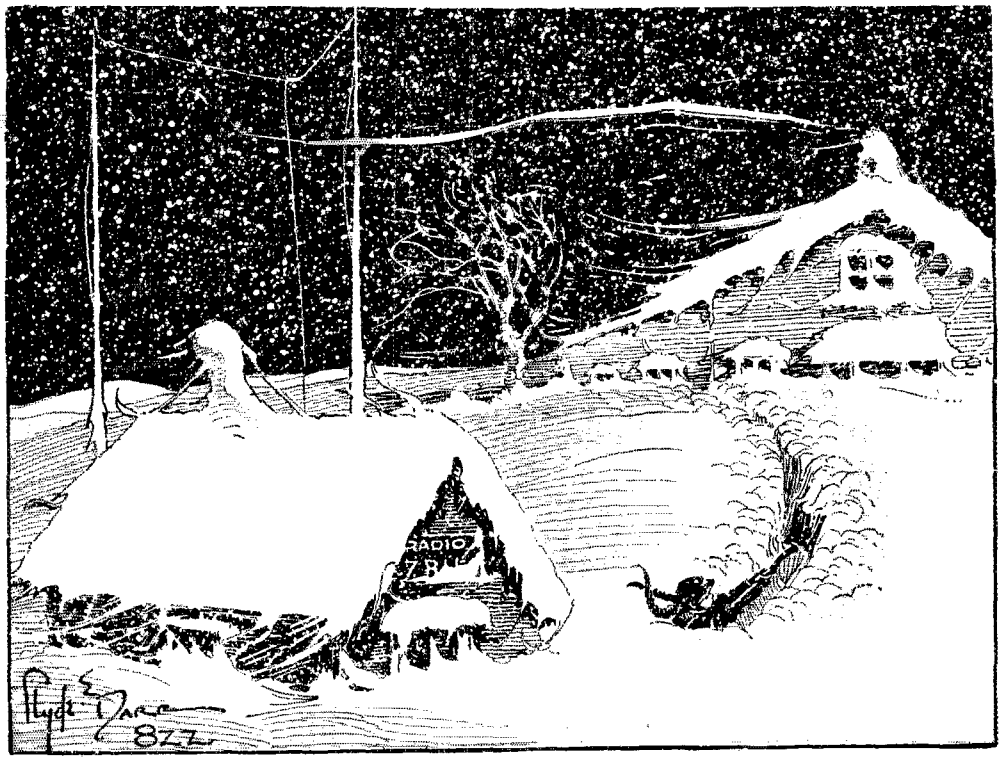
QST

DEVOTED ENTIRELY TO

AMATEUR RADIO

Published by the American Radio Relay League



March
1927

25¢

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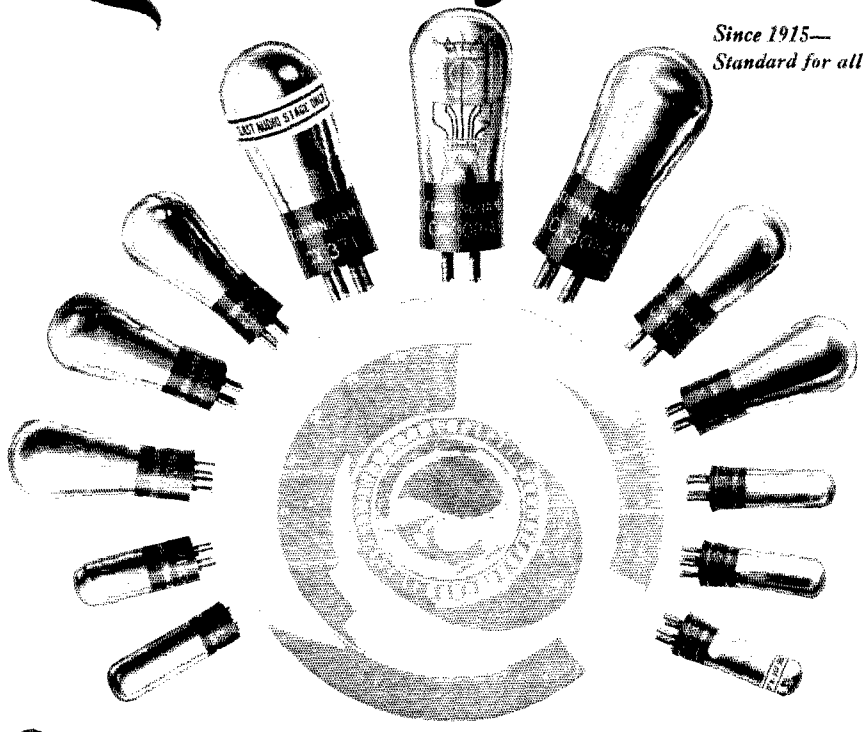

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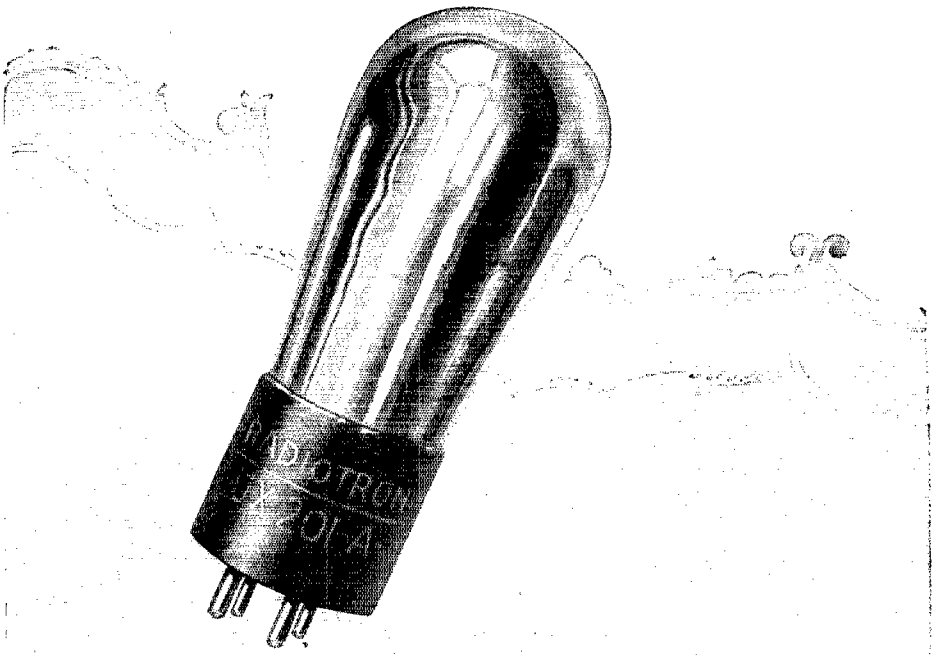

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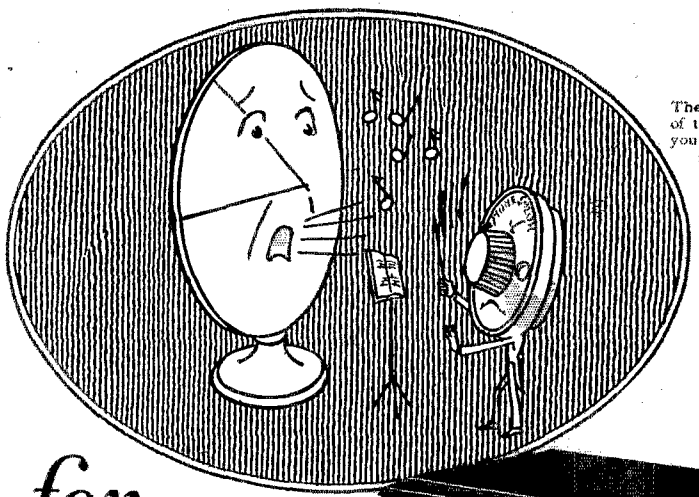

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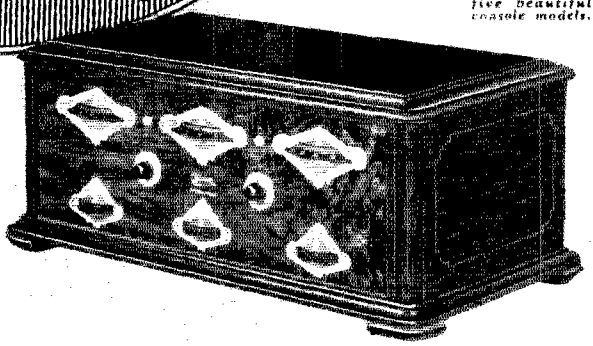

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QST

The Official Organ of the A·R·R·L

VOLUME XI — MARCH, 1927 — NUMBER 3

QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn., U. S. A. Official Organ of the A.R.R.L. and the International Amateur Radio Union

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Subscription rate in United States and Possessions, Canada, and all countries in the American Postal Union, $2.50 per year, postpaid. Single copies, 25 cents. Foreign countries not in American Postal Union, $3.00 per year, postpaid. Remittances should be by international postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds.

Entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized September 8, 1922. Additional entry as second-class matter, acceptable at special rate of postage provided for above, at Springfield, Mass., authorized September 17, 1924.

THE AMERICAN RADIO RELAY LEAGUE

The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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 the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

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EDITORIALS

WELL, folks, at this writing we almost have a new radio law! Almost but not quite. After weeks of effort the joint Congressional conference committee seeking to reconcile the differences between the House's White Bill and the Senate's Dill Bill unanimously agreed to a compromise on January 26th, and on the 29th the House passed it with neatness and despatch. No such luck in the Senate, tho. The Senate has been wrangling about it every day, and in truth at this moment the bill seems tottering on the very brink of passage. We have held *QST* open absolutely as long as we dare, hoping for definite action to report, but now we have to close. We suppose that about the hour this form gets on the presses, the Senate will act!

There is no use presenting the complete text of the compromise proposal while it is still just a bill—it would fill five of our pages with small type, and it may not pass after all. Because of the wide differences which at first existed between the House and Senate bills, the compromise bill is probably the best arrangement that could be expected. It does not seem to us to be a particularly inspired document, and it shows clearly that it is a compromise between two schools of thought, but it is undoubtedly capable of operating satisfactorily under an intelligent and fair-minded Commission.

Like all the recent proposals for a new radio law, this one does not recite the actual regulations within the law itself, but establishes administrative authority which is empowered to make regulations and change them whenever needed. The important question whether a Commission or the Department of Commerce should formulate the regulations has been compromised by giving a Commission full authority for a period of one year and the Secretary of Commerce the authority thereafter, except that the Commission would continue to act as an appellate body and would retain the power to revoke licenses. Those who thought that radio was too big a problem to be handled by "one man" should be satisfied by this compromise, which provides government by a Commission during the important first year while the whole structure of regulation is being rebuilt, and those opposed to the Commission idea should be reasonably happy over the thought that it will last for only a year. The original Senate proposal of a permanent Commission with full powers was very distasteful to most radio interests, and in this respect at least the compromise is very much better.

Broadcasting and radio trade of course occupy the center of the picture in the new bill. Its basic provisions naturally would apply to all classes of stations, so let us briefly sketch the major provisions that would affect us amateurs. During the first year of the law, the Commission would classify stations and prescribe their wavelengths, power, operating characteristics, etc. The Secretary of Commerce would refer all license applications, including requests for modification of existing licenses, to the Commission during this period. The Secretary of Commerce, however, would issue operators' licenses, assign station calls, and inspect stations. He could refer any of his matters to the Commission for ruling, and any of his decisions might be appealed to the Commission. After the first year the classifying of stations and making of regulations would be done by the Secretary, and he would also issue the licenses except those involving dispute or conflict, which would continue to go before the Commission. The Commission also would continue to handle the matter of revocation of station licenses, to hear appeals, and to rule upon other matters brot before it. Whenever a station license or a modification thereof was refused by the licensing authority (Commission or Secretary as the case might be) an appeal might be made to the Court of Appeals of the District of Columbia; and whenever a station license was revoked by the Commission, appeal might be taken either to the Court of Appeals or to the district court of the U. S. in which the station was operated. These provisions for appeal seem ample. Government stations would be exempt from classification and wavelength assignment by the licensing authority, using wavelengths to be prescribed by the President. In this provision we fear there is room for conflict and it is to be hoped that an earnest effort will be made to coördinate the assignments if the bill passes.

Construction permits for station erection will be again required if the bill is enacted, as was proposed in several recent schemes for new legislation, but "a permit for construction shall not be required for Govern-

ment stations, amateur stations, or stations upon mobile vessels, railroad rolling stock, or aircraft". Important as it is to us to be exempt from this permit requirement, the actual mention of the amateur here is of vastly more importance, definitely fixing the fact that the Congress, if it enacts the bill, intends that amateurs shall be provided for. A similarly valuable reference occurs in the regulations concerning the secrecy of messages, which will not apply "to any radio communication broadcast or transmitted by amateurs or others for the use of the general public".

There is much uncertainty, of course, as to just what will happen under the new law, and how it will happen. At the moment of writing, with the old law appealed and the new Commissioners not yet appointed, we have no regulations. Almost anything can happen, for the new Commissioners can juggle the classes of stations they decide to permit and can assign them any wavelengths they desire. With what eagerness and anxiety, then, the radio population of the United States awaits the naming of the Commissioners and their first public pronouncements! There is considerable comfort in knowing that the question of radio legislation is settled for some time to come. Let us now hope that the men chosen for Commissioners will be intelligent and fair-minded, able and with a knowledge of radio—and let us also fervently hope that some of them know what Amateur Radio is!

There is, of course, some uncertainty as to whether the bill will be enacted. It is fairly certain that a majority of the Senate is in favor of it, if it can be brot to vote. There is greater uncertainty as to just what will happen, and how it will happen, if the law does pass. As soon as it is passed, and until the new Commisioners are in action, we shall have no regulations and all licenses will stand suspended. Then almost anything can happen, for the new Commissioners can juggle the classes of stations they decide to permit and can assign them any wavelengths they desire. With what eagerness and anxiety, then, the radio population of the United States will await the naming of the Commissioners and their first public pronouncements! There will be considerable comfort in knowing that the question of radio legislation is settled for some time to come. It will then be up to us to hope that the men chosen for Commissioners are intelligent and fair-minded, able and with a knowledge of radio, and not politicians chosen for political reasons—and we shall also be fervently hoping that some of them know what Amateur Radio is!

But don't be too surprised if, before this *QST* reaches you, you read in the daily press that the bill has died and there is no new law.

DIRECTOR Babcock, who is considerable of a navigator and an amateur astronomer as well as a radio amateur, has pointed out to us that radio amateurs are making a serious error in their references to Greenwich Time. In our international QSO's Greenwich Time is now a necessity, and it is of the utmost importance that we keep straight on it.

There are two breeds of Greenwich Time. First of course there is civil time, which on any meridian commences at midnight and comprises the twenty-four hours until the following midnight—the kind of time people live by. Thus the English amateur, arising at seven o'clock in the morning, finds that it actually is seven o'clock or 0700 by Greenwich Civil Time (G.C.T.). Then there is the other kind of time, mean time, the hour angle of the mean sun. The mean day, the astronomical or solar day, commences at noon of the civil day of the same date. The mean time which is based on the meridian of Greenwich is known as Greenwich Mean Time (G.M.T.). It is to be noted that these two brands of time differ by twelve hours.

The story boils down to this: we amateurs, all over the world, have been using Greenwich Civil Time and calling it Greenwich Mean Time. We want G.C.T., right enough, but we must stop calling it G.M.T. Both the League and the I.A.R.U. have endorsed G.M.T. as a standard for schedules and records, presumably in the belief that the M. in G.M.T. stood for "meridian"; certainly it has been the intent of both bodies to recommend as a standard the civil time of the Greenwich meridian. When I tell you I'll see you on the air at a certain hour Greenwich Time, I'm thinking of the civil time of London, using it as a standard because it is known to both of us, figuring my own time difference therefrom, and expecting you to do the same for your location. We all do that; we mean G.C.T., yet most of the time we call it G.M.T. It is perfectly amazing to us how the amateurs of the world got along with this misunderstanding, yet apparently the misunderstanding has been universal and there have been no hitches. How often we've heard an operator say "0000 G.M.T." when he meant 7 p. m. E.S.T. Yet 0000 G.M.T. really is seven in the morning, E.S.T., and 7 p. m. E.S.T. actually is 1200 G.M.T. However, 7 o'clock in the evening, E.S.T., *is* midnight or 0000 by Greenwich Civil Time, and that is what we always mean. Navigators, by the way also have been using G.C.T. instead of G.M.T. since the first of 1925.

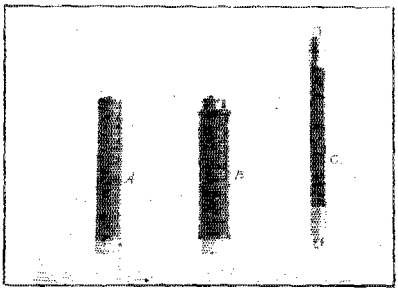
The dope, then, is to keep on thinking in the same figures that we have in the past, but call it G.C.T. or simply "Greenwich Time", and never use the term G.M.T.

Cures for "Power Leaks"

By Robert S. Kruse, Technical Editor

FOR some time now, one of the standard questions in our letters of inquiry has been, "What can I do to stop interference from a power leak?"

We have answered some phases of that question before but a brief review may be useful. If the "power leak" has not been located the first job is naturally to find it, which is not easy for an inexperienced person. The tendency is for the beginner to "find" the noise in a hurry by the simple



THE THREE TYPES OF CHOKES

At the left a simple "choke corrector", then an "absorption corrector" with the choke covered by alternate bakelite spacing rings and iron absorbing rings to waste r.f. power. The long choke is the "strain corrector" and is of the same type as the simple choke tho longer and slimmer. All three types have the end turns spaced more widely to prevent flashing between turns.

process of blaming it on the nearest convenient electrical device that he does not happen to own. Almost always when the trouble hunter of a generating and distributing company meets someone who is

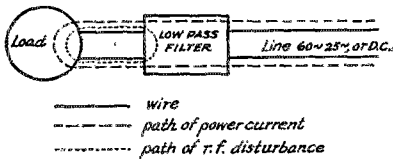


FIG. 1

THE GENERAL NATURE OF POWER-LINE INTERFERENCE FILTERS

very sure and very angry he may begin by assuming that the angry one does NOT know.

The experienced man can tell something by listening, especially if he is familiar with the neighborhood. Thus he may be able to decide at once that a certain noise is the thermostat of an oil-burning furnace and after a few questions walk to the correct house—generally the one from which the kick came. If several people have the same disturbance he may compare the intensity at the different receivers, get an approximate location and thus simmer the problem down. Finally, if the noise is either uncertain in nature or so intense as to cover much territory he will work with a portable receiver, hunting the points at which the noise is greatest by the method of "cross hatching" the city, taking care not to be deceived by local "bumps" in the noise. Usually these extensive noises had their beginning in an electrical distribution, power or lighting system, the wires of which spread it about. In such a case the job is one that can be done best by someone familiar with the network of the city, which indicates that the problem is one properly belonging to the light company or the street car company as the case may be. The progressive firms of these sorts will be found to own portable radio equipment for handling such jobs and if approached in a fair manner will be perfectly willing to go after the difficulty and remedy it if possible. One must, of course, remember that a complex network is bound to develop new

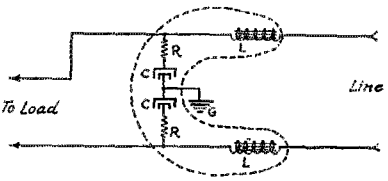


FIG. 2

THE CIRCUIT OF THE TOBE INTERFERENCE FILTER NO. 1

defects constantly and that only persistance will keep the radio noise level down in a city. To have the noise come back again is not a sign that the first job was poor—it is usually a new noise.

FILTERING SCHEMES

It was said above that usually the extensive noises are carried around by electrical wiring. Naturally the noise will not travel around on the wires if it is kept out of them in the first place. The most common sources of noises are motors, thermostats, and devices that create spark or brush discharges. Unfortunately all of these must be connected to the line in order to make them operate—and that automatically connects their (accidental) radio-frequency output

to the same line. The cure lies in an arrangement such as suggested in Fig. 1, which permits the low-frequency power to flow to the device but prevents the high-frequency (accidental) power from flowing back into the line.

There is nothing new about this, of course, but some improved ways of doing the thing have appeared recently in such form that they can easily be installed next to the offending oil-burning furnace, ventilating fan, X-ray machine or other neighborhood nuisance. I anticipate that it will not be long until lighting companies will insist that interference-making devices must be taken off the line or equipped with such filters as the following.

THE DAYFAN DEVICE

The Dayfan interference filter is appropriately known as the "Quietus" and is made in two types, known as 6001 and 6003 for 110-volt and farm-lighting plants respectively. This filter was tested at my

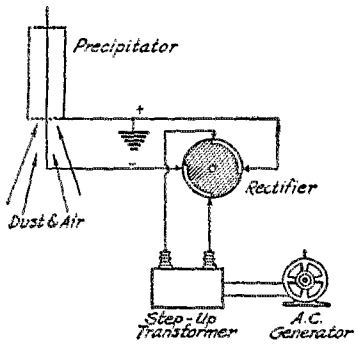


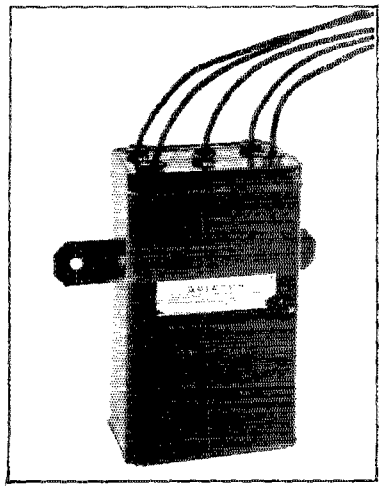
FIG. 3

SCHEMATIC WIRING OF A COTTRELL DUST PRECIPITATOR

The device is used at smelters, cement mills, etc., to save the powdered materials and protect the surrounding population and vegetation.

home and *entirely* suppressed interference from a vacuum cleaner motor whose commutator is in such bad condition that reception for a block or more around is impossible when the thing is running. Several previous "remedies" had completely failed on this affair which is kept around for just the purpose of making such tests. One of our neighbors has an oil-burning furnace with a bad thermostat and a bad motor commutator. Since the 220- to 110-volt wiring goes first to their house and from their meter-board to ours we get the full benefit of this. Whenever the motor of the furnace-blower is running radio reception on any wavelength is hopeless at 1OA. The 6001 "Quietus" was therefore connected into the incoming line with an immediate complete suppression of the motor noise and a geat reduction of the irregular thermostat "rrrrrrr". In the first test about a dozen different loads were tried up to 600 watts and even the heavily inductive ones could be broken without bothersome noise in either the c.w. or the broadcast receiver.

The current-carrying capacity of the device includes anything that may properly



THE DAYFAN "QUIETUS". TWO OF THE OUTER WIRES GO TO THE LINE, THE TWO OTHERS TO THE LOAD. THE CENTRAL WIRE GOES TO GROUND OR TO THE METAL FRAME OF THE LOAD-DEVICE

be connected to an ordinary 110-volt branch circuit of the house wiring and the device appears not to heat on loads up to 10 amperes, above which it was not tried.

Mr. O. E. Marvel, V. P. in Charge of Engineering for Dayfan states that the filter employs a pair of iron-free choke coils wound to cover a broad band of wavelengths. My understanding is that there is a choke on each side of the line and that windings of the two chokes are interleaved to provide the necessary by-pass capacity across the line.

THE TOBE FILTER

Sometime after the "Quietus" arrived was received the Tobe Interference eliminator No. 1 which is made for the same purposes as the "Quietus" and seems to show results of the same sort though the test has been less complete because of a delay in shipment. This filter is made on a design by Sewall Cabot and uses the circuit shown in Fig. 2. In a letter from Maurice M. Osborne it is explained that the 2-ohm resistances in series with the condensers are for the purpose of delaying the action of these condensers so as to avoid burning

thermostat contacts or motor commutators. In this case the chokes have iron cores.

Mr. Osborne calls especial attention to the very common misunderstanding to the effect that such filters are to be connected to the radio receiver. This is entirely incorrect—they are connected to the "interference factory" as shown in Fig. 1. Eventually we will probably reach the point where the customer will demand that any electrical device must carry its own protection and be unable to make radio interference, also he will feel perfectly free to send the device back if it does make such interference. Meanwhile, a few trainloads of such filters as the above will make life in the U.S.A. a bit easier. A very simple filter devised by Mr. J. J. Jakosky is shown in Figs. 7 & 8.

The devices so far described apply mainly to noises manufactured in household electrical appliances. Such noises are usually local though an infernal nuisance just the same. When electrical devices of higher power manufacture the noise it is usually able to blanket a much larger area and to be much more of a nuisance. Just what one does about this sort of thing depends on the nature of the trouble. If the thing is a line defect the lighting company or power company or street car company will possibly be able to cure the difficulty—but it is not always so sure that they ought to be compelled to. A defect like a bad insulator is a clear case, but what is one to say about the composite "hash" caused by a large number of "static leaks" on wooden transformer-carrying crossarms? The installation originally was according to good practice with the ground wire clamped under one of the bolts holding the transformer. This was o.k. for the main purpose—an occasional spit or sputter did no harm. Now the lighting company is suddenly asked to stop this—even to prevent the invisible stray discharge thru the wood. The people that protest don't want to pay for a change—the company gets nothing for making the change.

There are many such examples. Probably the power company will do what power companies usually do—absorb the cost of the alteration to a newer method. Still it is rather a hardship to discover that every scrap of metal on a wooden pole is a possible source of a radio-kick, even though it is 100% o.k. for the job that created it.

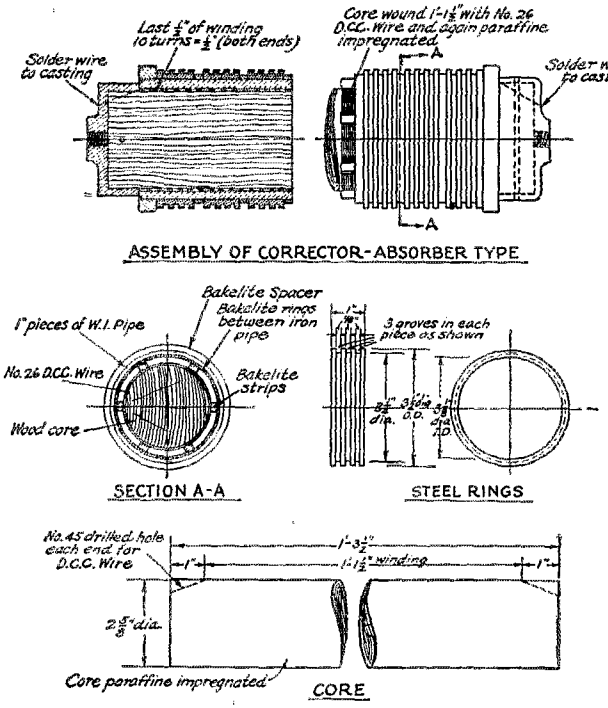


FIG. 4

THE ABSORPTION TYPE OF CHOKE

The choke proper is a single-layer winding of No. 26 D.C.C. wire on 2⅝" paraffined wood core, the winding being 13½" long, while the core is 15½" long. Bakelite strips are laid over this and 9 iron absorbing rings are slid over the bakelite. The coil without the rings is known as the "choke type corrector" and provided with tension lugs is called the "strain type corrector." The choke as shown is the "absorption type corrector." The uses of the three types are shown in Fig. 5.

CONCENTRATED SOURCES

The most violent noises are fortunately of more definite sort; it is possible to find the place where they begin, the particular machine that makes them. Transformers and generators are *very seldom* guilty, in spite of the popular opinion that a noise is

THE TOBE INTERFERENCE FILTER NO. 1. THE PRESENT PRODUCTION IS IN A BROADER AND SHORTER CASE WITH MOUNTING LUGS. LARGER TYPES ARE MADE TO ORDER

"a leaky transformer". Figures from the power companies show that the noises (when they start outside the customer's house at all) can generally be traced to "static leaks" and that when they are from a particular machine it is generally something that is *using* power, not something that is generating it or transforming it.

CONVERTERS

Synchronous converters ("rotaries") frequently operate with more or less sparking at the d.c. end and if the lines to and from

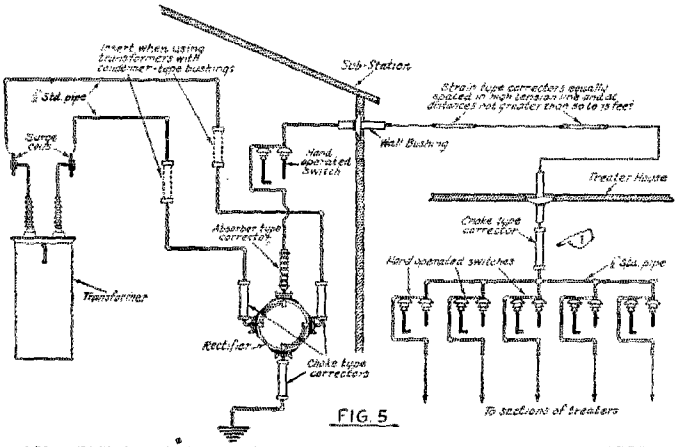


FIG. 5

AN INSTALLATION SHOWING THE LOCATION OF "CORRECTORS" OF THE THREE TYPES AS AN INDICATION OF THE WAY IN WHICH TROUBLESOME NETWORKS OF OTHER SORTS CAN BE ATTACKED IN DETAIL

the machine are overhead, considerable radio interference may occur. In most cases this can be very greatly decreased by keeping the commutator in the best possible

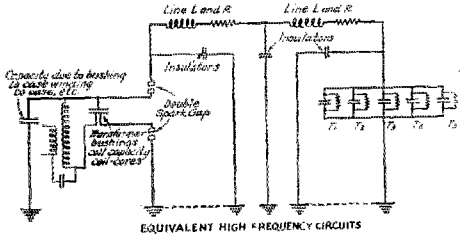


FIG. 6

EQUIVALENT CIRCUIT OF A PRECIPITATOR INSTALLATION, SHOWING HOW A TROUBLESOME CIRCUIT MAY BE ANALYZED SO AS TO HELP IN DEVISING CURES FOR THE R.F. SURGES

shape. Sub-stations in which the d.c. feeders leave underground seem much less likely to cause this difficulty, even when the wires come out on poles later. Perhaps this is because the underground section acts as a sort of low-pass filter and sifts out the r.f. On the other hand the cause may lie in the date of construction, and therefore the design of the apparatus.

It would be extremely interesting to try the effect of an enlarged "Quietus" or "Tobe filter" on a sub-station that readers know to contain a "bad" converter.

ARCING DEVICES

Anything that arcs or sparks is bound to generate r.f. or (what is just as bad) to shock nearby receiving circuits into r.f. oscillation. The list of such contrivances is almost endless and includes the many variations of the vibrating and rotary rectifier, X-ray machine, Tesla-coil (including the so-called, "violet ray"), dust-precipitators, "ozone" bleachers, street-lighting arcs and all their various relatives.

The general method of attacking such devices can best be explained by a brief account of the way in which an especially severe case was handled.

JAKOSKY'S PRECIPITATOR WORK

The Cottrell dust precipitator is a device working along the general scheme suggested in Fig. 3. An alternating current generator feeds a step-up transformer whose output is rectified by a synchronous mechanical rectifier and then fed to the precipitator which consists of a rod or wire inside a pipe, or else several wires suspended between plates. In any case the wire is charged to a high negative voltage and the pipe or plates grounded as shown. The dust, suspended in air or other gas, passes thru the precipitator and the intense electrical field "grabs" the dust particles out of the gas, leaving them on the precipitator conductor from which they fall or are removed in larger masses.

During the operation of this high-voltage device, brushing, flashovers and surges naturally occur in a system in which 20,000- to 100,000-volt wires are surrounded by dust. Since the precipitators act as condensers and the wires to them as inductances the whole thing becomes a high-power transmitting antenna with a spark set connected to it, which obviously is a combination capable of especially severe interference.

Mr. J. J. Jakosky has done a very fine piece of work for the Western Precipitation

Co. of Los Angeles in devising cures for this interference. His detailed report unfortunately is too large to reprint. In it there is developed a theory for the failure of

MR. JAKOSKY SEARCHING FOR SOURCES OF INTERFERENCE WITH A PORTABLE LOOP RECEIVER. THE "WIRED RADIO" EFFECT WAS FOUND IN THIS WAY

various schemes that have been tried, a discussion of the disturbances that were found and finally exact specifications for devices

stop the r.f. from proceeding out on the line toward the precipitator but that the voltage across these chokes would rise as high as 20,000 volts by reflection effects. This, added to the line voltage, was enough to cause discharges. There was therefore developed a choke that not only "choked" but also absorbed the r.f. energy and wasted it. This choke is shown in Fig. 4. It should be a very useful basis for any similar problem. In addition to this it was found that in the laboratory tests chokes at the rectifier suppressed some of the interference but left strong radiation in the region of 130 to 180 meters wavelength. This was cured by inserting other chokes in the line itself. It was found that any precipitator feed line more than 50 or 75 feet long required such chokes at intervals but that conditions varied considerably as "every supporting insulator, switch, mounting, etcetera, acts as a condenser." Therefore chokes had to be added at various points as found by test, the locations of a typical installation being shown in Fig. 5.

INDUCED SURGES

Just as a lightning stroke causes sparkovers in wiring which it has not struck, so an arc or spark may cause induced voltages of high enough value to create noise in any nearby metal work. In the case of the precipitator installations it was necessary to bond and ground such things as metal fences to stop noises.

The same thing has been found to apply to outdoor sub-stations not using rectifier equipment. Even when there is no arcing

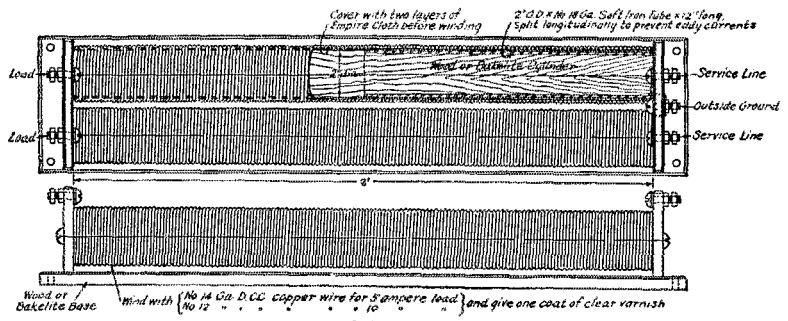


FIG 7

A FILTER DEVISED BY MR. JAKOSKY TO PREVENT R.F. NOISES FROM FOLLOWING THE 110-OR 220-VOLT LINE INTO A HOUSE

This is essentially a low-pass filter plus an r.f. power-wasting feature. The chokes themselves are wound on 2" bakelite tubes 24" long inside of which are 1 foot lengths of iron pipe which are grounded. The iron pipes are split endwise to prevent eddy current losses at 60 cycles and to prevent excessive 60-cycle inductance. No. 14 wire is used for a 5-ampere load. No. 12 for a 10-amp. load.

to cure the difficulty. The complete report is most informative for anyone interested in correcting line interferences and deserves publication.

It was found that choke coils at the rectifier terminals would to a certain extent the voltage induced in metal fences by a 60-cycle line may be enough to create hissing, frying and popping noises.

When all the various remedies had been applied it was possible at the test installation and at the laboratory installation to

receive distant broadcast and c.w. signals with *no* radio interference tho previously any reception was practically impossible. There is no reason for thinking that similar cases cannot be handled equally well and Mr. Jakosky's report (which is on file here) would be of considerable interest to anyone cursed with an especially bad case of "power leak".

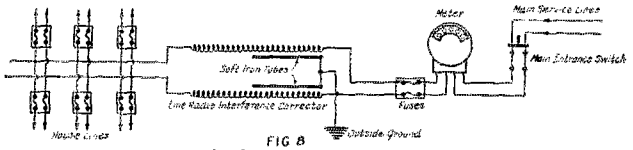
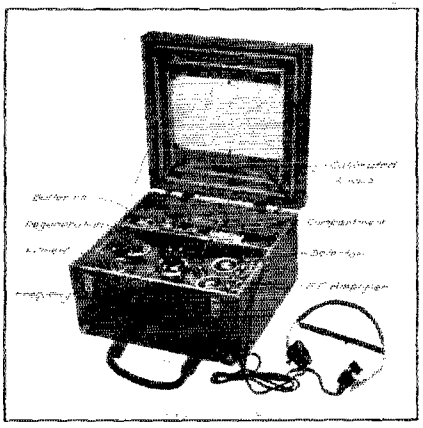


FIG 8
DIAGRAM OF CONNECTIONS

THE CONNECTIONS OF THE JAKOSKY FILTER OF FIG. 7

The r.f. disturbance following the line to the house is stopped by the r.f. chokes and then is partly wasted in the iron pipes and partly by-passed to ground by capacity effect between the winding and the iron pipe. Some by-pass effect is also secured because of the capacity between the coils themselves.

The methods worked out by Mr. Jakosky have been used at a considerable number of installations of the Cottrell treater with excellent success. Since the conditions vary widely this confirms the belief that many sources of disturbance can be attacked in the same general way, the methods naturally differing somewhat with the voltage and current.



THE PORTABLE LOOP-ANTENNA RECEIVER WITH A TUNING RANGE OF 30-900 METERS. THIS SET, UNLIKE MOST SUCH SEARCH EQUIPMENT, COVERS ALL OF THE BUSY "CITIZEN RADIO" BANDS

The portable receiver shown in one of the photographs was used to explore the "interference topography" of the buildings. The two tube set was found best since a more sensitive set was unable to locate trouble exactly, also one could be sure that if the 2-tube set inside the plant was not troubled the more sensitive sets farther away would not be. If the noise was brought down to a point where the set near the source could no longer find it then that trouble was over with. During this investigation it was found that a surprising amount of noise can wander into a home by way of the lighting circuits as "wired wireless". After some experimenting a filter to prevent this was devised. Its construction and connections are shown in Figs. 7 and 8.

THE SET ITSELF

When all other means have been used and noise still persists one can sometimes secure relief by a modified Fessenden interference-preventer arrangement. Such an arrangement was described by Roy B. Ashbrook and Ralph W. Wright in the October 23 issue of the Electrical World for last year. The wiring arrangement is shown in

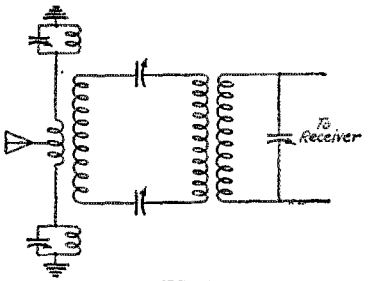


FIG. 9

Fig. 9. The coupling transformer is carefully made symmetrical and the set itself is well shielded as is the intermediate circuit. The two traps are then tuned slightly apart, one being tuned to the signal that is wanted. The two branches of the circuit are almost alike as far as the noise is concerned and balanced currents flow in the two halves of the primary. The signal currents are not balanced because of the difference in tuning of the trap circuits. In an installation on the Southern California Edison Company's system this arrangement practically removed the severe noise from a leaky 30,000-volt transformer bushing nearby while decreasing the signals only about 50%. When tried in entirely unshielded form on the furnace noise at 10A a very considerable improvement was noticed, even though the circuit was somewhat simplified to permit combining the two trap-circuit condensers so as to run them from one control. The intermediate circuit could be omitted since the case was not as bad as that of the 30,000-volt line.

Standard Frequency Station 9XL

By Hugh S. McCartney*

Standard Frequency stations 1XM and 9XL are operated on regular schedules through the generous cooperation of their owners and operators who contribute their time and effort as a service to the A. R. R. L. The organization and extension of this system is due to an Experimenters' Section Committee, known as the O. W. L. S. (Official Wave-Length Station) committee. Details may be found on another page under the heading "Standard Frequency Schedules"

IN June, 1926, *QST* carried a request for volunteers for the transmission of standard frequency signals. The Gold Medal Station offered the use of its short-wave transmitter, 9WI, for this purpose, but arrangements had already been made with another station for the work. It later developed that this other station would be unable to make the transmissions for various reasons, and Mr. K. V. R. Lansingh of the O. W. L. S. committee of the Experimenters' Section wrote to the Gold Medal Station asking if we were still willing to undertake the job. This was in September, and on November 19th the first transmission was sent, which will give some idea as to the amount of work necessary to have everything in shape. In addition to this, the work had to be done so as not to interfere in any way with the operation of the rather heavy schedule of WCCO.

WCCO-9XL-9WI

The Gold Medal Station WCCO-9XL-9WI occupies a rather unique position in that it is owned by Washburn-Crosby Company, and is operated jointly with the Minneapolis Civic and Commerce Association and the St. Paul Association. Two studios, one in the Nicollet Hotel in Minneapolis and the other in the Union Depot in St. Paul, are connected by telephone lines with the main transmitter near Anoka, Minnesota, some twenty miles northwest of the Twin Cities. It is here that WCCO-9XL-9WI is located.

Figure 1 shows the station house of WCCO-9WI-9XL, the antenna towers and the antenna system used by the 5 Kw. broadcast transmitter of WCCO. The tower nearest the building is also used to support the long receiving antenna for the short-wave set, the Zeppelin sending antenna of 9WI and the two antennas used for transmitting the standard frequency signals of 9XL.

WCCO

Although WCCO has only been in operation about two years at the present location and the increased power (5Kw.), reception reports have been very satisfactory, the station having been heard in several points in Europe, Australia, South America, Mexico, Alaska, and by ships at sea. When the station was moved outside of the Twin Cities, provision was made for the installation of an amateur station, and it was then that 9WI came into existence. While it has never been possible to have regular schedules of operation for 9WI, or to be on the air with it at all hours, nevertheless it has been consistently heard in Australia with an average reported audibility of R5,

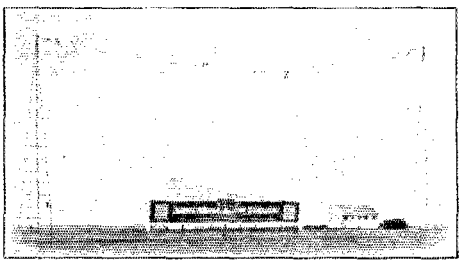


FIGURE 1. STATION WCCO-9XL-9WI. THE ANTENNAS OF 9XL AND 9WI, ALTHOUGH NOT VISIBLE IN THE PICTURE, RUN TO THE TOWER NEARER THE STATION. THE ANTENNAS FOR 9XL ARE SHOWN IN FIG. 2

and two-way communication was established with "AQE" while that station was near the south pole last winter.

Figure 2 shows the floor plan of the building, and is given merely to show the relation of the standard frequency transmitter to the 5-Kw. Western Electric broadcast transmitter. As all transmissions from 9XL and 9WI are made while WCCO is on the air with programs and going full power, it will be seen that there was considerable QRM with which to contend. Not only was it necessary to have a receiver that would eliminate these signals, but also one that was shielded against other sources of QRM such as are generally caused by battery chargers, generators, automatic water pumps and the like.

9WI

For amateur c.w. work under the call 9WI, the receiving antenna is a single wire which extends from the window of the operating room to the top of the tower, and from there runs approximately 1000 feet to a tree where it is anchored. A report of

*Chief operator WCCO 9XL-9WI, R. F. D. No. 3 Anoka, Minn., also 9DWO.

the tests made with this antenna as compared with others of different lengths will be sent in as soon as a few more measurements can be taken. The transmitting antenna for amateur work is of the Zeppelin type described by Dr. Pickard in *QST* some

wire horizontal counterpoise directly beneath it, and about 12 feet from the ground. This system has a natural frequency of about 4000 Kc. and is used with a series condenser and antenna load for operation at fundamental frequencies from 3500 Kc. to

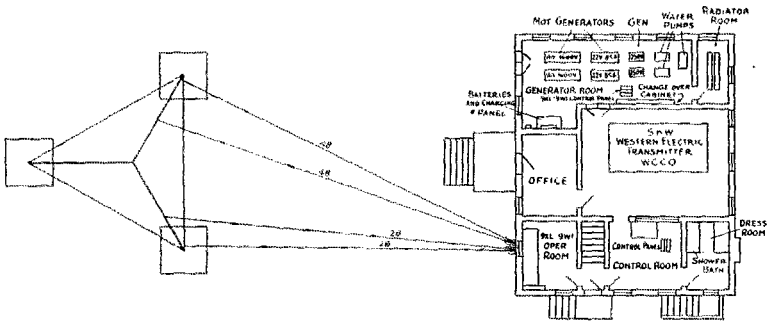


FIG 2

PLAN OF THE STATION AND OF THE ANTENNAS USED BY 9XL

The arrangement of the antennas can be understood better by reference to the text. The big triangle is the base of the nearest tower and the squares under its corners are the concrete footings. WCCO's antenna is not shown here but appears in Fig. 1.

months ago, and is designed for operation on 39 meters. This antenna is *let down* when standard frequency schedules are to be sent, and others substituted that will permit operation over larger bands. Pulleys

5700 Kc. and is operated at fundamental frequencies with an antenna load and series condenser over a band from 6500 Kc. to 9000 Kc. Third harmonics of these two systems are used for the 15000 Kc. band.

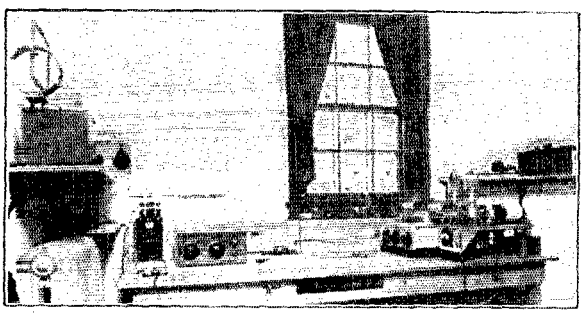


FIG. 3. STATION 9XL OF THE EXPERIMENTERS' SECTION S. F. SYSTEM

have been placed at various heights up the nearer tower so that different length systems may be tried and changed very easily. The leads are brought in through plate glass panes in the windows. In the center of these, holes were drilled (at twenty-five cents each) to take the short pieces of threaded brass rod to which the leads are fastened.

9XL

For standard frequency transmissions two antenna systems are used. The larger consists of a single-wire antenna suspended nearly vertically from the tower, with a one-

CALIBRATION EQUIPMENT

Photograph Figure 3 shows a general view of the operating room while in Figure 4 may be seen that part of the equipment used in the measurement of the standard frequencies. The equipment on the shelf in Figure 3 is the standard frequency meter, which is a General Radio Precision type with worm-and-gear drive and special coil calibrated over a band from 1600 Kc. to 2400 Kc.; an oscillator calibrated for the same frequencies and a General Radio crystal oscillator which holds the quartz plate used for checking the curve of the frequency meter. The shelf is metal covered and grounded, and the standard frequency meter and oscillator are securely fastened to it in order that all measurements may be repeated under the same conditions at any time. On the small shelf below are the coils used in the receiver and oscillators and portable oscillator on the bench beside the additional coils for the frequency meter. The receiver is for calibration work and covers a band from 300 Kc. to 25000 Kc.

SHIELDING

The receiver, which is used for amateur work as well as in the measurement of fre-

quencies, is the ordinary short-wave type using one stage of audio amplification, and is equipped with plug-in coils covering a band of from 1500 Kc. to 2500 Kc. All battery leads, as well as the phone circuit as far as the jack, are in lead-covered wire with the coverings soldered together and fastened to the copper cabinet that shields that receiver. These are not grounded, however, as it was found that the shielding was much more effective when the shields were left "floating". It was not found necessary to shield the batteries in any manner, as when no antenna is used (as in the measurements of frequencies) the pick-up was minimized to the extent that signals from WCCO were only heard on exact harmonics, and then only over about three degrees on the dial. With a short antenna, but no ground, WGY has been received on 9150 Kc. (32.79 meters) with no interference from this station's harmonic on 9360 Kc. (32.03 meters). A duplicate position is provided for another receiver in case it is desired to compare one circuit with another. Battery supply and antenna are obtained in the duplicate position by throwing double-throw switches. Another single-pole, double-throw switch mounted on the backboard makes it possible to compare two different types of antennas. Due to the excessive pick-up of the long receiving antenna, it is necessary to keep it grounded while WCCO is on, as otherwise the antenna current in the big transmitter drops off about two amperes, and when figuring I^2R that means quite a few watts output.

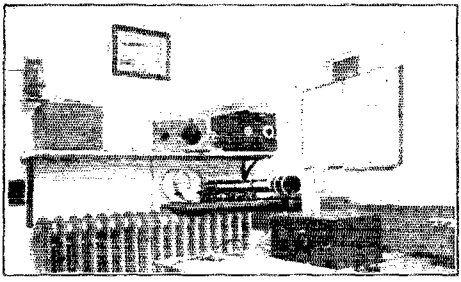


FIG. 4. 9XL'S MEASUREMENT EQUIPMENT

Standing on the grounded metal covering of the shelf are (left to right) a precision wavemeter, a tunable oscillator and a General Radio crystal-controlled oscillator used as a standard. The wavemeter and crystal oscillator are fastened down permanently. On the lower shelf are additional wavemeter coils and coils for another tunable oscillator which is standing on the table beside the receiver.

9XL's TRANSMITTER

Figures 5 and 6 will give an idea as to the construction of the standard frequency transmitter. The transmitter was built "breadboard" so as to permit ease in tuning when QSYing from one frequency to the next. Two Western Electric 212 D (250-watt) tubes are used in parallel, this being possible due to the fact that Western Electric tubes are graded and marked so as to permit parallel operation. The circuit, Figure 7, is a series Hartley, proving very flexible over the wide band of frequencies covered in the transmissions. The inductances are mounted on glass towel rods and are held firm by the center rods going through the inductances and clamping them firmly against the two outgoing side rods. Two sets of rods were necessary to obtain the desired coupling and were cut to the required length by means of a hack saw, turpentine and perseverance. The coupling generally used in transmissions is from 6 to 7 inches, and with an input to the tubes of between 300 and 450 watts any change in frequency is very slight. For the higher

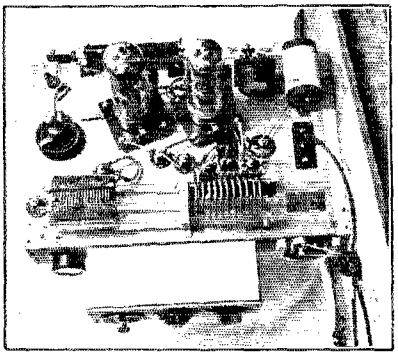


FIG. 5. THE TRANSMITTER OF 9XL. THE EXTENSION AT THE FRONT OF THE SET REMOVES THE CONTROLS FROM THE TUNING CONDENSERS AND REDUCES HAND CAPACITY EFFECTS WHEN TUNING

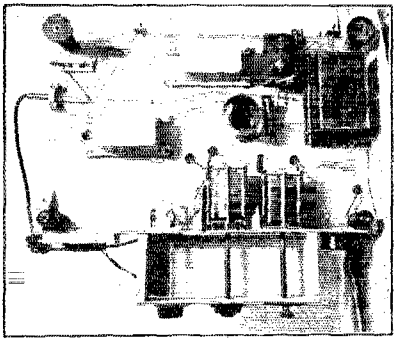


FIG. 6. BOTTOM VIEW OF 9XL'S TRANSMITTER, SHOWING THE TUNING AND BLOCKING CONDENSERS, ALSO THE KEYING RELAY. THE INSULATING SHAFT-EXTENSIONS OF THE TUNING CONDENSERS CAN BE SEEN INSIDE THE CONTROL-EXTENSION OF THE SET

frequencies a smaller closed circuit inductance having 7 turns of ¼-inch copper tubing wound to a 2-inch diameter is substituted for the one pictured. The r. f. chokes are plug-in so as to allow changing at various frequencies. The closed circuit and antenna condensers are the regular Cardwell transmitting type, and the small vernier across the closed circuit condenser is an ordinary Bremer-Tully receiving condenser having two plates cut down and "double-spaced". The dials are mounted on fibre shafts six inches from the condensers so as to minimize body capacity. The keying relay is mounted on a rubber sponge to absorb mechanical vibrations.

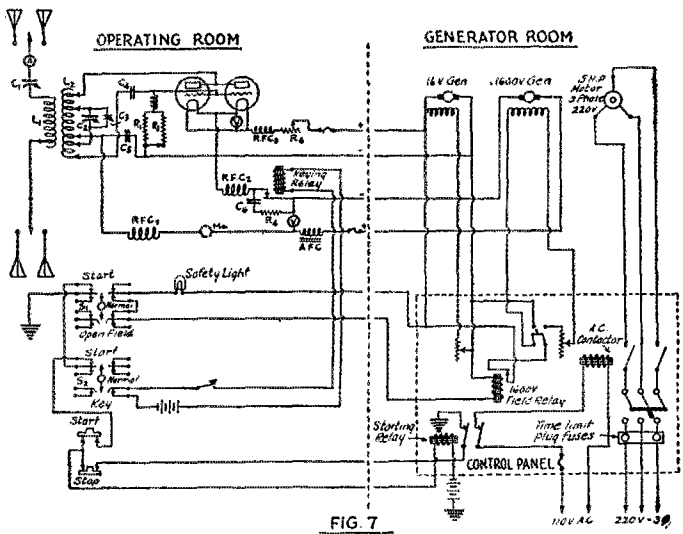


FIG. 7

COMPLETE DIAGRAM OF 9XL

A—Antenna Ammeter 0-5 Amp.
M—Plate Milliamperes 0-1000 M. A.
V—D. C. Voltmeters 0-30 0-2000.
L1—20 T. No. 8 solid copper wire 4" D. spaced ¼" c. to c.
L2—11 T ¼" copper tubing 4" D. spaced ½" c. to c.
C1—Antenna series condenser. 440-μμfd. variable.
C2—Closed circuit tuning condenser 440 μμfd. variable
C3—Bremer-Tulley receiving condenser. 2 plates cut down to size of half dollars and spaced ¼".
C4—Grid mica. 7000-volt 2500 μμfd.
C5—H. V. by-pass. 3000-volt. .02 μfd.
C6—Keying condenser. 3000-volt. .32 μfd.
R1 & 2—5000 ohms each.
R3—Variable
R4—150 ohms.
RFC1—170 T. No. 26 d.c.c. 3½" D.
RFC2—100 T. No. 26 d.c.c. 3½" D.
RFC3—20 T. No. 16 d.c.c. ¼" D. spaced.
RFC4—20 T. No. 28 d.c.c. ¼" D.
AFC—15-henry choke.

POWER SUPPLY

Power is supplied to the standard frequency transmitter from a motor-generator set. As will be seen in Figure 2, duplicate sets of generators are included in the installation for WCCO, one set being used one day and the other the next. A small control panel was built to control the set not in use in order to supply 9XL-9WI. Flexible leads from this panel are clipped on the switching terminals in the change-over cabinet in the generator room, and the supply is run to the operating room in lead-covered cable which was pulled through a special conduit for that purpose. The control and transmitter circuits are shown in Figure 7. The filament supply is from a 16-volt, 600-watt generator and the plate from a 1600-volt, 2000-watt generator. Both generators are mounted in line and driven by a 5-H.P. motor.

In order to put the transmitter in operation, the two switches S1 and S2 in the operating room must be held in the nonlocking position, and the button marked "Start" must be pushed. As will be seen this supplies ground to the starting relay (which already has battery standing on one side) and as it pulls up it closes the supply to the contactor, which in turn starts the motor. The starting relay holds itself up through one of its contacts until the ground is broken by pressing the button marked "Stop". These two buttons ("Start" and "Stop") are also nonlocking. The reason for having the ground for starting feed through switches S1 and S2 in the non-locking position, is to make certain that the switches have not been left in the wrong positions; that is, with S1 "Normal" (straight up) and S4 locked in the keying position. This would allow the high voltage to build up as soon as the generators were started, and if the key were unintentionally pressed, or the lever on the key closed, the high-voltage would be applied to the tubes before they had time to heat sufficiently. As soon as the set has started, S1 and S2 are released and return to "Normal" position, which closes the 1600-volt field relay through a light and gives an indication that the high-voltage is applied to the set. S2 is then pulled into locking position, which closes the keying relay circuit. In making the adjustments on the transmitter, S1 is pulled into the locking position, which opens the 1600-volt field rely and puts out the light, showing that it is safe to work on the set.

SENDING AN S. F. SCHEDULE

In adjusting the transmitter to the desired frequency, the clips and condensers are set at pre-determined points which have been recorded when tuning. A careful record is kept of all settings obtained, ever though they may not be used at the time, as at some future time some condition may arise that will require a setting of just that kind. The oscillator and receiver are next set at their correct frequencies, and the frequency of the oscillator read directly on the standard frequency meter by means of the change in beat frequency method. The oscillator is set at 1875 Kc. and the re- previously calibrated, it is seldom necessary to read just more than once to obtain the correct frequency. The receiver is then tuned to zero beat with the oscillator and the key of the transmitter is closed. The transmitter having been previously adjusted it is merely necessary to tune to zero beat with the receiver.

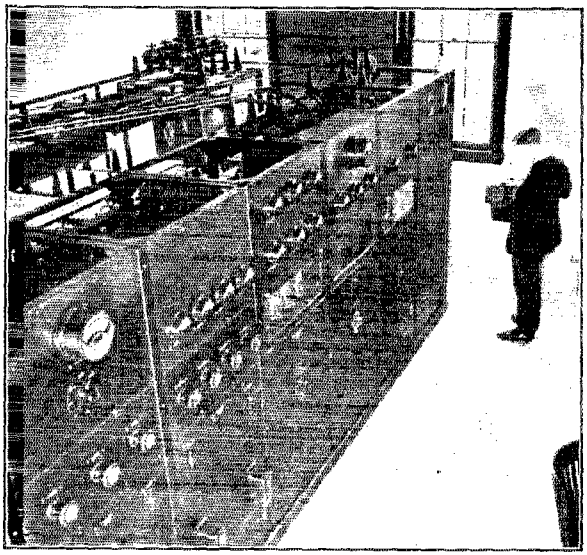


FIG. 8. JUST FOR CONTRAST, HERE'S THE 5 KW. WESTERN ELECTRIC BROADCAST TRANSMITTER OF WCCO

If, for example, it is desired to transmit a frequency of 7500 Kc., the transmitter tuning controls are set at the points indicated for that frequency by previous calibration. The oscillator is set at 1875 Kc. and the receiver at 3750 Kc. The second harmonic of the oscillator is now beating against the fundamental frequency of the receiver. The receiver is tuned to an audible beat with the oscillator and the dial of the frequency meter is turned until a change in this beat frequency is noted. The frequency meter dial is slowly turned still further until this beat frequency has passed through "one-half cycle" and return to the frequency at which it first started to change. If the beat frequency was originally 500 cycles, the frequency will change as resonance is approached, either increasing or decreasing, depending on whether resonance is approached from a higher or lower setting of the frequency meter. Due to the amount of coupling used between the oscillator and frequency meter in order to minimize the "dragging" effect the meter would have on the oscillator, this change in frequency is not large. When, after turning the dial, the beat note has returned to the original frequency, the scale reading of the frequency meter is noted, and if this indicates a correct frequency for the oscillator, the receiver is then tuned to zero beat with it. The transmitter having been previously adjusted to 7500 Kc., it is then only necessary to close the key and adjust for zero beat with the receiver. The transmitter is then beating against the second harmonic of the receiver, and during the transmission this frequency is maintained by means of the small vernier condenser in parallel with the closed circuit condenser. The capacity of the vernier is so small that zero beat may be followed over ten to fifteen degrees on the dial. In some transmissions, the transmitter is beat against the third, fourth, or even the fifth harmonic of the receiver. This allaws the operator to obtain an idea as to the character of the note.

During the transmission, three operators are required, one on duty at the main transmitter and the other two sending the standard frequency schedules. Mr. Smith (9BLY) has had the "pleasant" task of tuning the transmitter for all the points covered in the transmission and making it work, as well as doing part of the construction. Mr. Anderson (9DGM) is responsible for the construction of the control panel and contactor, and for a large part of the of the construction of the transmitter; the writer doing the calibrating. We wish to take this opportunity to thank Mr. Lansingh for the many suggestions made, and for the assistance given during his stay here on his way to the west coast. While many extra hours have been put in in the attempt to make these transmissions of value to someone, we feel that the time has not been wasted, as we have all had experiences never encountered in the operation of a broadcasting station, and a few cards reporting reception of any of the transmitters (WCCO-9XL-9WI) in opera-

(Continued on Page 32)

The Theory of a Tuned R. F. Transformer

By Glenn H. Browning and Frederick H. Drake*

THE mathematics to be given, apply to any tuned radio frequency transformer, whether it be for frequencies included in the broadcast band or some frequency chosen for the intermediate transformer. However, the theory has only

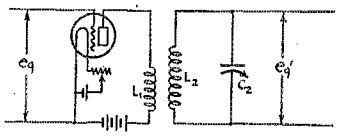


FIG. 1

been checked with experimental curves over the broadcast band.

