, .25 Ampere
Platinum Filament.
Amplifier and Detector.
"THE ROLLS ROYCE OF RADIO TUBES"

ALL TYPES **\$2.50**

TYPE 202 (5) WATT TRANSMITTER \$3.00

ALL TUBES GUARANTEED

to work in Radio Frequency. Especially adapted for Neutrodyne, Reflex and Super-Heterodyne Sets

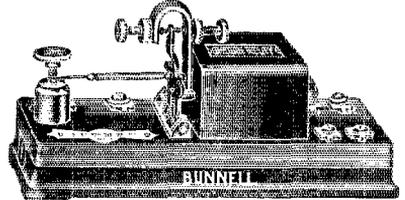
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WHEN ORDERING MENTION TYPE

ROLLS ROYCE TUBE CO.

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GHEGAN RADIO RELAY



Taps permit tubes of various impedance to be used. With Bunnell Register this Relay will copy telegraphic signals at a speed of 60 to 90 words per minute.

With Siphon Recorder speeds up to 200 words per minute have been obtained. Normal operating current is ¼ to 2 Milli-Amperes. Send stamp for catalogue No. 45 Q., Ghegan Radio Relay... \$40.00
Special Price to Dealers.

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No. 140 Best value in a Two-Fone Plug ever offered. Holds four cord tips under set-screw. Used with two pairs head fones or one pair and loud speaker. At your dealer's.
Plug 60c

HERBERT H. FROST, Inc.

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Essential Loud Talking Crystals make dead sets live wires.
See your dealer or us.
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DUPLIX

SERIES "FR"

TRADE MARK
NONE OTHER

Precision Condenser

In this series we have met the demand for a condenser in which the rotor can be grounded. Also for a condenser for very short wave reception both in the super-heterodyne and tuned radio frequency circuits.

A CONDENSER IS NO BETTER THAN ITS BEARINGS.

Herewith are part of the results of tests on production models of Duplex Series "FR" Precision Condensers, made at Yale University.

Frequency (Kilocycles)	429.	600.	1000.
Wave Length (Meters)	700.	500.	300.
Resistance (Ohms)	.07	.045	.02
Phase Difference (Seconds of Arc)	20.	18.	14.

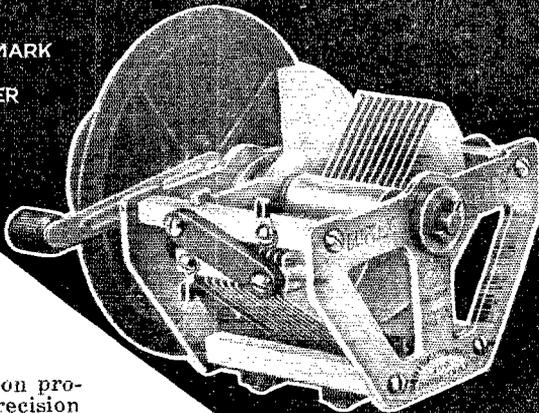
At 1000 cycles—Phase Difference 17 seconds—Resistance 25 ohms.

The real significance of these tests is the fact that over the entire broadcasting range there is no variation of over .05 ohms. This is of extreme importance to the designer and builder of radio receiving sets.

"Facts for Fans" goes into more detail. We will be pleased to mail it to you.

Some Valuable Jobber's Territory Still Open.

THE DUPLIX ENGINE GOVERNOR CO., INC.
32 FLATBUSH AVE. EXTENSION, BROOKLYN, N. Y.



PATS. APPLD FOR

PREMIER

Audio Frequency



\$3.50

one half actual size
TRANSFORMER

A lap ahead of the field

About the size of an English Walnut. Saves space; light weight; mounts anywhere; unsurpassed in performance. Ratios 1 to 3, 1 to 4, 1 to 5, \$3.50. 1 to 10, \$4.50.

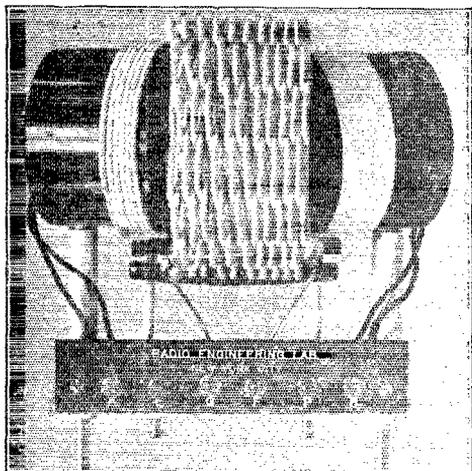
Ask your dealer for this "Little Wonder"

Premier Electric Company

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CHELSEA

QUALITY RADIO EQUIPMENT
CHELSEA RADIO CO., Chelsea, Mass.



LOW LOSS TUNER UNIT

MOST EFFICIENT TUNER AVAILABLE

REAL DX. RECEPTION

EXTREMELY SHARP TUNING

TWO TYPES

AMATEUR—90 to 275 METERS

BROADCAST—250 to 550 METERS

Price \$10 each Write for Information

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TOWER'S

TOWER'S Scientific
 WEIGHS ONLY 80Z
 Perfect Tone Mates
\$2.95
 Plus a few cents postage



OUR \$200,000.00 COMPANY STANDS SQUARELY BACK OF EVERY HEADSET

WORLD'S GREATEST HEADSET VALUE

now \$2.95, with Notable Improvements

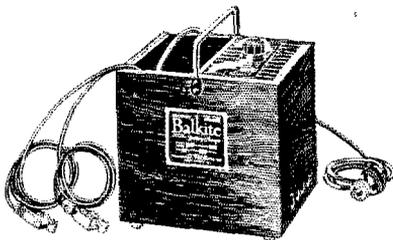
Longer Cord (full 5 feet), Stronger Magnets, Higher Resistance, Increase of Sensitivity, Perfect Tone Mates
 EVERY SET TESTED BY LICENSED RADIO OPERATORS

Send no money - Order on a Post-Card

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Scientific

Tested and Listed as Standard by Underwriter's Laboratories



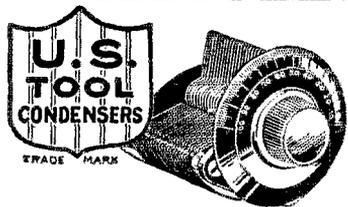
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 PATENTS APPLIED FOR
Battery Charger

NOISELESS and INDESTRUCTIBLE

A new battery charger for Radio "A" (6 volt) batteries. Entirely noiseless. Has no moving parts, requires no attention or adjustment, and cannot get out of order. No bulbs to break. Simple and unfailing in action. Can be used while the radio set is in operation. A positive economical charger for home use. Can also be used to charge "B" and automobile batteries. If your dealer can't supply you, sent direct on receipt of price. Money back guarantee.

Price \$19.50 (\$20 West of Rockies)

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 North Chicago, Illinois



It's Capacity that Counts !

Good condensers are designed according to microfarads, not number of plates alone. U. S. Tool Condensers are designed for correct capacity.

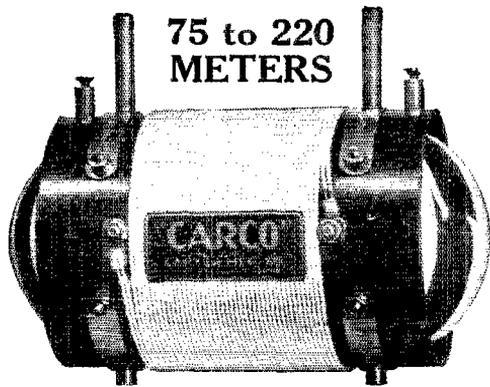
100% GUARANTEED
 End Plates of CELORON

For Superheterodyne, Superdyne, Inverse Duplex and Four Circuit Tuner Circuits

Condensers of recommended capacity for all known circuits are also carried in stock by leading radio retailers.

Write for Booklet

U. S. TOOL CO., Inc.
 112 Mechanic St., Newark, N. J.



75 to 220
METERS

Gentlemen—

I have tried the HAM Special Coupler which you sent me on the tenth, and I find that it is all you say it is and more too. Due to very bad weather conditions and much static I have not been able to do so very much work with it, but the fact that on one evening during a bad power leak I could not get WGY on the high wave, so I tuned them in on the low wave, using the Ham Coupler and they came thru loud and clear. At the same time a violet ray machine in the next room in this house was being used. Strange to say, I could not notice any interference from the violet ray, whereas on any one of my other receivers it is impossible to receive at all when this machine is in operation. With it I can tune way below where KDKA or WGY come in, and can go up to 250 meters. This is just what I wanted and so the set is installed for keeps.

Sincerely yours,

C. HOOVER. 9AMU

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HAM SPECIAL**
**SHORTWAVE-LOW LOSS
COUPLER**

DESIGNED BY A HAM FOR HAMS

A compact unit in a space of only 3"x5½". Antenna Rotor and secondary Stator designed for "Low Loss" and "Low Resistance." Our special single layer, multiple wound inductance does the trick. A "Low Loss" Condenser for secondary is the only addition required for a complete tuning unit. DX work requires a "Low Loss" tuner. Rebuild your set with a "CARCO" Ham Special. An increase in efficiency will result.

PRICE \$8.00 EACH

SPECIAL PRICE TO HAMS ONLY, \$5.00

This Special Price is NET. No Discount to Dealers
Sent C.O.D. A Postal with name, address will bring it.

SET MANUFACTURERS and DEALERS—We specialize on Couplers and inductances. Let us know your needs and we will design the tuner for the desired circuit. Are you interested in a small variometer. (2" by 3") for crystal sets? We have them.

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WE REPAIR
RADIO TUBES

WD-11	\$2.50	DV-2	\$2.50
WD-12	2.50	DV-5A	2.50
UV-200	2.50	UV-199	2.50
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DV-6	2.50	UV-201A	2.50
DV-1	2.50	C-301A	2.50

Mail orders solicited and promptly attended to.

H. & H. RADIO CO.

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Have you tried it?

Chelten Midget Vernier

You've often wished for a closer capacity adjustment of your variable condenser. Here it is—the Chelten Midget Vernier. The 13 tiny plates and air spaces give sharp tuning. Costs but \$1.50.

A Precision Instrument

CHELTEN ELECTRIC CO.

4861 Stenton Avenue

Philadelphia



**For Speed, Convenience
and Prestige—**

use a

Leach Break-In Relay

as described in the June issue of QST, pages 33 and 34.

Mod. 18 Type S1 (6 V. DC, 4 Ohm) \$23

Mod. 18 Type S2 (120 V. DC, 1,000 Ohm) \$25

SILVER KEY CONTACTS

Dia.	Thickness	Lth. of shank	Thread	Per Pair
1/8"	1/16"	1/2"	8-32	\$1.50
1/8"	1/16"	3/4"	10-32	1.75
1/8"	1/16"	1"	10-32	2.00
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We specialize in BREAK-IN RELAYS, STRAIGHT RELAYS, ARC RELAYS and automatic switches.

LEACH RELAY COMPANY

507 Mission Street

San Francisco,

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RECEPTRAD

Supreme
for the
**SUPER-
HETERODYNE**

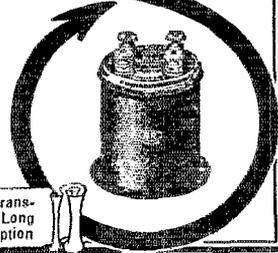


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With RECEPTRAD Replacement Parts, Super-Heterodyne is at its best. The efficiency and perfect construction of RECEPTRAD Parts combine to produce a Super-Heterodyne set that knows no limits in distance, that enables selectivity in the finest degree, that reduces operation to extreme simplicity and that brings in programs from afar in clear undistorted tones.

FREE Super-Heterodyne Blue Print showing complete hook-up of the famous Greiff 8 - Tube Super

RECEPTRAD PARTS
for the Super Heterodyne—a complete package
1 Oscillo-Coupler, Type SW-21
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3 RF-1716 Transformers—Range 5 to 25 M. meters
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Price \$53.50
Greiff Super-Heterodyne Manual—\$1.50
Write for complete literature and prices on individual items



RADIO RECEPTOR CO.

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New York City

R. F. 1716 Trans-
former for all Long
Wave Reception

A WONDERFUL SOLDERING IRON!!

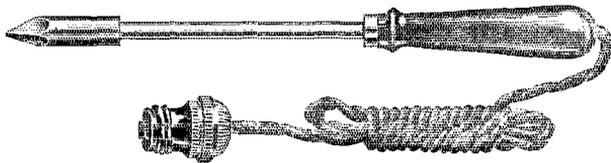
Forged Copper Tip. Heating element practically indestructible. Gives you hot-tip, just what you want. This iron has burned in test continuously for over 700 hours. Will last for years.

Try it.

PRICE \$2.50 At dealers
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The Hartford Inst. Co.

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DOLLAR RADIO SPECIALS

3 Standard Base Bakelite Sockets	\$1.00
6 Porcelain Sockets	1.00
125 Ft. Tinned Copper Wire No. 16	1.00
1 Pr. Rubber Ear Cushions & New Radio Map	1.00
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3 Bakelite Dials—3" or 2 1/4"	1.00
50 Ft. Genuine Copper Ribbon Aerial	1.00
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1 Reinartz Coil, value, \$2.00	1.00
1 Monodyne Set, regular \$10.00	EXTRA
SPECIAL	5.95

Send for large illustrated catalog No. 5Q

WESTERN RADIO CORPORATION
Cedar Rapids, Ia.

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No warping or buckling of plates. Stamped to PERMANENT FLATNESS and tempered to STEEL HARDNESS—reasons enough for a guarantee of lasting accuracy.

MICROMETER GEARED VERNIER

Reducing gear gives hair-line adjustment, so essential in the finely tuned circuits. Separate tension adjustments.

Jobbers and Dealers: Write Immediately for Proposition

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WHERE CAN I GET THAT LOW LOSS TUNER WIRE? SURE THING FROM 8ML CLEVELAND. PURE SOLID COPPER, DOUBLE COTTON COVERED FOR LOW DISTRIBUTED CAPACITY \$1.25 100 FEET PREPAID.

THE FRONT DOOR TO YOUR STATION—YOUR ANTENNA. DOES IT INVITE THE SIGNALS IN? A GLISTENING, BRIGHT ANTENNA, SHIMMERING GOLD IN THE SUN SURE PEPS UP THOSE SIGS BOTH COMING AND GOING. No. 12 SOLID COPPER ENAMELED AERIAL WIRE STAYS NEW. DOESN'T KINK OR WRAP AROUND YOUR NECK. YEP STAYS NEW. 1c A FOOT, POSTAGE ALLOWED TO 3rd ZONE. DON'T LET EM STRAY. GENUINE OHIO BRASS CO. PORCELAIN ANTENNA INSULATORS PUTS THOSE SIGS WHERE YOU WANT EM. THE 5" FOR LOW POWERS AND RECEIVERS, 75c; THE 10" FOR THE HIPOWER FIENDS, \$1.50 (GLAZED ALL OVER). POSTAGE ALLOWED TO THIRD ZONE. STAND 3000 LBS. PULL. FLUX DISTRIBUTING SHIELDS ADDED \$1.00 ACCEPTING A SUBSTITUTE MAKES YOUR STATION A SECOND RATER. YOUR STATION IS JUDGED BY ITS ANTENNA. FIRST TO HAVE EM. ALWAYS HAS EM. RADIO 8ML, CLEVELAND, O. 4837 ROCKWOOD ROAD.

TRADE EVEN—Westinghouse \$85 500 volt mg new and guaranteed. Want Grebe 13 Quick-Watson 5BX.

SELL—Paragon RA-10 \$40.00; 10-R Frequency Unit \$20.00; Home-made detector two step \$15.00, all for \$65.00. 9ARK.

ADVANCE SYNCHRONOUS Rectifier, New \$30. H. Williams, 137 Parkwood, Pasadena, Cal.

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GOOD TRANSFORMERS MEAN GOOD DX—GET YOURSELF AN ACME, THEY ARE BUILT RIGHT. HAVE FOLLOWING IN STOCK, ALL MOUNTED, TWO HUNDRED WATTS, PLATE VOLTAGE FIVE FIFTY AND SEVEN FIFTY, FILAMENT TEN VOLTS. PRICE \$20.00. THREE HUNDRED WATTS, PLATE ELEVEN HUNDRED AND SEVEN FIFTY, FILAMENT TEN VOLTS. PRICE \$25.00. SIX HUNDRED WATTS, PLATE FIFTEEN HUNDRED, AND ONE THOUSAND, FILAMENT TWELVE VOLTS, PRICE \$33.00. REAL FILTER CONDENSERS, UC 490 STANDS 1750 VOLTS DC AND SELLS FOR \$2.50. HEAVY DUTY HAND KEY, 1/4 INCH SILVER CONTACTS NAVY TYPE KNOB, PRICE \$4.00. CHEMICALLY PURE SHEET ALUMINUM. YOU CANNOT BUY ANY BETTER, 90c PER SQUARE FOOT. SHEET LEAD, 30c PER LB. 75c PER SQUARE FOOT. HOW ABOUT SOME REAL ANTENNA WIRE? No. 12 SOLID COPPER ENAMELED IS THE "HOT STUFF" 1c PER FT. OHIO BRASS INSULATORS FIVE INCH 75c TEN INCH \$1.50. NAVY TYPE KNOBS FOR THE OLD KEY, 35c SAVES A BURN IF THE KEY IS HOT. AMRAD S TUBES, \$8.00 EACH, YOU WILL USE THEM EVENTUALLY? WHY NOT NOW? WHATS UR QRA? WE WANT IT FOR OUR MAILING LIST. DROP A CARD TO THE ONLY HAM STORE IN THE FIFTH DISTRICT. FT. WORTH RADIO SUPPLY CO., 104 EAST TENTH ST., FT. WORTH, TEXAS.

FOR SALE—1-1000 volt 300 watt 60 cycle 110 volt Esco motor generator used less than 30 days. Regular Price \$132, will sell for \$100. \$25 cash with order, balance collect. I have joined the U. S. Navy to further my radio work. G. H. Libbing, 205 East Main St. Fort Wayne, Ind.

CASH SALE—500 volt, 200 watt Robbins and Myers motor generator for 110 volts, 60 cycles, \$50.00, with field rheostat, \$58.00; four UP1719 grid leaks @ 50c, three PR535 rheostats @ \$1.50, two UV202 @ \$4.00, one UC1819 condenser \$3.00. Everything guaranteed good as new. Money orders only. 8SK.

NEW FRESH Genuine Cunningham, 5-Watt, Tubes, \$5.10, Net. Send cash or M. O. Henry Paulson & Co., 37 S. Wabash Ave., Chicago, Illinois.

WANTED—Transmitting condenser for spark set 1KW. 97 Springfield Avenue, Newark, N. J.

FOR SALE CHEAP—I kw spark transmitter. Will sell parts separately. Harold Sullivan, Macomb, Illinois.

NEW AND USED equipment for sale all good no junk RCA 1638 transformer \$12.50; Amrad ME condenser \$3.00; magnetic modulator 3 1/4 amp \$7.00; Rheostat PT 537 \$6.00; UC1014 condenser new style \$1.50 old style 2 for \$1.00; Grid coil 70 turns 22 with 6 taps 4 inch \$2.00; 5 plate "WAVE" condenser with dial \$1.50; 300 turn HC coil with mountings \$1.50; Grid leaks 1719 50c; 1718 \$1.50; UC 1015 condenser \$2.50; 3 1/2 inch wooden rotor with 48 turns 24 with shaft 50c. Surplus experimental equipment. Lot \$35.00. 9DMB Grayville, Illinois.

