QST
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AMATEUR RADIO
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The short-wave broadcasting station at KDKA, East Pittsburgh.

MAY 1928 25°
The General Radio Company have recently developed a complete line of Transformers and Filters. While primarily intended for use in conjunction with the new UX 250 Power Amplifier tubes, they may be employed in any heavy duty plate supply unit utilizing either one or two UX 281 Rectifier tubes or equivalent. This line consists of both a half and a full wave transformer, a complete filter unit consisting of suitable chokes and condensers, and a power speaker filter. Bulletins describing these units will be sent on request.

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*Note: The document contains the names of many individuals and addresses related to the communication department of the A.R.R.L.*
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Radio

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Factory: Richmond Hill, N. Y.
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"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.

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EDITORIALS

LAST month on this page we discussed some of the problems which will face us amateurs next year when the Washington Convention takes effect. We found those difficulties divisible in the main into two groups, technical problems and operating problems involving cooperation, and we then particularly discussed the latter group and presented an A.R.R.L. plan designed to meet the need, at least as a starter. Now just as the very finest of stations will be helpless under next year's conditions unless we have international cooperation, so will the very finest effort at cooperation be futile unless the technical problems are overcome. Tempus is very rapidly fugiting and it is time for the amateur world to sit up and take notice, examine the situation carefully, analyze its difficulties, find out how to overcome them, and then apply the information to the rebuilding of individual stations—not next year but right now, during 1928, so that the stations may possess a reasonable chance of performing satisfactorily when the bands get clipped and all the world's amateurs get pitched-forked into the same restricted territories.

Honest confession is good for the soul, we're told, and an honest examination of amateur radio ought to help it. Let us grow introspective; let's examine ourselves as keenly as we can and talk plainly about it; let's not look too closely at either our few super stations or at our few terribly-poor ones, but at the great average of American amateur stations. It is not a reassuring spectacle in view of next year's requirements. It is our opinion that amateur radio in this continent has grown up in such a liberality of operating privileges and such a laxity of regulation-enforcement that the average American amateur station is utterly incapable of successful operation in a situation making such requirements as the international bands of the new convention make. We seriously doubt if as many as one-half of one percent of the active stations of to-day are good enough to offer their operators any reasonable chance of success in international work next year. The rest, we think, will have to be rebuilt: transmitters, receivers and frequency-meters. We don't mean that most of these stations are incapable of meeting the requirements of law and regulation to-day; almost all of them are. Nor that all of them wouldn't be capable of meeting the requirements of next year's regulations; perhaps many of them would. That isn't the point at all. The government turns over certain territory to us, with certain fundamental limitations upon us, and doesn't care what we do within those limitations. However, the problem has only started then. The great job is to equip ourselves to carry on satisfactorily after we have met all the requirements of law and regulation.

It is not impossible. The chief requirement is going to be the exercise of thought. The defects in our equipment are immediately apparent and the remedy is known in many cases. Perhaps it has never been actually necessary in the past, while our privileges were relatively so great, to have more than a transmitter which transmits legally and a receiver which receives; but now it becomes necessary to do a much better job than that. We must prepare ourselves not only to meet quite difficult regulations but to be able to engage in two-way communication with other stations who are under the same handicaps, and to do this through a closely-packed mass of signals from many other stations attempting the same thing.

Under these conditions, of what use is a wave-meter that barely suffices to tell an amateur whether he is within or outside of a 1000-Kc. band? Is it not obvious that an amateur will have to possess a wave-meter, and a precise one, and one with an open scale capable of discerning between, say, 7080 Kc. and 7085 Kc.? And isn't it obvious that they will be called frequency-meters rather than wave-meters, and that we shall be thinking almost exclusively in terms of frequency? Again, when all the amateurs of the world are in bands but a few hundred kilocycles wide, of what utility is an autodyne receiver which has the present-day 1000-Kc. American band crowded into 18 degrees of dial movement? It becomes apparent, we think, that autodynes will have to be rebuilt for wide-open scales and that even then, because of the inherent mathematics of simple heterodyne reception, the job may not be good enough for really high-class and satisfactory reception. Whereas, in days now almost past, the complication of more elaborate receivers was never justified on the ground of their increased sensitivity, such complication may become very much warranted next year because of increased selectivity. Any method for obtaining selectivity from im-

The chie
provements in the simple autodyne to the
construction of short-wave superhetero-
dynes and the employment of band-pass
filters, for example, becomes worth investig-
gating. And transmitters! Imagine an im-
numerable thousand American amateurs trans-
mittin in a 150-Kc. band. Suppose you're
one of them and you've just hooked some
choice DX and have received a GA. And
then your frequency drifts 5 Kc. as your
tube heats. Where are you? Sunk, fellow,
sunk! Freely admitting and, in fact, in-
sisting that American amateur transmis-
ters have performed marvelous feats, they
need a complete house-cleaning to meet
next year's requirements. The crystal-
controlled d.c.-supply set represents an
ideal except for its difficulty in shifting
frequency and its cost. Other sets, it
seems to us, need to be redesigned so that
the frequency is steady and stays steady
during keying, changes in voltage, tube
heating and antenna swaying. They must
be much more precisely adjustable than
they are today, capable of finding an exact
frequency when wanted, holding it as long
as desired, changing, and settling down on
exactly a previous frequency when required.
Do you know many transmitters that do
that to-day? Probably a great deal can be
done in the design of self-excited trans-
mitters but it may be that we shall have to
come to a master-oscillator arrangement
of some sort as most desirable for next
year, just the same as a somewhat more
advanced type of receiver than the simple
autodyne may be warranted. The problem
will be to devise arrangements that are not
too complicated and not too expensive, so
that they remain within the technical ability
and the pocketbook-range of average ama-
teurs. A general power reduction may be
a positive help in the new difficulties, and
supply it is not going to say that
"raw a.c. on the plate" of self-excited oscil-
lators must be taboo next year.

In pointing out the manifold defects of
present American stations and the neces-
sity for rebuilding most of them, we do not
mean to be too discouraging. It is not that
the new convention brings restrictions
which make operation impossible. It is
simply that in the past it has not been
necessary for us to be precise and build
really good "gear" and now it is necessary.
With lots of room we have been successful
in the past despite floppy waves, hum notes,
crawling frequencies, too-big condensers,
sloppy practices, haywire assembly, and
lack of precision measurements. These
must go and the amateur station which
survives this year must be prepared to over-
come them. This general thinking over
and reconstructing amateur stations is, we
think, the biggest job ahead of amateur
radio this year, and the greatest thing that
the League can do to help is to see that
QST presents practical, helpful informa-
tion on the subject. Our Board of Direct-
ors carefully considered this subject at their
recent annual meeting and eventually ap-
propriated a sum from the League's surplus
to finance a technical development program
at Headquarters for the very purpose of
finding answers to these problems and pub-
lishing the answers in QST this year, while
we are all engaged in rebuilding. The work
is now being organized and soon we hope
to supplement the usual array of QST
articles with results from our own shop, prac-
tical articles relating mostly to transmis-
ters, receivers and frequency-meters and
designed to be of immediate application by
the average member in meeting these press-
ign problems. The Board feels that this
is one of the finest things that the League
can do for amateur radio.

We believe that every member ought to
commence now to take stock of his station
and plan how it should be altered to meet
these needs. QST for the past two years
has been full of information which is still
modern and which bears upon all these
problems. The Handbook will be a potent
help. And our pages during the remainder
of this year we trust will contain the an-
ters to the remaining problems. This
year, fellows, is the design year, from
power supply to corona shield, from the re-
cieving antenna to the ear-cans.

One of the things we must look into is
this new 10-meter band of ours. It is now
open to general amateur use. It contains
2800-Ke. more than all of our new bands
from 20 meters upward. It is commonly
supposed to be worthless because something
happens to all waves shorter than 12 or
13 meters which keeps them from produc-
ing useful signals even at the Antipodes
except under rare and very freakish con-
ditions. Eminent engineers have told us
that the secret of the 10-meter band lies in
devising a method of controlling the angle
of radiation, that if we can find this we
will have 10 meters tamed. No more fer-
tile field for the amateur experimenter was
ever offered. Lasting fame and glory await
the successful. If a few hundred able
amateurs devote their talents to this band
for a while we believe the answer will be
found. It just must be found—amateur
radio has to have some way of making all
those good kilocycles perform usefully.

In the general course of reconstruction
to meet 1929 difficulties the average ama-
teur can do much to help himself. A.R.R.L.
Headquarters is going to do everything it
can to help. But we, too, need help and the
Staff will welcome ideas, suggestions
and papers that bear upon this work.

K. B. W.
Getting Started at 30 Megacycles
By Robert S. Kruse, Technical Editor

30 MEGACYCLES, of course, is the same thing, as the rubbery 30,000 kilocycles, which in radio is related to 10 meters. Use the term you prefer and we will proceed.

In the last issue of QST there was an announcement to the effect that the Federal Radio Commission had just opened the 28-30 megacycle band* to general amateur use. If anyone knows what the procedure is and what formalities are to be gone through, he hasn’t bothered to tell me about it. As far as I am concerned it is still between the Commission and the Supervisors, which has the advantage that we needn’t talk about the legal formalities.

The main effect of the announcement so far appears to have been a complete collapse of the bootleg activity on 30 Mc—the attraction probably went out when it became legal. This story is being written to meet a demand for some encouragement of work by folks who were willing to stay in line until the word was given.

Do not become excited, for I have not the faintest illusion that anyone will put on more speed because of anything said here—

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*30 Mc.=30,000 Ke.=10 meters.
THE NEEDLESS DIMENSIONS

It seems quite senseless to talk dimensions for 30 Mc, when every reader of the magazine can in the last year's file find all the information he has the slightest need for. Anyone can see that 30 Mc is half way between 15 Mc and 60 Mc, so that if we know how to send and receive 15 and 60 it is almost an insult to explain how to work at 30. It happens that we do know how to use both for 60 Mc is at 6 meters—which we have explained until blue in the face—and 15 is at 20 meters, on which several stations work now and then.

Please understand therefore that I am not going to talk to anyone except the folks who have just lost all their QSTs and haven't the necessary $2.50 to get a replacement file from Circulation Manager Houghton. The rest of you will please turn to something else, for I do not wish to anger you in my last "story" as Technical Editor. You might retain the irritation and carry it over to Westman, who hasn't done a thing to deserve it and must be given a clean and fresh start at this desk.

Very well then; the transmitter must of course be something between a 5- and 20-meter transmitter, which is to say it must have very little coil, as much condenser as you can stand and a circuit that will be decently steady, considering the frequency.

Crystal control will be very nice if you care to try it—and I hope you do. For the rest of us something simpler must serve. Probably the best arrangement is somewhat that of Fig. 1, which explains itself except for the fact that the two tubes are of the same size but have separate plate supplies. This isn't a funny notion, it is a strict necessity. It is unfortunate that the first circuit cannot use more C and less L, for that would make it steadier, but at the same time would cut down the 2nd harmonic, which is what we wish to amplify and feed to the antenna. Keying had best be by Beverly Dudley's method—see his recent article on the oscillator-amplifier transmitter, in fact see both the first article and the follow-up on keying.

THE PLAIN OSCILLATOR

If that still seems too complex try a plain oscillator and use all the C and as little L as you can. Figure 2 tells that story pretty well. Here there isn't any decent place to key. My suggestion is that you break the antenna circuit or detune it—but mount the key so it will not vibrate the set.

THE RECEIVER

Need I recommend a receiver after all that has been said on that subject? Surely you remember that, even though all of your QSTs were burned with the house and the insurance company will not replace them.

Yes, you are right, it will be a double-detection receiver using the circuit of Fig. 3, 4 or Fig. 5. There isn't the slightest need of showing the internal connections, for anyone able to operate the set will know them by heart now.

THE ANTENNA

The antenna system can be anything you have a liking for, half-wave, odd harmonic, bent, straight, with or without reflections, high or low, horizontal, vertical, slanted and fed by one of the 99 methods. Since nobody has admitted knowing how to radiate 30 Mc, so that it will do something useful you are perfectly welcome to try anything—remembering that it may be just as well not to waste tests in the customary fashion—which is to say by telling QST about it so late that nobody can be warned. This article should appear in the May issue of QST, your apparatus can therefore easily be ready by May 15th, private tests can be run in that and the next month and a notice sent to QST for the "X" Section at the same time for June tests. These can be transmitted to the Section by mimeo

(Concluded on page 15)
Ten Meters and the Ultraudion

By J. T. McCormick*

Ten meters is coming. Some of us are afraid of it; some are doubtful as to its practical possibilities; and, no doubt, many of us will be too plain lazy to give it a trial. Nevertheless, QRM is going to give many a low-powered station its choice of trying ten meters or else suffering what is almost sure to be an almost QSOless existence. High time, then, that we start mental preparation for a ten-meter future.