If an input radio frequency voltage e_g is applied to the grid-filament of the vacuum tube, shown in Figure 1, the problem is to amplify it so that the voltage e'_g is as large

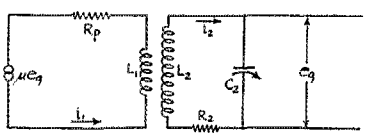


FIG. 2

as possible. This system is equivalent to the circuit shown in Fig. 2, as far as alternating currents are concerned, where R_p is the internal plate-filament resistance of the tube, and μ is its amplification factor.

This method of replacing a vacuum tube by an impressed voltage of μe_g in series with the plate resistance has been used for some time when treating the vacuum tube as an amplifier.

The problem of finding the amplification of the system e'_g/e_g then reduces to solving the circuit for i_2 since to a very close approximation.

$$e'_g = L_2 \omega i_2 \text{ -------1}$$

The following standard abbreviations were used:

$$\tau = \frac{M}{\sqrt{L_1 L_2}}\ ;\ \eta_1 = \frac{R_p}{L_1\omega}\ ;\ \eta_2 = \frac{R_2}{L_2\omega}\ ;\ \frac{\omega}{2\pi} = \text{imp. frequency}$$

$$\omega_0 = \frac{1}{\sqrt{L_2 C_2}}\ ;\ \frac{\omega_0}{\omega} = \theta$$

M is the mutual inductance between L_1 and L_2; f is the impressed frequency. With these abbreviations, it may be shown that regardless of the setting of C_2, that the amplification of the system is given by equation 2.

$$\frac{e'_g}{e_g} = \frac{\mu\,\tau\sqrt{\frac{L_2}{L_1}}}{\sqrt{\eta_2^2+(1-\theta^2)^2}\ \sqrt{\left\{\eta_1+\frac{\tau^2\eta_2}{\eta_2^2+(1-\theta^2)^2}\right\}^2+\left\{1-\frac{\tau^2(1-\theta^2)}{\eta_2^2+(1-\theta^2)^2}\right\}^2}} \text{ -------2}$$

When C_2 is tuned for greatest signal, which is:

$$\tau^2 = (1-\theta^2)(\eta_1^2+1) \text{ ---------3}$$

When equation 3 is satisfied equation 2 reduces to:

$$\frac{e'_g}{e_g} = \frac{\mu\,\tau\sqrt{\eta_1^2+1}\sqrt{\frac{L_2}{L_1}}}{\eta_1(\eta_1^2+1)+\tau^2\eta_1} \text{ ---------4}$$

It is easily observed that equation 4 has a maximum with respect to "t". This is found to occur when:

$$\tau^2 = \frac{\eta_2}{\eta_1}(\eta_1^2+1) \text{ ----------5}$$

When equation 5 is substituted in equation 4, the greatest possible amount of amplification is given for a tube used as an amplifier, and a tuned radio frequency transformer. This condition is given by equation 6.

$$\frac{e'_g}{e_g} = \frac{\mu\sqrt{\eta_1\eta_2}}{2\sqrt{\eta_1\eta_2}} \text{ ---------6}$$

It will also be noticed that this relation can only be satisfied at one frequency, as "n_1" is not the ordinary power ratio, but depends upon the internal plate-filament resistance of the tube. However, "n_2" is almost constant over a considerable range, as will be observed in Fig. 3.

In order to see how much variation in amplification there would be when equation 5 was satisfied for a wavelength of, say, 350 meters, curves were plotted of equation 4. These are shown in Fig. 4, and indicate that as long as a coupling of .5 is obtained with the correct value of L_1, high amplification is obtained over the whole range of wavelengths used in radio broadcasting.

Equation 6 showed that L_2, the inductance of the secondary of the tuned r.f. transformer should be made as large as possible, consistent with tuning down to the lowest wavelength desired. It also showed that the turn ratio of a transformer of this type does not indicate how much amplification is

* Both of Browning-Drake Corporation, Brighton, Mass.

going to be obtained, for the turn ratio is modified by "n_2", which takes into account the high frequency resistance of the secondary of the transformer. Of course, "n_1" also enters, but as it has the plate-filament resistance of the amplifying tube contained in it, little can be done with present day tubes to change its value.

It is queer that so-called engineers make a practice of winding the primary of a radio

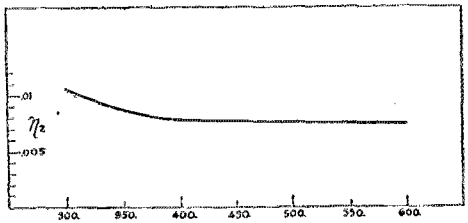


FIG 3

frequency transformer with large wire to keep down resistance, when the primary is in series with this plate resistance, which usually amounts to, from between 15,000 to 20,000 ohms, so that even a few hundred ohms resistance in the primary winding is unappreciable when compared to the 15,000 plate resistance which cannot be done away with.

With this data at hand, the constants of the radio frequency transformer were completely determined, but when one was made up on two concentric cylinders, and tested in the laboratory, the amplification pre-

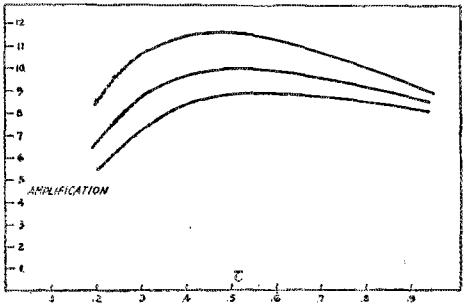


FIG. 4

dicted by theory was *not* obtained. After considerable work, a "slot" wound primary was adopted with a result that the theoretical amplification was closely approached, tending to show that the capacity between coils L_1 and L_2 must be kept down to a minimum for maximum amplification. Fig. 5 shows the theoretical curve of amplification "A", and the measured amplification "B" which was obtained with the "slot" winding, using the constants predicted by the equation given. These measurements were taken with a vacuum tube voltmeter which has been described many times before, and will not be taken up here. It is sufficient to say that a radio signal of the desired wavelength was impressed across the grid-filament of the vacuum tube (in this case a UV-199), by means of a resistance and the output voltage and input voltage consecutively measured by means of the voltmeter. Extreme care was taken to keep down stray capacities which might introduce errors in the results. The oscillator which supplied the incoming voltage was placed in a separate room, and partially shielded, a twisted pair bringing in the signal from the oscillation to the r.f. transformer. These precautions were taken so that the secondary of the r.f. transformer would not pick up a voltage directly from the oscillator. With the apparatus thus carefully arranged, no voltage could be detected across the outtput of the amplifying system

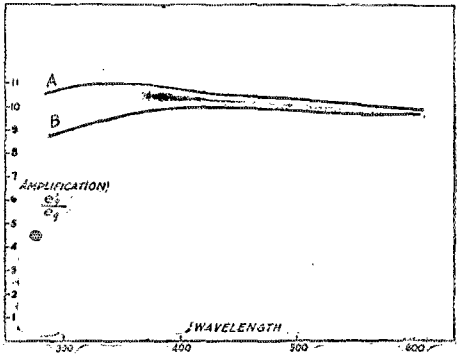


FIG 5

when the input voltage was reduced to zero. This showed that there was no direct pick-up from the coils or the batteries used. Several different methods were also employed in obtaining the amplification of the system shown in Fig. 1, so that it is believed that the values given on the graph are very nearly correct.

Now that we have shown that theory and experiments give substantially the same results, let us briefly summarize the quantities which play an important part in the amplification of the system described. First, make L_2 the inductance of the secondary winding as large as possible consistent with tuning down to the lowest wavelength desired. Second, secure a good coil and condenser whose losses are low, so that "n_2" is as small as possible. We have found that lower "n_2" could be obtained better by a single

layered solenoid than by any of the so-called "low-loss" coils.

Third, find the value which can conveniently be obtained for "t", and keep the primary winding bunched and at the low potential end of the secondary. Use small wire for primary.

Fourth, knowing the plate resistance of the vacuum tube to be used as an amplifier, and the mean frequency at which the transformer is to be used, together with "n_2" of the secondary, and "t", solve equation 5 for the inductance of the primary winding.

By means of these four steps, an efficient tuned radio frequency transformer can be designed by one who is somewhat acquainted with mathematics, and who has the facilities for measurements of quantities such as inductance.

In the original paper which was presented before the Northeastern District Convention of Electrical Engineers at Worcester, and later before the Institute of Radio Engineers at New York the tendency for the grid circuit to break into oscillations was also considered and the necessity for some type of neutralization considered, but will not be taken up here, as it does not bear directly on the transformer design.

It is sincerely hoped that this discussion on the quantities entering into the design of a tuned radio frequency transformer may be a help for those designing efficient amplifiers, as there is certainly a great need for a careful investigation along this line.

Strays

NOTICE TO U. K. MEMBERS OF A.R.R.L.

By virtue of the same arrangement, members of the Radio Society of Great Britain who desire to belong to the American Radio Relay League may join or renew their membership by addressing the same to Mr. J. Ashton J. Cooper, Ass't Hon. Secretary, R.S.G.B., 53 Victoria St., Westminster, London, S.W.1, who will forward the same to Hartford. The dues are 12/6 in the United Kingdom and include a subscription to *QST*.

T. & R. MEMBERSHIPS

By reciprocative arrangements established with the Radio Society of Great Britain, members of the A.R.R.L. residing in the United States and Possessions and in Canada who desire to belong to the Transmitters & Relay Section of the R.S.G.B. may join via A.R.R.L. Headquarters at Hartford, which will transmit the remittance to London, eliminating the inconvenience of an international remittance, etc. The dues are $3.50 per year and include a subscription to "The T. & R. Bulletin", a most excellent ham monthly.

BOOK REVIEWS

By R. S. Kruse, Technical Editor

Swoope's Lessons in Practical Electricity, 17th edition, revised by Erich Haussman, E. E., Sc. D., Professor of Physics at the Polytechnic Institute of Brooklyn, Fellow A.I.E.E. Published by Van Nostrand, 8 Warren St., New York City, 693 pages, 542 illustrations. Price $2.50. (1st Edition 1900)

Several things about the heading of this review must strike the reader. It is not every book that lasts for 26 years and reaches the 17th Edition. That "Swoope" has done so is due to a happy combination of theory and practice. The theory alone seldom interests the reader long when he is "going it alone", while the practice alone makes an indigestible mass—one can read it but seldom understand it.

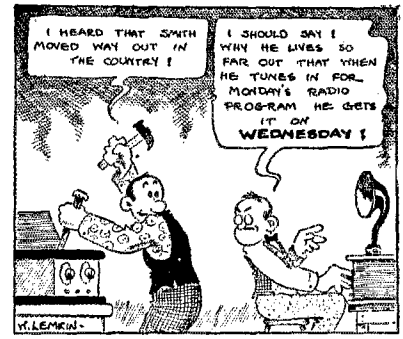
One should not be misled by the unhappy title "Lessons in Practical Electricity". This book is *not* one of those terrible books that are written in the ". . . now-little-children-I-will-tell-you-how-it-came-about" manner. On the contrary, it is a thoroughly solid book, written in good understandable style. Radio is not neglected—neither is it allowed to swamp the book. It gets 4 of the 34 chapters—a proper proportion.

"Swoope" will be an excellent addition to the radio amateur's bookshelf.

Principles of Modern Radio Receiving, By L. Grant Hector, Ass't. Prof. of Physics, University of Buffalo. Published by Burton Publishing Co. Buffalo, N. Y. 304 pages, 160 illustrations, $5.

Imagine a book which discusses the theory of radio reception very well indeed and at the same time manages to walk the narrow path that goes between the bogs of mathematics and the brambles of inaccuracy. That sentence was not intentionally flowery; it was occasioned by the enthusiasm that one naturally generates when a book comes along that is just right, and this one is. A careful reading of it will give one a good fundamental understanding of the non-oscillating types of reception employed in modern practice, either above or below 200 meters. The oscillating receiver, unfortunately, has been left somewhat aside but the defect is not serious, a good c.w. receiver is not hard to understand when one has grasped the others. Beyond saying that the book is pleasantly logical one can not add more without listing chapter headings. Instead it is much better to recall that figure 83 shows a single circuit tuner inside a black rim labeled "In Memoriam", also that the discussion of amplifiers is singularly complete in a time when amplifiers have just finished changing day by day.

This is a good book to own; I am glad that our copy will be available for *QST* work.



Quartz Crystal Calibrators

By A. Crossley*

A piezo-electric crystal calibrator is a crystal controlled oscillating circuit which is capable of producing currents of radio frequency which are equal to the fundamental and harmonic frequencies of the crystal employed in such a circuit.

The quartz crystal controlled oscillating circuit has been found to be the most constant source of frequency. No self-oscillating circuit of any type will approach the constancy of frequency which is obtainable by resort to crystal control for obvious reasons. This latter statement is based on the fact that the self-oscillating circuit frequency is dependent on the resonant condition of the oscillating circuit. This resonant circuit is made up of an inductance and a capacity and shunted across such a circuit is the grid-filament or plate-filament impedance. These impedances are of different values and are dependent on the filament and plate voltages, and therefore act similar to a resistance shunt across the

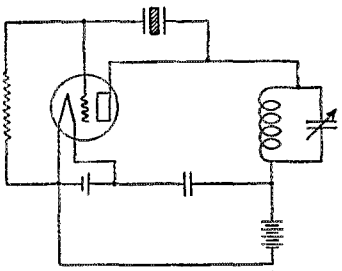


FIG. 1. CIRCUIT USING CRYSTAL BETWEEN PLATE AND GRID

resonant circuit. A resistance shunted across a capacity increases the effective capacity of such a circuit, and therefore, a variation in shunt resistance produces a variation in effective capacity.

Assuming that the frequency of the self-oscillating circuit is adjusted to definite value for one filament and plate voltage, it is very easy to change the frequency of such a circuit by changing either the plate or filament voltage or both. Other factors such as change in inductance or capacity due to temperature or ageing effects also produce a change in the frequency of the self-oscillating circuit. From these various assertions we can see that the frequency of any self-oscillating circuit is dependent on a number of conditions which are extremely hard to maintain constant and therefore we cannot consider such a system for use as a standard of frequency.

The quartz crystal is a very hard substance and has a very small temperature coefficient and when employed in a crystal controlled circuit it will permit the generation of one frequency. Changes in plate or filament voltage produce a negligible change in frequency so that for all practical purposes the natural period or frequency of the crystal can be considered to be correct. If a greater degree of accuracy is required a temperature coefficient factor can be applied, which is equal to one part in 20,000 for the lateral electrical axis and one part in 40,000 for the electrical axis which represents the thickness of the crystal.

Information on methods of cutting quartz plates from the natural crystal may be had from articles by Cady[1] and Hund[2] or from my paper on "Piezo Electric Crystal Transmitters" which will soon appear in the Proceedings of the Institute of Radio Engineers[3]. In these articles further information on the electrical and optical axes is given, together with simple formulae for approximately the frequency of the crystal from its several dimensions. In this article we can consider that there are three frequencies in a quartz plate and that we are interested in making the crystal oscillate at only one of these frequencies.

There are two simple ways to make a crystal oscillate feebly thus providing a constant source of radio frequency. The first method is shown in Fig. 1. In this figure the crystal is placed between grid and plate and the grid is biased with a grid leak. The phase adjusting circuit consisting of a coil and a variable condenser, is placed in series with the B-battery source. An r.f. by-pass condenser is shunted across the B-battery while the conventional "A" battery is employed to heat the filament of the tube. The second type of oscillating circuit is shown in Fig. 2. In this figure the crystal is placed between grid and filament terminals of the vacuum tube while the remainder of the circuit is identical to that shown in Fig. 1.

The circuit shown in Fig. 1 will produce oscillations if the plate or phase adjusting circuit is tuned to a lower frequency than that of the crystal, while the circuit shown in Fig. 2 will oscillate when the phase ad-

*Naval Research Laboratory, "Bellevue", Anacostia, D. C.

1. W. G. Cady, Proceedings of the I. R. E., April, 1922.
2. A. Hund, Proceedings of the I. R. E., August, 1926.
3. A. Crossley, Proceedings of the I. R. E., January, 1927.

justing circuit is tuned to a higher frequency than the crystal frequency.

I prefer the circuit shown in Fig. 2 for two reasons: First, that there is no danger of an accidental short-circuiting of the B-battery as would be the case in Fig. 1, if the crystal should slip out from between the crystal contact plates and these plates touch each other; second, because of the smaller values of inductance and capacity which is necessary to tune the circuit to the oscillating condition.

GENERATION OF HARMONIC FREQUENCIES

There is a mistaken idea among those not familiar with the piezo-electric crystal art, that harmonic frequencies are generated, or

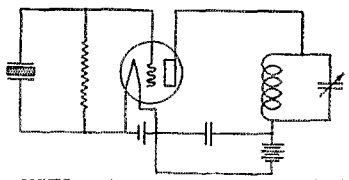


FIG. 2. USING THE CRYSTAL BETWEEN THE GRID AND FILAMENT

are present in a crystal. Such is not the case as the harmonic frequencies of the fundamental crystal frequency *are only produced in the phase adjusting or plate circuit of the tube.*

If we consider using the circuit shown in Fig. 2 and employ a small inductance and a large capacity it is extremely difficult to observe harmonic frequencies greater than the fifth, while if we increase the size of the inductance and reduce the capacity we will notice an increase in the number and strength of the harmonics. Now, as an extreme case, if we dispense with the condenser and employ a large inductance which has a very small distributed capacity; we will observe a much greater increase in the number and strength of the harmonics.

From this information we know that it is necessary to employ in the plate circuit a phase adjusting means which has a preponderance of inductance with a minimum capacity in order to produce the greatest number of harmonic frequencies. We also know that a circuit which has a small inductance and a large capacity will afford very sharp tuning to a single frequency while a large inductance and small capacity circuit tunes broadly and responds readily to a broad band of frequencies. Now if we consider that the wave form of the fundamental frequency in the plate circuit is not sinusoidal, due to the use of the grid leak, then it is correct to say that irregularities in the wave form indicate the presence of harmonic frequencies. Now if we employ the large inductance coil in the plate circuit we provide a means for matching impedance at harmonic frequencies with that of the plate-filament circuit of the vacuum tube, due to the fact that such a coil system responds to a broad band of frequencies. This matching of impedances therefore provides a maximum generation of power at the harmonic frequencies which makes possible the crystal calibrator.

DESIGN DATA ON CRYSTAL CALIBRATOR

The crystal calibrator has become a necessity in the modern radio laboratory, and due to its simplicity and reliability, as well as its relatively low cost, it can also be considered for use by up-to-date amateurs.

It can be used to measure very accurately, inductances, capacities, frequency meters and the frequency of any type of self-oscillating or crystal controlled transmitter. It may be termed the "watch dog of the laboratory" as it affords a means for obtaining an accurate check on numerous conditions which normally cause a considerable amount of trouble.

In the interest of assisting the amateurs to keep their transmitters within the assigned frequencies, and also to provide a reliable type of wavemeter, I am describing a type of crystal calibrator which should be of interest.

This crystal calibrator, exclusive of the cost of the crystal, can be made for approximately fifteen dollars. No previous experience with crystal oscillating circuits is required as the circuit will make any optically good crystal oscillate.

Referring to Fig. 3 we observe a schematic diagram of the crystal calibrator. The crystal is shown at (1) and for our use, should be a low frequency crystal, say 500 Kcs (7.76 mm thick by 23 mm square) which should be housed in a moisture-proof container of some kind. The upper and lower brass contact plates for the crystal should be smooth and preferably lapped surfaces. The upper contact plate can rest on the crystal or it can be separated from the crystal by an air space of approximately .003". If the plate rests on the crystal, its weight should not exceed seven grams and a flexible lead one and one-half or two inches long, consisting of three or four strands of No. 38 or No. 40 copper should be soldered to the plate. Greater piezo-electric effect is obtained with the plates in intimate contact with the surface of the crystal although for use with the crystal calibrator, where only feeble piezo-electric control is necessary, an air space can be tolerated.

When assembling the crystal holder unit, care should be taken to have the surfaces of the contact plates and the crystal as clean as possible. Use pure grain alcohol or carbon tetrachloride (Pyrene fluid) for cleaning the crystal holder unit. A small

amount of dirt or liquid on the surface of the crystal will prevent it from oscillating, so be careful and observe precautions previously cited.

A grid leak having a resistance of two megohms is shown at (2). This leak should be of the metallized filament type similar to the Daven glastor or Durham resistors. Do not use any leaks which are made of the India (carbon) ink and paper as such leaks are noisy and do not maintain their rated resistance when subjected to currents met with in the calibrated circuit.

A UX-199 or 201-A tube can be used in the circuit, the preference being in favor of the UX-201-A tube. The tube (4) with the usual filament heating battery (3) is shown in the figure.

A Universal or pancake wound coil can be employed at (5) in the figure and if such a coil is not available a cylindrical coil can be used. The coil best suited for this purpose should have a very small distributed capacity and experience has shown that the pancake or Universal wound coils have a very small distributed capacity and are the best type for use in crystal calibrators. The coil recommended for this circuit for use with the 500 Kcs crystal is of the following type; i. e., one inch inside diameter of ap-

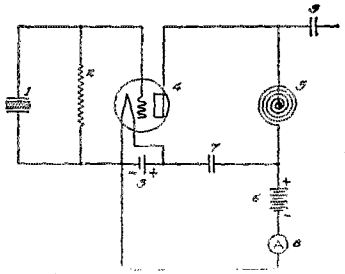


FIG. 3. THE CRYSTAL CIRCUIT USED IN THE CALIBRATOR

proximately 190 turns of No. 24 D.C.C. wire having a winding width of one-quarter inch.

The inner terminal of the coil should be connected to the plate of the tube while the outer terminal is connected to a 45- or 90-volt B-battery (6). A d.c. milliammeter (8) having range from approximately 0 to 5 milliamperes is inserted in the circuit as an oscillation indicator. Shunted across the meter and B-battery is a paper by-pass condenser having a capacity of approximately 0.5 μfd.

A coupling condenser (9) having a capacity of 50 microfarads provides a means for coupling the calibrator to a receiver or any type of frequency meter. The coupling lead should not be greater than eight feet in length and should be suspended in air at least two feet from the wall or any grounded object.

There are other means for coupling calibrators such as employing another coil of similar characteristics to the plate coil and coupling this coil to the plate coil or by taps on the plate coil.

OPERATION

Having assembled the calibrator, first light the filament and then observe the meter (8). If the meter needle shows a

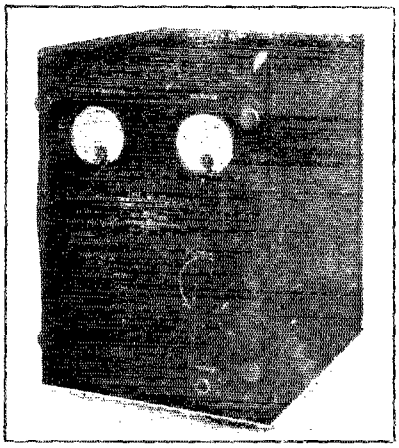


FIG. 4. FRONT VIEW OF THE COMPLETED UNIT

maximum current reading and then falls back to a small value, this is an indication that the circuit is oscillating. If the meter shows a steady maximum reading then the circuit is not oscillating and further work is necessary. This usually should consist of reducing the number of turns on the plate coil until the circuit starts oscillating. If this change in plate coil turns does not make the crystal oscillate, change tubes or the grid leak. If the crystal is a sluggish oscillator it can be triggered off into the oscillating state by varying the filament voltage abruptly over a range of about two volts, or the crystal holder can be tapped gently.

Sometimes, a cause for the calibrator refusing to oscillate is due to location of the plate coil near grounded objects or the placing of bad dielectrics in the field of this coil. The coil should be mounted on a wooden form and spaced at least two inches from other parts of the calibrator.

Having started the calibrator oscillating, it will be of interest to observe how it functions. This may be done by placing the coupling lead near an oscillating receiver, the frequency range of said receiver being previously known, and by varying the dial on the receiver a series of beat notes will be heard. If the receiver is set near the

500 Kcs setting and the dial varied until a zero beat note is obtained then that setting is exactly 500 Kcs. Now continue increasing the frequency of the receiver until another beat note is heard, which is most

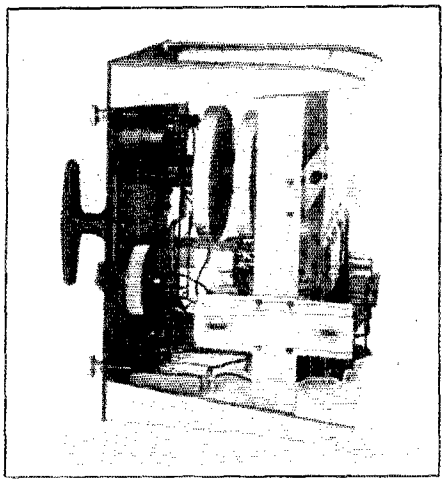


FIG. 5. INSIDE VIEW. THE TUBES SHOWN ARE WESTERN ELECTRIC "N" TUBES

likely 750 Kcs while the next beat note observed will be equal to 1000 Kcs and so on at intervals of 500 Kcs or fractional parts of 500 Kcs.

For the lower frequency settings it is possible to hear the fractional harmonics and the integral harmonics, while at the higher frequency setting of the receiver only the integral harmonics are heard. All fractional harmonics are much weaker than the integral harmonics and therefore can be easily recognized. The fractional harmonics are produced by the beating of an odd harmonic of the receiver with an even harmonic of the calibrator or vice versa, for instance if we observe a beat note at 750 Kcs on the receiver then we know that the second harmonic of the receiver is beating with the third harmonic of the calibrator. Numerous other combinations of harmonics of the receiver and the calibrator produce other fractional harmonic observations and aid materially in finding other points between the integral harmonic settings.

A 500-Kc. crystal can be used to advantage in checking frequencies higher than 2000 Kcs and is well suited for use by amateurs. Manufacturers of broadcast equipment should use a 100 Kc. crystal calibrator which will produce enough harmonic settings to accurately calibrate any frequency meter that operates in the broadcast frequency band.

Crystals can be purchased from various companies that advertise in *QST*. When purchasing crystals, it is always advisable to state how you wish to use it, giving data on plate voltage, type of tube and also the circuit in which it is to be used, because there is a slight error in calibration when crystals are employed with different circuits and tubes. An example of this case may be cited as follows. A certain crystal was employed in a crystal calibrator circuit using 201-A tube and 45 volts for B-battery, and for this condition oscillated at 4002 Kcs, while, when this crystal was employed in a power circuit with an output rating of 80 watts, it oscillated at 4000 Kcs. The difference in frequency for these two conditions was .05 percent which represents the extreme change which is possible when employed in different circuits when operated at a definite temperature.

There are two kinds of crystals, those that can be used as feeble oscillators, such as employed in crystal calibrators and those which are employed to control oscillating circuits having outputs ranging from 5 to 100 watts. It is comparatively easy to make crystals for use in feeble oscillating circuits, but a considerable amount of skill and knowledge of crystal structure is required in the manufacture of power crystals.

Crystals may be of square, round or oval shape for use in feeble oscillating cir-

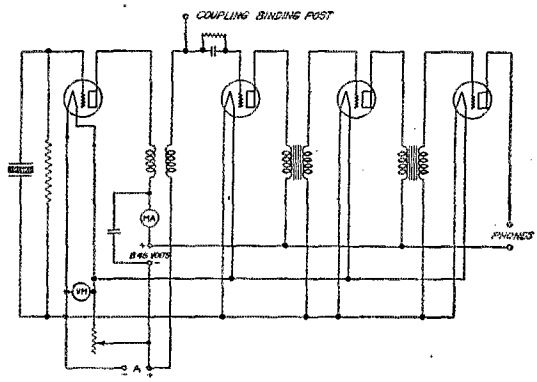


FIG 6. THE COMPLETE CIRCUIT USED IN THE CALIBRATOR

cuits, but for power purposes, the square crystal is to be preferred.

For an absolute check on the frequency of the crystal calibrator, it is advisable to assemble the unit and if found to function correctly, it should be shipped to a standardizing laboratory for final calibration. When shipping this unit a maximum amount

of care should be exercised to provide means to prevent damage due to rough handling.

The various parts of the calibrator can be readily noted by reference to Figs. 4 and 5. The most conspicuous part of the unit is the Litzendraht Universal wound coils, one of which is in the plate circuit of the oscillator and the other coupled in the detector circuit as shown in the schematic wiring diagram (Fig. 6).

In closing it is suggested that the crystal calibrator be considered seriously by all persons engaged in handling radio traffic of any kind, because it is the only reliable means of checking quickly the frequency of any radio frequency system. Persons carrying on trans-oceanic traffic should be especially interested in this device, because it will prevent them from accidentally operating in a frequency band which belongs to another nation.

A.R.R.L. Information Service Rules

Please help us by observing the following rules:

1. Keep a copy of your questions and diagrams and mention that you did so.

2. Number the questions and make a paragraph of each one.

3. Make diagrams on separate sheets and fasten them to the letter.

4. Print your name and address (not merely your radio call) on your letter. Don't depend on the return address on the envelope as this is destroyed when the letter is opened.

5. Don't ask for a comparison of the various manufacturers' products.

6. Before writing, search your files of *QST—the answer probably is there.*

7. Address all questions to Information Service, American Radio Relay League, Inc., 1711 Park Street, Hartford, Conn.

8. It is not essential to enclose an envelope as long as you supply postage and PRINT CLEARLY your name and address on your letter.

Strays

The second annual convention of the Institute of Radio Engineers was held on January 10, 11 and 12. A mighty nice program was outlined, allowing time for trips to the New York BC stations as well as through some of the large manufacturing plants. After Clayton has been there a year, we may expect them to also include the usual QSL card and liar's contest in their conventions.

Midwest Convention Coming!

WHOOPIE!! Another Midwest Division convention, in conjunction with the Iowa State College Radio Short Course, is to occur on April 15th and 16th at the Iowa State College at Ames. Save up your shekels, you Midwest fellows, for this is going to be *good.*

An excellent program has been planned under the direction of Mr. D. C. Faber of the college, who will be in charge of the Short Course. Unfortunately up to press time we have not received details for publication. There are going to be lots of stunts and prizes, movies, etc. Registration will take place Friday morning the 15th, with a short informal meeting for the purpose of getting acquainted. There is to be an A.R.R.L. traffic session that afternoon, and somewhere on the program there will be a real ham banquet of course.

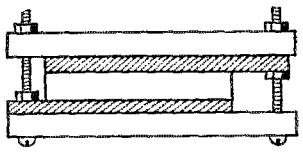
Everybody is invited and a big time is assured. Last year's convention in connection with the College Short Course proved very popular but this one promises to skin it all hollow. Ames April 15-16!

Strays

Attention, Sea Going Brass Pounders! Under this caption, there appeared in a recent issue, a stray on the Government publication "Radio Aids to Navigation" which stated that it was obtainable from the Supt. of Documents. This should read that it is obtainable from the U.S. Hydrographic Office at Washington D.C. We hope you haven't swamped the poor Supt. of Documents in the meantime.

Russ Shortman Jr., 6BWS, tells us that most of the Arizona gang are using a very weak solution of borax in their rectifiers. A small package of borax is emptied into 5 gallons of water. The jar is shaken for a minute and then left to settle. The solution is then siphoned off. It is not necessary to put oil over the solution as it doesn't creep as bad as the concentrated ones.

Frederick T. Swift Jr. of 6CMQ gives us the following on what he terms as being a simple, beautiful, cheap and efficient crystal



mounting that may be made in a hurry. The drawing gives the general scheme. Starting from either the top or bottom, you have bakelite, tinfoil, crystal, tinfoil and bakelite.

Coming—An International Relay Party

A World-Wide Contact Contest to be Held in May

By F. E. Handy, A.R.R.L. Communications Manager

SELDOM a week goes by but that Warner or Kruse drop into the C.D. to ask for the latest dope on foreign contact. "How shall I send my X-Section test notices for amateurs in Ecuador, Austria, etc.? Who is most dependable and who can QSR promptly?"

Elsewhere in this issue are listed the stations known to be the "best bets" for good foreign contact as we go to press. While the larger countries can always be reached easily, not every foreign QSO is reported to the C.D. and this makes it difficult to get complete information on foreign contact points.

So why not an international party with some experimental test messages to see what we can do? This will give us all a chance to have some good fun including both relaying and international DX; it will serve as a starting point for the lining up of more definite contact for all foreign points; new contacts and friendships will be made. Among other things the contest will help the C. M. to answer some of the questions so frequently fired at him.

Here you are, OM! Here's a contest in which every amateur in the whole world can have a part—the only requirement, an amateur radio station. The contest will show which stations in each country are the star stations for two-way international work. There are test messages to relay which will insure that actual solid two-way QSOs are made. These messages are going to be entirely of an experimental nature so that all countries can take part whatever their regulations regarding the handling of radiograms. Both operating and station performance will play a part and a great deal depends on the judgment of the individual operators. The tests will show which stations can do the best work in each part of the world. They will show which countries make the best record. The tests will show which stations in the United States can work most countries in the two weeks of the tests—also what stations can do the BEST work with any particular country.

Certificates will be awarded to the stations making the best score in each territory, country or locality *outside* the MAINLAND of United States and Canada. Certificates will also be awarded to stations *in* the United States and Canada. These certificates will appoint the stations that prove themselves best fitted for the post to be known as OFFICIAL FOREIGN CONTACT STATION—and there will be one such station appointed for every participating locality (see a list of international intermediates). It is possible for a U. S. or Canadian amateur to hold a certificate for *more* than one country but every station has equal opportunity in the two weeks of the contest. A full report of the results and the scores of the highest stations in each country will be given in *QST* as soon as the results of the contest are in.

Participating stations in the United States and Canada will each be provided with suitable test messages just in advance of the contact contest—one message to be given an amateur in each of the foreign localities worked. The messages will each require an answer. As soon as received, the foreign amateur writes a reply, the text of which must be of eight or more words (five figures or fraction thereof count as one word). This return message can be given *only* to *some other* U. S. or Canadian amateur and will not count for anything in the score if returned through the same station. During the tests *each* U. S. or Canadian amateur will try to give as *many* countries a message as possible. Each U. S. or Canadian amateur can give but one message to ch foreign country. There are going to be plenty of stations on the job, however, and therefore plenty of messages to go around. Just as soon as a few of the messages are off the hook, the North American gang will begin to look for replies because received messages count for more in their score.

Any wavelengths at all that are used by amateurs may be used in the contest. It may be helpful if the participants spend some time in advance of the tests in listening-in to note where everyone is located on the dial or even in digging some information out of the tables in the I.A.R.U. Department of back *QST*s to learn what wavelengths are used most by each foreign locality. 20-meters will undoubtedly play an interesting part in this contest, as many countries are working on that wave already and find solid contact possible with very low power. The man with the one or two five-watters has just as good a chance of rolling up a big score as the chap with the high-power outfit. Perhaps you noted the simple outfit with which 1BIG won the Traffic Trophy. With the same set he has gone down to 20-meters and reports hooking some English stations. By proper adjustment and operation *you* can do the same thing.

Here is an example of the way things

should go off under the rules of the contest —more of them later. Suppose at the start of the test oa2YI works nu1BHW and takes 1BHW's particular message for Australia selected at random from his list of messages provided by A.R.R.L. HQ just before the tests begin. The stations finish the QSO and 1BHW looks for other countries to work while 2YI writes out an answer to give to some *other* station in the U. S. or Canada at the first opportunity. On his next QSO 2YI hopes to send this message and at the same time receive another message to boost his score all he can. If the message he takes on the second QSO happens to have the same text as the previous message, he can take it, but he must be sure to answer it differently before QSRing back to a U. S. or Canadian station. Late in the contest 2YI may work 1BHW again and while unable to take another message from HIM, he can give 1BHW this message taken from any U. S. or Canadian station except 1BHW. 1BHW will know it is a different message because it will bear a different serial number than the one assigned the similar message by 1BHW. Every set of message assignments bears a cipher number which *must* be used in numbering the reply test message for identification and checking purposes.

Sample messages as sent by U. S. or Canadian amateur stations:

TEST MSG FM NU/NC (Insert call). NR 2271A32 (Insert date). — . . . — WHAT IS THE WAVELENGTH OF YOUR TRANSMITTER PLEASE — . . . —

Answer as worded by foreign amateur and sent to some *other* U. S. or Canadian station:

REPLY TEST MSG FM OA/OZ/EG/FO etc. (Insert call). NR 2271A32 (Insert date msg returned to U. S. or Canada —. . .— MY WAVELENGTH IS TWENTY THREE METERS TO BEST OF MY KNOWLEDGE —. . .—
(Sign your QRA if you wish for identification).

RULES OF CONTEST

1. The contest opens May 9 at 0000 G.C.T. and closes May 23 at 0000 G.C.T. Only work falling between these dates and times will be counted—be sure to remember the dates, May 9 to 22 inclusive.

2. United States and Canadian amateurs may *each* send just ONE message to any foreign locality.

3. Evidence of more than one test message to any one country from a single U. S. or Canadian station will make a contestant ineligible for either a certificate or honorable mention. Other evidence of intentional infraction of the rules will make the contestant ineligible similarly.

4. United States and Canadian amateurs may receive only one reply test message from any one station in a foreign country. This rule is to prevent a single North American station from gaining a great number of points too easily and to give all contestants an equal chance with all amateurs outside the U. S. and Canada.

5. Reply test messages must contain *eight* or more words in the text. These replies are prepared by the contestant himself who exercises his own ingenuity to make each message different than other messages for checking purposes. Reply test messages are counted only when sent to a station in the U. S. or Canada other than the station from which the original message bearing the distinguishing serial number was received.

6. Credits: United States and Canadian stations—
Successfully sending the test message counts 1 point.
Receiving a reply test message from abroad counts 3 points.
Stations in all other localities—
Successfully receiving the test message counts 1 point.
Successfully transmitting a reply test message to a United States or Canadian amateur station other than the one from which the original message was received counts 3 points.

7. Confirmation by mail is required of all participants at the close of the contest. Whether your score is 1 or 100 we want the dope for *QST*.

a. United States and Canadian stations should return the message assignment sheets with the record showing when the message was sent, call of station to which message was given, date and wavelengths in the spaces provided on the assignment sheet. The copies of all messages received from foreign localities must be turned in as evidence of QSO with stations in the different localities. The information on time, call, date, and wavelength should also be included directly on each message.

b. Foreign confirmations: Copies of all test messages received and copies of reply test messages must be turned in with the information requested under (a.).

8. All reports should be mailed to the following address promptly at the conclusion of the contest: INTERNATIONAL CONTEST EDITOR, COMMUNICATIONS DEPARTMENT, 1711 PARK ST., HARTFORD, CONN.

9. The test message serial number must be used in the reply test message. It is suggested that foreign participants include name and QRA at end of their reply test messages for identification purposes. This is not a requirement necessary for proper credit but it is desirable as is self-evident in a contest of this magnitude.

10. U. S. and Canadian amateurs must signify that they desire to enter the *contact-contest by dropping* a QSL-card to the following address signifying their intention to participate. This will be acknowledged promptly but the actual message assignments will not be given out until just before the start of the contest. Send your QSL card to this address early if you expect to participate in the *first big international relay party*: INTERNATIONAL CONTEST EDITOR, COMMUNICATIONS DEPARTMENT, 1711 PARK ST., HARTFORD, CONN.

Every foreign amateur will have a chance to make an unprecedented number of U. S. and Canadian QSOs!

Every U. S. and Canadian ham will be in on the fun!

Two weeks of opportunity to smash all previous records!

All amateurs in the world are cordially invited to participate.

COME ON IN, OM. Get your station in trim now and plan to grab off one of those certificates. U. S. and Canadian amateurs, get your QSL-entry cards in early to make *sure that your set of test messages is* mailed you in time.

Detection—Grid or Plate

By Sewall Cabot*

A three-electrode vacuum tube may be used for two distinct types of detection, known respectively as "grid detection" and "plate detection". Curiously enough the question of the relative merits of the two methods existed even before Lee DeForest's first three electrode patent No. 879532 issued in 1907.

Grid detection assumes a variable grid-bias voltage which is obtained by a condenser in series with the grid—and some form of resistance leak to discharge it. Plate detection assures a fixed voltage bias on the grid and a corresponding point grid-voltage plate-current curve where it is bending most sharply.

When Van Der Bijl wrote his book on the thermionic vacuum tube and its application in 1920, both of these types of detection were already thoroughly understood.

HISTORY

In 1906, at Cambridge, Massachusetts, I was in charge of receiver-design research for the Stone Tel. and Tel. Company, which was making receivers for the Navy. In October of that year, DeForest got in touch with us and informed us that he had invented a new and sensitive detector and I was sent to New York to get the "dope" and some of the tubes to start a research.

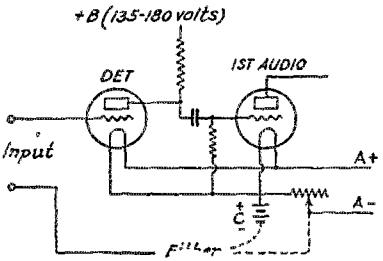


FIG. 1. A HIGH-MU DETECTOR OPERATING ON PLATE DETECTION AND RESISTANCE-COUPLED TO THE AUDIO AMPLIFIER

The resistance coupling at once enables one to match the high plate impedance of the tube and to "load" the first audio tube so that it will not howl as it would tend to do with a transformer whose primary impedance could hardly be brought to the high value necessary.

DeForest showed me the circuit just as it stands today with the condenser in series with the grid (but minus the leak). I came back to Boston and began a research to try to get the best circuit for it. The tubes of those days were by no means uniform, some being very hard and some very soft. About the first thing I noticed was that a strong signal would put the set out of commission for a few seconds with some of the tubes, especially those that ran without much heat on the outside of the bulb, indicating a high vacuum. When this happened, I began feeling the connections for a loose joint and noticed that when I touched the grid terminal the set came back into commission. This looked as if a charge had been trapped on the grid by the condenser and I put a pencil mark to discharge it. Without intending to go on record as wishing to contradict the validity of any existing patents, I believe that this was the first appearance of the grid leak.

The addition of the leak improved matters materially with hard tubes. It was not necessary with the soft ones, which behaved as if they had a leak inside of them. I then argued that if the tube were so sensitive to grid potentials, it would be better to find out what happened when we put an adjustable voltage on the grid. I removed the condenser and leak and connected an ajustable C battery in the circuit between grid and filament, and I applied jointly with John Stone Stone, January 4, 1907, for U. S. Patent 884110, which covered this use of the adjustable C battery. It so happened that the soft tubes, which were the most sensitive, gave best results with a plus adjustment of "C" bias, which was accordingly noted in the specifications and claims. This briefly gives us the meaning and origin of the two methods of detection.

In grid detection with a condenser and a leak, it is well known that we get suppression of the higher frequencies to an extent which varies dependent on the loudness of the received signals. To get best response, we must use a zero or plus bias at the grid, and this in turn creates inside the tube a condition equivalent to a resistance leak between grid and filament. I think the bad results of this leak have been somewhat lost sight of in modern receiver design and we are now suffering from distortion and loss in selectivity in sets that use grid detection. This could be obviated by a very small change in their wiring to convert them to the plate type of detection.

The change is easy since I believe that in all cases the necessary bias may be obtained by the filament rheostat drop from the 6-volts of available battery voltage to the 5-volts wanted on the filament. The separate C battery is thus really not required.

With plate rectification, I do not think a separate detector rheostat is necessary. Simply use a common resistance in the com-

* Member I.R.E., Consulting Radio Engineer, Brookline, Mass.

mon return on the negative side of the filaments, so that the detector grid will be about one volt more negative than the negative side of the filament.

This will stop the leak in the tube and the gain on available r. f. voltage on the detector grid will in many cases compensate for the decreased percentage of detection, to say nothing of the increase in both freedom from distortion in the quality of reception and the gain in selectivity of the circuit which tunes the grid of the detector tube. We need all the selectivity we can get these days.

HIGH-MU TUBES

For a detector tube used in this way, I prefer one of the new high-mu tubes, which are now available. The plate should best be fed through about 2 or 3 megohms from the B-eliminator or B-battery voltage of 180 volts, and resistance-coupled to the grid of the first audio amplifier tube as shown in Fig. 1. This gets rid of the need of a separate tap. It will be noted that less plate voltage is needed with plate than with grid rectification. In as much as we are detecting on the lower bend of the plate-current grid-voltage curve, much lower voltage actually applied to the detector plate is necessary to reach the sharpest point of the bend, and this should be found by experiment. On an average set 1-10 to 2-10 milliamperes in the plate circuit of the detector tube is about right. In most sets this will be found to correspond to a voltage of something less than 22-½ on the detector B-plus binding post when using a 201-A, 200-A, or high-mu tube for a detector[1].

Anyone can try this out at small expense with one of the many resistance-coupled amplifiers, by modifying its wiring slightly as shown in Figure 2.

REGENERATIVE DETECTORS

In the case of sets using regenerative detectors, there is an additional problem which sometimes shows up with "grid" detection and which often can be remedied by resorting to "plate" detection. This is that on approaching the "floating point" (critical regeneration) the receiver suddenly "plops" into violent oscillation. I think the cause of this is that in grid detection with regeneration control, the plate circuit has an inductive reactance, making it possible to start oscillations in the grid circuit by transfer of energy through the plate to grid capacity. Below the "floating point" oscillations are suppressed by the leak inside the tube. Before the "floating point" is reached this leak suddenly disappears as the condenser takes up a negative charge, due to the normal action of oscillations in "grid detection." This negative charge of "bias" on the grid automatically removes the leak and the set snaps into violent oscillation before it has reached its most sensitive adjustment.[2]

The sum and substance of this tendency of a regenerative detector tube using grid detection, to "plop" into oscillation, is that it is usually quite impossible to get any-

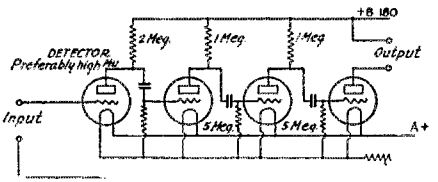


FIG. 2. A RESISTANCE-COUPLED AMPLIFIER ADAPTED TO PLATE DETECTION. THE CHANGES CAN BE UNDERSTOOD FROM THE TEXT AND FIG. 1

where near the "floating point" or critical regeneration. With plate detection, regeneration is so much more smooth that the "floating point" can be more closely approached.

I believe, therefore, that it is possible in actual practice using a regenerative detector to get fully as much if not more overall amplification with the plate rectification, because of this phenomenon, not to mention the gain in r. f. voltage on the grid, as spoken of above.

C.W. WORK

The author has not of late had much experience with c.w. reception by oscillating receivers and it is possible that the grid-detection method may be best in this instance. In as much as plate detection gives considerably greater voltage available on the detector grid, it would be an interesting subject for experiment for members of the A.R.R.L. They should bear in mind that plate-detection will never perform satisfactorily with the filament rheostat on the plus side unless a C battery is used.

In summing up the case for plate-detection, therefore, there is no question in my

1. Assuming a plate circuit *resistance* of 200,000 ohms one will have on the detector tube a plate voltage of 16.8 with a current of rather less than 1/10 mil when operating from a 180-volt source with a 2 meg. plate resistance in series as suggested by the author. —Tech. Ed.

2. The argument given by the author suggests a possible explanation for the seeming contradiction that most observers prefer a rather large grid capacity and low resistance for non-oscillating (broadcast) reception but a small capacity and high resistance for oscillating (c.w.) reception. In broadcast reception the critical condition is being approached from the non-oscillating side and the aim is to go as far as possible without having the bias rise so as to permit oscillation. This indicates large C (over 200 pfds) and small R (under 3 megs). In c.w. work the intention is to approach from the other direction, using a combination that will continue to oscillate easily —i.e. will maintain the bias suggested. This indicates small C (below 100 pfds) and large R (above 4 megs).—Tech. Ed.

mind as to its superiority over grid-detection in a modern radio broadcast receiving set.

(1) Because of its superior freedom from distortion.

(2) Because the tuning is greatly sharpened as compared to grid rectification.

(3) Because in spite of theoretical considerations, the actual gain obtainable from plate rectification may even exceed that from grid detection when the detector tube is used regeneratively. This is because it is more easy to approach close to the "floating point". Also the gain on the available r. f. voltage on the detector grid will bring up the amplification, so that the over-all may be greater than with grid detection.

I expect to see a great increase in the use of plate detection in broadcast reception in the next year or so for these important reasons.

In c.w. reception with oscillating receivers I think there is a chance for interesting and possibly profitable experiment with plate-detection.

Standard Frequency Transmissions

THE Official Wavelength Station Committee of the Experimenters' Section, A.R.R.L. announces the following standard frequency schedules. The actual transmissions are based on crystal-controlled oscillators and precision wavemeters and an accuracy of better than 1/10% is to be expected.

The methods used at station 9XL are described elsewhere in this issue. The frequency values at 1XM are based on the standards of the Bureau of Standards and have been checked by the Cruft Laboratory and by the Communications Laboratory of the Massachusetts Institute of Technology. While the accuracy mentioned above is to be expected, no guarantee is made other than the one that transmission will be suspended if errors are found by the O. W. L. S. Committee.

Station 1XM is operated by the Communications Division, Massachusetts Institute of Technology and the M.I.T. Radio Society, Cambridge, Mass.

Station 9XL is connected with, and a part of, the "Gold Medal Station" at Anoka, Minnesota, full details of management and operation appearing elsewhere in this issue.

SCHEDULES

In the following "f" is the frequency in MEGACYCLES and the *approximate* wavelength in meters follows.

(Figures are frequencies in MEGACYCLES per sec.; approx. wavelengths in parentheses)

Friday Evening Schedules			Sunday Afternoon Schedules	
Eastern Standard Time for 1XM Central Standard Time for 9XL Time (PM)	Schedule A f λ	Schedule B f λ	Eastern Standard Time for 1XM Central Standard Time for 9XL Time (PM)	Schedule C f λ
8:30	3.50 (85.7)	6.50 (46.1)	3:00	10.0 (30.0)
8:42	3.60 (83.3)	6.75 (44.4)	3:12	12.0 (25.0)
8:54	3.75 (80.0)	7.00 (42.8)	3:24	14.0 (21.4)
9:06	3.90 (76.9)	7.25 (41.3)	3:36	14.5 (20.7)
9:18	4.00 (75.0)	7.50 (40.0)	3:48	15.0 (20.0)
9:30	5.70 (52.6)	7.75 (38.7)	4:00	15.5 (19.3)
9:42	6.50 (46.1)	8.00 (37.5)	4:12	16.0 (18.7)
9:54	7.00 (42.8)	8.25 (36.3)	4:24	18.0 (16.7)
10:06	7.50 (40.0)	8.50 (35.3)	4:36	20.0 (15.0)
10:18	8.00 (37.5)	8.75 (34.3)		
10:30	8.50 (35.3)	9.00 (33.3)		

Date	Schedule	Station
March 4,	A	9XL
March 6,	C	1XM
March 11,	A	1XM
March 13,	C	9XL
March 18,	B	9XL
March 25,	B	1XM
April 1,	A	9XL
April 3,	C	1XM
April 8,	A	1XM
April 10,	C	9XL
April 15,	none	
April 22,	B	9XL
April 29	B	1XM
May 1,	C	1XM
May 6	A	9XL
May 8,	C	9XL
May 13	A	1XM
May 20,	B	9XL

DIVISION OF TIME

3 minutes—QST QST QST nu (Station call letters)
3 minutes—5 sec. dashes broken by (station call letters) every half minute
1 minute—announcement of frequency in megacycles per second (8.75 megacycles per sec. is sent as "8 r 75 MC")
1 minute—announcement of next frequency in megacycles per second.

Special Notice—The continuation and possible extension of these transmissions depends entirely upon the response of the A.R.R.L. If you use the transmissions send a note to Experimenters' Section, A.R.R.L., Hartford, Conn.

—*R. S. K.*

Standard Frequency Station 9XL

(*Continued from Page 19*)

tion here will prove that our time has not been spent in vain.

(Speaking for the Experimenters' Section and also as Technical Editor, it seems to me that such fine work as has been done at 1XM and 9XL deserves much more hearty thanks than we are giving. *Every* A. R. R. L. man has benefited directly or indirectly from the transmissions of these stations and of WWV. The least that can be asked is that a note of acknowledgment be sent to the Experimenters' Section which will take especial care and see that it is forwarded and also noted in *QST*.)

—*Robert S. Kruse.*

A Flexible Transmitter

By F. J. Marco*

EVER since amateur two-way radio communication became divided into a number of popular wavebands, (20, 40, 80 and 160 meters) there has been a real need for a system of speedily shifting wavelengths in both receiver and transmitter without impairment of efficiency.

It is well known that a receiver or transmitter can hardly be designed which will cover the entire range of amateur frequencies now in use unless the inductances are changed to keep the L/C ratio from getting entirely out of the reasonable limits of efficiency.

The receiving problem has been fairly well covered in *QST*,[1] but the transmitting problem is at the present writing just coming into general notice. The ideal amateur transmitter is one which can almost instantaneously shift its wave to a more favorable one, taking into account the skip distance, time of day, season of year, etcetera. We have found that in these winter afternoons, 20 meters is by far the best band; later, at 6 p. m. we shift to 40, and possibly up to 80 for traffic handling or medium distance work. During the dull hours when the 40-meter U.S.A. stations are riding over our heads and it is still too early for the super-DX we use 80 meters. Many more contacts with distant stations are possible if waveband shifting is made a matter of seconds rather than long minutes of clip-adjusting and retuning.

In the design of a low-powered transmitter, using plug-in inductances to cover the three most popular wavebands, there were several considerations of major importance. The first, and most important, is the choice of an appropriate circuit. In order to make adjustments simple and speedy, both for the experienced amateur and the novice or "converted" broadcast listener, a circuit entirely adjusted by panel-controlled variable condensers is to be preferred to one which requires the juggling of many clips, taps and dials. Therefore, that old-standby which is so popular with hundreds of amateurs, and which is variously called the Armstrong or the "tuned grid-tuned plate" circuit, was chosen. This is described by Ballantine[2] as one of the best circuits for short-wave transmission because of its inherent steadiness, efficiency, and ease of adjustment. It can be entirely controlled by two variable condensers, one in the grid and the other in the plate circuit, and is very nearly fool-proof.

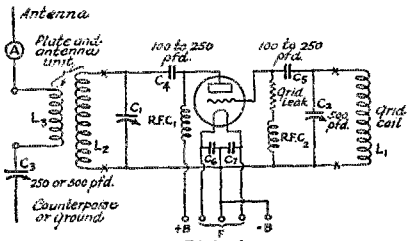


FIG. 1

THE TRANSMITTING CIRCUIT AS DESCRIBED IN THIS ARTICLE

Shunt feed of the plate supply is through r.f. choke No. 1. The condenser capacities are stated in picofarads which are the same as micromicrofarads. Note that the tuning capacities C-1 and C-2 are larger and the blocking capacities C-4 and C-5 are smaller than usual. This steadies the wave.

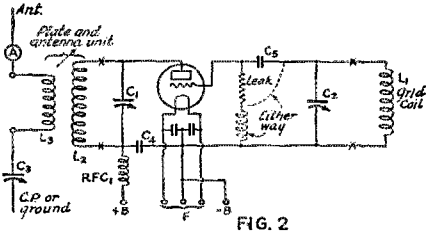


FIG. 2

THE SAME CIRCUIT MODIFIED FOR SERIES FEED OF THE PLATE POWER

Note that the only changes are in the position of r.f. choke No. 1 and in the position and capacity of C-4. The advantage of this change is that any "bumps" in the choking action of r.f. choke No. 1 have very little effect, provided C4 has a capacity of 500 picofarads or more. The disadvantage is that the rotor of C1 is "hot".

Another major consideration is that of its small size and pleasing appearance. Amateur radio has graduated from the days when we needed a shack in the back yard or basement to keep the noise of the rock-crusher out of the house. A good c.w. set

* Consulting Engineer, Aero Products Inc., also 9ZA, 5723 Winthrop Ave., Chicago, Ill.

1. Referring only to recent issues of *QST* we have Multiplex Short-Wave Reception (Clapp) March, 1926; Tuner Design (Holbrook) March, 1926; The Grebe CR-18 (J. M. C.) June, 1926; Of, By and For The Beginner (McCormick) June, 1926; Easy Tuner Design (Baird) and Four Tuners in One (Gilchrist), both in Sept., 1926; Short Wave Tuner Kits (J. M. C.) and Covering All Wavelengths (Clayton) and a Portable Transceiver (Gunther) all in Oct. 1926. A Short-Wave R.F. Amplifier (Bouck) and The Flying Loop (Wright), both in Nov. 1926. A Short-Wave Super-Regenerative Receiver (Dallin) Jan. 1927. A Compact Receiver (Learned) Feb. 1927 and Short-Wave Plug-in-Coil Receiver Design (Marco) Feb. 1926 and A Shielded Short Wave Receiver (Marco) Dec. 1926.—Ed.

2. Ballantine's "Radio Telephony for Amateurs", available thru *QST*'s book department.—Tech. Ed.

of medium power can be placed in the corner of a small room without undue crowding and because of the inherent pride all good amateurs have in a workmanlike, beautiful set, "hay-wire" construction and straggling leads are a thing of the past. Witness *QST* photos of modern stations, the ones who really step out! We must also remember that the BCL is beginning to sit up and take notice, and invariably his wife objects to any uncomplimentary additions to her household furniture. Therefore, our transmitter must be a pleasing addition, rather than an eyesore.

In Figure 1 we have the circuit as used with the new Aero transmitting inductances. The grid and plate circuits of the tube, are each tuned by a plug-in inductance and a 500-picofarad variable condenser. The condenser readings for any particular wavelength are *almost* identical, as the same L/C ratio, within narrow limits, is used in each circuit.[3] Shunt-feed of the plate power to the plate is shown rather than that of series-feed, primarily because of the greater safety afforded the operator in the former. The grid and plate blocking condensers may be anything from 100 to 250 picofarads, as these values are not critical. The smaller capacity is to be preferred on the shorter waves, as tube heating does not cause such bad "creeping" of the wave. Too small a capacity cannot be used, however, as it may interfere with the feed-back thru the tube and cause trouble in starting oscillations. The leak (of which more later) is shown shunted from grid to filament, although it may, of course, be connected directly across the grid condenser. Both grid and plate circuits are isolated at radio frequency by the usual r.f. chokes which are in this case, small honey-comb coils which are effective when wound with small wire. The filament is by-passed, at the tube, by two paper condensers, which may be anything from 1000 pfds on up.

The plate unit is provided with a variable antenna coil of a fixed number of turns, placed at the filament end of the plate coil. The circuit may be tuned by means of a variable condenser shown in the counterpoise-ground lead of the various complete diagrams in order to resonate the antenna fundamental or one of its harmonics to the desired wavelength. This condenser may be anything which will stand up and has 250 to 500 picofarads maximum capacity. The antenna coupling is controlled by tilting the antenna coil back and forth.

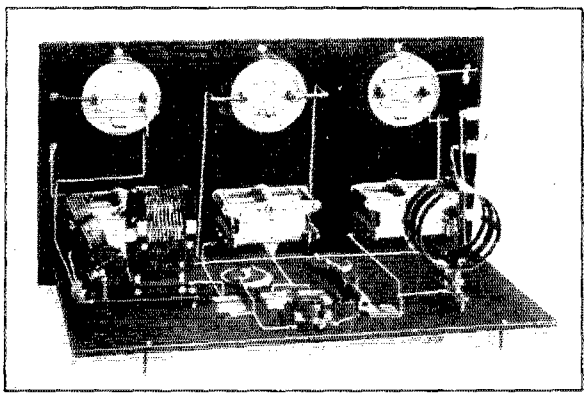


FIG. 3. REAR VIEW OF THE SET
The coils from left to right are antenna coil, plate coil and grid coil. At the center front is the socket and near it the filament by-pass condenser C6 and C7, also the plate and grid condensers C4 and C5 and the grid leak. The two discs on the base are the honeycomb chokes. On the panel from left to right are the tuning condensers for antenna, plate and grid.