RADIO SET BARGAINS—Model V Kennedy Receiver with phones and plug (New) \$60.00. Kennedy Type 311-522 Portable Receiver complete with tubes, batteries and phones, (Shelfworn) \$75.00. Kennedy Type 231 Receiver and \$21 Two-stage Amplifier, a three circuit set (New) \$60.00. Write for pamphlet and information. Fargo Plumbing & Heating Co., Fargo, N. Dak.

FOR SALE—8CDZ's entire transmitting and receiving equipment. CR-13 with Ace two step, 4 new 201-A's and Westinghouse B. Bats. \$115.00; 20 watt transmitter with generator and 900 cycle alternator 3 meters six good 5-watters, Acme chokes, inductance and fil. transformer and other extras \$145.00. J. Evans, Washington Court House, Ohio.

SELL—CHEAP—two three-coil honeycomb regenerative receivers, each complete with tube and phones. Also .22 caliber Savage Sporter rifle, and new two-spring Victrola motor. Write for description and prices. L. V. Mincemoyer, 121 West Lincoln Ave., South Williamsport, Pa.

WESTERN ELECTRIC AVIATION type microphones with breast-plate, shoulder straps, 6 ft. cord and plug, \$1.00 each. 3MK 1528 Moran Ave., Norfolk, Virginia.

OMNIGRAPH WANTED—Arthur Munz, 162 Seventh Ave., Roselle, N. J.

WHO PRINTS YOUR QSL CARDS? 500 TWO COLOR CARDS \$4.00. SAMPLES ALL DISTRICTS 10 CENTS. CURTIS, 5AQC, 1109 EIGHTH AVENUE, FORT WORTH, TEXAS.

FOR SALE—Ultradyné Parts, 4 Ultraformers, tuning coil, oscillator coil instructions and blue prints. Complete \$20.00. Robt. Gephart, Edinburg, Indiana.

WANTED—Omnigraph Buzzer and Key. Ryan Shoe Co., Hannibal, Mo.

WANTED—500 cycle 1 to 1½ kw. spark set complete, or 500-900 cycle 1½ kw. two bearing motor-generator for use on 110 volts D.C. with starter and 500 cycle transformer. Walt Hemrich, Kukak Bay, Alaska.

158 GENUINE Foreign Stamps. Mexico War Issues. Venezuela, Salvador and India Service Guatemala, China, etc., only 5c. Finest approval sheets 50 to 80%. Agents Wanted. Big 72-p. Lists Free. We Buy Stamps. Established 20 years. Hussman Stamp Co., Dept. 151, St. Louis, Mo.

ATTENTION HAMS—Have you spent hours trying to cut peep and meter holes in panel? I have a tool that drills them one to five inches in diameter as easily as quarter inch one. Only \$2.50 postpaid. Homer Malcomb, Whitewater, Wisc. 9EKH.

9BA1's TRANSMITTER, Seventy Dollars. Self-rectifying circuit, two amps radiation. Meters, rheostats, inductance, switches, four sockets, condenser, chokes, mounted on panel. Acme 200 watt transformer, mounted. Changeover switch, two five watters. Photo and description for card. Geo. F. Martin, 1103 S. Third St., Evansville Ind.

LARGE SIZE Edison elements 5½c pair post paid. 36 pair makes an ideal 48 volt "B" battery. A—6 Edison cells 225 ampere hour \$7.50. A—8 cells 300 ampere hour \$9.50. Arthur Chapelle, 7NX, Woodburn, Oregon.

WESTINGHOUSE Dynamotor \$11.00. 30 V-350 V. normal. Will run off 110 D.C. with resistance 2AGT, 115 Wadsworth Ave., New York City.

BRAND NEW 3 tube Radiola R.C. with 5 Guaranteed New W. D. 12 tubes \$48.00. Hurry for this. Set fully guaranteed. Milton Shutter, 8696 Dumjarton Road, Apt. 406, Detroit, Mich.

TRADE OR SELL CHEAP—two victrolas, National Cash Register, Motorgenerator, 600 volt dynamotors; 75 watt transformers, two 30 henry chokes—want supplies for 100 watt set. 9DY, Brillion, Wisc.

CALLS HEARD POSTAL CARDS—(for DX reports). Send \$1.00 with your name, address and call letters for 100 (\$1.75 for 250) DX report postal cards printed in two colors. Call letters red, green, yellow or blue. Complete form for description of your station, etc. State if member of A.R.R.L. Cards also printed to order; prices upon application. Twenty-four hour service. Samples on request. Printed by 9AVO—member A.R.R.L. Radio Print Shop, Box 582, Kokomo, Ind.

FOR SALE OR TRADE—need hundred watt transmitting parts, write for prices. 1 Radiola V; 1 Radiola Sr. complete; 1 Radiola Jr. amplifier complete; 1 Grebe RCRN; 1 MI Magnavox, Myers tubes, RF and AF chokes; 1 Grebe CR9; 1 Reinartz det. and two step; Ohio brass insulators 5"—75c; 10" \$1.50 prepaid. Tate Radio Co., Harrisburg, Ill.

TYPE A Edison elements, drilled, separators included 5c pair. Monroe Martin, Annnville, Pa.

WHILE THEY LAST—A few power tubes, ALL SIZES. 500 cycle Ball bearing Generators and transformers, all sizes. General Electric 1500 Volt 500 Watt self-excited Generators with shaft extending \$45. Parts for Broadcasting Stations, etc. J. K. Hewitt & Co., 252 Neptune Ave., Brooklyn, N. Y., Radio 2RK—2FP.

WAVEMETERS Calibrated Two bits per point, 90 to 600 meters. C. S. Van Wert, 4 Fruit St., Worcester, Mass.

WANTED—Ten watt CW transmitter. Must be cheap for cash. Also Omnigraph, W. K. Davis, P. O. Box 158, Gainsville, Ga.

SELL—500 V—100 W Emerson Motor Generator. Guaranteed. First Bank Draft for \$40.00 takes it. 9AJM Chas. F. Enz, Lockport, Ill.

FOR SALE—Combination transmitter-receiver. 10-watts fone or telegraph. Detector and two stage audio receiver. All in one cabinet. A reliable, sure-fire Western Electric airplane set. Just right for Summer and Fall work. Complete with 350 volt dynamotor but without batteries, tubes, etc. Very fine condition. Worth over \$200. First check for \$120 gets it express prepaid. Who will be first to grab this bargain? J. F. Davidson, 6CEK, Box 216, Kingman, Arizona.

TRADE THORDARSON Push-Pull Transformers, Acme R-2, Fada Coupler (with switches) for 5 amp. Tungar or Omnigraph. Wheeler Watkins, 17 Faxon St., Utica, N. Y.

RENT ME YOUR OMNIGRAPH—Send Terms to A. H. Glines, Weymouth, Mass.

SELLING OUT—Parts for 100 watt panel set cheap. Baldwin fones \$7.50. Receiver with one-step \$17 complete. 5 watt cw and fone \$15 complete. Also RC parts. 9CTB. 303 Martin, Muncie, Ind.

RADIO PRINTING BUSINESS—Well established and making good profit. Owner going to college and will sell at bargain. Address Box R, care QST.

MOTOR-GENERATORS, For Sale. 200 Watts 1000 V. with 110 V. D.C. motor \$80.00. Motors and Generators repaired and rewound all work guaranteed 1 year. Morton Electric Co., 4832 Rice St. Chicago, Ill.

FIRST M.O. for \$75.00 takes Grebe "13". Hardly used. Need money. 9ARK.

30 HENRY CHOKES, Current Rating 750 milli-ampers, \$10; Wavemeter, Range 40 to 120 meters, \$18; New Jewell 15 V.A.C., \$6.50; New Jewell T.C. 10 ampere-meter, \$10; Thordarson 100 watt mounted plate transformer, \$11; UV200, \$2.50; UV202, \$3; Two Variometers and Variable Condenser, all \$4; large 7" Transmitting Inductance, \$5. 3PZ-3XO.

BARGAINS—TRANSMITTING—Weston 0-5 Thermo Ammeter \$12.00; Weston 0-200 Milliampere \$7.00; General Radio 0-2.5 Radiation Ammeter \$2.50; 2-New Type Amrad "s" Tubes each \$7.50; 2-Five Watters each \$3.00; Fifty Watt Socket \$1.50; Federal Hand Microphone \$4.00; 200 Watt Acme Power Transformer \$12.00; Radio Corp. Modulation Transformer \$5.00; 2-UC1015 Series Condensers each \$4.00. Receiving—Grebe CR8 and Rork \$78.00; Grebe CR3 and Rork \$78.00; 2-UV201-A's each \$3.00; 2-UV199's each \$3.00; UV201 \$2.50. 3BJ, James Marx, 932 North Fifth St., Reading, Pa.

GREBE CR 2 for 25 berries. 8EU.

FOR SALE—Western Electric power amplifier with three 216A bulbs and horn \$75.00. Grebe 13 short wave receiver 80 to 300 meters \$50. R.C.A. 1016 power transformer 1500 to 3000V \$25.00; 375 V 75 Watt transformer with fl. windings for 2-4-6-8-10 volts mounted \$8.00. Homcharger \$5.00; magnetic modulator 1367—\$10.00; Grid chopper P.X. 1638 \$5. U.C. 1803 Faradon Condenser \$2.50; 0005 Hartman condenser \$3.00; .001 condenser \$2.00; three U.C. 490 condensers at \$1.50 each; two U.C. 1866 condensers at \$1.00 each; one Atwater Kent variocoupler at \$5.00; 2-300 turn honeycomb coils \$1.00; Thordarson audio transformer at \$2.50; terms are cash with order or C.O.D. No trades considered; must have cash. Radio 8BCA, Galion O.

FOR SALE—two Grebe CR3's, \$40. each. Perfect condition. Guaranteed. Harris, 1317 S. 7th. St., Waco, Texas.

WANTED—Vibroplex in good condition. State price. Exner, 668 Riverside, New York.

FOR SALE—750 V 100 W. Esco motor generator \$85.00; UT 1357 Magnetic modulator, \$7.50; 75 watt Acme Filament transformer \$8.00; type 5½ scale 0-300 Jewell milliammeter \$6.00; type 33 scale 0-15 Jewell DC voltmeter \$5.00; everything good as new. All guaranteed. Rex Clingenpeel, Hartford City, Ind.

FOR SALE—Esco 1500 watt 2000 volt MG Unit 3 HP AC 110-220 volt motor \$325; Esco 100 watt 500

volt MG unit AC motor \$50. Flush Type 301 Weston meters, 0-10TC 0-3000 volts with reactors 0-100, 0-500, 0-1000 DC milliamperes, 0-2 DC amperes, 3-204, 1-203, 2-202 used about 200 hours never above rated voltage or load 30 heavy 600 milliampere acme choke 2 UC 1831 Variables, 3 sets 204 tube ends 1 RCA chopper mounted on AC motor, Special copper 16 studs mounted on 1/2 H.P. sink motor, United wireless coffin 1UP 1016 750 watt transformer, above apparatus hardly used, am moving and must sell, make offer, C. R. Runyon, Jr., North B'way, Yonkers, N. Y. Radio 2AG.

SELL—Reinartz and two step, \$30. 9CIU.

FOR SALE—Paragon ten watt transmitter, less tubes, etc. Twenty-five dollars, Holtzer-Cabot dynamotor, five hundred volts for twelve volts, Twenty dollars. H. Zirschky, Burbank, Okla.

WAVEMETERS made to order, or you furnish condensers. 50 meters up \$3.50 up. Motor generator 1500 volt 150 watt \$80. A. Wade, 465 N. Lake St., Los Angeles, Calif.

SELL—20 watt set, double shelf and panel mounted. Includes 2 meters, separate transformers, filter, tuning condenser, 4 five watters and other apparatus. Radio Corporation, Jewell and Thordanson parts; a real ham set; \$90 complete. Also—wound good spark set. 5AMK.

LOW LOSS—Schnell Coils, \$3.00; New Reinartz, \$2.50 Spiderweb and others. General Radio Company apparatus. .00025 low loss condensers, plain, \$3.90; geared, \$4.25; Sockets, 90c; Jewell Meters, \$6.75; UV-201A-s, \$4.50; complete parts for LOW LOSS SETS, panels and rods. Any type low loss coil built. UV-202, \$7.25. Frossell Radio Laboratory, South Williamsport, Penna.

GENERAL ELECTRIC Transmitting Sets for fone, cw, low Complete with dynamotor, tubes spares \$75. Portable. Operates from 12 volts. Cost \$350. Pure DC for the plates. General Electric 350 volt .143 ampere dynamotors for 12 volt supply. Filter attached \$18. 1500 volt .233 ampere for 25 volts Double commutator 12,000 breaks per second! Unused \$45. Holtzer-Cabot 500 volt .07 ampere for 12 volts \$22 Any of above adapted for belt drive \$3. additional. When driven with AC motor will also generate current for filaments etc. New 1/2 KW 500 cycle self excited generators \$22.50 Crocker Wheeler 1/2 KW motor generators. Navy Flame Proof Keys with "Blinker Light" \$1.50 Tubes WE 50, RC 250, 1000 watts etc. Henry Kienzle, 501 East 84th Street, New York.

QSL CARDS printed to order. Send us ur design and we "fix em up rite." 2 color work—200 for \$2.75 and \$1.00 for each additional 100. 3BJT, 701 Walnut Ave., Scottsdale, Pa.

FOR SALE—Brand new R-3 Magnavox in original carton, twenty-five dollars. J. P. Hyde, Bristow, Va.

SUMMER SPECIALS IN EDISON ELEMENT STORAGE "B" BATTERIES THAT WILL LAST A LIFETIME. FREE WITH EVERY BATTERY A GOOD CHEMICAL RECTIFIER WITH CHEMICALLY PURE ALUMINUM PLATE 1/2" THICK. 48 VOLT 2 AMPERE EDISON ELEMENT STORAGE "B" COMPLETE, \$9.00. (INCLUDES STOPPERS) KNOCKED DOWN, \$7.75. 100 VOLT 2 AMPERE UNIT COMPLETE, \$17.00. KNOCKED DOWN, \$14.00. SAMPLE CELL 20c EXTRA. KNOCKED DOWN 100 VOLT 1/2 AMPERE STORAGE "B", \$11.75. INCLUDES WIRED TYPE "A" ELEMENTS, STOPPERS, SEPARATORS, PURE NICKEL WIRE, RUBBER TUBING, RACK, PANEL, CONTAINERS, POTASH AND RECTIFIER. SAMPLE CELL 15c. SPECIAL PRICES ON TRANSMITTING BATTERIES AND ELEMENTS. RUBBER STOPPERS WILL KEEP DUST AND DIRT OUT OF YOUR EDISON ELEMENT STORAGE "B" BATTERY. WILL ALSO RETARD EVAPORATION. 35c PER DOZEN PREPAID. SAMPLE 3c STAMPS. EVERYTHING FOR THAT STORAGE "B" BATTERY. J. ZIED, 530 CALLOWHILL ST., PHILADELPHIA, PA.

FOR SALE—Bug key, first class condition. Eight dollars. John McNay, Butler, Missouri.

BARGAIN—Slightly used Z-nith regenerator, \$35; Homer Grimm, Clear Lake, Iowa.

MAGNAVOX M4—Latest battery-less reproducers. Magnetically balanced. Improved rubber cushioned diaphragm. High resistance winding. List \$25. In-

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troductory \$21. Radio Central, Dept. Q, Abilene, Kansas.

RAMSEY'S RADIO REVISED. Price \$2.00 postpaid. For review of first edition, see April QST, p. 50. Eighty-four experiments, mimeographed. Note enlarged book brought to date. University Book Store, Bloomington, Indiana.

ANY LICENSED HAM CAN after memorizing Code our way (15 minutes) quickly increase speed. Many long anchored at about 12 jumped few hours to 25 per. Corroborative reports free but please give call. Dodge Radio Shortkut, Dept. SC, Mamaroneck, N. Y.

HOW ARE THESE for prices on new standard goods? Sure great, they say. No. 12 enameled solid copper wire 75c per 100' coil. Ten coils or more, 69c per coil. Why pay third more? 20" glazed porcelain insulators tensile strength 1500 pounds \$1.15. 4 or more \$1.00 each; UP1368 power transformers \$14.50; UP1653 160 mill. filter reactor, fb for 50 watts, \$7.25; UP1627 300 mill. reactor \$10.45; PX1638 choppers \$3.60; Magnetic modulators half price; All RCA meters 40% off and more, UM530 \$3.50, UM533 \$3.65; UC1806 .002 mfd. 6000 volt Condenser \$1.80 (regular price \$7.00—some bargain!); UC1831 variable antenna series condenser \$5.40; UC1015 \$3.00; Rheostats, PR535 only \$1.20, PR539 \$1.25, PT537 \$5.50; Special, UV1714 RF transformer 200-5000 meters \$2.50, fb for Super-Het or Ultra-dyne. Say, y'ain't seen nothin' yet. Send for free bargain list. Better order now to get in on this. Shipments C.O.D. E. F. Johnson, 9ALD, Waseca Minn.

FOR SALE—2000 volt 1000 watt motor generator set. Consists of 110-220 volt AC motor and two generators. Easily filtered. Am moving to Florida and must sell for \$125; cost \$200. In very good condition. All inquiries answered. Wayne Mason, South Brownsville, Pa. SAAP

FOR SALE—Kennedy 110 with 525 Amplifier 26,000 meter perfect condition, Circassian Walnut Cabinet \$200. \$50 cash balance \$15. month to reliable party. Some bargain. One Elgin Super Reinartz new assembled in mahogany cabinet tuner only \$20; Two Vecarola Loud Speakers \$6 each. One 10-D Western Electric Speaker perfect condition \$35. Wanted latest model Super-Heterodyne and Ultra-dyne. Stamp for particulars. V. D. Liggett, Tyler, Texas.

TUBES UV-202's \$6.50; 216-A's \$8.00; W.E. "N" 215-A's \$8.00; VT-1's \$5.50; VT-2's \$6.00. Moorheads, others. 32 volt 1800 RPM universal motor \$3.00. 110 volt universal, vacuum cleaner \$7.50. Also other equipment. Thomas Lloyd, 949 Ogden Ave., New York City.

WANTED TO BUY—750 volt motor-generator, filament transformer, CW inductance, short-wave receiver, meters, Raymond Chamberlain, Grand Island, Nebraska.

FOR SALE—two 1500 volt, 500 Watt Motor Generator Sets, Motor and 110 Volt Direct Current. Price each \$73.00, complete with field rheostat and starting box. Also a number of other sizes; some with A. C. Motor drives. Queen City Electric Company, 1734 W. Grand Avenue, Chicago, Illinois.

FOR SALE—1 G.E. Receiver \$75.00; 1 Marko Battery \$10. 1 Prestolite battery \$25. 1 pair Baldwin phones \$8.00; 1 Magnavox \$20; 1 Tungar Rectifier \$10 meter and extra bulb, 1 UV202 and rheostat \$6.00; also other apparatus, write for description. R. M. Nelson, 58 Pennsylvania Ave., Binghamton, N. Y.

CW RECEIVER—We have a three tube Reinartz set built for CW and broadcast. Has all refinements and is in cabinet. Parts alone cost \$65.00. Built by experienced engineer. Will take \$50.00 and will include pair Western Electric Phones. Send Stamp for photo and description. Van Blaricom, Helena, Mont.

COMPLETE 5 WATT C.W. and fone set going for \$45. Write for description and DX records. Edward Powell, Lagrange, Ga.

AMATEURS—try MAGTO for your core metal, its highly magnetic, finely powdered, and has many uses in the radio field. Five pounds for one dollar, postpaid. American Chemical Co., Dept. 4, East Youngstown, Ohio.

SELL—Slightly used, Radiola V, \$80.00; R-3 Magna-

vox \$20; A. Benesovitz, 415 McKinley St., Hibbing, Minn.