Mr. Kruse has frequently told us that the Ultraudion is a 'star performer' at short wavelengths. That circuit, then, is likely to prove to be our best bet. The credit for our initial 'tip' goes to those 5-meter pioneers whom we have assisted so poorly in the past. Crystal control, with its frequency multipliers, will be beyond the purse-strings of most of us; some circuits, such as T. P.-T. G., may prove hopeless. It seems profitable, therefore, to become more familiar with the Ultraudion.

I nearly fainted when I found that some beginners were interested in the Ultraudion circuit, but afraid to try it because it was 'tricky.' The Ultraudion is a 'star performer' at short wavelengths for the very reason that it is less 'tricky' than any other oscillating circuit in existence!

The first step is to 'get' the Ultraudion "straight". Since writing the article which appeared in the September, 1927, issue of QST, I have discovered that a great many fellows are entertaining wrong impressions of the Ultraudion circuit.

Some seem to have acquired the impression (from goodness knows where!) that the Ultraudion is inefficient. The Ultraudion is exactly as efficient as the Hartley circuit if the adjustment of each circuit is equally good. (I wouldn't have dared to make that "crack" if I were an R. E.—more of that later.) The real difference lies in the fact that the Ultraudion is simpler to adjust and hence the adjustment is likely to be more nearly perfect.

The antenna coupling does not need to be of the type shown in the September article. You may use any type of coupling permitted to amateurs. 9CV uses voltage feed. 9AEK uses very loose inductive coupling.

Some fellows complain that they miss the extra grid and plate clips outside of the tuned circuit, to which they have been accustomed. Use 'em; go to it! However, they are likely to cause complications to 'set in' at 10 meters. If you like, you may also QSY by means of clips rather than by the use of plug-in coils.

Even the method of keying has been questioned. Key wherever you would key any circuit—but watch those clicks! 9AEK keys in the primary of the plate transformer and solves the problem of 'tails' by using a filter which is not quite good enough to produce a d.c. note. Since the tails are d.c., they do not bother. Another scheme which might be used in this connection is to put a 'bleeder' on the filter; to connect a high resistance across the filter output. The resistance, of course, would need to be able to dissipate the necessary energy without undue heating, and the plate transformer capable of handling the additional load. A relay might be used to disconnect the 'bleeder' when the key is down, but look out for clicks. These schemes, of course, are applicable to any circuit.

Some have asked if a ground is necessary. 9AEK has no ground on its 'fifty' and the owner brags that his Ultraudion is more efficient than his old Hartley, W.A.C. and pride of his heart.

Some think that the helix must be 'hot'. What's the matter with Fig. 1? Surely it will work! The helix is at grid potential which isn't high enough to be dangerous.

Can self-recification be used? I haven't tried Fig. 2, but it certainly ought to work. Perhaps some of the foregoing state-

*QHR, 210 N. Knox Ave., Topeka, Kansas.
ments are silly and some radical, but something of the sort seemed to be necessary in order to clear up a lot of misconceptions.

Now to clear up another erroneous impression. Some of you fellows seem to have gathered the idea that I am a radio engineer. I'm just common ham—the dumb variety that shies and runs at the first hint of anything that sounds like mathematics; I'm even a rotten operator. I hear the gentleman in the back row mutter, "Well then, where does the big stiff get the nerve to take up valuable space in QST?" The 'nerve', dear friend, is inherited from Irish grandparents; the only reason my stuff gets into QST is because it's ham stuff! The kind of information we hams need the most can be obtained only from a fellow ham. If that ham happens to also be a college graduate, E.E., R.E., etc., so much the better, but we can't all be R.E.s, you know. Whenever I discover something about radio that I think is new and useful, I feel it my duty to pass it on to the rest of the fraternity. The A.R.R.L., remember, is 'of, by and for' the amateur; no contributions, no QST. Afraid of your grammar? Send it in; H.Q. will fix it up so that the rest of the gang will think you’re a college professor. Don't try to be brilliant. Do give your contribution a good injection of horse sense. Fellows, we're going to want all the 'dope' on the Ultraudion we can get when that 10-meter band opens up. Every fellow who discovers even just enough material to fill a 'stray' ought to quit riding for a minute and 'come across.' We fellows have a big advantage over the R.E.s inasmuch as we have no reputation to lose if we happen to 'pull a boner'—the editing at H.Q. will protect us, anyway.

Now let's consider the future. When the new international agreement becomes effective, we will have six amateur bands, all in harmonic relation with one another. The Ultraudion, with its ability to cover three such bands, makes it possible for those who have the time, money and desire, to make use of all of these bands with but two transmitters and two antennas. A receiver which will cover all bands might be built, but it is probable that most of us will also need two receivers.

Some fellows doubt the efficiency of chokes designed to cover three bands. It must be admitted that there is a 'best' choke for every wavelength, but the fact remains that a choke can be made to cover three bands and do the job in each band just as well as the chokes that are actually used in the average amateur one-band set. Let us suppose that you want a pair of chokes to cover the 40-, 80- and 160-meter bands. Here is my prescription: Select a...
winding form not over 1 1/2" in diameter. Select a wire-size as small as is consistent with the plate current of the tube you use, remembering that a single-layer winding has excellent cooling properties. Wind what you consider to be a good 160-meter choke. Wind another just like it. Now connect both chokes in their proper places in the set and test in each of the three bands with antenna and counterpoise disconnected. Watch the plate milliammeter for "dead spots" as you swing the tuning condenser across the band. If excessive plate current indicates a "dead spot" in one of the bands, remove 1/4" or so of the winding from each choke and repeat the test. If the "dead spot" remains or if one appears in another band, repeat the unwinding process. It sounds as if one would finish by removing the entire winding, but such is not the case.

I would suggest a similar procedure in winding chokes for the 5-, 10- and 20-meter bands, using a form not over 1/2" in diameter and spacing turns.

The circuit shown in the September article would be proper for a 40-, 80- and 160-meter transmitter. Fig. 3 is suggested for the 5-, 10- and 20-meter set.

Make C3 (in Fig. 3) as large as your purse will permit. Insert it in the helix about half-way between the center and the grid end. Don't try to find the exact node, because 'there ain't no sech animule'. There is, of course, a node if we regard only the current and voltage which belong strictly to the tuned circuit, but this circuit does not present infinite impedance to the r.f. component of the plate current—hence there must be an r.f. voltage drop across the plate choke through which the plate current flows; that is, the whole of the r.f. voltage drop in the external plate circuit is divided between the tuned impedance and the plate choke in series, the tuned portion, of course, taking the major part of the drop. The reactance of the untuned choke is neither directly in phase nor directly out of phase with that of the tuned circuit and, therefore, is unlikely to either aid or hinder oscillation to any great extent.

C3 must be able to stand up under the plate voltage plus the grid bias voltage and must be able to carry the r.f. current of the tuned circuit without heating. If the set is to use low power, I suggest that you buy four good fixed condensers of the receiving variety of 2,000 pf, or larger, capacity and connect them in series-parallel. The combination will have the same capacity as one of the condensers used alone, but the voltage breakdown and current-carrying capacity will be doubled. Mount C3 as close to the helix as the plug-in clips will permit.

Unless the filter is jammed right up against the transmitter—and it shouldn't be—the use of C4 is advisable for the purpose of by-passing whatever r.f. gets past the plate choke and thus keeping it from wandering all over the shack. 1,000 pf. will probably provide ample capacity in the case of C4.

**THE FEEDBACK CONTROL**

An ordinary single-spaced receiving condenser may be used to control feedback in a fifty-watt Ultradion set. The condenser may or may not stand up if used at C2 in Figs. 1, 2, 3 or 5, but will easily stand the 'gaff' if used in either of the positions indicated by the dotted lines of Fig. 5. In these positions the plate voltage is removed and the condenser has only to withstand the r.f. voltage applied to the grid.

If the connection across the plate choke is chosen, the last filter condenser, C3, should be moved up close to the set, as it is now a part of the r.f. circuit. See that the key is not on the wrong side of C3.

It is obvious that C2 shunts the r.f. chokes when used in any position and thereby forms a tuned circuit. The natural period of the circuit thus formed, however, is far removed (longer wavelength) from the transmitting frequency and for this reason it is possible for the functions of condenser and chokes to be separate.

The two chokes are practically in parallel where r.f. is concerned and, theoretically, it would seem a good idea to put them on an equal footing by shunting the grid leak with a fairly large fixed condenser. Such a condenser seems to make very little difference in actual practice, but it does tend to protect the leak if the grid choke happens to show 'fire' on the wrong end.

Now look up all the 5-meter 'dope' you can find and—let's go.
Recent Changes in Radio Law and Regulations

The 10-Meter Band Opened; Phone Waves Changed; Amateurs Defined; Washington Convention Ratified.

At the urgent request of the American Radio Relay League the Federal Radio Commission has opened the 28,000-30,000 Kc. band at 10 meters to general amateur occupancy. This large band offers promise of relieving amateur congestion in the narrowed short-wave bands of next year if its secrets can be mastered, but obviously it must be available for experimentation before this end can be accomplished; therefore the request for its immediate opening.

The Commission has also altered the amateur phone allocations in accordance with the recommendations of the A.R.R.L. Board of Directors, as explained in detail in our last issue. At the same time a definition of the amateur station was adopted which will prevent the granting of amateur licenses for non-amateur purposes and protect our bands against invasion.

These matters are covered in the Commission’s General Order No. 24, dated March 7, 1928, which reads as follows:

For the purpose of clarifying the amateur situation the Federal Radio Commission has adopted the following definition and regulation:

“An amateur station is a station operated by a person interested in radio technique solely with a personal aim and without pecuniary interest. Amateur licenses will not be issued to stations of other classes.”

In accordance with the channels designated for amateur use under the new International Radiotelegraph Convention, the Federal Radio Commission has opened for amateur use the new additional band between 20,000 and 28,000 kilocycles, or 9.99 and 10.71 meters. The Radio Division of the Department of Commerce is hereby authorized to open this band immediately for amateur use.

The Federal Radio Commission has revised the list of radio telephone bands open for amateur operation to read as follows:

<table>
<thead>
<tr>
<th>Kilocycles</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>64,000 to 56,000 or 3,550 to 3,500</td>
<td>4.69 to 5.35</td>
</tr>
<tr>
<td>2,000 to 1,715 or 150.0 to 175.0</td>
<td>94.5 to 95.7</td>
</tr>
</tbody>
</table>

Acting upon this authority the Department of Commerce has published revised amateur regulations summarizing all current orders, and here reprinted for the guidance of members:

REVISED AMATEUR REGULATIONS

March 6, 1928.

Supervisors of Radio and Others Concerned:

For your information and guidance the Federal Radio Commission has established the following regulations governing the licensing and operation of amateur radio stations. These regulations supersede those dated October 28, 1927.

An amateur station is a station operated by a person interested in radio technique solely with a personal aim and without a pecuniary interest. Amateur licenses will not be issued to stations of other classes.

Amateur radio stations are authorized for communication only with similarly licensed stations, except as indicated below, and on wavelengths or frequencies within the following bands:

<table>
<thead>
<tr>
<th>Kilocycles</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>401,000 to 400,000</td>
<td>0.7477 to 0.7496</td>
</tr>
<tr>
<td>64,000 to 56,000</td>
<td>4.69 to 5.35</td>
</tr>
<tr>
<td>30,000 to 22,000</td>
<td>9.99 to 10.71</td>
</tr>
<tr>
<td>16,000 to 14,000</td>
<td>13.7 to 21.4</td>
</tr>
<tr>
<td>8,000 to 7,000</td>
<td>27.5 to 42.8</td>
</tr>
<tr>
<td>4,000 to 3,500</td>
<td>75.0 to 85.7</td>
</tr>
<tr>
<td>2,000 to 1,500</td>
<td>150.0 to 200.0</td>
</tr>
</tbody>
</table>

and at all times unless interference is caused with other radio services, in which event a silent period must be observed between the hours of 8:00 p.m. and 10:30 p.m., local time, and on Sundays during local church services.