Figures 3 and 4 show the front and rear view of a small transmitter designed to use one UX-210 tube. The panel measures 18 by 10 inches and the set is about 10½ inches deep. The plug-in coils are the main item of interest of the set. These are shown in Figures 5 and 6 and will bear rather complete description. The construction is very similar to that of the Aero receiving coils, and employs a skeleton framework of bakelite rings and strips. The windings are of No. 14 enamelled wire, which is ample to carry anything up to about 100 watts input. Two plate coils and two grid coils are necessary to cover the entire band, 16.5 to 90 meters inclusive and without gaps. The coils are in pairs of course, only two being used at a time. Figure 5 shows the grid and plate coils, with their mounting bases and antenna coil, for the 40-and 80-meter bands. The units are primarily intended for the construction of low-powered transmitters using less than 100 watts input although, they can of course be used on somewhat higher powers. An overloaded fifty watter (to the U. S. Amateur this means at least 400 watts input), will heat the *wire*, only. No other effects occur and the electrical loss is small. The design of the transmitter depends to a great extent upon the type of tube and power intended. In any case the grid tuning condenser may be an ordinary single-spaced receiving variable. For one or two UX-210s the antenna and plate tuning condensers may also be receiving units. For a fifty watter, the plate and antenna condensers had best be double spaced to

3. The condition for oscillation in this circuit is that the plate circuit must be tuned not to resonance but slightly off so as to have the effect of an inductive plate lead. The tuning of the grid L/C circuit should control the wavelength.—Tech. Ed.

prevent flashing over. The grid and plate blocking condensers, in the case of low power, may be ordinarily Dubilier or Sangamo receiving condensers. For high power, RCA surplus stock UC 1015's may

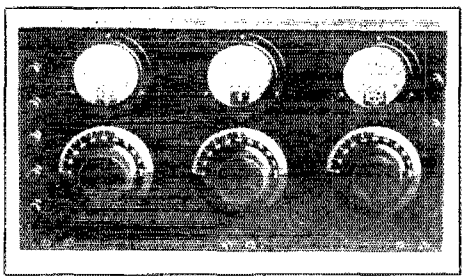


FIG. 4. FRONT VIEW OF THE SET

The meters from left to right are plate input milliammeter, filament voltmeter and r.f. output (antenna) meter. None of these are essential but all very useful. The five binding posts at the left are the power leads which could, of course, be cabled and brought out elsewhere.

be used. The filament by-pass condensers may be anything at hand. The range of the meters also depends upon the tube in use. For one or two 210's the milliammeter should be 100 to 150 full scale; for a fifty watter, perhaps a bit higher, say 300 mils. A 0-10 or 0-15 volt a.c. voltmeter is o.k. for the filaments. Even if d.c. filament supply is used occasionally an a.c. meter will do. It is sufficiently accurate on d.c. to keep the error within safe limits. The antenna ammeter is a problem. In the first place it doesn't mean much except to tell when there is antenna current and in the second place its range of reading is very wide. As one changes wavelength the antenna resistance naturally changes greatly, therefore the antenna current does the same. At 9ZA, using one UX-210 tube and an average single wire antenna and *ground* the readings vary from .1 to .8 amperes. A 1-ampere r.f. meter is therefore sufficient for this power at this station. The low-reading meter is better than a 0-3 as small changes will be shown more accurately and it can always be shunted after it gets beyond full scale. The grid leak will vary with the tube. This particular set uses a 4000-ohm lavite resistor of the smallest size. It is suggested that a tapped 10,000-ohm leak be tried. 5000 ohms is about right for a 210, a 201-A or a "VT2", but for a 171 or 112 a much higher resistance (15,000 to 20,000 ohms) is better. In any case the grid leak should be made for transmission. Receiving grid leaks of the carbon or metallized glass sort seldom have enough heat radiating ability to render them safe.

The question of power supply again depends upon the tube in use. For the filaments, a step-down transformer may be used with a primary rheostat to adjust the voltage to the correct value for the tube. If no center tap is available, one may be made as shown in Fig. 9A. When operating the filament from a storage battery, the center tap post should be connected to one of the other filament posts, preferably the negative as shown in Fig. 8. With B batteries on the plate of the tube the key may be placed in the negative lead to the set or in series with the grid choke in the grid-leak line. This latter may lead to considerable hand capacity on the key and therefore is not recommended. In any case two small r.f. chokes in series with the key at the set, will prevent any capacity effects on the shorter waves.

The set may also be run from a half-or full-wave rectifier, unfiltered, or even directly from the a.c. line. When using a very pure source of power supply on the plate on the shorter waves, extreme care should be taken that everything is tight and that there are no swinging leads, keying vibration, etcetera, as these will cause unsteadiness and consequent poor transmission. The key should not be on the baseboard of the set, in fact the set should be on rubber sponges.

If the d.c. is obtained from a so-called B eliminator the key may be placed in the 110-

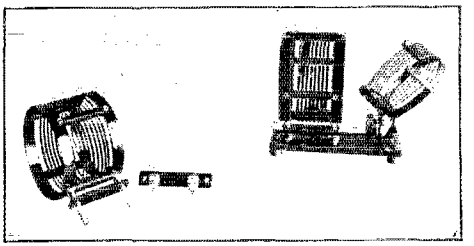


FIG. 5 THE COIL MOUNTING WITH THE 35-TO 90-METER COILS USED FOR THE 40-AND 80-METER BANDS

At the right is the plate and antenna unit showing the hinged antenna coil, and the 8-turn plate coil. At the left is the grid coil mounting and the grid coil. All coils are wound with No. 14 wire spaced by its own diameter and are equipped with two spring plugs.

volt line or in the d.c. output leads. Both should be tried. The regulation of these eliminators is sometimes poor, that is, the voltage drops considerably as the key is pressed which may give rise to "yooping" if the key is in the d.c. output. On the other hand if one tries to key in the 110-volt line to the eliminator the filter may not permit the d.c. voltage to rise and fall fast enough so that the keying will not be clean cut. The dots may even be *missing* entirely.

When the keying is not quite right in either the output or the input of the B sub, one is practically compelled to short-circuit some of the filter chokes of the B sub or else disconnect some of the condensers tolerating some ripple for the sake of improved keying. Of course all this is useless if the

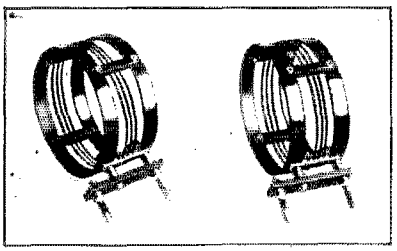


FIG. 6 THE 16.5-TO 52-METER COILS USED FOR THE 20-AND 40-METER BANDS

These plug in to the mounting shown in Fig. 5 and are identical with the larger coils except that they only have three turns.

transformer and rectifier of the B sub are not fit to provide sufficient plate current for the transmitter. That should be investigated first.

The antenna, counterpoise and other details of accessory are more or less optional

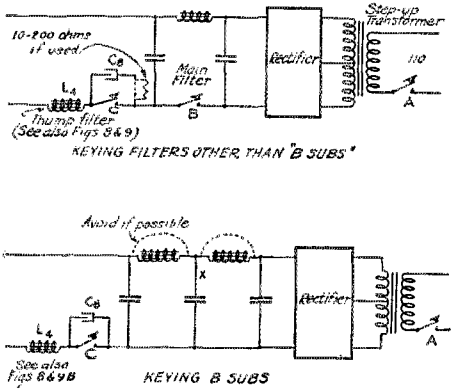


FIG 7

THE CIRCUIT AS USED WITH DIRECT CURRENT IN BOTH FILAMENTS AND PLATE CIRCUITS

If alternating current is used in the filament that part of the circuit remains as shown in Fig. 1. The plate d.c. may be obtained from battery, generator or a rectifier and filter, either home made or a commercial "B sub".

with the operator. It is recommended that the new A.R.R.L. Amateur's Handbook be rigorously followed as to these questions, together with power supplies, keying troubles, etcetera.

TUNING

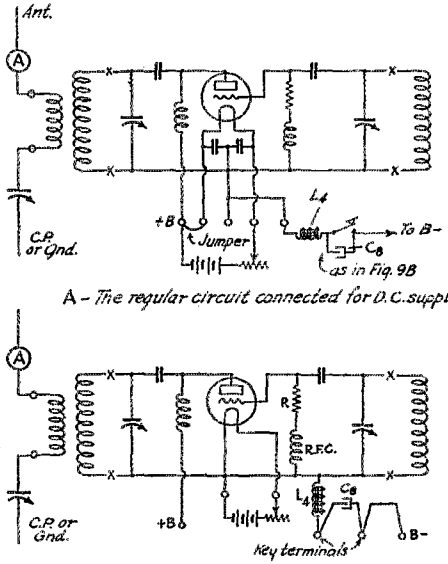
Tuning the set is simple and convenient after all settings are recorded, as in a receiver. With the antenna coil at right angles, (that is, very loose coupling) set the grid tuning condenser at center scale, press the key and rapidly vary the plate condenser back and forth around 50. The plate current will decrease to a minimum at reasonance and increase as the point is passed. Watch the tube and raise the key immediately if the tube begins heating dangerously. The approximate tuning adjustments, when setting up for the first time, can most safely and conveniently be found by using reduced plate voltage. When the minimum plate current mentioned above is found take a reading on the wavemeter or listen in on the receiver for the wave. Readjust both plate and grid condensers until the desired wavelength is had. Then couple the antenna tightly, press the key and tune the antenna condenser for maximum radiation current. Then retune the plate condenser slightly for an increased reading. This will disturb the wavelength slightly and a small readjustment all around should be made. Open and close the key slowly and see that the antenna current comes up to the same point each time, in other words, see that the wave is steady.

If unsteady, loosen the coupling and retune. The highest antenna current on a given wave, with a *steady* wave, is usually the best although the fellow at the other end, if he's honest, can tell you much better than the antenna meter will. Do not be too sure that the keying and wave are o.k. just because the antenna meter comes up promptly. Make *sure* by taking your receiver into another room and listening (without a receiving antenna). After the optimum adjustments for a given wave are made, they should be logged and then other waves logged. It is usually best to pick one wave in each band, (20, 40 and 80) and always retune to it exactly, rather than picking a different wave at each retuning. However, it is sometimes an advantage to shift slightly to avoid interference and it is here that the flexibility of the set is shown.

For the twenty-meter band the small size coils will be used, but for 40 and 80 the larger are better. That is, although the 20-meter coil will tune to 52 meters, slightly better output will be had from the larger coil on 40 meters, as the L/C ratio is a bit nearer optimum. The difference is not great. Incidentally, if no peak is noted when tuning the antenna condenser, it can best be left at maximum and the other controls adjusted to optimum.

The range of the transmitter, like all short-wave equipment is problematical. Perhaps a record of the work done at 9ZA in testing the set will give the best perspective. The station is in an apartment house, surrounded by steel-frame buildings

and near an elevated railway. It is not a "good location". 400 volts of B batteries were used (with an eight-volt filament storage battery) on the plate of one UX-210. The usual horizontal wire about 58 feet long, voltage fed from a single wire feeder 7 feet off the center. The fundamental wave of the antenna is 37.9 meters. As many different wavelengths were to be used the radiating system was operated as a T, connecting the feeder lead to the antenna post on the set and grounding the other post to a convenient radiator, hardly an efficient arrangement. The antenna meter read .4 ampere on 40 and .1 ampere on 20 meters wavelength. In three days' time, all U.S. districts were worked (and Canada), on 40 meters reports from the Pacific coast being as high as R7. Of course the d.c. note had a lot to do with this. Texans repeatedly reported R9 (for some unknown reason) and other reports in proportion. Enough 80-meter work was done to insure good operation on this band. The set was worked on 20 meters for only one day. In two and one half hours time *all* U.S. districts were worked on 19.72 meters, daylight at both ends, and some very unbelieveable reports obtained. Of these, 5DW's R9 is the most! This was with less than 20 watts input to the tube on all waves. Several stations asked if it were "crystal control" which worried me for fear it might be sarcasm, as some rather extensive precautions had to be taken to prevent passing trucks and L trains from wobbling the wave on 20. To these stations who so kindly assisted in these brief tests and manifested such interest thanks are hereby extended.



A - *The regular circuit connected for D.C. supply*

B - *Circuit if building for D.C. only - key click preventer built in.*

FIG. 8

WAYS OF KEYING WITH A RECTIFIER AND FILTER, INCLUDING B SUBSTITUTES

If keying is unsatisfactory and the filter needs to be modified as suggested in the text add jumpers shown by dotted lines or disconnect condensers at point X.

Bert Smith of Cardwell, from a "rather poor location in Brooklyn" (to quote him), did considerably better. With one 201-A and 135 volts from a B eliminator, a.c. on the filament, he worked all U.S.A. districts except the 3rd and 8th in the one evening the set was on the air. This was on 40 meters.

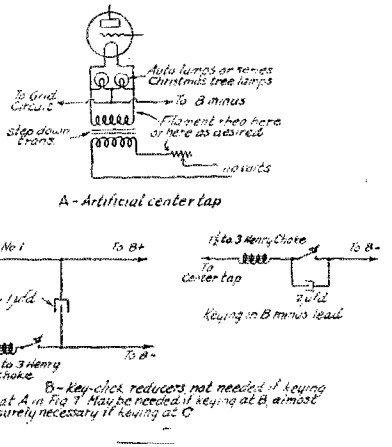


FIG. 9. INCIDENTAL CIRCUITS

Of course, all these are as nothing along side of 8ZG's Australian work on the 199 tube (see *QST* for July, 1926). However, the operation of the set has been so gratifying that the dust is gathering on 9ZA's one kilowatt set—in favor of the more flexible small set. The neighboring BCL's are happy at last!

Strays

F. E. Handy, our Communications Manager, announced the arrival of a Junior operator on January 8th. In accordance with the regular policy of coöperation, he came on duty at 2.45 a.m. Handy tells us that he sounds more like a BC station than anything else, so far.

A daughter was born to Mr. and Mrs. L. W. Hatry on January second. Her name is Gale and Hat tells us that they could not have picked a more suitable one.

The stork made a third visit and left a son, William Mason Beckley, 3rd, to Mr. and Mrs. F. Cheyney Beekley on the morning of February 9th. He'll soon be on for the early morning watches at 1KP-NRRC.

This seems to be a prosperous year for last season's benedicts.

How Our Tube Circuits Work

No. 4—Master Oscillators and Power Amplifiers

By Robert S. Kruse, Technical Editor

IN THE first three articles of this series we built up our more common transmission circuits by shifting the usual c.w. receiving circuit (regenerative detector) a little at a time. We found—or at least I hope we did—that it was rather easy to see that the same general ideas applied to all of these circuits and it remains only to say what can be done with them when we have them.

Let us put it this way. Any tube circuit that can be made to oscillate with fair dependability can be used—

1—As a transmitting oscillator, feeding an antenna.

2—As a transmitting oscillator feeding an r.f. amplifier, which in turn feeds the antenna. (When used this way the thing is usually called a master oscillator.)

3.—As a receiving circuit for c.w. and probably for other kinds of signals also.

4—As a laboratory oscillator or "driver".

Naturally there is all sorts of room for *opinion* as to the "best circuit" for each of these purposes, just as there is all sorts of room for opinion as to the best automobile in the $1000-$1500 class. Likewise—none of the folks with the opinions can convince each other; everyone keeps on believing that *he* is right. This is just as it should be, for each man gets along best with the device he understands and both would be unhappy and unlucky if they swapped circuits or motor cars. As Don Wallace says, "The circuit that you like the best is the best for you." (That has been quoted before but it bears repeating.) The mistake comes in thinking that a circuit is no good for other folks just because you cannot work it—never having learned how. Remember that the other fellow can't work your circuit either but that *both of you are right* in praising your own circuits—as long as you don't "run down" the other circuit.

That's all of the sermon!

MASTER OSCILLATOR CIRCUIT

As we just said, *any* oscillator can be used as a "master oscillator". There is no such thing as, "The Master Oscillator Circuit". All of these arrangements are simply an oscillator with a stage or two of r.f. amplification. It may be a Hartley master or a Colpitts master or a Vallauri master or an Armstrong master or a crystal-controlled master (which is a special sort of Armstrong circuit).

POWER AMPLIFIER CIRCUIT

In just the same way there is no such thing as a "Power Amplifier Circuit". The output of the oscillator may be amplified by any sort of an r.f. amplifier that would work in a receiver. Just as the r.f. amplifier

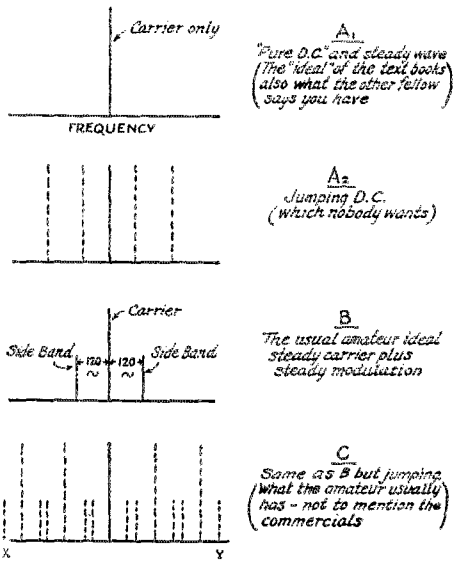


FIG. 1

in the receiver must be kept from oscillating so also the r.f. amplifier in the transmitter must be kept from oscillating—and any of the usual schemes will do the job. The amplifier may be a single-stage affair or have several stages—just as in the broadcast receivers and a few short-wave receivers. The only real difference comes in the amount of power the two affairs handle, which makes the transmitting amplifier a little more "cussed" to handle if it has more than one stage.

Let's go over that again. There is no such animal as THE Master Oscillator-Power Amplifier—neither is there such a thing as the BEST Master Oscillator-Power Amplifier.

CHOOSING THE CIRCUIT ARRANGEMENT

From all this we can see that you are perfectly free to choose the sort of oscillator

that you happen to like after which you may add the sort of r.f. amplifier that you happen to like. The only mystery about the thing is why anyone calls the amplifier a "power amplifier"—and then hitches that same name onto the last audio tube of a receiving set. The jobs are entirely different and the term is just a little meaningless. In the rest of this paper I will not use it but say "r.f. amplifier", which is clear and unmistakable.

In beginning to choose the circuit arrangement one must go at it in some such fashion as this—

1—What oscillator do I like best?
2—Will this oscillator work when an amplifier is hitched to it?
3—What amplifier do I like?
4—Will my pet oscillator and pet amplifier work together or will I get a very complicated arrangement out of the affair?
5—What made me think I wanted an r.f. amplifier in the sending set. What advantage did I expect to gain? Am I really getting that advantage?

Just to be contrary, let's start with the last question.

WHY AN AMPLIFIER?

Nine times out of ten the builder of a set with an amplifier is trying to get a steadier frequency from the set—and about 9.8 times out of ten he does not do it.

There are several good reasons for this, the main one being that a wobbly oscillator is not made steadier by having an amplifier hitched to it. One has to *start* with a steady oscillation before the amplifier can amplify a steady oscillation. Therefore job number 1 is to build an oscillator that is steady, and to forget all about the amplifier for the moment.

THE OSCILLATOR

Right here let us stop to recollect what we *mean* by a steady wave, and of what good it is to us. In Fig. 1A we have the sort of thing the text books (and sometimes *QST*) claim we should want—a "pure d.c." carrier wave that is also perfectly steady. Once upon a time I heard two stations that really had such waves. They were 1XAU, the first crystal-controled station, and 2AJF which used a motor generator. They were both interesting, both very novel, both calculated to attract attention—and both wore one's ears out in about 15 minutes because of the terrible monotony of the note. Since that time I have listened to an awful lot of stations that are pretty close to this sort of thing—and they are all very tiring to copy. However it is still considered polite to tell the other fellow that he has "pure d.c. perfectly steady".

In Figure 1B we have a more practical condition, a steady carrier wave with some 120-cycle modulation. If this is received with an oscillating detector the result is pleasingly steady without being monotonous. As far as I personally am concerned this is a much better ideal; one has a signal that "stays in the tuner" without having to listen to the thin wail of "pure d.c." Everyone is perfectly welcome to his own opinion on that point, of course.

In 1C we have this same thing as it is generally sent out by the average amateur station—and a goodly share of the commercials.

"WOBBULATION"

My good friend E. S. Purrington of the Hammond Research Laboratory pointed out to me several years ago that there were *three* sorts of things that can happen to the "pure d.c." of Fig. 1A before it leaves the sending set. They are as follows—

A—*Unsteady carrier* wave generated by by the tube. (This is entirely bad.)
B—*Modulation of the carrier* by ripples in the plate supply, in other words by incomplete filtering of the plate supply. (Some of this I think is desirable as explained above.)
C—*"Wobbulation" of the carrier* by changes in plate voltage, either from incomplete filtering of plate supply or else by voltage changes made when keying.

This word "wobbulation" was invented by Purrington to explain that the effect, like our usual modulation, was caused by changes in plate voltage but that it appeared NOT as side bands but as unsteadiness of the carrier itself.

THE CAUSE OF "WOBBULATION"

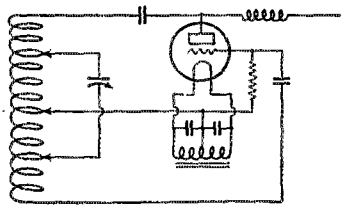
We can start off by saying that any oscillator which suffers from "wobbulation" is not good, even though it is used with raw a.c. plate supply which covers up the effect.

What we mean by "wobbulation" is this. Suppose that we have an oscillator operating on *battery d.c.* with a voltage of about 100. Tune in the c.w. note of the thing and then change the voltage to 500. If the note jumps this means that the oscillator is not able to stand voltage changes without shifting wavelength. Most amateur transmitters will not stand this test.

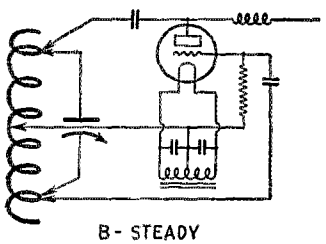
Suppose now that we put such an oscillator at work in an amateur station. First we will try it with d.c. on the plate. Nobody will copy the thing—the dots are in one place on the tuner and the last part of each dash is in another. The boss of the station then tries to fix matters up by using a plate supply with lots of ripple on it so as to "broaden the wave". The men on the receiving end then stop kicking and the sta-

tion seems to be o.k.—except that it does not "get out" very well. Generally the station runs for years before anyone suspects that anything is wrong. What has happened is about like this.

At first the oscillator was doing the stunt of Fig. 1A. When the buzz-saw plate supply was added the result was a flock of sidebands added to the performance which resulted in a mess like Fig. 1C, which makes it



A - UNSTEADY



B - STEADY

FIG. 2

possible to hear *something* all the way from X to Y on the tuner scale. The tone sounds rather well because the whole business (carrier and sidebands) is being "wobbulated" back and forth across the territory X-Y at the rate of 120 cycles per second, PLUS some extra trips (possibly larger) occasioned by keying surges. In the process we have managed to make a "broad tuning" c.w. signal that *seems* steady and has a fairish note but that hasn't much "punch" at any of the various waves in the band where it can be heard.

GETTING AWAY FROM "WOBBULATION"

Suppose that we managed to steady up the signal so as to get the effect shown in Fig. 1B. The energy is not at one clearly-defined tune and has much more power at that point than the wobbly one managed to deliver by making repeated trips "across the tuner".

That is all very good—but how do we make an oscillator "hold still" at one wavelength?

Naturally everyone will start to think about crystal control of the oscillator and that is certainly a way to do the thing. It is really too bad that crystals are not able to control large tubes and that we are therefore compelled to use a whole row of amplifier tubes before we get the output up very far—especially since this calls for a variety of plate and filament voltages, which is both expensive and complex. None the less if one is able to construct a crystal job that is a first-rate way of doing the thing. The details with all manner of variations have been given in our pages by J. M. Clayton and others.

The effects of a crystal-controlled oscillator can be *approached* (some say equalled) with fewer tubes by using some circuit precautions. They are not especially complex and are worth trying.

STEADINESS WITHOUT CRYSTALS

QST has said many times that the way to make an oscillator steady is to——

A—Keep the tube cool.
B—Use much capacity and little inductance.
C—Avoid excessive grid excitation.
D—Keep the load on the tube small compared to its rating.

These rules are good for a plain oscillator and are also good for an oscillator with an r.f. amplifier.

A—KEEP THE TUBE COOL

If one thinks it over a bit one will see that it is not so important to keep the tube cool as it is to keep the temperature steady. Good results as to steadiness can be gotten by using a very low input or also by using a higher input and keying so as to keep about the same load on the tube. The second device is a little troublesome in practice because the oscillator has an unpleasant way of continuing to feed the antenna even when the amplifier is not working. This can be stopped partly by neutralizing the amplifier (which ought to be done anyway) and partly by shielding, the latter being necessary if several stages of r.f. are used.

It is a little easier to keep the oscillator cool when it is followed by an amplifier because one does not need so much output from it to get the same final output to the antenna. Thus a plain oscillator might be expected to give 50 watts to the antenna while if there was an r.f. stage the oscillator need give only perhaps 5 watts which can be amplified easily to the required 50. The oscillator will of course need to generate more than 5 watts, otherwise we would again have it fully loaded, whereupon it would be unsteady unless crystal-controlled. A good rough rule is to use two tubes of the same sort. Then the one can generate perhaps 30 watts of which 5 watts is fed to the amplifier which runs it up to 50 and supplies that to the antenna.

B—LARGE C AND SMALL L

Referring to Fig. 2A we have about the usual amateur 80-meter arrangement with

a baby capacity of 50 or 75 picofarads and much inductance. Such a circuit is wide open to voltage changes, every one of them changes the frequency.

We have been—and I am now—recommending the arrangement of Fig. 2B with a large capacity and much less inductance. For the 80-meter band a capacity of 250 picofarads is quite workable if one is willing to let the efficiency drop a bit to gain steadiness, and that is perfectly o.k. when one is intending to use an r.f. amplifier anyway. Personally I like the idea even when no amplifier is to be used.

Mr. Melville Eastham of General Radio recently made some tests to gain information on the weaknesses of amateur transmitting oscillators and has made suggestions which I have tried to represent in Fig. 3. These ideas are equally good for master oscillators and those feeding the antenna by way of an r.f. stage.

Mr. Eastham does not agree with our belief that the efficiency must go down when a very large capacity is used to gain steadiness. On the contrary he finds that a 40-meter oscillator made as shown in Fig. 3 gives very good efficiency although using something like 25 times the capacity we are used to at that wavelength. Since the circulating current in the tuned circuit is bound to be very large special care has been taken to keep down the resistance. Naturally the helix (what little there is of it) has been made of heavy *copper* which should probably be kept bright or even be silver plated. The width of the strip must not be too large to prevent eddy current troubles.

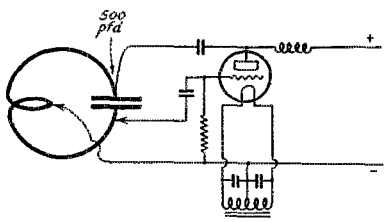


FIG 3

MR EASTHAMS 40 METER OSCILLATOR

The usual variable condensers (even the transmitting sorts) seem not to answer for this job if one depends on connecting to the rotor thru the bearings or thru springs at the ends of the rotor. At any rate Mr. Eastham finds it advisable to solder a pair of flexible leads (not stranded) directly to the rotor spacers as shown in Fig. 4. I have a notion that it would be best to use insulating bearings so as to avoid a bad path in parallel with a good one, though that was not stated to me. Since the flexible leads prevent the condenser from traveling thru its entire half-turn the coils must be made so that one lands at the top edge of the band when at maximum C, whereupon a small decrease wipes across the band. Usually one does not need to work clear across an amateur band and the "band" referred to is the one of the particular station.

AS GOOD AS CRYSTAL CONTROL?

Such an oscillator shows a really surprising steadiness of note with rather large changes in plate voltage and there have actually been some opinions to the effect that in practice it is steadier than a good many of the "crystal notes" that are heard on the air.

Just how far this thing can be carried is another question. When the tube power gets large the circulating currents will become rather startling and it will become harder and harder to keep the heat (resistance) losses in the condenser and coil down. Clips and such things are out of the question even for a UX-210, also a meter in the tuned circuit will mess things up hopelessly because its resistance is very much the largest in the circuit. Any experience gained with this sort of set will be very much worth while to us. Possibly we have not been pushing the high C/L hard enough.

ARMSTRONG CIRCUIT

Right at this point it is well to point out that the idea just given fits beautifully into the Armstrong tuned-plate tuned-grid circuit which has a reputation for steadiness. The sets working with this circuit generally use a rather large C as compared to the sets built on other circuits. There is a good reason for this. The grid circuit is (usually) the controlling circuit and while it is tuned to resonance the power available is not so large that it is hard to make a tuned circuit

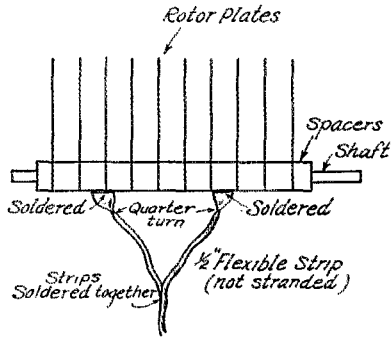


FIG 4

that is good enough. The plate circuit is tuned a little below resonance, therefore the currents in it do not get up to such terrifying values. Of course it *is* possible to work the circuit with the plate controlling and

then the plate circuit is likely to get very warm. The location of the control seems to depend on the C/L ratio in the tuned circuits—though that is not a positive statement. Usually it is the grid controls, and I am not quite sure just what makes the exceptions act as they do.

C—AVOID EXCESSIVE GRID EXCITATION

When one is using a tube that feeds the antenna directly, the temptation is to get every possible microampere into the antenna. This means hiking the input, usually by running up the grid excitation. The result is a family of harmonics and some unsteadiness. To permit adjustment of that feature the grid connection of the usual set is made adjustable, as is suggested in Fig. 3.

D—KEEP THE LOAD ON THE TUBE SMALL

The best comment on the need for underloading an oscillator (either coupled to the antenna or feeding via an r.f. stage) is that in all measurement work rule No. 1 is to use a large tube and to draw very little power from it. In transmission practice this means tolerating less antenna current or else adding an amplifier to make up the loss from looser coupling. Only a crystal-controlled oscillator can stand up under a full load without shifting whenever the load goes off and on. The larger the C/L in the oscillator circuit (IF the resistance of the L-C circuit is kept down), the smaller is this effect.

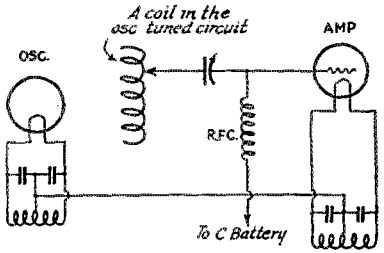


FIG. 5 COUPLING

THE PRACTICAL SET STARTS

So far, 11 pages of blue copy paper have been used to harp on a steady oscillator—and at that the thing hasn't been talked to death by any means. However—we must get ahead.

Knowing how to make an oscillator steady we can choose the pet circuit and think over the possibility of making it steady. This will be found possible in every case by observing our rules A, B, C & D. That answers question 1—for a while.

Next one decides question No. 2. Now any decent oscillator can be made to feed an amplifier and the real question is simply to decide how the two are to be connected so that we don't have the plate voltage on the amplifier grid or some such matter as that. Generally the coupling is made by some arrangement not far different from that shown in Fig. 5. Note that the return path from filament to filament is shown. With very few exceptions it is a good rule to keep that path as shown. The condenser in the grid lead need not be variable though it is convenient to have it so. That answers question 2 rather hastily, except for the keying problem which is too long to drag in. One can only say that it is nice (when possible) to let the oscillator run all the time and to key in the amplifier. Unfortunately this leaves some energy in the antenna at all times. With care that can be cut down.

Next, one has to choose the amplifier, to decide how many stages it is to have and what circuit is to be used in each. To get a snapshot view of the endless ways of doing that job just consider the many sorts of r.f. amplifiers in broadcast receivers. Just as all the various broadcast receiver arrangements can be made to give first rate results so also can the various r.f. amplifiers for transmission. One can only hope to give a few general rules.

ONE STAGE

Those of you who follow the semi-engineering articles of *QST* know that we have fallen into the way of saying that one can get about the same r.f. amplification from any one of the following—

1 stage of un-neutralized tuned r.f. (detuning or resistance to stop oscillation).
2 stages of regenerative but non-oscillating tuned r.f. (neutrodyne etc. with some regeneration left).
3 stages of fully balanced *and shielded* r.f., tuned as before.

The advantage of the first system is its simplicity; its disadvantage is its extreme trickiness and tendency to "flop" into oscillation. The advantage of the last system is its beautifully reliable performance; the compensating disadvantage naturally being in the cost. The 2nd system lies between.

My own feelings are that even a single transmission stage of r.f. amplifier is an infernal nuisance unless it is "neutrodyned" or "riceodyned" to a sufficient extent to keep it from oscillating. Some regeneration seems to do no harm and adds to the output, therefore the neutralizing condenser can be run a little off the best balance point. This is lucky because the bulky nature of sending coils prevents one from making a set in which the balance stays correct with changes of tune, such as are always being made. The general nature of the balancing schemes is shown in Fig. 6. In both parts of this figure the coil at the left is the one in the L-C circuit of the oscillator. The output of the

amplifier is shown as direct-coupled to the antenna. This is done here mainly for simplicity and a tuned plate circuit is quite o.k. It adds an adjustment (and a mean one at that) but makes up for this by getting rid of a stopping condenser and r.f. choke. A useful and common compromise is to leave the plate coil untuned and couple it closely to the antenna, just exactly as in the r.f. transformers of a broadcast receiver. Figure 6 attempts to show these variations.

MULTI STAGES

As soon as one starts to work with several stages of r.f. it is strictly necessary to begin thinking about spacing, shielding and—perhaps—neutralizing. In our February issue, F. J. Marco shows how to go about the design of a 2-stage non-neutralized r.f. amplifier and a study of that article will help. In previous issues multi-stage neutralized amplifiers of various sorts have been described for receivers (broadcast) and for transmitters (crystal control). Few of these tackled more than two stages without doing some shielding.

Reference back to the descriptions of the transmitters at South Schenectady (Experimenters' Section, June, 1926) will show that with fairly high powers it was found possible to screen well enough with carefully made cages of copper screening, provided they were spaced apart a bit as shown in the photos on page 36 of that issue. The cages must be very complete though and any doors must have good overlaps and be connected to the cage with jumpers.

A complete 2-stage shielded unit was shown by John M. Clayton on page 22 of our November issue, and a first-rate discussion of shielding in general by D. R. Clemons appeared on pages 9 of the March, 1926, issue. These articles are very much worth re-reading.

FREQUENCY CHANGERS

The troublesome feedbacks between stages can be dodged if one starts with an oscillator at (for instance) 160 meters, changes this to 80 meters in the first stage, 40 in the next and 20 in the third. What wavelength one starts with depends on what is wanted and how many stages are used. This thing can be done with an ordinary oscillator (if it is a good one) although the methods have mainly been described in connection with crystal-controlled sets. It will be best to reread *all* of the following. Practical Crystal-Controlled Transmitters, p. 21, January, 1926; A Multi-Stage Crystal-Controlled Transmitter, p. 29, June 1926; A 20-40-80-Meter Crystal-Controlled Transmitter, p. 33. August 1926; A Shielded Crystal-Controlled Unit, p. 22, Nov. 1926; and Low Power Crystal-Controlled Transmitters, p. 14, Jan. 1927. Parenthetically, those articles constitute a series that is classic. Possibly no other subject in amateur radio has been covered with such exceeding thoroughness. It is therefore additionally remarkable that almost without exception these articles (and others on the subject) were either written by former Ass't. Tech. Ed. J. M. Clayton or directly due to his efforts in the interests of crystal control.

OTHER VARIATIONS

Naturally any stage in the amplifier can be made push-pull by using one of the various circuits shown in the 3rd installment of this series of talks. To add neutralization to these circuits without causing them to go

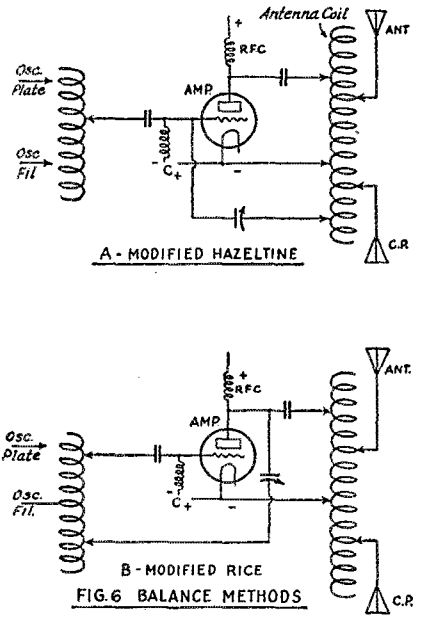


FIG. 6 BALANCE METHODS

off into an ultra-high-frequency oscillation (between 4 and 6 meters depending on the tube) is quite a trick. Combinations that have been used in practice include alternate stages of ordinary amplification and push-pull, also the frequency conversions (when any are made) can sometimes be made more conveniently with the aid of the push-pull stages since they can be connected to reinforce the 2nd harmonic. Those interested in this stunt are advised to read Van Der Bijl on the push-pull audio amplifier, the same scheme then being applied to r.f.

Ordinarily one simply runs the tubes with a high bias to distort the wave and emphasize the 2nd harmonic.

VARIOUS PRACTICAL KINKS

To this overly-long story there must be added a few suggestions as to practical ar-

(*Continued on Page 51*)

Experimenters' Section Report

AS all members of the section have been informed, another year of our activities has just closed and reports from all members have been requested. Since this is being written on January 29th, the reports have not been received except in a few cases and no details can be given. Those reports which have been received are very encouraging and show that some worth-while work has been done in addition to the considerable amount which has already been recounted in *QST* as articles and otherwise. When a considerable share of the reports has been received (about February 15th at a guess) the new outlines and problem lists will be started thru. The outline revision must naturally proceed as other *QST* work permits and first attention will be paid to the problems that seem to be most urgent.

STANDARD FREQUENCY OBSERVATIONS

There seems to be a very general misunderstanding as to the status of the standard frequency transmissions from stations 1XM and 9XL. This free precision service was originally conceived as an extension of the service rendered by station WWV of the U. S. Bureau of Standards on longer waves. K. V. R. Lansingh, then at Massachusetts Institute of Technology, enlisted the interest of the M.I.T. Radio Society and the Communications Section of the Institute. After much preliminary work it was decided that 1XM was ready to proceed, whereupon the friendly coöperation of the Bureau of Standards was secured and Mr. Lansingh was made a member of the Experimenters' Section committee on Official Wave-Length Stations (OWLS) whose membership is is follows—

C. M. Jansky Jr., Technical Advisor.

D. C. Wallace, O.W.L.S. and O.W.L.S.c. (crystal control).

K. V. R. Lansingh, In Charge Standard Frequency Transmissions.

The standard frequency stations are at present 1XM and 9XL as explained in the schedules printed elsewhere in this issue. Our contact with 1XM is via Messrs. Lansingh and J. K. Clapp, the latter of the M.I.T. faculty. 9XL is reached via Messrs. Lansingh and McCartney the latter, Chief Operator of WCCO-9XL-9WI.

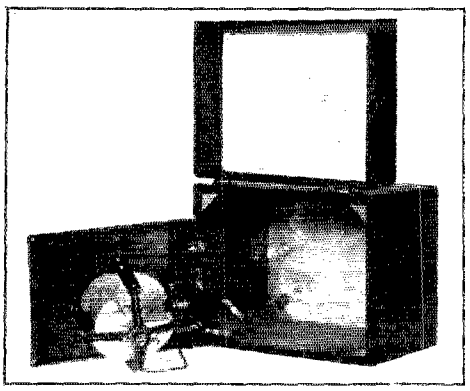
The un-scheduled work of the O.W.L.S. and the O.W.L.S.c. differs radically from that of 1XM and 9XL. These stations operate as they see fit and handle whatever matter they wish, merely indicating the operating wavelength (or frequency if the operator prefers) at the end of transmissions. Their work is checked by Mr. Wallace and stations discovered off their announced wavelength or failing to announce are dropped from the system. The O.W.L.S.c. (crystal) can as a rule be depended upon for somewhat greater accuracy than the plain O.W.L.S.

S. F. TRANSMISSION OBSERVATIONS

At the suggestion of Mr. Lansingh there has been sent to all members of the section mimeographed observation blanks for recording the audibility, fading, etc., of the S.F. stations. Since these stations are operated with the greatest care as to uniformity this should give us most valuable transmission information.

THE 5.2-METER TESTS

Because of the necessity of writing *QST* "copy" over a month before the members see it there is no final information on the 5.2-meter tests from 2EB, 2XM, 9EK-9XH, 9EHT, etc. In fact, at this time new sta-



tions are still joining both the transmissions and reception observations. Observers are at work in Australia, New Zealand, Argentine Republic, England, Italy, France, South Africa and of course in the U. S. A. and Canada. At this writing letters have probably reached the German and Austrian societies whom we appear not to have reached by radio. Unless the hours of the day have been chosen wrongly it seems that we should gain some reasonably good data. Any data still held on ANY transmission near 5 meters should be rushed to this section at once.

2EB

The "king pin" of the test is 2EB, whose location was incorrectely given in the foregoing issue. The street number is 8505

167th street. The town, Jamaica, Long Island, New York, was correct. This station operates with a special tube in an ultraudion connection. About 750 watts are fed to an elevated antenna operated at a harmonic, the current 50 inches from the end being somewhat above 2 amperes. The wavelength is shifted slightly from time to time but stays near 5.2 meters.

GENERAL RADIO 5-METER WAVEMETERS

The General Radio Co. of Cambridge, Mass., has made up for us a special group of 15 wavemeters with a range of approximately 4 to 6.5 meters in wavelength. They are individually calibrated, excellently built but (for obvious structural reasons) not enclosed. An aluminum backed and celluloid covered calibration curve is furnished with each meter. The group of 15 will probably have been exhausted before this is printed (two went to Australia) but others will probably be available from G.R. at $8.

"THE GENERAL RADIO EXPERIMENTER"

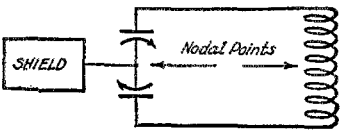
Those not acqainted with the above named monthly paper of "G.R." have a pleasant surprise ahead. The "Experimenter" is one of the very few trade publications that is thoroughly worth while—because it is not written as an advertisement but as an engineering record.

THE ALUMINUM TEST

When this is read the aluminum rectifier tests will almost certainly be under way. An ample number of men have volunteered and provided data on their operating conditions, which have been transmitted to Mr. Junius Edwards of the Research Department of the Aluminum Co. of America. The final plans can be made rather promptly now. The tests will naturally need to run over a considerable period of time but the final result should be of great interest in as much as they cover the first serious attempt to make tests under the purely amateur radio condition of small currents at high voltages—which is a problem totally different from that of a "B sub" or "trickle charger".

REFERENCES

Wireless World (London) carried in its August 11 issue of last year an article on a



tube-operated relay that may solve some of the problems about which we are receiving letters.

In the January 1927 issue of Wireless World (London) appears a most interesting article on the experimental investigation of the existence of the Heaviside layer. This article, with some others in the Jahrbuch will be abstracted in the next issue of *QST*.

Special attention may well be paid to the discussion of a.c. operation of receiving filaments which begins in the Feb. issue of Radio Broadcast. This problem interests all alike. In the same issue of R.B. appears an account of some short-range 1-meter transmissions. While the ranges are inconsiderable the methods are of interest and might with more power be worth repeating.

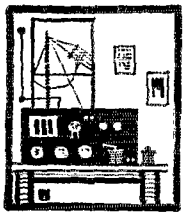
Letter Circular LC223 of the Bureau of Standards provides a good assembly of information on the use of quartz oscillators in checking stations in the broadcasting range of wavelengths.

Wireless World (London) carries in its January 19th issue a very good account of a method of calibrating from 20 to 2000 meters from a single known wavelength, such as may be provided by a calibrated crystal. A crystal is NOT necessary, however, and a broadcasting station may be used as a basis.

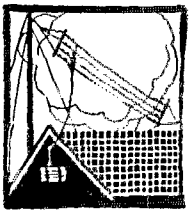
A LABORATORY CONVENIENCE

The average laboratory condenser has an unpleasant habit of having a capacity that is too high or too low for the job in hand at the moment. Raymond C. Schlorf of Chicago therefore uses as an all-around convenience; a two-section receiving condenser mounted in a copper shielded box and with the rotor grounded to the shielding. The two stators are brought out separately. This permits the use of a single section, the two sections to tune two circuits together (within the limits of accuracy), the two sections in parallel and (under some circuit conditions) the two sections in series. The construction and circuit are shown in the illustrations. Notes and photos on devices found useful by other members will be appreciated.

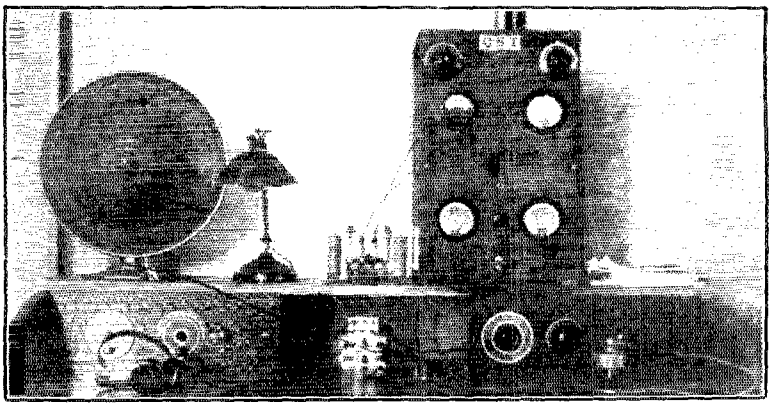
—*R. S. K.*



Amateur Radio Stations



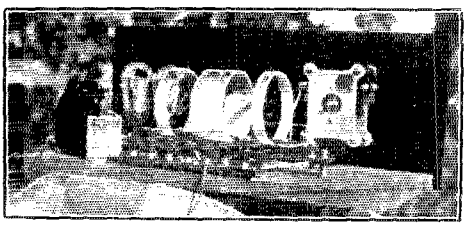
5ZU, Austin, Texas



THIS station is run by Wesley Hope Tilley, an old timer and pre-war DX spark man. The station has been in more or less continual operation since 1915 when it started off with a spark coil, a Wm. B. Duck 200-to 2500-meter loose-coupler and a hunk of galena.

The outfit shown in the photos is built into a desk especially made for the apparatus. The short-wave receiver is at the left, the broadcast receiver at the right and the transmitter on top of the b.c. set. The transmitter uses two or three 203-A tubes in a loosely-coupled Hartley circuit with either Heising modulation or grid-leak modulation. The phone is used very little on account of QRM to neighboring broadcast listeners. On c.w., 5ZU has been heard almost everywhere there is a station to listen to his signals.

The plate supply is a 750-watt Esco 1,200-volt motor-generator located in the kitchen. The m.g. is mounted so as to be practically quiet in operation. A frame is made from 1" x 4" lumber, being 12 inches wide and 48 inches long. With a bottom of heavy lumber it constitutes a shallow tray four inches deep. A second hand 30 x 5 inner tube is inflated to a point where it resembles a life preserver and is doubled up and put in the frame. A heavy piece of beaver board rests on top of the inflated tire and the m.g. sits on the beaver board. 5ZU says the m.g. cannot be heard in the next room with all doors open. To get away from commutator trouble in the receiver, the frame and m.g. are mounted in a box which is thoroughly lined with sheet zinc. The box as well as the lead sheathing which



covers the two high-voltage leads is grounded to a separate ground. Whereas, without the shielding on the m.g. and leads, reception was impossible on even the strongest signals, with the present arrangement the m.g. cannot be heard in the receiver at all.

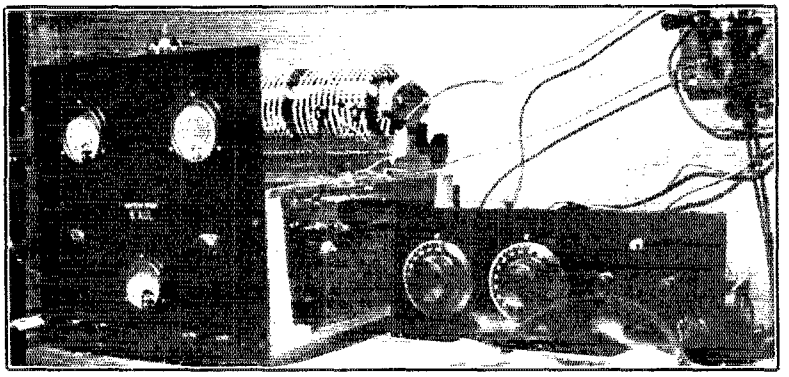
The antenna for 40-, 80- and 160-meter operation is a horizontal wire 65 feet long

and 50 feet high tapped in the middle. The counterpoise is a duplicate of the antenna and is strung directly under the antenna and 10 feet off the ground.

The receiving set is the familiar amateur arrangement with two tubes. Regeneration is the throttle method type. General Radio parts are used throughout, except in the coils which are home-made mounted on small bakelite strips and supported on G. R. plugs and jacks.

One of the most useful things 5ZU is doing now is a weekly QSO with ex5EN who is in Colombia, South America, with the field force of the Standard Oil Company. Once a week 5ZU transmits all of the local and U. S. news to Colombia where 5EN picks it up and typewrites the "newspaper" called *The Radio Rumpus*, which is about all of the news the party receives.

8AUL, Wheeling, West Virginia



THIS station has been in continuous operation since 1923. Enough spare parts are always on hand to keep one transmitter on the air while another one is being built. The original 8AUL was a 10-watt affair. It was replaced by the present one which uses a single 203-A in an inductively-coupled Hartley circuit. The transmitter panel is of Bakelite, the frame and baseboard being of paraffined wood. The filament transformer and plate choke are mounted on the baseboard. All of the r.f. portions of the transmitter are mounted on the upper "board" which is of quarter-inch plate glass. The tube socket, REL inductances and Cardwell condensers are mounted here, the condensers being placed bottom-side-up and having insulating shafts extended to knobs on the panel.

Plate supply to the tube comes from a Thordarson 450-watt transformer the output of which is rectified by four "S" tubes, and filtered by a 30-henry choke and four 1-mfd. condensers. An auxiliary supply of 600 volts of storage B batteries is always on hand in case of emergency.

The antenna is a four-wire inverted L cage 88 feet long. Its average height is 39 feet. The ground lead is 6 feet long, connecting to a miscellaneous assortment of junk copper buried deep in the ground. The receiver is the usual "Schnell" circuit and has two stages of audio frequency amplification.

Although the local conditions at 8AUL are particularly poor, the city being surrounded by hills and the station located in the manufacturing end of town, the DX has been very good. 8AUL's signals having been reported in twenty-four foreign countries, stations in eighteen of which have been worked. The station is owned and operated by Robert D. Craig of 4414 Water Street. 8AUL is an O. R. S. and does a lot of good traffic work.

Strays

Fred Schnell is doing the popular trick at Madison of working his transmitter in a room that is usually s'teen degrees below zero. He uses an oil stove to heat it and a pan of water over it to keep the air moist. Recently, he broke the crystal in the transmitter when starting up and upon investigation found that the moisture had collected around the crystal and holder which resulted in their being frozen together. From this it may be deduced that you can't hold a crystal solidly and still expect it to shimmy.

SOUTH AFRICA

THE following has been received from Robert Oxenham, A4L, regarding the recent broadcast from 2XAF. "I must say that conditions here on Saturday, November 27th were not very favorable and in fact, I was afraid at 10 p. m. that we were going to get nil. The weather was stormy and windy and the strays were in abundance. At 11 p. m., I tested through to Capetown Broadcasting Station putting through 2XAG but the strays were drumming in badly. I would like to remark here about the good spirited action of Capetown Broadcasting Station in their assistance in endeavoring to make a success of the stunt on behalf of the amateurs. On the previous Saturday night, they were on for hours during the early morning testing with me on 2XAF which was really FB that night. Everything was very clear and I was receiving them about R9.

"On the night of the broadcast, we came on the air at 1 a.m.,which is 6 p.m. E.S.T., and I immediately found 2XAF which I relayed from my receiver through a transformer and over the telephone line to the station's amplifier. As my aerial is practically under theirs (being only about one-quarter mile away), I was afraid of interference from their harmonics. Their normal wave is 375 meters.

"Conditions were still very bad and I found 2XAF only about half their usual strength but by a little perseverance and thanks to their putting on a musical number at first, I was able to tone down the strays a bit and when Mr. Maxim was introduced I was able to hear everything nicely. I was listening direct to Capetown on another set and could hear exactly what the others were hearing. I was unable to write down what I heard for, naturally, I had my hands full controlling the receiver but I heard everything and by the reports I have had from many of the listeners, they liked very much the speeches of the A.R.R.L. officials.

"I have not received word whether the Johannesburg broadcast station, JB, was able to relay 2XAF, but by the Rand Daily Mail report they had spasms of bad periods with strays and fading. We continued relaying for about an hour after the speeches had concluded and heard the message via telegraph to the American Expedition in Brazil and also a portion of the special concert being sent to them.

"Our hams are very much pleased with all the trouble taken by the A.R.R.L. I hope you people will have a relay for the other countries after this as the European countries should get it excellently. Mr. Maxim addressed his fellow amateurs in South America, Australia, Asia and New Zealand.

"I sent a message myself, previous to the tests, via one of the Brazilian amateurs telling him to notify his gang that Mr. Maxim and others were to speak to South Africa via 2XAF. The Brazilian said he would let them all have it.

"Our boys are still QSOing all over the world and I was QSO 7QY at Ilo, Patagonia, near Cape Horn, two nights back. This is the first QSO between Patagonia and South Africa. A5X has been busy with the European stations of late and the South American and United States stations are good with many working. I hope the time will come when we are all one international union as proposed by Mr. Warner."

CHILE

Don Wallace passes the new QRA of sc2LD as being Luis M. Desmaras, Avenida Manuel Montt 157, Providencia, Chile. Wallace tells us that the new signals are many times louder and the r.a.c. far easier to copy than the old d.c. The QRA of sc2BJ is T. Taylor, Casilla 868, Valparaiso.

COLOMBIA

Colombia has made its debut into amateur radio with a first contact between slBGTA and 1CMP. BGTA is located in Bogata, the capital of the country and we have not the full QRA as the station is unlicensed. 2ARM also reports another Colombian signing CL. Its QRA is also Bogata.

CZECHOSLOVAKIA

Robert Kreisinger, nu2TC, has been visiting Prague and has very kindly translated some letters for the Czechoslovakian club. From them we obtain the following information. "This state is composed of three

general parts, Bohemia, Moravia and Slovakia which will use different numerals to designate their locations. Those stations in Bohemia will use a "1" followed by two letters, those in Moravia a "2" and in Slovakia "3".

"Amateur radio is strictly prohibited in this country so that all work must be done under cover. Many efforts made to induce the government to permit amateur transmitting stations have been unsuccessful. The most prominent amateur is csOK1 (new intermediate ("ec") who has communicated with a number of U. S., New Zealand, Australian and Brazilian stations. A wavelength of 46 meters is used for transmitting. 2ZN has changed his call to 2UN and another station now working is 2YD. Both are very active, use the same power which is 30 watts and are located in Moravia. Recently, an amateur was caught operating what was reported to the authorities as being a "high powered" station. A squad of thirty-five postal and police authorities were sent to locate it only to find the amateur using a modified receiver to broadcast phonograph records!

"The most favorable time to call and work us is between six and twelve p.m. E.S.T. We listen in the U. S. amateur band. Club members will greatly appreciate correspondence and QSL cards from American amateurs but they should be sent under cover to Radioklub Ceskoslovensky, Praha 11 Slovansky ostrov 5, Czechoslovakia."

ENGLAND

K.E.B. Jay, eg2BMM tells us that his nonradiating license has been replaced with a real one and his new sign is eg2HJ. FB! He gives us the QRA of BVJ as the Royal Naval College, Dartmouth, England.

The Q.R.P. Transmitters Society with headquarters at 178 Evering Road, Clapton, London, E.5, England are desirous of arranging a schedule for working across the pond on about three or four watts and would be glad to hear from any "nu's" who are interested.

J. Ashton J. Cooper writes us that the status of the Transmitter and Relay Section of the Radio Society of Great Britain has been changed somewhat and the members of the Section are now all full members of the Society. We understand that the T & R Section, as such, is now abandoned, and henceforth operates as the R.S.G.B. itself. There have also been some changes in the officers and council. The present officers are President, Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., M.I.E.E. Acting Vice President, Capt. Ian Fraser, M.P., C.B.E. The council consists of Messrs. O. F. Brown, J. R. Halliwell, F. H. Haynes, Thomas Hesketh, R. J. Hibberd, R. Hodge, Gerald Marcuse, E. J. Simmonds, H. Bevan-Swift, H. Pocock, F. A. Mayer and J. A. J. Cooper. There were no changes in the other officers.

In the future all QSL cards to be forwarded by the Society should be sent to QSL Section, R. S. G. B., 53 Victoria Street, Westminster, London, S. W. I. and all queries regarding QRAs to QRA Section, R. S. G. B., (eg6BT), 82 York Road, Bury, Suffolk, England.

FRANCE

We quote from a letter from ef8YOR, "During the months of October and November, the conditions were, on the whole, excellent for DX. The French stations were in full activity. In particular, the powerful station ef8JN, operator and owner, M. Levassor, QSOd numerous DX. It established the first Europe-Singapore contact with ss2SE. It communicated regularly with the French cruiser fc8FLO in China, Corea and Japan.

"A very interesting QSO was established with the ship "Cassdopèe" in the Tahiti

ef8JN at MELUN

roadstead. But the most notable novelty at ef8JN was an all-day contact with oz2AC and fi1B (new intermediate "af") in Saigon on 20 meters, then on 15 meters. Subsequent to these tests, General Ferrié, Director of the French Military Telegraphy, in distributing to the various observatories in the world, via amateur radio, the modifications in connection with the international operations in longitude, congratulated Mr. O'Meara, oz2AC, and M. Levassor.

"QSOs were established with the whalers ARDI and AQE in the South Pole seas, messages were thus relayed to Norway.

"8KF has just QRO again and transmits with a plate input of 4000 watts. It con-

tinues to QSO aj3AA in Kilo. The signals were reported R8 by foA6N and foA5X. ef8KF was QSO nu6AWT and 7AFN, which is the most difficult DX for Europe.

"ef8JF was in contact with Alaska and the signals of many other French stations were reported from there. The new station, ef8TUV, was reported QSO in numerous places in the Far East and this station effected the first contact on 22 meters with ss2SE in Singapore and with many other stations in China and the Philippines.

"The signals of the American stations came in very QSA during October and still more so during November. Station ef8YOR which is specializing in traffic with American amateurs, managed 85 QSOs in October and 91 in November with all districts but the sixth and seventh. The record was 18 in one night. All this was on the 32-and 44-meter bands with a new transmitter at 8YOR, the QSB of which is now pure d.c.

"In the 20-meter band, the U. S. A. stations come in very QSA, especially from 12.00 to 16.00 GMT. The signals of nu1RD are among the most powerful on this band, while on 38 meters, the signals of nu1AAO come in very QSA, generally more powerful than WIZ! Many Frenchmen are trying to QSO the U. S. A. on the 20-meter band, mostly towards 18.00 GMT (10 a.m. E.S.T.) on Sundays."

We are showing a picture of ef8JN, the station of L. Carrot and A. Levassor at Melun. This station previously signed 8TOK before its present license was received.

HUNGARY

Receiving is generally permitted but transmission is prohibited by law except of licensed stations. The government probably intends to regulate short-wave transmission according to the English and German methods. Transmission will be permitted only by clubs and other groups. There is one organization made up of the editorial staff of the Hungarian Radio News, an amateur organ, which includes the best representatives of the Technical High School, Electrotechnical Association, Research Institute of the Hungarian Post and other men well known in the country. They intend to create a national association, similar to the A.R.R.L. and then make connectons with the I.A.R.U.

The Technical High School and the Research Institute are already in possession of short-wave transmitting equipment of power up to 1 Kw. It is hoped they will be heard in the U. S. A. and experiments will be started in January.

NEW ZEALAND

According to oz1AE there are quite a few of the Zedders on their 85-to 92-meter band on their Wednesday nights which correspond to our Thursday mornings. Several of the American amateurs have been heard on the 80-meter band but have always been QSO someone and never seem to listen above 85 meters where the New Zealanders are. It is believed that contact could be had again on this band and it is a good deal more to shoot at than the 40-meter work.