FOR SALE—deForest, Type "O," 20 watt transmitter, complete with tubes, microphones, buzzer and key—\$95.00; also Grebe CR-3, special detector unit and Radiocraft two stage amplifier—\$90.00. Everything in excellent condition. For further information and photograph, write J. O. Persons, Jr., 70 North Fulton Avenue, Mount Vernon, New York.

THE SOUTHWESTERN General Radio Company, of Port Arthur, Tex., presents the "Southwestern 1-77", a superior type low loss tuner, and the "Southwestern 5-55" CW transmitter. Confidential discounts to A.R.R.L. members. Complete line amateur apparatus.

EDGEWISE WOUND COPPER RIBBON— $\frac{1}{8}$ " wide outside diameter; 5 inches 12 cents; 6 inches, 15 cents; 7 $\frac{1}{2}$ " inches, 17 cents per turn. Genuine new Remler Giblin and DeForest coils mounted on bakelite plugs 100-150-200-300-400-500-750-1000 turns half list price. Pure sheet aluminum $\frac{1}{16}$ " inch 80 cents; $\frac{1}{8}$ " inch \$1.60 sq. ft., postage extra $\frac{1}{16}$ " 2 lb., $\frac{1}{8}$ " 3 lbs. No C.O.D. on aluminum. Genuine silicon transformer steel, cut to order, 25 cents pound, 10 pounds and over 4 cubic inches weight 1 pound, postage extra, Bakelite panels up to 5" wide any length, $\frac{1}{8}$ " thick, 1 cent square inch, 100 inches and over, postage 2 lbs. to 100 inches extra. Geo. Schulz, Calumet Mich.

MASTER RADIO CODE IN 15 MINUTES. Ten word speed 3 hours. Our Students made these world records. Failures all methods thank us for License. Hesitation kills speed. Our method kills hesitation. Instructions that instruct only \$2.00. Qualifying records 100 Licensed students free. Dodge Radio Shortcut, Dept. SC, Mamaroneck, N. Y.

SINGLE DIAL OMNIGRAPH \$6. New Warranted Audio Transformers \$2. New "S" Tubes Pair \$20. O-500 Milliammeter \$6. Let's Trade. Want Bug. James R. Curtis, 5AQC, 1109 Eighth Avenue, Fort Worth Texas.

ACME TRANSFORMERS—A few 75 watt full mounted Acme Power Units at \$10.00. Regular price \$15.00. Van Blaricom Co., Helena, Mont.

HAMS ATTENTION—U.V. 202 \$4; U.V. 216 \$3. These tubes are guaranteed. Get them while they last. Agents wanted. P. S. Millard, 75 Baldwin Pl., Bloomfield, N. J.

WE DESIRE TO ANNOUNCE the King DX, an amateur low loss tuner of the finest type. A.R.R.L. Members receive preferred prices. King Radio Corporation, Port Arthur, Texas.

SELL—Grebe CR8, \$40. W. J. Baker, Route 14, Dayton, Ohio.

MUST SELL IMMEDIATELY—10 watt transmitter panel mounted complete with tubes, transformers, and "S" tube rectifier. Everything perfect condition. All inquiries answered. Milton Buzzard, 701 Walnut Ave., Scottsdale, Pa.

FOR SALE—Grebe CR13, perfect condition used only one month, fifty dollars. D. W. Pinkerton, Sta. B, Toledo, O.

FOR SALE—Twelve inch oak insulators—thoroughly impregnated with paraffin—great strength and insulation, very light. Postpaid thirty-five cents each. John McNay, Butler, Missouri, 9DZO.

FOR SALE—4 used VT-2, \$4 each; 2 used UV-201, \$2 each. Wm. Myler, Jr., 1444 Marlboro St., Wilkesburg, Pa.

MANY BEGINNERS ANCHORED AT about 5 per now thank us for License. Qualifying records 100 Licensed Students free. Dodge Radio Shortcut, Dept. SC, Mamaroneck, N. Y.

HI OLDTIMERS—4 genuine double filament audiotrons (3 unused) guaranteed. Bought before war. Good DX one tube single circuit tuner with "S-Ar-De" bank wound inductance (without cabinet). Will trade for good 5 or 10 watt C.W. complete ready to operate. Send photo if possible. George H. Smith, Charlevoix, Pa. EX.80G.

ORS A.R.R.L. is certificate proficiency. List our students holding this appointment also records rapid progress, quick success free. Dodge Radio Shortcut, Dept. S.C. Mamaroneck, N. Y.

1RCA 325 watt power transformer \$18.00; 2RCA UV216 Kenotron rectifiers \$3.50; 1Giblin variocoupler \$4.50; 1 RCA 50 watt power rheostat \$3.00; Frank L. Pedro, 1815 E. 14th St., Oakland, Calif.

SELL—Freed-Eisemann NR 5; one Grebe CR 9; two Melco Supreme receivers. All in first class condition. Jack Cochran, Teague, Texas.

NEW WESTERN Electric 50 watters, \$25.00. 2BYJ.

STOCK OF NEW receiving and transmitting apparatus at low prices. Write your wants. L. J. Lease, East Liberty, Ohio.

GREBE SETS at a Sacrifice—brand new stock—Never been used: 1 CR-5, 1CR-8, 1 Rord, 1 Rork also 1 OT-3 DeForest Midget Radiophone, never been used, \$49.00. M. M. Fleron & Son, Inc., 113 No. Broad St., Trenton, N. J.

IF YOUR Neutrodyne won't "Neut" O.K., send 10c for details of Kladag Coast To Coast circuit, bill of materials, etc. to change over your Neut into a set that will bring them all in from Mexico City to Tunucu, Cuba, on a Loud speaker. Or send \$5.00 for all extra parts, blue print, etc. you need to do this. Stamps accepted. Radio list for stamp. Super Heterodyne specifications, 10c. Kladag Radio Laboratories, Kent, Ohio.

MAKE \$120 WEEKLY IN SPARE TIME. Sell what the public wants—long distance radio receiving sets. Two sales weekly pays \$120 profit. No big investment, no canvassing. Sharpe of Colorado made \$955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. OZARKA, 853 Washington Blvd., Chicago.

RADIO GENERATORS—500 volt 100 watt \$28.50 Battery Charging Generators \$8.50, High Speed Motors Motor Generator Sets, all sizes. Motor Specialties Co., Crafton, Penna.

\$12. EACH takes Ohio or Wagner synchronous 110 volt sixty cycle eighteen hundred R.P.M. motors built in $\frac{1}{4}$ H.P. frames. Can be used as power motors. Highest quality $\frac{1}{8}$ " x 6" test tubes \$3.00 gross. Perforated hard rubber separators $\frac{1}{4}$ c. No. 20 99% pure nickel wire \$1.50 per hundred feet. Kimley Electric Company Inc., 2665 Main St., Buffalo, N. Y.

LOCAL RADIO representatives wanted for special work at convenient hours. Full information. Maitland Roach, 2905 Columbia Ave., Philadelphia.

TELEGRAPHY—Morse and Wireless—taught at home in half usual time and at trifling cost. Omnigraph Automatic Transmitter will send, on Sounder or Buzzer, unlimited messages, any speed, just as expert operator would. Adopted by U. S. Govt. and used by leading Universities, Colleges, Technical and Telegraph Schools throughout U.S. Catalog free. Omnigraph Mfg. Co., 16M Hudson St., New York.

REAL ANTENNA INSULATORS—10 inch porcelain, 90 cents each, Lorain Radio Supply Co., Lorain, Ohio.

REAL BARGAINS—Weston 0-1000 voltmeter \$15; Weston 0-25 milliammeter \$6; Two Mershon electrolytic condensers \$10; Flame proof key \$3; Acme double $1\frac{1}{2}$ henry 500 ma choke \$5; federal switch \$1; Western electric microphone \$4; UP1016 power transformer \$19; PX1638 chopper \$3; UT1357 magnetic modulator \$5; UM576 0-500 milliammeter \$6; UM578 0-500 voltmeter \$9; UP1654 filter reactor \$8; UP415 filter reactor \$4; UP414 microphone transformer \$6; UC1819 variable condenser \$3. 2CO Walter Cobb, 178 Main Street, Orange, N. J.

MUST DISPOSE OF Grebe 13 \$55.00; Single circuit and 2 step \$40.00; Acme transformer 500 watts 1500 volts \$12.00. Leon Hadley, Orchard St., Leominster, Mass.

\$3.95 TUBES \$3.95

GUARANTEED NEW Genuine Radiotrons. All types sent postage prepaid. General Sales Service, Onset, Mass.

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MUST SELL—5 amp. Tungar \$20; 2 amp. charger \$14; one tube BCL set \$15; Panel type send-receive switch \$3; CN113A Navy receiver with audion cabinet to match \$40. All in good condition. H. F. Mason, 490 Ann St., Hartford, Conn.

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Mr. G. D. Spawn, Delmar, N. J.
Howard I (?) Morris (?) 56 Rutland Road, Brooklyn, N. Y.
F. C. Van der Voort, Rockaway, N. Y.
R. W. E. Decker, 834 Riverside Drive, New York City.

Stillman Shaw, Hartford, Conn.
Robert Murphy, R.F.D. No. 3, Baldwinville, N. Y.
INCOMPLETE ADDRESSES prevent answering the following letters:—

Radio 7BM, Aberdeen, Wash.
C. E. Morenus, (No Address)
F. Sinclair Moore, Lane Technical High School (No town or state).
Radio 1ARE, Pittsfield, Mass. (No name or street).
Hunter Dickson, 1519 E. 68th St. (No city or state)
Bernard Pickard Hansen, (No address)
Mr. (No name) R.F.D. No. 8, Springfield, Tennessee.
No signature, Wharton, Texas.
E. L. Dye, (No address).
Clyde M. Rogers, No address.
Clear Lake, Utah, (No signature).
G. C. Medved (?) St. Paul, Minnesota.
E. L. Millard, Jr., "Elm Press."
A. C. Anderson, Minneapolis, Minn.

Please send information on these addresses to A.R.R.L., 1045 Main St., Hartford, Conn., marked "Addresses."

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BUY A RADIOLA 111 and tune in on the Republican and Democrat Conventions. Radiola 111-\$35.00 with two tubes and phones. Or a Zenith ZR 4 complete with tubes, batteries, loudspeaker \$168.50. Send 2 cent stamp for price list. Amateur Radio Supply Shop, 525 Park Ave., Kent, Ohio.

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FOR SALE—One ten watt CW transmitter complete with power transformer and everything except tubes, \$50; one Reinartz tuner and two stage complete with tubes and battery less "A" battery. Both working excellent. Rec. set \$75.00. 9EEI, Frank Schnepfer, Cresco, Ia.

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50c straight, with copy in following form only: **CALL — NAME — ADDRESS.** Any other form takes regular HAM-AD rates.

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1AGQ—Rubin Cohn, 36 Pliny St., Hartford, Ct.

1CAK—1ZD—1XAX—John M. Wells, 40 Main St., Southbridge, Mass.

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2CV—Irving Koreman, 1465 60 th St., Brooklyn, N. Y.

3HM—Charles D. Larus, 3507 Seminary Ave., Richmond, Va.

3PQ—Walter A. Cobb, Camp Kittatinny, R.F.D. No. 5, Newton, N. J.

5AIL—Thos. H. Holmes, 573 College St., Beaumont, Tex.

5APZ—C. H. Tucker, 718 F St., Perry Okla.

5CK—John Mitchell, Havana, Ark.

5OX—Robert E. Franklin, 1806 Valentine St., Houston, Texas.

8AEG—Norman C. Baehr, 9509 Willard Ave., Cleveland, O.

8AJZ—Edgar R. Robinson, 1013 Vine St., Sandusky, Ohio.

8DOF—Karl V. Rittstatt, 643 Howard St., South Brownsville, Pa.

8DOW—R. S. Brown, 521 Paris Avenue, Grand Rapids, Michigan.

8WL—Louis J. Schneider, Jr., 2144 W. 93rd St., Cleveland, O.

9BER—Ralph C. Wolfe, 115 N. 11th St., New Castle, Ind.

9DMK—Reassigned to Robert Waffle, 388 So. Park Ave., Fond du Lac, Wis.

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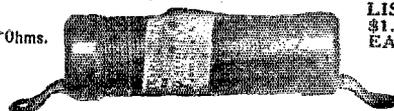
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—FOR YOUR CONVENIENCE—

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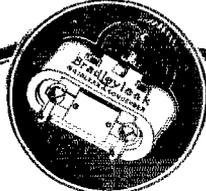
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For Summer Radio

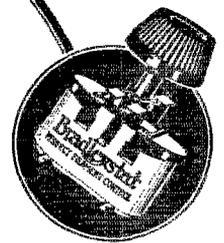
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Range— $\frac{1}{2}$ to 10 Megohms.
A grid condenser of 0.00025
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Flewelling, Crosley, etc.
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Noiseless, senseless filament
current control for ALL
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An adjustable resistor for ra-
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Price, any range, \$2.00



The Bradleystat holds first
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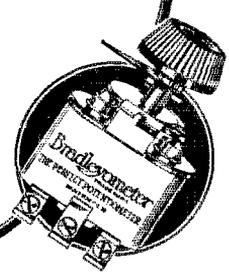


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For A- and B-battery circuits.
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Use Allen-Bradley Products

Summer Radio Sets are portable sets! This means that they must be built for abusive service, and must operate under conditions that are often unfavorable for good reception. Short antenna, loop antenna, and similar receptive devices call for extremely sensitive sets. This, again, means that the parts used must be of high efficiency for maximum signal strength.

Allen-Bradley Radio Products are known the world over for excellence of construction and perfection in operation. They make any good set better, and insure a full measure of enjoyment in summer camps when used in portable sets. Make your set a good set. The above radio parts are the finest obtainable. Follow the advice of radio experts. Use them!

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Please send me a complete set of your de-
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products.
Name

Allen-Bradley Co.
Electric Controlling Apparatus

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Every Allen-Bradley radio product is guaranteed for ONE YEAR against defects in material and workmanship. Any defective material will be repaired or replaced, without charge, within the guarantee period.

THE AMERICAN RADIO RELAY LEAGUE

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

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

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in America and has a history of glorious achievement as the standard bearer in amateur affairs.

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

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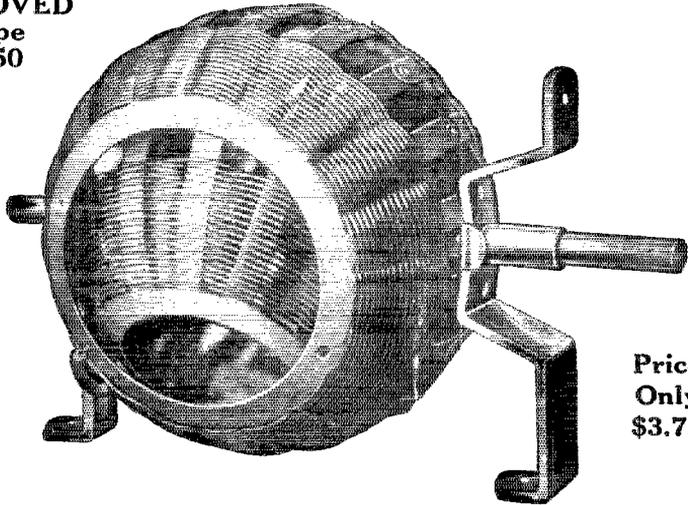
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AMRAD Variometers permit use of the scientific principle of Inductance Tuning, by which greater voltage reaches the tubes than in any other way.

To use the Inductance principle, the tuning elements must be ex-

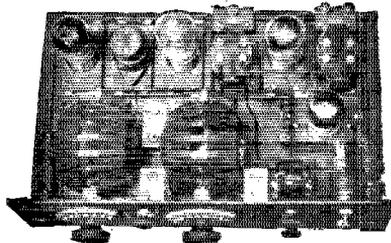
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Due to their design and construction, AMRAD Basketballs have the very minimum of dielectric losses, and therefore function at peak efficiency.

Nothing has so popularized

Basketballs as the enthusiastic reception they have received from radio amateurs. See them at your Dealer's, or ask your friends about them.

Write for Descriptive Bulletin V



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Basketball Variometers and Couplers are worth waiting for. If your Dealer can't supply you at once, place your order with him and he will obtain them for you promptly.

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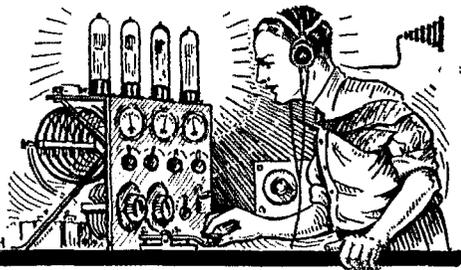
205 College Ave., Medford Hillside, Mass.

AMRAD Dealers in Principal Cities and Towns

The Traffic Department

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

CB8



As a reminder, don't forget the new system of numbering messages as outlined in June *QST*, page 26. We are anxious to have the benefit of all different criticisms and comments from amateurs who have already started the new system. Much improvement can be made in the delivery of messages if the office of origin and date are transmitted on every message. Later on, it may be a good plan to refuse a message that is not complete in every way—perhaps this would teach some of the laggards how to handle traffic. Yes, there are plenty of them in our ranks.

It doesn't seem possible that we will go hunting for something to do this summer with our programs of short wave tests from NKF, U.S. Naval Research Laboratory; FL, Eiffel Tower; and 1XAM, our own 1QF. All these stations and others are transmitting practically every day on waves between 11 and 120 meters. We intend to learn something more about short waves and daylight work. Copies of schedules can be had from the Traffic Manager, 1045 Main St., Hartford, Conn. If you are interested, drop your card to the above address and copies of all short wave schedules and special tests will be sent. We want and can use all the stations we can get—will you be with us, OM?

With the opening up of communication to South America through CB8, we feel we are drawing near to the "Round the World Relay" by amateur radio and there is no reason why we shouldn't connect England with Australia (about 12,000 miles or half way) this coming fall. We need more concentration on two-way work with Australia and New Zealand and we believe the 100 meter waves will solve this problem. Who will be the first American or Canadian ham to work one of them? A nice boomerang trophy awaits the lucky ham! Up to May 22, CB8 reports the following stations heard: 1ABF, 1XAM, 1XW, 1XZ, 3ABD, 3OH, 4IZ, 8BPA, and 9UA. Canadians: 1AR and 1BQ. Brazil 2SP, L. Y. Jones, Jr., Rua Frei Caneca No. 22, Sao Paulo reports 1BCR, 1XZ, 8ABS, 8VE, 9CII, and 9ZT. 2SP includes reception up to May 24.

Some of the fellows seem to hesitate about taking out the new O.R.S. Certificates. What's the trouble—haven't you confidence in your ability to operate your station according to the requirements or are you just naturally bashful? Surely it can't be the later—where is the bashful ham—there isn't one. We want to see more applications for the new O.R.S. and we want more sta-

tions on the air and operating consistently. We are looking for "real traffic" men who know how to handle traffic. We've got something up our sleeve for the coming year—something that will boost traffic—but we haven't time to waste on careless and negligent operators who don't know what it means to deliver or relay a message within 48 hours. Only the O.R.S. will be able to handle some of this new traffic and delays or non-QRS will not be tolerated.

The new manager of the Dakota Division, elected by membership vote, is D. C. Wallace, (9XAX-9ZT) 54 Penn Ave., Minneapolis, Minn. Wallace was the winner of the Hoover Cup for 1923 and it looks like he has designs on the 1924 cup and unless he gets some pretty strong competition right away, he will walk off with it. Some of you fellows had better wake up! Remember this: it is only six months to the end of the year and 9ZT-9XAX has got a good lead on most of you and has far more operation to his credit than a good many stations where there are three or four operators—Wallace is alone. Are you going to sit by like wooden men and let him take this cup again or are you going to give him a run for his money. It isn't too late, but you've got to start "doing" right now.