Amateur radio telephone operation will be permitted only in the following bands:

<table>
<thead>
<tr>
<th>Kilocycles</th>
<th>Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>64,000 to 56,000</td>
<td>4.69 to 5.35</td>
</tr>
<tr>
<td>3,550 to 3,500</td>
<td>84.5 to 85.7</td>
</tr>
<tr>
<td>2,000 to 1,715</td>
<td>150.0 to 175.0</td>
</tr>
</tbody>
</table>

Spark transmitters will not be authorized for amateur use.

Amateur stations must use circuits loosely coupled to the radiating system, or devices that will produce equivalent effects to minimize key impacts, harmonics and plate supply modulations. Conductive coupling, even though loose, will NOT be permitted, but this restriction shall not apply against the employment of transmission line feeder systems to Hertzian antenna.

Amateur stations are not permitted to communicate with commercial or government stations unless authorized by the licensing authority except in an emergency or for testing purposes. This restriction does not apply to communication with small pleasure craft such as yachts and motor boats holding limited commercial station licenses which may have difficulty in establishing communication with commercial or government stations.

Amateur stations are not authorized to broadcast news, music, lectures, sermons or any form of entertainment, or to conduct any form of commercial correspondence.

No person shall operate an amateur station except under and in accordance with an operator’s license issued to him by the Secretary of Commerce.

W. D. TERRELL,
Chief, Radio Division.

The Washington International Radiotelegraph Convention of 1927 was ratified by the Senate in executive session on March 21st, and thus the United States becomes a party to the treaty. Its provisions do not become binding until January 1, 1929, and it is to be expected that the orders quoted above will be the basis of amateur regulation for the remainder of this year.

The Congress having failed to take action on new radio legislation by March 15th, the date on which the administrative authority of the Federal Radio Commission was to terminate, control passed to the Secretary of Commerce as provided under the 1927 Act. The Secretary, however, immediately delegated the Commission to carry on for
him, as is authorized in the Act, until Congress should take definite action on pending legislation. Eventually the new bill was passed and on March 28th was signed by the President, thus definitely continuing the Commission in administrative power. A bitter fight occurred over provisions of this bill relating to broadcasting, but there is little in it of concern to transmitting amateurs. The Act provides that the terms of the present members of the Commission shall expire at the end of one more year, the commission's authority and salaries being continued for another year. Broadcasting station licenses are to be issued for no longer than three months, and all other licenses for no more than one year. The Commission is directed to make a reallocation of broadcasting stations, wavelengths and power for each of the five zones.

The Commission at once extended all broadcasting licenses until May 1st and on March 27th issued the following order terminating all old Department of Commerce station licenses on August 31st.

GENERAL ORDER NO. 28

All licenses covering coastal, point-to-point, technical and training school, experimental, ship and amateur radio transmitting stations extended by the Federal Radio Commission General Orders 1 and 3, dated March 15th and 29, 1927, respectively, are hereby terminated on August 31st, 1928.

Applications for new licenses or renewal in these classes must be filed with the Federal Radio Commission not later than July 31st, 1928, through the Supervisor of Radio of the Department of Commerce, unless already filed.

All formal licenses in these classes issued by the Federal Radio Commission for definite periods subsequent to General Orders 1 and 3 are not affected by this order.

Thus the Commission definitely undertakes to put all stations under Commission licenses and, by calling for a new deal, prepares to take action in the commercial short-wave field. Particular attention is called to the last paragraph of the above order. As previously reported in QST, Supervisors of Radio are at present engaged in calling in old Department of Commerce licenses to amateur stations and replacing them with Commission licenses. This work is proceeding as rapidly as the clerical facilities of the district offices permit. By next month we expect to have definite instructions for amateur procedure under this order but it seems plain that if an amateur does not already possess a station license from the Federal Radio Commission and does not automatically receive blanks for making application therefor, he should write his Supervisor for the blanks in time to get the application filed prior to July 31st—particularly if he wants to retain his present call.

Speaking of application in advance of expiration date, we are reminded that there has been some confusion about the policy of the Department of Commerce with respect to operators' licenses. Amateur operators' licenses may almost always be renewed upon application, without re-examination, provided the application is made before the license expires; otherwise examination is necessary. Nor can an amateur expect to be notified that his license is about to expire: it is up to him to watch his dates. The following is quoted from the January 31st issue of the Radio Service Bulletin:

Renewal licenses may be issued to operators of other (than commercial extra first—Ed.) classes without examination, provided the operator has had three months' satisfactory service during the last six months of the license term. One year satisfactory service out of two years of the term may be considered for renewal at the discretion of the examining officer.

Renewals or new licenses may be issued a reasonable length of time previous to the expiration of existing licenses, but must bear the exact date of issue, which must correspond with the date on the back of Form 765 forwarded to the Radio Division.

Operators who fail to apply for renewal of their licenses (This means operators' licenses—Ed.) on or prior to the date of expiration must be re-examined.

If, because of circumstances over which the applicant has no control, an operator is unable to apply for renewal of license on or prior to the date of expiration, an affidavit may be submitted to the Radio Division through the Supervisor of Radio or examining officer, attesting to the facts, which will be considered by the Radio Division, which will advise the Supervisor of Radio or examining officer in regard to the issue of a renewal of the license without re-examination.

With increasing complexity of radio administration, we amateurs must now expect a sterner enforcement of regulations, particularly in anticipation of the difficulties of next year under the new convention. The Radio Division has many new inspectors and assistants in training school now, ready soon to proceed to the districts to assist in enforcement, and they are being supplied with test cars and elaborate measuring equipment. IAAH of Weymouth, Mass., has been suspended for six months for operating phone on 210 meters, complicated by having changed address without notifying and receiving the endorsement of the Supervisor. Wholesale house-cleaning of off-wave amateurs is to be expected at once. Every amateur should watch his step and comply strictly with regulations.

—K. B. W.

Getting Started at 30 Mc.

(Concluded from page 10)

All of which cooks down to this: if we will just use the information we have had for the last two years it should be easy to find out things about 30 Mc. by the end of August. We will not do it unless there is much more cooperation than there ever was on 20 and 5 meters.
Rotten DX
By the Old Man

SAY SON, something's got to be done by someone about this bum DX business. I have studiously refrained from venturing my opinion of it for a long time because of the laws regarding profane language in print. I cannot hold in any longer and by golly here goes.

I suppose that two-thirds of the boys I have hooked up with lately on the forty-meter band have kissed me good-bye because I was not DX enough. Say—where has a man got to live to be DX? These rascals holler their heads off CQing until you begin to believe they are in need of help. When you feel sorry for some poor gink and call his back, thinking to assuage his hungry soul with a little chat, you find he quickly glances over the walls of his shack and when he finds he has already accumulated four of your QSL cards, he drops you like a hot potato and bursts out again in a CQ yell.

Have these poor creatures got bitten by some kind of a bug, or something, or what it is that ails them?

I'll be keelhauled if I answer any more CQ's unless the gent indicates by some Q signal that he is not afflicted with DX-litis. How are we to know the blamed disease is not catching?

To-night, sitting here with Kitty, I answered a "six" whose soul seemed to be yearning for something or other. A "six" used to send the hair up on the back of my neck and thrill me all through. But this piece of pork came back saying, "Abt R4 OB FB want DX CUAGN ta ta de dah de dah" and went off into another CQ spasm without even breaking.

I just about lost what little I have left of a sweet disposition, and Kitty, being within range, got spat upon promptly and copiously.

Renouncing my own country in disgust I twisted into the foreign band and ran across a Frenchman squalling for somebody to answer him.

I answered, thinking here's a polite nationality, known down the centuries for holding all long—and short—distance records for gentlemanly behavior. If he hears me, which he will not, he will respond in the good old-fashioned way and we shall have a nice little bit of two-way communication.

By golly he came back! The hair went up on the back of my neck and the thrills surged up and down my insides the way they do when you hook on to some chap you never hoped to get. Finishing my call he said, "GM OM Abt R4 want DX CUAGN ?? ta ta de dah de dah" and garbed if he didn't burst out in more CQ flames!

Kitty was over across the shack cleaning up, so I hove the corn cob at her, slammed down the cans and delivered myself of my favorite and most profane expletive, which is, "Well Garb Bish his Zork", and spent the rest of the evening reading "Calls Heard".

I say it's time to vaccinate somebody or something. Here we are, a world full of amateurs, able to communicate two-way anywhere upon this 'ere earth, and instead of doing something worth while we spend our juice and our time grubbing for QSL cards.

Who is going to care a thousand years hence whether George collected an acre of QSL cards or not? What we want is efficient, reliable and consistent two-way telegraphic communication. That's where the big thrill comes from. That's what we are here for.

I'll be gormed if I don't wouff-hong the next gazayho who tells me he wants DX and a QSL card. It's enough to make a man sweardam and call the cat a litch. There now!
Amateur Television

By Paul H. Thomsen*

The General Electric Company, at Schenectady, is experimentally broadcasting television.

These are all the data that are needed to enable the amateur to pick up these signals and make a picture out of them.

It will be recalled that when Mr. C. Francis Jenkins, himself a member of the A.R.R.L., showed government officials visiting his laboratory, June 13, 1925, what was happening at the moment in the Anacostia Navy Radio Shack, NOF; he made the prediction that sooner or later the amateur would get a new kick out of radio by picking pictures out of the air. The first published account of this work appeared in QST for July of that year.

The purpose of the following description is to point out the essentials in the method and show how simple the receiving apparatus may be.

Reduced to its lowest terms, television reception consists of some white and black dots arranged in proper order on a flat screen at persistence-of-vision speed. This is strikingly illustrated when one cuts off the motor, and discovers that the picture instantly vanishes, and in place of it is a great collection of unrelated dots.

With a neon lamp costing one dollar, and almost any motor to rotate a suitable disc, these radio signals can be made into a picture. While with the only lamps available at present, the pictures will not be large, it is fair to suppose that more suitable lamps will be available soon. The lamp first referred to is the General Electric Co's G-10 lamp, 1/4 watt, cylindrical electrodes, medium screw base.

The motor should be at least 1/16 h.p., and preferably attached to the house-lighting circuit. A flanged hub is mounted on the motor shaft to carry the scanning disc.

The disc is 12'' in diameter and has 48 tiny holes therein, arranged about 8/18'' apart and in a spiral of a mean diameter of 91/4''. The holes should be approximately 1/32'' in diameter; and the inner end of the spiral is 8/18'' shorter radius than the outside end. (See Fig. 1.)

The neon lamp is attached, like a loudspeaker, to a radio receiving set, with perhaps 250 volts of battery in circuit. You may find it desirable to increase the bias on the grid. The incoming signals blink this light in a picture order.

You can listen to these picture signals but they don't make sense. However, if you will start the motor and look at the neon lamp through the flying holes in the disc, you will see a lot of black and white dots and dashes scattered over the picture area, and probably without intelligible order at first.

If, however, the speed of the disc is slowly increased until it is in synchronism with the transmitting station, a perfectly formed picture suddenly flashes out in the picture plane.

The picture will tend to move to the right or to the left, but by increasing or decreasing the speed of the motor the picture can be held rather steady in the lighted plane.

If you are in the d.c. district, a d.c. motor with an adjustable rheostat in the field of the motor, gives the necessary speed adjustment to bring the disc into synchronism with the transmitting station. Another smaller adjustable resistance in series as a vernier helps to more easily hold the motor in synchronism.

If you have only a.c. juice available then the cone pulley arrangement shown in the

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* * *

1. Information as to transmitting schedules and wavelength has not been announced but the signals can be located by listening for them.—Ed.

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17
even the cover of dad's Saturday Evening Post. Cut a 12-inch disc out of it, with an accurately located centre opening to go on the flanged hub on the motor. On this disc lay off 48 dots, spaced very accurately in even decrements of radius to give about a 4° offset of the ends of the resultant spiral arrangement of dots on the disc.

Now take a sewing needle. Break off the eye and the point. This is to be used as a punch to cut tiny holes in the disc where you put the dots. If you find the needle hard to hold, put it in a small stick, and hold the stick. Lay the disc on a block of wood sawed so short that the punching can be done in the end grain of the wood. Or get a piece of lead, and scrape it smooth, and cut the holes in the disc by punching out tiny discs of paper, with the needle-punch, which will leave the holes in the paper cut clean.