PORTUGAL

eg2HJ sends us this list of the districts in Portugal. The numbers of the districts will, in most cases, be followed by a combination of two letters, 1st, Portugal; 2nd, the Azores; 3rd, Maderia, 4th, Portugese Guinea; 5th, Cape Verde Islands; 6th, Augola; 7th, Mozambique; 8th, Goa; 9th, Macao; 10th, Qunor.

U.S.S.R.

We hear from Wladyslaw Grzybowski, "The short-wave work seems to be developing in the U.S.S.R, intensively enough to let us hope that it will yield a popular and strong amateur short-wave organization.

"Although it is permitted to install transmitters, there are very few licensed amateur transmitters owing to the strict Governmental regulations. To the average amateur, it is almost impossible to obtain a license as he must prove that he is doing scientific work and must procure a recommendation from some leading radio institution. It is more than evident that such an institution cannot be giving papers to everyone and therefore, only their staff can obtain the necessary recommendations.

"The Society of Radio Amateurs originally called the Society of Friends of Radio is a vast organization with branches throughout the country. It is the only organization in the country and is an assembly of BLCs who do not bother with transmitting amateurs. The Society takes very little part in short-wave work although it is assigning call letters to the listeners-in on these waves. The call letters are RK1, RK2 etc. Their number has reached 26 and is rapidly increasing. As most of them have transmitters, there is a difficulty arising in signing their transmissions.

"Official calls for amateurs are O1RA, O2RA etc. The unlicensed amateurs use the intermediate R followed by a figure with two or three letters. These letters are usually the man's initials. Some sign with their R-K calls and others who have licenses prefer to use their more famous unlicensed calls. When the initials of a man's name are already being used, the figure is increased.

"There are about 30 transmitters known to most amateurs and a few which only experiment but never handle any traffic or give their QRAs. Consequently, a considerable number of QSL cards are wandering about the country looking for stations. R.

a.c. shows itself most freely and usually with a power of 20 watts or more. Pure d.c. represents a receiving valve and the beginners even use their receivers.

Contact has been had with most of Europe and due to the vast area of the country, contacts within its bounds may also come under the heading of DX."

WAC CLUB

There have been several recent additions to the club and we now have 39 members. nu2MK's cards were all old ones, the latest being dated some six or seven months back. If any of the rest of you fellows are holding out on us like this, we are going to get peeved. The members at the present time nu6OI, nu6HM, nu1AAO, nc4GT, np4SA, nu9ZT-9XAX, eb4YZ, nu9DNG, op3AA, nu2APV, op1AU, nu5ACL, nu5JF, eg2IT, eo5NJ, op1CW, fo1SR, nu1CMP, nu1CMX, eb4RS-3AA, nu 71T, nu1CH, sc9TC, nu5TW, nu6CTO, op1BD, nu9BSK, nu4TN-4SI, am2SE, eg5XY, sc2LD, ef8CS, nu2CRB, oa2SH, nu7VH-7TM, nu2MK, nu2AHM, nu2CYX and su2AK.

NEW QRAs

nu2BLS worked fmOCRB who gave his QRA as Rabat, Morocco. We also have Secteur des Transmissions, Quezzan, Morocco for fm8ST. This was received from 1CKP, who worked him. Several have heard and worked DEH which turns out to be a freighter, the S.S. Santiago, bound for New Orleans. We do not know his QRF. He is using a fifty watter with 3,000 volts on the plate. QRH about 38 meters. The S.S. Minerva, mentioned in the December issue, has been worked by several and there seems to be divided opinion as to his correct call. Some claim it as VED while others are just as positive that it is VEL. WIY has been worked by nu5DF. This is an oil tanker running from Los Angeles to Boston. The note is a 500-cycle one and the wave is 38 meters. 8CFL has worked the steamer, Wm. Irish, of the Atlantic Refining Company. Two 201-As are being used with d. c. on the plates. The wave is 40 meters. We understand that LW is a U. S. freighter that used a 5-watter on its last trip and worked a large number of American hams. It is now using 250 watts with 500 cycles on waves between 35 and 37.5 meters.

How Our Tube Circuits Work

(Continued from Page 43)

rangements that have not fitted into the previous paragraphs.

We have said that some modulation on the wave is desirable to take away the monotony. One good combination for this result is that installed by Beekley at 1KP. The scheme is to operate the master oscillator on a string of storage B batteries which make it independent of line fluctuations. The output is amplified by a back-to-back amplifier. By this I do not mean a push-pull amplifier but the thing we ordinarily call "one tube on each side of the cycle". These storage B batteries are now being turned in for B-battery substitutes (rectifier-filter arrangements) in this vicinity and probably can be purchased cheaply elsewhere also. Here they can be bought as low as $1.50 per 48-volt tray, in good order.

When operating an amplifier with 2nd-harmonic-distortion in view, the tube can be run with a grid bias as high as one-half of the normal plate voltage *if* it is a double-ended tube so that the plate voltage can be raised at least 50% above normal. The input will then be fairly good and the output will have a strong 2nd harmonic. On single-ended tubes one has to be a bit more careful.

GENERAL

There remains just one thing to be said. When the set refuses to work—don't rush a letter to the Information Service until you have stopped to think the thing over thoroughly. If an amplifier is being used and the combination does not behave well, try taking the amplifier out to see if the oscillator alone will act decently.

If careful thought and re-reading of *QST*'s articles (also Ballantine) do not seem to locate the trouble there is time enough to write the Information Service, giving a complete diagram with every possible dimension and constant and an *exact and complete* statement of the trouble. The surprising thing is that when you have such a careful letter written you will generally have come upon the answer!

In the article, "On Top of the World—nc5GO", which we published last month, the call was given incorrectly. The call that should have appeared is *nc5AO*. We regret the error and apologize for it.

Strays

H. B. Gemmill of Soo, Ontario, tells us that he is using a pair of Raytheon tubes to rectify the output of a 550-volt, center tapped transformer. He connects the two full-wave terminals in parallel and puts one tube in each lead. It works nicely for a couple of 210s.

3FI and 3ABH are starting a monthly pamphlet of Calls Heard which is to include lists from all parts of the whole world, so we understand. The pamphlet will sell for 15 cents per month or one buck and a half a year on subscription. The boys will welcome your list for publication. The address is 2857 North Bailey Street, Philadelphia, Penn.

Calls Heard

ALL lists of calls should be prepared in exactly the same form as they appear below. It is preferable that they be typed although they will be accepted when printed in ink. They must be double-spaced and no punctuation or indicators designating stations worked or best DX should be used. There is no excuse for incorrectly made up lists as each *QST* carries several pages showing the proper arrangement.

1CUE, J. B. Henry, Lincoln, N. H.

oa-2be oa-2bk oa-2ds oa-2gq oa-2sh oa-2tm oa-2yi oa-3ef oa-3en oa-3hl oa-3px oa-3xo oa-4cg oa-4nw oa-4rb oa-5da oa-5hg oa-5rm oa-5sa oa-7cw oz-1ax oz-2ae oz-2xa oz-4aa oz-4ai oz-4ak sb-1ab sb-1ac sb-1af sb-1aj sb-1ak sb-1al sb-1am sb-1ap sb-1ao sb-1aq sb-1ar sb-1aw sb-1br sb-1ib sb-2ab sb-2af sb-2ag sb-2al sb-2sq sb-5aa sb-5ab sb-6qa sb-snf sb-snni sb-poa sb-sqlz sa-ba1 sa-cb8 sa-fc6 sa-ga2 sa-bk1 sc-2ab sc-2ar sc-2as sc-2bl sc-2id su-1am su-1bu su-1cd su-1fb su-2ak fo-a3b fo-a4z fo-a5h fo-a5o ef-8di ef-8ix ef-8jn ef-8yor eg-5dh nq-8kp nm-1aa nm-jh ei-acd nj-2pz fopm sm1p fm-8st ho-6axw na-7mn age dx8 ngd xg.

1HV, A. Sienkowski, 65 Geer Ave., Norwich, Conn.

5aqk 5aqy 5ard 5atr 5asr 5atx 5aty 5aua 5auh 5aur 5ax 5de 5dl 5dq 5dt 5eb 5eh 5ek 5fc 5fi 5gm 5hz 5ii 5in 5jd 5kc 5kk 5kl 5kv 5le 5ls 5maj 5md 5mn 5mq 5na 5oj 5ql 5qo 5qr 5rh 5rz 5sd 5sp 5sw 5uk 5wy 5wz 5zl 5zu 5ev 6abg 6aaq 6adt 6asr 6ahn 6ai 6aji 6ajm 6anc 6ank 6ano 6baf 6bam 6bau 6bav 6bcq 6bdl 6bgc 6bha 6bhh 6bhr 6biw 6bjv 6bpm 6bug 6bux 6buy 6bve 6bxf 6bxg 6bxi 6bzr 6cav 6cct 6cfx 6cgx 6chq 6cil 6cqw 6csx 6cto 6cua 6cub 6cuc 6cul 6cwm 6dam 6dat 6dca 6ha 6hf 6hj 6mb 6mh 6my 6or 6pv 6qw 6rj 6sb 6ty 6ul 6zbj 6zf 6drn 6cyu 6cfx 7ek oa-2yi oa-2bk oa-2sh oa-2tw oa-4bo sb-1ak sb-1aw sb-2af sc-2ab sc-2as sc-2id ef-8cl ef-8fj ef-8gm ef-8hu ef-8ix ef-8jf ef-8jn ef-8ku ef-8ssw ef-8yor ef-8xix eg-2kf eg-2nm eg-2od eg-2oq eg-2qb eg-5dh eg-5by eg-5mq eg-5wq eg-6yb se-1fg ei-acd ei-1co ei-1au nj-2pz ek-4abf ek-iz nm-cyy nm-jh nm-1e nm-ij nm-1n nm-1o nm-iy nm-5b nm-5c nm-9a nm-9c nm-9x en-pira en-opm fo-a3b fo-a5o np-4ag np-4sa np-4ug nq-21c sa-af1 sa-ba1 sa-cb8 oz-1ab oz-1ac oz-1ao oz-1ax oz-2ac oz-2ae oz-2xa oz-3ai oz-3bq oz-3xb oz-4aa oz-4am oz-4av oz-vlb nrrg nrrl voq

2AMG Bernard Fein, 900 Riverside Drive, New York City

6ayj 6awa 6aaf 6amm 6adp 6aco 6bhz 6bgv 6bq 6bil 6bjv 6bmw 6byz 6bux 6bxi 6cmw 6ckv 6cmg 6dp 6ia 6bq 6gl 6pw 6nw 6or 6rn 6zat 7ek 7oy 7vh 7vq nq-8kp nj-2pz ne-1da ne-1aq ne-8bl ne-3adn ne-3iy ne-4dw ne-8aw ne-8azs nm-xi nm-o2m nm-5n na-wwdo na-7mn na-7de sb-1ac sb-1ad sb-1ap sb-2ab sb-2ag ef-8yor eg-2it eg-2wj eg-5dh fm-oftn sm1p ch noec neem aa7 ab1 cb3

A. O. Burling, 8629 143rd Street, Jamaica, L. I., N. Y.

September 1 to January 1

4hz 4jk 4kj 4km 4lb 4le 4ll 4ob 4oi 4pf 4pi 4pz 4qb 4rm 4rw 4tv 4uk 4wj 4aae 4cu 4cv 4dd 4dw 4ea 4ei 4fl 4fw 4gw 5aab 5abq 5abu 5acl 5adi 5aec 5ain 5ajs 5akk 5ame 5apo 5aq 5aqt 5ash 5asr 5auc 5aur 5auz 5av 5ce 5dq 1eb 1ek 1ev 1hn 1hz 5im 5ia 5pi 5ql 5sd 5sw 5tp 5wz 5zai 6aat 6agr 6akm 6anr 6avb 6avj 6awq 6ayj 6bam 6bch 6bcn 6bjl 6bqt 6bux 6bvd 6bvv 6cci 6cco 6che 6chq 6crr 6cu 6cub 6cuc 6cuu 6cyd 6dj 6jn 6la 6pv 6pw 6vz 6zat 6zbj 7abf 7av 7es 7ld 9aaq 9acy 9adr 9aeh 9aek 9afx 9ai 9atq 9azo 9bcl 9bfn 9bjz 9bqe 9bqw 9bsa 9cbj 9ces 9cft 9cis 9cmo 9csq 9cwq 9day 9dc 9dcj 9dez 9dk 9dpj 9drd 9dtf 9dwz 9dxt 9dxy 9dyc 9eag 9ecb 9eea 9egh 9hp 9axe 9jk 9nk 9nr 9wv sb-1aa sb-1al sb-1ap sb-1aq sb-1bi sb-2ab sb-2ag sb-2ak nc-2au nc-2ax nc-2bv nc-3adn nc-3ael nc-3hp nc-4dw nc-5ar nc-9ai nc-9aq nj-2pz fo-a3b fo-a5o nq-5ry nq-8az nq-8kp sa-ba1 su-1cd su-1cg su-2ak oz-2ra agb age gdq ocdj ptc wdyc wvz

3GX, J. Gray McAllister, Jr., Box 243, Hampden, Sidney, Va.

oa-2cy oa-2rx oa-2sh oa-2yi oa-3cn oa-3xo oa-4cg oa-4rb oa-5bq oa-5hq oa-5ma oa-5oq oa-7cw nb-be2 sb-1aa sb-1ak sb-1ac sb-1ar sb-1ia sb-1ib sb-5ab snni sb-sql nc-1am nc-1an nc-1aq nc-1dq nc-2cq nc-3adn nc-3aei nc-3az nc-3bk nc-3cs nc-3qs nc-3ud nc-4da nc-4dq nc-4ck nc-4fz nc-8aw nc-8azs hik cqo ef-8st fopm eg-2cc eg-2jb eg-2nm eg-2sw eg-5by eg-5lf eg-5sz eg-2it oh-fx1 ek-4uah nm-xc61 en-opm fo-1sr fo-a3z fo-a4v fo-a4z op-1aj nq-2jt nq-7cx nq-pwx et-2pr su-1fb su-2ak

3VI, Paul T. Holtzman, 1108 Eutaw St., Baltimore, Md.

oa-4cg sb-1ac sb-1ao sb-1ak sb-1ai sb-1ap sb-1aw sb-1br sb-1ia sb-1ib sb-2ab sb-2ad sb-2af sb-ag sb-2an sb-2as sb-5aa sb-5ah sb-snf sb-snni sb-sq4 nc-1ar nc-2ai nc-2be nc-2fo nc-8az nc-3el nc-3cs nc-8dh nc-3he nc-3qs nc-3xi nc-3zb nc-4dy nc-5go nc-9cd sc-2as ei-acd nj-2pz oh-6buc oh-6xaw nm-1n nm-9a nm-jh fo-a3z fo-a4l fo-a5o rxy np-4rl nq-21c nq-8kp sa-cb8 aa7 cg5 hm hik lw nba nrk wbo wyf wva bzl

4DK, M. I. Hull, 653 Rozelle Street, Memphis, Tenn.

20-Meter Band

1bqt 1uw 1xam 2eig 2ctq 2tp 3bgj 4eaa 4kx 6bgz 8evq agk wll

40-Meter Band

oa-2bk oa-2eg oa-2cm oa-2sh oa-2yi oa-3em oa-3kb oa-3wm oa-8xo oa-5bg oa-5wh oa-7es oa-7la sb-1ak sb-1aq sb-1aw sb-1bi sb-2ab sb-2ag sb-2aj nc-8by nc-3el nc-3jl nc-3xi nc-3zb nc-4dy nc-5bf sc-2ab sc-2ah sc-2ar sc-2id ef-8jf eg-5dh oh-6ajl oh-6axw oh-6buc oh-6dbl oh-6kq oh-6nz oh-6xk ei-acd nm-1n nm-9a fo-a3b fo-a5o fo-1sr np-4ja nq-8kp sa-af1 su-1cd oz-1ax oz-3ai oz-4ac ntt noh voq wnp nm-jh aa7 aq8 bb3 kio giq and ajs ab1 rxy vkp wdyc

4LK, Lee and Foulkes, 502 Spearing Street, Jacksonville, Florida

40-Meter Band

6aa 6adk 6bch 6bfl 6bqt 6bye 6bxi 6bzf 6ccl 6cgm 6cua 6dn 6hj 6jn 6zat 7aay 7ek 7eq oa-2no oa-2rb oa-2sh oa-2tm oa-2uk oa-2yi ao-3al oa-3yx oa-5hg oa-5ps oa-7bq sb-1aw sb-6qb nc-1ar nc-2eg nc-2al nc-3jl nc-3mp ef-8bf ef-8di ef-8jf ef-8gm ef-8ix ef-8mul ef-8rf ef-8ssw ef-8yor eg-2iteg-2kf eg-2kz eg-2nm eg-5dh eg-6mu ei-1ay ei-1co ei-1gj nj-2pz ek-4yad nm-9a fo-a3b nq-8kp sa-fc6 su-1cd su-2ak oz-1ax oz-2xa oz-3ar oz-4ak oz-4wr aa7 av7 ab1 bam cb3 dgn gbpz glky gmd hik kel koh vlb xc55 xg

6ALH, Paul B. Hayes, 2604 Prosser Street, Sawtelle, Calif.

oa-2ar sc-2id sc-2ar ef-lx ei-1it aj-1ts ek-1ln fo-a5o fo-a3e fo-a4e sb-1ar sb-1aw voz cuq oz-1ar oz-1at oz-1ap oz-4ag oz-4al oz-4aa su-3fl eg-4fm oh-6aff oh-6hdl oh-6a xw noil nrrg

6ASM, C. A. Nichols, 1220 West Manchester Ave., Los Angeles, Calif.

Heard between October 3rd and December 20th, 1926

np-4sa oa-2rc oa-2yi oa-2sh oa-2ij oa-3ef oa-3gm oa-4rg oa-4bd oa-5bg oa-5hg oa-7cw oz-1ao oz-2ac

oz-2xa oz-2ae oz-2ak oz-2ar oz-3lb oz-3aj oz-3ai oz-4am na-7hw na-wwdo eg-2od oh-fx1 oh-6oa oh-6dea oh-6axw oh-6clj oh-6dcf nm-jh nm-9a nm-1k nc-3zb nc-3xi nc-4dq nc-4bn nc-3kp nc-8xz op-1bd op-3aa fo-a3h fo-a5o sa-bh5 sa-af1 sc-2ab sc-2as sc-2bl sc-4aq sb-1am sb-1ib sb-2ab sb-2ad sb-snni nq-paw nq-8kp aj-1it nj-2pz su-2ak su-1eg agb rxy aa7 bp-1 msn aqa aqe hik wsr wyf

6AUP, 3986½ Brighton Ave., Los Angeles, Calif.

1ahv 1ajx 1amd 1ana 1aof 1asf 1awo 1bez 1bqq 1btr 1byx 1cjc 1emp 1fl 1gw 1mk 1xv 1zq 2afg 2ait 2amj 2anm 2apd 2apv 2bsc 2bvh 2bw 2crb 2cty 2cuq 2cvj 2cvs 2cxl 2czr 2fz 2gv 2hc 2hp 2nf 3aha 3any 3auv 3bg 3bms 3ckl 3gp 3hg 3lw 4cm 4cu 4er 4fs 4hl 4li 4ll 4ni 4oa 4pf 4pk 4rm 4rr 4si 4sl 4tn 4wj 8ada 8ago 8ajn 8akk 8aly 8amu 8anb 8arg 8aul 8avo 8bbl 8bct 8ben 8bhf 8bko 8bn 8bpl 8brc 8buy 8bvt 8cau 8ceo 8crx 8csv 8daq 8dbb 8dcm 8dds 8ded 8dhp 8dhu 8dke 8dld 8dmd 8doe 8dqw 8dsy 8gk 8gz 8im 8jj 8pl 8rd 8rx 8ry 8vj 8vt 8wt oa-2dy oa-2rx oa-2sh oa-2yi oa-3an oa-3bh oa-3dc oa-3xo oa-4bd oa-4cg oa-5hg oa-5wh oa-7es oa-7cw oa-7dx od-sk2 sb-1am sb-1ar sb-1aw sb-1ib sb-2af nc-3xi nc-4dq nc-4dt nc-5ar nc-5au nc-5bf nc-5bn sc-2ab sc-2ah sc-2ar sc-2as sc-2bl sc-2ld ef-8yor oh-6bdl oh-6clj oh-6dcf oh-6dea oh-6nl aj-1mu nj-2pz nm-1j nm-5b nm-5c nm-9a nm-jh fo-a3b fo-a3e fo-a4e fo-a5o ep-3bz op-1hr op-3aa nq-2lc nq-8kp sa-db2 su-1am su-1cd su-2ak oz-1ao oz-1ax oz-2ac oz-2ae oz-2ak oz-2bg oz-2br oz-2gc oz-2xa oz-3ai oz-3aj oz-3ar oz-3xb oz-4aa oz-4ac oz-4am fb1o ftj kdgi knt rxy

6AVP, Julius Shulman, 548 North Cummings Street, Los Angeles, Calif.

1acc 1aei 1akw 1ao 1asd 1adm 1amd 1aw 1bez 1bo 1ch 1co 1eg 1kr 1ng 1nm 1ma 1pr 1ry 1uf 1xu 1xv 2aat 2aef 2alm 2apv 2auy 2awk 2awu 2blm 2bo 2bai 2cty 2cuq 2dy 2eu 2gy 2hp 2ol 2sg 2uk 2um 3aai 3akq 3bns 3bui 3bw 3ck 3kp 3nw 3qf 3rt 4aa 4ak 4dq 4fa 4fl 4hl 4km 4nt 4qd 4rm 4ru 4sj 8ahb 8akf 8alo 8aly 8amd 8asb 8aul 8axs 8bbs 8bct 8bep 8bev 8bg1 8bpl 8brc 8buy 8bzt 8cab 8cau 8cbr 8cem 8ccu 8ci 8cs 8dcq 8ded 8dek 8den 8dgx 8dhu 8dk 8dmm 8dpn 8dt 8hv 8im 8jf 8st 8sv 8ro 8vj 8vz 8xz oa-4ae oa-7dx sb-2ak nc-1ar nc-3hp nc-4gt nc-5aj sc-1gw sc-2ar sc-2as sc-2bl sc-2bm ac-3as nm-1h nm-1u nm-4r nm-5n nm-7a fo-a4r fo-a4z ey-4ua am-2se nm-xc55 su-2ak su-8on oz-2ai oz-2ar oz-2bj oz-2bl oz-2bg oz-3ai oz-4aa nmng nhn need nnh bb3 wik wvx wwdo hik rxy ank ftj zcy

Theo Kidd, Navrdosta, Hanscom, Alaska

1aao 1sk 1xm 1yi 1kw 1bl 2uo 2aaw 2ca 3aab 3cdv 4si 4hi 5atx 5aur 6adp 6agr 6api 6ath 6aty 6arc 6ax 6aye 6azs 6bq 6bs 6bco 6bis 6baf 6bzf 6bvm 6cdw 6czz6ccl 6eae 6eac 6fg 6kw 6rw 6lh 6nw 6nx 6ta 6wa 6vr 6zbf 6zsx 7aao 7adf 7aif 7acf 7bs 7eb 7ek 7hc 7kn 7gr 7sm 7sy 7if 7or 7qn 7wb 8rq 8xk 9dqu 9alh 9cet 9ek 9si 9xi eg-5dh

8AXA, C. B. Hoag, 123 East Matson Ave., Syracuse, N. Y.

Heard on 20 meters on December 18th and 19th

4aj 4km 4lk 4ou 4pf 4sl 5aav 5qi 5wz 6eb 6fz 6kg 6mu 9aem 9agq 9ahq 9aln 9anz 9atb 9atq 9baz 9bcl 9bdg 9be 9bff 9bhi 9bi 9bkq 9bmr 9bsk 9bui 9bvp 9bwo 9caj 9caw 9cen 9egh 9cia 9cn 9cwa 9cye 9dac 9dax 9dga 9dhb 9dij 9dla 9dlg 9dnw 9doe 9dpw 9drh 9drr 9duz 9dwd 9dxg 9eai 9ef 9eff 9egc 9eir 9ek 9eti 9fk 9hb 9kd 9kp 9ln 9mn 9ux 9uz 9xx nc-1ar nc-1ak nc-4bt nc-4dw

8BSR, L. F. Strobel, 680 Yale Street, Akron, Ohio

Heard during December

6aah 6acg 6adk 6afp 6amm 6atu 6avb 6awq 6azs 6bam 6bas 6bbv 6beh 6bep 6bfe 6bgc 6bhz 6bia 6bil 6bmw 6bq 6bqt 6btf 6bws 6bxd 6bxi 6bxn 6bye 6bzn 6cco 6ccw 6cdl 6cgm 6chy 6cii 6cmg 6cpf 6cqm 6crr 6cuw 6cvw 6cyu 6dcq 6ddo 6dea 6dn 6eb 6fr 6hm 6jn 6mu 6oh 6rj 6ry 6rw 6ta 6vr 6vz 6zat 7aat 7aij 7aix 7al 7bd 7ek 7gb 7gj 7hc 7it 7lz 7mn 7ny 7or 7ps 7pu 7qg 7rx 7tx 7ul 7uo 7vi 7vl 7zn 7zu oa-2yi oa-5wh oa-6mu oa-7cs oa-7kw na-7cx sb-1am sb-1ao sb-1aw sb-1ib sb-2af sb-2ag sb-9qa sc-2ah sc-2ak sc-2ar sc-2as sc-9tc ee-ear2 ef-8fj ef-8ig eg-5dh se-1fg ei-ecd ei-1gw nj-2pz nm-5b nm-5nm nm-9a fo-a3b fo-a4z fo-a5o op-1hr nq-2lc nq-5ny nq-5ry nq-8kp sa-ba1 su-1am su-1ar su-1fb su-2ak oz-3ap oz-3ar dq8 fajh hik hl lw ndr rgt rxy sbm

8BEN, R. H. Lucia, 109 West Chestnut Street, East Rochester, N. Y.

oa-2yi nb-1aa sb-1aa sa-1ak sb-1al sb-1am sb-1ao sb-1ar sb-1aw sb-1ax sb-1bd sb-1bi sb-1ib sb-2ab sb-2af sb-2ag sb-2as sb-2ia sb-5aa sb-5ad sc-2ah sc-2as sc-2ld ee-ear2 ef-8cl ef-8ct ef-8fj ef-8gi ef-8gm ef-8ix ef-88jc ef-8jf ef-8jn ef-8kf ef-8pep ef-8ssw ef-8tis ef-8tuv ef-8udi ef-8ved ef-8woz ef-8yor fm-8st fm-ocrb eg-5dh eg-5lf eg-5pz se-1fg ei-acd ei-1au ei-1co ei-1ma ei-1rm nj-2pz ek-4abf nm-jh nm-9a fo-1sr fo-a3b fo-a4z fo-a5o fo-a5z ea-hl nq-8kp sa-af1 sa-ba1 sa-cb8 sa-dz9 sm1p su-1am su-1bu su-1cd su-1eg su-1cx su-2ak 98x ad ab1 av7 gfup kjoe wiy wva wwdo

8DCW, Wilbert Simpson, Saranac, Mich.

Heard during December

6aaf 6aah abc 6adp 6aej 6ael 6agg 6agr 6ahn 6ahp 6ahs 6aix 6alt 6ahm 6anh 6ann 6anu 6aod 6aou 6aqx 6asy 6auk 6avj 6axu 6baj 6bau 6bbn 6bbv 6bch 6bcm 6bcn 6bco 6bek 6bfe 6bhz 6bil 6bjf 6bjh 6bjl 6bjv 6bkj 6ble 6bod 6bph 6bqt 6btj 6bux 6bvc 6bvm 6bvx 6bws 6bwy 6bxi 6bxn 6byz 6bza 6bzd 6bze 6bzf 6bzn 6cby 6ccl 6cco 6cdu 6cdv 6cer 6cfr 6chk 6chl 6cho 6cht 6cih 6cii 6cil 6ciw 6cjg 6clk 6cmt 6crr 6cte 6cto 6cuc 6cux 6cwp 6cyg 6cyh 6cyi 6cyu 6czz 6dau 6dcw 6zat 6aa 6dj 6dp 6fr 6gw 6hj 6hu 6ih 6jn 6jp 6ku 6kw 6mu 6nw 6pv 6rv 6rw 6ta 6ud 6vr 6wb 6xk 6yb 7abb 7acb 7acf 7ach 7aib 7am 7az 7bd 7dk 7ek 7fb 7gv 7lz 7ny 7oq 7or 7ou 7tx 7tz 7uo 7vm 7zn oa-2bb oa-2dy oa-2rx oa-2sh oa-2tm oa-2yi oa-3bh oa-3my oa-3ot oa-3xo oa-4nw oa-5ax oa-5hg oa-5lf oa-5rm oa-5wh oa-7cw oa-7dx na-7kn wwdo sb-1ac sb-1af sb-1ak sb-1al sb-1am sb-1ao sb-1ar sb-1aw sb-1bo sb-1ia sb-1ib sb-2af sb-2ag sb-2al sb-2au sb-2id sb-2wr sb-5aa sb-6qa sb-poa snni sb-sq1x sb-sq2 sb-sq3 nc-1ak nc-1ar nc-2bo nc-3adn nc-3ael nc-3br nc-3dh nc-3jl nc-3ur nc-4a1 nc-4aq nc-4cb nc-4ck nc-4cl nc-4dq sc-2ab sc-2ar sc-2as sc-2bl sc-4aq ed-oxz ef-8ct ef-8hu ef-8ix ef-8la ef-8yor ef-ocng ef-octn eg-2od eg-5dn eg-5ma eg-5nj eg-6bd eg-6fa eg-6iz eg-6jv eg-6mu oh-6axw oh-6bue oh-6dcf ei-1ay ei-1gw ei-acd aj-jkzb nj-2pz ek-4mca ek-4uah nm-1n nm-5b nm-9a nm-cyv fo-a3b fo-a8z fo-a4v fo-a5o fo-a5t fo-a7h ep-3fz nq-2jt sa-ba1 sa-cb8 sa-de3 sa-dh5 sa-fc6 em-smtn em-smwu su-1bu su-1cd su-1cg su-2ak oz-1fe oz-2ac oz-2ae oz-2gc oz-2ak oz-2br oz-2xa oz-3ar oz-4aa oz-4av oz-4ak sm1p age dx8 fr3 gcda glky glsq hik kdgi keu lgn mo2 ptd ptm pts rs rxy sad sgc sx vz 9ze

8GJ, Francis B. Stevens, 77 Grey Street, Buffalo, N. Y.

Heard during December

1ag 1gp 1ctp 1zn 2ahg 2bhm 2ts 2mm 3bwt 3gg 4bl 4dd 4dy 4ks 4lk 4ft 4pr 4nf 5aj 5aq 5at 5he 5eb 5aur 5aay 5jf 5ajj 5akl 5ajs 5rh 5ww 6anq 6ayj 6bod 6bux 6bxt 6bye 6clt 6aat 6cqw 6cql 6crx 6er 6eyr 6rh 6pw 9ael 9be 9brk 9amv 9ama 9awt 9ayx 9ben 9egq 9fl 9dwd 9rf 9ut 9bye 9egu nc-3bk sbm wvr pkx zhc

8MN, Karl W. Busch, 637 Englewood Ave., Buffalo, N. Y.

40-meter band

4ev 4pf 5aao 5abp 5acl 5adt 5ahd 5akn 5aky **5alh 5amt** 5apg 5apj 5apo 5aqe 5aqy 5aif 5aur 5zaf 5ad **5aq 5df** 5dg 5dl 5eb 5et 5ev 5in 5jd 5mz 5oa 5pi **5xe** 6agg 6agr 6ahs 6akx 6awq 6baf 6bam 6bch 6bcj **6bcn 6bia** 6bjv 6bjx 6bvw 6bzf 6bzm 6ecl 6cdu 6chy 6cqm 6cqw6dcq 6am 6dn 6eb 6hj 6mu 6pw 6rf 6xg 7abh 7aek 7aib **7av** 7ek 7eo 7jc 7jf 7ko 7ob 7ry 7uq 7wu 9dia oa-4bd oa-5bu sb-1aa sb-1am sb-2ab sb-2ad sb-2af sb-2ag sb-6qa **sb-sq2** nc-4dq nc-4dy nc-4dw nc-4eb nc-5et sc-2ab ef-8fj ef-8gi eg-2nm eg-2qb eg-5by eg-5dh eg-5mq **eg-6pu** ei-acd nj-2pz nm-jh nm-5b nm-9a fo-a3b fo-a4z np-9c nq-8kp sa-af1 su-1bu su-2ak oz-2ac oz-2xa **oz-4ac** abj kkj sfv aa7 in bn33 eg-2vq ..

Leon Brauhn, Box 41, East Dubuque, Ill.

oa-3ba oa-8tm oa-4an sb-1ak sb-1am **sb-1ar sb-1aw** sb-1ib sb-2af sb-2ag sb-2ib sc-2as sc-2ag **sc-2lg oz-1ax** oz-4ac oz-4ak oz-4am su-1bu su-1cd **su-2ak sa-8bg** nm-9a nj-2pz wvc wvr rxy fut

9CNL, Stephen L. Fitzpatrick, 39 Emerson Street, Denver, Colo.

1aal 1aga 1bez 1bmg 1ch 1fn 1xv 1zw 2bg 2bm 2bsc 2bvh 2cnm 1cty 2dh 2fa 2gv 2jn 2rs 2xaf 3au 3di 3ep 3gp 2iu 3jm 4aae 4aah 4br 4dd 4mi 4qb 5aaq 5agy 5air 5aiu 5ajs 5akn 5apg 5apo 5app 5aqe 5atf 5bh 5do 5fq 5he 5sw 5tt 5uk 5ww 6ajm 6akm 6anp 6aod 6asm 6ayj 6bis 6bhz 6bvw 6bxc 6b za6bzd 6ccl 6cct 6chk 6cqw 6cuw 6cva 6dct 6dp 6ef 7fl 7bx 7jf 7rx 8afq 8akk 8bf 8bzn 8cam 8ced 8cpk 8dfo 8dke 8drs 8ew 8cp 8kn 8sv 8tn 8xe oa-2bk oa-7aa oa-7cs sb-1af sb-1al sb-1ao sb-2ab sb-5aa nc-1ar nc-2xi nc-3kp nc-8xi nc-4bu nc-4fz nc-4hh sc-2as aetn oh-6abw ni-8fc nj-2pz nm-1h nm-1n nm-9a nm-cyy nm-jh nm-vc2 oz-1oa oz-4ak fo--a5o op-1bd nq-8kp bb3 aa7 kdef aik ket ng giq ex7 xch1 wiy wvc wik

9DMA, Caledonia, Minn.

oa-2bb oa-2cs oa-2no oa-2rx oa-2sh oa-2yi oa-3dc oa-3en oa-4an oa-4bg oa-5bg oa-5bw oa-5wh oa-7dx sb-1ac sb-1ao sb-1ar sb-1aw sb-2ag sb-2as sb-6qa sb-9qa ocng fm-ocrb fm-octn fm-8ma oh-6acg oh-6aji oh-6akp oh-6bdl oh-6dea oh-6nl oh-6tq fx1 ei-1fg nj-2pz ek-4mca nm-1j nm-1n nm-9a fo-3ca nq-pwx nq-2jt nq-2mk su-1cd su-2uk oz-1ao oz-1ax oz-2ac oz-2ae oz-2aq oz-2bg oz-2ka oz-3ae oz-3ai oz-3aj oz-3ak oz-4aa oz-4ak oz-4am aa7 ajs amh aqe bb3 dx8 glky hm lw rxy spc

9DUD, Wells Chapin, 1429 Blackstone, St. Louis, Mo.

sb-1ab sb-1ac sb-1ak sb-1an sb-1aq ab-1ar sb-1as sb-1ao sb-2ab sb-2aac sb-2ag sb-2aa sb-5aa sb-5ab sb-6qa snni smlp em-7aa nj-2pz ef-8kf ef-8yor ef-8dk ek-y4 ai-1aa sc-2ld sc-3ag sc-2ag sc-2ar fo-a5o fo-a3n oa-2bl oa-2as oa-2am fo-a4c fo-a6n oh-6axw 51c 55xc na-7kk np-4je np-4sa nq-8kp nq-2lc x9 xk kdgl

nc3ADN, Montague Thomson, 18 Erie Ave., London, Canada

oa-2rt oa-2dy oa-2sh oa-2rx oa-3my oa-4cq oa-5hg oa-7bq oa-7cw oa-7dx sa-aa8 sa-1af sa-ch8 eb-4zz sb-1an sb-1ak sb-1aw sb-1aq qb-1bi sb-1ar sb-1ad sb-1ax sb-1ia sb-1al sb-2af sb-2ag sb-2ab sb-2al sb-5aa sb-6qa se-1fg ef-8el ef-8yor ef-8ix ef-8kv ef-8fj ef-8woz ef-8kf ef-8gi ef-8pp ef-8udi ef-8xix ef-88sw ef-8jc ef-8rbp ef-8cn ef-3ca eg-5xy eg-5qg eg-2nm ei-1au ei-1gw ei-1ma ei-1cu ei-1co ei-1ay nj-2pz nm-9a nm-1n nm-5b fm-8st od-sr4 fo-a3b fo-a3c fo-a3m fo-a3z fo-a5o fo-1sr oo-2as np-4ja np-4ug nq-8kp su-1cd su-2ak oz-3vp jh rxy ank oedj wyf lw kdgl

nc-3BH, H. W. Fairley, 278 Beresford Ave., Toronto, Ont., Canada.

Heard from November 25th to December 31.

6aah 6acz 6adv 6afp 6agd 6agr 6ajm 6akm 6api 6awq 6azs 6bac 6bch 6bcj 6bgv 6bil 6biz 6bjl 6bjx 6bno 6byh 6bzh 6bzm 6cco 6cet 6cdw 6cei 6cfx 6ckv 6cmt 6cnn 6cql 6csd 6cto 6cu 6dcq 6dim 6dn 6gw 6gx 6hj 6ih 6jn 6ry 6rx 6vr 6yb 6yd 7acl 7ag 7aif 7aij 7bd 7dk 7ek 7fe 7gh 7gj 7ng 7ny 7ob 7or 7ps 7qg 7tx su-1cd su-1cy su-2ak su-2as oz-2xa oz-3ai oz-3ar oz-4ak oa-2dy oa-2mh oa-2yi oa-3ba oa-3bq oa-5bg oa-5hg oa-7bq oa-7cw oa-7la sb-1ac sb-1af sb-1ak sb-1al sb-1am sb-1an sb-1aq sb-1ar sb-1aw sb-1ia sb-1ib sb-2ab sb-2ad sb-2ag sb-2as sb-5aa sb-5ab sb-6qa snni sb-su1x sb-sq4 nc-1ac nc-1am nc-1ar nc-1da nc-1dm nc-1ei nc-2al nc-2au nc-4al nc-4ck nc-4dq nc-4dw nc-4dv nc-4fz nc-8azs sc-2as sc-2ld ef-8ab fo-pm eg-5dh nj-2pz ek-4uah nm-1j nm-1n nm-9a en-omd fo-a3b fo-a4l fo-a4z fo-a5o nq-2lc nq-2mk nq-8kp nq-pwx kel woet nosn wvx aa7 acd ocdj rby xg dx8 nbl

1AN C. Morgan, 308 Peel Street, Montreal, Canada.

oa-1ao oa-5bg nb-her nb-hes sb-1aw ed-7ec eg-2cc eg-2nm eg-2nh ei-ier ei-igw aj-3ww jhhb nm-7x en-stb fo-a3b fo-a4m fo-a4l fo-a4z fo-a6n fo-1sr eb-b2 nq-2mk ef-8go am-2se oz-1ao 6fz ca fw voq pow rdw rrp tuk nrrl nerm nrrg nrra evs

ee-EAR44. J. Romero Balmas, Paseo del Principe, 10, Almeria, Spain

1enp 1aao 1bhm 1aox 1era 1ekp 1axx 1emf 1bzp 1erb 1ajx 1bgc 1cez 1vz 1gp 1rf 1my 1kl 1rd 1ej 1bq 1uu 1aom 1air 1bjf 1afl 1awe 1ng 1asr 1ala 1aer 1sw 1ga 1amb 1xj 1axa 1afy 1pr 1cz 1aci 1asf 1ic 1ahy 1ahh 1cki 1asu 1bsd 1by 1bz 1amd 1aep 1ag 1as 1evj 1emy 1ask 2amj 2ayj 2cxl 2evj 2adg 2bwa 2baa 2kp 2ay 2tp 2gx 2av 2nz 2pm 2bm 2em 2sz 2bar 2atg 2cty 2ff 2gv 2fj 2bum 2cbq 2tp 2bbx 2crb 2afg 2ha 2ase 2anm 2abw 2aml 2abp 2cbl 2cuq 2ags 2ewa 2am 2aby 2xaf 2ahm 2bv 2ait 2amh 2ejb 2arm 2arx 3bbb 3bqj 3akw 3ld 3vi 3jo 3ay 3td 3gp 3pf 3bva 3ahl 3agp 3hg 3bwt 3acm 3qw 3auv 3nz 3acw 4iz 4ft 4bn 4si 4ak 4dd 4bl 4st 4jo 4jk 4mj 4nh 4aah 4dm 8bhe 8cer 8adm 8ajm 8gz 8pl 8bg 8xe 8kf 8brc 8bnr 8avd 8aly 8hnh 8rh 8chp 8rc 8aj 8zae 8dae 9bpb 9dq 9mc

F. N. Baskerville, 9 Artheg Drive, Altrincham, England

20 Meters

1adm 1aj 1xam 1xx 2amj 2anm 2aoi 3aqe 3rdv 4dm 8aj 8air 8aul 8axa 8cbi 8cug 9bsk 9cet 9xh nc-1ak nc-1dd nc-3fc sb-1an

40 Meters

oa-2dy oa-2yi oa-3xo oa-4rb oa-5hg oa-7cs od-sk2 nc-2be nc-2bg nc-3xi nc-4dq sc-2ab sc-2as sc-2bl sc-2ld sc-8ax oh-6aff oh-6bue su-1cg jhhb fo-a3b fo-a3e fo-a42 fo-a5x fo-a5z fo-a6n sa-cbs sa-ba1 sa-fc6 sa-hb5 op-1bd op-1hr op-1lt op-8aa sm-2se oz-1ao oz-1fe oz-2ak oz-2ar oz-2bg oz-2hx oz-2cg oz-3ak oz-3ai oz-3ar oz-3xb oz-4aa oz-4ae

B. and F. Smith, 101 Highfield Road, Saltley, Birmingham, England

Heard between November 7th and 24th

1aao 1aba 1abz 1adl 1aef 1afo 1afu 1afy 1ajm 1ajx 1ale 1als 1amp 1aox 1apj 1aq 1asu 1avi 1awz 1axa 1axx 1aya 1ayj 1ayl 1bcn 1bdt 1ben 1bhm 1bkv 1bms 1 bux 1bz 1bzp 1caw 1cdp 1cmf 1cmp 1cnz 1csy 1cue 1ga 1gp 1hb 1kf 1kl 1lc 1lj 1lv 1nl 1nq 1or 1pe 1rd 1rf 1sl 1sw 1uz 1vz 1wi 1xzm 1xj 1xv 1zw 2aby 2afg 2afq 2afr 2afv 2agk 2akv 2ali 2all 2alp 2amj 2amq 2arv 2arx 2avq 2axy 2ayj 2bal 2bkr 2blm 2bm 2bvd 2bvh 2bw 2bzo 2ce 2eft 2erb 2etf 2eug 2evj 2evk 2ezr 2ds 2ej 2ev 2ft 2ha 2ho 2kx 2nz 2pv 2sb 2th 2tp 2xa 2xt 3ab 3acu 3auu 3au 3blc 3bmz 3bns 3bqp 3bva 3edv 3ckj 3dh 3ds 3ee 3gp 3hg 3jo 3jm 3mv 3np 3pf 3sj 3ut 4ah 4ak 4bn 4ei 4dd 4ei 4fa 4fd 4ft 4fw 4jr 4kn 4ni 4te 4ob 5aad 5apo 5anl 5cd 5ck 5dl 5ev 5jf 5ql 6am 6ts 8ade 8ago 8ahl 8alk 8aly 8amu 8anc 8aul 8avd 8ayg 8bas 8bgm 8ben 8bf 8bfp 8bjh 8bjy 8bkn 8bm 8bmn 8box 9bpq 8bre 8bth 8byt 8cbr 8cer 8cli 8cpk 8cqm 8cxh 8cye 8daq 8ded 8dia 8dph 8dpq 8dsy 8dtt 8eq 8kc 8mc 8su 8uy 8xe 9adg 9ain 9akm 9alm 9atv 9axb 9axq 9azn 9bcl 9bk 9bna 9bre 9ckw 9crv 9eq 9et 9ezw 9ddz 9dea 9dm 9dr 9drs 9eag 9ebj 9ees 9ejg 9ejj 9ez 9la 9mc 9pt 9xk aa7 nc-1aa nc-1da nc-1dd nc-2ax nc-2al nc-2do nc-2fo nc-3xl sb-1ab sb-1ad sb-1ai sb-1ak sb-1ap sb-1aq sb-1ar sb-1bi sb-1bl sb-1br sb-1ib sb-2ab sb-2af sb-2ag sb-2am sb-2ia sb-6qa sc-2ab sc-2ar sc-2as sc-2ld sa-ba1 sa-bg8 sa-dz9 sa-hb5 su-1am su-1eg su-1fu su-2ak od-sk2 fo-a3z fo-a4l fo-a4z fo-a5x fo-a5z fo-a6n op-1dl op-3ac af-1b nj-2pz oa-5bw oa-5hg oz-3ai oz-3ar xd jxia

BRS. 29, Lawrence L. Parry, 106 Church Road, Moseley, Birmingham, England.

1aae 1aao 1aer 1aff 1afn 1ah 1ajx 1akz 1amz 1aoh 1asf 1asr 1atv 1au 1awy 1axa 1bhs 1bk 1bms 1bon 1bqt 1bu 1buo 1bz 1ch 1cjc 1clv 1cmf 1cmx 1di 1er 1ga 1ic 1lc 1ny 1on 1rm 1uw 1yb 1zk 1zs 1zw 2afn 2agb 2agq 2agz 2aib 2amj 2av 2avr 2bs 2buy 2cdu 2cvj 2cxl 2cyx 2dh 2ff 2gk 2hp 1ol 2tp 2uz 3ab 3acm 3afq 3aha 3agw 3auw 3bee 3bva 3cdv 3cjr 3gp 3kr 3ld 3oq 3ot 3pf 3tr 4dd 4ft 4io 4iz 4jk 4li 4mc 4mu 4pk 4qy 4rc 4rd 5amt 5fr 6dn 7ek 7vh 7wu 8adg 8aol 8alk 8atv 8aul 8avd 8avl 8ax 8bay 8bni 8bra 8bth 8bsc 8buy 8daq 8drj 8dse 8pl 8pk 8thy 8tlu 8ze 9act 9bdq 9bl 9bph 9cd 9etq 9ezw 9ek 9in 9to abl kel voq wnp

eg-2HJ, K. E. B. Jay, 19 Elm Close, Amersham, Bucks, England.

1aae 1aao 1aen 1air 1akr 1asf 1asr 1awb 1awd 1axx 1bez 1bid 1bqd 1bux 1bvl 1bz 1cib 1cmp 1ga 1hv 1lj 1nq 1xj 1yd 1aof 1art 1aru 1asf 1atg 1bca 1bqd 1cki 1ckp 1cue 1de 1kk 1nv 1rd 1sl 1vz 1wz 2ae 2agn 2ait 2aqw 2awq 2bv 2bz 2cuo 2evj 2fx 2gy 2jn 2kw 2uo 2aes 2aib 2ait 2alp 2arm 2asq 2asu 2avr 2ayj 2baa 2bui 2cbk 2een 2etn 2evs 2evj 2fi 2kx 2sq 2sz 3afp 3ahl 3ain 3aje 3auv 3bgs 3bsc 3ckj 3cl 3dh 3gp 3ji 3mk 3pf 3qw 3rt 3ue 3bqz 3bwt 3eds hg 3jo 3ld 3rt 3zw 4aab

6bl 4he 4ll 4aah 4dd 4gu 4hl 4kt 4lk 4lq 4rn 4sl 4tk 4tv 5atf 5avs 5dl 5kc 5akn 5ew 5jf 6rn 6ahp 6bfl 7gs 8adg 8aj 8ajn 8dkg 8dpj 8nt 8qb 8ade 8agq 9avo 9bau 9bcn 9bcn 9bf 9cco 9cwt 9dan 9daq 9ded 9dsy 9dxk 9rb 9rt 9nt 9ain 9asd 9ats 9baz 9bbw 9bcl 9ccs 9cn 9cxc 9cxe 9cye 9dng 9efk 9ez 9hb 9la 9lc 9nk 9sd 9zk 9bmm 9bqe 9dr 9eev 9sv sj oa-3ef oa-5bg oa-5hm oa-7cs oa-7cw oa-3yi oz-2ac oz-3ar oz-4aa oz-4ak oz-4am oz-4ac nc-1ar nc-2be nc-2bq nc-3fc nc-4dq fo-a6n fo-a4z fo-a6n sb-1ao sb-2ab sb-2am sb-2kr sb-5aa sb-5ab sb-6qa su-2ak op-3ac op-wuaj 2xg and anf gkd kdgl kgbb sgt dgk wsws

ex-nu-2TC, R. Kreisinger, Branik-Prague, na Dobesce 296, Czechoslovakia.

40-Meter band

1ch 1ga 1ic 1np 1nl 1qb 1xm 1aae 1aap 1aeu 1aet 1ale 1amd 1arc 1asa 1asf 1asr 1asu 1atg 1avl 1bez 1bux 1cdu 1cki 1ckp 1cmp 2dh 2fo 2me 2mk 2nz 2qr 2sq 2sz 2aes 2afx 2agn 2anx 2arm 2avb 2bwa 2cbg 2chk 2cvs 2exl 3au 3dh 3jo 3jn 3ld 3sj 3tr 3ahl 3akq 3bqj 3bva 3bwt 4bl 4cv 4lk 4qb 4rn 4tv 6bjl 8bmw 8ceq 8ces 9bdg 9dte 9ell sb-1ag sb-2as nc-1ac nc-2fo op-1aj

su-1AM, A. Mantegani, Jr., Casilla No. 37, Montevideo, Uruguay

1rd 1blf 2aim 2gk 2fj 2tp 2px 5wi 5aab 5ada 5rg 5aqy 6vrv 6ael 6bjx 6bgt 6bmw 6sb 6cua 6arx 6btm 6no 6awa 6am 8hpl 8ben 8bf 8aly 8adg 9axh 9eji 9avy 9xi ac-8xx aj-1ts aj-1sk aj-3aa fo-a4l fo-a5t oz-2ae oz-2ac oz-3aj oz-3ar wiy bb3 dx8

su-1FB, Carlos E. Juele, La Paz, Colonia, R. O. del Uruguay.

1aao 1aci 1acl 1afm 1afs 1ahg 1air 1are 1awe 1bbo 1bhs 1bie 1big 1btr 1bux 1bzp 1cex 1ch 1cib 1ckp 1cmp 1cmx 1cue 1du 1ga 1kk 1my 1pl 1rd 1rf 1vr 1vz 1wi 2aep 2agq 2ahm 2apv 2bbb 2crb 2cxl 2ezr 2gk 2vh 3auv 3bva 3cbo 3cdk 3chg 3ckg 3hg 3jw 4ft 4ib 4iv 4iz 4ni 4tv 5acl 5agn 5akn 5akz 5asv 5ax 5he 5mi 5og 5ox 5pk 5zai 6adk 6aff 6afg 6afs 6agk 6aii 6aix 6aji 6ajm 6am 6and 6awq 6bav 6bbq 6bbv 6bcl 6bhz 6bjd 6bjv 6bjx 6bls 6bmw 6cae 6cfi 6cga 6cgo 6cgw 6cib 6cnn 6cns 6ct 6cto 6dab 6dag 6dam 6dcf 6dp 6hm 6jn 6jy 6kb 6kg 6nw 6nx 6oi 6or 6sb 6vc 6vo 6vr 7df 7rl 8abm 8adg 8afq 8aly 8bf 8bgi 8bna 8brg 8byn 8cau 8ahk 8aip 8ct 8cug 8dme 8pk 9aj 9cxc 9dqu 9cbj 9b3 9avy 9ev pk3 sp-5oa nc-1ar nc-9bj ei-1co ei-1gw ei-1cu ef-8jn ef-8di ef-8gi aj-1sk aj-1km aj-1ts aj-3aa aj-3az oz-2ac oz-2ak oz-1fe oz-4oa oz-2ae oz-3ai fo-a5t fo-a8s fo-a4l fo-a3z fo-a3b fo-a6l fo-a5o fo-a3k fo-a4v oh-6axw oh-1fx oh-fil oh-6aff oh-6dcf oh-dm2 oh-dgo oh-6tq eg-5dh eg-gmd eg-5nj oa-2sh oa-2tm su-1fb

su-1BR and su-2AK, J. C. and L. A. Primavesi, Cassilla de Correo No. 37, Montivideo, Uruguay.

1air 1amd 1bhm 1bux 1bqt 1ccz 1ch 1cib 1ckp 1cmx 1rd 1wi 1zs 2apv 2amj 2aqw 2ctf 2czr 2fj 2gk 2px 2tp 2uo 3cdk 3hg 3lw 3zo 4iz 4jr 4km 4nh 5adz 5he 5jf 6aim 6arv 6bjx 6bbq 6bxc 6bxr 6bzm 6chy 6cua 6dau 6oi 6vr 6zat 8ade 8adg 8ben 8bnh 8bf 8bzt 8don 8mc 9aek 9eji 9bht oa-2bk oa-2ss oa-2tm oa-2yi oa-4bd oa-4cg oa-4rb nc-1ar nc-2ax nc-2bg nc-2fo ef-8ij ef-8jn ef-8gm ac-8em ac-8ag ac-8flo ac-8xx af-1b fm-8ma eg-2it eg-2kz eg-2pz eg-2xy eg-5da eg-5nj eg-5tz eg-6td oh-6acg oh-6nlb ei-1ax ei-1au ei-1co ei-1cw ei-1gw ei-1er ei-1rm aj-1km aj-1mu aj-1sh aj-1sk aj-1sm aj-1ts aj-1zb aj-3aa aj-8az aj-8kk aj-3yz ek-k7 nm-1n nm-jh fo-a3b fo-a3e fo-a4l fo-a4x fo-a6l op-1au op-1bd op-1hr np-4sa np-4ja em-2co em-smuk oz-1ao oz-2ac oz-2ae oz-2ak oz-2bg oz-2br oz-2xa oz-3ai oa-3aj oz-3ar oz-3xb oz-4aa oz-4ac oz-4am bxy nuqg wvr dx8 ab1

eb-4XS-3AC, Roger Parent, 183 Chaussee de Aeusy, Verviers, Belgium.

1aao 1aap 1aay 1aci 1aep 1ag 1aga 1ahu 1aj 1ak 1ajn 1amd 1amz 1aof 1asu 1aza 1bum 1bcz 1bhm 1blb 1bms 1bgt 1big 1bgg 1bhs 1bz 1cjh 1ch 1cmp 1ckp 1cek 1caw 1cmf 1fs 1ga 1ic 1ii 1mp 1rb 1rf 1sw 1sf 1tu 1ux 1vx 1xme 1xv 1xm 1zj 1bez 2agt 2aev 2amj 2amh 2apu 2apv 2asq 2bl 2bhc 2caa 2cum 2cv 2cy 2crb 2cc 2ckl 2cvf 2cs 2cmj 2ld 2md 2nz 2om 2px 2qr 2qs 2rs 2tp 2uf 2uo 3ay 3bms 3cjn 3ckj 3cdv 3gp 3hg 3jm 3jo 3fu 3qw 3uv 3wo 3pf 4aa 4cu 4dd 4fl 4ff 4iz 4na 4pk 4qb 4ni 4sl 4sa 4st 4sv 4cv 5mk 5oa 5kn 5aa 5pz 5he 6avm 6azs 6ch 6fs 6ho 6jn 6rt 7if 7lf 8am 8aul 8abj 8aly 8amu 8adh 8bbe 8bm 8bn 8bja 8cpk 8ccg 8es 8ew 8gp 8ib 8kf 8jf 8mc 9yu 9cfi 9cbc 9ji 9baz 9avy 9vm 9ell 9jj 9fu 9kc 9bc nc-1ac nc-1ar nc-2be nc-2fo nc-3kp sb-1ai sb-1ak sb-1aw sb-2ab sb-2ag sb-2am se-1fg nt-hik oz-1ac oz-1co oz-2ac oz-2am oz-2od oz-3az oz-4aa oz-4ac oz-4ao oz-4ap oz-2gc oz-4ar oz-5mf oa-2tm oa-2yi oa-3bk oa-3bq fo-a4d fo-a3b fo-a6m nj-2pz nq-2lr nq-2mk ai-6mu af-8qq su-der ac-cel

M. Thommassin, 16bis Blvd. St. Jacques, Paris.
Heard between December 6th and 25th

1ads 1axx 1aul 1awe 1ayl 1asf 1ag 1amd 1ad 1aer 1aof 1adm 1bbx 1bhs 1ch 1ga 1pm 1rd 1tz 1uz 2aol 2aoe 2ait 2awq 2awf 2bir 2bwa 2bzo 2bhy 2gy 2nz 2or 2xaf 2tp 3axp 3auw 3au 3hg 3jo 3mv 3pl 3pg 3ue 3wu 4ak 4aab 4ail 4aah 4cv 4jk 4rn 5kn 6hm 8akv 8brc 8bja 8chc 8cau 8dsy 8gk 8vx 8xe 9bqe 9bmm 9dte 9sj

New England Division Convention

THE annual New England Division Convention of the American Radio Relay League will be held in Hartford, Conn., on April 15th and 16th. It is under the auspices of the Radio Transmitter's Association of Hartford. For further details read the next issue of *QST*.

FLASH! 5-METER RESULTS

On January 31st station 2EB was in two-way communication with station 2NZ at a wavelength of 5.19 meters and several messages plus a half hour of conversation were put thru. 2EB is operated by Boyd Phelps at Jamaica, Long Island, New York and 2NZ is operated by E. S. Strout at Teaneck, New Jersey. The transmission was across 15 miles of steel-building-infested New York, the total distance about 30 miles. Transmission over the same region at 40 and 80 meters is very poor so that the results can be regarded as satisfactory.

There is also a fair possibility of a two-way QSO between 2EB and Italian ACD at Bologna. Phelps and Ducati have heard each other's signals weakly and Ducati has removed his receiver to a more favorable point for further tests. This is being written on February 1st.

Strays

R. G. Chrouch of Lowell, Michigan, tells us that a mixture of collodion and motor graphite plastered onto any convenient insulating material makes a cheap gridleak.

Correspondence

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

The Handbook

War Department
Office of the Chief Signal Officer
Washington D. C.

Editor *QST:*

The Radio Amateur's Handbook, published by the American Radio Relay League, has been received and read with interest.

The book is clearly written and contains just the sort of encouragement and information needed to lead young men, who are interested in radio, on into the radio expert class.

Only recently the cordial relations, that have always existed between the American Radio Relay League and the Army, have taken definite form in the organization of governor's and corps radio nets to handle National Guard traffic. Doubtless, this coöperation between the American Radio Relay League and the Army will be more fully covered in future editions of the Handbook. The League has shown a very commendable spirit of coöperation with the Army. This coöperation is considered of first importance and would be invaluable to the country in case of an emergency.

Mr. F. E. Handy, the Editor of the Handbook, and the staff of the League's periodical, *QST*, as well as the members of the League who have contributed so much to its success, are to be commended on an excellent piece of work.

—C. McK. Saltzman, Major General, Chief Signal Officer of the Army.

Flowers

Quincy, Ill.

Editor, *QST:*

Your apology in the January *QST* was uncalled for and I, for one, a rank beginner, should manifest some method of appreciation to the staff who got out this book [The Radio Amateur's Handbook]. It contains more information on genuine amateur operating than I could get out of the other books on short waves in six months. It is the "dope" with no reservations.

Sincerely,
—R. C. Schnellbacher.

Regarding QSO

604 East Washington St.,
Ann Arbor, Mich.

Editor, *QST:*

Just spotted a letter in the January *QST* on the subject of QSO between stations of different operating aims. I must say that I agree with Mr. Smith. Unlike him, I am a "youngster in years" and not a very expert operator. But I have been at the game long enough so that the operating of some of the gang gives me a dull ache in the stomach.