It looks like there will be a small band or several small bands of short waves for general amateur use—hope we can announce it by the time this reaches you—but be prepared for the dope via ARRL Broadcasting stations which broadcast every Saturday and Sunday night at 10:30 P.M. standard time. You'll get the news as soon as we can pass it out to you. In the mean time, are you prepared to transmit and receive on short waves around 100 meters? If not, get busy and rig up a short wave tuner—see the back numbers of *QST*—the transmitting dope is there too. Don't go to sleep this summer just because your set has the 'hee-bee jee-bees'—make use of the summer months for construction work and get ready for a big traffic season. Get in on the tests etc., but don't let the dust accumulate on your junk.

ATLANTIC DIVISION
C. H. Stewart, Mgr.

The new line-up of the organization is showing greatly improved conditions. Traffic reports are coming in in mid-winter form. The new A.D.M. for Western New York is 8PJ, replacing 8AWP. We look forward to some reports from this section each month.

2BRB, the A.D.M. for Eastern New York and 2WR, the A.D.M. for Northern New Jersey are making things hum and new life is being instilled wherever necessary to bring about better cooperation.

For the benefit of those who don't know where to send their reports, please be governed by the following:

Northern N.J., A. G. Wester, 2WR, 1075 Chancellor St., Hilton.
Southern N.J., H. W. Densham, 3EH, Collingswood.
Eastern N.Y., E. Glaser, 2BRB, 845 E. 13th St., Brooklyn.
Western N.Y., C. Taylor, 8PJ, 598 Masten Ave., Buffalo.

Two western N.Y. stations reported traffic: 8AOH, 10; 8HJ, 27; Southern N.J.; 3APB, 14; 3BAY, 62; 3BEL, 37; 3BWJ, 32

EASTERN NEW YORK—There are half a dozen reports missing this month. The fellows who aren't sending in reports had better get busy or take the consequences. 2CHY handed in a good report for Brooklyn with the help of the A.D.M. 2ACS is the new C.M. of Schenectady and is showing his worth already with an excellent report. 2ADD from Yonkers hands in as fine a report as usual. 2ANM has taken over the job of D.S. for New York Dist. No. 3, and has given up his job as C.M. of Troy at the request of the A.D.M. 2BBX, 2CIZ, 2CHY, 2CYX, 2CRQ, 2CEV, 2ADD, 2CXB and 2CSL have been appointed O.R.S.'s. The reports from the Bronx and Manhattan haven't fallen any as the C.M.'s are hot after the bunch. Many stations are closing for the summer: 2KU, 2XQ, 2XNA (part). 2ADM has quit for good—so he says. 2CYX and 2CRQ are doing fine work. 2CUZ is the best station in Yonkers. 2CMG, the station of the Hudson River Yacht Club, is a new-comer and is doing excellent work. The Ancient GBMers are still represented. 2AQH, 2SM, 2CWX and 2BWB are still at it. Yes, sparks, is what we mean. 2CXB is the most active station on Long Island. 2KR is still ruining a 201A. 2BWE is taking a trip around the world as an op. 2BWE has consented to junk the spark and put in a 50 or two. Great stuff, OM sez the whole Second District and lots of others. HI, 2UA, D.S. District No. 2, has a terrible time trying to get reports. How about some reports from Westchester, Putnam, and Dutchess counties? 8AOT and 8AVR are the only active stations in the 6th district. 8AVR is going to open up soon. 2GK is still on the job working all the DX and getting reports together. 2ACS handled the most traffic in the upper part of the state. (FB, OM)

Traffic: Brooklyn, 2BRB, 110; 2CPQ, 106; 2ABN, 96; 2AAY, 66; 2CHY, 48; 2ADC, 61; 2WZ, 82; 2CJR, 60; 2CZM, 55; 2CRB, 43; 2CLA, 20; 2BXR, 48; 2AGO, 20; 2DL, 31; 2AX, 38; 2BZO, 23; 2ABR, 28; 2WC, 14; 2CHG, 16; 2AHI, 8; 2PF, 15; 2CXA, 8; 2EQ, 6; 2CWO, 6; Bronx, 2CRQ, 314; 2CYX, 157; 2ABH, 29; 2CWR, 2; 2FZ, 10; 2BEX, 105; 2SM, 12; 2CVX, 58; Manhattan, 2CPK, 159; 2KR, 92; 2XNA, 6; 2CHK, 19; 2CSL, 10; 2CMG, 27; 2CTE, 36; 2BNL, 16; Richmond, 2CEP, 33; 2CEV, 51. Dist. No. 14: 2BPP, 11. Dist. No. 3: 2ANM, 7; 2CPZ, 7. Dist. No. 5: 2CEG, 44; 2BXW, 5; 8AVJ, 56; 8APU, 20; 8BXP, 23. Dist. No. 6: 8AVR, 3; 8AOT, 2; Yonkers, 2CTZ, 73; 2APY, 18; 2ADD, 9; 2AG, 8; 2CII, 2; 2AQH, 26; Schenectady, 2ACS, 364; 2CWJ, 70; 2GK, 43; 2ADM, 20; 2CGJ, 12; 2CPA, 12; 2XQ, 11; 2ALK, 10; 2AIF, 8; 2AAZ, 5; 2CZH, 2.

NORTHERN NEW JERSEY—Every month finds activities greater and if it keeps up to the present rate, Jersey will be a banner state. A route will be established from N.Y.C. to Asbury Park, Atlantic City and Philadelphia for the summer, for the seashore traffic. 2FC is back again with renewed pep. 2CPD will be a fine station for clearing all So. Jersey traffic as he gets into Atlantic City regularly. 2BUY, 2ARS and 2AUH are now getting into action and along with 2FC will form the backbone of the sea-shore express route. Newark has awakened from a long slumber and traffic is moving through this city via 2AMF, 2CMK, 2BXD and 2LIT. A new C.M. will have to be appointed as 2BMS has fallen by the wayside. 2AXF is new C.M. of Irvington and is complaining about a few local I.C.W. and fone hams who hog the air during DX hours. 2CQZ is still going strong. 2ALY and 2CDR will be back in the fall. 2WR has been listening in more than sending, trying to get a good line up on future O.R.S.'s and C.M.'s and the future will find some new appointments in this section. 3FP is back and has erected a 68' sea-going mast which looks great. 3CS has a new special call 3ZI, but he wishes he has a new stick instead. 3OH has a new 100 watt set. The spring has got hold of 3BLZ so his call will be absent for awhile. 3XAN threatens to open with 500 watts so local R.C.L.'s beware.

Traffic: 2BJZ, 16; 2PC, 17; 2CUA, 10; 2WR, 53; 2AXF, 17; 2GC, 1; 2AFG, 10; 2BNT, 24; 2AYN, 2; 2AWW, 20; 2CMK, 70; 2AMF, 105; 2BXE, 39; 2BQ, 29; 2CRD, 29; 2CTS, 11; 2BEO, 12; 2AEY, 58; 2BQA, 32; 2BGO, 35; 2BYD, 10; 2CRP, 17;

2CYQ, 189; 2CQD, 10; 2CQZ, 112; 2ACD, 94; 2BQ, 20; 2CRW, 14; 2CYW, 25; 2CBP, 8; 2QS, 2; 2ABS, 10; 2CVG, 7; 3FP, 6; 3ZI, 7; 3BLZ, 1; 2CPD, 63; 2AUH, 12; 2ADU, 6; 2ATE, 6; 2ATI, 35; 2CUB, 28; 2DAB, 1; 2AJF, 6; 2CGK, 10.

EASTERN PENNSYLVANIA—Quite a few stations made their initial report this month. Sever O.R.S. appointments were issued the past month with a few still pending, which shows active stations are on the boom. Most of the consistent reporters came across this month and made a fine showing. 3QV has 20 west coast stations in his credit. 3BA breaks out for the first time. How's that for summer work, 3ZM installs a portable transmitter in his motor car and parks in some ideal location. Wide publicity should be given to station 3ZF-3BOB for the service they are planning to give amateurs of this and nearby stations. A new master oscillator system is being installed whereby standard frequencies will be transmitted to enable official stations to calibrate their wave-meters and receivers also a standard shielded oscillator with a special harmonic elimination circuit to plot the received wave length of the station requesting same. A wave meter which is one quarter of one percent below 30 meters is also part of the equipment. The station is in charge of three experienced operators having 10 years of radio to their credit. Accuracy will be maintained at all times. This is indeed a service to the Atlantic Division. Philadelphia stations were a little more active this month.

Traffic: 37M, 23; 3BAU, 4; 3QV, 21; 3BNU, 29; 3CJN, 39; 3MQ, 13; 3TP, 37; 3AUV, 26; 3ZO, 101; 3BBV, 20; 3CGX, 45; 3EQ, 14; 3KJ, 54; 3GK, 15; 3CGS, 10; 3ABH, 27; 3BTU, 27; 3FS, 17; 3AWA, 13.

WESTERN PENNSYLVANIA—Dist. No. 8: 3AOX has just patched up trouble with the Radio Inspector and promises to be back on the air. 8AKI has been very busy finishing up high school work but has managed to get in on the Pennsylvania R.R. Emergency Tests.

Dist. No. 9: The 9th Penna. District is coming back to its old reputation under the guidance of the D.S. at 8VE. 8BV has been doing very little on account of school. 8QM, 8TW is a new member. 8BJT is a new station. 8CDC is another of our active stations in the P. R.R. tests. 8CEO was one of the most successful in the P. R.R. tests. Also worked regular schedules with 4JR and 9DWW. 8DLI is another new station located at Parnassus, the home of the mighty 8BZC. The whole gang certainly does welcome back home the Alexander brothers, of 3JQ. 8AGO has changed from the Master Oscillator to a coupled Hartley circuit with very favorable results. A new 1 watt (input) set using the Master Oscillator circuit is under construction and will be on the air soon. 8CEJ has joined the bunch of 150 meters. 8CEI is still tearing large holes in the ether and getting out FB. 8CVY is handling a fair amount of traffic but reconstruction is keeping his total down. 8CES is not in DX shape just now, but he and 8RS are combining and are going to have a big station. 8CKO has moved to a new and better location.

Dist. No. 10: 8ADS is still handling traffic and getting out well with the lone 50-watt 8CCK is also doing very fine work and handling his share of the traffic. 8BRB has blown his 5-watt set up again and is off the air temporarily. 8CMH is a new station for this district and is located at Sligo.

Dist. No. 11: 8DKI is getting out very good as usual. 8SR of Olean, N. Y. reports 84 msgs to the district, inasmuch as he could find no one in New York who would take his report. This is a mighty fine station for N.Y. and the A.D.M. up there should get after him. (Thanks, OM, for your report. We are glad to take care of it for you and the Pennsylvania districts will be more than glad to QSR your msgs.—A.D.M.) 8CWW and 8CQL are the only prospects for keeping Erie on the map this coming season.

Dist. No. 14: The report for the month of April was missing due to pressure of business resulting from FLOOD of March 29th but the district has been functioning nevertheless even if only on two cylinders. During the sleet storm of February 19th this district suffered heavily from sleet and high winds which tore down every antenna in the district and it has only been by perseverance that some have been restored so that League business could be handled and to these stations I have sent my appreciation.

8DBL is getting along in true A.R.R.L. style handling all msgs coming his way. 8BJA, also back in the game in good shape is handicapped by business but looks for improvement soon. 8BBP is back on the air but as yet has been unable to put up a decent antenna. 8BRM is getting in shape but due to feminine QR? 8BGG, 8WR and 8BDU are not working at the present time.

The O.R.S. certificate of 8BKY was cancelled because he did not know how to observe the rules and regulations of the U.S. government or the requirements of the A.R.R.L. and after numerous warnings persisted in transmitting on 100 meters and using a false cal. 8XCW, for this purpose.
 Traffic: 8AKI, 15; 8BW, 15; 8LW, 88; 8QD, 23; 8UT, 9; 8GDC, 22; 8BJT, 27; 8CEO, 24; 8CIX, 70; 9DLL, 6; 8VE, 35; 8JT, 125; 8AGO, 83; 8CEJ, 48; 8AIG, 46; 8CEI, 31; 8CMF, 23; 8DHW, 22; 8CVY, 12; 8CES, 3; 8AYW, 2; 8CFB, 2; 8DIZ, 4; 8CTF, 11; 8CKK, 77; 8BRB, 21; 8CMH, 5; 8ADS, 15; 8BYI, 23; 8DKI, 49; 8SR, 84; 8CON, 36; 8BJV, 84; 8DBL, 83; 8AAF, 4; 8BBP, 55; 8CBM, 5; 8ABS, 106.

MARYLAND—In spite of bad DX, WX, traffic is kept moving, although only a few stations are reporting as usual. 3LG is still the star Baltimore station and reaches out in all directions equally well. 3BCK, our YL, has been reported in England, using 10 watts, 450 RAC on plates, the best miles per watt for any local station. 3APT is very much elated at being logged in France. 3AJD is heard across the pond frequently. 3XAO-3TE is working British stations on 100 meters, a new record for Baltimore stations to shoot at. 3JS is a new 10-watter, self-rectified set, and sounds promising. 3SQ is on again with a temporary antenna and CP, and doing FB. 3MF is kicking out even better than before, using S tubes. The following are on the air occasionally and are getting out well: 3PH, 3WP, 3DQ, 3TF, 3RMO, 3CJC, 3AEK, 3CDU, 3CJW, 3UZ, 3CHB, 3FK, 3BU, 3GL, 3SF, 3LL, 3SS, 3AOJ, 3HU, 3DO, 3CGC, 3FB. 3APV is doing remarkable work with one 5-watter.
 Traffic: 3LG, 122; 3APT, 37; 3MF, 15; 3HG, 9; 3APV, 102.

DISTRICT OF COLUMBIA—Many of the old stations which were more or less permanent fixtures in the capitol, have disappeared. However, there is reason to expect the following back on the job soon. 3SU, 3JJ, 3AB, 3SU turned to the making of B.C.L. neodynes and is about fed up on the job; 3JJ has had a case of temporarily lost interest; 3AB has been having antennae come down as fast as he put them up.

The big need of the District of Columbia right now is two or three consistent and conscientiously operated stations—not station specializing in high power output. We have been relying chiefly on 3APV, a station just outside of the district using a 5 watt tube, but well operated. 3BWT deserves commendation on the clean way in which the station handles messages.
 Traffic: 3APP, 4; 3BSB, 5; 3BWT, 31; 3HS, 20; 3TY, 4.

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

NORTHERN INDIANA: Dist. No. 1: Muncie is shaking off some of the old moss with 9EG and 9EJU breaking out. Both 5-watters, but real 5-watters. Detector. 9DRS has kept up a good day-light schedule. Albany. 9AUC claims DX record and championship getter of miles per watt. He worked 1ARY using one 201A tube and radiating one tenth amp. Marion; 9CLN got his 100 watt one going in line shape. 9AZX is on low power but finds that low power is all that is needed for the low waves.

Dist. No. 2: 9CTE is still working sixes. 9FB is on the air quite consistently and is doing good work. 9BON says that traffic is better and is working more. 9NI is starting up with a 5-watter. 9DKT is a new station. 9CNO is moving to So. Haven, Mich. 9CHV is back on the job now and then. 9DYT worked west coast 10 times in 15 days with a 5-watter. 9CP is on spasmodically. 9DJT went to Kansas and on his fourth day there got married. Nothing slow about him!
 Traffic: 9CTE, 152; 9DJZ, 66; 9AUC, 65; 9EG, 64; 9BON, 58; 9DWA, 56; 9AKD, 41; 9EJU, 41; 9DLW, 35; 9CYW, 30; 9FB, 26; 9CP, 22; 9DBJ, 22; 9DYT, 20; 9CLN, 17; 9BUJ, 11; 9DLN, 8; 9AZX, 8; 9DWW, 5; 9DKJ, 5; 9CUS, 5; 9EH, 4; 9DKT, 4; 9EHU, 4; 9ABL, 3.

SOUTHERN INDIANA: Traffic is picking up in Southern Indiana. The cause of this increase is not known but is probably due to a general revival of interest in amateur radio in this section. 9BJL reports being on a transcontinental which went thru in 20 minutes.

The Indianapolis Radio Club (affiliated with the A.R.R.L.) elected officers at the last meeting May 19th: R. D. Scobey, 9BIW, president; D. J. Angus, 9CYQ, V.P.; Bill Ehlers, 9ARP, secy-treasurer.
 9VC, 9WE and 9CYQ have purchased new 1500 volt D.C. generators for plate supply.

Traffic: 9BCC, 148; 9DHR, 90; 9ES, 68; 9EJI, 36; 9EJA, 32; 9EVZ, 30; 9BJL, 26; 9DUC, 25; 9BJR, 19; 9AWG, 17; 9CYQ, 14; 9TG, 12; 9TA, 8; 9CUR, 8; 9FB, 6; 9BIW, 1.

KENTUCKY: Traffic between Lexington and Middlesboro can be handled in short order but traffic from Lexington and Covington is slow as there are not many active stations. There seems to be a dead spot between Covington and Louisville and these two cities rarely, if ever, get reliable connection. 9ELL with aerial 10 ft. above CP has the traffic honors this month. 9ARU is still working west coast on four 5-watters, handling traffic. 9BAZ and 9DIT are holding their own and doing good work. 9MN, a newcomer, is on with two 201 amplifier tubes and getting out. 9WU is ready for steady work and can handle traffic in any direction. 9BEH has four 5-watters with "B" battery plate supply. 9DYC, 9DJN, 9CUR, 9DRC, 9CAQ, 9AFE, 9BDE, 9BEH, 9CON are all active but handled no traffic.
 Traffic: 9ELL, 39; 9ARU, 32; 9BAZ, 30; 9WU, 18; 9EI, 6; 9MN, 2.

MICHIGAN: Dist. No. 1: Ypsilanti; 8BOB is on 150 meters with 6 five-watters. 8DKA is QRM from school work but on once a week. 8ANP has a 100-watter going OK. 8AOG is a new station. 8DIL has "S" tubes working and has a W.E. 50 watter pumping 5.5 amps in aerial. 8BDO is on 185 meters with a good sharp wave. 8AMS is on with a good kick and doing good work. Please remember fellows that this is practically the only route to the north now. Shoot him your stuff as he is QSO with other north stations. Thousands of msgs can go to Resort country, get that business this summer, remember 8AMS. Now QSO with Frankfort, Mich. and Petosky. 8ZH is on as much as possible in daylight. Checking waves, look out! 8CAP walked 18 miles to get a 5-watt tube to replace a burned out one—he didn't get it then—some spirit!

Dist. No. 2: 8DCW leads district No. 2 with 8CFQ second.

Dist. No. 3: 8DGC seems to be the only active station in GR. 8BCV is going strong with his 15-watter. Kalamazoo seems to be the only city with any real active traffic handlers on this month. We have a new comer who signs 8AOR and is a promising young ham. 8CZZ still burning up some of the OM's money in light bills without much DX so he says.

Traffic: 8DCW, 317; 8CFQ, 240; 8DFB, 164; 8YN, 143; 8BZD, 102; 8DIL, 95; 9CE, 88; 8BNC-8DAG, 66; 8CQJ, 47; 8CZZ, 44; 8AMS, 35; 8CPY, 33; 8CLG, 32; 8ZH, 31; 8APN, 31; 8DBO, 29; 8AIB, 25; 8BUC, 25; 8ZZ, 21; 8BWJ, 19; 8BOH, 17; 8DGC, 16; 8BDE, 13; 8CWX, 10; 8BGQ, 8; 9AEN, 7; 8WA, 6; 8BCV, 6; 8AOR, 5; 8ZF-8BEZ, 5; 8CAP, 2; 8CPD, 2; 8BFW, 2; 8CIC, 1.