Of course, thin metal sheet or bakelite, or most any other material can be substituted for the paper or thin cardboard disc, but the paper disc is easier to make and is just as good if it is not torn.

About the only thing you will need to get made outside is a suitable hub, with nut and two washers between which latter the disc is clamped. The illustration shows how it should be made. (See Fig. 3.)

A ground-glass plate about 1" square is mounted near the rotating disc. It may be on either side, that is, next to the lamp, or on the opposite side of the disc from the lamp, in alignment with the holes in the disc. In the first mentioned position one looks at the illuminated disc through the tiny holes; in the other position the glass is illuminated by light from the lamp shining through flying holes, to build up the picture.

The ground-glass can be made, if it is not readily available, by rubbing a piece of clear glass on very fine sandpaper to which a little oil or turpentine has been applied.

Of course, mat celluloid film or mat surface mica will also answer very well. The impression of good workmanship is heightened if one mounts it in a small frame, like a picture frame.

The radio picture signals broadcast by WGY are sent out from pictures made up of 48 lines to the picture. The rate is about 16 to 18 complete pictures per second, but to know the exact rate is not important because the motor of the receiving machine is speeded up until the picture appears, no matter what the rate may be.

The received picture can be made to seem about a 1½" square by looking at it through a reading glass, or a condenser lens such as is used in magic lanterns and motion picture theatre projectors.

We understand Mr. Jenkins will also be broadcasting movies soon, with the same number of lines per picture, which will add another source of pictures for the amateur.

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Central Division Convention

May 25, 26, 27, Milwaukee, Wis.

YES! fellows, the Milwaukee Radio Amateurs' Club is taking the bull by the horns and is sponsoring the first big Central Division Convention to be held at the Republican Hotel in Milwaukee, Wisconsin, on the above dates.

The mayor of the city will give the address of welcome to the delegates. Lectures and demonstrations of electrical phenomena will be given at the School of Engineering. Entertainments of all kinds have been arranged to give those who attend all the pleasure possible. Prizes will be awarded to winners of stunts.

Two men from A.R.R.L. Headquarters will be with us; F. E. Handy, Communications Manager and one other. We are doing our best to prevail upon Secretary-Editor K. B. Warner to drop his mantle of responsibility and be our guest of honor. Director Darr will be here and act as toastmaster.

From the above you see what we are trying to do for you and we extend to everybody a cordial invitation to attend.

Let's hear from you, gang. Write Frank J. Jutrasn, 9ALL, Chairman, 385 Eleventh Ave., Apt. 5, Milwaukee, Wis., for reservations.

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Strays

Durham metalized resistors may now be obtained in values from 250 to 3,000 ohms. They are designed for use in grid circuits of radio frequency amplifiers to keep them from oscillating. The fact that they have a very small amount of self inductance and capacity should make them suitable for various jobs around the work table of the experimenter.
Practical Audio Filters

By L. W. Hatry*

THIS is a strictly practical discussion so I can discuss 10X conditions and enjoy myself. A newspaper office is generally a bum place in which to talk amateur radio, in addition to being a bum place to have an amateur station anyhow.

With fifteen or twenty linotypes, each with its electric motor, three metal saws, lathes, presses, punches, drills, compressors, an elevator and a door with a squeak I find myself harassed with not less than 1,691 different noises including WIZ and programs from WTIC. How to cure it? Ask the guy with the mania for by-passing his a.f. transformer secondary. Says he, "What you need is a low-pass amplifier." This actually gets rid of 75% of 1% of annoyance and brings the set within the prohibition amendment.

The amplifier I use goes down and dredges up bass, and I find it useful because of that alone, but also at times I find it useless when used only with treble filtering. After I by-pass to get low-pass (and succeed) I also get a nice husky rumble which makes my headset sound like Rip Van Winkle's dream. The cause of the rumble was easy to discover without extensive meditation or cerebration: 10X lives twenty feet from a nice husky compressor which shakes the floor, the receiver, the transmitter and my teeth. Mechanical vibration generates unnecessary bass in my set. Shunt capacity wasn't all I needed! I had to filter out some bass and lose that rumble, as well as filter out the treble and lose hisses and other higher noises. Figure 10, which is detailed further along in this article, was assembled for the purpose from a box full of Electrad fixed condensers, an A.F.T. primary (General Radio, incidentally) and a bunch of test leads with clips to allow quick change. The final result of high and low filtering was a quiet headset (except for some clicks) and some pleasure in reception.

This introduction is being written in full view of a short note about 300 words long in which Kruse tells me I have not said positively that I tried any of the things this article tells about. I do therefore this day appear before myself and swear that this is the whole truth and nothing else but: (1), that I have tried each and every one of these things and that each and every one of them worked except when the test clips shorted against each other, or the condenser cases, or choke cores, or on general principle, and (2), furthermore I can prove the whole of this by the tube that got burned out trying to assimilate 45 volts.

![Fig. 1. The Meaning of High Pass, Low Pass and Bandpass](image1)

Where the curve is low the signal has been cut down.

![Fig. 2. The Simplest Possible Means of Getting (a) High Pass, (b) Low Pass and (c) Bandpass](image2)

None of these simple affairs give sharp cutoffs but it does not matter for the present purpose.

![Fig. 3. As in Fig. 2 We Have Here from Left to Right, (a) Low Pass, (b) High Pass and (c) Bandpass](image3)

The curves of a and b will have rather sharper cutoff than the ones shown in the same position in Fig. 2.

from a Burgess (advt.) B battery, a procedure which I had often warned that tube against.

But to be serious, and to make this article useful, let's start at the beginning of filtering in an a.f. amplifier, telling the methods that may be used and why in theory and end up with the specific practical methods which evolve therefrom. Therefore, proceed.

**WHAT THE FILTERING DOES**

Audio filtering is desirable and necessary because: 1, it reduces background noises which mask signals; 2, it increases selectivity because it tends to keep out the best notes of a pitch within the filtering limits.

I shall neglect setting a position for the...
filter. It may be on the first or second a.f. transformer, or at the headset. I can't find a preferable location for it.

What may be done toward choosing some frequencies and eliminating some others best may be summarized in three curves as shown in Fig. 1. In $A$ we represent high-pass selection or filtering, the lower frequencies are variously obstructed. And so on to $C$ which attenuates on both sides of one frequency. We have some control of the cut-off, the slope may start at approxi-

![Diagram of a circuit with transformers and a diode](image)

**Fig. 4. Result of Insufficient Grid Bias in Broadening a Peaked Transformer**

Curve $a$ is with proper bias, $b$ with insufficient bias. In Morroco: the cutoff is considered as having become important when the voltage gain has dropped $\frac{3}{4}$. By this rule curve $A$ at the point $A'$ spans from 275 to 1300 cycles while $B$ at $B'$ spans from 196 to 1800, a difference of nearly 500 cycles! In general the effect of any secondary load is to flatten the peak without greatly widening the lower part of the curve. The transformer does not pass more frequencies, simply the proportion between those amplified is altered.

![Diagram of voltage gain vs. frequency](image)

In combination, generally, they may be used to steepen the slope of cutoff, to increase selectivity. Simple filter units used in the line to give curves of the type of $A$, $B$ and $C$ in Fig. 1 are lettered similarly in Fig. 2 in order that comparison will be facilitated, and similarly Fig. 3.

**Some Definitions**

In the amateur language which we will use in this article a “tuned” transformer is as selective as a single transformer can be (Erla made one but it was often not used correctly as will be shown) while a “peaked” transformer is not as selective but is best at one frequency. (Old R.C.A. 9/1, old Acme 4½/1, Thordarson 5/1, Hedgehog 3/1, and some others, all of which were also misused.) Finally the “good” transformer is the modern broadcast listener's type costing $6 and up at list and having weight in proportion.

If all waves were “d.c.c.w with crystal control” a sharply tuned amplifier would be the only sensible kind. Since there are such waves, and since they gradually become more numerous let us think about the proper use of such tuned or peaked transformers.

**The Effect of Grid Bias**

From Fig. 4, if a transformer has a peak, and we wish to preserve the peak, the load on the secondary must be minimized. The grid should, as much as possible be kept from drawing current. The ordinary grid return is to the negative leg of the filament as in $A$ of Fig. 5. The positive half of the a.f. thus swings the grid positive, as $F$ minus is the point of lowest potential natural to a tube. When the grid goes positive the load resistance is lowered; the BCL when compelled to use such transformers improves quality by shunting fixed resistors across the secondary, thus lowering the load resistance and thereby decreasing the ac-

![Diagram of a transformer with a diode](image)

**Fig. 5. Grid Return to Give Best Results from a Peaked Transformer**

The return shown at $B$, or else a one-cell (1½ volt) grid bias is recommended.

centuation of certain frequencies (or flattening the peak).

On the other hand, when we want the peak to be there and do business such resistances must not be used, likewise we must make sure that the grid never goes positive. This can be done by connecting as in Fig. 5 which puts the rheostat drop on the grid as bias and since we can run a 201-A filament at 4½ volts this makes possible a bias around 1½ volts, and not even the strongest signal from the detector is likely to exceed that, therefore the grid will not go positive at any time, and therefore the sharpness will be preserved. The bias may of course be gotten from a C battery. At any rate, complaints of lack of selectivity from peaked or tuned transformers mostly may be laid at the door of improper negative grid bias for the amplifying tube or tubes.

**CUTTING THE LOW END**

Without any modifier of its frequency characteristic an a.f. amplifier is certainly inflexible. The simple filters, condenser or choke, provide the necessary modifiers. Consider the condenser's effect upon a good transformer, such as the Sangamo, which has a curve of the general type shown in Fig. 6. This figure shows the modifying effects, of three capacities shunted across the secondary. Obviously the flexibility of the amplifier is incomplete if only the upper end of the a.f. band may be attenuated. To modify at the bass end, a shunt primary choke accomplishes effects which are graphically shown in Fig. 7. To have both in an amplifier is only sensible, and this is possible from a switch which may be used in Fig. 8, an arrangement I found very useful. With the switch arranged as in Fig. 8, rotation gives only the very high, and then more and more into the bass. After that, beginning on the capacities, a little treble cut-off, and more and more until only the very low tones are left. But although such a simple switching arrangement is handy, two switches would be better, one for the bass and one for the treble cut-off, so that a combination of both will make a peak (Fig. 9) at any one of three places in the spectrum at will. The more taps on the inductance or the more capacities available the more control of cut-offs obtainable and the greater number of peaks may be placed, but I find three each of capacity and inductance sufficient.

I have tried a number of stunts, all of which are fairly simple, and which have various merits. Fig. 10 requires one switch for control. It progressively attenuates both ends of the band as it is advanced and it ends by giving a peak. The series condenser attenuates bass and the shunt condenser attenuates treble. When attached to the headset, a detector or amplifier may be used without reconstruction. As the switch lever progresses to the right it causes reduced series and increased shunt capacity, cutting both bass and treble progressively. The same effect with a choke is obtained by B. Only here the shunt choke attenuates bass while the series portion attenuates treble. In both cases where the switch connects directly to plate the choke is so large or the capacity so low, that no particular effect at filtering is experienced. In A of Fig 10 the shunt battery choke L, is used only to keep the a.c. to the phone path. A fixed resistance of 25,000 ohms is just as good and is cheaper. The choke would be the primary of an a.f. transformer, or at least 5 henrys although more inductance is desirable; 20 hys. being the maximum desirable. Of course, either 10A or B may be applied earlier in the audio system, for instance, to the primary of an a.f. transformer, in which case L would be 50 hys. or a fixed resistance of 50,000 ohms. Fig. 11 shows three other simple arrangements. The variable resistance gives control of cut-off, whether high or low. Again
the ideas are applicable at any earlier position in the a.f. net, but the choke as in the case of Fig. 8 must be across the primary

![Diagram](image)

**FIG. 8. A SWITCHING SCHEME THAT WILL GIVE SUCH CURVES AS SHOWN IN FIGS. 6 AND 7**

It would be better to provide two switches, one for the capacitors and one for the choke so that both ends can be cut at once. The capacities can be bought, the chokes must be made.

while the condenser is across the secondary.