I do not wish to presume, but Mr. Smith made no definite suggestions about how to fix things up. Here're mine. What is the matter with sticking an extra letter on the end of our dearly beloved CQ designating the kind of station we wish to work. For instance, let the report hound call "CQR CQR CQR". That little "R" on the end of each CQ would mean that any QSO with this station will be short and snappy with nothing but an exchange of reports.

Let the friendly lad call "CQC CQC CQC". The "C" would mean that he is ready to discuss the weather, women, politics or what have you with any station. Then the traffic man who wants to *receive* traffic will call "CQT CQT CQT". The signal for traffic to be sent, is the usual directional one. A few "oy's" sprinkled in would tell the yearlings where they were at.

These are just suggestions, gang, open to any additions, substractions or criticisms. Some system ought to be adopted as the present system is the bunk.

—Robert Laurenson, 8AGV.

Also Regarding QSO

1101 Climax St.,
Lansing, Mich.

Editor, *QST:*

Letters of 3GP and 8DOY appearing recently in *QST* move me to write calling attention to several facts evidently overlooked. The implication is that an R5 signal should be sufficient to handle traffic. Many a time I have connected with a station of even R6 strength only to have them fade to inaudibility or be drowned out by some stronger station. I do not believe a station would take the trouble that 3GP reports on repeats and then drop the matter without good reasons. Perhaps it was QRM, QSS, perhaps 3GP did not pick up the QSL due to fading. *One can never judge of the other fellow's operating conditions by a signal report as the real test is, "Did he get the message?"*

The tendency to *not* chat is certainly deplorable but due largely to the great distances. When stations were fifty miles away as they were ten years ago, there was

more in common than at present. I find the weather makes a good opening, however, especially when we have 14 below here and the other man is in Texas.

In reply to this last point, a signal to designate the DX hound may be found by this formula, DX=(CQ)^n. In other words, the real traffic station uses as far as possible, commercial procedure with a minimum of CQs while the DX or card hound calls for five minutes and then shuts off his receiver to get his replies via U. S. mail.

—*M. H. Pancost, 8ZF-8KN.*

More on QSO

14 Upland Road,
Cambridge, Mass.

Editor, *QST:*

The article in the January *QST* by 3GP was extremely interesting to me. I absolutely agree with his views, but where he classifies amateurs into three groups, namely (1) Experimenters (2) Traffic seekers (3) Social or friendly operators, I should add a fourth, DX fiends.

I also agree with him when he says that no station should undertake to QSR when he has no intention of doing so. Being quite busy in school, I am not on the air much and when a fellow asks me if I'll QSR, it depends entirely on whether I have time for it or not. If the message is for Cambridge or is extremely important, I should certainly take it.

Now, a certain ORS asked me, "QSR? QRV?" and the message immediately followed without waiting for my reply as to whether I could take it or not. As it happened, I did not have time for it, as it was late Sunday night with school early in the morning.

I replied to the station after he had sent the message to me that I could not take it and explained why not. He replied by giving me the message the second time. He evidently thought that I said to QTA. Now, this in itself might be excusable because of QRM, but when I repeated what I had said to him before he came back and gave me the message a third time saying the station for which the message was destined was in Cambridge. I knew the station had moved from Cambridge about two years ago. Why, rather than giving me the message a third time, didn't this ORS wait for my reply? He evidently had an *ancient* call book and, of course, didn't know the correct QRA of the message.

A very handy thing to have around any active amateur station is an up-to-date call book, which can be obtained from the Gov't. Printing Office, Washington D. C. for the paltry sum of twenty-five cents.

To go on with my story, the fellow came back this time sending a blue streak and said, "Why didn't you tell me that in the first place" and then, to add insult to injury, he started to call CQ DX. Well, how could I tell him in the first place, when he wouldn't listen to what I was saying? Now I consider this ORS (although I have never seen it) a "Ham" station, but I prefer to be an "Amateur" station. Let's have a little *more* coöperation in handling messages.

—*H. K. MacKechnie, Operator 1ADP.*

Caution for Arc Welding

Boyden, Iowa.

Editor, *QST:*

Mr. O. H. Eger wrote a fine article on arc welding for small parts and this letter is not written with the intention of detracting in any way from the article which appeared in the November issue of *QST.*

There are, however, some safety precautions that should be observed. The combined light and heat rays of an electric arc are capable of producing very painful burns, in almost all respects the same as those produced by direct sunlight.

The effect on the eyes is about the same as snow blindness, the intensity of suffering depending on the amount of current through the arc and the length of time the eyes are exposed to the rays. Under no circumstances attempt to use a welding arc without at least using very dense goggles. To be safe, the goggles used should be dense enough to enable the operator to look at the sun on a clear day with little or no discomfort.

If the current through the arc is heavy or the amount of work on hand will require over one half hour, a shield should be provided for the face unless the operator is content to suffer a sunburned face. The degree of the burn depending on time and current as before.

A satisfactory shield can be made by cutting a three-inch window in a piece of heavy cardboard or fibre, eight or ten inches square and fitting a glass of the proper density in the window. A short handle is necessary if the shield is to be portable. If the work is to be done in a vise, the shield can be mounted on a bracket to leave both hands free. Two or three hours use of a shield placed about sixteen inches from the arc will show a solid white film deposited upon the surface and with no shield, these particles are literally shot into the operator's skin.

With all apologies to Mr. Eger,

—*Marvin Stutzman.*

Silent Keys

It is with deep regrets that we list these operators as being permanently off the air.

1BLW, Albert Champlin of Westerly, R. I.
2KV, Walter A. Remy of Bronxville, N. Y.
5UY, E. Burrall Frysinger Jr. of Cleburne, Texas.
6BCL, Clayton Buffum of Pacific Grove, Calif.
6WV, Armond W. Lembke of South Pasadena, Calif.
8ABZ, Daniel R. Axford of Oxford, Mich.
8AKU, William N. Aseltine of Pittsburgh, Pa.
8VQ, Hugh Stewart of Freeport, Pa.
9AAP, C. C. Dimock of Chicago, Ill.
9AEA, Ludwig W. Kern of Dwight, Ill.
9AER, Bradford W. Hutson of Wilmette, Ill.
9BM, Elden F. Horn of Denver, Colo.
9CMS, Arthur M. Butler, of Long Prairie, Minn.
nc5AN, C. W. Ferries of Vancouver, B. C.

First Annual Roanoke Division, North Carolina State, Convention

RAIN and sleet failed to prevent the arrival of quite a good bunch of hams at Charlotte on Friday, January 28th. A A. Hebert and 4JR were on hand to welcome early arrivals. A fine ragchew took place Friday night with everyone taking part in the QRM. More hams began to arrive early Saturday morning, and registration and rag chewing occupied everyone until 11 a. m. when an inspection trip to the wired wireless system of the Southern Power Company at the Lakewood Sub-Station took place. After lunch there was an inspection trip to several stations including the portable station 4CQ of the Charlotte Amateur Radio Association. A technical session followed, and nice talks were given by A. A. Hebert, 1MK; P. C. Bangs, 4AZ; and E. J. Gluck, WBT.

A splendid feed, with special non-radiating grapefruit was served in the Chamber of Commerce banquet hall. S. L. Hall, 4UQ, presided and plenty of QRM was furnished by 4CQ and 4JR on a buzzer and RCA power speaker. Speeches were heard from Mr. Hebert on the history of our A.R.R.L. and Amateur Radio and from Mr. Gravely, Roanoke Division Director, on Cooperation. A movie of HQ was shown by Mr. Hebert and the gang enjoyed the introduction via screen, to the HQ staff.

Stunts were presided over by E. J. Gluck, and a number of witty things were pulled on the fellows present. 4SJ, the brass poundin' parson, took first place as a winner of prizes. He even went so far as to tell the biggest lie (hope his congregation doesn't read *QST*). After all the prizes were awarded the gang chewed the sock for some time and finally drifted off by threes and fours after having attended the best get-together in these parts for years.

The Charlotte Amateur Radio Association wishes to thank the gang for supporting the convention by their attendance, and to thank the manufacturers who contributed prizes.

SK, CU AT CHARLOTTE AGAIN NEXT WINTER.

We are very sorry to record the death of Mr. C. C. Dimock, 9AAP, who passed away after a short illness. Mr. Dimock was associated with the Chicago, Milwaukee and St. Paul Railroad. He was instrumental in the organizing of the amateur emergency routes for this road which were used for actual emergency traffic on several occasions. Even though an elderly man, he was so intensely interested in this work that he built an amateur station in the Union Station building in Chicago. He left us with a memory of his true kindness and friendliness to all amateurs.

Strays

We have heard that a certain so-called foreign station signing BBT is no other than an American one who is trying to put something over. His Spanish is said to be below par and his fist very similar to that of a certain American operator. That's a mighty cheap sort of a joke and we fail to see where the "humor" comes in.

9CDE suggests that it would be nice if QSL cards had the flag of the station's country printed upon it. This would not only add to their beauty but would also be instructive.

Correction

Through a most unfortunate error, an omission was made from the article "Radio Frequency Transformer Design in Voltage-Stbilized Systems". The paragraph under the heading "The Loss Method," on page 17, was incomplete and should have read as follows:

In the design of a loss-stabilized receiver it should be noted that regeneration and oscillation are due to several main factors, a variation in any one of which, either aggravates or nullifies the tendency. These are:

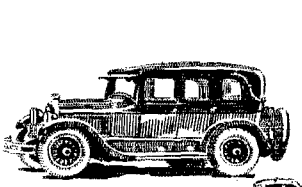
The voltage factor of the tube (Mu)
The plate-resistance of the tube (Rp)
The grid-plate capacity of the tube (Cm)
The L and R of the tuned input circuit.
The resonant frequency of operation.
The positive reactance in the plate circuit.

In the tube, a high mu, a low plate resistance and a high grid-plate capacity will make for regeneration. In the tuned circuit a high inductance with a low resistance, (low-loss coil) works in this direction and in the plate circuit a high positive reactance (tight transformer coupling, high M) strengthens the effect. These statements of course neglect stray electric or magnetic couplings, which can be reduced to a practical zero by proper shielding and by-passing, or else nullified by spacing and phasing of units. With this information at hand we may now attack the tube characteristics, the losses in the tuned circuit or the coupling link, (transformers). The tube mu and also the grid-plate capacity are practically fixed structural constants and cannot easily be modified by the set designer. The plate resistance may be altered by a regulation of either the plate voltage or the filament emission, accomplished respectively by a variable high resistance in series with the B-battery or a variable filament rheostat. The tuned circuit can be made of high resistance in relation to its inductance either by actually designing it as such or purposefully inserting resistances in series or parallel with the completed circuit, by metallic absorption, etc. A very useful effect may sometimes be obtained by placing a metallic sheet (such as a condenser end plate or condenser frame or a shield) very near to the coil. The absorption automatically varies with frequency and may be made always of such magnitude as to make the receiver stable without at the same time being too far below critical regeneration. A coupled tertiary circuit may be used to give a similar effect.

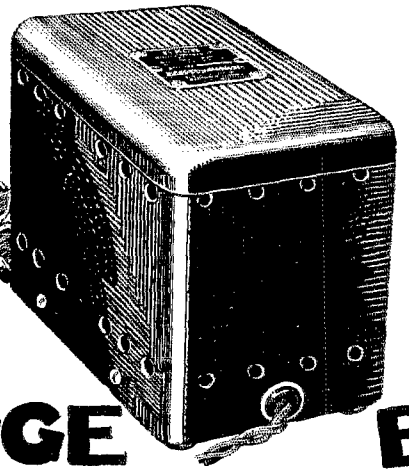
In lowering the positive reactance of the plate circuit to such a value that steady oscillation cannot be maintained the primary coil is either made so small or so loosely coupled to its secondary that the total of its self and mutual inductance never rises to a limiting value at the resonant frequency. This total may either be fixed or variable over the broadcast spectrum, the latter being preferable because of the poor frequency-energy characteristic of the usual fixed transformer. It is possible to so vary the coupling with tuning that the receiver is automatically maintained in a condition of critical regeneration over the band although this adjustment is usually so critical as to make its use impractical except in laboratory model or carefully balanced factory built receivers.

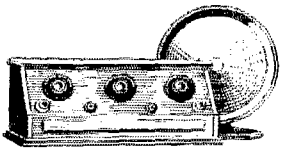
In making a choice of the type of stabilization to use we may at once eliminate any attack upon the resistance or inductance of the tuned circuit. It is obvious that changing the inductance-resistance ratio of this circuit to a value sufficient to stop oscillation will seriously affect the selectivity of the receiver and thus destroy a part of its utility in gain stability. This leaves the *tube plate resistance* and the *plate load* as the only allowable variables. The remainder of this paper shall deal with the optimum proportioning of their ratios to obtain maximum effectiveness.

We offer sincere apologies for the error.



KEEP YOUR CAR BATTERIES PROPERLY CHARGED





KEEP YOUR "A" BATTERIES PROPERLY CHARGED

CHARGE BOTH

DIRECT FROM ELECTRIC LIGHT SOCKET

WITH THE

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ELKON

3 AMPERE CHARGER

Even if the Elkon 3 Ampere charger were not equipped with the Elkon Rectifier its simplicity, effectiveness, and general economy of operation would still make it a pronounced success.

BUT, equipped with the ELKON BONE DRY rectifier, it occupies an exclusive and unique position, far in advance of any similar device.

It operates at *considerably less cost than other types of chargers* . . . . and without attention.

It is bone dry, operating without acids, alkalis, tubes, moving parts or water.
It is rugged, strongly built, can be taken or used anywhere, so that it is ideal for charging both "A" batteries and car batteries.

SIMPLY CONNECT IT TO LIGHT SOCKET, TURN IT ON, LEAVE IT ON. It will not overcharge, because it has the inherent Elkon Tapering characteristic, by which the charge decreases as the battery becomes replenished.

It causes no interference, it makes NO NOISE, it has nothing to burn out, break, spill, or spoil. Short circuiting cannot harm it.

As the size of radio sets is increasing, as well as the number of hours of daily use of the set, this charger is becoming more and more popular in all parts of the country.

An almost indefinite life of service, at low operating and upkeep expense.

Descriptive Circular on Request

At dealers everywhere $17.50 *Pacific Coast price slightly higher*

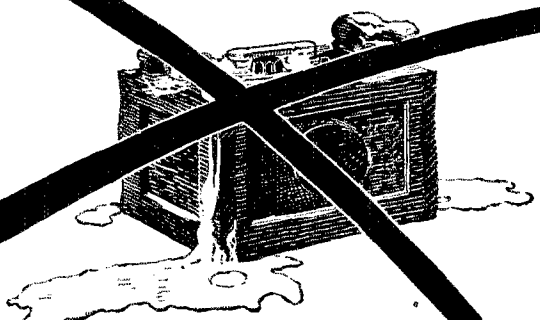
ELKON WORKS Inc.

Subsidiary of P. R. Mallory & Co. Inc.

Weehawken, N. J.

NOW

you can do away with your 6 volt storage "A" BATTERIES



ONCE AND FOR ALL

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ELKON "A" POWER

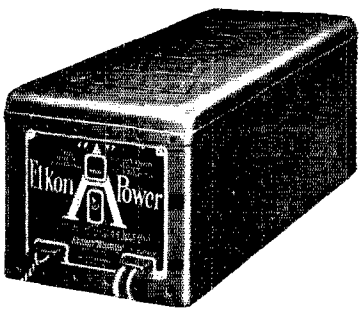
More than a year ago Elkon announced to a doubting public, the first Trickle Charger that operated WITHOUT LIQUIDS OF ANY KIND, WITHOUT TUBES, MOVING PARTS, NOISE OR INTERFERENCE.

Today there is no doubt . . . . anyhere. Thousands of Elkon Trickle Chargers, from coast to coast have proved,—are proving,—that the exclusive Elkon principle of BONE DRY rectification is among radios revolutionary developments.

In the ELKON "A" POWER the Elkon rectification principle is accomplishing in the field of storage "A" battery elimination what the Trickle Charger has done in its field. It provides at last, perfect "A" elimination in every sense of the word.

FLAWLESS RECEPTION . . . . equal to the finest high capacity storage battery at its infrequent best, now, tomorrow . . . . next year, for an hour or twenty four hours, for any set of more than 2 tubes for use in homes. All this is assured by the Elkon "A" Power and *more*.

For with an Elkon "A" Power installed in place of "A" batteries you are not changing one nuisance for another. There are NO DANGEROUS OR CORROSIVE ACIDS OR ALKALIS with the Elkon, NO DISTILLED WATER to replace, NO TUBES, NO MOVING PARTS, NOTHING TO ADJUST OR NEED ATTENTION.



Remember that the Elkon principle of rectification is a demonstrated, time-tested success. That nothing has ever been put out under the Elkon name we are ashamed to own as ours.

The "A" Power is a PERMANENT installation, built to serve and to endure.

Descriptive circular on request.

At dealers everywhere.
$60.00

ELKON WORKS Inc.
Subsidiary of P. R. Mallory & Co. Inc.
Weehawken, N. J.

Radio— Past and Present

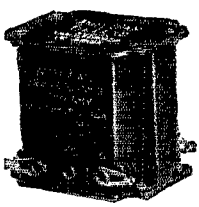
Some of us can remember when Marconi sent the first transatlantic wireless message. This company furnished the transformers used in that test. Today, in commercial Radio our apparatus is playing an increasingly important part.

AmerTran products are highly regarded by set builders and experimenters. Their success has been achieved by setting and maintaining a high standard for audio and power amplification.

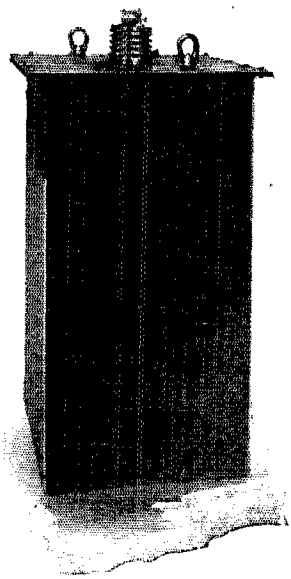
Shown below is a Retard Coil for operation in circuits of about 25,000 volts to ground. It is mounted in a heavy welded boiler plate case, and is designed for use in filter circuits. This is an example of the service we can render on all special problems related to rectification through vacuum tubes.

The American Transformer Co.

178 Emmet St.
Newark, N. J.

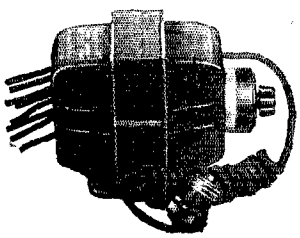


The AmerTran De Luxe Audio Transformer. Made in two types for 1st and 2nd stages.



We have been meeting the requirements of professional Radio Engineers for 26 years.

Correspondence with our Engineering Department is cordially invited.



The AmerTran Power Transformer Type PF52

"You bet Faradons 'll stand up, O.M."

Complete block assemblies for usual eliminator requirements.

Model T. The high efficiency, all metal mica receiving set type unit in desired capacities with convenient terminals. Very compact.

Convenient units for assembly or replacement in special filter hook-ups.

In ½, 1 and 2 mfds.

"That's why I use 'em wherever I need a condenser."

Since 1907 Faradon experts have met the condenser needs of amateurs and manufacturers with a capacitor specially designed for each particular purpose.

Get the Faradon unit or block having the capacitance desired in the operating voltage class to meet your requirements.

If your dealer has not complete information on the unit you desire, descriptive data will be sent on request.

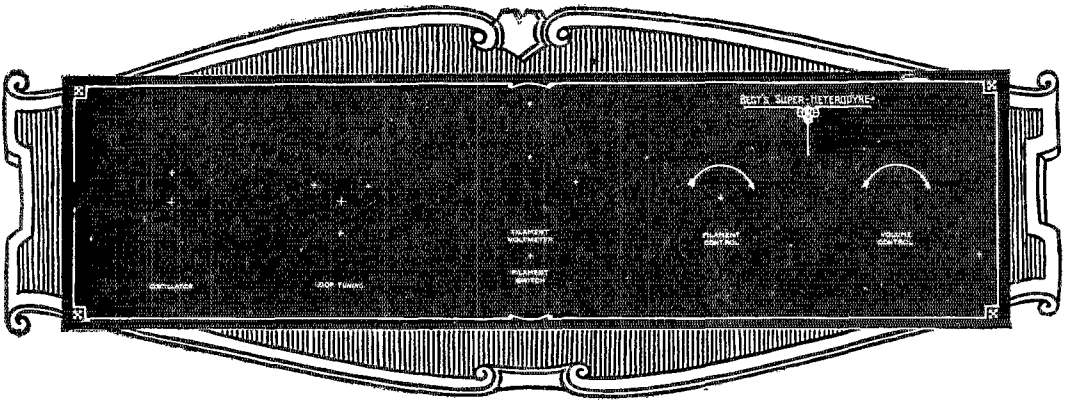
WIRELESS SPECIALTY APPARATUS COMPANY

Jamaica Plain, Boston, Mass., U. S. A.

Faradon

688

Electrostatic Condensers for all Purposes



Bests' Super, Karas, H. F. L.

FORMICA is supplying handsomely decorated Kit Panels for leading kit sets through leading jobbers and dealers all over the country. These panels make it possible to build at home a very good looking set. There are two sizes of Bests' Superheterodyne, Karas Equamatic front and sub panels, H. F. L. Nine-in-line Superheterodyne with sub panel, Victorine single dial and two dial control. There is also an Infradyne 7" x 28" and one 7" x 30", Aerodyne, St. James 8 Tube, Browning Drake National, Madison Moore Superheterodyne and Camfield Duoformer.

Special panels cut to size and Formica Tubing are also available for amateurs

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Made from Anhydrous Bakelite Resins
SHEETS TUBES RODS

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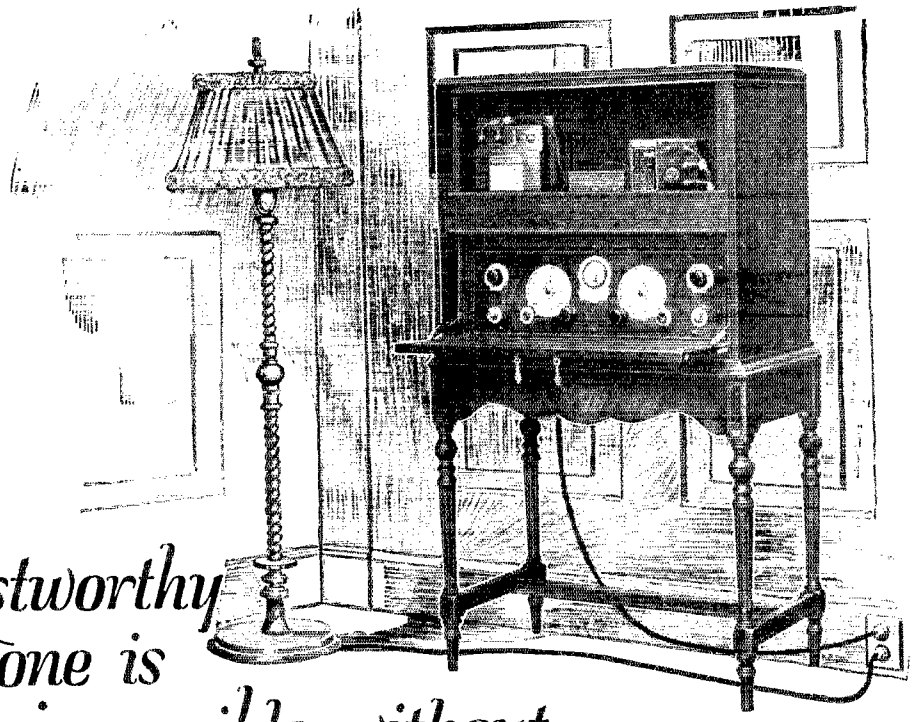


Trustworthy Tone is impossible without Constantly Correct Potentials

Radio reproduction which is fully efficient only when all batteries are brand new—is limited radio.

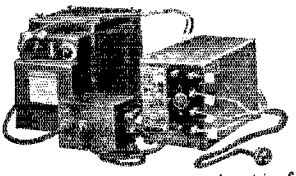
An ideal combination for the man who demands maximum radio results with minimum attention to up-keep is a Stromberg-Carlson No. 502, five-tube Receiver, furnished with constant power by the Stromberg-Carlson complete electric socket equipment.

The Receiver itself is unsurpassed in sensitivity and selectivity by any other 5-tube Receiver. And it has all the exceptional tonal qualities of the famous Stromberg-Carlson 6-tube models. Its totally shielded coils give the fullest protection a 5-tube Receiver requires against "back door pick-up". When the No. 502 is operated with complete electrical equipment, broadcast listening is a real delight.

The Stromberg-Carlson electric socket equipment (shown in the illustration) was designed expressly for Stromberg-Carlson Receivers. It is not a compromise to give average results with all makes of radio apparatus; but it supplies a Stromberg-Carlson with the same potentials at all times under all conditions—an important factor in satisfactory radio reception.

Ask your dealer to show you this combination—No. 502 Receiver powered by Stromberg-Carlson electric socket equipment.

Stromberg-Carlson Telephone Mfg. Co.
Rochester, N. Y.



Complete power supply equipment for Stromberg-Carlson Receivers. Left to right

	East of Rockies, Eastern Rockies & West Canada		
Gould AC-6H.D. Socket-Power Unit	$38.00	$43.00	$51.00
No. 301 Power-Switching Relay	11.00	11.75	15.00
No. 401 "B" Socket-Power Unit with U.X.-213 tube	64.00	70.00	87.50

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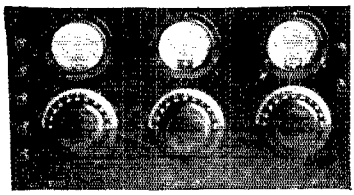
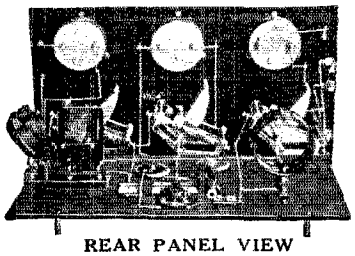
Stromberg-Carlson

Here's the Ideal Amateur Transmitter!

Built Around the Famous AERO Transmitter Coils

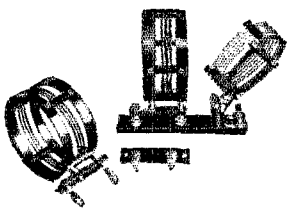


FRONT PANEL VIEW



REAR PANEL VIEW

Here's a new transmitter that is sure to appeal to every true amateur! Compact and pleasing in appearance, it has a really remarkable range on low power. Embraces flexibility to a heretofore impossible degree, because it is built around the famous AERO plug-in coils. Two pairs of AERO coils cover the entire band, 16.5 to 90 meters, without gaps, and are instantly interchangeable. These coils operate perfectly on low power, yet handle in excess of 1000 volts just as efficiently. Read the description of this wonderful transmitter elsewhere in this issue. Then plan to change over to this set. It's really very inexpensive, considering its great range on low power. Here are the AERO Kits you should use, tuning either kit with three good .0005 variable condensers:



KEY 2040 KIT **Price $12.00**

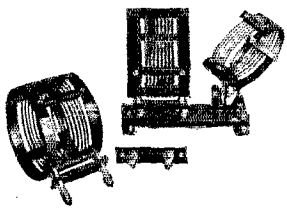
Kit contains 2 AERO Coils, 17 to 50 meters each, 1 AERO Antenna Coil Mounting Base, 1 AERO Grid Coil Mounting Base, 2 AERO Essential Choke Coils.

If you desire to have this set tune to 90 meters, simply buy two AERO 40 to 80 meter transmitting coils, which plug in the same mounting bases, and work efficiently with the above items.

KEY 4080 KIT **Price $12.00**

Kit contains 2 AERO Coils, 36 to 90 meters each, 1 AERO Antenna Coil Mounting Base, 1 AERO Grid Coil Mounting Base, 2 AERO Essential Choke Coils.

If you desire to have this set tune also to 20 meters, simply buy two AERO 20 to 40 meter transmitting coils, which plug in the same mounting bases, and work efficiently with the above items.



Plan for D. X. Records NOW

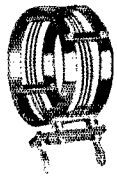
Order these coils direct from us if your dealer hasn't them and start now for wonderful records. Specify code or key numbers when ordering. Or write at once for complete descriptive literature. Remember these coils are made by the makers of the AERO Low Wave Tuner Kit, and other famous AERO Inductance Coils.

Aero Products, *Inc.*

Dept. 16

1772 Wilson Ave. **Chicago, Ill.**

Price List *of* Individual Parts



AERO TRANSMITTER COILS

In two sizes. Range 17 to 50 meters and Range 36 to 90 meters.

Price, each

$4.00

AERO ANTENNA BASE

Code number Pri. 300 To hold Antenna Coil.

Price, each

$3.00

AERO GRID COIL BASE

Code number Grid. 100 To hold Grid Coil

Price, each

$1.00

AERO ESSENTIAL CHOKE COILS

The finest choke coil made.

Price, each

$1.00

SEND COUPON BELOW FOR *FREE* BOOKLET

SAVE $45.00

R. L. Duncan,
Director, R. I. A.

I AM cutting the price of our radio course to the bone because I need 450 more students this month to fill the big demands for trained radio men.

As fast as we can supply graduates the shipping companies are snapping them up as radio operators to travel to the far corners of the earth. Other branches of radio are insistently clamoring for more trained men to fill responsible, well-paying positions on shore. So I am making this drastic reduction in the cost of our Home Study Course to radio amateurs only to induce more young men to make radio their life career.

Pass U. S. Government Radio License Examination

This course eliminates the elementary phases of radio with which most amateurs are familiar. It carries you right through the more advanced radio operating technique and teaches Commercial procedure thoroughly. It qualifies you to pass your U. S. Government First Class Commercial License Examination.

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Moreover you can study at home—without giving up your present occupation. Radio Institute of America is the world's oldest radio school. The instruction is the finest obtainable anywhere. To be sure of getting the benefit of this special course send for bookle A-3. Just fill in the coupon below. It costs you nothing to receive this 40-page booklet chock-full of information.

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Please send me your special booklet A-3 with full information about the reduced price of your radio course for amateurs.

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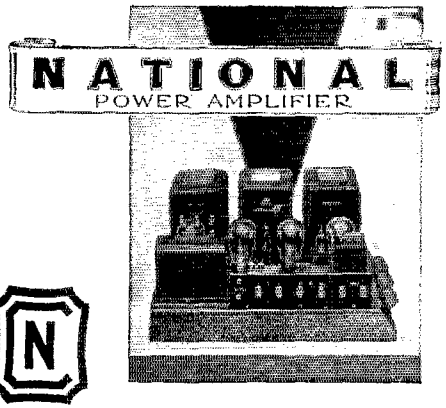


Supplies all B current for your set and C bias for the power tube, and gives any Radio Receiver true quality and fidelity of tone with as great volume as desired. Uses either Raytheon BH or Rectron fullwave rectifying tube.

National Company Inc., Cambridge, Mass., W. A. Ready, President, makes also B Eliminators, the famous NATIONAL Tuning Units with BROWNING-DRAKE Coils and Transformers, Impedaformers, Velvet-Vernier Dials with or without illumination, and Variable Condensers, including the new Girder-frame Condensers.

Send for Bulletin 116 — Q — 3

RECEIVERS
TRANSMITTERS - EQUIPMENT

Ensall Radio Laboratory Equipment is built to a Quality Standard. Built for use in Amateur Stations, on Board Sea Going Yachts, Cruisers, etc. The Most Rigidly Designed Equipment Available. Highest Quality Parts employed in our Receivers, for Amateur or Broadcast, and in our Transmitters, Self Excited and Master Oscillator Designs. Special Equipment built to order. Quotations furnished upon receipt of data covering the Equipment you desire. Transmitters, of any Type Reconstructed.

We cater to Special MARINE Installations.
Quotations on request.

ENSALL RADIO LABORATORY
1208 Grand View Ave. Warren, Ohio
"Pioneer Builders of Short Wave Apparatus."

New Learner's Buzzer Practice Set

on base board, consists of key and buzzer, $1.00; Western Electric Co. Radio Phone Transmitter & Receiver, Type CW938, fair condition; 2 Generators 12-350 V; Switchboard. Hand Mike type CW 930; Panel mike, type CW 1053. Price complete $16.00—Airplane flame proof key with Blinker light, Type CG.1140, Maker International Radio Tel. Co. Price $4.00. Just a sample of our bargains. Get our new and latest reduced price list for 2c stamp. We bought $10,000 worth of United States Government Radio Transmitting and Receiving Sets and Parts. Mail orders sent all over the world. WEIL'S CURIOSITY SHOP, 20 South 2nd St., Philadelphia, Pa.

Hey, Ham—ave u ordered ur copy of Handy's Handy Handbook ?

THE BEST $1 YOU EVER SPENT!

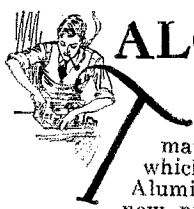
PUBLISHED BY
AMERICAN RADIO RELAY LEAGUE
1711 PARK ST. HARTFORD, CONN.

ALCOA ALUMINUM BOX SHIELDS are shipped knocked-down. Of heavy sheet, about the thickness of a half-dollar. (.080"—No. 12 B & S) to be completely effective for shielding.
Consists of: Top, Bottom, Sides.
4 Extruded Corner-Posts
8 Aluminum Screws
Assembles 5" x 9" x 6"
Easily modified.
Ask your dealer, or write us.

Some Other Applications of Aluminum:—
Alcoa Shields,
Box Shields,
Cabinets,
Panels,
Variable Condensers,
High-purity Rods,
Foils for Fixed Condensers.
Die-Castings,
Screw Machine Products.

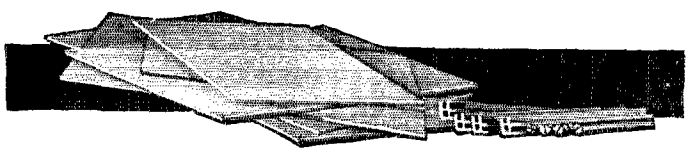
Now—

ALCOA ALUMINUM BOX SHIELDS



TO meet the growing demands of new radio design, which insist upon shielding, the Aluminum Company of America now provides a Box Type Shield. Aluminum, used with success in the Alcoa Wing Type Shield (for interstage shielding) gives the set builder and the manufacturer an adaptable, easily-worked material of great durability and shielding performance combined with extreme lightness. Its uniformly high quality, judged from both metallurgical and radio standards, is established.

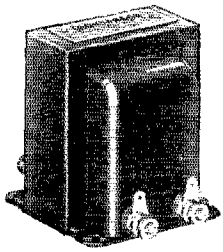
The New Alcoa Box Shield is especially designed to be of the greatest use to the greatest number of set builders. If it does not suit your size requirements exactly you will find that a few moments' easy work will adapt it most satisfactorily to your needs—being easily cut, easily worked and permanent when assembled. Ask your dealer.



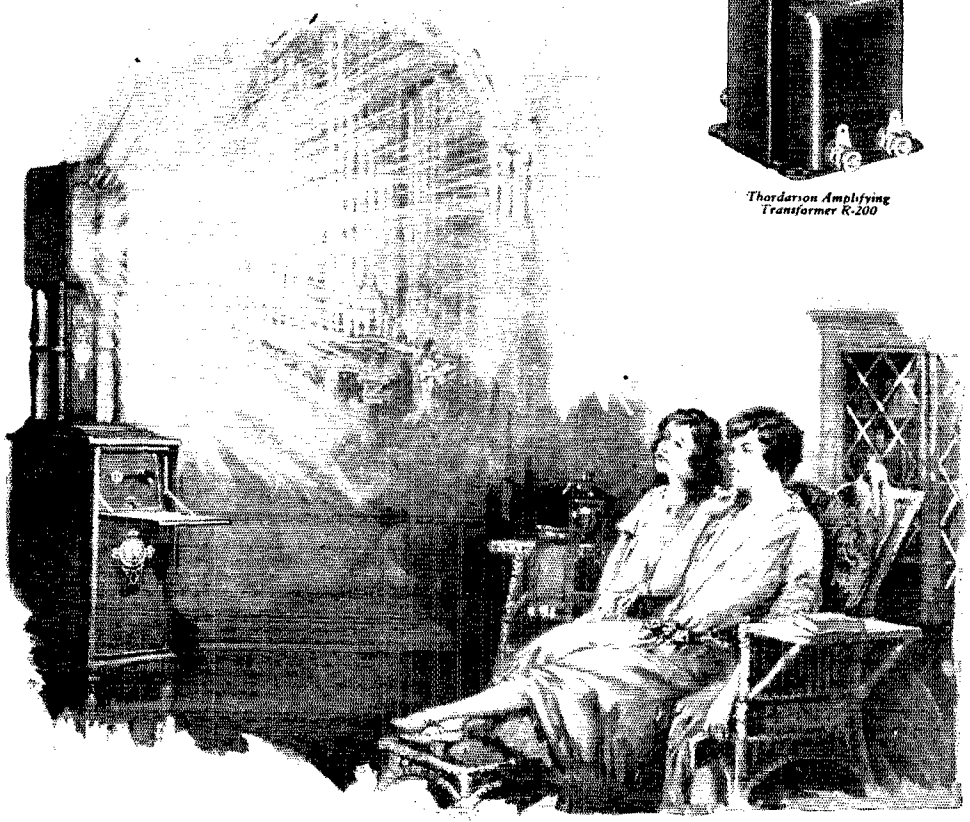
ALUMINUM COMPANY *of* AMERICA

2324 Oliver Building, Pittsburgh, Pa.

ALCOA ALUMINUM



Thordarson Amplifying Transformer R-200



"The soul of music slumbers in the shell
Till waked and kindled by the master's spell."
(Samuel Rogers—"Human Life").

WITHIN your set slumbers a world of music which you can charm to a living fullness and richness of tone by installing Thordarson Amplification.

The manufacturers of leading quality receivers have recognized in Thordarson Amplifying Transformers a fidelity of musical reproduction which removes the ordinary artificial tones of radio and replaces them with living harmonies.

Whether you are buying a complete receiver, or whether you are building your own—if you enjoy music—be sure that your transformers are Thordarsons.

THORDARSON

RADIO TRANSFORMERS

Supreme in Musical Performance!

THORDARSON ELECTRIC MANUFACTURING CO.
Transformer Specialists Since 1895
WORLD'S OLDEST AND LARGEST EXCLUSIVE TRANSFORMER MAKERS
Huron and Kingsbury Streets — Chicago, Ill. U.S.A.

(3550)

"B" Eliminator TESTING Problem Solved by Sterling

TO GET full value from your "B" Eliminator you must *know* that your "B" Power is delivering the *right* amount of voltage to detector, amplifier and power tube.

Low resistance voltmeter suitable for testing batteries are worthless for testing "B" Eliminators. This specially designed High Resistance Sterling is accurate for both.

Whether this voltmeter is used in your business or for your own set, it is *essential* if you want the facts about any "B" Eliminator.

It is the Universal Voltmeter for the Amateur
R-415

Sterling voltmeter meets the special needs of the amateur in a variety of ways—for testing the output of D. C. Generators, and for every other purpose calling for a *high resistance* voltmeter.

Never before has a laboratory instrument been available at a price so reasonable.

Sterling

R-415 VOLTMETER

A laboratory meter at the remarkably low price of

$8.50

THE STERLING MFG. CO.
2831 Prospect Ave. Cleveland, O.

World's Finest Radio *BUG*

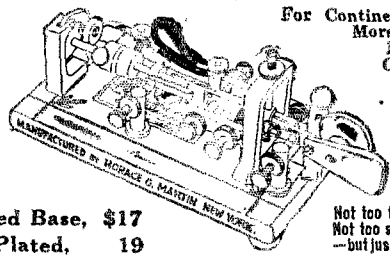
Improved Martin

Reg. Trade Marks
Vibroplex
Bug
Lightning Bug

VIBROPLEX

Trade Mark Reg. U. S. Pat. Off.

For Continental, Morse or Navy Codes



Japanned Base, $17
Nickel-Plated, 19

Not too fast—
Not too slow—
—but just right

Get This BUG Now!

Now is the time to get your BUG. Be up-to-date—enjoy the many advantages of sending with this Improved BUG. You'll be amazed to find how easy it is to learn and to operate. Nothing can compare with this BUG in EASE and PERFECTION of sending. Over 100,000 users. Saves the arm, prevents cramp and enables the "ham" to send with the skill of an expert.

Special Radio Model

Equipped with extra large specially constructed contact points to break high current without use of relay. Not too fast—not too slow—but just right. Sent anywhere on receipt of price. Money order or registered mail. **$25**

THE VIBROPLEX CO., Inc.
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Best Radio Text Ever Produced
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"RADIO THEORY AND OPERATING"

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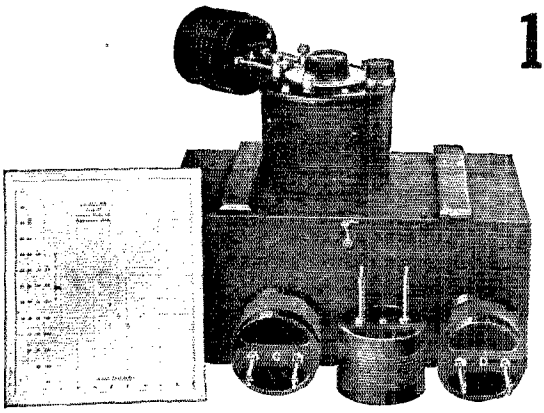
Two brand new Wireless Specialty Apparatus Company's Navy Transmitters rating ½ KW. Complete with Heltzer-Cabot Motor-Generator, meters, condensers and spare parts box. An exceptional value. Our price $650.00.

RADIO SURPLUS CORPORATION
250 Washington St. - Boston, Mass.

Amateur Transmitters!

Here are two ways you can be sure you are on your right wavelength



TYPE 358 AMATEUR WAVEMETER, Price $22

1 By using an accurate wavemeter with a resonance indicator lamp

By placing a Type 358 wavemeter tuned to your proper wavelength close to your transmitter while it is being operated, you have an excellent means of determining whether or not you are on your wavelength.

If your transmitter is properly tuned, the indicator lamp will light every time you touch the key. If the lamp does not light, you may know that your transmitter is off wavelength and should be re-adjusted.

The type 358 wavemeter is especially designed for amateur use in checking wavelengths. It covers a range from 15 to 220 meters, by interchanging four coils of low loss construction. These coils are carefully wound on threaded Bakelite forms, thereby insuring accuracy and permanance of calibration. Coil ranges are as follows:

Coil A	15 to 28 meters	Coil C	54 to 114 meters
Coil B	26 to 56 meters	Coil D	105 to 220 meters

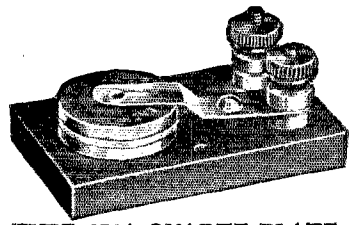
Type 358 wavemeter, with calibration chart—**$22.00**

2 By controlling your shortwave transmitter output with a quartz plate

The Type 276A Quartz Plate is intended for use by amateurs in controlling the frequency of transmitters.

The plates are ground to oscillate at one specified frequency only, and thus limit the output of the transmitter to one particular wavelength.

Type 276A QUARTZ PLATES are supplied at random frequencies between 1750 and 2000 k. c.



TYPE 276A QUARTZ PLATE
With Holder, Price $16.00
The only licensed plates available to amateurs

They provide harmonics in 20, 40, and 80 meter bands and may be used for transmitter control on these wavelengths. Calibration is to ¼%. All plates are guaranteed to oscillate when used as directed.

Type 276A Quartz Plate **$15.00** Type 356 Quartz Plate Mounting **$1.00**

GENERAL RADIO CO., CAMBRIDGE, MASS.

GENERAL RADIO

A. R. R. L. MEMBERS ATTENTION!

You are not all located within shopping distance of a dealer stocking General Radio parts. Remember that we will deliver, post paid, anywhere in the United States, any of our radio parts on receipt of current catalog price.

Also if we can be of help to you in supplying technical information, we will welcome your correspondence. Have you a Bulletin No. 926 in your file? If not, a post card will bring it.

ECONOMY SALE!

Telegraph KEYS **49c**

C.R.L. Power Rheostat for 7½ watters **75c**

Federal 11-plate Condenser **25c**

MICROPHONE

This is the usual mike used for ham purposes, but is spring-suspended and comes in a broadcast type frame,

$15

Hand type mike for 5-watt stations, $8.00.

High Frequency BUZZER **75c**

Power Rheostats for 5-watt Tubes **20c**

SIGNAL UV SOCKETS **10c**

FIRST-RATE 50-WATT SOCKETS
Quality construction and material make this an utterly reliable socket. **$1.50**

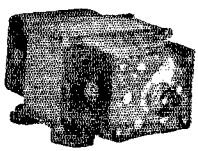
2 MFD. Condensers
Guaranteed to stand 500 volts
85c

ELECTROSE 12 in. and 18 in. INSULATORS **$1.00**

RCA 201 TUBES for low-wave transmission **95c**

Westinghouse Resistance or D.C. CHARGER **$2.50**

LAST CALL on RCA TRANSFORMERS



Model UV-1016

Order NOW or never!

UV-712, $7 Audio Transformer (9/1) . . . $1.60
UP-1016, $38.50 Power Transformer $11.50
UP-1656, $15 Filament Transformer $5.50
UL-1008, $11.50 Oscillation Transformer . . . $7.50
UV-1716, $8.50 Superhet Transformer . . . $1.10

FEDERAL TRANSMITTING CONDENSER, factory rebuilt **$2.95**

KING-CARDWELL 11-PLATE CONDENSER **95c**

RATHBUN CONDENSERS, 11, 23, or 43 PLATE **$1.00**

KELLOGG CONDENSERS 11 or 43-PLATE **75c**

KING-CARDWELL 11-11 PLATE, $1.50

DUAL CONDENSERS 15-15 PLATE, $1.95

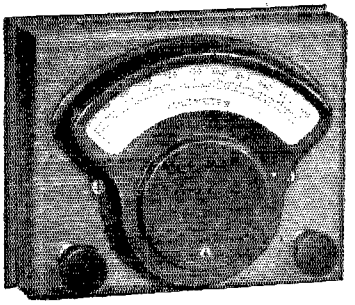
Motor-Generator
A limited quantity of Holtzer-Cabot ½ K.W. motor-generators, 500 cycle. Absolutely brand new. An exceptional value at $75.

WIRELESS SPECIALTY COMPANY'S **CONDENSERS**
Capacity, .006. Suitable for transmitting.
SPECIAL, 25c

RADIO SURPLUS CORP.
250 WASHINGTON ST.
Boston **Massachusetts**

Hoyt

B-ELIMINATOR VOLTMETER



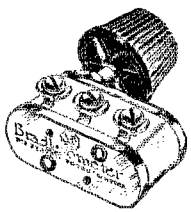
This new instrument with the necessary high resistance of 1000 ohms per volt gives true voltage readings of the output of B-Eliminators. Proper operation of Radio Sets by B-Eliminators demands accurate knowledge of voltage settings. Dealers and Service-men can get them accurately with the HOYT B-Eliminator Voltmeter.

Price 0-300 volt range $30.00. Higher ranges at higher prices.

BURTON-ROGERS CO.
Sales Dept. for Hoyt Electrical Instrument Works
Boston, Mass.

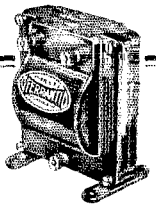
Bradleyometer

THE PERFECT POTENTIOMETER



Uses graphite disc resistors which are noiseless and not affected by atmospheric conditions. Metal parts are nickel plated. One hole mounting. Finish and knob match Bradleystat. Made in 200 and 400 ohm ratings.

Allen-Bradley Co.
Electric Controlling Apparatus
277 Greenfield Avenue
Milwaukee, Wis.



FERRANTI

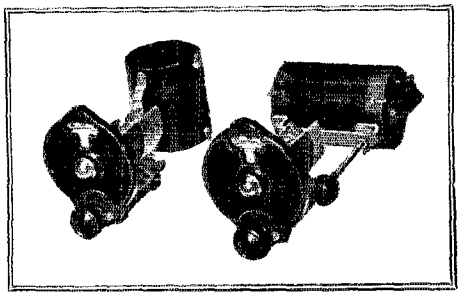
Audio Frequency Transformer

Bassnotes—treblenotes—all notes are amplified by this ten times-tested transformer.

$12—A.F.3. The best transformer at any price.

FERRANTI, Inc.
130 West 42nd Street, New York.
FERRANTI ELECTRIC, LTD., 26 Noble St., Toronto, Canada
FERRANTI, LTD., Hollinwood, England

BROWNING-DRAKE RADIO



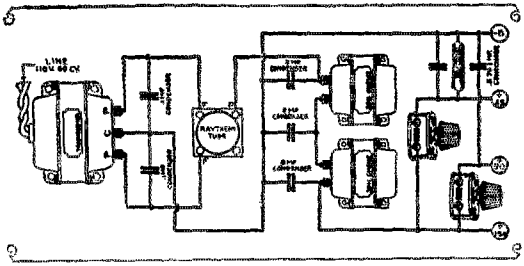
Receivers—Kits—Cabinets

BROWNING-DRAKE is known to most of you. We prize very highly the amateurs' recommendation, and it has been one of the biggest factors in our success. Our object will always be to merit the good-will of the amateur fraternity, as it has been accorded us in the past.

Browning-Drake is now announcing a new kit for home construction. The assembly recommended actually is more sensitive and considerably more selective than previous Browning-Drakes. The factory built receivers are now standard on the market, and we will keep on building them so they will give just as little trouble as in the past.

Dealers: Some of you hams are dealers, and if so we hope you will write for further information. The new Browning-Drake parts are now available, together with construction booklet for re-sale to your customers at twenty-five cents.

BROWNING-DRAKE CORPORATION, BRIGHTON, MASSACHUSETTS

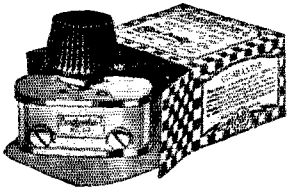


Improve Your B-Eliminator *with Allen-Bradley Resistors*

WHEN you build a B-Eliminator, be sure that your kit contains Bradleyohm-E for plate voltage control and Bradleyunit-A for fixed resistors. Then you will be assured of perfect plate voltage control.

Bradleyohm-E

PERFECT VARIABLE RESISTOR



This oversize variable resistor is used as standard equipment by leading B-Eliminator manufacturers. The scientifically treated discs in Bradleyohm-E provide stepless, noiseless plate voltage control, and the setting will be maintained indefinitely. Do not experiment with makeshift variable resistors. Ask for Bradleyohm-E in the checkered carton.

Bradleyunit-A

PERFECT FIXED RESISTOR

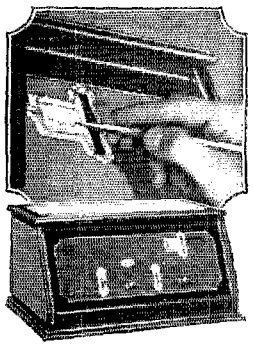
This solid, molded, fixed resistor has no glass or hermetic sealing in its construction. It is a solid unit, with silver-plated end caps, that is not affected by temperature, moisture and age. By all means, use Bradleyunit-A when you need a fixed resistor.

Send for folder "How to Build a B-Eliminator" describing seven popular hookups

ALLEN-BRADLEY COMPANY
277 Greenfield Avenue Milwaukee, Wis.

Use
Allen-Bradley
Perfect Radio Devices

CROSLEY



Single Drum
CONTROL
$50

27 Stations brought in distinctly on loud speaker in 30 minutes

"The other night I tuned in 27 stations, loud and clear, just like the Cincinnati stations, three of which were going full blast. I identified each program, didn't hear any others in the background,—all with one finger.

The air was certainly full. It was between 7:00 and 7:30 P.M., Central Standard Time. Some stations were less than a dial marking apart. It is amazing how the jiggers they call "Acuminators" helped on such fine separation. I'd like to see some two hundred dollar sets do as well!"

Name on request.

Write Dept. 18, for Catalog

THE CROSLEY RADIO CORPORATION
Cincinnati, O. - Powel Crosley, Jr., Pres.
Prices slightly higher west of the Rockies

SPECIAL TO AMATEURS

Our new amateur dept. in charge of F. J. Marco, 9ZA, has everything that amateurs desire. The Barawik Radio Guide gives full details. Send for it.

FREE RADIO GUIDE

RADIO BARGAINS

Shows the latest wrinkles, newest developments in radio at startlingly low prices. Get the set you want here and save up to 50%. The best in parts, kits, complete factory-built sets and supplies. Orders filled same day received. Write for free 164-page copy NOW; also please send names of one or more radio fans.

LATEST HOOK-UPS & RADIO CATALOG

BARAWIK CO., Dept. 113, CHICAGO, U. S. A.

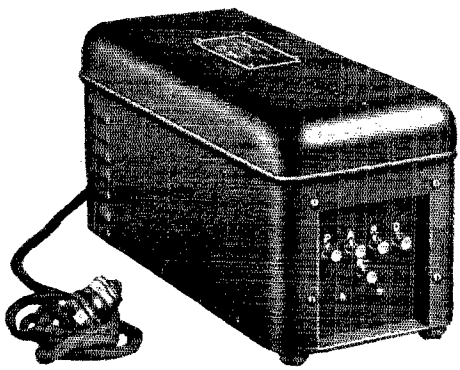
TNX OMs

FOR QSL'S ON MY LAST AD. THIS MONTHS BARGAINS WILL GLADDEN THE HEART OF EVERY HAM. AS ALWAYS — PROMPT — RELIABLE — MAIL ORDER SERVICE, WITH THE 2 MA. MONEY BACK GUARANTEE. WL HR GOES. Filter condensers: Filed time 2 MFD 2000 volt $5.29. 4 MFD 2000 volt $8.89. Sangamo 2 MFD 1000 volt $2.19. 4 MFD 1000 volt $3.69. Acme 2 MFD 2000 volt $5.95. Thordarson combined plate & fil. transformer 1650v. & 7½v. fil. with mid-tap) $6.19. Thordarson filament transformers, 80 watt (for 7½ watters, $6.10, 150 watt (for 50 watters) $7.90. Thordarson plate transformers 100 watt, $10.95, 350 watt plate $14.90. Acme 75 watt power transf. $13.69, 200 watt $18.40. 150 mil 30 henry choke $16.19, 300 mil $22.25. All Jewell 3 inch flush amount, milliammeters, A. C. and D. C. voltmeters $6.00 each. All Jewell thermo-ammeters $9.79. Genuine Cardwell .00025 transmitting condensers $3.39. Cardwell .00044 $8.95. R. E. L. Transmitting inductance (double with coupling rods) $8.95, single unit $4.65. RCA UC-1803, 10,000 volt condensers, specified for tuned plate and grid circuit, $.95 each. Faradon 1 mfd 1750 v. $2.19 .002, 3000 volt $2.19. Ward Leonard grid leak, 5000 ohm center-tapped, for 50 watters $1.79, heavy duty for up to 250 watters $2.59. Crescent Iarite 5000 ohm leak $2.19, heavy duty G. E. leak $1.59. R. E. chokes $.69 each. For tt S. W. rcvr AERO short wave coils $2.49. R. E. L. S. W. coils $3.69. Lots of other buys, complete transmitters, short wave Receivers, Supplies for Broadcast Stations, Experimenters, ETC. Deal with a brother ham and save your shekels.

RADIO 2 MA, 168 WASHINGTON STREET NEW YORK CITY

AMRAD

AMRAD CORPORATION Harold J. Power, *Pres.* Medford Hillside, Mass.



Here's a "B" Eliminator that

equals fresh new "B" batteries

B eliminators usually fail to give reproduction qualities to your radio that come from fresh new B batteries. First class B eliminators are usually quiet in operation and supply proper voltage and current but the reproduction in the loud speaker is faulty because the electrical capacity of the eliminator is not sufficient for the tremendous drain of current extremely loud or low notes demand. Such eliminators must draw the current all the way from the lamp socket through the filter choke into the receiver. The time element is appreciable so that the peaks of many notes are chopped off which causes distortion.

The Amrad B eliminator employs the famous Mershon Condenser as the principle capacity unit. This famous condenser has many times the capacity of any other eliminator condenser and constantly provides you with a sufficient supply of energy for the correct reproduction of any sounds that may come through your radio.

Free from breakdowns

Paper condensers now used in B eliminators frequently break-down. Here the Mershon has such a large capacity that any excessive voltage surges are eliminated; the charge being instantly absorbed. This also protects the receiver set against punctured parts or insulation break-down.

Won't get noisy

Nor are there any variable adjustments to get out of order. All parts are readily accessible as no compound or other filler is used in its manufacture. The Amrad B power unit is mounted on a metal base and incased in steel box, black enamel finish.

This as well as the other products of the Amrad Corporation are a tribute to the engineering skill of the Amrad laboratories and the influence of mass production methods of Powel Crosley, Jr.

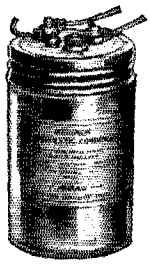
Write Dept. 4c7 for catalog

$35.

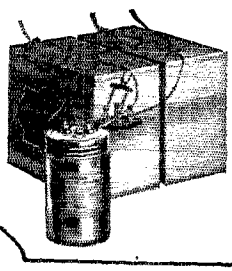
Including the celebrated AMRAD S-1 tube

THE MERSHON CONDENSER

freshens up old "B" Eliminators and prolongs life in "B" batteries



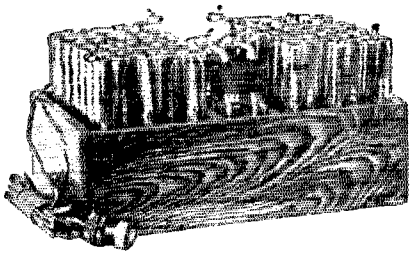
The Mershon Condenser assists in more perfect filtering (straining) of the uneven current supplied by a lamp socket. It also acts as a reservoir to store a large amount of energy which is necessary for a continuous smooth flow demanded by incoming broadcasts. This energy such as fresh B batteries deliver must be on tap instantaneously for loud sustained musical notes. The improvement in tone quality is particularly noticeable on low notes.



Mershon Condenser connected across B batteries (with a disconnecting switch) greatly prolongs useful life of these dry cells. It in itself does not wear out—can be used continuously.

$8

90 VOLT POWER UNIT $12.75



NEW TRICKLE "B" CHARGER

Trickle charges any storage "B" battery from 90 to 150 volts. Electrolytic type and full-wave rectification. No rectifying bulbs to break, die or burn out. Price only $3.75 complete.

B. HAWLEY SMITH

328 Washington Ave., Danbury, Conn., U.S.A.

Mfr. of Storage "A" and "B" Batteries, "A" and "B" Power Units, "A" and "B" Tricklers

This new "Hawley" Power Unit is unconditionally guaranteed to not produce the slightest trace of hum, line noises or otherwise even upon 25 cycle current which is the bugaboo of all eliminators. Really a two in one unit—can be used as an eliminator directly connected to the house line or as you now use batteries unconnected to line. Simpler to hook-up than dry cells as all voltages—detector, intermediate and amplifying—all plainly marked. Runs any 1 to 10 tube set of any design or circuit with truly remarkable results in comparison to the dry cell method. Simply plug into house current—and forget. Come complete—nothing to purchase extra. For 110 to 120 volt Alternating Current—25 to 60 cycles or higher. 90 volt Power unit $12.75, 112½ volts $15.25, 135 volts $17.50. Special or larger voltage sizes to order. Also built for 32 volt farm plants and 110 volt D.C. current at only $3.00 additional in any above sizes. Knock-down kits at still greater savings. Sold on my 5 year old 30 day trial refund "You must be satisfied" basis. Order direct—send no money—simply say—ship C.O.D. Ample stocks—same day shipments or write for my free literature, testimonials, etc.

RADIO OPERATORS WANTED

THE EASTERN RADIO INSTITUTE can train you quickly and thoroughly because:

MODERN AND EFFICIENT METHODS
THOROUGH INSTRUCTION under staff of LICENSED COMMERCIAL OPERATORS
MODERN APPARATUS including SHORT WAVE TRANSMITTER
FOURTEEN years a RADIO SCHOOL
THE OLDEST, LARGEST and MOST SUCCESSFUL school in New England. RECOMMENDED BY THE A. R. R. L.
Day or Evening Classes Start Every Monday.
SPECIAL CODE CLASSES

Write for Illustrated Prospectus

EASTERN RADIO INSTITUTE
899 BOYLSTON STREET BOSTON, MASS.