OHIO: 8FU is only operating on good nights on account of heavy QRM. 8AVN QRMing first district with his spark. Hams and B.C.L.'s of Lima are cussing a bad power leak. (Cut out the spark, OM—T.M.) 8DOX worked 200 miles with detector. 45 volts on plate. 8CY has new calls, 8XM and 8ZE. 8GX has new call 8XT. Both are going to operate from 100 to 125 meters. 8PL's license was suspended for six months. 8AIB is on again with a 50-watter—pure D.C. 8ANB-8ZAB, C.M. for Cincinnati is doing his stuff. 8CHB is going strong on daylight work. 8ANB has a special set for R.R. emergency work. Ohio's best traffic handlers were: 8AAJ, 8CCI, 8AIB, 8ANB, 8ZE, 8BDM, and 8BYN. Ohio also comes to the front with "Buckeye News" a mimeographed sheet giving detailed activities of all Ohio stations. This is sent free by the A.D.M. to all stations reporting. (Very FB, OM—T.M.)
 Traffic: 8BYN, 354; 8AIB, 100; 8AAJ, 75; 8ANB-8ZAB, 69; 8ZE-8GX-8XT, 61; 8CCI, 57; 8BDM, 57; 8CWP, 47; 8ER, 40; 8KG, 37; 8TJ, 36; 8CVH, 35; 8ALW, 34; 8BNE, 30; 8BMB, 29; 8GD, 23; 8ZC, 26; 8CNL, 26; 8PL, 25; 8CHB, 21; 8AGP, 20; 8GZ, 19; 8FU, 17; 8CMU, 16; 8BZT, 16; 8DFF, 15; 8BZR, 15; 8BIE, 14; 8DKM, 12; 8COJ, 10; 8FM, 8; 8MD, 6; 8BDF, 6; 8RY, 5; 8BFB, 5; 8CAB, 5; 8BWC, 2; 8CNR, 2; 8BHE, 1; 8AVN, 38; 8TJ, 12.

WISCONSIN: Dist. No. 1: 9BFY is closed down for the consin. 9CII just got a 50-watter working and has no trouble working sixes and sevens. 9BKR is QSO in all parts of the U.S. and Canada. 9BBY handled 273 words of press for the Journal in the News Contest. 9ELV still works the west coast easily and always manages to have one good tube in the socket. 9AAP is doing some good work handling stock and dairy reports for the Department of Markets. (Atta Boy—T.M.) 9DXA and 9BHM ex-9CKW reports antenna down, no tubes, transformer busted, sweetheart on strike, O Death, where is thy sting! Hi.

Dist. No. 2: 9BIB is still the best station in

Racine and works both coasts easily. 9AZR is reaching out well and is rapidly improving in traffic work. 9DDQ has sent his O.W. to the country so he can work on his set. HI. 9DWP and 9HO. Baird's new station at Kenosha, has been busting up the ether lately with an antiquated rock crusher, but promises a 15-watter soon. The A.D.M. has a hunch the B.C.L.'s drove him to it. 9BMY is a newcomer working up in A.R.R.L. affairs. 9DKS, the station of Madison's C.M., is temporarily out of the game as the C.M. is now operating the Wisconsin Department of Markets Station at Stevens Point. 9DZV is taking care of A.R.R.L. matters in Madison during 9DKS's absence. 9AZA gives a small msg total but he is on the job nevertheless.

Dist. No. 3: 9BMU has opened up with a 50-watter. 9DJI reports traffic a bit slow—everybody trying for DX records. 9BVA has worked 30 states and 8 districts on a low wave. 9BSA is a new station at West Bend. 9ADP makes a lot of noise and has a lot of fine DX to his credit. 9ALA claims 4 districts and 8 states for a starter. 9CXY, Sheboygan High School, is working fine for a beginner. 9AEU reports DX poor but has been moving traffic in spite of it.

Dist. No. 4: 9BLF again heads the list. Says he is getting out fine but DX not so good since the trees began to leave. 9AKY gets out fine with one fifty. 9EIL built a special short wave tuner and now works sixes at will.

Dist. No. 5: H. Jones, D.S., reports that he is moving to Minneapolis and will have to resign as D.S. We are sorry to see you go, OM, and all join in wishing you best 78, and hope to hear further from you. W. C. Bridges of Superior is recommended to succeed Mr. Jones as D.S.

The Wisconsin A.D.M. now publishes "Badger News," and activity sheet sent free to all stations that report to him. (FB, OM, you've started something—D.M.) (Yea, Bo!—T.M.)

Traffic: 9CCF, 135; 9BIB, 135; 9EGW, 123; 9BFY, 121; 9AZR, 86; 9CII, 84; 9BMU, 78; 9CJI, 78; 9BVA, 62; 9BKR, 60; 9DTK, 57; 9BBY, 55; 9ELV, 54; 9BLF, 51; 9EL, 147; 9BVE, 41; 9BSA, 30; 9BYE, 28; 9AAP, 25; 9DBM, 24; 9CTU, 22; 9ATO, 21; 9DP, 21; 9BQG, 20; 9ALA, 18; 9ALI, 17; 9DRP, 16; 9CXY, 15; 9AZN, 15; 9EGH, 15; 9BSO, 15; 9AEU, 14; 9DHG, 13; 9CYG, 12; 9AZA, 12; 9EAR, 11; 9ATW, 10; 9APZ, 9; 9BMY, 8; 9CWZ, 8; 9DKS, 6; 9AKY, 6; 9EIL, 5; 9DST, 5; 9AJX, 3.

DAKOTA DIVISION D. C. Wallace, Mgr.

New O.R.S. certificates were issued to 9CVU, 9GZ, 9BQJ, 9CRW, 9AND, 9EBC, 9BQJ and 9AEI. The personnel of the Administrative Staff of the state has changed. D. C. Wallace is now division manager, ad M. G. Goldberg, is assistant division manager. N. A. Canfield is resigning as he is going to sea. E. J. Caveny, C.M. of Luvrue, is also going to sea, and new appointments will be made to fill these vacancies.

9DPX was going to sea so quit his job and packed up. His mother saw a movie of ocean waves in action, the night before his leaving, result, 9DPX will stay home and transmit on a couple of 20's. 9DEB is getting married soon. 9AE has gone to Alaska, leaving 9BPM running the traffic handling in St. Paul. 9ELY has worked 4JE, Porto Rico several times—he also worked Mexican BX and Canadian 9BP. Dr. Young, a jeweler in north Minneapolis, has offered a silver loving cup for the best all around station in Minnesota district No. 3. The judges have been appointed, namely, C. L. Jansky; L. C. Smely; D. C. Wallace. All stations are eligible for this in this district, except those in any way connected with the judgments. 9DOE and 9ADF of Duluth did fine work during a recent storm on the Great Lakes and handled 20 messages for ships who were blockaded a few miles from the Port of Duluth. They were their only means of getting messages, as the Duluth commercial station was wrecked in the storm. 9BBP and 9BKX have incorporated and a real station will be the outcome. 9BJJ is a new man at Madison filling in the place of 9BKB now at school. 9BFU has difficulty in keeping fiver and a Ford going at the same time. 9BVS is leading the Redwood gang in getting out of the ninth district for the first time. 9DSW is graduating and has suffered the loss of his pole and he can't get satisfied with 1100 miles working DX, on the shorter pole. 9DDP has rebuilt his transformer with the hope of getting more reliable signals out of ten watts. 9EGG has been doing some sensational work with low input and is averaging 22 000 miles to the watt by transmitting a distance of 48 miles, daylight, to 9AXS with a fiver pulling 1/4 milliampere input, .0015 watt consumption. 9AXS is using a single set,

one tube, and gets 9EGG fine. They are continuing their work. 9BAB is out for the summer and will not be on till fall when he will have 100 watts. 9DCH is watching daylight traffic. 9COF is just removing the black crepe of mourning following the extinction of a fiver. Another has come to bless his happy home. 9MB sports a commercial ops license in his station. He has spent most of his time this month in experimenting and repairing and wants daylight schedules between 6:30 and 8:00 A.M. 9DYR is winding transformers and testing before building a portable super. Traffic: 9DOE, 332; 9CO, 197; 9BMR, 101; 9CDV, 81; 9EGU, 72; 9ABI, 38; 9EGF, 18; 9CAJ, 56; 9SF, 3; 9BVS, 5; 9EGG, 9; 9DDP, 9; 9DYR, 5; 9BNT, 56; 9MB, 11; 9COF, 14; 9DCH, 10; 9BFI, 36; 9DAW, 41; 9CVV, 13; 9ELY, 74; 9BEP, 10; 9BIS, 60; 9RTL, 15; 9BTI, 5; 9ZT, 70; 9AWV, 10; 9DGE, 25; 9CXP, 78; 9CPM, 238.

NORTH DAKOTA: 9UH, 9DKB and 9AEJ have suspended operations for the summer after putting through some very excellent work during a sleet storm that paralyzed communication in the vicinity of Devils Lake. The evening of April 25 was rainy. During the evening the temperature dropped and the rain froze to all wires. At 6 A.M. not a wire into Devils Lake was up and there was no communication of any kind. At noon on April 26: 9UH called 9AEJ with a press report. 9AEJ succeeded in putting up a temporary aerial by 2 P.M. and communication was established with 9CSI at Grafton who telephoned to Fargo to start the press as reception was good at 9AEJ. 9DKB started transmitting at 3 P.M. direct to 9AEJ, 9DKB was relieved at 4 P.M. by 9UH who completed the work. 9AEJ relayed an acknowledgment to 9UH and 9DKB via 9CSI. Telegraph and telephone communication resumed shortly after 6 P.M.

Due to extra heavy QRN practically all North Dakota traffic is handled during the noon hour and very reliable efficient routes have been worked out by 9DNX, 9CSI, 9AMP and 9AEJ. Message traffic going west is handled promptly through any North Dakota station relieving a situation that has bothered for some years.

Traffic: 9AEJ, 7; 9AMP, 30; 9DNX, 72; 9EBT, 18.

SOUTH DAKOTA: The new regulations put a stop to the usual after supper work so we must get the habit of getting up early or be on at noon for intra-state work.

9AGL, 9ABY, 9CKD, 9DEC, 9DID and 9AVZ have been on for work at times but lack regularity. The new fad is reaching down to the lower wave limit instead of crowding next to 200 which is the right spirit. 9CKT is doing excellent work in daylight. He reports being heard by Canadian 4HZ in broad daylight. This is quite a record, the distance being 987 miles, and in view of the fact that 9CKT uses only a so-called 5-watter. 9AYD was the best Sioux Falls station this month. 9BOF blew his 50-watter; with which he has hung up a DX record of 1250 miles.

Traffic: 9CKT, 98; 9AYD, 57; 9DKQ, 6; 9BOF, 107; 9DWN, 113; 9AGL, 75; 9DEC, 38; 9CKD, 31; 9ABY, 21; 9DUI, 8.

DELTA DIVISION W. W. Rodgers, Mgr.

TENNESSEE: 5KA has been appointed an O.R.S. 5CN, our latest relay station, is rapidly coming to the front.

Traffic: 5CN, 75; 5NT, 25; 5ANT, 72; 5KA, 54; 5ALV, 26; 5WO, 14; 5EK, 43.

MISSISSIPPI: New O.R.S. certificates have been issued to 5AGS, 5AGV, 5AKP and 5AIR. Traffic: 5KR, 50; 5AGS, 18; 5QZ, 40; 5AIR, 16; 5AKP, 14; 5AGV, 27.

LOUISIANA: Short waves are the talk of this state now and are cutting thru the awful QRN FB. Traffic: 5KC, 43; 5AAT, 35.

ARKANSAS: Traffic is rather low here due to shut-downs in several good stations. Traffic: 5ANW, 12.

EAST GULF DIVISION H. L. Reid, Mgr.

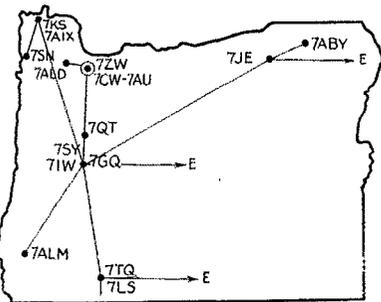
GEORGIA—Due to the summer static and the coming of school examinations for some of the amateurs there has been very little real message work and handling of traffic this month. Some stations have been on only one or two times during the month. Coupled with this, three stations have burned out tubes, and on account of bad weather conditions, have not been in any rush replacing them.

In LaGrange only one station, 4JD; Ashburn, 4PL, have handled any traffic. Three stations have been active in Savannah, there being only one station on 200 meters, 4DY. The other stations which

7ZL, 40; 7WP, 39; 7ZF, 37; 7IT, 34; 7KZ, 32
7EL, 16.

WASHINGTON—Conditions have been exceptionally good for this time of year. 7AF holds the honor of relaying most messages, is QSO all parts. 7AX comes next. 7NO has schedule with Alaskan 7AEB three nights a week, and is QRV for traffic going this way. 7AFE deserves mention for working two 3 stations in the same town in ten minutes. (FB) Yakima has awakened at last, 7MI being the new station. 7AFE, 7IH, 7AEZ, 7ADP, 7OY, 7MA, 7AEL, 7CA, 7ABF, 7FD and 7OO are holding down Seattle so ought to not be hard working there from now on. New stations 7HO, Sedro Wolley, 7ALI, Mont Vernon, 7IX, Selah, 7AEZ Seattle, shows hopes of being real active stations. Stations now having new O.R.S. certificates are: 7WS, 7FQ, 7FN, 7WA, 7NO, 7RC, 7BJ, 7FD; others will soon be issued but owing to small supply of certificates no more could be issued. The map will probably help out in giving an idea of the stations that are handling traffic. Many of these participate in being on throughout the summer.

OREGON—New O.R.S. certificates were issued to 7ABY, and 7AKK. Traffic is moving throughout the state with very few definite schedules. Stations can be heard, however, nearly every night in any part of



OREGON ROUTES

the state. 7AV seems to be the star message handler with 81 to his credit for the month. 7IW and 7ZW have a schedule on Mondays, Wednesdays, and Fridays at 6:30 P.M. Wavelengths used are near 150 meters for both stations. The most reliable stations in the north are 7CW, 7KS, 7ALD, 7AIX, 7AV, 7FY, and 7GV. Traffic to the eastern part of the state is moved through 7ABY. An important message from a U of O man to his folks in Portland was taken at 7IW, relayed to 7CW, foned, and an answer received back in less than 10 minutes.

Traffic: 7LS, 30; 7TQ, 22; 7FR, 11; 7MF, 10; 7ALD, 45; 7AKH, 13; 7AIX, 12; 7KS, 34; 7IW, 49; 7AV, 81; 7GV, 15; 7CW, 35; 7AIP, 6; 7ZW, 10; 7AKK, 25; 7FY, 21; 7UT, 9; 7JN, 6; 7PP, 3; 7ADM, 12; 7FD, 14; 7KY, 6; 7ACK, 2; 7GQ, 22.

IDAHO—7OB is about the only station in Southern Idaho handling traffic. 7OT is the only Boise station heard these days. 7GW of Pocatello is heard intermittently. 7ACE is doing good work in Buhl. 7QP is a new station in Kellogg. 7LN has had a lot of QRM on account of graduation from High School. 7IU at Blackfoot has been reaching out in fine shape.

ALASKA—The open season is now in full swing in the far north and ham life is better than ever in the history of Alaska. Stations active in traffic work are 7MN of Ketchikan, 7AIB of Anchorage out to the westward and 7AEB still farther west at Kukack Bay, Kodiak Island. All of these stations have been QSO the states many times during the month. 7KL is at Yes Bay. He uses spark but hasn't been able to work the states yet. He works other Alaskan stations with ease. 7NO, one of the reliable stations in Aberdeen, Wash. has a regular schedule with 7AEB and traffic between Alaska and the states is handled regularly. 7CF of Tacoma works 7MN at Ketchikan regularly.

PACIFIC DIVISION M. E. McCreery, Mgr.

Strengthening the organization in a few spots is taking a little time, but there will be no dead timber when we get through. Here and there is room for improvement and as fast as men can be found, they are being put into these places. The Pacific Division will be a top-notch before fall or we will know why.

QST FOR JULY, 1924

CALIFORNIA—Dist. No. 1: 6AVR-6ZBF is changing his QRA to Pennsylvania and we are losing a good station. 6BNY is using two 5'ers, but will change to a 50 before long. 6AWX and 6CIA continue to pound them out. 6ZH is now 6XBQ and will operate on about 100 meters.

Dist. Nr. 1A: 6KAD is busy fishing this time of the year and we don't blame him. There is a great difference between fishing for the giant Tuna weighing upwards of a hundred pound and the business of spending all day drowning worms one at a time and when one is lucky he might catch a fish that would make fair bait for a Tuna. So—we envy the Major!

Dist. Nr. 2: Los Angeles traffic slowed up considerably because of warm weather and QRN. 6BEG lost another stick and was forced out for a time. 6MH is out for lack of tubes. 6CBB and his 100 watt perking better than ever. 6AAO-6CHV has been troubled with "rectifieritis." 6BVG and 6KA-6XBC get out fine on short waves. 6AFG has moved out of the city and claims better reception. 6BRA has been out with a broken mast. 6AQD blew three 5'ers and was out on that account. 6CFM is getting out better with his new rectifier. 6BJR is reaching the east in good style. Some Sheba got hold of 6BWE. 6BDW is knocking 'em dead with lots of noise. 6MG and 6PL have some tests on with Australia. 6CMU is handling traffic in all directions. 6LJ got his 500 cycle outfit perking and gets out FB. 6CGS has a new antenna system. 6ALH has been on but seldom, as has 6CMS. 6ALF is trying to make his 5 watters act like 50's.

6BBW has been on consistently and works the east coast often. 6BUR has been changed from a 5 watt to a 250 watt. 6CIS works 1's and 2's every once in a while. 6BUW is a new 500 watt station.

The Long Beach traffic has fallen some. 6AKQ, 6JA, and 6CLR will be off the air for a while. 6WT is sticking up an 80' stick. 6CCW works along in spite of QRN. 6CAE is a new station. 6NE is held up for a new transformer. 6AUR is on once in a while. 6BQS is back from a short lay-off.

B. R. Coles has taken over districts 4 to 8, inclusive in California and will act as A.D.M. New appointments will be made when suitable men show themselves to be able to handle the jobs.

6CJV, operating only a few nights was heard in all districts and worked 3ME—using a pair of 5'ers. 6AME worked 2RR on a 5'er. 6NX has been on with phone, but hasn't handled much traffic. 6CEI and 6CIE are in Santa Cruz clearing traffic. 6ZAR-6TV is being removed to 6CMI for summer work. 6ZAU is rebuilding. 6ZAH is operating on short waves. 6BAB is off the air with a blown tube. 6NH is changing his QRA. 6APT is using 1/2 K.W. spark temporarily.

Traffic: 6BRA, 168; 6AJQ, 32; 6AQD, 102; 6BVZ, 2; 6BRO, 1; 6MG, 30; 6PL, 104; 6CLQ, 180; 6AAO, 122; 6JI, 2; 6AFT, 52; 6CMU, 50; 6CMS, 20; 6RF, 22; 6VC, 15; 6CNL, 57; 6BBW, 102; 6BUR, 28; 6CIX, 8; 6CDY, 3; 6COU, 4; 6AKQ, 3; 6AUR, 10; 6BQS, 12; 6CAE, 3; 6CGW, 50; 6CNH, 15; 6JA, 36; 6WT, 8; 6ZH, 48; 6CIA, 16; 6AVR-6ZBF, 10; 6BNU, 6.