As an example of peculiar methods of getting a filtering effect when no other scheme is available and something must be

![Diagram](image)

**FIG. 9. THE EFFECT OF A PRIMARY SHUNT CHOKE AND A SECONDARY SHUNT CAPACITY IN PRODUCING PEAKS AND HIGH OR LOW CUTOFFS.**

The effects are as follows:

<table>
<thead>
<tr>
<th>Primary Shunt Choke</th>
<th>Secondary Shunt Capacity</th>
<th>Passes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Henry</td>
<td>0.005 µfd.</td>
<td>peak at 250</td>
</tr>
<tr>
<td>4 Henry</td>
<td>0.0025 µfd.</td>
<td>peak at 500</td>
</tr>
<tr>
<td>2 Henry</td>
<td>0.0015 µfd.</td>
<td>peak at 1000</td>
</tr>
<tr>
<td>16 Henry</td>
<td>0.01 µfd.</td>
<td>peak at 120</td>
</tr>
<tr>
<td>None</td>
<td>0.05 µfd.</td>
<td>60 cycles and down</td>
</tr>
<tr>
<td>1</td>
<td>none</td>
<td>2000 ** &amp; up</td>
</tr>
<tr>
<td>1/2</td>
<td>none</td>
<td>4000 ** &amp; up</td>
</tr>
</tbody>
</table>

*The effects would be somewhat different with other transformers than the Sangamo.*

done, consider Fig. 12. Here is a large choke L of 30 henrys, keeps the a.f. to the transformer while R and battery D load the core of the A.F.T. with a fixed magnetic field under control of R. Saturation of the A.F.T. core cuts down the inductance of P and causes high cut-off under control. The limit of current is that which heats the A.F.T. somewhat. D would be 40 volts and R 25,000 ohms maximum.

We should not forget that even with a "good" transformer a peaked effect may be gotten by using a tube with excessive plate impedance. The "good" transformer, being designed for the 201-A begins to suffer with

![Diagram](image)

**FIG. 10. A SIMPLE CONDENSER OR CHOKE STUNT FOR SHARPENING UP BY STEPS AND FINISHING WITH A PEAK**

When using the condensers as shown at A the C in series with the phones cut the low notes and those in shunt cut the high notes. When using the inductances as shown at B the series L cuts down the high and the shunt L cuts down the low notes. The switch arrangement is such that with either the effect is to make the peak sharper as the switch is turned from 1 to 5.

the 240 high mu to some extent, and with the shield-grid tube shows a fairly sharp peak.

No tuned filters are included. My general criticism of them is due to their tendency when sharp to have a decrement that allows them to hang on to clicks with the twang peculiar to their natural period. If the click is going to "sing", as it will with tuned filters or transformers, it is an annoyance to me of a major order. Tuned traps have received attention in other numbers of QST.
More elaborate filter nets are easy to construct. Their selectivity may be made excellent, for band or single frequency pur-

poses. But when that is accomplished their inflexibility is great, nearly as great as their expense and constructional difficulty. But don't avoid experimenting with them for they teach excellent lessons. For the best set of easy to use information on the sub-

ject consult the July and August 1923 QST's for the articles by Dolenaugh, nothing in radio literature on the subject is as clearly explained; or as easily handled by the man able to work arithmetic with symbols as well as figures.

Some Changes at Headquarters

W ith great regret QST announces the separation from its staff of Mr. Robert S. Kruse, for the last five years its Technical Editor. Mr. Kruse has resigned in order to launch on his own in the radio consulting field, retaining his residence at West Hartford. QST for January of 1923 first bore his name as Technical Editor and his work in the ensuing five years is known wherever amateur radio is known. His lucid writings have created an enviable reputation for him and for QST, and under his technical direction QST has become a world-respected medium in the radio field. Best wishes, "LQ"!

Mr. Harold P. Westman, for the past year and a half the Assistant Technical Editor of QST, succeeds Mr. Kruse as Technical Editor. His long and varied radio experience along development and experimental lines, and his recent work in the constructional field as evidenced by his articles in QST, assure him of success in his new duties. Mr. Westman was in charge of 2BQH and the Segal Radio Laboratory at Mamaroneck, N. Y., before he joined the QST staff and he has since been known as 1AL and as partner in 1DQ. Prior to his tenure as Assistant Technical Editor, he conducted the A.R.R.L. Technical Information Service.

Mr. Ross A. Hull, ex-0a3JU, for the past year in charge of the A.R.R.L. Technical Information Service and Experimenters' Section, has accepted an appointment as Associate Technical Editor, in which duties he will be associated with Mr. Westman in the technical editorship of the magazine. He will also be in charge of the A. R. R. L. technical development program over the remainder of this year, a subject discussed at some length on this month's editorial page.

Mr. James J. Lamb, 3CEI and ex-9CEI, has joined our staff to assume the Technical Information Service and the management of the Experimenters' Section. Mr. Lamb is the author of the article describing a portable receiver, published in our April number.

Mr. G. Donald Meserve, of 1FL, Hudson, Mass., ex-president of the Eastern Massachusetts Amateur Radio Assoc., has joined us to become QST's Assistant Advertising Manager.

For those who still wonder who "RP" at 1MK is, let us say that this is the sine of 1MK's new Chief Op, Mr. R. B. Parmenter, formerly of 9WR-9OX, Louisville.

It will be noted that we do have openings at A.R.R.L. Headquarters, and in a variety of occupations. Qualified A.R.R.L. mem-
bers are logical candidates when vacancies occur. The headquarters office would be glad to have applications on file from interested members, for consideration in such events, reciting fully their attainments and qualifications.

—K.B.W.

**Strays**

Howard F. Mason (no further identification needed) tells us that the Bureau of Standards will tell you the frequency of your crystal within a gnat's eyebrow if you will send them twelve dollars together with your crystal, holder and oscillator unit. By using harmonics of the crystal circuit and another oscillator, it is possible to get accurate calibrations of frequency meters.

We are told by E. Kohls that 6BSB has recently purchased some bird seed for his slop-jar rectifier. He hopes to get one of these "peep peep" notes.

A simple way of making a substitute gimlet is to clamp a small twist drill in a two-inch dial. We don't know who to blame for this idea as it was swiped from a carpenter who was installing a lock at hdq. We suppose it may be just another proof of how radio is revolutionizing other industries.

McMinn of 2WC made 37 points in the International Contest which he believes will entitle him to a binding post or about eight inches of BX.

When removing bases from tubes, a simple method is to put the whole tube in boiling water for about five minutes. Then, twist the glass part and it will come loose from the base. Hold the tube, prongs downward and touch the ends of the prongs to the tip of a very hot soldering iron. After a moment, the solder can be flipped out with a snap of the wrist which will leave the leads running through the prongs free. This is much less painful than busting the glass and digging the remains out. —A. S. Mason.

**Let's Be Tolerant**

By Hiram Percy Maxim, President A.R.R.L.

Not so long ago the fellow who advocated C.W. was regarded as an enemy of amateur radio. The spark was the thing, and no amateur with true amateur spirit could consider C.W. I remember some of us used to print on our QSL cards "The spark forever".

To-day there are a lot of us who regard phone as something derogatory, and beneath notice. Is it possible that we may be making the same mistake as the fellows who scorned C.W.?

Times change, and we have to change with them. The thing we sneer at to-day is often the whole works to-morrow. The older a person grows, the more he realizes this continual change. Thus it comes about that the older among us are the more patient and tolerant.

It is with this in mind that I am sorry when I see the attitude of some of us toward amateur phone. Phone does not require a knowledge and a proficiency in handling code. People can phone who cannot communicate by dot and dash. The dot and dash man will always have something up his sleeve that the phone man never can have. But many of our best dot-and-dash men are interested in phone. How do we know that this phone bug might not bite some of us who now sneer at it? Are not our ideas regarding phone likely to change profoundly, should the little bug by chance pick us out to bite? And will not we expect decent treatment when we get to fooling around on the air with our phone? And so, until we know more than we now know, would it not be prudent to be tolerant toward the fellow who has different ideas regarding phone than we may happen to have at the present time?

Let's be tolerant. Let's remember the early days of C.W. vs. Spark. Besides, there's nothing to fear. Code will never go out. We do not have to say "V as in Victoria" nor "Z as in Zebra" in code. The dots and dashes can be counted, and there is no doubt. Our code is as safe as the ages. We code men can easily afford to be tolerant.
The Twin City Vigilance Committee
By Carleton H. Kohler

As we have mentioned in recent issues, the amateur-listener interference situation is again acute. This article describes the excellent work of the amateurs of Minneapolis and St. Paul in caring for this situation. We hope that it may serve as an inspiration to other clubs to undertake similar work and as a guide to individual amateurs everywhere. The Chicago Radio Traffic Association is taking care of Chicago needs in a similar arrangement. Where are all the rest of the cities—Editor.

The amateur interference situation had, for some time, been growing increasingly serious in Minneapolis, and it was deemed necessary that something be done at once. The relations between the Minneapolis amateur and the broadcast listener, and between the amateur and the City of Minneapolis, had been unduly strained for a considerable period of time. Consequently, early this year a Committee on Amateur Interference was formed by the executive council of the Twin City Radio Club to aid in bringing about a readjustment of affairs.

We were faced with the possibility that silent hours from 6 p.m. to 12 a.m. would be made compulsory for all amateur stations in this vicinity unless immediate action was taken to relieve the QRM situation. Therefore the Committee on Amateur Interference gave Twin City amateurs decisive notice that interference on their part would no longer be tolerated. We have discovered that, for the most part, only a few stations were causing interference, and as we felt that such interference could be eliminated, we justly decided that we would ostracize any amateur not cooperating with us. Surely we cannot let the uncompromising attitude of a few amateurs definitely injure the well-being of the majority. In addition, due to the rather chaotic conditions here, amateurs of this vicinity were being blamed for interference not caused by them at all. Briefly, then, we came to the conclusion that prompt, vigorous action would have to be taken if we were ever to rectify this complex and unsatisfactory state of affairs.

Now, however, that the Committee has been formed, we are cooperating directly with the City of Minneapolis through Mr. O. M. Frykman, City Electrical Inspector, and also we have the backing of and are cooperating with the Supervisor of Radio at Chicago.

The effect of these arrangements has been very gratifying, for the Minneapolis amateur now has the good-will of the city officials and the general public, and as a result of the work complaints of amateur interference have decreased practically to zero.

Our Committee not only has arranged to be informed of, to investigate and to adjust all complaints received by the radio office at Chicago and the Minneapolis city authorities, but also we have arranged to supply the Supervisor at Chicago and the City of Minneapolis with complete details of every interference case investigated by us. We have, in addition, requested the Supervisor to call upon us at any time for special investigations and reports. Thus the office at Chicago is able to have in its files a complete report on all complaints originating in this vicinity. To show to what an extent Mr. H. D. Hayes, the Supervisor, appreciates the help rendered to his office and the broadcast listeners of this territory, I quote from one of his letters:

This office appreciates the cooperation thus extended to the broadcast listeners and believes that your action will tend to prove to the general public that the amateurs, both individually and collectively, are not only willing but anxious to assist in making radio conditions as near ideal as possible, especially as far as unnecessary interference is concerned.

In order that the amateurs may be more than ever in a position to show that they are a more or less self-regulatory body and that they will play the game when given a chance, this office will until further notice refer to you personally, as chairman of the amateur interference committee in Minneapolis, all reports of amateur interference received from that vicinity, with the request that through your organization you will make every effort either to relieve the condition complained of or attempt to satisfy the complainant that his complaint is one that cannot be remedied by the amateurs, either due to the interference experienced by him being caused by the operation of electrical equipment, other than radio transmitters, or possibly by the limitations of his particular type of receiver and receiving installation.

In the operations of the Amateur Interference Committee we make it a practice to investigate personally every complaint received and to adjust the situation definitely in order that the complainant will
have no further reason for protest. This has stopped the flow of complaints to the Federal authorities.

In order to inform the general public of the existence of the Committee and to convince them that we are here to serve them, we have had the cooperation of Minneapolis newspapers. One member of our Committee looks after publicity. We have spent considerable time during meetings of the Twin City Radio Club in discussing ways and means of preventing interference to broadcast reception as caused by the operation of amateur transmitters, and so far we have been quite successful in devising means for eliminating such interference. All amateur stations complained of are inspected by us, and we can usually thus clear up the trouble. Personally I believe that amateur interference to broadcast reception is not preventable and can, except perhaps in unusual cases, be eliminated if a sensible attempt is made. Many amateurs, however, do not seem to be sufficiently ambitious to make such an attempt unless a very perceptible stimulus is provided. In my own case I am using a transmitter designed for one-half kw. operation on 40 meters and it has been necessary to devise a special Interference-filter in order to eliminate QRM to neighboring B.C.L.'s. Now that this special filter is employed it has been proven that no interference is caused even to a B.C. receiver (4-tube T.R.F.) located in the same room with the transmitter. Nor does the use of such a filter reduce the amount of DX worked—instead the tendency is in the other direction.