A Laboratory Product

CRESCENT LAVITE RESISTANCES

for Distortionless Amplification

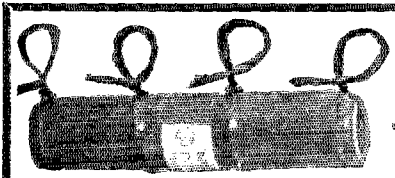
Dual resistances for DeForest "H" tubes; one or two fifty watters, $3.50. Special Grid leaks for any tube to order. Let us solve your voltage drop problems. Use all tubes in a crystal controlled transmitter on main generator. Our resistances will take care of the different voltage requirements.

CRESCENT RADIO SUPPLY CO. 1 Liberty St., Jamaica, N. Y.

Hey, Ham—
Have u ordered ur copy of
Handy's
Handy
Handbook?

THE BEST $1 YOU EVER SPENT!

PUBLISHED BY
AMERICAN RADIO RELAY LEAGUE
1711 PARK ST., HARTFORD, CONN.



15,000 ohm Gridleak

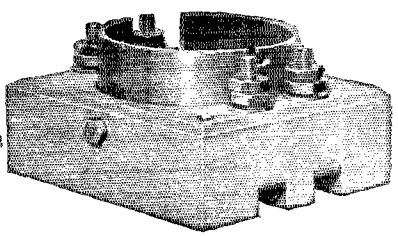
Tapped at 5,000 and 10,000 ohms with 85 watt capacity. Price $1.50.

5,000 ohm 85 watts $1.00
5,000 ohm W. L., 20 watt, 75c.
10,000 ohm 150 watt, $1.50

UC 1015 Condenser

7,500 volts tested, sulphur and mica insulated, eleven capacities, .0002 to .001 mfd, for grid and plate blocking.

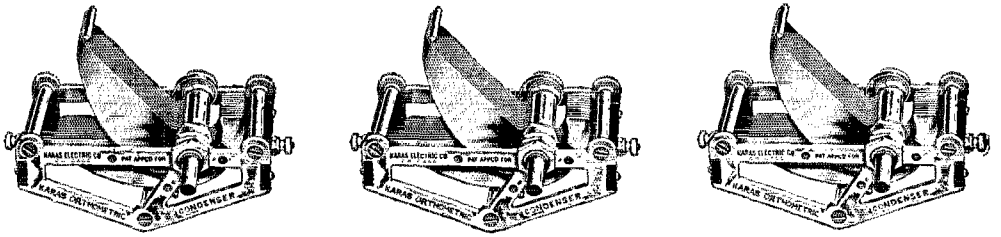
Price $1.25



50 Watt Lowloss Socket

Maple treated base with brass airgap shell and heavy phosphor bronze springs. For UV 203A UV 217 and similar tubes. Price $1.25

Utility Radio Co., 80 Leslie Street, East Orange, N. J.



USE KARAS CONDENSERS IN YOUR SHORT WAVE TRANSMITTER

Their Low Losses, Precision Construction and Scientific Design Will Insure You Amazing Results

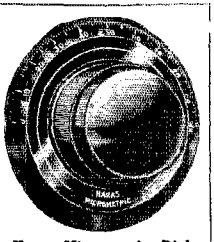
KARAS Orthometric Straight Frequency Line Variable Condensers are ideal for low power short wave transmitters such as the Aero Short Wave Set. Three of our .0005 23-plate Orthometrics will give amazingly satisfactory results in this transmitter.

Karas Condensers have the lowest losses known. As a matter of fact their losses are practically immeasurable. One engineer in testing Karas Orthometrics placed a charge across the plates on Saturday noon and found that nearly the full charge was still there on Monday morning. All dielectric material in Karas Condensers is placed outside the effective electro-static field. Every Karas plate is soldered at every point of contact. And we use only the finest quality hard rubber insulating material.

Our precision methods in building Karas Condensers insure your having a sturdy, rigid, accurately built and wonderfully efficient condenser for your transmitting set. You have only to examine a Karas Orthometric at your dealers to appreciate its fine, durable construction, its remarkable bracing not only across the frame but also across the plates. Do you know of any other condenser so sturdily built? And so accurately do we work in the Karas factory that only by going to limits as fine as ¾ of 1/1000 of an inch can we satisfy ourselves that Karas quality is permanently guaranteed to be 100%.

The scientific eccentric shape of Karas plates gives a perfectly straight line frequency curve. This is a most important factor in a variable condenser whether for transmitting or receiving, and you will find it mighty advantageous.

Secure 3 Karas Orthometric .0005 23-plate condensers from your dealer for your Aero Transmitter. Note their beautiful clean-cut design their superior construction—their unsurpassed performance. If you will add 3 Karas Micrometric Vernier Dials to your Aero Transmitter equipment you will know the further joy of split-second tuning, due to the marvelous 63-1 ratio of these dials. They are free from backlash, and none can ever develop. Their control of tuning is as fine as 1/1000th of an inch!



Karas Micrometric Dials Make Sharp Tuning Easy

Oscillatory circuits require Karas Micrometric Vernier Dials for best results in tuning. Micrometrics tune to within 1/1000th of an inch—have 63 to 1 vernier ratio—never falter or slip—have large convenient knobs which do not tire the hands—are made of Bakelite—have gold inlay markings—are smooth as velvet in action and are absolutely free from backlash. For 100% tuning efficiency order Karas Micrometrics TODAY.

Price $3.50 each

Interesting Condenser or Dial Pamphlet Mailed FREE on Request

You can order Karas Condensers and Dials from your dealer. The price of the condensers for the Aero Transmitter is $7 each; the dials $3.50 each. Most good dealers handle Karas parts. To secure a copy of our FREE pamphlet describing in detail the construction and operation of Karas Condensers and the advantages of Karas Dials, mail the coupon direct to us. If your dealer should happen to be out of stock of Karas parts you may, if you wish, order these from us also. If you use the coupon when ordering YOU NEED SEND NO MONEY. Simply hand the postman the price of the parts upon delivery, plus a few cents postage. Whether you order the parts from your dealer or from us be sure to write for our FREE pamphlet describing Karas Condensers and Dials. DO THIS TODAY.

KARAS ELECTRIC CO.

1033 ASSOCIATION BLDG. CHICAGO

Karas Electric Co.,
1033 Association Bldg., Chicago.

Please send me your FREE pamphlets describing Karas Orthometric Condensers and Karas Micrometric Vernier Dials.

Please send me 3 Karas .0005 mfd. capacity 23 plate Orthometric Condensers, price $7 each, and 3 Karas Micrometric Vernier Dials, price $3.50 each, for which I will pay the postman $31.50 upon delivery, plus postage. It is understood that if I am not entirely satisfied with this apparatus I may return it for refund of purchase price any time within 30 days.

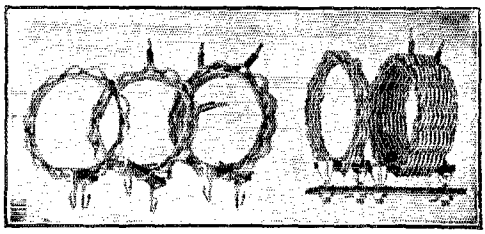
Name .....

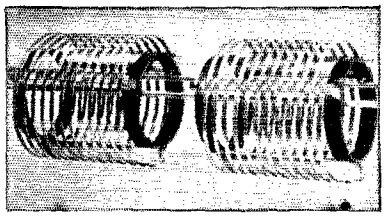
Address .....

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

(If cash accompanies order we will ship postpaid.)

SHORT WAVE PRODUCTS FOR EVERY AMATEUR





REL LOW WAVE PLUG-IN COILS

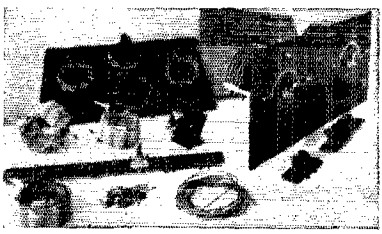
Loose basket weave wound with triple cotton covered paraffin impregnated wire. Moisture proof, low losses. Unit consists of five coils, plugs and mountings. Wavelength range 10-110 meters. Catalogue 119 Price $4.50

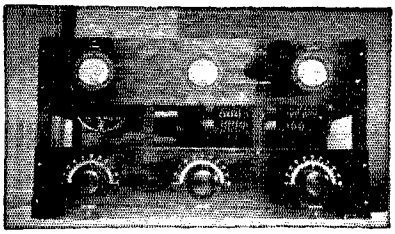
REL Transmitting Inductances

Designed for Low Wave C.W. Transmission. Flatwise wound nickel plated ribbon mounted on crystal glass spacers. Catalogue 127

Type L- (40, 80, 150 meter wavelengths)
Type S- (20 meters and less)
Single Unit, either type with three clips $5.50
Double Unit, either type with six clips and two glass coupling rods $11.00

—AND THE KITS!





Short Wave Receiving Kit

Capacity controlled feed back circuit with separate coils for antenna, secondary and tickler. Kit is complete, each part selected for its individual high quality. Wavelength range 10-200 meters. Catalogue 130 Price $36.00

TRANSMITTING KITS

Master Oscillator Power Amplifier transmitting kits. Catalogue 155. Contain all apparatus to make up either of the following; two 7½ watt tubes TR5—$86.00, two 50 watt tubes TR50—$96.00 or two 250 watt tubes TR250—$114.00.

—AND THE CATALOGUE!!

No use to kid yourself any longer. You *need* this catalogue of ours with its wealth of information on all that could be of interest to every Short Wave Enthusiast. Send today. The price is only 25c.

Please remit U. S. currency or money order.

REL Owns and Operates Experimental Station 2XV on 15.1 Meters, 19867 Kilocycles, Crystal Controlled.

Radio Engineering Laboratories

27 Thames Street, New York City

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 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.

.....1927

American Radio Relay League,
Hartford, Conn., U. S. A.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of 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.

.....

.....

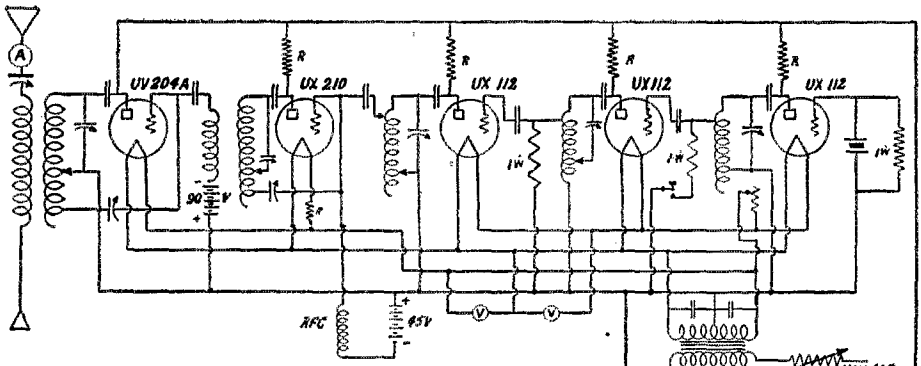
Station call, if any .....

Grade Operator's license, if any .....

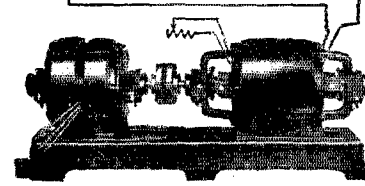
Radio Clubs of which a member .....

Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may send him a sample copy of *QST*?.....

..... Thanks!



THIS Crystal Oscillator in this diagram is a UX112, controlled by a 320 meter crystal for 80 meter operation, or a 160 meter crystal for 40 meter operation. Assuming a 320 meter the first UX112 oscillates at 320 meters. The second UX112 at 160 meters. It also amplifies at this wave-length. The third UX112 oscillates at 80 meters. The UX210 acts as an amplifier This last tube also acts as a driver for the 204A, which is tuned to the wave-length of the UX210. The plate supply comes from an "ESCO" Item No. 26.



ELECTRIC SPECIALTY COMPANY

Mark "ESCO" Trade

225 South Street — Stamford, Conn., U. S. A.

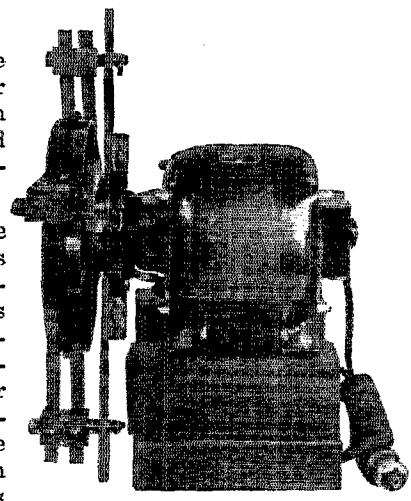
Manufacturers of Motors, Generators, Motor-Generators
Dynamotors and Rotary Converters, for Radio and Other Purposes

THE SUPER SYNC

The Synchronous Rectifier That Can Be Filtered

The Super Sync is the only synchronous rectifier that can be filtered with ordinary type of filter and deliver a pure direct current.

The construction of the commutator enables this rectifier to rectify practically the full wave thus making the R.A.C. delivered much easier to filter. It is impossible for the voltage to jump between segments as the insulating ridge between the conducting segments prevents break down at this point.



The brushes on this rectifier are made of copper leaf and make a clean sliding contact, there being no air gaps for the brushes to jump.

The commutator is turned at a synchronous speed by a ¼H.P. synchronous motor. This motor can be supplied for either 110 or 220 Volts 50 or 60 Cy. Motors with special name plate ratings can also be supplied.

PAT. PENDING

PRICE $75.00 F.O.B. ST. LOUIS, MO.

MARLO ELECTRIC CO., 5241 Botanical Ave., St. Louis, Mo., U.S.A.

SANGAMO
Mica Condensers in intermediate sizes

IMPROVE TONE RANGE AND VOLUME

IT is accuracy, not luck, that makes one receiver sweeter and more powerful than another that is almost its twin. Especially condenser accuracy, for the closer you come to absolute accuracy at these critical parts, the more wonderful your receiver will be. The cost of accurate condensers is small—the effect is immense.

Now you can get Sangamo Mica Condensers in capacities in between the usual stock sizes so you can build with greater accuracy than ever before. They are guaranteed to be accurate, and they always stay accurate, being solidly molded in bakelite. Neither heat, cold, moisture, pressure nor acid fumes will affect their capacity, because bakelite seals the delicate parts against all outside influences.

Capacities in microfarads and prices

0.00004	40c.	0.001	50c.
0.00005		0.0012	
0.00006		0.0015	
0.00007		0.00175	
0.00008		0.002	
0.0001		0.0025	
0.00012		0.003	60c.
0.00015		0.0035	
0.000175		0.004	
0.0002		0.005	70c.
0.00025		0.006	85c.
0.0003		0.007	90c.
0.00035		0.0075	95c.
0.0004		0.008	$1.00
0.0005		0.01	1.15
0.0006		0.012	1.20
0.0007		0.015	1.25
0.0008			

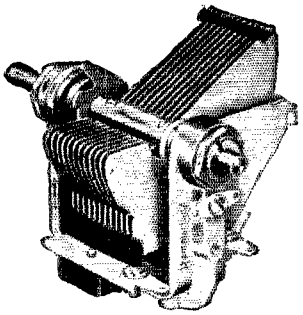
With Resistor clips, 10c. extra

Sangamo Electric Company

6332-1 *Springfield, Illinois*

RADIO DIVISION, *50 Church Street, New York*

SALES OFFICES—PRINCIPAL CITIES
For Canada — Sangamo Electric Co. of Canada, Ltd., Toronto.
For Europe—British Sangamo Co., Ponders End, Middlesex, Eng.
For Far East—Ashida Engineering Co., Osaka, Japan



The "MIDLINE" Condenser

With Removable Shaft

Wherever Good Workmanship is Appreciated

Professionals and advanced amateurs, the world over, praise this condenser. It is a precision instrument without a superior and has new features that easily adapt it to any scheme of single-control, multiple operation.

Write for Descriptive Folder

HAMMARLUND MANUFACTURING CO.
424-438 W. 33rd Street, New York City

For Better Radio
Hammarlund
PRECISION
PRODUCTS

Become a Radio Operator

See The World. Earn a Good Income. Avoid Hard Work.
Learn in the Second Port U. S. A.

Radio Inspector located here. Positions plentiful. Splendid Climate. Other advantages to the student unequalled in any other American port.
Nearly 100 per cent of operators graduating on Gulf during past four years trained by MR. CLEMMONS, Supervisor of Instruction. Every graduate secures position.
Day and Night Classes; enroll anytime. Write for Circular.

Gulf Radio School 844 Howard Avenue New Orleans, La.

"JACOBS ANTENNA SPREADER"

Made in both 5" and 7" diameters.
Patented Sept 8, 1925; Sept. 7, 1926.

Made of metal for erecting either 4, 6 or 8 wire Cage Antenna or counterpoise. R. T. Cole, 5ZAA writes "The Spreaders have given perfect satisfaction on my short wave transmitting antenna." Price $6.00 per dozen; $3.25 for a half dozen. Circular upon request. If your dealer doesn't keep them, send me his name.

CHARLES F. JACOBS (2EM) 279 Park Place, Brooklyn, N. Y.

HALCO

We Now Offer You PARTS for the DALLIN-HALCO SUPER

Front and sub-panels, drilled and engraved, $7.50 per pair; Rubber sub-panel brackets, $1.50 per pair 50,000 ohms Carter Resistors $1.50 each; Benjamin UX Sockets, 40c each; Acme 50 k.c. Transformers, $2.50 each; Halco coils, including oscillator coils and three plug-in coils 10-80 meters, $6.00 per set; Blue prints showing arrangement of parts approved by Edward B. Dallin, 50c each.

Halco Mail Order Service
132 Hanover Street Boston, Mass.

HAM-ADS

NOTICE

Effective with the July issue of QST the policy of the "Ham Ad" Department was altered to conform more nearly to what it was originally intended that this department should be. It will be conducted strictly as a service to the members of the American Radio Relay League, and advertisements will be accepted under the following conditions.

(1) "Ham Ad" advertising will be accepted only from members of the American Radio Relay League.

(2) The signature of the advertisement must be the name of the individual member or his officially assigned call.

(3) Only one advertisement from an individual can be accepted for any issue of QST, and the advertisement must not exceed 100 words.

(4) Advertising shall be of a nature of interest to radio amateurs or experimenters in their pursuance of the art.

(5) No display of any character will be accepted, nor can any typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others.

(6) The "Ham Ad" rate is 7c per word. Remittance for full amount must accompany copy.

(7) Closing date: the 25th of second month preceding publication date.

THE life blood of your set—plate power. Powerful, permanent, infinitely superior to dry cells, lead-acid Bs, B eliminators. Trouble-free, rugged, abuse proof, that's an Edison Steel-Alkaline Storage, B-Battery. Upset electrically welded pure nickel connectors insure absolute quiet. Lithium-Potassium solution (that's no lye). Complete, knock-down kits, parts, chargers. Glass tubes, shock-proof jars, peppy elements, pure nickel, anything you need. No. 12 solid copper enameled permanently perfect aerial wire $1.00; 100 ft. Silicon steel laminations for that transformer 15c lb. Details, full price list. Frank Murphy, Radio 8ML, 6406 Carl Ave., Cleveland, Ohio.

NAVY standard compass receivers, SE144OA-150-1250 meters equipped with detector, 3 stages audio, ideal for commercial work and broadcasting stations, $275. 10/350 volt Navy dynamotors $25.00. Navy 900 cycle alternators self-excited $25. Western Electric tubes. UV204 $95. Dubilier Mica Condensers .004-8500V at $8. Western Electric 2B Superheterodyne receiver, complete, new $240. U. S. Navy, Western Electric, Submarine chaser CW936 transmitter, receiver, new, original case, $225. Long wave navy receivers CN240, $65. Navy precision wavemeter 100-4000 meters $100. Navy direct reading wavemeters with galvanometer manufactured by General Radio—range 300-1000 meters. Can be calibrated for shorter waves. Special $18.50. Guaranteed new. Navy tube control for SE173 and other receivers type SE1071 at $45. each. Arthur Faske, 1515 Eastern Parkway, Brooklyn, N. Y.

25% to 35% discount to amateurs on receiving parts, no sets. Our weekly data sheets give you more dope than all the radio magazines together. 20 weeks' trial $1.00, 52 weeks $2.50. Over .two pounds data, circuits, catalog, prepaid 25c. Fred Luther Kline, Kent, Ohio.

$2.95 BRAND new Gould 24 volt rubber enclosed batteries, about 2500 mills. Hunt Spencer, 3558-65 Street, Woodside, New York.

EDISON elements pair 3½ cents. 9EHO.

OMNIGRAPHS, vibroplexes, transmitters, transmitting tubes, "S" tubes, receivers, chokes, meters, transformers, sync rectifiers, wavemeters, motors, motor generators, super heterodynes, Radiolas, Grebe CR18s bought, sold, exchanged. What have you? L. J. Ryan, 9CNS, Hannibal, Missouri.

NEW RCA apparatus 203A 50 watters $20. 202 5 watters $2.50. 50-Henry chokes $5. Five watt sockets $.75. Transmitting inductance $3. Modulation transformers $3. 1750 volt 1 mfd condensers $1.50. Large transmitting rheostats $3. 5-ampere magnetic modulator $3. Reactor $1. RF Choke $1—also Esco 110-500 volts 150 watt dynamotors $30 also 12-500 volts and severel spare armatures for Esco machines. Grebe "CR18" $10. Long wave Navy 3 tube receiver $10. Paragon radiophones $10. Federal microphones $2.50. G. R. Precision wavemeter $25. G. R. variable can condensers $1. Ferd. Mann, Delaware Place, Hempstead, N. Y.

WATTERS, genuine RCA in original cartons FB for your low power transmitter, only $2.50 each prepaid. 9GF and 9CYN, 853 Lafayette Parkway, Chicago, Ill.

FOR sale—Three 1000 watt, one 500 watt McCullough water cooled tubes. Condition good. Used 250 hours in broadcasting station. 30 feet rubber tubing with each tube. 80 bucks for the big ones, 60 bucks for the small one. Shipped express C. O. D. 8BWR, Michigan State College, East Lansing, Mich.

WESTERN Electric power amplifier $19.00. Magnavox Three-stage power amplifier $14.00. Signal I-plate condensers at 50 cents each. Get my bargain list for the ham. 9MV Story City, Iowa.

SELL cheap. S. W. receiver and transmitter parts. Write J. Ross Day, 715 N. 9th St., Vincennes, Indiana.

HAMS: Get our Samples and prices on printed call cards made to order as you want them. 9APY Hinds, 19 S. Wells St., Chicago, Ill.

UP-1656 Filament Transformers 75 watt output 7.5v, $6.00 ea.—UP-1658 Filament Transformers 150 watt output 10v, $8.00 ea.—UV-712 audio transformers ratio 9/1, $1.50 ea.—Genuine Cardwell Variable Condensers, type 123-B .0005 mfd, $2.00 ea.—Signal R-48 Telegraph Keys, $2.25 ea.—Jewell meters, send for cat—Amrad Lighting Switches, $1.50 ea.—W. E. Mikes 349-BW, $4.00 ea.—Acme Modulation Transformers $4.50 ea.—G. R. type 384-T 2000v Variable Transmitting Condensers $4.00 ea.—Fleron Stand-off insulators, 3 inch 75c ea.—All new and Guaranteed. Radio 1-CPE 228 Weld St., Roslindale, Mass.

BRANDES superior head sets $2.10 prepaid while they last—F. A. Snyder, 1811 N. Lamar St., Dallas, Texas.

SELL—Advance sync rectifier good condition, $15. J. Robertson, Auburn, Ala. 5OA.

YOU'RE next, OM. Westinghouse Cooper-Hewitt Mercury Vapor Rectifier tubes, $11.75 ea. shipped via express only. New, in original crates, guaranteed. Put a note on the air that'll kick out. Tubes will run one fiver or a bank of quarter-kilos. All the dope, blueprint and photo, 10c plus a 2c stamp. Can shoot you all the parts, too. Wilbur E. Gemmill, 434 N. Beaver St., York, Penna. nu3AAO.

SLIGHTLY USED 'H' tube twelve bucks 2BBW.

GENERAL Electric 24/1500 volt 850 watt ball bearing Dynamotors unused $35.00. With shaft extension for external drive $38.00. Navy SE 1012 range 50-1000 meters New $45.00; used $35.00. Flame proof keys $2.00. New supply of 500 cycle generators and motor generators ½ KW to 5 KW. With and without gasoline engines. Complete Navy spark sets ½ to 5 KW. 500 cycle transformers easily tapped for low voltages ½ KW $12.50. Advise your requirements. Small Sangamo Watthour meters especially made for Navy for battery service. You need one. $12.50. Navy Wavemeters $45.00. Henry Kienzle, 501 East 84th Street, New York.

DODGE Radio Shortkut fixes signals in mind to stick. Kills hesitation. Cultivates speed. Produces results. 9CMW Usher reports "Purchased your method to increase receiving speed. Some points don't quite understand. Please explain xxxxx. Have caught on and in three evenings raised speed from 15 to 25 per. Shortkut is FB". Quarter coupon and reports rapid progress made by 200 users (all licensed) 25 cents. Specimen reports each district on request. Shortkut with Appendix and Better Key Work $3.50 U. S. and Canada—elsewhere $4.00 reg. mail. None C. O. D. Send money order. Check may delay. C. K. Dodge, Mamaroneck, N. Y.

WANTED—30-henry 150 ma. choke. Must be cheap. 6CUW, Bisbee, Arizona.

SELL—20 and 50 watt parts generators, tubes, etc. Branston super kit, also T M Lehrone airplane. Ted Finefield, Iowa City, Iowa.

SELL or exchange. Tubed Crosley four; brand new General Electric 20 watt transmitter E. T. 3619 never used; short wave set; B flat clarinet outfit; .22 Remington pump; Maxwell touring; Indian twin. Want omnigraph, transmitting or what have you? State particulars. Roger E. Curran, Dundee, N. Y.

MARCONI lightning switch $5. Type 1 send receive switch $7. SE-143 medium wave receiver $65. SE-70 Navy audion cabinet $15. Navy type 44 cell Edison B battery $15. 4PB.

GENUINE Nathaniel Baldwin phones type "C", $6.35. Aero inductance coils short wave $10. Selenium for television experiments two ounces $2. I give discount on radio parts. Money orders only. Leroy Schlichting, 1003 West Third Street, Davenport, Iowa.

ABSOLUTELY complete ten watt transmitter. Nothing extra to buy. First $55 gets it. Clement Pack, Menasha, Wisconsin.

HAM equipment at lowest prices. Transmitters and receivers built to order. Plug-in coil kits 15 to 200 meters $5. B eliminators, tubes, filters, write for list. 6SH.

FOR sale—One complete transmitting outfit including 1 Thordarson 3000 volt transformer, 1 Acme 30 henry choke, 2 .2 mfd Faradon condensers. 2 DeForest H tubes, 2 REL inductances, volt meter, milliameter, National condenser mounted on panel. Key, Bradleystat No. 2 omnigraph, Teco shortwave receiver with set coils. Everything brand new, never used for $100. E. H. McWhorter, Jr., New Bern, N. C.

SUPER sync rectifier, guaranteed new condition. With vibration-proof mounting $50 F. O. B. Miami. 4FM.

SELL—UP1368 and other 5 watt parts. Write for list. 8DCF.

FREE! During March, with every $10.00 order or more, one R. E. L. radio frequency choke free. Sangamo filter condensers, 1500 volts D. C. test, guaranteed for continuous operation at 1000 volts D. C. 2 mfd. $2.50; 4 mfd. $4.00. R. E. L. transmitting inductances, double unit, Type L, complete, $10.00. R. E. L. receiver kits, complete $29.50. Allen Bradley "Radiostats", those husky primary rheostats, $6.50. Allen Bradley "Radioleaks", 2000-30,000 ohm variable transmitting grid leaks, $5.00. All postpaid. Other prices on request. G. F. Hall, 133 East Gorgas Lane, Philadelphia, Pa.

PURE aluminum and lead rectifier elements holes drilled brass screws and nuts, pair 1/16", 1"x1" 13c, 1"x6" 15c, 1¼"x6" 17c, 1½"x6" 19c. Sheet alumium 1/16" $1.00, lead $1.00 square foot all prepaid. Silicon transformer steel cut to order .014" 10 lb. 25c, 5 lb. 30c, less than 5 lb. 35c per lb., .022" thick 5c less per lb. Postage extra. Edgewise wound copper ribbon 7 sizes, seen Jan. *QST*, ⅛" square copper wire better than copper tubing 50c lb. postage extra. Air pocket insulators blue glazed porcelain 8" leakage path fine for transmitting, 4 for $1.00 prepaid. Geo. Schulz, Calumet, Michigan.

LOUDSPEAKERS $25 Dictograd upright speakers $10, prepaid. Write for list of other bargains. Frank A. De La Mater, 311 East Adams, McAlester, Oklahoma.

SALE or trade—Westinghouse 250 watt 1000 volt motor-generator motor 110 volt 60 cycle perfect condition. Want 500 or 750 watt 1000 volt motor-generator. R. O. Koch, Manitowoc, Wisconsin.

OMNIGRAPH for sale. Thirty dials (two sets) with buzzer. New contacts, $25. Express prepaid if cash with order. Herbert Fiske, East Wareham, Mass.

QSL cards $1 per 100, highest quality, orders filled immediately, COD or cash with order. William Green, 207 Cathedral Parkway, N. Y. C.

PURE "B" current from your light socket thru an Edison element "B" power unit. No trimmings. Just pure value. 90 volt, $10.95. 135 volt, $15.00. 180 volt, $18.95. Complete with charger, cord, plug, bakelite panel, etc. Nothing else to buy. Edison elements, first grade, Type "A", welded 5c per pair. Drilled, 4c. 3-G welded, 6c. No. 20 pure nickel wire, 1c per ft. No. 18, 1½c. Separators, 4c per doz. Sheet separator 5½"x8½", 5c. Potash-Lithium for making 5 lbs. Edison solution, 85c. Send for new catalog. J. Zied, 904 N. 5th St., Phila., Pa.

CW 936 Western Electric 8 tube receiver and transmitter, never been used, also 40 foot steel mast, what cash offered? H. R. Read, 363 Flushing Ave., Brooklyn, N. Y.

400 V. 100 W. Esco coupled to 220 V. 3 ph A. C. motor $25.00; same with 110 V. single phase motor $30.00. 1500 V. 600 w. Double Commutator Westinghouse motor generator $175.00. 2500 V. 2 Kilowatt Generator double commutator generator coupled to three phase 220 V. 1750 speed motor. 2500 V. 600 W. Double Commutator generator coupled to 110-220 V. 60 cycle single phase motor 1750 speed. 1 mfd Western Electric Condensers 50c. New ¼ H. P. 110 V. 3500 speed Robbins & Myers alternating current motors $8.50. Prices f. o. b. Chicago. James Smat 1734 Grand Av. Chicago, Ill.

ARE you having trouble with your transmitter? Or do you wish to ask us any questions? If you do, we will very gladly answer them. We want you to feel that we are headquarters for information on Amateur problems, as well as for Amateur supplies. Some new items we have added: General Radio 358 wavemeter, A. R. R. L. handbooks, DeForest transmitting tubes, REL equipment, Sangamo filter condensers, and 1/16"x¼" copper strip. Write for our "Hamalog", which has just been brought up to date with a new supplement, making it more valuable to have than ever before. E. F. Johnson, 9ALD. Waseca, Minnesota.

CURTIS—Griffith 250-watt power-filament transformers 350-550 each side $12.50. Thordarson 650-volt power-filament transformers for 5-watters $6.90. Thordarson power transformers 350-550 each side $11.00; 1000-1500 each side $16.00. Edgewound Inductance 6-inch, turn 12c; 4-inch 10c. 50-watt sockets $2.50. Aluminum square foot 85c; lead square foot 85c. Jewell 0-15 Voltmeters $7.50; 0-500 Milliammeters $7.50. National 23-Plate 3000-volt transmitting condensers $11.50. New "Ham-List" 4c. James Radio Curtis, 5-A-Q-C, 1109 Eighth Avenue, Fort Worth, Texas.

HAM headquarters:—Deliveries are now being made on Mueller 150-watt input tubes $15.00. RCA 5-watters $6.15. Potter 2000-volt 1-mfd condensers $2.50; 2500-volt 1 mfd $3.25. Aerovox 1500-volt 1-mfd condensers $1.75. Tobe 2000-volt 5-mfd Condensers $17.00. UC490 Condensers $2.50. Aero 15-133 meter Kit $12.50. Used Vibroplexes $10.00. "Ham-List" 4c. R. Curtis, 1109 Eighth Avenue, Fort Worth, Texas.

WANTED:—Omnigraphs, 50-watters, S-tubes, Syncs, 10KW tubes. Price Griffith, 1109 Eighth Avenue, Fort Worth, Texas.

HERE you are boys! Make an honest Kopeck. New, never used, Ferguson 6 tube shielded broadcast receiver. List $75. Yours for $48.00. First check takes it. Still lots of parts left, meters, wavemeters, 210 tubes, 216 B Kenetrons, Acme chokes and power transformers, REL inductances. Every customer now all smiles. I treat 'em right. 2PX, R.F.D. No. 5, Schenectady, N. Y.

500-900 CYCLE alternators and other Army equipment. Robert B. Bridge, 2412 Main Ave., San Antonio, Texas.

POWER transformers for Raytheon, UX213 or chemical rectifiers, center tap secondary and 6 volt center tapped primary $4.00. With 30H chokes to match $6.00. Unmounted chokes 30H—$1.75. 50H—$2.00. Write for new interesting list of transformers, chokes, meters, eliminator parts, etc. M. Leitch, 32 South Park Drive, West Orange, N. J.

ARRL sweater emblems should be worn by all League members. They are diamond shaped 5"x8" and made of best quality yellow and black felt. Only $1.00. No C.O.D.s. Eric Robinson, Jefferson Road, Webster Groves, Missouri.

SELING out—write for list. 7AAT.

I have some bargains in transmitters and transmitting equipment. Write for list. If you are a beginner and want to get in the transmitting game right, then write for my list. Dan Moore, Jr., Newark, Ark.

TRANSFORMERS Thordarson, plate, filament, eliminator and receiving at special prices. Headphones and battery chargers also special. For latest low-price list write 2APJ. 643-5 West 171st Street, New York City.

SELL transmitting and receiving equipment. Write for or send list. E. M. Hatch, 9 Sewall Ave., Brookline, Mass.

Q R A SECTION

50c straight, with copy in following address form only: CALL—NAME—ADDRESS.

1BMG—Charles H. Stevens, 94 Prospect St., Stafford Springs, Conn.

2AEI—William Green, 207 West 110 Street, New York City.

2AHP—Charles G. Roberts, Alpha Delta Phi House, Union College, Schenectady, N. Y.

2BV—Chas. M. English, 9 Park Circle, White Plains, N. Y.

2LH—Edgar Hoose, 527 Ovington Ave., Brooklyn, N. Y.

2MK—E. F. Raynolds, Central Valley, Orange County, New York.

3EF—Wendell H. Hosstelley, 101 Upland Terrace, Collingdale, Pa.

3KP—4828 N. W. 16th St., Washington, D. C.

3NN—Robert R. Achey, Quakertown, Pa.

4DP—49 West 4th St., Atanta, Ga.

4DV—W. M. Harison, 1004 Milledge Road, Augusta, Georgia.

4ES—455 N. E. 28th St., Miami, Fla.

5ALS—Leon Dellmon, 114 West Tenth Ave., Pine Bluff, Arkansas.

5MC—William L. Crafton, 901 West Walnut St., Blytheville, Arkansas.

7ND—W. Chester Campbell, 810 National St., East Las Vegas, New Mexico.

6BJG—T. D. Garcia, Van Nuys, Calif.

6CZB—Frank L. Robertson, 429 S. Greenleaf Ave., Whittier, Calif.

7ACG—John Leonard McMillan, Lexington, Oregon.

7QA—7IY—Wm. Donald McKeeth, 412 Seventeenth Ave., S., Nampa, Idaho.

8BAG—F. A. Lidbury, 33 Sugar St., Niagara Falls, N. Y.

8CEG—Warren McDowell, Canaseraga, New York.

8RD—C. H. Vincent, 12694 Northlawn Ave., Detroit, Michigan.

8RS—Maxwell Scott, Whitney's Crossing, New York.

9BGO—W. O. Beasley, 708 Poplar St., Carthage, Missouri.

9BHP—Edwin C. Blanford, 1710 E. 20th St., Owensboro, Kentucky.

9BQF—Meinard Magedanz, LeSueur, Minn.

9CCQ—Vere Davis, R. F. D. No. 4, Braymer, Missouri.

9CEX—Edward Seppla, Dollar Bay, Michigan, Box 65.

9CIG—Ray E. Cryder, Morris, Illinois.

9GT—C. W. Johnson, 1914 S. Troy Street, Chicago, Illinois.

9QW—Frank S. Casper, 1219 Wentworth Ave., Chicago Heights, Ill.

9WR—R. B. Parmenter, 324 South 39th St., Louisville, Kentucky.

oa5HG—H. M. Cooper, 51 Hastings St., Glenelg, South Australia.

sb1BN—Nanto J. Botelho, Rua General Polydoro, 104, Rio de Janeiro, Brazil, S. A.

nc4CU—Walter J. Beaumont, 9674 Jasper Ave., Edmonton, Alberta, Canada.

sc2FF—G. W. Fisk, 308 Victoria Road, Tientsin, N. China.

eg2RG—C. A. Richardson, 20 Craignish Ave., Norbury, London, England.

NEZB—U. S. S. Briarcliff, Pier No. 7, Tompkinsville, New York.

enOWC—W. H. and C. de Beaufort, den Treek, Leusden (U) Holland.

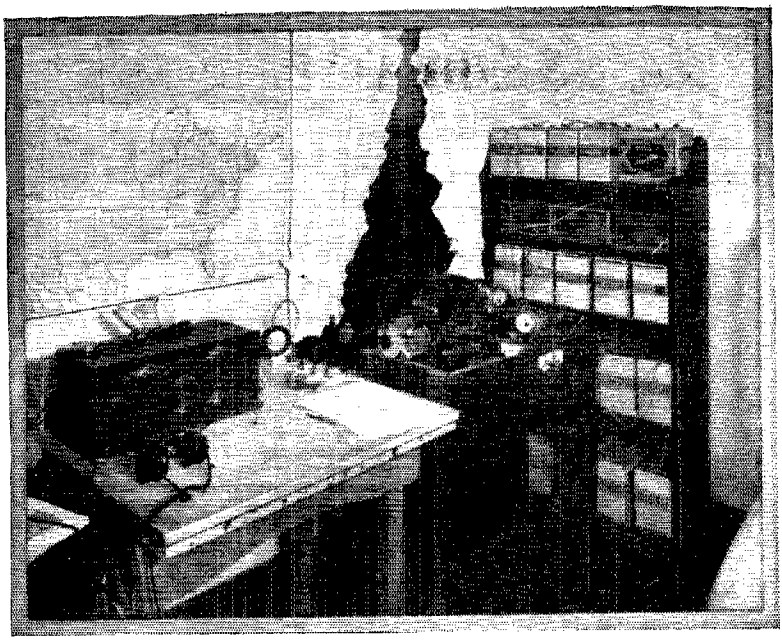
opWUCC—W. N. Haltiwanger, Pettit Bks., Zamboanga, P. I.

su1GG—W. Frigueira, Magallanes 1070, Montevideo, Uruguay, S. America.

The following stations belong to members of the A.R.R.L. Headquarters gang. Mail for them should be addressed care A.R.R.L., Hartford, Conn. When operating 1MK they use personal sines as indicated.

1MK Headquarters	1ES A. A. Hebert "ah"
1AL H. P. Westman "ws"	1GO L. A. Jones "lj"
1BAO R. S. Kruse "lq"	1KP - NRRC F. Cheyney Beekley "beek"
1BDI F. E. Handy "fh"	
1BHW K. B. Warner "kb"	1OA R. S. Kruse "lq"
1BUD A. L. Budlong "bud"	1SZ C. C. Rodimon "cr"

FOR YOUR CONVENIENCE
QST'S INDEX OF ADVERTISERS IN THIS ISSUE



Works every continent —*on Eveready*

AMATEUR radio station 9 EGW, owned and operated by R. T. Inman, Beloit, Wis., has worked every continent with his transmitter, the plate supply of which is a bank of 24 Eveready Layerbilt "B" Batteries. The De Forest "H" tube draws 110 M. A. from these batteries, and at the end of eleven months of daily work they are still in use, making nightly DX contacts.

"I am very much pleased with these batteries," writes Inman, "as they have long life under heavy load, and give the transmitter a pure DC note which has exceptional carrying qualities. The DX record with these batteries is every continent worked."

We believe that the Eveready Layerbilt "B" Battery No. 486 is the longest-lasting, most economical dry cell "B" battery ever built. Certainly its remarkable record at 9 EGW is ample proof of its ability to "last longest" not only on short wave transmitters, but on short wave and BCL receivers. Use the Eveready Layerbilt for plate supply and realize its remarkable economy as well as the absolutely pure DC it provides.

NATIONAL CARBON CO., INC.
New York San Francisco
Unit of Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night, 9 P. M., Eastern Standard Time, through the WEAF network stations.

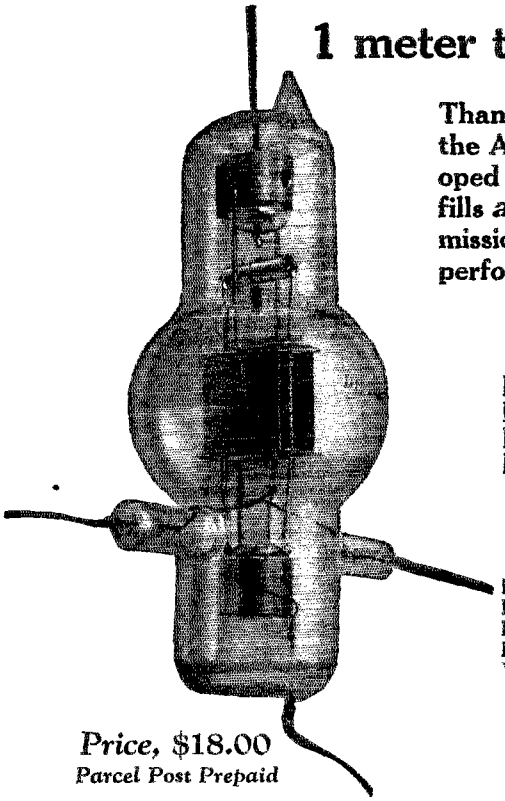
EVEREADY
Radio Batteries
-they last longer

Reliable

LONG DISTANCE COMMUNICATION

on

1 meter to 200 meters



Thanks to the co-operation of members of the A-R-R-L, De Forest has further developed the Type-H tube to a point where it fills ***all*** the requirements of amateur transmission. The result is still more uniform performance with extended filament life.

Technical Data

INPUT RATING 150 WATTS

Plate Voltage	500—3000
Plate Current	40-50 MA.
Fil. Voltage	10
Fil. Current	2.35A

HR Thermionic Rectifiers

Will operate 4 H Tubes

Fil. Voltage		10
Fil. Amperes		2.35
Plate Voltage A. C.		2000
Plate Mill Amps.		250 Max
Voltage Drop	400 at	250 MA
PRICE	$16.00	

Price, $18.00
Parcel Post Prepaid

Sold and Shipped Direct
Upon Receipt of Money Order

DE FOREST

TYPE-H

TRANSMITTING TUBE

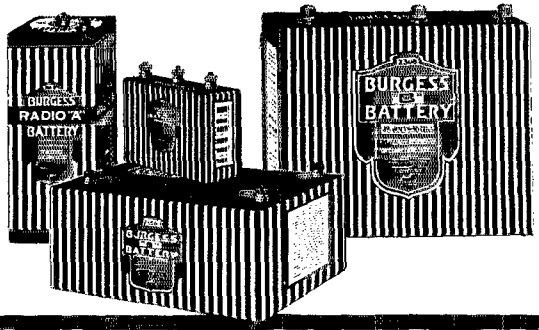
139 Franklin St. DE FOREST RADIO CO. Jersey City, N. J.

An acknowledgment of Our Debt to the Amateur

The growth of our amateur call list to proportions forcing, because of lack of space, the discontinuance of its publication in QST, impresses us with the responsibility accompanying such widespread preference for Burgess products. We feel now, that every effort must be made to ***maintain*** our position with the "ham."

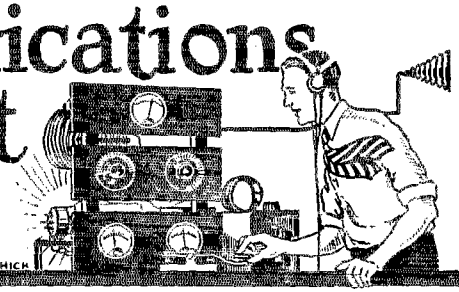
To this group, as much as to any other in radio, we owe a lasting debt of gratitude. It is one that we shall repay through constantly striving to make Burgess Batteries give ***longer*** and ***better*** service always.

BURGESS BATTERY COMPANY
General Sales Office, Chicago



BURGESS
RADIO BATTERIES

The Communications Department



F. E. Handy, Communications Manager
1711 Park St., Hartford, Conn.

Accuracy Counts

Mildred S. Lorentson. 1AID

THE message delivery situation is now receiving some attention. It is also about time that something be said and done about the condition in which messages arrive. Surely, a little attention given to ACCURACY by the operators engaged in message handling will prevent a message from being so badly scrambled by the time it reaches its destination that the place of origin has been completely changed and the text altered to correspond with the "guesses" of the operators through whose hands it has passed.

Surely, there is no disgrace in asking for a repeat when one has lost a word or two. I have received several badly scrambled messages but one I originated and started on its way to California takes the prize. The number and station of origin were garbled in addition to the sense of the text being materially changed. Instead of reading, "You seem to be having a FB time stop A QSL to your letter on way" the sense was changed to something like "You ought to be getting time to QSL my letter".

I believe there is no reason for a message to go through such a transformation before reaching its destination. When a repeat is necessary don't hesitate to ask for it. Disgrace is going to come from being caught in the garbling of some message that you relay rather than in asking for a QTA on something doubtful in a message. Read what the Rules and Regulations say about complete messages and the non-use of ham abbreviations in the text of messages Abbreviate in rag-chewing but don't try to save time in message handling when you are going to sacrifice accuracy by doing it. Let's cooperate and make message deliveries 100% perfect in quality, quantity, and correct transmission. ACCURACY COUNTS!

Expeditions Again!

THE Forbes-Leith Persian expedition (FLP) just leaving the States for Persia is the latest expedition to carry short-wave radio for general amateur contact. Charles Warren, Jr., 2AKV, (WN) was selected as chief operator. He expects to use a coupled Hartley circuit and 2,000 volt dynamotor and a quarter kilowatt tube transmitter working on 20, 34, and 44 meters. This expedition will probably be out about one year. This is not only the first expedition to Persia but the first land-going expedition to attempt contact from a foreign country with a transmitter of this type of construction. The expedition will be out for about one year. Both receiver and transmitter were built by R.E.L. Some regular schedules (7:15, 8:15 and 9:15 p.m. E.S.T. daily) have been arranged with New York Times' Station 2UO. It is urged especially that all the gang keep their ears on the job, connecting as often as possible for two-way work and sending reports to 2AKV's Hewlett, Long Island, N. Y., address from which they will be forwarded to him in a hurry. FLP is going to acknowledge to every station worked. Please give FLP your cooperation in the ways requested.

KNT, Zane Grey's yacht *Fisherman*, was worked for over an hour Jan. 18, by Balling of 8ALY when in port at Auckland, N.Z. 8ALY reported the sigs R5, 500-cycle note wavelength 37 meters, oz1AO and oz1FQ at the key. The following message was received for Headquarters and it is requested that everyone cooperate in KNT's short wave tests working two-way if possible and in any event reporting the transmissions overheard:

Auckland, N.Z. KNT Nr 1 Jan. 18
To Handy, ARRL, Hartford, Conn.

Zane Grey yacht Fisherman will be at N.Z. for next three months. We are expecting to work on short waves a great deal in that time. Would appreciate having reports on our signals sent care of Fred Dewey, 730 South Spring St., Los Angeles, 73's (signed) KNT.

6CKV is reported to have had the first U.S. QSO from Bay of Islands, N. Z. 6CKV reported the QRH as 34.5.

GMD, the Dyott-Roosevelt expedition, reached its objective and has started on the return trip. Operator Bussey reports that it became necessary to make a dugout canoe out of a tree—that they are now sailing down the River of Doubt expecting to be back in the United States sometime in April. The last message to be received came via sb1IB, 2FJ, 2AMJ, 2CTF on Sunday Jan. 30, stating that the gasoline supply for the M.G. set was exhausted thus closing the communication history of this successful expedition. 2ADH is responsible for sending us all the news on this expedition promptly. Thanks vy, OM.

As announced last month, the Wilkins Expedition has gone north again under the auspices of the Detroit News. Mason, 7BU, will be at Point Barrow and Walter Herrick, formerly 7SC, will base at Fairbanks, Alaska. 7½ watt crystal-controlled sets will be used with 50-watt power amplifier equipment whenever it is possible to transport the weight. The plane at Barrow will not carry the 50-watt amplifier. Calls and wavelengths will be same as last year: KFZG and KFZH 24, 35.5 and 73 meters.

Everyone keep on the lookout for sigs—and as usual let us have reports as soon as this or any other expeditions are worked so we can follow the progress of amateur contact from month to month in QST. Burgess batteries are used.

The *Larsen*, ARDI, was worked for 20 minutes Feb 7 by Sterling, nc4AL who used two 201A tubes with 220 volts DC on the plates and about 18 watts input!! vy FB! ARDI is a whaler in the antarctic and was on 33 meters when nc4AL worked her. More reports of contact with expeditions are requested. Please let's have more definite information on just where they are located when worked, too, OMs.

The Swedish motorship, *Laponia*, xemSJB, leaving Cuba, Feb. 24 uses 42.2 meters, 500 cycles and is anxious to test with U.S. amateurs.

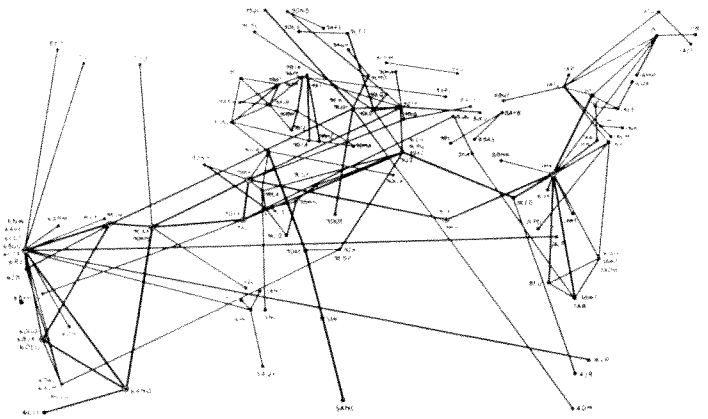
5AT of New Orleans accomplished a bit of fast work a while ago. He phoned a message given to him by KDWU, the yacht *Fortuna* located at Fort Myers, Fla., to the District Superintendent of the RCA in New Orleans and gave the answer back to KDWU. the whole process required but three minutes. Have to go some to beat that for speedy relaying. FB!

With the Route Managers

ANOTHER month has rolled around, and with it has come a fine collection of R.M. reports. Of course there are still a bashful few who have not been heard from yet, but we'll hope they will get up courage enough next month to drop us a line. And by the way, if any of you have suggestions to make that will help others in their work, be sure to send them along with your reports next month.

Now it's about time we all became acquainted, so "meet the gang". Here's a list of all the R.M.'s appointed to date:

Del., Md., D. C.: E. W. Darne, 3BWT.
East. Pa.: E. L. Maneval, 8EU.
West. Pa.: H. S. Myers, 8BRC.
South N. J.: Ed Raser, 3ZI.
West N. Y.: H. E. Frost, 8AYB.
Illinois: F. J. Hinds, 9APY.
Kentucky: L. H. Howard, Jr., 9ABR.
Ohio: J. P. Turner, 8AU.
Miss.: W. H. Moffat, 5AGS.
North Dakota: M. C. Adams, 9DKQ.
South Dakota: John Berg, Jr., 9DWN.
North Minn.: N. H. Schensted, 9CPO.
East. N. Y.: Herbert Rosenthal, 2QU.
N. Y. C. and L. I.: E. Roberts, 2AFV.
J. R. McKenna, 2AVB.
David Talley, 2PF.
M. E. Solotar, 2CYX.
J. B. Kilpatrick, 2EV.



SOME MORE CONSISTENT TRAFFIC ROUTES

Iowa: B. E. McElwain, 9CZC.
Kansas: Vernon Dennis, 9BGX.
Missouri: J. W. Stone, 9DAE.
Nebraska: L. F. Burwell, 9BFG, (C.R.M.)
A. H. Cumming, 9EBL.
Connecticut: C. B. Weed, 1BHM.
East. Mass.: E. L. Battey, 1UE.
West. Mass.: R. S. Brown, 1AAL.
New Hampshire: C. B. Evans, 1OC-BFT.
Idaho: C. C. Anderson, 7JF.
California:—
East Bay: J. H. MacLafferty, Jr., 6RJ (C.R.M.)
J. Geritz, 6CTX.
W. G. Smith, 6CCT.
Len Bullis, 6BGB.
L. A.: H. G. Pearce, 6DDO.
J. M. Hayes, 6BAV.
Jack Barsby, 6BBV.
San Diego: Juan Rodriguez, 6CGC.
Santa Clara: C. J. Camp, 6BMW.
Arizona: D. B. Lamb, 6ANO.
Montana: L. H. Bolen, 7PU.
N. C.: P. G. Isenhour, 4MI.
West Va.: E. L. Murrill, 8AMD.
Colo.: T. E. LaCroix, 9DKM.
Ala.: C. T. Harrison, Jr., 5DL.
Okla.: J. C. Cardin, 5ANL.
L. M. Edwards, 5FJ.

There you are. And now that we know each other, let's get down to business. Carrying on from last month, you will find another map of consistent traffic schedules on this page. These maps ought to be of benefit to everyone in routing traffic efficiently.

Now for the reports. Some of you are still sending in lists of actual station-to-station schedules. Keep it up. While there is not enough available space in *QST* for it all we will try to provide RMs with information on schedules. Be sure to list the times and days of regular station operation in your next report. Here's the dope for this month:

MISSOURI—RM, J. W. Stone, 9DAE—St. Louis: 9ZK, 5:30 pm Mon. Fri., 10:30 pm Wed., and all night Sat., 80m. Warrensburg: 9DAE, 5-6:30 pm daily 80m.

NEW HAMPSHIRE—RM, C. B. Evans, 1OC-BFT —Concord: 1OC, 6-8 pm daily, 75m.; 1BFT, 8-10 pm M. W. F., 8 am-4 pm Sun., 38m.; 1AVL, 4-7 pm daily except Sat. Sun., 37.8m.; 1AOQ, 4-6 pm daily, 10 pm on nightly, 39.5m.; 1AIP, 10-12 pm daily, 38.5m.; 1AER, 10-12 pm every other night, 39m. Manchester: 1IP, 6-8 pm daily except Thurs., Sat., 78m.; 1JN, Sun. afternoon, 82m. Hampton: 1AEF 6-8 pm daily, 79m. Claremont: 1ATJ, 5:30-8 pm daily, 76m.

LOS ANGELES SECTION—RM, H. G. Pearce, 6DDO—Los Angeles: 6DEG, 6:30-7 am Tues. Wed. Sat., 39m.; 6DDO, 6-8 pm and 19-11 pm daily, 38.2 and 40.8m. Pasadena: 6BBQ, 5-7 am daily 38.9m.

SAN DIEGO SECTION—RM, J. Rodriguez, 6CGC —San Diego: 6AJM, 8-8:45 am daily, 38m.; 6CGC, 10 pm Tues. Fri., 39m.

COLORADO—RM, T. E. LaCroix, 9DKM — Denver: 9DKM, 6-10:30 pm daily, 81.5m., and 6-8 am daily, 40.5m.; 9CJP, 8-10 pm daily, 37.5m.; 9EAM, 9-12 pm daily, 81m.; 9CDW, 8-10 am Thurs., 6-10 am Tues., 40.5m. 9BJN, 5-6:30 pm daily, 37.5m.; 9CDQ, 7-9 pm daily, 78m.; 9DWZ, 7:30-8 am daily, 37.5m.; 9CNL, 6:30-10 am daily, 40m.; 9CAA, 6:30-8 pm M.T.W.F.S., 84., and 8-10 am daily except Mon., 39m.; 9CBH, 5:30-9 pm daily, 79.5m. La Junta: 9CDE, 6-10:30 am daily, 40-80m.

OKLAHOMA — RM, L. M. Edwards, 5FJ—Norman: 5FJ, 9-11 am and 6-8 pm daily, 39.5m.; 5AMO, 10-12 am and 10-12 pm daily, 40m.; 5AVB, 6-10 pm daily, 38m. Fairview: 5VH, 12-12:30 am and 7-8 pm daily, 38m. Enid: 5ANT, 12-1 pm and 6-8 pm daily, 41m.

WESTERN MASSACHUSETTS—RM, R. S. Brown, 1AAL—Worcester: 1AAL, 6-8 pm daily, 10:30-12 pm Thurs. Fri. Sat., 79m., and 6-7 am Thurs. Fri. Sat., 39m.; 1DB, 10:30-12 pm Mon. Wed. Fri. Sat., 80m., and 10:30-12 pm Tues. Thurs Sun., 40m.; 1GR, 6-7 pm daily, 40.32m.; 1BIV, 10:30-12 pm, 80m.; 1ASU, 5-8 pm daily, 40m., and 10:30-12 pm daily, 80m.; 1AJK, 10:30-12 pm daily, 80m.; 1AQM, 10:30-12 pm daily, 80m.; 1UM, 11:30-12 pm daily, 80m.; 1JV, 10:30-12 pm F. S. S., 80m.; 1YK 10:30-12 pm daily, 79m. Springfield: 1EO, 6-7:20 pm Mon. Wed. Thurs., and 5-1:30 pm Sat. Sun., 78m.; 1APL, 5-8 pm Sun. M. W., 79m.; 1AWW, 7-8 pm daily, 78m. Pittsfield: 1AZW, 7 pm daily except Sat., 76m.; 1ARE, 10:30-12 pm daily, 80m.; 1AAE, 6-8 pm daily, 39.5m.; 1AZD, 10:30-12 pm daily, 85m. Greenfield: 1AOF, 6-8 pm daily, 85m., and 8-10 pm daily, 41m. Chicopee: 1AAC, 5-6 pm daily, 42m.

That's all there are this time.

You have all seen many foreign-bound messages floating round and round for weeks before they finally either die on the hook, or get to some foreign point. This is due mainly to the fact that we don't know just where to place these messages to get them out of the country. Hence the following list of stations having reliable foreign contact: Australia—1AAO, 1AXA, 1BHS, 1BKE-AKM, 1CMP, 1CMX, 4DD, 4TS, 6AM, 8GZ, 9DNG; Belgium—*8AVD; Brazil—1BHS, 6AM, 8GZ, 8JG; Chile—*5APO, 6AM, 8GZ; England—*1BQD; France—1BHS, 4DD, 9DNG; Germany—4DD; Hawaii—*6NP,

*6AMM, *6CSX; Jamaica—9DNG, *2AG; Japan—*6AJM, 9DNG; Italy—1CFI, 3CDQ, 4DD; New Zealand—8GZ; Philippines—*6AMM, *6AJM, *6BHR, *6BJX, 7PU; Rhodesia — 9DNG; So. Africa — *1XM, 2BO, *2NZ, 4DM, 4IZ. Those stations honored with a star are ones having definite and regular schedules with the foreign country under which they are listed. Please send traffic for these points through some of these reliable stations. Let's see some more stars next month. Just because you have this list, don't start originating a bunch of worthless messages for the foreigners, and remember that many countries allow only experimental traffic to be handled by amateurs.

Experimental traffic is usually defined as that which does not compete with or lessen government revenue from existing government telegraph and cable services. Messages between amateurs regarding the technicalities of station construction adjustment or operation, messages regarding short-wave amateur tests, those concerning I.A.R.U. and A.R.R.L. activities—in short, messages that can be classified as relating to non-commercial business conducted by non-commercial organizations can be freely handled while personal and business messages which would otherwise go by R.C.A. or cablegram will be refused by foreign amateurs in countries where only "experimental messages" may be handled. A partial list of these countries follows: England, France, Germany, Australia, New Zealand, Belgium, South Africa, Spain, Ireland, Denmark, Madeiria, S. India, Indo-China.