ROANOKE DIVISION W. T. Gravelly, Mgr.

The gang in West Virginia are still suffering from effects of recent storm accounting for the lack of interest. 4SU has dalite sked with 4EA and 3BMN and arranging sked with 4RU. 4EA works dalite sked with 4BX. 4BX also has dalite sked with 3BMN and 4JR. 3BMN maintained his regular skeds with a lone UV-201-A working 600 miles. A map for Virginia is being prepared now and will appear later. 3DT will be closed for the summer and we wish to thank Mr. Henshaw for the good work done in getting this station on the air. We will need more men on this station next year. 3CKL is in shape to handle traffic south. The R.I. paid the State a visit recently and found a considerable improvement in wave lengths of all stations most of them being correct.

Traffic: 3CKL, 35; 3BFT, 45; 3TI, 21; 3CKK, 12; 3ATB, 2; 3BMN, 47; 4EA, 25; 4SU, 53; 4FT, 25; 4BX, 33; 4RW, 12; 8AMD, 9; 8BRM, 12; 8AGL, 3; 8ABQ, 6; 8CXM, 3; 8CQH, 15; 8AUE, 19.

ROCKY MOUNTAIN DIVISION N. R. Hood, Mgr.

9CAA—C.W.—262 Msgs.
C. E. Stedman, Denver

COLORADO—The only substantial traffic routes now open in Colorado are the East-West route through

trial Ontario in the A.R.R.L. and is very enthusiastic for the short waves. No doubt many of you during the past couple of months have heard the signals of 3CO signing off from the test room at Ottawa with a 240 cycle I.C.W. set. This set is the model of the one to be used on the Arctic. The circuit used is a Meissner; input will be between one and two kilowatts so that exceptional distances should be covered. 3CO to date from the Ottawa test room has been putting out tremendous signals, by far the loudest amateur signals that have ever come into Toronto and his input has only been about 500 watts.

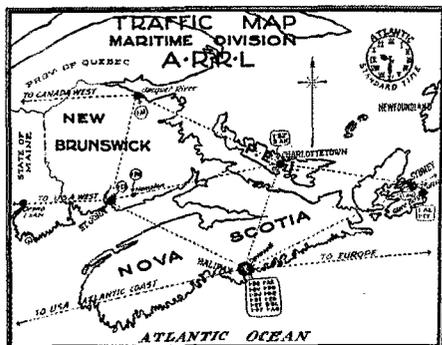
The ship is sailing on or about June the 25th so that he should be out of the Saint Lawrence River by the end of the month. Any change in schedule or wave length will be notified by publication and also by the regular broadcast system of the A.R.R.L.

Many amateurs have figured that if Mix had only been on 100 meters instead of 200 he would have had no difficulty in communication. We will now have an opportunity of testing whether this is the case. In any event Mix will at last have an outlet for the accumulated traffic of the past few months and no doubt Choat will be in touch with him by the middle of July so that by the time this issue is in the hands of the gang relayed traffic from the Bowdoin should be pouring in.

Now, fellows, let's go and show the B.C.L.'s that this is going to be a radio summer. Hi!

MARITIME DIVISION
W. C. Borrett, Mgr.

Traffic routes within the Maritime Division, ARRL, are possible now through the establishment of several new stations in the outlying districts during the past month. A map showing the routes to be



The most easterly A.R.R.L. District in America, the "Maritime Division" of Canada. Maritime Division A.R.R.L. includes New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland, and Labrador. Time used: Atlantic Standard Time (one hour ahead of Eastern Standard Time.) Only active A.R.R.L. stations shown on map. Traffic for Montreal or west, best route through u1XAH or c1AF. Halifax best for European traffic. All stations please make schedules with nearest traffic points shown on map. Also work direct, if possible, and shorten delays. Other divisions please study map.

followed is printed herewith, and all stations are requested to make schedules with the nearest stations to them on the map. The D.M. is pleased to state that he has made a trip to Yarmouth, N.S., and has taken up the matter of establishing an ARRL relay station there with two amateurs and this will complete the circle. Correspondence is going back

and forth with several Newfoundland Hams and before long it is hoped to have at least one station working the rest of the Maritime Division. Summer and daylight saving, are making it hard to keep up our usual pep in the division but nevertheless we still continue to bust records. 1AR has broken forth into prominence by having had his signals reported by a ham station in Los Angeles near Valparaiso, Chile, a distance worthwhile. 1BQ has done some splendid work and was within an ace of establishing another record for the division, when on May 23, he heard Argentine amateur CB8 calling A.R.R.L., but for some reason which he will never be able to explain he did not answer the Argentine station on about 120 meters. Next day to his great surprise the Canadian Press published the fact that this same CB8 had been copying him working U.S.A. stations. We hand him the "biseuit" or "raspberry" for this month to keep company with 1BV who pulled the same stunt with British 2OD some months ago. However, 1BQ has been working Canadian 4th district direct this month just to show us what he really can do. 1BT is suffering from college exam QRM. 1DJ can claim the best D.C. note in the division. His voice also is QRK in Hartford using his lone 202. 1AQ is a newcomer. The star for the month is 1DF who is also another newcomer in Halifax district. He has one 202, and is without doubt one of the best operators in the division. 1DD was in Hartford and other points for the best part of the month, and worked his division from the U.S.A. on every available night. In Cape Breton, 1AE has come to life and is QSA in all parts of the division and has filled a very important traffic route to Newfoundland. (PB, OM!) 8AW in Newfoundland is getting a set together and should be on soon. 9AK is one of the best Maritime stations now. 1BZ is back again. 1EI has new location and has a real good signal on the low waves. 1AF of Trans-Atlantic fame has succeeded in getting 1AB on the air. 1DN can also be heard doing his bit.

The two events of the month that caused considerable enthusiasm to be aroused around the division are the visit to the division of Mr. Gerald Marcuse, British 2NM, who talked to his brother hams in England by radiophone from 1BQ and the visit to the League Headquarters of the D.M., who worked several of the gang from 1XW, 1XAM, 1XAQ, 1XJ, and 1CKP.

Summer conditions are coming fast but the division hopes to keep its place of prominence by working VDM, the steamer "Arctic" (on the short waves) on his trip to the far North.
Traffic: 1AR, 28; 1BQ, 15; 1DT, 2; 1DJ, 3; 1AQ, 4; 1DF, 35; 1DD, 7; 1BZ, 2; 9AK, 18; 1EI, 2; 1AF, 4.

ONTARIO DIVISION
C. H. Langford, Mgr.

EASTERN ONTARIO: Ottawa is a center of activity with 3CO in the test room, 9CC as portable flivver radio, and 3AFP on general consistent work. 3HE trying to run a trans-Canada relay all by himself, nearly accomplished it when he gave a Calgary message to 1BQ within 30 minutes.

CENTRAL ONTARIO: Toronto was honored by a visit from British 2NM. The gang had the pleasure of entertaining him for a day. The star stations of the Kitchener-St. Thomas districts are 3ADU and 3ACO. The London stations have begun work on the clean up idea.

WESTERN ONTARIO: 3GN reports that the station is on the air every day at 12 o'clock for traffic. 3AEO is on the air Sunday mornings, only. 3BG, 9BJ and 9AR will be off the air for a short time. Summer is with us as we know but keep on the lookout for the good nights and above all don't forget Choat as VDM up north.

Traffic: 3WV, 16; 3AEC, 54; 3BG, 10; 3GK, 8; 3KQ, 12; 3OH, 21; 3LY, 44; 3ACU, 10; 3CO, 15; 3XN, 10; 3ACO, 105; 3GQ, 34; 3XX, 51; 3VH, 47; 3WG, 44; 9BJ, 11; 9AL, 66; 3GN, 2; 9AR, 28; 9BW, 22; 3XL, 16; 3YV, 29; 3KO, 30; ADU, 56; 3YH, 18; 3BQ, 42; 3HE, 102.

QUEBEC DIVISION
J. V. Argyle, Mgr.

Official Relay Stations in this Province are 2BG, 2BE, 2BN and 2CG. Messages for Halifax or Europe should be routed through these stations exclusively as they are always on the low wave. 2BE will always be found on 135 meters and 2CG on 127 and they listen on the band 105 and 150 meters.

A reliable schedule with Winnipeg is carried out on Wednesday and Saturday nights at Midnight E.S.T. Route western Canada traffic this way.

(Concluded on page XVI)

Calls Heard



When preparing a list for QST, it is essential to observe the following rules:

1. List the calls neatly on a separate sheet of paper with a line of space between lines; do not embody them in a letter.
2. Arrange the calls as they will appear in QST: across the page, numerically by districts, alphabetically in each district, Canadian and foreign calls listed separately, state whether spark or C.W., and give period of time covered by the list.
3. Forms close on the fifth of the month preceding the date of issue of QST. Make your lists cover the period from the first of one month to the first of the next if possible, but don't let your list come in late.
4. List only calls over 500 miles distant.

HEARD DURING MAY unless otherwise specified

L. H. Fitzgibbon
38 Trewine Rd., Wimbledon, S.W. 20, London, Eng.
1aac, 1ael, 1aje, 1ajw, 1alw, 1anr, 1aur, 1avf, 1ayl, 1cak, 1emp, 1iu, 1xi, 1xu, 2bwb, 2cla, 2cnk, 2cpd, 2cxl, 3ccu, 3cdn, 3hh, 3me, 3vh, 3we, 3do, 3avd.
Can.: 1ar, 1bq, 1dj, 1dt, 1eb, 1ef, 2cg, 3bj, 3bq, 9ak.

W. R. Burne, 2KW
Springfield, Thorold Grove, Sale, Cheshire, England
1aja, 1aw, 1bfc, 1cmp, 1cpn, 1cpv, 1eb, 1er, 1sw, 1xaa, 1xah, 1xak, 1xar, (1xaw), 1xj, 1xw, 2csl, 2xah, 2xar, 3bg, 3idt, 3kq, 3gk, 3mb, 3ot, 3ws, 4io, 4xe, 4xx, 8YV, NKF.
Can.: 1ar, (1bq), 1dj, 2bn, (9bl).
Italian: (acd), (1er), (imt).
Danish: (7zm), (7ec).
Luxembourg: (oaa), Holland: (ony), (oba).
Belgium: (w2), (p2).
France: 8du, 8aq, 8bm, etc.

Frederick L. Hogg, 2SH
37 Bishop's Rd., Highgate, London, England
1aac, 1aja, 1ajp, 1avf, 1axn, 1dz, 1xah, (1ber), 1xu, 1xj, 2cxl, 2cqx.
Can.: 1ar, (1bq), 1dd, 2be, 2bn, 2cg, 9ak, 9al.
Hv to QRT till middle June. Pse QSL if you've hrd me. Will do same.

R. L. Royle, 2WJ
"Southold" Alderman's Hill, Palmers Green, London, England
All received with Dec. 1 L.F.
(April 20th—May 20th)
1aac, 1aar, 1abs, 1ael, 1ann, 1ka, 1rb, 1sf, 1xah, 1xak, 1xam, 1xaw, 1xj, 1xw, 1xu, 2adk, 3cdn, 3wg, 3yo, 8pl, wvw.
Can.: 1ar, 1bq, 1dd, 1dt, 1ef, 2ru, 2be, 2bn, 2cg, 2jd, 9ak.
Phone: c1bq.

F. W. Higgs, 5KO
45 Howard Rd., Westbury Park, Bristol, Eng.
April 18th to May 25th
1xah, 2cci, 3xar, (qra?), 4xe, 8xs.
Can.: 1eb, 1ef, 9ak.
Argentine: cb8.

W. G. Dixon, 5MO
"Dipwood," Rowlands Gill, Newcastle-on-Tyne, Eng.
(May 1st to 15th)
1afn, 1aja, 1xw, 1xaa, 1xah, 1xak, 1xbb, 1xib, 3idt? 4ku, 4xx, 8afu.
Can.: 1ar, 1bq, 1dj, 1eb, 4co.
NKF vy qsa on Reinartz & one step.
Pse QSL to 5MO for Crd.

S. K. Lewer, 6LJ,
32 Gascony Ave., West Hampstead, London N.W.6., England

(April 13th—May 18th)
(Receiver; Det. & one step A.F.)
1aac, 1aar, 1abf, 1act, 1act, 1ah, 1aja, 1akl, 1alk, 1ali, 1apr, 1aqr, 1are, 1arx, 1auw, 1avf, 1awf, 1awh, 1awv, 1baa, 1bcr, 1bep, 1bgs, 1bgt, 1bgq, 1bhm, 1bjm, 1blb, 1bne, 1cap, 1cib, 1ick, 1lco, 1lce, 1cpf, 1csl, 1ct, 1dz, 1eq, 1er, 1gv, 1il, 1qx, 1sa, 1se, 1um, 1xa, 1xap, 1xu, 1mb, 1ml, 2adk, 2ag, 2ama, 2anu, 2avg, 2awe, 2az, 2bgo, 2bl, 2buy, 2cjr, 2ck, 2cpf, 2cpv, 2cpr, 2crw, 2cw, 2cvi, 2cx, 2cxl, 2cxw, 2cxz, 2dn, 2ei, 2em, 2gu, 2hk, 2kd, 2ki, 2kr, 2ku, 2pv, 2rk, 2rw, 2sw, 2vf, 2vw, 3aqy, 3auv, 3bay, 3cjn, 3hh, 3me, 3oh, 3ws, 3xar, 4an, 4sh, 4xc, 4xf, 8abi, 8abs, 8alf, 8amr, 8apt, 8avl, 8bbf, 8bfe, 8bkd, 8cgu, 8ck, 8cuu, 8dm, 8dda, 8fc, 8ir, 8qa, 8xs, 8za, 9ahz, 9bib, 9dk, 9elb, 9iv.
Can.: 1aq, 1dt, 1ef, 2cg, 2hn, 9ak, 9cf.
WAB. WNP on 20th and 28th Jan. Hrd 73 U's and C's on April 18th!
My total nw 532! Pse QSL. All crds answered.

F. D. Bell, 4AA
Palmerston South, New Zealand
During Feb. and Mar. on detector and one step:
1aac, 1all, 1bsz, 1cmp, 1cpn, 1yb, 2cgb, 2rk, 2brd, 3ccx, 3hs, 3if, 4my, 5aj, 5ajb, 5alr, 5av, 5be, 5bx, 5ht, 5lr, 5nk, 5nw, 5tj, 5vw, 5zav, 6aac, 6agk, 6akz, 6aoj, 6apc, 6aq, 6arb, 6avj, 6axr, 6awq, 6bh, 6bm, 6bs, 6bdi, 6bc, 6bid, 6bf, 6bj, 6big, 6bn, 6bq, 6brf, 6bwv, 6cn, 6cax, 6cay, 6cbg, 6ccy, 6cdg, 6cdn, 6cf, 6cgv, 6cjh, 6cka, 6ckr, 6cmr, 6cnu, 6cng, 6eb, 6gt, 6ip, 6pl, 6qj, 6rn, 6ze, 6zt, 7ael, 7bj, 7co, 7fd, 7fq, 7fr, 7ga, 7hl, 7th, 7ob, 7qd, 7so, 7ta, 7vn, 7zu, 8aa, 8acy, 8apt, 8at, 8azm, 8bgj, 8bhn, 8byn, 8cv, 8die, 8es, 8jo, 8ka, 8pl, 8ry, 8vy, 8xbf (115 meters), 8yd, 9aco, 9afm, 9aim, 9ash, 9atn, 9awf, 9azg, 9bd, 9bc, 9bt, 9bj, 9brk, 9bxa, 9ca, 9cdn, 9odv, 9ogu, 9cjc, 9cjj, 9cly, 9cpo, 9cpz, 9ctv, 9dro, 9eky, 9g, 9mc, 9zy.
Can.: 3bq (123 meter), 4xc, 5go, 9bp.
Phillipine: 1za, Manila.

Abbe Le Boy
Neuvy-en-Beauce, per Janville, Eur et Loir, France
April: 1bvl, 1dz, 1xah, 1xj, 1xz, 2adk, 3xar. Can.: 1af, 1bq.
May 10th; 6xa? (probably 6xad) working with 9bfq between 5 and 6 a.m. GMT. 16th; 8xh, (for 8xes) working with 8xa??. Text of messages generally good, but calls badly sent. So many stations heard are not identified for this reason. Am listening from 100 to 125 meters 5 to 6 a.m. GMT. QSL to all cards rec'd.

Juan E. Chibas, 8GT
G. Portuondo baja 12, Santiago de Cuba, Cuba
1cmp, 1xak, 1xu, 2ach, 2bxd, 2cee, 3ahp, 3cjn, 3ot, 3yo, 3zo, 3xar, 4zy, 4er, 4fs, 4ft, 4iu, 4iz, 4je, 4jy, 4z, 4kk, 4oa, 4pb, 4pk, 4pt, 4q, 4w, 4y, 4rr, 4tf, 4ua, 4xe, 4xr, 4xx, 5amh, 8cqh, 5xbp.
Cuban: 2by.
WGY, KDKA on 100 meters.
1BGF Tuner & 1 a.f. used.

Can. 4EA, Winnipeg, Man.
1aac, 1aur, 1bbo, 1bsz, 1cib, 1ckp, 1ctp, 1fs, 1kc, 1sn, 1yb, 2azy, 2atf, 2atz, 2agq, 2bqb, 2bxd, 2brb, 2bxc, 2crb, 2cee, 2cxy, 2cla, 2cpd, 2cu, 2ts, 2rk, 2le, 2pd, 2wr, 2gk, 2cpa, 3bdi, 3bva, 3cdk, 3hh, 3wf, 3agr, 3ade, 3hs, 3mb, 4rr, 4hs, 4gz, 4sc, 4gu, 4ba, 4kl, 4my, 4oa, 4og, 4pk, 4io, 4dv, 4xc, 4ft, 4bz, 4ll, 5ap, 5or, 5amh, 5ph, 5ul, 5lr, 5tc, 5qh, 5aw, 5anc, 5pg, 5ts, 5au, 5zav, 5kc, 5jl, 6buy, 6cka, 6apc, 6ajh, 6arf, 6aao, 6ahp, 6cix, 6agk, 6cm, 6pl, 6cef, 6bdt, 6cmr, 6cgv, 6rn, 6lv, 6bic, 6bcl, 6avr, 6ea, 6zt, 6avv, 6alu, 6bra, 6bso, 6bik, 6aja, 6apw, 6rs, 6nx, 6bij, 7ws, 7co, 7dt, 7ajt, 7vs, 7fd, 7fq, 7au, 7afu, 7agi, 7acz, 7un, 7ew, 7ahv, 7wp, 7adq, 7agv.
Spark: 8tj, 9cs, 9edh, 9ees.
Can.: 1ar, 2bn, 2bg, 2cg, 3kz, 3ws, 3xi, 3bg, 8gg, 4ab, 4dq, 4gt, 4io, 4eo, 5ef.

Can. 5AY, River Jordan, B.C.
(40 m. W. of Race Rocks)

5rg, 5vo, 6adt, 6age, 6agk, 6akw, 6awl, 6arp, 6asv, 6avr, 6avj, 6awe, 6bdt, 6beo, 6bjw, 6bou, 6buh, 6bur, 6cbb, 6cdg, 6che, 6chl, 6cjb, 6clq, 6cqi, 6crr, 6cw, 6gl, 6kw, 6pl, 6rf, 6rm, 6ts, 6old, 9cju, 9eet, 9ua, 9zt, 7ahs, 7aw, 7hm.

Can.: 4aa, 4ab, 4ic, 4io, 5ch.

IAAP, Westerly, R. I.