For a time we experienced considerable trouble from interference arising from sources other than the operation of amateur transmitters. At the present time both the local electric company and the telephone company are aiding us in our interference-elimination work. Mr. D. E. Cottam, our S.C.M., has been doing some very excellent work for the Northern States Power Co., in eliminating interference caused by the equipment of the power company and other electrical apparatus.

Matters have now reached a very satisfactory stage in this city; in fact we are approaching a state of idealism which we did not think could ever materialize. We have received aid and assistance from every side. We are indebted to the Supervisor at Chicago for excellent support and continual encouragement; Mr. Hayes has made some very helpful suggestions and has been most courteous and sincere in his supervision of our work. Likewise Minneapolis city officials deserve much credit for the splendid backing they have given us, especially Messrs. O. M. Fryekman and E. L. Harris, chief electrical inspectors. Above all, Minneapolis amateurs have been extremely unselfish in their cooperation. We have obtained the good-will of the broadcast listeners. As a result of all of this, complaints of amateur interference have practically disappeared.

Our work, while much of the time tedious and difficult, has been upon the whole a great pleasure and we are now reaping the rewards. We have discovered that the policy of cooperating with the broadcast listeners is a policy that "pays big"—for isn't it much better to exert ourselves a bit and perhaps voluntarily curtail a few of our privileges and thus receive the friendship of the B.C.L. and the respect of the Federal radio authorities, than to do "what we dare please" and be "in Dutch" with everybody? This information is submitted in the anticipation that, by its publication, amateurs all over the country may be moved to follow similar methods. It is hoped that amateurs in other cities will awaken to action and that soon the interference problem will be remedied nationally. It is well known that, in general, the situation is serious and that the amateurs will suffer unless corrective measures are quickly and effectively adopted. Minneapolis is doing its part and is looking forward to some cooperation from other cities.

Editor's Note: Since the receipt of the above article a letter has been received from Mr. Kohler explaining an expansion of the work of the Twin City QRM committee, from which the following is quoted:

"Now that the broadcast listeners have been pacified and are no longer encountering interference with their reception, we have decided that a few other matters should be taken care of, these matters being "off-wave" operation, use of raw a.c. on plate, poor operating, operation without license, and other kindred evils. Accordingly we have arranged to supply the Supervisor with regular reports on amateur affairs in this territory. Infractions of law and regulations are being acted upon by the Supervisor, while we are taking care of other phases such as "poor operating". The executive council of the Twin City Radio Club felt that there was no reason why all Twin City amateurs should be brought into disreput by the improper actions of a few of our number. The best way to correct the existing troubles was to turn the offenders over to the Supervisor. Consequently the club has advised Twin City amateurs that the off-wave business and similar offenses had best be stopped at once. This was sufficient to correct the situation and at present amateurs of this vicinity are cooperating very well. The official observation stations still maintain supervision and are making frequent

(Continued on page 38)
The Middle Capacity in a Two-Section Power-Supply Filter

By James Millen* and D. E. Replogle †

This is the fourth of a series of articles by members of the Raytheon organization. The first appeared in the September, 1927, issue, the second in the February, 1928, issue, and the third in the April issue. The fifth will follow shortly. These discussions relate to design, construction and operation of the type of low-pass filters which are used in "A" and "B" substitutes and in transmitting plate supplies.—Technical Editor.

As has already been pointed out in earlier papers of this series, the function of the first filter condenser (C₁ of Fig. 1) of a 2-section filter of the conventional type is to control voltage regulation. It was also shown that this condenser had some effect on the magnitude of the ripple voltage in the filter output, likewise that the capacity of the final condenser C₅ (though it also had some effect upon the amount of ripple in the output circuit) operated primarily to control the audio tone quality obtainable from the receiver to which the unit was connected. In the case of a transmitter the effect of C₅ is similar but the manner in which this appears depends on the nature of the modulation, the nature of the keying, the circuit constants and the adjustment.

The purpose of this paper is to treat upon the functions of the middle condenser of such a filter circuit, C₂ in Fig. 3. The purpose of C₂ is purely that of ripple suppression. That it can have no appreciable effect upon regulation, as does C₅, or upon audio quality, as does C₅, is quite obvious. Measurements were made, therefore, to determine the relative effectiveness of different values of C₂ in suppressing the ripple voltage in the filter circuit output. The result is the curve given in Fig. 2, showing the relation of the value of C₂ in microfarads to the value of ripple voltage (r.m.s.) in the output. The power unit and filter circuit employed was of the standard Raytheon variety. The output was loaded to 40 m.a., which was selected as equivalent to the current consumption of the majority of radio receiving sets in use at present.

The method employed was to measure the impedance drop across a known resist-

![Image of circuit diagram]

**FIGURE 1. THE TYPE OF CIRCUIT UNDER DISCUSSION**

The effect of condenser C₁ was discussed in the September article and the effect of C₅ in the February article. The present discussion treats C₂.

![Image of graph showing curve]

**FIGURE 2. CURVE TO SHOW EFFECT OF VARIOUS CAPACITIES FOR C₂**

The applied voltage was 300 per half of the secondary winding of the transformer, i.e., 300 volts on each side of the center-tap.
ance in the output circuit (Fig. 3) by means of a vacuum tube voltmeter. The ratio of this resistance to the total value of resistance across the power unit output is a known constant by which all of

the vacuum tube voltmeter readings are multiplied in order to obtain the full value of ripple voltage across the filter output.

As a result of the exceedingly low value of ripple voltage obtained when using large values of $C_a$, it becomes necessary to employ a carefully constructed resistance coupled amplifier between the output circuit and the vacuum tube voltmeter for values of $C_r$ much in excess of 1 μfd.

**SERIES RESONANCE EFFECTS**

Upon study of the circuit given in Fig. 1, it will be seen that a series resonance circuit is formed by $L_i$ and $C_a$. Should the value of $L_i$ and $C_a$ be such as to cause resonance at 120 cycles, then the effectiveness of the filter will be seriously impaired.

Generally, as in this instance, the inductance $L_a$, has a value of approximately 30 henries in a high grade power unit filter circuit. Under such conditions, what value of $C_r$ will cause resonance at 120 cycles?

\[
\frac{1}{\omega L} = \frac{1}{\omega C} \quad \text{or} \quad C = \frac{1}{\omega^2 L}
\]

$C_a = 5.9 \times 10^4$ farads (approx.)

and for $L_i = 15$ henries, at 120 cycles $C_a = .06$ microfarads

at 60 cycles (Half wave rectification) $C_a = .24\mu f$ for 30 henries

and $C_a = .5 \mu f$ for 15 henries

Thus we see that the values of $C_r$ that will cause trouble, due to series resonance effects, are considerably below those ordinarily employed in practical applications, and need, therefore, be given no further consideration in circuits of the conventional types.

While this concludes the data available at this time on the functions of the three condensers, individually, the curves given in Fig. 4, showing the effect upon ripple voltage of various combinations of inductance and capacity will no doubt also be of interest. From a careful study of the data shown here and in the preceding articles the designer of a B-power unit filter circuit may readily determine the most economical combination of inductance and capacity for a desired minimum value of ripple voltage. Likewise, the owner of a power pack who is desirous of decreasing the "hum" may obtain a rather good idea of the most

![Figure 3. Circuit used to obtain the curve of Fig. 2](image)

**FIGURE 3. CIRCUIT USED TO OBTAIN THE CURVE OF FIG. 2**

\[e = 300 \text{ volts as before.}\]

![Figure 4. Curves showing effect of changes in both $L$ and $C$](image)

**FIGURE 4. CURVES SHOWING EFFECT OF CHANGES IN BOTH $L$ AND $C$**

The four top curves relate to the single-section filter circuit labeled "circuit A" and show the effect of changes in the inductance of $L_1$ for each of 4 values of $C_1$. The lower curve, $B$, relates to the circuit labeled $B$ and shows the effect of various values of $L_1$ when $L_2$ has an inductance of 34.2 henries and the condenser values are 2, 2 and 4 μf. The voltage input to the rectifier is the same as in the other figures.

The effective method in which to apply the additional material at his disposal.

In obtaining the data for Fig. 4, the actual inductance of the filter chokes under the different operating conditions was measured in each instance so as not to introduce errors due to variation in inductance with different values of either a.c. or d.c. passing through the choke.
6CMQ

6CMQ is primarily an experimental station. It consists of two main parts. The first is more or less permanent, and consists of the short wave receiver and amplifier, key, and transmitting control panel. As may be seen from the picture, these are mounted in cabinets, fastened to the desk, with all wiring concealed. The rest of the station is experimental. Any one of three transmitters can be connected in the radio room or in a “dog house” mounted on the roof within six feet of the end of the antenna. No matter what transmitter is in use, or where it is connected, it is operated from the same control panel.

The short wave receiver is of the conventional condenser control of feedback variety with plug-in coils for the 20-, 40- and 80-meter bands. It is also equipped with interchangeable choke coils, although one covers all the bands. The filament of the 201-A detector tube is run at only three volts and seems to give better results this way than when five volts are used. The receiver is connected to a Grebe RORK two step audio amplifier. This receiver unit operates from a separate set of “A” and “B” batteries. A trickle charger mounted under the desk can be connected to the “A” battery, when desired, by the switch at the left of the receiver. The phone cord passes through the table top and over a weighed pulley, which keeps it tight, and out of the operator’s way.

The transmitter control panel is mounted at the extreme right of the desk. On it is mounted a 0-1000 d.c. plate voltmeter, a 0-200 milliammeter, a switch to short out the milliammeter, and a filament control jack, which connects the phones to

THE EQUIPMENT AT 6CMQ

The transmitter on the shelf in front of the window is a tuned plate-tuned grid arrangement employing a single UX-210. At the present time, any one of three transmitters may be shifted in this place and connected to the power supply circuits in short order. To the right of the globe is an annograph and next is the field rheostat for the high voltage generator. The biscuit tin is the monitor box for checking the transmitted signals. The phone needs no further introduction. Just beneath it is the control panel for the transmitter. To its left is the receiver and Grebe two-stage audio amplifier which also holds up the clock. Behind the typewriter is the Kennedy receiver and between it and the short-wave set is a G.R. wavemeter.

FIG. 1. TRANSMITTER CONTROL PANEL CIRCUIT
a microphone hower so the operator can listen to his own fist. It also connects another six-volt storage battery to the starting relay. Fig. 1 shows the internal connections of the control panel. The relay which short circuits the phones when the key is up is an old high-frequency buzzer. This works well here due to its high speed operation and to its small size. The phones are connected in series with a 10,000-ohm resistance, the two being shunted across the primary of the hower modulation transformer. The resistance cuts the hower signal down to comfortable volume and prevents the hower relay from shorting the primary of the transformer and stopping the hower. The filament control jack connects the battery to the starting relay, hower, keying relays, etc. Since the jacks in Grebe amplifier are also filament control, the phone plug is the only switch necessary to start either the transmitter or receiver.

The hower itself is nothing but a microphone and loud-speaker unit, mounted facing each other, and connected through a modulation transformer. A Ford coil works very well as the transformer. The hower does not appear in the photograph since it is mounted under the table. When it is desired to use a break-in system, a blank plug is used to start the transmitter, and the phones are left connected to the receiver.

The above description covers the permanent part of the station. At times it has been known to survive as long as six weeks without an appreciable change. The rest of the equipment was built with an eye on simplicity and flexibility. The transmitter usually consists of one of three units, or combinations thereof.