There are absolutely no restrictions on traffic handling with the following countries and the chances of handling a large number of citizen radio messages and rendering a real service to the community are excellent: United States, Hawaii, Philippines, Alaska, Brazil, Chile, Uruguay, China.

Please remember that this R.M. work is going to be most helpful in improving our relaying practise, bringing it closer to A.R.R.L. standards. Every O.R.S. should cooperate with his R.M. and S.C.M. to improve our organization. Get behind the officials of your Section. Do your best in handling traffic at the same time you enjoy one of the finest sports and hobbies on earth, and it won't be long before we'll able to start a message with assurance that it will be sent accurately and delivered promptly. And by the way, when you send in your reports, please be sure your name, call, wavelength, and regular operating times are included.

About 20-Meter Work

WHILE it is too early at this writing to say anything about the 20-meter tests held during February, it is safe to say from the number of reports received recently that 20-meter activity is booming. More stations are getting in readiness to QSY to that wavelength daily. Not only is a good bit of transcontinental work going on but foreign amateurs are at last putting out good signals and a good number of contacts over great distances have already been made, some on extremely low power. While perhaps the greatest amount of activity is observed on Saturday and Sunday, there is plenty going on all the time. Most stations prefer 20-meters for long distance daylight work, but plenty of fellows are finding "20" equally useful after dark—also over great distances.

A good wavemeter is as essential to successful 20-meter work as to work elsewhere. However, if you are going down to "20" in a hurry it is possible to check up with a fair degree of accuracy by looking for some "landmarks" either near the 20-meter band or else by finding familiar "marker" stations in other bands and using the proper harmonic of your oscillating receiver to check a point or two. NKF has crystal controlled transmitters on 37.3 and 74.8 meters. WIZ similarly marks the top edge of the 40-meter wavelength band which is assigned to U. S. amateurs. On 20-meters WIK seems to be the best "landmark" at present, this station marking the upper edge of the 20-meter waveband used by U. S. amateurs. Below WIK lies the whole U. S. band and just a few degrees above WIK on the dial one runs into foreign stations that use their assigned 23-meter wavelength.

Just to show how different stations are stepping out on 20-meters here are some reports received by the Communications Manager from various sources

From 5QJ, New Orleans, La via 1ZL Feb. 1 6.15 pm EST on "20", "The following stations heard here Sunday Jan. 30: 1ADM, 2DY, 3BWT, 4EI, 4QY, 5APG, 6RM, 7EK, 8ALY, 9KU. Worked: 8CT, 8CBI, 8BDP, 8DHU, 6VZ, 1ZL." 1ZL himself (Bridgeport, Conn.) reports working 7EK at Everett, Washington at 9.00 pm EST Feb. 1 using just his lone CX-210 tube with 27 watts input. He says, "It's great sport, this 20-meter work. 7EK gave me r-5 and reported steady sigs. He was R-7-8 here. 9CAJ and I ran a test at midnight but N D.—his sigs had dropped out then. We will run more tests and send you dope." 1ZL has recently worked the following stations: Daylight: 4SI, 9AHQ, 9DPW, 9DBW, 9AYB, 9CP, 9FK, 9XX, 9EIR, 9EAS, 8NT, eg5HS, nc3GG. Night: 6BUX, nc4DW. Stations heard but not worked yet: ef8CT, nc4BT, ef8DI, nj2PZ, oh6ACG. Here's a list of stations worked by 9DBW (Northfield, Minn.) on "20": 9BYL, 1AAO, 8ALY, 1CMX, 6RW, 8BKM, 8AXA, 5RZ, 8ALY, 5WZ, 1VF, 6BAU, 8BTR, 6ADP, 200, 1BYV, 8DEM, 2CTF, 1APV, 2GP, 6FZ, 6BXR, 2GP, 7PU, 1MY, 1CJR, 2AOL, 1ADM, 6ANN, 8AHD, 6BIH. 8NT (Buffalo, N. Y.) has worked: 9EIR, nc4DU, 8BDP, 9QS, 9ATQ, 9CYB, 5WZ, 9DPU, 6NX, 6ANN (often), 6ZAT, 9ASM, 9BND, 9DBW, 9KV, 5QL, 9DAC, 6LH, 5ACL, 9RG, 5WZ and 5DQ. 5RZ (Greenville, Tex.) says, "I find 20 meters mighty good for day work and at night too when there is anyone on that wavelength. It seems to me night work on 20 meters is just as good as on 40 contrary to belief otherwise. I work 1's, 2's and 6's right along at night. Suggest more stations get down on "20" to relieve the congestion on 40-meters." 6CCR (San Francisco, Cal.) says, "Your bulletin was FB this time with the 20-meter dope. I dropped down on "20" and raised oh6ACG first shot with a report of R-7 and steady—worked him single for about half an hour. Also worked nc4AF, 8BPL, 9BYL, 9CAW, 9ASM, 7EK, 6RM, 6LH." 20-meter calls-heard Jan. 16-20 by 1BVB Westerly, R. I. (all cards QSLed): 4DM, 4RR, 5ACL, 6BIH, 8DGX, 9CN, 9CP, 9EK, 9KV, 9AFA, nc3GG. From 1ADM, "20-meter stuff sure FB, have been able to QSO somebody in Europe every Sunday for over six weeks now. Got the QRA direct from iACD the second time we clicked." 8BAG (Niagara Falls, N. Y.) worked eg6YQ and heard eg5HS, eg2KF Feb. 6. 4QY (Ft. Myers, Fla.), "Worked 1CAW four times yesterday and 20-meter sigs reported R-6 at 3 pm. Was also QSO 9's, 8's, and 6RW at 8 pm and reported R-4 then." 8BEV copied eg5HS and worked egBVJ Jan. 26. 8DBB (E. Sparta, Ohio) has a 20-m crystal-controlled set and is glad to test with anyone on the 20-meter band. 9EK and 2NZ have worked sc3AG on 20 meters. 2NZ is probably the first "2" to work oh6ACG, the contact taking place Feb. 10. Strout reports the sigs very good and steady until 11:20 p.m. E.S.T.

South American and Australia are in on the 20-meter work as well as England, France and Italy and it is hoped that South Africa, New Zealand and other countries having lots amateur activity will have tossed their hats in the ring for some 20-meter records by another month. 1BIG heard eg2DZ, eg2KF and eg5FS and worked eg6YQ with 10 watts input. oa7DX asks the gang (thru 8NT) to look for his 22 meter sigs each Sunday morning between 0200 and 0430 G.C.T. 8NT and 9CP report Uraguay as the most active 20-meter country in South America. su2AK is FB in Buffalo as late as 9 pm EST. 9CP worked su1CD twice, QSS R4 up to R7, between six and 7pm C. S. T. and reports that 2JN and 6ZAT also hooked him. 1AMU reports hearing su2AZ, 2AK and 1CD regularly between 2 pm and 8 pm EST. 6AOD suggests that an occasional "20" sent before the call will help receiving stations and eliminate unnecessary calling without result due principally to the fact that some 40-meter stations with a strong second harmonic are often copied on the shorter wavelengths.

These reports of 20-meter work drifted in from different points and so are a very good indication of a generally increasing interest all over the country in what is doing on 20-meters. Everyone is finding out something new about 20-meters and having some good fun and solid QSOs with even low power outfits. The 20-meter band is just getting started for regular amateur business. There are lots of vacant kilocycles, plenty of nice opportunities for traffic work over great distances and on schedule especially, also there's a good gang of old timers who are doing the pioneering and with whom one can have some

nice rag-chewing and friendly contacts. The experimental possibilities in finding what's necessary to give a steady, fairly broad signal best for solid two-way communication are tremendous. Hop to it, fellows.

—*F.E.H.*

OFFICIAL BROADCASTING STATIONS

Below we are listing again the up-to-date schedules of the active A.R.R.L. Official Broadcasting Stations. These stations use the wavelengths specified in parenthesis after their calls and broadcast regularly at the times given, the time specified in each case being local standard time for the city where each station is located. The schedules become effective automatically upon their publication in *QST* and remain in effect until corrected or supplemented in later issues.

It is now possible to select one or more stations in order to listen for the broadcast at a definite time and wavelength, although you will probably "run across" the broadcast at some time during the course of ordinary listening.

O.B.S. are requested to send the broadcasts slowly enough and with steady, even, keying so that even beginners can make use of the broadcast information. Each week the latest news of expeditions, A.R.R.L. schedules, tests and important amateur news of the hour will be sent from the League's Official Broadcasting Stations. About the time this notice is published some changes in the working arrangements of the Broadcasting system will be made in order to cut down the time between the writing of the Broadcast message and its transmission from the individual stations in order that everyone actively on the air be posted with as up-to-the-minute Headquarters news as possible.

The operators of the various stations are willingly giving up part of their time to this work and will appreciate it if you will drop them a card saying that you copied the Official Broadcast from them on schedule. Headquarters will be pleased to have any suggestions for making this service of still more interest and value. Only thus can we improve. There are plenty of stations in this list so that some of them can be heard in every part of the country. Listen on the wavelengths given and see for yourself.

1AID (41) 10:00 am Sun; 1AMU (19.5) 7:00 pm Wed.—6:00 pm Sun; 1AOF (41) 6:30 pm Mon.—(85) 11.30 pm Sat.; 1AYJ (41) 9:30 pm Mon. Fri.—8 am Wed.—(77.5) 10 pm Mon.; 1BEP (80) 10:30 Tues. Thurs. Sat.; 1BFZ (81) 7:00, 10:30 pm (39) 12:30 Wed. Sat. Sun.; 1BIG (75.5) 7:00 pm daily; 1BQD (37.8) 5:30 pm daily; 1BVB (38) noon and 11 pm daily; 1BZ (39.4) 7:00 pm Tues. Thurs.; 1CKP (38.5) 7:00, 10:30, 12:30 pm Mon. Sat.; 1CMX (38) 7:00 pm Mon. Wed. Fri.; 1GA (38.35) 7:00 pm Tues. 10:30 pm Tues. Thurs.—(19.175) 12:30 pm Sun.; 1MK (78.5) 11:00 pm Tues. Wed. Thurs. Fri.; 7:30 pm Mon. Wed. Fri.; 2ADH (41.2) 12.00 am Sun.; 2APV (37.57) 7:00, 10.30 pm Mon. Thurs.; 2CTH (38) 7:00 pm Tues. Thurs.—(20) 7:00 pm Sat. Sun.; 2PF (76.5) 10:30 pm Wed.; 3ALE (78) 7:00, 10:30 pm Tues.—(40) 12:30 pm Tues.—7:00 pm Fri. Sun.; 3BWJ (40.9) 7:00 pm Mon. Wed. Fri.; 4JR (78.9) 7:00 pm Mon. Wed. Fri.; 4OB (37.5) 7:00 pm Mon. Wed. Sat.; 4TR (40.03) 7:00, 10:30 pm Tues. Fri.—(80.06) 7:00, 10:30 pm Thurs.; 5ACL (38.5) 7:00 pm Tues. Thurs. Sat.—(21) 12:30 pm Sun.; 5ADA (41) 7:00 pm Sat.; 5AKP (38) 8:30 pm Sun. Wed.; 5ANC (81) 7:00 pm Mon. Thurs. Sat.; 6AMM (19.5) 12:30 pm Sat.—(19.5-39) 7:00 pm Tues. Thurs.; 6BJX (40) 6 pm daily except Sun.; 6BXD (40.5) 7:00 pm Mon. Wed. Fri.; 6CLK (41) Tues., Thurs.; 6:30 pm. 6CLP (41) 12:30 pm Sat.; 6UO (76) 10.30 pm Mon. Wed. Fri.; 7PU (40.5) 7:00 pm Sat.—(80.5) 10:30 pm Sat.—(20) 12:30 pm Sat.; 8AHK (39) 7:00 pm Wed. Sat.; 8APC (19.3) 12:30 pm. Sun.; 8BHM (42.5) 7:00 pm (85-CW and phone) 10:30 pm Sun. Wed. Fri.; 8CEO (76.5) 7:00 pm Mon. Wed. Fri.; 8DME (84.3) 7:00 pm Thurs. Fri.; 8EQ (82.5) 7:00 pm Wed. Sat.; 8EU (84) 7:00 pm Wed. Fri.; 8PL (37.67) 5:30 pm Mon. Wed. Fri.; 8ZH (76) 7:00 pm Tues. Fri.; 9ADR (37.5) 7:00, 10:30 pm Thurs.—(20) 12:30 pm Sun.; 9AGL (79.5 or 39.75) 7:00, 10:30 pm Mon.; 9AUG (42) 10:30 pm Wed.; 9BKJ (83) 7:00 pm Tues. Thurs. Sat.; 9BQO (40) 7:00 pm Tues., Thurs., 9CET (38) 11:00 pm Mon. Thurs.; 9CGY (77) 7:00 pm Thurs.; 9CJS (180) 7:00 pm Wed. Fri.—(41) 12:30 pm same days; 9CNL (40) 7:00 pm daily; 9CPM (38.05) 7:00 pm Tues. Thurs. Sat.; 9CVR (40) 10:30 pm (also midnight) Sat. Sun.; 9CZC (76) 10:30 pm Wed.; 9DAE (81) 7:00 pm Mon. Wed. Fri.; 9DPJ (80.55) 7:00 pm Mon. Wed.; 9DWK (200) 10:30 pm Sat.; 9EGU (37.5) 7:00 pm Mon. Wed. Fri.; 9HP (39) 7:00 pm Tues.; 9KZ (80) 7:00, 10:30, 12:30 pm Tues. Sat.; 9MN (88) 6:30 pm Mon. Wed. Fri.; 9RR (82) 10:30 pm Tues. Thurs.; 9ZC (84) 10:30 pm Sat.; nc2AL (37.8) 12:30 pm Sun.; nc3AKP (52.5) midnight Wed.; nc3AZ (79) 7:00 pm Tues.—(52.5) 10:30 pm Wed.; nc3CS (41.82) 7:00 pm Sat. Sun.—(52.5) 10:30 pm Wed.; WOAX (240) (voice) 12:20 pm Tues. Fri.

CLUB ACTIVITIES

BRITISH COLUMBIA—The British Columbia Amateur Radio Association expects to occupy new quarters in the rear of 5HB's place very shortly. A set will be installed.

CALIFORNIA—At a recent meeting of the Western Amateur Radio Association, photos of NKF and a very interesting talk were enjoyed.

The Oakland Radio Club is holding regular meetings, and its membership is rapidly increasing. It has applied for affiliation with the A.R.R.L.

At an A.R.R.L. meeting recently held at the Commercial Club in Los Angeles, Colonel Foster, 6HM, and Director Babcock, 6ZD, gave very interesting talks. Original entertainment was provided by 6BYX, 6CHZ, 6BJX, and others. Several suggestions and resolutions were passed. 9IL was a visitor who attended. Every one had an exceptionally good time.

The Santa Clara County Radio Association is now in its new home at 45 East Santa Clara St., San Jose, with a 900 cycle outfit working as 6SV.

DISTRICT OF COLUMBIA—Chief Supervisor of Radio, W. D. Terrell paid high tribute to the spirit of the radio amateur, speaking at a dinner of the Washington Radio Club. He stated that he had been identified with amateur radio since Aug. 13, 1912, and had found his dealings with amateurs very pleasant indeed.

ILLINOIS—The New Trier Radio Club of Kenilworth is planning on giving code practice to all who are interested in amateur work. This is FB. Regular meetings are held, and are very well attended.

A code class has just been concluded at the Western Electric Company's Hawthorne (Chicago) works, where 90% of the telephone equipment for the U.S. is made. Two courses in radio are conducted by the Hawthorne Club. One deals with fundamentals, while the other delves into analysis of various phenomena. The club, having noticed an increasing interest in amateur communication, began a series of code classes with several radio operators as teachers. 160 enrolled, among them 15 women, 70 of the 160 completed the 10 weeks course fully qualified to pass the government examination for amateur radio operators. Instruction was by means of signals produced by feeding the output of a buzzer through a power amplifier to a loud speaker. This is one of the most active amateur industrial organizations in the country. Tubes are tested and reactivated free of charge to members.

At a recent meeting of the Chicago Radio Traffic Association, 2LO, of Sydney, Australia, gave a very interesting and informative talk. The present membership of the club is about 85, all of whom are active.

MICHIGAN—The City of the Straits Radio Club is busy getting details arranged for the coming Michigan State A.R.R.L. Convention to be held in Detroit.

NEW YORK—The Radio Club of Long Island held a theater party which will be remembered as one of the most enjoyable events of many a year. A popular show was followed by a midnight supper at a fashionable restaurant, and pleasure reigned supreme.

PENNSYLVANIA—The Lansdowne Radio Association has recently elected 3ACF, 3BG, 3CKH, 3BQP, and 3BAL as its officers for the coming year. The club has a crystal controlled outfit on the air, and is reaching out exceptionally well.

TRAFFIC BRIEFS

foA3B recently tried to take a long A.R.R.L. message from 2CUQ about the 5-meter tests but he had to give it up due to very heavy QRN. Getting in touch with 2BO who was getting through to South Africa about R-5, A3B got the message phoned and sent by radio (after 25 minutes of telephone contact). The S. A. work took about 3 hours and after 2BO put the long message through, he took some special stuff bound for Westinghouse, 8XK which was delivered promptly. Good work, everybody.

ARMY AMATEUR NOTES

Captain A. C. Stanford, Liaison Agent at Ft. Monmouth held the first of a series of nation-wide competitive tests Feb. 21 and 25. The test consisted in the reception of six messages, each with 20 five letter words or code groups sent at various speeds from 2CXL. On Monday, Feb. 21, 3 messages were sent from 2CXL on 80 meters at 10pm, 11pm, and midnight, EST. On Friday, Feb. 25 three messages were sent at the same times on 40 meters. Each amateur copied as much of each message as possible, sending the test messages with time, name, and address to Liaison Agent, Fort Monmouth, N. J. As soon as the results are known, the best scores will be announced in *QST*.

1ST CORPS AREA—Mr. D. S. Boyden, 1SL, and Army Amateur Representative, has been appointed First Lieutenant in the Signal Corps Reserve, and Radio Advisor to the Corps Area Signal Officer. The A. A. work in this area is being reorganized. The Area will be divided into fifteen Monitor Districts, each in charge of a Monitor Station. All present schedules have been cancelled, and stations are requested to get in touch with the Commanding officers of their local National Guard Units for new schedules and information.

2ND CORPS AREA—A marked improvement in the A-A activities was shown during the month of January. 8HJ, N.C.S. of Western N.Y. Net, 8VW, 8BHM, and 8DME continued their good work in keeping all A.A. schedules. All A.A. stations should consider the new schedules of prime importance, and should make every effort to keep them. 2ASE, N.C.S. of Eastern N.Y. Net, has established reliable schedules with 2SC, and is organizing net schedules for the A.A. stations in his Net. The Bronx net has been fully organized, due to the efforts of 2CYX, the N.C.S. Schedules are kept by 2CVS, 2ALP, 2BAD, 2AWU and 2APV. 2CJJ is a new A.A. station. 2ARM, 2APD and 2ADO kept all net schedules in the Brooklyn-Staten-Island Net, under 2PF as N.C.S. 2AKV has resigned as the N.C.S. of the Long Island Net, and is succeeded by 2AVB. 2AUE is the alternate. 2KS resigned as N.C.S. of the New Jersey Net, and his place is taken by 2OU, who is busy getting the bunch organized. 8HJ is holding down his end as the N.C.S. of the New Jersey N.G. Net in fine shape. Over 400 amateurs attended the A.A. meeting for the Hudson Division, held recently in New York. Captain Stanford of 2CXL, and Colonel Gibbs, the 2nd Corps Area Signal Officer were present.

3RD CORPS AREA—A Net comprising all A.R.R.L. affiliated stations is in operation under 3SN as N.C.S. 3IC has a couple of new prospects for A.A. work in this Corps Area.

4th CORPS AREA—4IO, the N.C.S. is keeping weekly schedules with 2CXL. All amateurs interested in A.A. work in the 4th Corps Area should get in touch at once with Mr. James Morrs, 4IO, 1765 North Decatur Road, Atlanta, Ga.

5TH CORPS AREA—A.A. work in this area is at a stand-still. 8BYN and 8GZ have been doing their best to stir up activity, but have not been too successful. 8DPT, of the Ohio National Guard, is now on 40 meters. Any amateurs in this Corps Area interested in A.A. work should write at once to 8BYN.

6TH CORPS AREA—Activities have been going strong here, under 9AFF as the N.C.S. 9DTK and 9AZN have been doing excellent work, and are to be congratulated. It is very necessary that National Guard Units get equipped as soon as possible.

7TH CORPS AREA—5QH, 5ANN, 5AQN, 5ABY, and 5AIP are the A.A. stations, with 5AW as the N.C.S. The net will be expanded as soon as possible.

8TH CORPS AREA—The Nets in the states of Tex., Okla., and New Mex. have been working very satisfactorily. Owing to lack interest, no nets have been formed as yet in Colorado and Arizona. More stations are wanted. 9BYC, 9DPP, 9BCW, 9BNG, 9CAA, 9CDW, 9DDF, 9DKM, 9DQG, 9EEA, 9AQG, 9BJN, 9AON, and 9DVL have applied from Colorado, and 6AZN, 6CDV, 6BJF, 6CBJ, 6AAM, and 6AZM have applied from Arizona. More are needed. All interested please get in touch immediately with Mr. L. D. Wall, 5ZAE. 5AIN, the N.C.S. of the eighth corps area has kept fairly reliable communication with 2CXL. 5WW is the most active station in the area.

9TH CORPS AREA—6RW, the N.C.S. has been handling traffic daily with 1BD, Camp Nichols, P. I. The following stations are commended for their co-operation in recent tests: 6RW, 6KW, 6HJ, 6PW, 6TA, 6UM, 6LS, 6BHG, 6RV, 6CRS, 7YA, 7PS, 7ZN, 7ABB, 7ZJ, 6ATB, 6DAI, 6BVG, 6DAH, 6DDO, and 6ARX.

The Roberts' Cup

As a special inducement to Philippine and American amateurs to keep well acquainted, Lt. Hadyn P. Roberts is offering two cups, one for the Philippine amateur station that handles the most traffic with the States, and one for the American station who handles most traffic with the Philippines. The traffic is to be counted from April 1, 1927 to April 1, 1928 inclusive, and an award committee at A.R.R.L. Headquarters will make the award based on station logs and message files submitted by contestants. The "Roberts' Cup" will be awarded again the next year and will be continued indefinitely as long as there is sufficient interest shown.

TRAFFIC BRIEFS

WANTED—QRA's. Please, please put a positive *and complete address on all messages you originate.* There is no rhyme or reason in trying to put through a message with an address like "Mrs. Smith, San Francisco, Calif." And unless you are sure that you know the addressee's present address, better not try to reach them via radio.

"Just make your *schedules* and you won't need to worry about traffic.—You just can't help handling piles and piles."—2ADH.

J. R. Miller, 9CP, and the Narwhal Tusk awarded to him for the best amateur radio contact work in handling traffic with the Putnam Expedition, VOQ during its trip into the Arctic in 1926. The "twisters" go around the tusk five times. This tusk is 6 ft. 3 in. long and has a cone shaped hole in its base 18 inches deep. It is one of the very few in the country. When propelled by a live narwhal, the single tusk is often rammed right through a small boat. Anybody want a fight with a narwhal?

Lt. Roberts of op1HR is now stationed at McCook Field, Dayton, Ohio doing some interesting work in connection with the Air Corps at the Signal Corps Radio Laboratory. He expects to be on the air soon—and from the air as well as from the ground.

On the way back to the States he visited amateur radio stations in China and Japan—said they all had *QST* over there. His report on conditions is of general interest. Radio equipment is contraband (munitions of war) in China but once smuggled in there seems to be no law enforcement to prevent its use. In Japan it is even worse, and although equipment can be purchased no transmitters are licensed. These amateurs are working under tremendous difficulties but have the same old amateur spirit that carries us through successfully. Lt. Roberts had many a wild goose chase in locating stations but finally found several and was surprised at the neat, efficient, and modern transmitters. For the most part the location had to be poor since the set must always be concealed. Signals from the States are reported to be louder than in Manila, P. I. and there are plenty of U. S. hams heard over there.

BRASS POUNDERS' LEAGUE

Call	Orig.	Del.	Rel.	Total
6BBQ	88	32	463	583
3BWT	86	86	335	507
8ALG	79	27	375	481
8VZ	225	32	179	436
1BFT-OC	156	18	222	396
6AYC	50	8	326	384
6AMM	34	98	246	378
8CWT	27	69	282	378
9EK-XH	118	179	72	369
1ATJ	12	10	332	354
9DTK	26	35	284	345
6AXW	239	10	94	343
6BJX	94	94	115	303
6AM	48	242	8	298
2CYX	102	90	105	297
9BKV	64	22	210	296
9CZC	4	17	250	271
5APO	30	23	206	259
8XE	36	22	197	255
9DXY	19	32	196	247
1MK	52	77	113	242
6RW	20	75	130	225
8BAU	11	7	202	220
1LM	11	8	194	213
6RJ	35	32	144	211
8EU	26	66	118	210
4OM	82	82	44	208
nc3JL	97	18	86	201
9DWN	36	28	136	200
9CAA	24	26	143	193
8AVK	32	18	142	192
3CBT	26	—	164	190
8AVB	36	12	140	188
9DOE	74	18	84	176
1BIG	9	36	125	170
8DNE	45	4	120	169
3CKL	61	12	94	167
2ANX	52	11	102	165
2BCB	32	18	102	152
2AWU	10	36	100	146
6ZBJ	25	7	114	146
6CCT	25	35	85	145
9EJQ	6	8	129	143
8KA	24	12	106	142
6BVY	49	93	—	142
8DED	39	24	78	141
6ANO	6	—	134	140
9ZK	31	8	98	137
5ANC	34	8	94	136
2QH	37	22	76	135
1BIL	66	33	32	131
7MP	37	7	86	130
3AWT	16	26	83	125
1NK	5	9	110	124
9CEH	30	30	64	124
4MI	6	16	100	122
9BQH	101	11	10	122
6ABM	20	3	98	121
1BFZ	24	5	92	121
1AEF	11	1	108	120
7PU	12	6	100	118
4BL	17	27	74	118
6BDL	46	8	63	117
8BRB	31	11	75	117
9WR	20	4	92	116
9DGW	1	7	106	114
5ANL	25	19	70	114
4LG	5	11	98	114
5AMO	12	17	84	113
6ALZ	56	14	42	112
5FJ	34	21	56	111
1AOQ	30	36	44	110
1AVL	10	—	99	109
2ALP	28	62	18	108
1IP	23	12	72	107
1DI	42	2	62	106
8CQG	8	9	88	105
8CNH	23	6	76	105
4TR	41	37	24	102
9APY	58	28	16	102
1BIV	15	26	61	102
op1AU	63	35	4	102
1BKV	16	1	84	101
9DLD	16	23	62	101
9DAE	19	6	75	100
7ABB	31	1	68	100

6BBQ takes the honors this month and we are glad to be able to list him in first place. 3BWT pulled up into second place by the usual consistent work. That *schedules* are responsible for the fine traffic records made by stations in the Brass Pounders' League is easily apparent both from the reports of the different individual stations and from a glance at the map of traffic routes given elsewhere in these columns both this and last month. Keep some reliable schedules for traffic work everyone and let's see a bigger B. P. L. gang next month.

TRAFFIC BRIEFS

During the Christmas Season, 6BJX's quick and absolutely dependable message service to the Philippines won a lot of public approval for himself and A.R.R.L. as well. He has a thick file of appreciative letters received from the recipients of amateur radiograms delivered through his station. Such work as his during the past year brings its own reward in the knowledge of worthwhile accomplishment.

8DK, of Cincinnati, Ohio, transmits press news of interest to A.R.R.L. members every day except Sunday at 6:00 PM EST, on 38.7 meters. At 4:00 PM on the same days, code instruction for future amateurs is given. This is FB work!

Fred Best, of 1BIG and Traffic Trophy fame, has been presented with the Queen City Radio Club Trophy. Congratulations, "SF". The trophy is a fine cup about a foot high, and properly engraved. Here it is in the photo—it isn't everyone who can win two trophies at once.

Among other important traffic handled by op 1AU and nu6BVY was one message to a Cincinnati hospital asking for a report on the condition of one of the patients. An answer was returned to the Philippines in just four days from the filing time of the message—not such bad service!!

Don'ts for the Dumb—from the W.R.T.A. Bulletin.

Don't expect to work New Zealand the first night you are on the air.

Don't hope to raise anyone with a note that does a Charleston all over the frequency scale.

Don't get the idea that the figures 210 on your transmitting tubes mean the plate current you can apply. They don't.

Don't make your monthly report to the S.C.M. and watch what happens to your ORS appointment.

Don't blame the fellow you are working for failure to copy you when you use a key that back-fires like a Ford.

Remember, fellows, that when you say you are QRV for traffic, the party at the other end believes you and gives you his messages. Then you should certainly come back and at least say "nd". Don't quit and leave him in the lurch, not knowing whether or not his messages are o.k. A good op is always ready to QRS for you if you request it. So after this, don't say QRV unless you really want to tackle some messages.

Watch for "ES" of 1GN. She is the new YL op of the first district. She is on mainly to work her brother, Clyde Smith, who is at 1YK. Why don't some more of you fellows get your sisters to operate?

Have you your copy of the ninth edition of the Rules and Regulations yet? It's now available to A.R.R.L. members upon request.

C. W. DeRemer, old op1CW, has left the Philippines and is now located at Fort Leavenworth, Kansas, where he is operator in charge of the Army Net station.

United States and Canadian hams are requested to listen for ebCH5 who is testing a new system of crystal control, as laid out by eg5NN. CH5 works on 45 meters nearly every day between 11 pm and 1 am GMT.

DIVISIONAL REPORTS

ATLANTIC DIVISION

DELAWARE-MARYLAND-DISTRICT OF COLUMBIA—SCM, A. B. Goodall, 3AB—Delaware: 3AIS has been heard both on 80 and 40 meters lately with an extremely good punch. He reports using a Hertz antenna chiefly on 40 meters. 3AJH reports consistent operation on 80 meters. 3ALQ reports working practically all districts with a 203-A.

MARYLAND: 3CFX is an example of what B-battery plate supply can do. This station apparently is developing into a good traffic point. 3PS reports shooting the 50 watter. This business of hiring and firing 50's makes a great life for us amateurs. 3RF and 3ACW are boning hard at some school work at present so they won't be heard for a while. 3VI succeeded in working South Africa on his H tube. 3OP was home for a short while but has gone to sea again. 3CGC is on especially for the PRR work.

DISTRICT OF COLUMBIA: 3BWT, as usual, rings up a high traffic total. He is working schedules approximately on the 5-point plan and finds it successful. 3GP reports getting traffic over to the west coast and back inside of a few minutes. 3CAB is out of town considerably which is cutting into the excellent traffic reports he has been knocking down recently. 3NR introduced a filter in the plate supply of the transmitter during the month and noted the improvement immediately. 3ASO is making preparations to forsake the 200-meter band and is expected to be on 80 meters shortly.

Traffic: 3CGC 24, 3PS 20, 3CJ 14, 3BWT 507, 3AB 68, 3GP 58, 3NR 51, 3ASO 63, 3CAB 18.

EASTERN PENNA.—SCM, H. M. Walleze, 3BQ—Our BPL gang took an awful flop this month. How come? We would like better cooperation from you *fellows with the RM, 3EU. Even tho you have all* the skeds you can handle, QSO Maneval and give him the set-up so he will know how things stand.

3AWT hit the high spots, but is bothered by BC harmonics. 3AVK is busy as usual. 3CBT, a new ORS, and ex op at 8ZO, made a nice showing. The rebuilding is all finished at 8WH. 3ADE popped his 50. NAI and WNW QRM's 3HD very badly. 3CW is DXing. 3BFE is cutting a figure on the west coast on 80 and low power. 3BIT blew his MG. 3AIG failed us this time due to school QRM. 3CMO rebuilt and is getting a 50. Kind BCLs cut 3CCQ's mast down. 3BCL ditched 40 and is now on 80. 3LW is messing with his new Xtal. 3AIY says the 40 M. gang is fast coming up to 80 and QRM is fierce. 3BQP came up and so did his total. FB. 3VF has been ill. 40 still holds 3CDS. 3BFL is active on 80. 3LM can't find room for a good antenna around his apartment. (Use the BCLs. Hi). 3ZM wants to QSO the 200 M. gang if there happens to be any. 3AY is going to move. Santa couldn't have brought 3NP a water-cooled tube—he says there ain't none such guy. Hi. 8RT chucks mean sigs into the lands beyond. 8ADQ had some hard luck that we can't mention here. Some freak tube is keeping 8AVL busy. 3AFQ is working on the RR. 3JJ sticks to 40. 3SM is teaching his OW (to be) the code. Hi. 3BMS cut a figure in the DX circles. 8DQG continues to perk OK. 3AUV has a husky C.C. transmitter. 3JN boosted his power. 3BUV handled a few on 40. A gang of PRR traffic passed thru 3AKW. A good many reports failed to arrive. A few were late. DON'T FORGET THE TEN MSG LIMIT.

Traffic: 3AVK 192, 3CBT 190, 3AWT 125, 3ADE 60, 8BFE 54, 3AKW 39, 8RQ 35, 3BMS 37, 3AIG 34, 8CCQ 32, 3SM 28, 8ADQ 29, 3BQP 22, 8DQG 18, 3NP 14 8CDS 14, 3AIY 14, 3JJ 12, 3AY 12, 3JN 10, 3AUV 9, 3CW 9, 3LW 8, 3BFL 7, 3BIT 6, 3VF 5, 3BUV 5, 3BLC 4, 8AVL 3, 8RT 3, 3ZM 1, 3AFQ 1, 3LM 1, 8WH 1.

SOUTHERN NEW JERSEY—SCM, H. W. Densham, 3EH—The old gang is back on the job strong again and it sure looks good to see the totals rolling up.

3UT came through high man but 3CFG gave him a close run with 3ZI and 3SJ running up. 3ZI is back on the air again at his own station and has been piling up traffic like he did in the old days. 3BWJ will soon have his crystal controlled set on 80 meters. 3CFG blew his 210 and the new one he bought was defective. 3XAN is giving up the game and has requested cancellation of his ORS. 3UT is running a code class and has four students already. 3ALX sends in his report from 8XE, where he is one of the ops during school term.

3KJ has been off the air for some time due to business QRM. 3CO, our boy wonder, burned up his power transformer. 3SJ reports 138 contacts in twenty-four days. The new address of the SCM is 112 Ardmore Ave., Westmont, N. J., but the mail address remains the same, Collingswood, N. J. 3AIO has been off the air but is now coming on again with a 100-watt set which is nearly completed.

Traffic: 3OQ 14, 3ZI 49, 3SJ 45, 3CO 1, 3KJ 4, 3CBX 3, 3UT 77, 3CFG 75, 3BWJ 2, 3BEI 1.

WESTERN PENNA.—SCM, G. L. Crossley, 8XE—The SCM is rather dissatisfied with the reporting of the Section. In the first place, the ORS do not report regularly. There were 7 out of the 37 in this section that did not report this month. 3 of the 7 lose their ORS for failure to report. I believe *this is entirely unnecessary because it takes so short* a time to report that one could do it while eating their breakfast or having their after-dinner smoke. The next point is the number of stations having an ORS and month after month report a total of 4 to 10 messages. This is not the spirit of the ORS, but instead it should be a spirit of traffic handling, and I am quite sure that any station can handle 30 messages in a month without half trying. The next thing is the idea of square play. *Just think* of a Section handing in a report like this: Orig. 214, Del. 6, Rel. 7. Now that is not doing for the other fellow as much as you expect him to do for you.

8CRR had a bit of hard luck when sleet broke down his mast but he worked North Dakota with the mast on his tin roof. 8JW is busy with exams at Swathmore as well as all the ops at school. 8ARC, 8BRM, 8XE, 8VE, 8AGO, 8DKS, 8BRC, and 8CEO report PRR. Congrats, McAuly, as Biddle's successor to Central Region PRR Radio Manager. 8BRB is going to the coast as a commercial op. 8DNO has a slogan "back to the fundamental and down to the Hertz". 8CWT, 8BBL, 8AXD and 8XE have been trying 20 meters. 8GI has crystal control and complains of the BCL harmonics in the 80 band.

8CKM has a new receiver and will be on soon. He says the receiver is a peach. 8CLV says he has failed on his reports because he has been moving. 8DOQ is rebuilding and at the same time increasing power to 2-210 tubes. 8CEO is trying to *stop some of* the BCL comment by way of education in the line of wave filters. And as I understand, he is making some filters adjusted to his wave and giving them to some of the loudest yellers. FB.

Traffic: 8CWT 378, 8XE 255, 8BRB 117, 8GI 94, 8CEO 74, 8CFR 64, 8AGO 48, 8BRC 41, 8DFV 37, 8AJU 35, 8VE 32, 8AMU 22, 8BRM 18, 8GK 14, 8ARC 14, 8BBL 14, 8DNO 10, 8CRK 10, 8DKS 9, 8CYP 9, 8ABS 9, 8AGQ 2, 8AXD 1.

WESTERN NEW YORK—SCM, C. S. Taylor, 8PJ—Three stations made the BPL this month. Several ORS have gone through and several are under investigation up to the time of this report. 8AYB, the new RM is on the job in good shape, having schedules with Ohio and Indiana. 8BAG had good luck on 20 meters the first hour of transmission by working 2 stations in England and he's all het up about it.

8ABG is handling traffic and some schedules. 8ABX came home from WJZ for the holidays and held schedules with 2DY run by ex3CG. 8ADE is now quite popular with foreigners working eg-6MU every Sunday morning at 0945. 8AYB has confined most of his work to local U.S. traffic. 8BCL works Savannah, Ga., on a 201-A and also handles traffic. 8BCZ has a new 50 watter and handles regular traffic. 8BFG handles a few messages and is looking for more traffic. 8BGN popped his 203A and is now using a UX210. 8BHM handled quite a bit of Xmas traffic. 8BLP keeps schedules with 2AXX and 8FX. 8BMJ handles traffic. 8RQK is down on 20 meters and says it's FB. 8BYE dropped his A battery on the terra firma and now is awaiting the repairs to same. 8CCR is now using crystal control and says it's FB. 8CDB handled a message to oz3AF about S.A. rebels. 8CDC has quite a bit of traffic. 8CEG and 8RS are new additions in the District. 8CNH has a new pipe mast and works Calif regularly with remote control set just completed. 8CNT only worked 847 stations this month.

8NT works Australian 7DX each morning at 7.00 am EST. 8QB handles traffic and schedules with 8ARC and 2QS. 8SD, ex8DPL, works the 6th district stations on a UX210. 8VW handles Army-Amateur Net traffic and has schedules with 2SC daily.

Several stations holding ORS appointments are delinquent in reporting. Please take notice of these few remarks and act at once or it may be necessary to revoke a few certificates.

The Seneca Vocational School has been added to the list of new ORS this month and reports from the school will be forthcoming as there are several operators at 8YP. 8BFN works the 5th district stations.

Traffic: 8DNE 169, 8CNH 105, 8CNT 104, 8BHM 84, 8AKC 72, 8AIL 70, 8CDC 70, 8DDL 54, 8BFN 17, 8CDB 51, 8AHC 47, 8SD 30, 8DME 28, 8VW 28, 8HJ 27, 8BMJ 34, 8CCR 25, 8AVJ 22, 8ANX 20, 8ARG 18, 8DRJ 18, 8AKS 16, 8CVJ 16, 8ADE 13, 8BQK 13, 8NT 13, 8QB 10, 8BCZ 9, 8ABG 8, 8ADG 7, 8AYB 7, 8BGN 6, 8DSI 6, 8BFG 5, 8BLP 5, 8BCL 4, 8BAG 2.

CENTRAL DIVISION

KENTUCKY—SCM, D. A. Downard, 9ARU—9OX is holding his own in the 1MK-6BJX trans-continental route. Schedules are responsible for his traffic figures. 9ATV is a newly appointed ORS at Lexington. At last we have an ORS at Lexington that can be depended on for reports. (Yes, it's intended as a slam for you other fellows that HELD ORS). 9EI has been on—off and on. He broke his first crystal. 9LH and 9JL are both inactive at this time. 9BCL is rebuilding. 9CDN lost his plate transformer. He is working on a crystal. 9EP is back from a trip south and will be on when this is in print. 9BAZ is back again. 9ABR worked English 2BZW on 39 meters. 9MN moved down to 20 and worked 6CLN at noon. 9KZ is using crystal control. 9ARU is on regularly in the 80 band. 9HP worked AQE and was reported R4.

Traffic: 9WR 116, 9OX 95, 9ABR 82, 9ARU 28, 9BWJ 26, 9ATV 15, 9HP 7, 9MN 12, 9BAZ 4.

WISCONSIN—SCM, C. N. Crapo, 9VD—9EK has schedules with NAJ, 9DTK, 9DOE, 4DM, 6ZBJ and would like a good reliable schedule with a station in the Dakotas or Minn. 9DTK has changed his power supply and is now using 2 old WE 212 D's. 9CFT is now our most northern station; if there are any stations in the northern part of the state, please QSO 9CFT or RM 9DLD or SCM 9VD. 9BWO sent in a good one—says some one rushed up to 9CYO's house and told him his house was on fire but it was only the flash-light bulb in his Hertz antenna. Hi. 9JM, a new station at Sturgeon Bay, has 120 w. input to a 203-A on 40 m. Welcome to our midst, OM. 9DND and 9DNB sent in their first report and are working on 20, 40 and 80. 9DCX sent his report via 9BSS and the air route but 9BSS didn't send in any report for himself. 9AGV is now working on 80 and finds more traffic. 9COI has several skeds around the state, working on 39.5 m. 9EAN gets home between semesters at U. of W. and gets a few msgs. thru. 9EHM says traffic scarce but probably due to lack of skeds. How about it, OM? 9EMD did a beautiful piece of work this month in getting out those Wisconsin Route Maps for 9DLD. Many thanks, OM, now watch Wisconsin. 9ANE has trouble getting out and getting traffic on 40. 9EAR thinks he could get more kick out of the old set on 150-200 and says 40 meters is the bunk. 9EGW was off the air most of the month—getting the set down to 40. 9EEM is a 10-watt stn at Manasha but he doesn't seem to get much traffic.

Traffic: 9EK-XH 869, 9DTK 245, 9DLD 101, 9AZN 58, 9CIB 53, 9BIB 39, 9DKA 35, 9CFT 35, 9BWO 33, 9DLG 22, 9JM 22, 9DND 21, 9DCX 28, 9AGY 20, 9COI 19, 9BJY 15, 9BPW 14, 9EAN 12, 9EHM 11, 9EMD 6, 9ANE 5, 9EAR 4, 9EGW 5, 9EEF 2, 9EEM 2.

ILLINOIS—SCM, W. E. Schweitzer, 9AAW—Fifty two ORS were cancelled this month because of failure to report. Five new stations were appointed: 9AXZ, 9CYN, 9RK, 9CWC, 9BWL. A total of 62 stations reported, certainly a record. Let's keep up the good work and see if we cannot have every station operating in Illinois report to the SCM before the first of each month. Every ORS must send in his form 1 report card each month if he is in operation during the month or not. Failure to comply with these regulations will mean cancellation of the ORS certificate.

The R-M, 9APY, is right on the job. Chicago stations are looking for outlets for their traffic. Any station desiring schedules should write him and he will put you in touch with several Chicago stations.

Traffic: 9CEH 124, 9APY 102, 9CIA 87, 9QD 84, 9BWL 67, 9EAI 65, 9DOX 63, 9NV 62, 9GE 61, 9AMA 46, 9AFF 44, 9CNB 43, 9SK 41, 9AAW 39, 9AMA 39, 9ALK 35, 9DXZ 35, 9CMX-9AMC 26, 9CN 26, 9PU-MI 26, 9BNA 24, 9BTX 27, 9DGA 20, 9ELR 20, 9AAJ 19, 9DYD 19, 9MZ 18, 9UB 18, 9CWC 17, 9AJM 16, 9DJG 16, 9RK 16, 9CSL 16, 9EHK 14, 9BVP 14, 9BL 13, 9CNP 12, 9BHT 10, 9DTR 10, 9NK 9, 9CZX 9, 9BHM 8, 9DXG 8, 9BPX 7, 9DLG 6, 9AAE 5, 9ALJ 4, 9CXC 4, 9ALW 3, 9BRX 3, 9BDL 3.

OHIO—SCM, H. C. Storck, 8BYN—Well, gang, you now have your new ORS certificates and we now have a good live bunch of ORS. Let's go. I *do* wish tho that some of you would get it thru your heads that you should send your reports on the 26th of the month, not earlier nor later as some are doing. Hereafter, reports not reaching 8BYN before the 28th will not be considered, as the SCM has been late in reporting several times because he held the report to catch the late-comers. 9BAU takes high honors for Ohio this month. FB, OM. 8AVB comes next and promises to make the BPL next month, too. 8BVR is now 8KA and turns in a good total. 8GZ has a Xtal on 7844 Kc. 8DJG was closed for repairs but turns in quite a few messages for the time he was on. 8CQU is on with schedules. 8DDQ says he needs a new filter. Donations are in order. Hi. 8EQ is also on with schedules. 8DFO has a Xtal controlled set now. 8DIH is a newcomer with a flock of schedules. 8DBM has been QRW with radio service work. 8DSY says he has been busy in many different ways but the SCM knows it's only an excuse. 8CMB says the "Three Musketeers" have 80-meter fones working in a three cornered system. 8AVX says he has been busy printing QSL cards. 8BPL is leaving us again for a few months. 8RJ is moving and will be off the air for a little while. 8CPQ has 8 sets—one on 80, 40 and 20. FB. How about 200, OM? 8BF says to shoot him your traffic for Australia and New Zealand. 8SI is using a 201-A with B batts. 8RN has put up a new pole and antenna. 8BSC is ready for schedules on any band. 8PL still insists there is no traffic. 8ARS is on some and goes strong when they are. 8BKM bought a new M-G. 8AZU is QRW school. 8AYO is on 41 meters flat and wants schedules. 8AKO lost his mast and 7½ watter. 8DEM still QRW school. 8BKQ is on 37.9 for traffic. 8AWX says 8DPQ is on with 50 watter and wet B Bat plate supply on 80 band. 8DIA had trouble with power supply and had to drop schedules. 8ACY is on with a new transmitter. 8CBI says he will have a mercury-arc rectifier soon. 8DQZ is still trying out new antennas. 8CLR says his tube doesn't want to light any more and he can't imagine what's wrong. 8AHH says he has tried for two months and the best DX is Columbus, Ohio. 8AEU doesn't like the quarterly ORS bulletin idea. Atta boy, OM, neither does the SCM. Too many fellows are sticking on 40 and not getting the traffic. The SCM knows, because he's one of them. The sooner more Ohio ORS realize that the higher bands offer more traffic, the sooner the totals will go up.

There is something real serious, tho, fellows that has to be taken up. The off-wave stations are on the increase, instead of decreasing. Let's hope that none of the Ohio ORS will be caught in the web. A big network of Official Observers has been thrown out and beware! Because action is going to be quick and drastic. Neither the SCM or A.R.R.L. Headquarters will stand back of any off-wave station. Watch your step, OMS. Another thing, there seems to be an increase in the amount of testing and needless interference, also, some of the Ohio gang as well as others have been trying out ICW and phone on 40. LOOK OUT. It's Dangerous!!!

This reads something like a sermon but the fellows to whom it applies need that much and more. Hope none of my gang are guilty.

Traffic: 8BAU 220, 8AVB 188, 8KA 142, 8GZ 75, 8DJG 72, 8CQU 59, 8DDQ 53,8EQ 51, 8DEO 47, 8DIH 47, 8DBM 44, 8DSY 40, 8CMB 40, 8AVX 34, 8BPL 33, 8RJ 33, 8CPQ 25, 8BF 19, 8SI 17, 8RN 16, 8BSC 15, 8PL 15, 8ARS 14, 8BKM 13, 8AZU 11, 8AYO 10, 8AKO 9, 8DEM 8, 8BKQ 6, 8DAE 6, 8AWX 5, 8KC 5, 8DGP 4, 8DIA 4, 8ACY 3, 8CBI 3, 8APZ 2, 8DQZ 2, 8IV 2, 8CLR 1.

MICHIGAN—SCM, C. E. Darr, 8ZZ—8DED has made the BPL twice and says he is going to try for it again. FB. 8AMS is frozen in with an antenna on the ground—18° below. 9EAY has completed his shielded receiver and says it's FB for weak DX. 9CSI is full of pep and going in to help the upper Peninsula gang out. 9ANT is another upper Peninsula man who does things with the A.R.R.L. spirit 8WO's crystal-controlled set is working some. Doc is strong for constant frequency transmitters. A gang of hams met at Monroe Jan. 23 and had a fine time. It was an enthusiastic demonstration of what Michigan hams can and will do. Michigan traffic reports are growing rapidly and more stations are reporting —a general increase in activity is bringing the desired results.

More stations are going to 80 meters in order to handle traffic with nearby stations at night. The traffic totals speak for themselves.

Traffic: 8LH 10, 8CCM 55, 8CWK 88, 8KN 9, 8CEP 68, 8JG 5, 8CQG 105, 8CPM 22, 8DCW 6, 8BOK 52, 8DED 14, 9CE 31, 8CRL 20, 9CSI 6, 9ANT 44, 8AUB 70, 8ZZ 12, 8QN 14, 9EAY 10, 8ADK 3.

INDIANA—SCM, D. J. Angus, 9CYQ—The Indianapolis Radio Club awarded their annual traffic prize of a 50 watt tube to 9ASJ who handled the most traffic during the year 1926. During 1927 the Club will give a traffic prize quarterly for the most traffic handled. 9BK is off due to a cold shack. 9CEY blew his Kenotrons and is now on with raw A.C. 9OG and 9CCL lost their calls due to inactivity. The Elkhart gang has a message handling contest and it was won by 9BQH with 122 msgs and was awarded a year's subscription to *QST*. 9ASX is going good, mainly on regular schedules. 9AUX is another that blew his Kenotrons and had to resort to raw A.C. 9CJJ is trying low power. 9ABP is fighting a soft 50 watter. 9BYI works regular schedules with 8DIH and others on 80. 9DUZ is experimenting with low power. 9AFA is on 20 meters with an H tube. 9EF is trying the same thing with a WE 50 watter. 9DIJ was presented with a blown 204A. He welded the filament and now is the local ether buster. 9BSK worked eg5HS on 20 meters and the east coast on 16.1. 9CP was QSO Cuba, Mexico and Australia. 9DGE of Minneapolis was a visitor at 9CP's joint. 9AFA uses a dynamotor driven by a storage battery so that if the juice goes off, he still runs. 9EJU has regular schedules on 176 meters. 9TE and 9DUK are two new stations at Muncie. 9CVX is trying for an ORS. 9DRH is going good at Peru. 9BKJ works 9DPJ at 3BQP regularly since 9DPJ left Fort Wayne. 9QR can't spend all his time on DX as he has to make demand meters at the General Elec. Co. for a living. 9CNC does all his daylight work on 20 meters and a 50 watter. 9DMJ is rebuilding since he passed the R. I.'s exam. 9EGE is going to 1 watt input on a 201A. 9ABW is on with a bunch of schedules, 9AIN is going better since he got his 1500 volt M.G. going. 9DYT is back to 80 meters and going to Purdue. 9CXG is back from the lakes but will take an ocean job if possible. 9CMV is looking for more regular skeds on 40 meters. 9DPJ is in Philadelphia temporarily. 9AEB is keeping regular east coast schedules. 9EBW is now rebuilt.

Traffic: 9BQH 122, 9DHM 71, 9BBJ 59, 9BYI 53, 9BUZ 46, 9CEY 38, 9DDZ 34, 9ASX 13, 9ABP 12, 9AUX 10, 9EF 8, 9BSK 8, 9CJJ 3, 9CP 2, 9ACR 63, 9DSC 34, 9CBT 24, 9CRV 17, 9AXH 8, 9APG 7, 9ALH 2, 9CLO 1, 9ASJ 30, 9BJR 20, 9DHJ 21, 9AEB 6, 9EBW 17, 9DPJ 21, 9CNV 23, 9DYT 26, 9CXG 20, 9AIN 42, 9ABW 36, 9EGE 18, 9CMJ 28, 9CNC 7, 9QR4, 9BKJ 19, 9EJU 10, 9DRH 28, 9CVX 4, 9BCM 10, 9CYQ 18, 9AYO 20.

DAKOTA DIVISION

SOUTHERN MINNESOTA—SCM, D. F. Cottam, 9BYA—Due to the holiday season and the general adjustment of the new year, this report doesn't show all the activity we hoped to record. Two new ORS are listed this month and both are doing good work. It is necessary that new material in the form of good active stations be added to the ORS list just as new business is added to any commercial house. If you wish to retain your appointment, either ask to be put on the inactive list in case you will be temporarily inactive, or else report regularly.

9CAJ, your R-M, is not receiving the cooperation he should. He is doing excellent work for what cooperation he has so far received but it is far from what he could do if he were given the information concerning your station that he should receive. Drop 9CAJ a letter or get in touch with him on the air, he is on a lot on all bands and he will put you on more routes than you can handle.

The Dakota Division Convention plans are coming through in fine shape. There is no doubt but what this convention will be second only to a National Convention. There are so many prizes already, including two crystals, that we are up a stump for enough contests, but one fifth of the manufacturers written have been heard from. Better be there and walk off with some useful apparatus besides learning how to use it correctly by listening to talks from nationally known radio men. 9DBC, a new ORS, is high man this month. 9CPM has new tubes, antennae and transformer. 9CAJ was off the air 2 weeks due to illness, but now keeps skeds with 6 foreign countries. 9BDW does DX on fone. He is building a crystal set with plug-in coils. 9CBE is very busy but he keeps one sked. 9BHZ wants sked with minneapolis on 40 or 80 at noon. 9DHP keeps 2 skeds, one with Jamaica. 9COS has had bum luck with 40-meter DX. 9IG is busy with school and at 9XI. 9NF will be on shortly at Lake Minnetonka. 9DZA reports a new ham. He is also boosting the Convention in fine style. 9DMA is at school so will be inactive. 9EFK has a new 203A with everything new including antennae. 9CCX is very busy at WCCO. 9DWO is busy with standard frequency skeds at 9XL. 9DEQ was QSO ef8RQ with a UX-210. 9AIR keeps one sked and is getting more from the RM. 9BOI is busy with school. 9ELJ is busy with school and ops at WAMD.

Traffic: 9DBC 68, 9CPM 38, 9CAJ 38, 9DBW 31, 9BYA 21, 9CBE 18, 9BTZ 14, 9BHZ 14, 9DHP 13, 9COS 13, 9BKX 12, 9IG 12, 9DZA 11, 9DMA 7, 9EFK 4, 9CCX 3, 9DWO 2, 9DEQ 2, 9AIR 1, 9GH 2.

NORTH DAKOTA—SCM, G. R. Moir, 9EFN—9BVF is on 80 meters. 9BJY has been trying to get a fone transmitter going. 9CRB is using 4 UX-210s. 9DM is on 40 and 80 meters. He has his motor-generator going now and wiggles right along. 9DKQ is on every night (39 and 82 m.) after midnight and sure works out in fine shape. 9DYV is making some changes in his set. 9EFN is working nearly every night with two ops at the key.

Traffic: 9DKQ 13, 9DM 4, 9CRB 1, 9BJV 2, 9BVF 13, 9DYV 2, 9EFN 27.

SOUTH DAKOTA—SCM, F. J. Beck, 9BDW—9DWM, the RM, put out his usual nice bunch of messages and has a good trans-con relay route. 9DGR works skeds with 9DWN and does a bunch of work on 80. 9BOT, a newcomer, started right out with a sked and has applied for an ORS. 9CKF has a 203-A now and handles quite a lot of foreign traffic. 9DB is on 20 with skeds with both coasts. 9NM, tho busy, handled a few. 9BBF still works on Xtal Xmitter and on 20 Sundays. 9TI, 9ALN and 9BKB are on occasionally. 9CFZ is a new station in Vermillion. 9CJS and 9AGL have been rebuilding. 9DIY has a new 50 and kenotrons. 9BNV, a new ORS, is rebuilding. 9BOW is on again doing fine low power work. 9CDS and 9CZG are new stations. 9AZR is having trouble. 9CNK is using a mercury rectifier. 9DID is testing on 40 with a new Xmitter. We urge all new stations to report to the SCM and if possible to handle schedules, write 9DWN at U. of S. D. More stations are needed on 80 meters.

Traffic: 9DWN 200, 9DGR 93, 9BOT 66, 9CKF 40, 9DB 21, 9NM 19, 9TI 16, 9BKB 7, 9BOW 7, 9ALN 4.

NORTHERN MINNESOTA—SCM, C. L. Barker, 9EGU—Three new stations sent reports in this month, and two or three of the old-timers have indicated an interest again and are with us once more. This is all very fine and seems to substantiate the SCM's comments on the Section activities increasing. FB, fellows, and thanks for the interest shown.

9AKM, a new ORS, leads the Section this month with highest traffic figures. 9CTW, another new ORS, at Delano, is building a new transmitter, but keeps the old one going while the new one is being finished. FB, 9EEP rebuilt his "15 watt set" so he can jump from 40 to 200 meters in three minutes. 9DUV has a grounded generator but found the trouble and works on 40 and 80 meters with remote control. 9BAY sure keeps a whole "raft" of schedules. 9KV reports good work on 20 meters and also tells that there is a new ham on the air in Duluth, 9DOQ, who is paralyzed in all but his right arm, and wants to chew the rag with the gang. Help him out, fellows. 9BMR has just finished rebuilding and promises to "knock-'em-dead". 9CKI has been held up a little, waiting for his new H tube. 9DKR has just completed a new precision wavemeter. 9BHY is a new station at

Cass Lake that is absolutely sold on the traffic end of the game. FB. 9BVH is now conducting a series of tests on different types of antennas, finding which particular type is best suited to his layout and location.

Traffic: 9AKM 65, 9ABV 53, 9EHO 40, 9EGU 35, 9CWN 33, 9CTW 29, 9EEP 26, 9DUV 26, 9BAY 22, 9KV 21, 9BMR 21, 9CKI 13, 9DKR 7, 9MF 5, 9ADF 5, 9BHY 2, 9BVH 2.

DELTA DIVISION

ARKANSAS—SCM, W. L. Clippard, Jr, 5AIP—The SCM is glad to report activities picking up in Arkansas. Several old timers coming back. 5NI and 5EP are new brothers this month. Welcome, OMs. Sure glad to have you. 5ER is a new OBS. 5KF uses mouse power but is sure FB. 5CK just added "another" fifty. Hi. Says QRM bad from banking. 5CJ reports 40 meters NG. 5SI is our new RM. FB, OM, let's make some schedules. 5IR is high total man this month.

Traffic: 5IR 48, 5ER 40, 5CK 14, 5PX 14, 5LV 10, 5AFR 10, 5WK 5, 5AIP 5, 5ABE 2, 5ABI 2.

LOUISIANA—SCM, C. A. Freitag, 5UK—There is some talk among the stations in this section of going back to 80 meters. The DX fever is dying out slowly and indications are that before very long the gang here will be settled down to traffic handling.

The Caddo Radio Club of Shreveport, La., (5OP) has come on the air with 50 watts on 80 meters. 5UK is also sending press to one of the old gang now commercial operator on a Standard Fruit and S/S Ship. This goes to him at 9.30 p.m. each night.

5QJ requests that anyone interested in 20-meter transmissions and reception get in touch with him. 5AT has been doing some fine work. For details, see Traffic Briefs.

Traffic: 5WY 3, 5ANC 136, 5EB 9, 5UK 31, 5QJ 2, 5AT 8.

MISSISSIPPI—SCM, J. W. Gullett, 5AKP—5AUB is rebuilding his transmitter and will use two 50 watters on the 40 meter band. 5KR worked a French Submarine off the coast of France (in the 40 band) while the submarine was submerged. 5AFV is back on the air on 40 meters. 5QQ has a schedule with 5QZ every night and he reports school QRM fierce. Hi. 5API reports working oh6AXW and KJOE and also reports a new brass pounder born Jan. 19th. Congratulations, OM. 5AAL has gone back to sea as a Commercial Op. Old 5AAJ has come back to town and is on the air now with a new call 5JP. 5AGS has decided to put in a rectifier to see if his two H tubes won't work greater DX. 5AKP has worked Italy and the Hawaiian Islands lately.

Traffic: 5AKP 42, 5API 41, 5ANP 37, 5QZ 35, 5QQ 27, 5ARB 19, 5AUB 11, 5AQU 5, 5AGS 1, 5KR 25.