(April and May)

4af, 4ai, 4do, 4jd, 4js, 4my, 4oa, 4sh, 5amh, 5ant, 5mo, 5pl, 5wi, 5zas, 8ak, 8aib, 8aro, 8axf, 8bmb, 8bmt, 8bse, 8bse, 8bse, 8cgr, 8cmu, 8dbm, 8dff, 8fu, 8ri, 8yx, 9aue, 9aka, 9baz, 9bcs, 9bjl, 9bjy, 9bmu, 9brx, 9brz, 9buk, 9zk, 9cip, 9dbj, 9dct, 9dro, 9dsv, 9dtn, 9dvw, 9em, 9elb, 9eoy? 9tg.

I AWE, Providence, R. I.

(5dj). 5aam, 5agv, 5air, 5aiy, 5ait, 5akd, 5ap, 5cn, 5dw, 5ek, 5in, 5ka, 5kq, 5lr, 5ph, 5qi, 5ue, 5ut, 5vu, 5xau, 5zai, 6adt, 6agk, 6ahp, 6apw, 6bbw, 6bra, 6brl, 6cdg, 6cgo), 6ea, 6gp, 6gt, 6ih, 6pl, 6ri, 6vd, 6zp, 7fa, 7iw, 7to, 9aau, (9aec), (9agl), 9aju, 9ag, 9aoj, 9aok, 9ars, 9ayd, 9bhn, 9bqy, 9cfr, 9cgs, 9ctr, 9dfz, (9dga), 9dlz, 9dmj, (9dp), 9dvw, (9dww), (9dxi), 9eb, 9efu, (9egw), 9eky, 9ih, 9ss, 9su, 9zt.

Can.: 2cb, 4af, 4fn, 4fz.

IBFS, 120 Myrtle St., Claremont, N. H.

4nr, 5mi, 8biq, 8bnh, 8buk, 8byb, 8cmh, 8dgo, 8dgr, 8die, 8dpo, 8rv, 8xkb, 8yn, 9diz, 9dqr, 9kd.

Can.: 1ae, 3gg, 9ak, 9bw.

2WZ, Brooklyn, N. Y.

4dv, (4dy), 4eb, 4z, 4kt, 4oa, 4qf, 4tj, 5aw, 5air, 6ea, 6gh, 6xp, 6amw, 6apw, 6cgv, 9eg, 9aau, 9baz, 9bmu, 9bna, 9ecw, (9cee), 9cii, 9czm, 9dbj, 9dls, (9dvw), 9dxl, 9ell.

Can.: 1ar, 1bq, 1dd, 2az, 2bn, 3bd, 3fc, 3he, 3ly, 3ml, 3ms, 3oj, 3wg, (3adn), 4fz.

3AJG, Powhatan Breeden III,

105 N. Linden St., Richmond, Va.

(March and April)

4bq, (4by), 4cp, 4er, 4mb, 4og, (4it), (4ma), (4gw), (4rf), 5agb, 5air, 5asg, 5ajg, 5am, 5bx, 5cn, 5st, 5mi, 5zw, 6aao, 6abk, 6ash, 6ajh, 6akz, 6alk, 6arp, 6abr, 6bel, 6cgv, 6cip, 6cjj, 6xad, 6bm, 6ei, 6rn, 6ut, 7acm, 7adi, 7ajd, 7aps, 7bi, 7co, 7io, 7ob, 7ot, 7sf, 9abf, 9afz, 9agb, 9ajd, 9apd, 9awp, 9aws, (9baz), 9bdm, (9bgh), 9bis, (9bmu), 9bpt, 9bqy, 9brk, 9brw, 9ccj, 9cde, 9cfl, 9cgr, 9eno, 9ecw, 9erl, 9eyw, 9dct, 9dry, 9ear, 9eii, 9xrw, 9ck, 9co, 9df, 9ei, 9ek, 9mn, 9qw, 9xi, 9yy, 9xaw, 9xax, 9xv, 9zt, 9yau.

I.C.W.: 5cn, 5qd, 5aki, 5aep, 7rr, 7el, 9ccs, 9aef.
Can.: 4cl, 4co, 4dq, 4fv, 4hh, 9al, 4cw.

3HS, Washington, D. C.

5aaq, 5aas, 5aaw, 5afc, (5agv), 5ahd, 5aiu, (5aiy), 5aib, (5aig), (5ajt), (5anf), 5aw, 5cn, 5ev, (5dm), 5dw, (5gr), 5ib, (5jb), 5il, (5mi), 5ut, 5nw, (5pa), 5ph, (5qd), 5qh, (5rg), (5rv), 5sk, (5ut), (5xau), 6aao, 6abk, 6adt, 6age, 6arg, 6ahp, 6ajf, 6akw, (6alk), 6apc, 6arp, (6aad), 6arb, 6aru, 6atz, 6avz, 6avv, 6bau, 6bbe, 6bbw, 6bel, (6bdi), (6bdt), 6bez, 6bh, 6bic, 6bji, 6bjg, 6jk, 6bql, 6bos, 6bra, 6brf, 6brk, 6brv, 6bui, 6buo, 6bur, (6cbs), 6ccy, 6cdk, 6cdn, 6ce, 6cef, 6cej, 6cfz, (6cgv), 6cix, 6civ, 6cmr, 6cns, 6ea, 6eb, (6gt), 6iv, 6ij, 6jk, 6lv, (6nb), 6of, (6gl), 6tm, 6tu, 6vw, 6xbc, 6zah, 6zp, 7abb, 7aci, 7ael, 7afe, 7afz, 7agf, 7aiv, (7akh), 7akk, (7ald), 7bj, 7ey, 7fd, 7fa, 7fr, 7fs, 7go, 7gq, 7ar, 7ih, 7it, (7iw), (7jn), 7lu, 7ly, 7ot, (7to), (7wp), 7xaf, 7zu, 9aau, 9abc, (9adg), 9aep, 9afy, 9agb, (9ahq), (9ahz), 9aic, (9alc), (9amx), 9axs, (9ayj), (9ayx), 9baz, (9bed), 9biw, 9biz, 9bki, 9bko, 9bon, (9bpu), (9bre), 9bsi, 9bit, (9bve), (9bxw), (9caa), (9caj), 9cew, 9cdi, 9cdo, 9cdv, (9cea), (9cee), 9cgr, 9czh, 9chc, (9cho), 9cim, 9ckh, 9cmk, (9ctg), (9cvo), (9evv), 9dct, 9dvw, 9ddq, (9dim), 9din, (9dng), 9doe, (9dls), 9dvw, 9dwb, 9dxu, 9dy, (9ebh), (9egt), 9gcu, 9eiy, 9eld, 9eli, 9ej, 9hm, (9ld), 9lz, 9oj, 9rc, 9rj, (9y), (9xbf).

Can.: 1bq, 1cp, (2cg), 3jt, (4bk), (4dq), (4fz), 4hh, (9ak).

English: 2nm, 2od.
Mexican: bx.

4IT, Spartanburg, S. C.

6cdg, 6ja, 6mi, 6qk, 6th, 7bpm, 7fo, Pse QSL card.

5AFF, Chattanooga, Tenn.

1aac, 1ace, 1all, 1cpn, 1xak, 1xap, 1xar, 2be, 2cx, 2el, 2ju, 2kx, 2amb, 2asm, 2cc, 3hh, 3ly, 3auv, 3azy, 3cez, 3bqp, 4cp, 4mi, 4qf, 4sh, 4tf, 4xc, 4xw, 5cu, 5ka, 5lr, 5sg, 5aac, 5xac, 5zas, 6lv, 6ol, 6uz, 6ape, 6bur, 6cmr, 6enn, 7co, 7du, 7fq, 7to, 7lu, 7ald, 7ayd, 8we, 8bhk, 8bmd, 8dl, 8djj, 8xah, 8zcd, 9bk, 9es, 9wu, 9aaw, 9ail, 9eel, 9eic, 9dy.

QST FOR JULY, 1924

5ANF, 202 Cloworth Bldg., Enid, Okla
(Det. only)

1alj, 1are, 1bie, 1biz, 2iu, 3bpp, 3nr, 4amu, 4eb, 4dc, 4jr, 4my, 4p, 4pb, 4tn, 5aam, 5abn, 5ail, 5amb, 5cg, (5uk), 5xbh, 5za, 6aao, 6aur, (6avr), 6bau, (6bur), 6chv, 6eb, 6bz, 7co, 7cq, 7zu, (8adg), 8anb, 8atc, 8aut, (8bce), 8bch, 8cab, 8eci, 8cwk, 8czi, 8dhs, 8do, 8er, (8fu); 8jt, 8yx, 8zc, (8zk), 9abk, 9aby, 9adu, 9aep, 9agl, 9ahj, 9ajg, 9ak, 9ami, 9amp, 9amz, 9aqd, 9ayx, 9azr, 9bdq, 9bfa, 9bib, 9bmd, 9bmu, 9bmx, 9bof, 9bqv, 9bqy, 9br, 9brb, 9brl, 9bvu, 9bxv, 9bxw, 9caj, (9ccb), 9ccd, 9ce, 9cen, 9cfr, 9cqv, 9civ, 9cju, 9clx, 9daj, 9daw, 9dbq, 9dcp, 9der, 9dkq, 9dwm, 9dp, 9dro, 9dsv, 9dwn, 9dww, (9ebt), 9ef, 9efz, 9egt, 9eic, 9eij, 9eiy, 9eli, 9elq, 9elv, (9le), 9no, 9pe, 9rc, 9rf, (9rx), 9tv.

Can.: 4er.
CYI, QRA?

5ANV, 880 Pearce St., Memphis, Tenn.

1axn, 1xb, 1azr, 1ze, 2aoy, 2bab, 3acy, 3ath, 3bnu, 3bof, 3bec, 3byu, 3cg, 3tr, 4az, 4dq, 4er, 4ic, 4jr, (4jd), 4kk, 4ll, 4my, 4rz, 4ru, 4su, 4tj, 5abw, 5abj, 5adv, 5ahp, 5ail, 5ajg, 5ajj, 5akn, 5all, 5amg, 5amk, 5zav, 5ae, 5ah, 5in, 5jl, 5lh, 5lr, 5pk, 5qd, 5ql, 5rg, 5sd, 5sz, 5to, 5va, 5za, 6aja, 6abx, 6aib, 6amb, 6anf, 6apt, 6atc, 6bjy, 6bka, 6bmt, 6bho, 6bvp, 6cei, 6cmu, 6cpg, 6cqh, 6cxi, 6daa, 6dad, 6dbm, 6deo, 6diz, 6dmx, 6st, 6ah, 6do, 6es, 6fm, 6gv, 6km, 6ku, 6wo, 9aag, 9aaw, 9aik, 9aim, 9ajv, 9app, 9aqn, 9arf, 9arp, 9att, 9avz, (9axb), 9bay, 9bdb, 9bis, 9bmb, 9bof, (9btd), 9cfk, 9cii, 9cmx, 9com, (9col), (9epz), 9cyu, 9cyw, 9day, 9dbq, 9dzc, 9dib, 9dlv, 9drs, 9dsv, 9dtg, 9eal, 9egv, 9elb, 9eno, 9ad, 9ff, 9lm, 9nu, 9ua, 9ur, 9wo.

6VD, Anaheim, Calif.

1awe, 1ka, 1xak, 2cdp, 2ce, 2xq, 3adb, 3ahp, 3atb, 3bei, 3cin, 3ekj, 3gc, 3hh, 3p, 3xaq, 3xar, 4dq, 4fs, 4kx, 4my, 4qf, 4ql, 4su, 4xe, 5at, 5aq, 5akd, 5amg, 5dw, 5ez, 5er, 5in, 5iu, 5lr, 5na, 5nk, 5pp, 5ps, 5qi, 5qy, 5rv, 5ua, 5ue, 5vm, 5zd, 5xbh, 5aih, 5aiz, 6apy, 6axf, 6bk, 6bmb, 6brm, 6bhn, 6cei, 6czi, 6cgs, 6cmv, 6cun, 6cwr, 6dqa, 6do, 6kg, 6rn, 6st, 6se, 6yd, 6zc, 6zz, 9aau, 9aaw, 9aec, 9ahz, 9agl, 9aim, 9amb, 9ap, 9apr, 9awv, 9bal, 9bjk, 9bkl, 9bmu, 9bnu, 9brt, 9bun, 9bxm, 9caa, 9cdo, 9cdv, 9cen, (dalite), 9ek, 9cjm, 9cqv, 9eoz, 9cyw, 9daw, 9ddp, 9dip, 9diz, 9dni, 9doo, 9dqu, 9dte, 9dun, 9dvw, 9dwn, 9dwa, 9dxy, 9dxr, 9eca, 9ego, 9ehq, 9ev, 9elb, 9eli, 9elw, 9lz, 9rc, 9xbf.

Can.: 3bq, 4er, 4hh?
KDKA, WGY on 100 meters. Use lmo low loss tuner and 1 stig a.f.

6AHP, Pomona, Calif.

1afa, 1afi, 1aur, (1are), (1awe), (1bie), 1boa, (1cmp), (1fs), 1ih, (1ka), 1xah, (2agb), (2atf), (2afp), 2bcm, (2bb), (2bkd), 2cee, (2cia), (2coz), (2eve), 2ewj, (2ewo), 2cxl, 2xna, 3abw, (3bva), 3ckj, 3gw, (3hg), 3me, (3qv), 3ws, 4cn, 4eq, 4hh, 4kl, (4my), 4pk, 4qf, (4sh), (4xc), (6any), (6ceu), (7mn), 8abx, (8ada), (8bpa), 8brc, (8byn), 8cxi, 8cxm, (8cyj), 8pl.

Can.: (3aec), 3ly, 3oh, (3pz), (3uj), (4co), (4fz), (4civ), (4cn), 4eb, (4fv), 4oi, 4er, (5as), (5hg).

6BUR, Whittier, Calif.

1are, 1aur, 1br, (1bsd), (1cmp), 1cpm, 1cpn, 1ka, (2agb), 2bxx, 2cdp, 2cu, 2iv, 2kf, 2rk, 3ab, 3abw, 3aec, 3ava, 3bk, (3mo), 3qu, 3ws, 3wx, 4ba, 4bk, 4bx, 4eb, 4io, 4kl, 4my, 4pk, 4xc, (6ado), 8abm, 8abx, 8aig, 8apw, 8amv, 8axk, 8bch, 8bfn, (8bpa), 8bul, 8zxc, 8bzy, 8caa, (8cci), 8cd, 8eel, 8czi, 8cgy, 8cmv, 8cmx, 8cvi, 8dae, 8dat, 8dek, (8dgp), 8dhs, 8djd, 8doe, 8kc, (8xy), 8yv, 8xe.

Can.: 4dq, (4cb), 4io, 5as, Pone: 5akf.
Foreign: bry?? qra?

7AKK, 592 E. 49th St. North, Portland, Ore.

2brb, 3ahs, 4xc, 4io, 5mb, 5na, 6aja, 6buh, 6cbu, 6edg, 6cob, 6err, 6ers, 6zp, 7ahb, 8vn, 8xaq, 9afu, 9amb, 9bly, 9xaw, 9zt.

No lists were received from the eighth district this month.

9DNG, Lawrence, Kansas

1aac, 1afa, 1ame, 1are, 1arv, 1aur, (1bdx), 1bie, 1cmp, 1cpn, 1ka, 1kr, 1pl, (1wr), 2blm, 2tr, 2cee, 2cxw, 2cdp, (3gc), 3cfn, 3buy, (3apv), 3ccx, 3cr, 3hs, 3bal, 3ckl, 3auv, 3ti, 3h, 4kl, 4f, 4xc, 4bk, (4dv), 4fg, 4t, 4rr, 4iz, 4tf, (6bul), (6bur), (6bd), 6gt, 6cgv, (6amw), 6is, 6or, 6apw, 6anp, 6nx, 6bel, 7qc, (7ry), (7zu), 7lu, 7to, 7hf, 7agi, 7co, (8cbx), (8dt), (8dnf), (8anl), (8dep), (8sv), (8cd).

(Concluded on page XVI)

Radio Communications by the Amateurs

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



Watch Your License

DEPARTMENT OF COMMERCE
BUREAU OF NAVIGATION
WASHINGTON

May 1, 1924.

American Radio Relay League,
Hartford, Conn.

Sirs:

The Bureau has received a large number of reports of amateurs operating on wave lengths below 150 meters in violation of the terms of their licenses.

In some of these cases the amateurs have admitted doing so and gave as their excuses that they had received information that there was no objection to their using any wave length they desired below 200 meters. This is an erroneous impression and should be corrected.

In some cases it appears that the amateur reported did not violate the terms of his license but was received on his first harmonic. This condition is not confined as you know to amateur stations only but the amateurs should make every reasonable effort to eliminate such harmonics.

The Bureau is satisfied that a very small percentage of the amateurs knowingly violate the law but where they are found to be doing so and are notified of this fact and the violation is repeated, it is necessary that they be restrained through a suspension of their license in order to not only carry out the intent of the law but to protect the law abiding amateurs.

Respectfully,

D. B. Carson, *Commissioner.*

R OK Tnx Vy OMs

EXECUTIVE RADIO COUNCIL,
SECOND DISTRICT, INC.
120 LIBERTY ST.
NEW YORK CITY

May 14, 1924.

American Radio Relay League,
Hartford, Conn.

Gentlemen:

In accordance with a vote taken at a regular Council Meeting held April 29, 1924, The Executive Radio Council, 2nd District, Inc., approved and endorsed the ideals and standards of the American Radio Relay League.

(signed) W. J. Howell,
President.

Do We Need A Business?

1049 Dufferin St.,
Toronto, Ontario, Canada.

Editor, *QST*:

In the last *QST*, I observe this question asked, one that I have asked myself many times. It has been a matter of question to

me for some time. While I delivered every message that I received, and QSRd as many as I could, still I often wondered if they were worth while. What did they mean, and did they have any value, intrinsic or otherwise? I have no doubt whatever that valuable messages could be and are handled, but from my observation 99% of the messages I hear seem to have very little interest or value to them. At the end of the month we have a nice little total of messages handled. Just what good have they done? Personally I like to judge the results by new stations worked, and new distances covered.

But far more valuable to me have been certain *conversations*. While at 9BJ, I was the first Toronto station ever to work c3GG. After taking some messages from him, we engaged in a real chat. For one hour and fifteen minutes we talked as though we had known each other for years. Letters resulted and more long chats. I worked him three times, running up a total of over five hours. In this working time many stations could be worked or many messages handled. However, these chats established a friendship. Is that worth while? Before very long I am going up to see 3GG, and camp there for the whole summer. Could handling any number of messages have produced the same results? A thousand times NO!

In addition to this chat, I have often had short parlies with DX stations. When 1MO worked f8AB, suppose Deloy had said "QRU CUL 73" as do most stations we work, would either of these two operators had the same feeling of satisfaction or pleasure as they did after their "chat"? True, they would have covered the same mileage, but how about the friendly spirit? Which counts most: messages handled or friendliness?

—Gordon E. Pipe

Something to Think About

Lenox, Mass.

Editor, *QST*:

In a well organized and interesting life, a man has his business in which he is thrown with other business men, and his recreation in which he relaxes from the routine of his work and enjoys himself with congenial acquaintances. In business a man likes others who have a system and organization in their work which brings results and keeps things in readiness to do big things when opportunity offers. Outside of business hours, a man chooses for his friends those who share his interests and are pleasant to talk to. If he sticks always to business he becomes narrow and uninteresting. The condition of things on

the air in amateur radio is somewhat analogous to this.

In the past few years, the A.R.R.L. has had a job to do in the way of organizing a dependable relay system. This has been done, and we have a system which is always ready to do business, and organize promptly when sudden opportunities such as long distance tests and storm relief work come up. The experimenter is the technical adviser and efficiency expert, and the O.R.S. is the business man.