The transmitter operates from a 110-to 220-volt 3-Kw. power line. The story of this power line is the standing joke of the station. Not long ago a 1000-to 1500-volt Kenotron plate supply outfit was replaced by the present 1000-volt motor generator. As a word of explanation it might be stated that the motor draws a starting load of 40 amperes. About a week after the arrival of the M.G. a recording voltmeter, property of the local power company, made its appearance on our back porch, duly connected to the light wires. An investigation proved it had a circular scale, calibrated from 70 to 130 volts, which revolved once every twenty-four hours. The record was traced on this scale by a broad pen. When the motor-generator was started the pen went about ten volts below the minimum on the scale. Goodness only knows how much lower it would have gone if the hub of the disc had not interfered. That night the set was on the air for a twelve-hour stretch, with the aid of another operator. The meter disc turned so slowly that it had not moved the width of a pen line before the generator was started up again, and so on far into the wee, small hours. In the morning the disc was solid red in the region between 110 volts and the hub, for a period of twelve hours.
was no one at home the next day when the meter was called for. That night a second meter was in the place of the first one, freshly loaded, and ready to go. From about seven until ten the results were the same as the previous night. Explanations were forthcoming, and now 6CMQ has a private 3-Kw. pole transformer, for it seems that there were four long blocks supplied from the same transformer, and the inhabitants found the 40-volt drop annoying.

The entire shelf over the desk and table can be used for the transmitter, if the need arises. Two sets of five wires each, tipped with lugs, come up from behind the table to the shelf to connect the plate and filament supplies to one or more of the transmitter units. This system of connections is largely responsible for the flexibility of the transmitter system in use.

There are three main units in the transmitter. The first is the tuned grid-tuned plate oscillator, shown in the photograph, which operates on 40 or 80 meters, by changing the clips on the inductances. It is used for low power work on either of the two waves, or as a master oscillator for the 50-watt power amplifier. Like all other of the transmitter units, its plate supply comes from the motor-generator. When used as a master oscillator, a 10,000-ohm resistance is placed in series with the positive high voltage so that the full output of the motor-generator may be applied to the 50-watt without overloading the 210. As may be seen from the picture, the base on which this unit is mounted is an old panel that used to be something else. From the lack of visible wiring in the photographs, it may also be guessed that all filament and non radio frequency wires are under the base.

The second unit is a 160-meter crystal oscillator, with a frequency doubling, 80-meter amplifier. Similar sets have been described in QST many times so that its description will be omitted. This unit is used as a low power 80-meter set or as a master oscillator for the frequency doubling 50-watt amplifier when used on 40 meters. Due to the fact that two of the three original crystals are now broken, and the wave of the remaining one coincides within 200 cycles with Mexican XC51, and is almost on top of nu2UO's xtal, this unit is seldom used.

The third unit is the 50-watt power amplifier before mentioned. It is equipped with interchangeable coils for the 20-, 40- and 80-meter bands. It is normally used as a frequency doubler, but may be used as a neutralized amplifier on the same wave as the master oscillator. Its plate supply is the 1000-volt motor-generator, a series resistances being used to lower the voltage to the master oscillator tube, if necessary.

The antenna is one of the most interesting features of the station. It is supported from a 40-foot, one-inch iron pipe mast, and the chimney of the house, which are about 80 feet apart. The average height of the antenna is only 27 feet. Both supports are equipped with a continuous rope through a pulley. The chimney is provided with a cleat to which the rope is fastened. The pole end has a harness clip to which are hooked 30 pounds of flat iron, and window weights, which allow the rope to expand and contract under varying weather conditions. Perhaps this device is the only reason why the pole is still vertical, despite the winds or, rather, gales which Altadena experiences at times. Harness clips are spliced on both ropes, and the antennas are hooked to these.

There are available two antennas always. The first is a 60-foot wire with a 60-foot lead-in. This is voltage fed at 20, 40 or 80 meters. The second is a 40-meter Zepp of standard construction, and size. The unused antenna is wound on a drum until needed. The lead-ins bolt under winged nuts to No. 10 x 32 brass bolts passing through a quarter-inch, plate glass window, mounted just behind the transmitter. With this system it is not unreasonable to ask a fellow to, "QRX for a new antenna". When the antenna was first built, considerable difficulty was experienced with har-
monics falling outside the band. The trouble was finally corrected by grounding the pole and all guy wires.

All the receivers operate off a 25-foot antenna, that is 15 feet high at the far end.

Beside the regular short-wave receiver, there is a tuned radio-frequency receiver using one of the new UX-222 tubes. This receiver was built from the article by R. B. Bourne, in December, 1927, QST. This, and the photograph are description enough and shows that the receiver slides into a tightly fitting copper case that is mounted in a cabinet. The fact that it is a three-handed set has prevented it from replacing the regular set. It is used only on DX signals. At the time the photograph was taken it was not connected for use.

The B.C.I. set is a Kennedy, which also takes in the 600-meter band. This set and its two step are seen on the table behind the mill.

A monitor box similar to that described in QST many moons ago is used to check up on the transmitter. In the photograph of the general layout it is seen directly above the receiver on the shelf. The details of construction may be seen in the picture of the interior. Plug-in coils are again used. This unit is also equipped with a filament control jack. The circuit is shown in Figure 2. Note that the jack is grounded, which makes it possible to mount the jack right on the can, and prevents the phone cord from acting as an antenna. When this unit was first built, it was too sensitive, and the transmitter paralyzed it. This was overcome by increasing the size of the tickler coil.

On the shelf, to the left of the monitor box may be seen the generator field rheostat. With this the voltage may be varied from 200 to 1000.

To the left of this is an Omnigraph, on which is a home made disc cut to send “Test test no6CMQ”. This is a great help when adjusting a transmitter, as it leaves both of the operator’s hands free. The main objection to it is that every new visitor has to have it explained to him why the disc reads “Test” and not “CQ”.

The telephone, seen at the right hand end of the shelf insures prompt delivery of local messages, and a constant source of QRM since it is an extension of the house phone and all phone conversations are R6 in the receiver.

At the extreme left of the shelf, in front of the filament transformer, is the proudest possession of the station. Some time ago the operator was complaining of the poor DX. Miss 6BXA suggested the use of a cat to improve this condition. (Ask TOM. No, not Tom cat.) It was explained that the cat had been tried, and while the DX certainly improved, the cat started to lose its fur. Two weeks later 6BXA made the station a present of “Felix” saying that he, she, or it, as the case may be, had been treated with an acid-proof paint and could well withstand the wear and tear that would be imposed on it. The Trans-Pacific Test certificate above the monitor box speaks well for the results.

The station is kept within bands with a General Radio wavemeter. When an exact standard is wanted, a General Radio precision wavemeter is available. This is one of few compensations to ham radio resulting from a job as chief operator in a broadcasting station. The station is owned by F. T. Swift, Jr., in Altadena, Calif. It boasts RCC, ORS, OWLS and RM standings. The operator is also Chairman of Communications for the well known Short-Wave Club of Pasadena.
Another Part of the Family

EVERY once in a while someone sings us a sad tune to the effect that amateur radio is passing—the old timers are all (gulp) commercializing themselves. Well—why not? Rich American amateurs are scarce, therefore most of us must work at something and it might as well be something that we like. Instead of wailing at the fact that amateurs are doing things in commercial radio let’s feel proud of the fact that one can’t look into any branch of radio whatever—none whatever—without finding it thoroughly filled with A.R.R.L. men.

As an instance—did you happen to know that the operating staffs of American broadcasting stations are very largely amateur and ex-amateur? Did you suspect that in general the proportion is highest in the best stations? So it is—there is statistical proof: the broadcast-operating game (just like the ship-operating game and the manufacturing game and the business of radio engineering) is a thing this outfit has manifold personal connections with.

These A.R.R.L. broadcast operators do a lot of interesting things that the straight message-handling operator will need to have explained to him. You see it is a job that is made up of wire telegraphy, radio, telephony and music.

Do you wonder that this sort of a job produces a WCCO group that can handle the ticklish 9XL standard-freq. job as well? Do you wonder that a visit to any B.C. station is worth while? However, if you go, be sure to have time to get acquainted with the operating staff and to talk to them; they have ample material for conversation. The apparatus will look familiar—until you try to trace the details of its operation—then you go back to the chart class.

Come into this station and let’s look around. Never mind the telegraph desk; those are the wires to the A. T. & T., W. U. and Postal. There’s a wire to Springfield too and it is used—but that becomes complex and can’t be told here.

The tall narrow framework cover there is a Western Electric r.f. amplifier of one stage with a rated output of 5,000 watts. Being water-cooled the tubes stand in metal jackets supported by the little table with the porcelain pillar legs. Since the plate voltage is upward of 10,000 it is necessary to prevent leakage to the grounded water-supply pipe and the grounded drain pipe. This is done by interposing long pieces of rubber hose, the water column inside them being long and slim enough to offer a high resistance so that the leakage is not excessive. The two rubber tubes are coiled in the lower part of the frame and at the bottom of the coil there is a water-failure device which (if the flow of water stops) operates an electrical contact and thru apparatus on the lower portion of the instrument panel.
gives an alarm and trips out the high-voltage supply, thereby preventing damage to the tubes.

In the upper level of the set there is another small insulated deck carrying the plate supply choke and the plate stopping condenser, from which a lead descends vertically to the plates.

Just behind the panel are the "ohmspun" resistors, also the chokes and condensers which have to do with the filament supply and the grid bias. On the rear of the same deck is a small vertical panel carrying filament fuses and cutoff.

The customary web of wire is gotten rid of by the good standard W. E. method—

cable all low voltage wires together and put them in the hollow of the nearest anglebar. The "cable" is of the usual telephone sort—wires laid together and fastened with a length of twine that runs along the cable and is half-hitched around it every inch or so. Perhaps some telephone man can explain why the procedure is called "swing".

Take a look inside of this special 1-kilowatt job. The central object is a bake-lite rack carrying "ohmspun" resistors which are tapped to the curious slider-switch just below, a construction that can be copied with advantage where it is necessary to have a variable voltage for grid bias or the like. The resistances shown are, by the way, rather good at r.f. and a scheme of this sort has been used in at least one W. E. transmitter as a sort of r.f. voltage divider to supply adjustable feed to an amplifier.

The inductances below have treated maple rods slotted for the metal strip of which the coil is wound.

The condenser strip above is of the sort rather common in large W. E. sets and although its exact use in this case is not known there is a suspicion that it is part of a system of capacity-coupling to the antenna. By this is meant real capacity coupling and not the l-wire r.f. feeder system which is commonly mis-called by that name. "Lend me your pencil John; may I draw on the back of your message pad? The thing I mean is the arrangement in which we have such a connection as that of Fig. 1, where the primary circuit is L, C, L, and the secondary circuit is L, C, C. The capacity C, is the coupling capacity, being common to both circuits. If it is large as compared to C, and C, the voltage across it is small, therefore the power transferred is small, therefore the coupling is loose. If C, is of a size not large as compared to C, and C, then by a similar logic the coupling becomes closer. By choosing the constants correctly the system can be made to reproduce the usual performance of the magnetic methods of coupling, with some advantages. Fig. 2 shows one practical form which explains itself. C, would be the mica condensers up there in the set.

Did you ever sketch out what happens when you try the same thing on an antenna which isn't grounded but uses a c.p. instead? (Note British effect obtained by referring to counterpoise by its initials.)

First of all, does it make any difference? Crazily enough it sometimes makes little difference in the operation but a considerable difference in the explanation of the operation. That probably does not sound rational—may not be rational—but is worth talking over. Cut off that monitor loudspeaker and we'll go over it. Perhaps some of you can make it clearer than I—I hope so.

First of all we will have to admit that the circuits of Figs. 1 and 2 are not very exact. They show the inductance of the antenna lumped in one place (L,) and the capacity lumped in another (C,) whereas
we know that even if there is a loading coil we still have inductance draped all along the antenna right out to the last centimeter. We really get a better idea of the actual situation by drawing a rough picture of the antenna field—meaning the electric or "static" field: (Incidentally, isn’t it funny that we talk about a “static” field when the thing is collapsing and unfolding at the rate of ??????? cycles per second?)

To get on—in Fig. 3A we have a crude picture of the antenna taken at the moment when the electrical field is actually “static”, which is to say at the moment of peak voltage and no current. The field is the private property (comparatively) of the antenna by reason of the fact (almost) that it all lights on the c.p., there being nothing else nearby. A sort of picture of the electrical circuit in terms of L and C would then look like A’ in Figure 4.