TENNESSEE—SCM, L. K. Rush, 4KM—4FA leads the gang with the largest traffic total this Section has had in some time. 4HL is busy with exams at South-Western but found time to build a new receiver. 4LX is a new ORS at Nashville and is getting out in great style. 4AJ sends in his first report and comes second with the traffic handlers. 4DK reports as usual and has changed his QRA to 653 Rozelle St., Memphis. 4CU is heard and is still confined with a broken leg. 4FI now operates the BC station, WSIX and says that he will have lots of time to handle traffic. 4KX still pounds the key at 4KM on Saturday nights. 4KM is on both 20 and 40 meters now.

Traffic: 4FA 55, 4AJ 30, 4KM 28, 4LX 9, 4HL 8, 4DK 2.

HUDSON DIVISION

NEW YORK CITY & LONG ISLAND—SCM, F. H. Mardon, 2CWR—There seems to be a certain amount of laxity among some of the hams in getting their reports in on time. For the information of these fellows who happen to be ORS, also the others who are trying to become ORS—your report is supposed to be in the mails by the 26th of the month so that they will arrive at the SCM's QRA not later than the 28th. My reports leave for HQ on that date and any reports that arrive later than that date are not credited with reporting for that month, three such tardy reports and the ORS appointment will be cancelled.

Manhattan: 2KR now uses Kenotrons instead of S tubes. He gets improved results with a 10' indoor counterpoise instead of a 50' outdoor one. 2ALS reports "40" punk for traffic but "80" FB. He will soon have a xtal going. 2LD is doing fine work. 2BCB has been out of work for a month and spent his time to good advantage pounding brass. 2AIR a new station to report, starts off good. Keep it up. 2ANX has been sick but is OK again now. He says if it wasn't for BCB and himself, Manhattan would be dead as far as traffic is concerned. He is trying hard to get that inter-borough route going and requests that any Manhattan station desiring to get in on some real traffic handling to communicate with him at 410 E. 70th St. His name is Joseph Toman, Jr.

Bronx: 2BBX hasn't been on much but when on, he works fine DX. 2ALL has been off because of cracking his mercury arc rectifier tube. He has a new one now and will soon resume working. 2BNL still has nil to report. 2AWU is at KVB but his second op keeps the set on the air. 2ARD is back again after a long silence due to YLs. 2AHG is on the west coast on ship. WAY. He sends 73 to the gang! 2ALP is doing good work taking traffic from Italians and French hams. He is now NR3 Bronx net. 2CYX worked good DX and kept schedules with all stations in the Bronx Army-Amateur Net.

Brooklyn: 2PF with the aid of 2BRB is working on his xtal set using a plug-in coil arrangement. He will soon be heard on 77.7, 38.8 and 19.9 meters. 2APD is working loads of DX on 76 meters. 2BO is doing some real hard experimenting. 2WC says he has nothing to report other than that he is on every day with his xtal set on 42.7 and 84.15. 2AVR has changed from 3rd harmonic antenna and counterpoise with Hartley oscillator to Zepplin-feed Hertz with tuned plate-tuned grid. He reports a great difference, favoring the latter arrangement. 2CRB is rebuilding the main set and will soon be going again. 2ALV is his new portable call.

Long Island: 2AJE and 2AWQ are going strong. 2AUE is busy at school, but stays until the late hours of the a.m. handling traffic. 2AIZ and 2AEV have nil to report. 2AGU, a new station to report, has a 7½ watter and we may expect good things from him. 2CLG, 2AV and 2KX are very busy working but get on once in a while. 2AWX sure is keeping his end of the Island on the map, and only using a 210. 2BSL is doing his share of work with good results. 2AAS and 2AYJ are working foreigners quite regularly now. 2AVB, RM of L. I., is doing fine work and has a schedule with 2ANX daily for inter-borough traffic-handling. Get behind him, fellows, 2ABF has been sick but is OK now. He turns in his usual large report.

Richmond: 2AKK helps to keep things moving over in his neck of the woods. FB, OM. 2CEP has been busy on 180 meters with i.c.w. and fone. 2AKR is doing fine work with a CX-310. You want to get down to the A.R.R.L. Hudson Division get-to-gethers if you want the latest dope, fellows, those who don't get there are missing most of the good things that are going on within the division.

Traffic: Long Island: 2AWX 141, 2BSL 4, 2AAS 7, 2AYJ 32, 2AVB 55, 2AEV 19, 2KX 4, 2AV 6, 2AGU 40, 2AWQ 22, 2AUE 67, 2AJE 33, 2ABF 211, Brooklyn: 2CRB 2, 2APD 86, 2BO 78, 2WC 58, 2AVR 62, 2PF 17. Manhattan: 2KR 22, 2ALS 28, 2LD 20, 2BCB 152, 2ANX 165, 2AIR 6, Bronx: 2CYX 297, 2ALP 108, 2AWU 146, 2BNL 4, 2BBX 47, Richmond: 2AKR 29, 2CEP 15, 2AKK 24.

NORTHERN NEW JERSEY—SCM, A. C. Wester, 2WR—Traffic reports are coming thru fine every month. However, very few reports are being received from the Newark District, which boasts a lot of stations. 2WR, the SCM's station, is now on the air on 38.9 meters after a silence of 6 months. 2CYV, tho not very active, mailed a report which shows the correct spirit. 2AT uses 77.5 meters for relay purposes. 2JC can be heard with a new crystal controlled Xmitter. 2CO is Chief Op. at 2JC, the Bloomfield Radio Club station. 2EY is rebuilding a new receiver. 2CPD is also building a crystal set and reports it impossible to QSO Atlantic City on any wave. 2CGK can work on any band, tho he stays mostly on 75. 2CGK is also very QRW BCL business with 2CXY. 2KA never fails to report. 2CW is installing fifty watts. 2JN now has a fifty working with A.C. on the plates. 2ANB had the misfortune of blowing his fifty watter. 2ABE has a parrot which can actually send "CQ". Hi. 2CTQ has dropped to 20 meters using 25 watts input. 2BLM reports working four Aussies. 2IS maintains a daily schedule with 8DNE. 2AVL and 2AXP are too busy for amateur work. 2ADL has a new rectifier which emits pure DC. 2ANQ started a radio club at the Orange YMCA. 2ALM put in tuned grid and plate circuit and worked Europe 3 times during the first week of operation. 2ADU is off the air due to loss of an H tube. 2DX maintains a Sunday schedule with 8ABG.

2CQZ has finished a Mercury Arc rectifier which is capable of delivering 4600V at 2KW. 2BW blew his S-tube rectifier and is now rebuilding the same with Kenotrons. 2ARC has a new transmitter perking on 40 meters working schedule with nc8AW. 2AVK received a 50 watter for Xmas which just won't step out. 2QI was off for the month, due to illness.

Traffic: 2AT 28, 2CPD 83, 2KA 6, 2CW 9, 2ANB 11, 2CTQ 38, 2IS 54, 2ADL 15, 2ALM 55, 2DX 18, 2CQZ 12, 2BW 4, 2ARC 9, 2AVK 16, 2QI 3.

EASTERN NEW YORK—SCM, Earle Peacox, 2ADH—The list of ORS is gradually increasing. 2ABY and 2AHJ were added this month, while 2UF and 2ASE are on the waiting list. 2AGM wants to get his back again. FB. ORS operators need not worry about their msg. totals. DEPENDABILITY is the greatest qualification. As long as we know a station can be relied upon to handle whatever traffic comes his way, we don't worry HOW MANY he handles. Nevertheless, those stations that handle no traffic at all will be dropped. At present there are about 38 reporting stations, of which 18 are ORS.

2CYM has decided to dismantle the transmitter. 2QU is still battin' 'em out and report 20 foreign QSO's. 2AGQ and 2CYH have the Heebie Jeebies. 2ASE is sweating blood with a load of soup jars. 2XAJ is experimenting with a lab model of a new 75 watt bottle. 2CUZ was QSO Australasia with 100 watts input pure DC. 2ASF is a new one. 2CTF is after the BZs.—several GMD messages were speared. 2AHJ has a WE 212-A but no socket. 2BOW is back on 80 from 40, but brought his new fifty up with him OK. No inter-stellar records were broken at 2CNS this month. 2PV and 2ADH let their subs to QST run out. 2ADH has a new station in with 2AAN. 2AML has a steady job with an orchestra. He's no flute blower, tho. 2LA reports one msg. originated. A WE 50 is sitting pretty at 2DD. The Australians complain of the QRM (next door). 2AAN has been working the Aussies right along with A.C. and now it's being rectified. 2APQ had a stiff tickler but he put some vaseline on it and now it goes into oscillation much easier. 2AG has a modulated crystal controlled set on 80 that knocks 'em under the table. 2UF will be on again soon with two big sticks. 2AJQ has rebuilt his station. 2BV is coming along FB. 2AHP with 8CBJ and 8WU at the key will be glad to make skeds for any time of day on 40. 2ANV's soup box is all dried up. (Try kenotrons for a change). 2CIL's brother is listening for GMD. He hasn't touched a key in 10 years but he can still copy CQ. Hi.

Traffic: 2QH 135, 2AHP 70, 2ASE 54, 2ADH 33, 2BOW 26, 2AML 24, 2CNS 21, 2PV 18, 2ABY 16, 2AHJ 9, 2UF 6, 2ANV 4, 2CTF 4, 2AGM 3, 2BV 3, 2DD 3, 2LA 1.

MIDWEST DIVISION

KANSAS—SCM, F. S. McKeever, 9DNG—The RM, 9BGX, would like all Kansas ORS to send their operating schedule along with their wavelength. He also wants more stations on the 80 meter band. 9CKV leads the state in traffic. 80 meters and schedules did the trick. 9DSR is showing up well as a new ORS. He has a fifty on 40 and is QRV traffic. 9BHR can QSY to most any band but is working most on 20 meters at present. FB.

9CV has the mercury arc working now. 9CET says DX is not what it used to be but at that, he worked nearly everything on the air. 9AEK is QRW but is on some. He put in break-in system and thinks it's FB. 9BGX reports traffic on 80 meters plentiful and invites the gang to come up.

Traffic: 9CET 42, 9BYQ 87, 9BGX 17, 9DNG 44, 9AEK 19, 9CNT 17, 9CKV 67, 9DSR 12, 9BHR 25, 9CV 5, 9CVL 4, 9DFK 9, 9LN 8, 9COR 2, 9DEP 4.

NEBRASKA—SCM, C. B. Diehl, 9BYG—9DXY reports good traffic. 9AL is busy with Army-Amateur work. 9CJT is experimenting. 9EEW is on 20 meters. 9DFR is QRW YLs. 9EHW runs his commercial radio store. 9BYG is trying to get started again. 9ASD has been busy with Army work. 9BOQ keeps several schedules. 9DAC's first traffic report is a good one. 9DUO is on again but reports traffic light. 9DUH craves more action. 9BBS has rebuilt and is now ready for action.

Cancellations: Forced to cancel appointment of 9AKS as an ORS on account of QRM. 9AGD resigned his appointment because business duties require his time so he cannot tend to ham radio affairs.

Appointments: 9DAC and 9DI appointed as ORS this month. We all extend to them the greetings of the Section and wish them a long and happy stay.

Nebraska Week went over big. Reports on it will be included in next month's report. We had a lot of fun out of it if nothing more.

9DLA has very recently moved his station from Denver to Atkinson, Nebr. and is QRV Nebr. traffic and sends 73 to the whole gang. We welcome him to our Section and hope he stays long.

Traffic: 9DXY 247, 9AL 14, 9CJT 3, 9EEW 17, 9DFR 6, 9ASD 6, 9BOQ 28, 9DAC 48, 9DUH 6, 9BBS 10.

IOWA—SCM, A. W. Kruse, 9BKV—A slight increase in traffic this month indicates that the routes are working good and credit is given the RM, 9CZC for his consistent work in lining up routes and schedules. The 80 meter stations lead again with 70% of the traffic with the rest on 20 and 40. Watch your reports, fellows, some of you were a bit late this month and almost missed the report for QST.

9BKV takes the cake this month and the high total is due to a bunch of schedules. 9CZC (Chief RM) continues to bat 'em out. 9EJQ pushes out a mean signal with 10 watts. 9DGW made the BPL right off the reel. FB. 9DEA is operating every night on schedule, and continues to keep Oto on the map. 9DLR coaxed his transmitter down to 20 meters and says results FB. 9DRA notified his folks in Penna. of serious illness when the local telegraph office was closed. FB. 9BWN had QRM from college and his traffic total suffered. 9AED is very QRW and his total dropped. 9DAU sticks to 40 meters and handles traffic whenever he isn't busy. Hi. 9AMG, a new station in Council Bluffs, keeps a schedule with 9BHR. 9CGY works late at his office and seems to have hard luck with his schedules. 9DSL is still QRW with school work and doesn't get much time for ham radio. 9CS is on 41 meters. 9DTZ and 9EHN both pound away on 40 and promise more traffic next month. 9EGS is busy with his radio business and has no time for schedules. Don't forget the Midwest Radio Convention and Short Course at Ames, Iowa. April 15 and 16. Plan to attend OMs and bring your friends.

Traffic: 9BKV 296, 9CZC 271, 9EJQ 143, 9DGW 114, 9DEA 87, 9DLR 79, 9DRA 65, 9BWN 58, 9AED 53, 9DAU 31, 9AMG 27, 9CGY 23, 9DSL 15, 9CS 9, 9EHN 7, 9DTZ 7, 9EGS 3.

MISSOURI—SCM, L. B. Laizure, 9RR—9DOE and 9ZK did the heavy work in St. Louis this month, hitting the BPL. 9BEQ was third and 9BHI fourth. 9RF and 9BWD are prospective ORS. 9DZN applies for an ORS. 9ZK handled some PRR emergency work and keeps a PRR sked on 6 pm Sundays. 9DOE keeps a daily noon sked with 9EK, which has been in effect since November. 9DUD is moving the station and rebuilding for 100 watts with Hertz antenna. 9BHI also stood by for PRR sked Sundays.

9DAE hit the BPL for the first time in many moons. The RM is trying his best to get a 4 way set of skeds with good success except west. QSO between 9DAE and Kansas City is still a problem, tho QRO may help. 9RR has established a sked with 9CKV for western QSO which has worked well so far. Another with 9DXY seems subject to varying conditions and QSS and works part of the time. 9DVF reports ND on account of rotten QSO and too many man-hours per msg. 9DNV is a new station in Hannibal on 40 and 80. 9ARA is back with msgs. and DX. 9CWZ is rebuilding. 9EBY is on at times. 9CXU says traffic is small from school QRM. 9CDF is still in Western Union school. 9BUE kept 3 daily phone skeds on high waves and handles a number of msgs. 9DAD is back with a jug on 40 and wants ORS.

9ACA is torn up for rebuilding for Xtal control. 9BSB is also working on Xtal. 9DQN is pounding brass in both Morse and Hamese. 9ACX is back on the air in lapses of YL QRM. 9ZD says his little 40 meter 210 set works so well he hasn't taken time to hook up the jug again since it was exhibited at the radio show in November. 8AOX is in KC working and has joined forces with 9ACA. The RI was scheduled for exams here Feb. 5th but report has it that he won't appear until the new radio bill is disposed of definitely. 9AHU is bucking the Xtal control game. 9RR reports keeping skeds and keeping up the letter game take nearly all his spare time. 9ADR is still working on 20 meters. 9ELT has

passed out for the time being. 9DBH lost his equipment along with a stack of QSTs back to 1922 in a recent fire so he will be off for awhile.

Traffic: 9BHI 19, 9DOE 176, 9ZK 137, 9BEQ 60, 9DAE 100, 9ARA 8, 9CXU 3, 9DAD 16, 9DKG 30, 9BOE 14, 9DMT 23, 9DIX 3, 9BQS 6, 9BSE 10, 9ACX 8, 9DQN 1, 9BSB 2, 9ZD 7, 9RR 48, 9ACA 1.

NEW ENGLAND DIVISION

RHODE ISLAND—SCM, D. B. Fancher, 1BVB—Traffic has taken a slump here since 1BIG won the Trophy. Only one station hit the BPL this month and he is using a small low-power transmitter.

PROVIDENCE & PAWTUCKET: 1BIL made the BPL and saved our reputation. He is using only a 201-A with 90 volts on it and QSO'd 33 stations in one week with this "powerful" set. Congrats, OM. 1AID was off most of the month with the result of little traffic. 1AMU is getting a doctor started in the ham game up in Pawtucket. FB, OM. 1DP is hitting on all 8 on 80 meters and has 1AHE's filament transformer, which puts 1AHE off the air. Hi.

Westerly: 1AAP fell way off in traffic this month trying for DX. 1BVB has reduced power from 1500 volts to 750 with the result of better reports and less blushing of the 50. It has been discovered that nothing is gained by overloading the tube and a lot of good power is wasted. 1BLW is sincerely missed by all. His ORS number will not be reissued by this office.

Newport: 1BQD still reaches out like a 50-kw. station. He has a schedule with eg2SW and is QRV for experimental traffic going that way. He also has a little YL presented him by the Mrs. Congratulations from the gang. OT.

Traffic: 1BIL 131, 1BVB 47, 1AAP 41, 1AMU 32, 1AID 12, 1CKB 11, 1AEI 8, 1AWE 4, 1BQD 26, 1EI 15.

NEW HAMPSHIRE—SCM, V. W. Hodge, 1ATJ*—Traffic decreased considerably this month but we have six stations in the BPL which is FB. Several stations who were slated for ORS failed to report. 1AEF, a newcomer, turned in a fine report. He uses a Tobe 30 watter. 1AER heard KFI on his BCL set and a few minutes later QSL'd thru 6ACH. Hi. 1OC, the RM, is keeping regular scheds. He is aiming for the 1000 mark next month. 1AOQ will be on 20 soon. 1AVL has been doing a lot of DX besides making the BPL. He got an R-9 from ef8CN. 1IP had bad luck with his skeds but sent in a good total. 1YB will be on regularly now with a bunch of ops. Any one wanting a reliable Mass. sked get QSO 1LM on 80.

Traffic: 1BFT 396, 1ATJ 354, 1AEF 120, 1AOQ 110. 1AVL 109, 1IP 107, 1AER 93, 1YB 59, 1JN 7.

EASTERN MASS.—SCM, R. S. Briggs, 1BVL—Traffic totals dropped off a little this month probably due to the end of the race for the Trophy and the fact that the holidays are over and traffic is not so heavy. All who have had real interest have stood by gamely.

1LM tops the list this month—our famous traffic men, 1UE, 1BMS, and 1AHV taking a rest. 1XM was not so active due to QRM from exams. 1NK is setting a good example by refusing rubber stamp messages and unreliable schedules. 1KY is back again from Phila. where she visited 3CAH. 1ADM says DX is fine on 20 meters. He also operates 1BDC. 1AHV and 1BKE are new crystal-controlled stations. 1ON worked 9ARA on 20 meters. 1AYX was unable to do some emergency work when wires were down because of QRM on 40 meters. (Why not try 80 meters, OM? SCM) 1ALP is helping. 1CEN built a transmitter. 1BDV is trying for an ORS. 1NQ is on the job every week-end. 1BCN blew an H tube and 1BKV blew a "fiver". 1NV is hoping to install an xtal set. BCL work keeps 1AVY busy but he finds time to do a little brass pounding. 1SL is on with xtal control with a 50 watter. Get lined up with him for some interesting Army-Amateur work, gang. 1CJR works 6's at noon on 20 meters. 1ACH has a new tuned grid-tuned plate outfit going and is looking for schedules. 1AXA had 204 foreign QSO's during 1926 working only on Sat. nights and Sun. mornings. FB and more power to you, OM. 1AIR worked su2AK and HIK. 1JL is still waiting to sail out on a ship. 1ABA just got a commercial ticket. 1GA rebuilt his xtal set and kept a fine schedule with eg2NM. George says Mrs. 2NM is a fine operator, too. 1BZ, 1AWB, 1BMS, 1AHV, 1AUF, 1FL, 1BFX and 1AQT are going to radio school. 1AGS has a new 50 watter which seems to perk a little better than his 199. Hi. 1UE went to dancing school for a while but then gave it up. 1BBM did some fine DX in spite of the fact that his pole came down. 1DI handled quite a bit of traffic. 1CMP is building an xtal control transmitter. 1PB is beginning to reach out and is a new ORS.

Traffic: 1LM 213, 1NK 124, 1DI 106, 1BKV 101, 1PB 17, 1AVY 15, 1AGS 11, 1NV 11, 1ADM 9, 1AIR 9, 1CJR 8, 1AHV 7, 1AXA 6, 1BDV 5, 1AWB 4, 1BMS 3, 1BZ 2, 1RF 2, 1NQ 2, 1ALP 1.

VERMONT—SCM, C. T. Kerr, 1AJG—Would like the fellows to fill out all their form 1 cards as these are now sent to HQ for operating QRH, etc. 1IT, a new ORS, copped the honors for traffic this month. He wants schedules with Montpelier, etc. Says he has to mail all his traffic. 1ATZ took second place but has to be silent till 11 pm. 1BEB is turning them out. 1BBJ, as usual, ranks high—running third this month. 1FN worked ep1AF. Keep it up, OM and let's see you cop the traffic next time. 1AC is rebuilding and going back to 80. Hi! 1AJG is on 38 meters. 1CQM is building a low power set to operate when home from RPI.

Traffic: 1IT 49, 1ATZ 24, 1FN 8, 1BBJ 22, 1BEB 6, 1AJG 23.

WESTERN MASSACHUSETTS—SCM, A. H. Carr, 1DB—1AAC with a new 50 watter has worked 10 Aussies and 12 Europeans in a little over 2 weeks and kept schedule with English 5MQ and 6YQ. 1AAE worked 23 foreigners this month. He put a message into Paris, London from San Francisco only a few hours after start. 1AAL was QSO eilPN and also kept schedule with eg5SZ. 1AJM our former high traffic man has a low total on account of experimenting on 20 and 40 meters. We missed his good relay work. 1AKZ has been using a UX210 for 13 months with 1000 volts on the plate. More power to him as the tube hardly would stand any more. 1AMS worked ef8GI on 20 meters. 1ASU has been running signal strength tests with Albany, N. Y. He has had pretty close to 100 QSO's with Europe in the past 3 months. 1BIV made the BPL again and did last month but his report card got lost in the mail. He totaled 139 last month but word got to the SCM too late. This is the third consecutive month he has made BPL. 1BKQ has a new transmitter now 2 250 watters in a self-rectifying circuit and will be ready on 78 meters in a week or so.

1GR has been building a new 1000 cycle receiver which he says is the berries. He is also secretary of the radio association in Worcester. 1JV is pounding out in great shape as usual and is the new Treasurer. 1XZ is using 100 watts input on a 250 watter in a new transmitter and they are looking for traffic. All stations take notice. 1UM is the President of our new Radio Association for Worcester and Worcester County and deserves great credit for progress of it so far.

Traffic: 1AAC 26, 1AAE 35, 1AAL 32, 1AJK 16, 1AJM 14, 1AKZ 29, 1AMZ 24, 1AOF 3, 1APL 10, 1AQM 21, 1ASU 24, 1AWW 13, 1AZW 19, 1BIV 102, 1BKQ 4, 1BVR 3, 1DB 4, 1GR 11, 1JV 39, 1UM 5, 1AZD 14.

CONNECTICUT—SCM, H. E. Nichols, 1BM—Our report this month shows a wonderful increase of activity and accomplishment. The low power stations are coming to the front with fine traffic totals and attractive DX records. The new amateur can enter the relay field with perfect confidence that there is plenty of work and room for him on our short wave bands. May our work expand with continued regularity. 1MK, Headquarters' station, leads our traffic list with a nice total. Jones is sure keeping the brass well polished. 1BMG was reported in England but is working hard to keep traffic moving in his own country.

1CJX is the connecting link from the upper end of the State to the lower. Several messages of importance to the SCM have been handled via schedule through his and 1FW, an old time local station. Many thanks, OMS. 1AOX says his fifty went to sleep but after performing an autopsy on the leads, he restored it to life and now everything is OK again. 1BEZ, 1HJ, 1CTI, 1BLF, and 1BGC all good southern Conn. relay men are working hard to keep things moving in their respective sections. 1BHM reports good activity in New Haven and says the local club has installed an exhibit at the Progress Exhibition where it is being operated by the members. FB. 1ADW reports a new YL station in his town by the call 1OS on 40 meters and whom he hopes to see become an ORS. 1CKP kept a schedule with ne8AZS in Labrador which is fine work. 1ZL put 20-meter signals over to England during daylight hours while home over the Holidays. He was using his famous fiver with 350 volts on the plate.

Traffic: 1MK 242, 1ZL 2, 1BGC 4, 1ACD 11, 1CKP 7, 1BQH 9, 9IV 9, 1BLF 10, 1ADW 14, 1BJK 25, 1CTI 29, 1HJ 29, 1AOS 33, 1BCA 40, 1BHM 41, 1BEZ 50, 1AOX 61, 1CJX 63, 1BMG 84, 1BHW 15, 1BCG 4, 1IM 16, 1ATG 12.

MAINE—SCM, Fred Best, 1BIG—1AQL has been away in connection with the Trans-atlantic phone tests. He keeps up the Houlton-New York end of the circuit and doesn't have much time for traffic, but when home, he will more than make up for lost time. 1FP kept schedules with 1BFZ and 1CFO and sent in his usual fine total. 1AUR, an old timer, has started up once more and already has handled a nice traffic total. Welcome back to our ranks, OM. 1ADI has hooked up the ole fifty and handled a few. We would like to see Harry a member of the BPL next month. 1CFO has been having hard luck getting out. He has a nice punch at 1BIG, however. Keep up the work, OM. 1CDX sent in his second report and is now in line for an ORS.

1QY of Auburn is going FB on 40 meters. He and 1SL have arranged an Army-Amateur net schedule. The new location seems much better than the old, Mac. 1BTQ turned in a report this month. He has worked every district in the U.S. and will soon be handling traffic with the best of them. 1KL has a new Xtal control set. 1BUB sent in a good total and reports a new junior operator. FB, OM. 1AMP has a swell Xtal control set going in South Portland. We believe he had the first Xtal control outfit in Maine, with 1KL a close second. FB, OMs. 1UU has been very QRW at college but sent in his usual report which shows that he is on the job and still thinks of ham work. 1BIG has been sick a great part of this month but at the present writing is OK once more.

Traffic: 1BIG 170, 1BFZ 121, 1ATV 61, 1EB 52, 1COM 33, 1BUB 39, 1AQL 32, 1FP 24, 1BNL 20, 1AIT 22, 1AUR 17, 1ADI 14, 1CFO 14, 1CDX 13, 1QY 12, 1BTQ 10, 1KL 6, 1AYJ 3.

NORTHWESTERN DIVISION

IDAHO—SCM, H. H. Fletcher, 7ST—7ABB came to the top in traffic handling this month but everyone slumped because of the holidays. Stations are beginning to hit their stride again. It has been reported to Headquarters that the gang in this Section is not sociable and will not give a newcomer help. Show them that this isn't true, fellows. Get in touch with the fellows you don't hear as well as those you do.

7JF now has a 50. 7YA is still breaking in new ops. 7QC spent most of the month clearing his river of ice. Hi. Now he is rebuilding his 40 meter set. 7GW has a two piece filament in his 210. 7CW blew his fiver. 7CJ is a new fellow at Ferdinand, using a fiver. 7QA is moving to Boise and building a portable Xmitter, 7IY.

Traffic: 7ABB 100, 7JF 69, 7QC 43, 7YA 26, 7GW 6.

MONTANA—SCM, A. R. Willson, 7NT—7PU with just two 201A's seems to have shown the rest of the bunch a thing or two when it comes to traffic-handling. Note his call in the BPL. He can work nicely on 20, 40 or 80 at will. 7DD is on 81 meters daily and has schedules with 9CAA, 9DWN and 7MG. 7FL has a new "sync" rectifier also 2 UX210's and kenotrons. 7AAW is getting a quartz crystal. 7AAT-AT got a shot of his 1100 volts but is right on deck. 7EL got out nicely with a UV202 and Ford coil plate supply. 7ZU handled a bunch with a "50" on 85 meters. FB. 7NT was forced to resign due to changing location to Seattle, Wash. Until further notice, reports should be sent on the 26th to Orville Viers, 7AAT, Red Lodge, Mont.

Traffic: 7PU 118, 7AAT 67, 7DD 65, 7FL 33, 7EL 21, 7ZU 12.

OREGON—SCM, A. C. Dixon, Jr., 7IT—The active Oregon stations are 7SY, 7ABH, 7AEK, 7EO, 7AV, 7WU and 7IT. 7AEK has had trouble finding a suitable supply for his 250 watter and finally decided to get a sink. 7AV improved his receiver. 7EO was on the air a couple of nights and that's all. 7SY turned in the best for the state. 7IT has finished working schedules with ox2XA after handling 10,000 words of business messages in the past few months. 7WU alternates between fone on 80 meters and key on 40.

Traffic: 7AV 1, 7ABH 5, 7EO 8, 7SY 45, 7AEK 6, 7IT 5, 7WW 4.

WASHINGTON—SCM, Otto Johnson, 7FD—The gang who reported on time last month have an apology due them from the SCM pro tem due to his failure to get the report back to Hartford on time. Sorry, fellows, and hope to prevent a recurrence. 7EK, 7MP and 7BB did the best work last month. 7MP leads again this month and is proving himself a real ORS. 7BB's traffic dropped slightly but he takes second place. 7AAE busts in with a good total. 7EK reports traffic scarcer this month. 7ACB is stepping to the fore in Seattle. 7KO, 7DX, 7AM, 7TX and 7AG help keep Seattle's' hook cleared. 7DX is 7MZ's portable now at the U. of W. 7AG worked Jamaican 2PZ (with the SCM as 2nd op). 7BB reports working folFR and HIK. 7VL, 7UL, 7RL, 7NH and 7ABX are QRW at WSC. 7BO is not on much 7NT, SCM of Montana, is now working in Seattle where he will be on soon. 7GE is still on the sick list. 7AIM reports being too QRW to get back on the air since he got married. The SCM knows how it goes, OM! 7FD is just getting back on with a 100 watt crystal control set. 7BU and 7SC are going north with Wilkins during February. 7OY is going north soon to pound brass at a cannery.

Traffic: 7MP 130, 7BB 86, 7AAE 54, 7KO 32, 7ACB 37, 7EK 32, 7DX 22, 7AG 13, 7AM 13, 7VL 7, 7RL 4, 7TX 4, 7BO 2.

PACIFIC DIVISION

HAWAII—SCM, John A. Lucas, 6BDL—Conditions are little improved, altho mainland contact seemed better. Several prospective ORS are on and doing good work. Quiet hours at Radio Club of Hawaii, 6BUC, have been lifted so now the Club will be back on the map. 6CLJ is quite successful on daily schedules with So. African A3B. 6BDL does not keep regular hours or schedules but gets in quite a bit of time. Luke Field Radio Club, 6AXW, kept schedules with 6OB, 6BKH, 6DDO and turned in a big total in spite of NPM arc and bad air. 6BC, a new station but an old timer at the key, is on Tuesdays and Thursdays. 6BC asked for dope on ORS and as he has the goods, expect he will be an ORS shortly. 6DBA has been busy building lately. 6CFQ is rebuilding. 6DCU blew a fifty, sold his transformer but is coming back on with a new fifty and a bigger and better transformer.

Traffic: 6AXW 343, 6BDL 117, 6BC 55, 6DBA 28, 6CFQ 15, 6CLJ 17, 6DCU 1.

EAST BAY SECTION—SCM, P. W. Dann, 6ZX—Chief RM 6RJ has sure been doing his stuff as his report to HQ will disclose. ORS and other League members who do not get in on the schedules are missing the best part of our Relay game. Better get busy, fellows, and write him regarding schedules.

The SCM received fourteen reports this month but that isn't all of the ORS in the East Bay Section so you fellows who did not report let's see a report next month or your ORS certificates will be cancelled. 6AYC, a new ORS, heads the list with 384 messages. He's an old commercial op and sure knows his stuff. Second was 6RJ and 6CCT third. 6CCT does all his good stuff with 7.5 and says if he gets a card from fcA3E he will be a WAC. 6AYC, 6CCT, 6BGU, 6CTX and 6RJ seem to be copping the schedules and they've sure got some good ones. 6RJ says he is looking for a school for Route Managers so he can learn to be one. Hi. 6CCT will soon have a 50 watter on 20, 40 and 80. 6IM is still batting out a few in Berkeley. 6APA keeps schedules with the Islands, and other stations in Calif. 6CTX handles traffic with 2ALP, 7WU and 6BMM. 6ZX is using 3 201 tubes for transmitter tubes and two 5 watt kenotrons for rectifiers. 6CEU, formerly of Hawaii, is now residing in and pounds brass at 6CKC once in a while. 6PD is the new call of the Berkeley Police Dept.

There are still stations not reporting whom I would like to see wake up, so next time, let's get the 19 ORS that are active, plus the new ones that have been appointed and those that wish appointments.

Traffic: 6AYC 384, 6RJ 211, 6CCT 145, 6IM 51, 6APA 84, 6CTX 33, 6HH 19, 6CKC 18, 6ALV 18, 6ANW 12, 6BER 10, 6AHW 9, 6CMG 8, 6BHM 4.

ARIZONA—SCM, D. B. Lamb, 6ANO—6DCQ is playing around with phone and is having good results. 6BWS has his rectifier going FB and keeping lots of schedules in all directions. 6CDU is a new ORS now and uses a UX-210 with R. bat. supply on the plate. 6BJF has at last gotten his rectifier working like it should. 6EL has moved to Phoenix where a small M.G. is doing its stuff. 6BJI has sure been having his trouble with 40 meters. 6CUW is on quite a bit when a YL doesn't hook him, which is always the case. 6CRJ is QRW with school. 6AZM works out FB with his UX-210 on the 40 meter band. He visited the SCM recently. 6CAP seems to be busy with school or YLs. 6ANO is QRW most of the time. 6YB, the U. of A., is on regularly almost any time of the day.

Traffic: 6BWS 44, 6CDU 16, 6BJF 37, 6ANO 140.

NEVADA—SCM, C. B. Newcombe, 6UO—6ABM rolled up a very good message total in spite of bad power leaks. 6GA has returned from his honeymoon and we hope the OW will let him move some traffic this month. Hi. 6AJP has returned to Reno and will be with us soon.

Traffic: 6ABM 121, 6UO 31.

LOS ANGELES SECTION—SCM, L. E. Smith, 6BUR—The big event of the month was the ARRL banquet held on Jan. 7 The gang all expressed their opinion that it was the best yet.

San Diego: The Silver Gate Amateur Radio Assn. is doing good work, holding meetings over the air and other stunts. 6BQ reports hearing lots of fone sets on 40 meters. Good schedules help 6DAU to clear the hook. 6BAS and 6AKZ have been too busy with business to do much traffic work. 6AJM has his crystal control outfit going and worked sb1IB first crack. FB.

Los Angeles: Five stations here and in the vicinity made the BPL this month. 6AM worked the Associated Press boat for 22 consecutive hours during the Catalina Channel swim and did a fine piece of amateur work. 6BJX again rates the high total. He has 6HM's old set, silver plated coils and what not. 6ALZ is sure putting Whittier on the map. 6DEG has been playing checkers over the air with 6AIJ. 6ANN helped put a message thru from Conn. to Honolulu in 13 minutes. 6CTP reports working lots of DX on an A tube. 6CHT has been working NNC and NIRC. 6HU helped get the news of the Wrigley Marathon around the country. 6BXC is rebuilding and promises a comeback. 6DAQ is having civil war—Papa does not approve of ham radio. (Why not teach him the code?) 6AHS says rebuilding pays. He gets fine reports now. 6CCO is building a 50 watt 20 meter set to go with his 250 on 40. 6CGK says he can't find a place to locate his set. 6CLK is handling a chunk of Philippine traffic. Route Manager has been sick for some time but is now ready to do his stuff again. 6CNK reports that the O.C.R.A. is coming to life again. The fall of a 90 ft. stick put 6IH out of business. 6AKW wants traffic for Australia. He is making daily tests. 6BHR has just recovered from a wrecked antenna and will be on again now. 6RF is having his troubles. He says 40 is no good for winter DX. 6BUX dropped to 20 and it sure made a hit with him. FB. 6DAJ has rebuilt his set and means business. 6AMS handled good traffic and has a new op, his brother, 6CZC. 6CYH is working fone on 80 meters every morning.

6CMY has been having trouble getting his new crystal control set to perk. 6BTM is doing good consistent work. 6CMQ is using a 7.5 watter on 80 meters. 6CSW says traffic is good and reports working all kinds of DX. 6BVO reports work with Hawaii.

Fresno: The gang shows a little more pep this month. 6BAV reports fair DX work. 6BVM made a good big traffic total, altho off the air for two weeks. FB. 6CCL follows second with a good number and good DX. 6ASV is installing remote control. Perhaps he is going to run his set while he eats.

Traffic: 6DEG 51, 6CSW 47, 6BXD 64, 6CMQ 9, 6BTM 18, 6CMY 22, 6CYH 66, 6AHS 38, 6BBV 2, 6DAJ 8, 6BUX 14, 6RF 11, 6BHR 6, 6AKW 7, 6IH 4, 6CNK 10, 6DDO 47, 6CLK 35, 6BYZ 42, 6CCO 22, 6AHS 41, 6DAQ 18, 6BXC 26, 6CGC 21, 6CT 24, 6HU 14, 6CHT 69, 6CTP 3, 6AKX 21, 6ANN 38, 6BAV 2, 6BVM 74, 6CCL 45, 6AJM 61, 6DAU 45, 6BQ 31, 6BJX 303, 6AM 298, 6ALZ 112, 6ZBJ 146, 6BBQ 583.

PHILIPPINE ISLANDS—SCM, M. I. Felizardo, op1AU—1AT is using two fifty watters in a self-rectified circuit now. The SCM has been reported in Argentina at 1.30 am PST and in South America at 5.30 pm (Manila Time). He seems to be able to get out pretty well. op9AB at Zamboanga has a 50-watter with 500-cycle supply.

Traffic: 1AU 102, 1AT 8.

SANTA CLARA VALLEY—SCM, F. J. Quement, 6NX—6AMM kept up his schedules with the Philippines again this month and handled 378, most of them over the 8000 mile jump. This station with 6BVY are the main outlets for Philippine traffic. 6BVY handled some msgs. for Manila refugees—main PI station is 1AU-1DL a close second. It can be said that this section is handling close to 500 PI messages each month. Route all your PI traffic through 6AMM or 6BVY for prompt replies. 6CSX still keeps his Hawaiian schedule and messages can be safely routed through him. 6BLT is dropping down to 20 and 6AZS qs QRW school work this month. 6CEI is QRW from basket ball. Hi. 6CUL just got his 50 replaced and is back on the air with a DX kick. 6BEU and 6AJZ handled their usual amount of traffic. 6CJD is still off the air. 6CZL-old 6ZK of the spark days, has again succumbed—but to the CW and will soon be on the air with a real set. 6MP is QRW school. 6BMW was QRW also this month as was 6NX.

Traffic: 6AMM 378, 6BVY 142, 6BCH 99, 6CKV 43, 6CSX 27, 6DDN 25, 6CLP 15, 6CTE 14, 6BON 8, 6ACQ 4, 6BLT 3, 6AZS 3, 6CEI 3, 6CUL 2, 6BEU 2, 6AJZ 1, 6NX 1.

SACRAMENTO VALLEY—SCM, C. F. Mason, 6CBS—We will have about six new stations on the air in this city in the next month or so. 6FH blew his H tube and he is temporarily off the air. 6GR moved his residence and has not arrived on the air to date. 6FR runs the local Broadcast Station and is only on the air in the morning. 6CKA works in a power station and has to change any schedules which he may have periodically. 6AVB can hold regular schedules with any of the other stations. He is using a 250 watt tube in a tuned plate and grid circuit.

Traffic: 6FR 79, 6AVB 27, 6CKA 20.

SAN FRANCISCO Section—SCM, G. W. Lewis, 6EX—6VR did it again by working South America with ch-2AS. 6RW and 6CCR report that 20 meters the berries for daylight DX. 6EX, 6KW, 6AXC QSD five meters. 6BAV is now using 180 and 80 meters for voice and code. 6HJ is still holding 80 meters down for S. F. 6AHE, 6PW, 6GG, have achieved crystal D.C. without the crystal, by using the tuned plate and grid transmitter. 6BSN has been having quite a time trying to stay on the air. He has moved to Barbara but his set is still in Fresno. 6VR has been appointed Section traffic manager.

Traffic: 6VR 52, 6CCR 35, 6AXC 10, 6HJ 33, 6KW 20, 6BAV 5, 6CIS 60, 6RW 35, 6RW 225.

ROANOKE DIVISION

VIRGINIA—SCM, J. F. Wohlford, 3CA—3CKA has dismantled his station and gone to college. 3CEL is on as much as time allows. 3BN was heard handling a few messages. 3AAI working crystal control has a schedule with 3SN. Sent one message that was delivered in Frisco, confirmation by mail. 3RX has schedules with 3AJT and 4RR. On regularly Saturday and Sunday has 500 volts on plate of 50 watters and gets out OK. Mercury arc on way. Has organized WMI Radio Club, 3RX, Pres; 3BBM Vice-Pres: 3UU, Secy. and 3BBT Treasurer.

3BZ is on the air and does lots of experimenting and rag chewing but no traffic reported. 3CKL seems to be about the best DX and traffic station in the section. Relayed one from ACD at Washington, D. C. Has schedules with 4MI, 8BAU, 8WK, is on every day at noon on 37.8. 3TI is second operator at this station working as much as time permits.

Traffic: 3CKL 167, 3RX 13, 3TI 4, 3AAI 6, 3CEL 15.

West Virginia—SCM, C. S. Hoffman, Jr., 8BSU—Traffic handling and inter-state schedules showed considerable increase, although general DX working decreased. New ORS: 8BJB, Hinton; 8DCM and 8AGI-8QH both of Huntington. Changes in Calls: Wireless Club of Huntington is 8WK.

8ALG made the BPL for two months. FB. His December report was delayed in mails and is included this month. 8VZ is getting a 5000-volt transformer for his 1-KW tube. 8BBM and 8CCN were on during Xmas vacation. 8BBM is now at 3RX. 8AIP was heard in Aust. 8CXM worked Sweden and Portugal. 8CYR and 8AWV visited 8AB and looked over his mercury arc rectifier. 8AUL was hampered by a power leak. 8CDV kept busy on PRR tests and worked sb1BR. 8BSU had a fine visit from 8BDP. The gang is always welcome at Wheeling. 8BSU is rebuilding. Mr. Aveningo, an ex-Navy man, is breaking into hamdom at 8BSU.

Traffic: 8ALG 481, 8VZ-8AYP 436, 8CBR 66, 8BJB 23, 8AUL 15, 8QH-AGI 17, 8CCN 9, 8BSU 4, CDV 7, 8BJG 5, 8AWV 2.

NORTH CAROLINA—SCM, R. S. Morris, 4JR—4RY has deserted the key and is using fone on 80 meters. 4OH reports QRM from exams. 4OC has trouble getting a steady signal so he is putting in crystal control. 4CZ's rectifier jars froze and burst so he is off now. 4SF hurt his finger so he is off until it heals. 4WG is off the air due to moving. 4UQ is just getting on the air with two 7½ watters. 4CQ, the portable set of the Charlotte Amateur Radio Assn., has just been placed in operation. 4WL will be on by Feb. 1. 4PR is DXing and YLing. 4BX is QRW business and YLs. 4TS has QRM from business. 4PP is showing the old timers up since he got his ORS certificate. 4MI is building a separate set for 80-meter work. 4SJ, the minister "4", should

have a complete new station going soon as he won about half the prizes at the Charlotte Convention, including the prize for the best liar. Hi! 4TO has just come on the air in Ashville with a 50 watter. 5EL shows promise of being an ORS soon. 4ET is an old timer coming on the air in Shelby. 4LP is trying to teach his OW the code and says she can already call "CQ NU 4LP". Hi. 4JR is still tinkering with his crystal. 4RI is having trouble.

Traffic: 4MI 122, 4PP 73, 4JR 52, 4SJ 23, 4RY 13, 4OH 6, 4TS 6, 4TO 6, 4EL 3, 4RI 2.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, C. R. Stedman, 9CAA—Denver: 9CAA has been on very little except to hold down the few schedules he has, but the results show what schedules will do. He is handling army traffic daily with 6CLQ between Ft. Logan, Colo., and Ft. Douglas, Utah. 9BQO has been working a certain YL overtime and so has no traffic to report. 9CJY finally hooked up with Australia. 9EAM is keeping a schedule with 9BWJ. 9OO sent an MG west so nil there. 9CNL and 9BQO are new OBSs. 9DKM asked in all seriousness the other day how many cycles were in DC. Hi. 9CJP boasted a 50 watter for a week and then the glass cracked.

There are a few stations in Denver handling traffic that are not ORS and are not reporting. We would like to hear from you fellows.

9TX is a new station at Brighton from whom we hope to hear more later. 9BYC is going to join the Experimenters' Section, he says. 9DVL had no traffic so 4 Denver hams went up there and originated some for him. Hi. We hear that ex 9AZG will open up soon in Boulder with an H tube. Welcome back, OM.

9DUI has two schedules to help things along. 9AGK is a new station at Colorado Springs. 9ADI did some fast relay work between Florida and the west coast. 9CDE is celebrating the breaking of a message total record at his station. In Nov., 1923, he handled 50 msgs and that record stood till this month. Hi.

Traffic: 9CAA 193, 9DUI 32, 9CJY 9, 9CHV 7, 9DWZ 29, 9BYC 71, 9AOI 5, 9CAW 21, 9QL 7, 9CJP 4, 9DVL 2, 9CDE 52, 9CNL 18, 9EAM 92, 9ADI 60, 9DKM 32.

UTAH-WYOMING—SCM, D. C. McRae, 6RM—Well, fellows, we still continue to stay on the map. Let's make the report for next month double this one.

6CVA was on only part of the month as he went to Calif. for a trip. 6CRR has his set going in good shape now and seems to be getting out better. 6RV is using the 20-meter band now with good results. 6CQL has a 250 watter going now on 40 and seems to be getting results. 6RM, the SCM's station, is going again now, using a UV-204 with about 200 watts input on 20 and 40 meters. 6BTX is on every night until midnight on both 40 and 80 meters. 6AIK still continues to hold out at Ogden and seems to be the only active station there now.

Don't forget, fellows, that your reports are due right after the 26th of the month. Please send them in on time to make sure that they reach the SCM in time to make *QST*.

Traffic: 6BTX 38, 6CRR 4, 6AIK 8, 6CQL 12, 6CVA 28, 6RM 53, 6RV 59.

SOUTHEASTERN DIVISION

FLORIDA—SCM, W. F. Grogan, 4QY—4DM leads this month in traffic. He is on 20 meters and worked sc1FB. 4BL got across on 20. 4LG blew two "fifties" but made the BPL this month. FB for a newly-appointed ORS, gang. 4TR has schedules with many stations. Schedules are the thing to increase that traffic report. 4DD lost a "fifty" this month. 4IZ has at last returned to Hamdom and sends in a nice report. Thanks, Bill. Lt. Comdr. Lee, 4XE reports the following stations on regularly for drill: 4TV 4QY, 4IZ, 4EZ, 4RA, 4XE, 4BL, 4DM, 4IE, 4MU and 4QC. 4TK and 4OB are still blowing fifties and tubes. 4HY reports 3CAB as a visitor. He left some very good dope on antennas. 4IG is still having trouble getting on the air since the storm. 4LK proposed that we have a ham convention. This is FB if some of you fellows will wake up and help get it started. 4CK will soon have three ops on watch in Miami. FB. Where is 4TV and 4JZ?

Traffic: 4OM 208, 4BL 118, 4LG 114, 4TR 102, 4DD 41, 4IZ 40, 4IU 30, 4TK 25, 4CK 25, 4OB 24, 4LK 20, 4HY 17, 4QY 12.

ALABAMA—SCM, A. D. Trum, 5AJP—5ADA has been on consistently at week-ends and has handled quite a bit of traffic. He has been holding conversation with Cuba quite frequently. 5JY, a newcomer in the field, has broken all records for a new ham by working all districts the first month on the air. 5AJP is on when time permits and does a bit of rag chewing. 5AFS sounds like crystal control of late. He gets that d.c. with a good motor-generator and condensers, says he. 5ATP came home the other day for a brief stay and did some good work. 5NL is thinking of returning to the game more regularly than ever. Huntsville is in the limelight again with the return of 5JP. Pollard promises some good reports. 5AAD complains of the hams that won't listen to anything but a d.c. note and he's a good right to do so. What's the matter with the hams of now-a-day anyway? 5ASR tells the world that ASR is doing her stuff for the fix she's in. All right, OM. 5AV tells the SCM to say for him that you can't keep a good ham down and he's saving up for a filter and 210 so he can use a d.c. note and keep down the howling of the BCLs on account of his a.c. note. Demopolis is coming out with Mr. J. B. Lewis, Jr., with call 5LX. Welcome, brother. 5AX wins the laurels for the month by a report for South Africa reporting him R7 with a pure d.c. note. Fellows, you ought to see AX with his chest hung way out. He's a papa of two fine kids anyway, and that's enough to be proud of. Birmingham can boast of another ham in 5WH. Well, OM, let's hear from you. 5DT moved and we didn't have much out of him this month. 5DL is making good use of his first class commercial ticket. He installed a voice set in an aeroplane for advertising purposes and the thing worked so good they got calls from Pensacola. 5AC is playing the role of second op at 5DL now.

Traffic: 5AAD 3, 5ADA 25, 5AX 25, 5AJP 18, 5DL 34, 5AFS 25, 5JY 8, 5JP 3, 5AV 7, 5ASR 18.

GEORGIA—SOUTH CAROLINA—PORTO RICO—SCM, H. L. Reid, 4KU—Georgia: This state is at about its usual standing. Most of the work is being done in Atlanta but credit is also due 4BQ at Rome for his nice work here of late. 4LL is also active and is doing some nice work. 4AV is doing the most reliable bit of message work and is closely followed by 4AAH and 4SI. 4IO is on and is QSO Europe and practically all foreign countries.

South Carolina: 4AAM is on and is now an ORS. 4KI is a newcomer on 80 and is destined to be a headliner. 4AZ is on at Spartanburg and we are mighty glad to hear from him.

Porto Rico: 4KD comes to the rescue from Porto Rico with a nice report of the activities. 4UR is in the States. 4UG is getting out fine on his five watter. 4RL is rebuilding. 4LZ is a new ham in Ponce. He is a native of Texas and is anxious to get QSO Texas hams. 4GM is a new one.—an old Radioman of the USN and is at present operator on the Lighthouse tender Columbine. 4JE is still at it when he is not at work with his broadcaster WKAQ (his second love. Hi.) 4KD has left the USN but is in the USNR.

Traffic: 4AV 82, 4AAH 34, 4AAM 15, 4KI 5, 4KU 3.

WEST GULF DIVISION

OKLAHOMA—SCM. K. M. Ehret, 5APG—The mid-year exams with all their cramming and boiled-down stuff tore great hunks out of the possible report this month. However, those that reported seemed to have been on the job. T.O.M. in his last spasm seems to have diagnosed our case. Lots of us have the experimental fever, etc., but there are a great number that pound brass daily and yet the Com. Dept. has never heard a peep out of 'em.

5ADO is not getting along fine in plain lands. 5AEQ reports a goose egg and says the ice on his antenna has the best of him. 5DQ is lining out for 20 now and says it's got it all over 40. 5ANL is going to try 40 on another Xmitter to see what it looks like down so low. Hi. 5VH will be on again soon. 5APC claims he put 135 volts B battery on a 201A and burnt out a 6 volt bulb in the antenna lead. 5ANT is on every morning. 5AVB is QRT school. 5QL gets 6-amps and plenty of good DX. 5AKA is on with Telefunken 30 and 1500 volts MG. 5ABO still hangs on to the 200 meter fone with good results, but says QTC NIL on that band. 5TW has been off the air all month as he has joined the Fire Dept. and is working hard.

Traffic: 5APG 17, 5SW 24, 5AMO 113, 5FJ 111, 5ABO 4, 5ADO 36, 5DQ 26, 5ANL 114.

SOUTHERN TEXAS—SCM, E. A. Sahm, 5YK—Activity in this Section has been rather great this month. Reports from all over the district are very encouraging. Two new ORS have just been issued. Two more will be issued in the next few days. 5MS is leaving us for a while to pitch his tent with the sixes. We hope to have you back soon, OM. 5ZAI says he is so busy that he can not be with the gang for a while. 5ARF-5AVI report some interesting experiments with Hertzian antennas.

Traffic: 5ARF-5AVI 56, 5MS 15, 5ALA 3, 5HC 4, 5HE 5, 5EW 6.

NORTHERN TEXAS—SCM, W. B. Forrest, Jr., 5AJT Final exams at the Univ. have kept the SCM very busy.

Traffic: 5APO 249, 5WW 39, 5SP 18, 5HY 5, 5AJJ 22, 5AKN 4, 5AMT 8, 5AUA 2, 5RG 22.

CANADA

VAN ALTA DIVISION

ALBERTA—SCM, A. H. Asmussen, 4GT—4HM, a new ORS, is doing nice work. 4CL may have some new dope on aerials, also dope on how to get d.c. sigs when using a.c. on his H tube. 4DG, another new ORS, is getting FB. 4HF is now in the BCL business. 4JF, the R. I. for the Igloo Hut Dist., expects to be a Dr. as well. 4CS is at the coast now. 4CU, another new ORS at Lethbridge, has a HE transmitter using H tubes. He wants to meet and QSO the Alberta gang. 4BI has the equipment but no time. 4DJ has a new Jr. op. Congrats, OM, and hope he will qualify for an ORS. 4AL may be the DX station of Alberta but to date, 4DQ is the STAR DX station. 4DA is a new station and may be an ORS. 4BN moved to Calgary. 4IO expects to work on 20, 40 and 80 meters soon. 4GT works week-ends only.

Traffic: 4CL 8, 4DG 6, 4DQ 2, 4IO 2, 4EB 6, 4GT 7.

BRITISH COLUMBIA—SCM, E. S. Brooks, 5BJ—Reports are coming in very weak. ORS who do not report by next month will have their certificates cancelled. 5AJ sends in a good report of activities in Victoria. 5AJ hopes to have his schedule with oz8AJ resumed again. 5AR is changing his QRA. 5GW is QSO Hawaii with battery input. 5HK is having trouble with his MG. Chilian stations come in FB but not QSO'd yet. 5CT is having trouble with the heap. 5AC keeps schedule with 5AV. 5EF has the old 250 perking again. 5GO worked sb1AW. Reports tube going west on account of being overloaded. Hi.

Traffic: 5GO 4, 5AC 2, 5CT 2.

QUEBEC DIVISION

QUEBEC—SCM, Alex Reid, 2BE—The real traffic work is being carried on by the 80-meter gang. 2BM has a 50-watt bottle and is looking for traffic. 2AL has been QSO Australia twice during the month and also reports working U. S. Patrol No. 147 N. W. D., of Hong Kong. FB, OM. 2BG was in touch with our old friend fo8B. 2AX is still using low power crystal-control but expects to hook on his big bottle shortly. 2HV is pounding brass regularly and has finished a beautiful wavemeter. 2FO is on again with a new receiver. 2EQ will be on 80 meters with 100 watts before this goes to press. 2AU is really the boiled owl of this section. His slogan is "We Never Sleep". 2BB worked the west coast. 2BV says his tube has the blues. 2DO has several schedules. 2CW is doing good work with a 201-A.

The SCM wishes to report that there will be ORS cancellations next month if reports are not forthcoming.

Traffic: 2BE 9, 2AU 14, 2AK 5.

MARITIME DIVISION

NEW BRUNSWICK—SCM, T. B. Lacey, 1EI 1AF 20, 40 and 52 and getting good reports. 1AN has an H tube going good and gets good reports. 1AQ has worked Belgium and foreign stations on 40 meters. 1AX is on every day and night getting out wonderfully with a five watter. 1AK has a new "250" now with lots of kick. Mr. F. D. Thorne is getting exceptional results with short-wave receiver. He will know where all foreign DX stations are when he gets going. 1EI is going on 20, 40, 52 and finds 20 great for DX. Mr. Turner, operator on Canadian Commander, was here and he has a nice 25 watter on the 40-meter band. 1MD is on the briny deep running from Halifax to West Indies using CRIO for a call on 40 meters.

Traffic: 1AK 63, 1AM 19, 1AN 8, 1AQ 14, 1AX 17, 1EI 5.

NEWFOUNDLAND—SCM, Loyal Reid, 8AR—8AR is busy at other things but is on the air occasionally. 8RG has worked Italy and is plugging away nightly. 8AF worked Scotland with his rebuilt set. 8AW pounds away regularly. 8BZ is getting down to the code. 8MC is getting experience in code before commencing. 8BC put up a new aerial and counterpoise. 8BB is leaving Newfoundland and going to Moncton. We hope to work him from there. 8BA, a new member, will soon be on the air.

PRINCE EDWARD ISLAND—SCM, W. A. Hyndman, 1BZ—1CO continues his good work. 1AP, a new station, is using a 201-A with 200 volts of B battery. 1BZ is travelling most of the time and is on very little.

Traffic: 1CO 24.

NOVA SCOTIA—SCM, W. C. Borrett, 1DD—1AE has a tremendous signal in Halifax. 1ED was home from Kings for the holiday and did considerable work. 1AR is reported to have lost his old 500 watter but is making just as much noise with lower power. 1DD spends most time on 40 on Saturday and Sunday. CHNS keeps him busy most of the week. 1DJ has been doing experimental work with CA, the transAtlantic radio station at Halifax, but is occasionally on the ham bands. All NS hams are requested to write 1DD with any suggestions for more interprovincial QSOs. How about it, gang?

ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, 9BJ—3JL leaves the other ORS of the Division far behind by turning in a total of 201 messages. Great work, OM. 3DH, while home during the Xmas holidays, clicked with oa7DX who reported him R6. We welcome 3RG and 3FM of Leamington. Let's hear from you fellows on 52.5. 3CM and 3CA are joining forces in a real HE station. They will be heard on the 40 and 80 bands. 3FU again hooks a Frenchman, ef8YOR and up9C (QRA?) both being worked. The fellows throughout the Southern Dist. are asked to keep in closer touch with 3IA. Please get your report in to him by the 17th of EVERY month.

Northern Dist.: 3NI has been using the 20 meter band almost exclusively this month so the traffic in this district has suffered somewhat. He reports being QSO all states but no records established. 3HP speared a Zeider and handled a substantial amount of traffic. 3BK is planning to break out with 2 210's.

Eastern Dist.: 3JL knocks 'em all flat this month with his traffic-handling abilities. He also had the satisfaction of working oh6AXW, oh6DEA and ep3FZ, to say nothing of being reported heard in France, Italy and British Guiana. 3AEL is reaching out FB and handling lots of traffic but it is rather hard getting a report out of him. 3NF was heard for a few days at Xmas. 3AFZ is using a 201. 3LO has a 202 perking on a low a.c. input. 3HO pounds brass now and then at 3AEL.

Central Dist.: Things have quieted somewhat here. 3BZ is busy keeping skeds, and 3CT is hobbling along on a 201-A after losing 2 fivers. 3DC is a new station and looks promising. 3EL rates the honors this month by working oa2RX with about 40 watts input to a "fiver". In recognition of this feat, 3EL will be in possession of the traffic shield for the month which was donated by the C.G.M. 3BL has been doing great work with his 210 fed from Edison B's. 3DR, 3CJ and 3CW are new stations. We take this opportunity to welcome back old 3JM. Fred Lake is back in the game again and awaiting his new call. 3MV is on again. H. S. Gowan, ex3DS, is now located in Toronto and on the air with his new call 3VC. 3FC is active on 20, 40 and 52.5. The monthly reports from the Northern Dist. always come down by radio, thanks to the schedule with 3NI thorugh this station. 3CK is not heard much and 3AO is off until his MG is rewound. 9AL has his new crystal set working but is not quite satisfied with it and is absorbing many volumes on the subject. The big bottle at 9BJ has not hit its stride yet, but the little battery set is certainly doing its stuff. 9BZ is a new station at Toronto University.

Traffic: 3JL 201, 3AEL 69, 3HP 54, 3BL 34, 3BR 32, 3CS 26, 3FU 25, 9AL 25, 3FC 25, 3EL 23, 9BJ 11, 3AZ 15, 3UD 7, 3RG 7, 3BZ 6, 3IA 6, 3DH 5, 9CC 4, 3BT 4, 3AFP 3, 3NI 3, 3LW 2, 3CT 1.