The trouble is that the business man has only one side to him. When business is dull, the general trend of conversation is, "ge om nil hr if QRU cu agn 73 gn," and that's all. It is a pleasure to hear a perfect relay machine working on the air, but when there is nothing to relay, the station and the operator are nonentities. What we need is the pleasant acquaintance for the hours of relaxation. The man with whom we can have a pleasant conversation about nothing of any great import. The man we get to know on the air and like for his personality as well as his efficiency. Some operators are nothing but machines, so let them remain the O.R.S.'s, but let's have something similar to an O.R.C.—Official Rag Chewer. The greatest compliment a man could be paid would be to have him a member of good standing in both. A man who is efficient in business and pleasant to talk to in recreation. Can you call your apparatus, on which you have spent many hours of hard and interesting work and concentrated your greatest efforts, a machine? To the real ham, his apparatus—his tubes, his antenna, his tone, all have personality, but to someone else who hears QRU hr cu agn 73" there is no element of this. Make others feel your personality and the personality of your set as you feel it when you hear your tone or see your ammeter go up. Goodfellowship is what the League needs—not only in Conventions, but in every dot and dash on the air.

—Harris Fahnestock,
1BBO-1XAS.

Our Business

209 3rd Street,
Oakmont, Pa.

Editor, *QST*:

The reference, in the March issue of *QST*, to the diminishing rate of message traffic and the editorial comments thereon will no doubt arouse the serious consideration of the more thoughtful relay men. According to our way of thinking the "bright side" as referred to, is the side upon which stress should be laid. For sometime past we have looked with disfavor upon the League policy of giving credit to stations according to the number of messages handled. We believe this to be entirely wrong.

Anyone who knows, and is inclined to be honest about it, will admit that a very large majority of the messages which go to swell the message total of those stations specializing in breaking traffic records, are of practically no importance, being in most cases improvised for the very purpose of increasing the message total.

This has two very bad effects. The first

and most important is that it lessens the respect of the community for the A.R.R.L. service; and that's saying a whole lot. We can talk to an outsider about the number of messages handled per month and show him the lists in *QST* but one message from him, delivered to a friend of his, even only a hundred miles away, is of more value than a hundred "pad" messages. The second effect is that of loading the air with QRM. It is questionable if the activities of the CQ hounds will ever be suppressed to a much greater extent than at present, in view of the persistent efforts of *QST* in the past to do so, but if the "no-account" messages were eliminated there would be more room for "our business," whatever it is.

We believe that it is generally admitted that the privileges of the amateur are his because of the A.R.R.L. At any rate it is a fact. The continued enjoyment of these privileges and the meriting of others is to a great extent dependent upon our ability and willingness to be of a greater service to those outside the A.R.R.L. We are speaking now from the standpoint of the ordinary station.

Let us consider one or two things. First suppose we change the form of the O.R.S. report. Instead of blanks for messages received and sent, let us count only messages delivered, by mail, by fone, or in person. Now say that we assign a numerical value to messages delivered by mail (1) fone (2) and in person (3) either by radio to the addressee or actually in person, and give the station credit on that basis, laying stress on the messages actually delivered. Note that omission of credit is made on messages relayed between stations. This is as it should be. We know that a great many messages are given to any station that will take them, in order to clear the hook, inasmuch as the credit is the same as though the traffic were well routed.

Then let each station try to arrange two or three definite points of contact in each direction and solicit traffic from persons outside the A.R.R.L. We realize that this is easily said. Would it be done? It is questionable. But if a few good forcible expressions of opinion in *QST* were printed it would not be ignored.

One thing more; when one looks at a map in a station, with the pins all over it, and considers that this is a picture of the effect produced by that one station, and then when we consider the thousands of stations all over the country one wonders whether we really are as much an organized force as we should be. Our signals interlace many times over until each night our signals blanket the country more completely than any other kind of communication. And yet on a certain night the attention of 8ZZ could not be attracted for an important message to WNP. What is lacking? We believe we need a call; some signal that would instantly compel the attention of all amateurs hear it—a ham SOS, to be used sparingly and with reverence. Honorable mention in *QST* and ham fame for those using it wisely, upon proper occasion; ostracism, and the contempt of decent hams, for those attempting to attract attention to

themselves by its use when not justified. If this would work out, consider the power of amateur radio. What a wonderful thing it would be if we hams would all respect that call as the ships at sea do the SOS. Is it impossible? Can we not, through the influence of *QST*, and backed by the best stations everywhere, establish a practice based upon this plan?

"Our Business" then should be: a small amount of traffic for each station, with the messages delivered; such traffic as we can handle for public utilities during storms, etc.; same rag-chewing after the hook is clear; tests for DX in the wee small hours; and at all times the possibility of hearing that greatest of amateur calls, our own SOS, originating somewhere in the nation's great nerve system, Amateur Radio, and shooting instantly to the vital parts of America, yes, even of the world.

—A. W. McAuly, 8CEO.
Wm. H. Keister, 8AGQ.

Amateurs Assist Power Company

14 Wood Street,
Pittsburgh, Pa.

American Radio Relay League,
Hartford, Connecticut.

Gentlemen:—

Att'n Mr. H. P. Maxim, President.

I wish to bring to your attention the excellent service rendered the West Penn Power Company, and incidentally thousands of our consumers, by radio amateurs during and after what was the most severe sleet and wind storm experienced in this section of the country.

Sleet began to fall over Western Pennsylvania the morning of February 19th and did not cease until the morning of February 20th. During the afternoon and evening of the 19th we began to lose power and telephone lines, one at a time, until Westmoreland and Fayette Counties were isolated from the rest of the System, resulting in a total interruption to service; light, power and electric railway. At the same time all other communication systems were completely interrupted in that section.

On the morning of the 20th Mr. C. M. Chorpenning (Radio 8WR) appeared at our Connellsville office, advising that altho his station was out of operation he desired to help to establish communication with our headquarters at Pittsburgh. He was advised that the antenna at 8XAP, our own station at Connellsville, was down, and since the town circuits were also down no power was available for motor-generator operation.

Since our operator had left Connellsville on other duties, Mr. Chorpenning advised that if agreeable to us he would get 8XAP onto the air. He accordingly gathered together all available storage batteries, (about 200 volts in all), strung up a temporary antenna and put the set in operation. Due, however, to limited power available, he replaced the 5-watt transmitter tubes with 201-A receiving tubes, using an input of 21 watts; he could not get Radio 8XY our station in Pittsburgh but was picked up by Mr. C. L. Gusweiler (Radio 8FM) at Roscoe, Pa., about one-half the distance to Pitts-

burgh. Radio 8FM advised Radio 8XY that 8XAP was attempting to get in touch with him, but that his signals were weak. Radio 8FM also advised that he would stand by and relay between 8XAP and 8XY if necessary, and also that he would relay by telephone any messages we had for our Charleroi Substation (a key point of our dispatching and transmission system). This program was carried out in detail for several hours, when 8XAP and 8XY were able to get in direct communication; however, 8FM continued to take messages to be delivered to Charleroi Substation. This program was carried on until late the night of the 20th.

On the morning of the 21st communication by wire was still totally interrupted and 8XY again tried communication with 8XAP. Although 8XAP answered, their signals were so weak that the results were unsatisfactory. Attempts were made to get in touch with 8FM but he remained silent. He, however, reported by telephone that he was without power. 8XY, however, heard Mr. R. M. Brown, Radio 8CTP, Monessen, Pa., communicating with 8XAP. On our request he relayed between 8XAP and 8XY until satisfactory communication was established between these two stations.

The value of the service rendered by these men, Mr. C. M. Chorpenning (Radio 8WR), Mr. C. L. Gusweiler (Radio 8FM) and Mr. R. M. Brown (Radio 8CTP) cannot be calculated. It was through their aid that the dispatchers at Pittsburgh were kept in touch with conditions; materials were ordered for repairs and switching orders were transmitted without a single error.

I wish to congratulate you on being the guiding hand of an organization of men of this caliber, who without thought of self-gain have, not only in this emergency but in many others, been of such inestimable value.

Yours very truly,
J. S. Jenks,
Vice President,
West Penn Power Company.

Measuring Your A.C. Input

1018 W. 5th Street,
Dubuque, Iowa.

Editor, *QST*:

With a view to determining the watt-input to any AC-operated device, the dope herewith, while not new is unknown to a great many. With every watt-hour meter such as is installed in homes there is a metering constant which is marked either on the meter disc or on a slip of paper in the terminal box. This constant is a number or fraction and means that for each revolution of the disc that many watt-hours, or that part of a watt-hour has passed thru the meter.

To get the input to a transformer C.W. set or motor, make sure there is no load on the meter and then count the number of turns by the meter disc in a certain length of time. This time should be checked as closely as possible. Then, with these figures to complete the following formula, the input is determined.

$$\text{Watts} = \frac{3600 \times \text{meter constant} \times \text{revolutions}}{\text{time in seconds}}$$

For example, the input of a C.W. transformer is to be measured with a meter the constant of which is 0.6. Connect the transformer to the line with its regular load on the secondary and, making sure there is no other load in the house, count the revolutions of the disc for five or ten minutes. If the disc has made 100 revolutions in ten minutes and 3 seconds the formula is:

$$\frac{3600 \times .6 \times 100}{603} = 358 \text{ watts}$$

If the meter constant is not marked on the meter it can be obtained from the local utilities company, giving them the number and type of the meter.

—C. M. Smith, 9DYB.

(The meter constant can also be found quite easily by burning, say, a single 40-watt lamp as the meter load, and counting the number of revolutions per minute of the meter disc. This figure, multiplied by .60 and divided by 40, if a 40-watt lamp is used in the test, will give the meter constant. The meter disc referred to is the large metal wheel inside and which can be viewed through the glass window of the case.—Dept. Ed.)

Some Hints on Coupled C.W. Sets

120 W. King Street,
Kitchener, Ont.

Editor, *QST*:

I was reading 9ZG's article in the April issue about coupled C.W. circuits, and noted his observation that it is possible to tune the primary in such a way, with the key down, that one gets more antenna current than can be "picked up" when the key is operated.

I have done considerable experimenting with a coupled Hartley circuit here, and have found that a more satisfactory way of obviating this difficulty than keeping the antenna slightly off tune is to loosen between primary and secondary coils until the phenomenon disappears. On my transmitter I use a two-turn coupling coil about an inch farther down the tube than the last effective turn on the plate end of the primary inductance, and a separate loading coil in the antenna.

With a coupled circuit, dropping to a low wave is extremely simple, it being merely necessary to insert a series condenser in the antenna—it may be in either the antenna or counterpoise lead—and cut out the loading coil.

In some cases the use of a coupled circuit reduces the antenna current, but it always reduce the plate current to a much more than proportionate degree, thereby making it possible to load the tubes, and incidentally making a pure DC note easily obtainable. There is no nodal point to worry about with loose coupling; that is, there is a nodal point, but no filament clip on the antenna inductance to try and balance the point on.

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Another valuable feature of the coupled circuit is that for local fone work, the radiation can be decreased to a point where it is powerful enough to understand but not liable to create interference on single circuit broadcast receivers, by simply tuning the antenna to another wave than that to which the primary is tuned. I might remark that I had difficulty in using grid modulation with the coupled circuit, on account of the fact that this system works best when there is a certain amount of resistance in the oscillatory circuit, normally provided by the antenna in a direct coupled set, and found that the best thing to do is first to adjust the grid condenser to as low a capacity as the tube will oscillate and modulate, and then carefully readjust the primary variable condenser a few degrees either way, when a point will be found where modulation increases greatly.

—H. S. Gowan, C3DS-C9BC.

Autobiography Of A Message

Ada, Oklahoma.

Most Esteemed Eddy, *QST*:

Give ear, O mighty OM, to the tale of my travels in the Hamdom of U.S.A. Minerva-like, I sprang from the brain of a mighty one. He was an American man. This Am, my father, was a man of some penetration, despite the fact that he was a member of the caste of the BCL.

The great Am had been attuned to the Infinite Nighthawk, when his neighbor, Ham, poured upon his antenna wild waves which strangled the Infinite Nighthawk.

Now, Ham had faults, despite the fact that he belonged to the royal caste of the Boiled Owls; and when Am protested, Ham saw fit only to remark that a Msg was a Msg, and it was long past the witching hour of Ten-thirty.

Then, O mighty OM, the great Am stroked his chin twice, winked thrice, and set me upon a card. Another card he addressed to the same destination and handed to the careful and efficient USM. Me he gave to Ham's noble brother.

I cannot adequately narrate to you. O worshipful OM, my travels thereafter. At times I shot hither and yon with breathless speed. Irreverent brethren of the noble Ham marred my countenance or sent me stumbling aimlessly backward. Once I lay impaled with others of my tribe for an excruciating forty-eight hours. At last, on a festive night in the season of DX, I reached the town of my destination. The next morning I lay on the desk of the brother of AM, for whom I was sent.

From a drawer in his desk he drew a familiar-looking card; and then I remembered the ancient story of the hare and the tortoise!

I pray, O beneficent OM, that the Wouff Hong be not idle, nor the hand of judgment slow. Else will not Am chastise the noble Ham for the deeds of his brothers, and will not the air be taken from Ham, so that he will suffocate? For Am is mighty. And the caste of BCL is more numerous than the caste of the Boiled Owl. Selah.

—J. O. Wood of 5AGA.

Memories

705 Monnett Ave.,
Norman, Okla.

Editor, QST:

I have watched with conflicting emotions the "Communications" section of QST. There has been a great deal of condemnation of the old spark transmitter, but every now and then some one rises to defend it. The "good old spark days" they say. Mr. Hutchins in his letter in the June issue looks back on the old days and sees everything with its rosy color—caused by tradition. I agree with him perfectly,—as far as he went. It seems to me that I can remember time and again when I had to haul out the greasy old condenser plates and tear through them to find the one that no longer was able to hold its own. And fuses had an awful bad habit of blowing out just when power was most badly needed. And again there would be a surge; the high voltage would get mixed with the 110, and I would have to rewind the old Clapp-Eastham. And then the rotary points would burn off, and the insulators,—the best there were in those days,—would give up the ghost. The QRM at times was simply fierce. One thousand miles on a so-called one kilowatt set was vy fb.

There were others who had more trouble than I. Old 5FO, who was the mighty power around there in those days, had to have separate power transformers installed. He fought the neighbors over the blinking lights and the telephone company was forever receiving complaints. The light bill, too, was something to think about.

After all, as I see it now, the only difference between those days and these is that there are now more of us and we have to share the air with the BCL's. And it isn't bad. Look what we can do now. We all get heard in New Zealand, South America, Europe, and most everywhere else. And the meter doesn't turn half as fast as it used to, nor do the neighbors howl about the lights blinking, nor do the condensers blow with half the rapidity they used to,—although five-watters blow often enough.

In five years some of us will be looking back upon these very days we are now going through and thinking about—the "good old days." History is easier to consider than the solid, hard facts of the present.

They may have been the "good old spark days" but these will be the "better old CW days."

—William G. Green, "ev" of 5VM.

CALLS HEARD

(Concluded from page XI)

Can.: 1bq, 1ar, (2bn), 3gg, 3kq, 3mc, 3oh, 3yl, (4aw), (cb), (4hh), (4io), 4fz, 9bx.

R. L. Willits, 716 Oak Park Ave., Des Moines, Iowa
1aom, 2wz, 3sp, 4cb, 4en, 4eq, 4lk, 4io, 4ky, 4qw, 4rr, 5ae, 5aek, 5ah, 5air, 5aj, 5aki, 5ak, 5al, 5cg, 5ei, 5ej, 5ek, 5ek, 5es, 5fv, 5gj, 5ht, 5ia, 5ju, 5ka, 5lh, 5lr, 5lv, 5mb, 5qh, 5qm, 5rg, 5rj, 5sg, 5va, 5vm, 5zas? 5zf qra? 6ox, 6cg, 7zu, 8abm, 8add, 8adm, 8acy, 8af, 8ajm, 8ajn, 8anb, 8aq, 8aqo, 8aro, 8ate, 8avx, 8bad, 8bb, 8bbf, 8bci, 8bfr, 8bgj, 8biq.

8br, 8bmb, 8bmz, 8bwk, 8bze, 8bzt, 8cbc, 8cbf, 8cbp, 8cci, 8cea, 8chb, 8cna, 8cpk, 8eux, 8evg, 8ewg, 8ezz, 8dat, 8dbn, 8dbu, 8dbq, 8dcw, 8dez, 8ded, 8dfd, 8dge, 8djj, 8dha, 8dhn, 8dhq, 8dhw, 8dil, 8dj, 8dkm, 8do, 8dp, 8ei, 8er, 8fm, 8hy, 8jj, 8kc, 8nz, 8pl, 8rm, 8ru, 8tj, 8uq, 8vk, 8vy, 8yd, 8zc, 9eld, 9oa, 9eca.

QUEBEC DIVISION

(Concluded from page IX)

Careful watch for Europeans is exercised on waves 105 and 150 from 9:30 E.S.T. to 10:30 P.M. E.S.T. 2AZ is to be congratulated on being the first Canadian "2" station to work Saskatchewan.

Everyone is urgently requested to try their utmost to keep touch with Bill Choat on VDM, SS "Arctic," Canada Exploration steamer which is enroute to a point north of WNP. All work is to be on 120 meters from VDM.

WINNIPEG DIVISION

J. E. Brickett, Mgr.
(by wire)

Practically all stations are busy rigging their sets to work VDM, the Arctic. The gang welcomes the return of 4DY, one of our best stations. A successful Trans-Canadian Relay was pulled by 1BQ-4CR-5BF, which was quite some stunt.

Saskatchewan boasts two new stations on the air. 4GH has changed from spark to C.W.

QRN has played an important part in breaking up our regular traffic routes and has caused a slump in our regular consistent relaying of traffic.

Practically every station in this division will maintain regular summer operation, especially on short waves. A concerted effort is being made to QSO WNP.

VANCOUVER DIVISION

A. J. Ober, Mgr.

ALBERTA: Traffic is moving east regularly on short waves. 4CW reports good DX on short waves. 4DQ works all U.S. districts and has a schedule with 4FZ. Traffic slides easy on this route. The western

STILL MORE FUNNY CALLS. BY THE AND GHT			
7RT NOF 551	8OP QUANT TO STARS AT CONTINUOUS WATER	3MO 30 DAYS!!	2AM A REAL BRILLIANT SWL
No CW WITHOUT 1VT	3CEL SAYS HIS RECTIFIER STAFFS	6HP MUST USE A GAS EMANE.	4FT SCALE 1000PH. - 1FT.
4BC SAYS HE REMEMBERS LONG TWT	1ow WONDER IF SHE'S MARRIED?	9APE THEY WANT HIS PICTURE IN QST	5DR SURE CURE FOR KCL'S

4DQ-5CT route is hard to keep going. 5CT is having meter trouble but we hope to keep this route open all summer. 4AB, tho not on regularly, works out in fine shape.

EDMONTON: No active stations since 4CL left. How about a little life from 4AH? 4JF is on the air now but does no consistent work. 4AH finds it hard to raise anyone.

Traffic: 4CW, 5; 4JF, 2; 4DQ, 86.

VANCOUVER ISLAND: 5HK, a new O.K.S. in Victoria, reports rebuilt transmitter which comes in better at 5CT. 5GK in Victoria is on the air again with 5DX's old half K.W. SPARK but Gawdnose how long they will let him live with that. 5AY at River Jordan is on with low power tube set but not much DX yet, and trying schedule for tests with 5CT.

Traffic: 5HK, 9; 5CT, 21.

VANCOUVER CITY: What's wrong with this district? No reports from D.S. Now gang, I know there is a lot of activity and am only too glad to mention it here, but who knows what it is? 5AK and 5GF please drop a line to D.M.