When we drop the antenna-counterpoise system nearer the earth the picture becomes more complex for we add a material amount of capacity between c.p. and ground, also between antenna and ground, giving the distressingly complex picture of B and B’ If now we use a large c.p. and thereby get a lot of capacity between the c.p. and ground we modify the picture somewhat we have the things shown in C and C’. This makes the whole thing indecently complex and a fit subject for mathematical treatment instead of soldering copper engineering by the present meeting. It is therefore a relief to find that as soon as we finish the job and use a ground we have the simple picture of D and D’. I know—I know—we are getting ahead slowly, but then I have not Dr. Pickard’s gift for saying much in a sentence. Bear with me.

If we hope to do any guessing on the coupling business we will need something simpler than Fig. 4. Going ahead we see that in each case we can group the capacitances under headings as capacity between.

- Antenna & c.p. (C_m)
- Antenna & ground (C_g)
- C.p. and ground (C_r)

Without as much as a court order we will bunch the little distributed capacities that way and draw Figure 5. It is quite likely that someone will be able to lump them more profitably, which will give us a good follow-up article. Having done this let’s try to work our method of coupling and see what comes of it.

In Fig. 6A” we have at the top a scheme that is certainly capacity coupling—but the set is up in the air too. That is a senseless procedure and we had better put it back down on the earth and feed the antenna by some sort of a feed line so it will not be necessary to chip ice off the helix or the tube before starting up. Of course if anyone wants to hang on an extra tuned circuit up there it is possible to leave L1 and C1 up there and feed them from the line. This will have the advantage that we can use the LC system as an impedance-matching transformer such as was described in the January issue of QST.

In B” we have tried it on the linear antenna near the earth. The first thought was to use C_g as a coupling capacity but it is very small and the voltage across it would be large, resulting in a large coupling, which isn’t wanted. Therefore C3 has been connected across it and made large. The result is that we no longer have a Hertzian system—we simply have a Marconi antenna with a series condenser C3 in the ground lead. That changes the wavelength too much for now we have an antenna twice as long as before (the node has of course moved to the earth connection) and the thing isn’t fitted for the wavelength we started with. Evidently this was a bad start and the way to do it is to put in a
reactance at the place X. This X had best be a choke coil such as is used over at WOAI in San Antonio. As I remember it that's a tapped coil of some 30 spaced turns on a 4" form. Then the primary circuit goes right along and the drop thru C3 is partly fed thru X to Cex and excites the antenna. X acts as a coupling control, the more inductance it has the less the coupling. One can see offhand that this isn't true capacity coupling but some sort of a link arrangement. The wire between C3 and Cex can be lengthened out more or less at will, as long as it doesn't start to fall into tune with the working wave. The "limiting reactance" can be a condenser, in which case we have the the classic 8XK arrangement with the corresponding difficulty that the harmonics get thru to the antenna more easily than the fundamental. That's why Strobel first used the choke at KFKX. Before someone asks me to name this sort of coupling we will move on to C4, for which I've made no diagram, but which of course is the same thing as B" except that Cex is large so that excessive coupling can be avoided by merely choosing the size of L1 and C1 so that the current thru the primary system is of the right size to give the desired coupling by reason of producing the right drop across Cex. This wasn't possible in B" because we would have had to work with such a very small C1 and such a very large L1—and one hates to handle a 5-kilowatt Tesla coil surrounded by blue fire.

When we get to D" we have exactly what we started with, and that's as far as most radio discussions get. Let's drop it for this time; someone else will do a better job at the next session.

Did anyone of you fellows ever listen to the stuff from your own B.C. stations at home? Clayt. Randall of WTIC uses a superhet with a meter in the last plate circuit, just to keep track of the modulation over the station. Eh? Oh no—there isn't any loudspeaker or headset—he just "listens" to the meter.

May we come over sometime and watch you make a line test? Good, I never did understand this audio oscillator test. Come over to 1MK sometime and watch the new Raytheon tubes. They are pretty good for—oh yes, that's right; we are not supposed to talk about them yet. Cut off the mike will you George?

---R. S. K.

Adapter for "852"

MANY of those folks who have sets employing 204-A tubes are probably very muchly interested in the UX-852 as a possibility for ultra high frequency work but have refrained from their use because they did not want to go to the trouble of installing new sockets which would not allow either tube to be used at will. Such will be interested in the UX-352 adapter, a photo of which appears herewith. The insulating parts are of bakelite and the filament, grid and plate leads are run behind the long panel upon which the other equipment is mounted.

This adapter is a product of Heintz and Kaufman of 219 Natoma Street, San Francisco, Calif.

—H. P. W.
A Crystal Grinder

By H. F. Mason*

MR. WATTS' excellent article on page 27 of the January QST shows how simple it is to grind your own crystals; but it is a tiresome job, nevertheless, and requires a lot of patience. Probably the slowest part of grinding an 80-band crystal is in roughing down the blank to a few thousandths over the required thickness. A contraption as shown in Fig. 1 will save much elbow grease here. The idea is not mine; it is a take-off on a grinder used by one of those venerable amateur telescope makers back in Springfield, Vermont. The sketch is self-explanatory. Arm A is a maple stick having brass bushings pressed into holes in it for bearings. The grinding disc or "tool" is a piece of coarse grained cast iron. When it wears untrue it is merely removed chucked in a lathe, and a very fine facing cut taken off. This makes it sufficiently plane, as this grinder is used only for roughing anyway. The toothed wheel B is cut from galvanized iron. In operation the pulley P is run about 250 r.p.m. The hook H acts as a pawl and boosts ahead the toothed wheel and iron disc about \( \frac{1}{8} \)-inch every revolution of P. Friction at D keeps the disc from moving otherwise. Before placing in the grinding rig the quartz blank is made approximately plane on both surfaces by hand grinding. No. 150 carborundum grains and water are carefully smoothed over the iron disc, the surplus wiped off, and the motor started. The center of the crystal will describe a path as in Fig. 2E.

In the semi-finals with No. 220 carborundum grains, as well as in the final grinding with No. 400 and then No. 600 carborundum, the planeness of the surface obtained depends a great deal upon the exact manner in which the crystal is steered over the plate glass. Fig. 2 attempts to show methods and the results. Method A will (unless something else is the matter) grind the center low while D will bring the corners low. B and C are intermediate. The exact method to use depends on the planeness of the plate glass on which you are grinding, the amount and grade of compound used, the thickness of the quartz, and the result of your last measurement with the micrometers. If the plate glass has been used several times for fine grinding, or if there is too much carborundum, the corners will grind low. This can be partly corrected by using method A. If the crystal is of a thickness corresponding to about 90 meters or under, the pressure of your finger in its center while grinding will cause the crystal to bend, tending to bring the center low. This can be corrected by using method D and very light pressure. Try and cover the plate glass completely or the glass will have its true ness destroyed and your crystal can never be ground true. Use too little rather than too much carborundum. The glass you are working on should appear like a piece of emery paper. Any surplus carborundum should be wiped off and should not be allowed to accumulate at the edges. If allowed to remain, this surplus will get under the edges of the crystals, as it is moved about, and will grind the corners and edges low. This of course is more pronounced with the coarser grains of carborundum. One "wet" of carborundum lasts from ten to fifteen minutes, after which it fails to cut and should be renewed.

Regarding holders, some have recommended top plates smaller in area than

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*Seattle Radio Laboratory, 3355 33rd Ave., So. Seattle, Wash. "X" Section, also 7BU.
the crystal, or a circular top plate for a square crystal. A crystal afflicted with low edges or corners will give best output with

![Diagram of crystal paths](image)

PATH OF CRYSTAL

- ![Path A](image)
- ![Path B](image)
- ![Path C](image)
- ![Path D](image)
- ![Path E](image)

FIG 2

a top plate that does not cover those places where the crystal is thin. This is simple to explain: the corners simply do not wish to come along and oscillate at the frequency of the center because, being thinner, the corners want to oscillate at a higher frequency. It has been my experience that a crystal having corners the same thickness as the center will give best output with a top plate the same size as the crystal.

It is important, when making connections to the crystal holder, that the leads be short so as to minimize stray grid-filament capacity.

Audio oscillations or "singing" is most liable to occur if the electrode plates are not plane or if interposed dirt particles prevent even contact between the electrodes and quartz plate.

Much trouble and grief in finding the right value of radio frequency choke to use across the crystal can be eliminated by using a resistance instead of a choke. A 50,000 ohm metalized leak is a good value to start with, and of course a higher resistance will result in less plate current and a low resistance in more plate current.

The Twin City Vigilance Committee (Continued from Page 36)

check-ups. The measures which the Twin City Radio Club have adopted for bringing about a readjustment of undesirable conditions (interference to broadcast reception included) have been very effective and there is no reason why similar methods cannot be put into operation in other parts of the country."

The Twin City Committee tentatively consists, in addition to Mr. Kohler as chairman, of Messrs. J. G. Pekoushek, 9EEK, president of the club; P. R. Gould, 9DEP, publicity manager; W. L. Kinsell, 9CEV; R. W. Billett, 9BIS; R. S. Spooner, 9LW; D. F. Cottam, 9BYA; and the personnel at 9ABK.—Ed.

Atlantic Division Convention

June 14, 15, 16, State College, Pa.

HERE'S the announcement, fellows, of the 3rd annual Atlantic Division Convention to be held at State College, Pa., on June 14-15-16, sponsored by Director Woodruff and Section Manager Crossley in cooperation with the Pennsylvania State College, Department of Electrical Engineering.

The program is replete with good things and any one missing this convention will regret it. Miss Zandonini, 3CDQ, is to speak on crystal grinding and calibration; McAnuy, 3CEO, on tube rectifiers and their characteristics; Dr. J. O. Ferrine of the A. T. & T. will talk on transatlantic phone and will have tubes to show us.

The committee in charge has made arrangements to take care of the delegates in the college dormitories. The YL's and OW's have a special cottage reserved for them and the cost for the rooms will be only $1.50 per night, 2 in a room.

Besides the good lectures there will be plenty of stunts, side trips and a general good time is guaranteed.

Convention cost is $5.00 and SCM Crossley, who can be addressed in care of Pennsylvania State College, State College, Pa., will be more than glad if you write him to say that you will be there.

Strays*

The Burgess Battery Company of Madison, Wisc., has recently supplied us with a copy of their Engineering Circular No. 15, under the title of, "Experimental High Frequency Radio for Aircraft". This is a most interesting thirty-page brochure which describes complete installations for both aircraft and ground stations. The set to be used aboard an airplane is designed for both key and voice modulation while the transmitter for the ground station is primarily constructed for telegraphic work. It can, however, be used for voice by the addition of another tube and some associated equipment which is described in the pamphlet. Copies of this circular may be obtained on request from the Burgess Battery Company.
A Combination Fieldmeter-Wavemeter-Voltmeter

By Eugene C. Woodruff*

NEVER put an ammeter into a "tank circuit." Don't use an ammeter in your antenna. Don't buy or make a wavemeter to be used with an ammeter or a small lamp as the indicating device.

Naturally the above "don'ts" must be qualified in the interests of both peace and accuracy. Don't "do any of these don'ts" unless you have very special reasons for each occasion, and unless you have money to spare. The apparatus about to be described will produce all the results the average constructor and operator will ever need, and that much more easily and cheaply. This device has stood the test of demonstration before several clubs in various cities. Invariably the fellows say, "I must make one like that," and "When will it appear in QST?"

Reference to the photos and diagram show the following parts:

L1. Wavemeter inductance on UX-tube base (for the 40-meter band 16 turns of No. 20 D. C. C.)

L2. Field-pickup coil. Suit yourself; almost anything from 1 turn an inch in diameter to 6 turns 2 inches in diameter.

Cl. Wavemeter condenser. Cardwell Balancet or equivalent.

Ma. Milliammeter. First choice for range 0-1.5 though meters up to 0-10 give nearly equal satisfaction. (To have the same voltmeter ranges with meters other than 0-1.5 the resistance shown must be changed.)

Det. Fixed Carborydum crystal detector with ample current-carrying capacity. Carborydum Co. type, or type that can be purchased at almost any "five and ten."

R and R2. Series resistances for voltmeter—Daven "high capacity" "Glastors;"

100,000 ohms for 150-volt range, 500,000 ohms for 750-volt range, both with above mentioned size of milliammeter. The "voltmeter" does very well for work with a "B" eliminator, as the load it puts on the eliminator will always be less than 1.5 milliamperes.

To use the device as a fieldmeter, remove the wavemeter plug-in coil L2 and connect pickup coil L2 to the Fahnestock terminal, place the pickup coil loosely coupled to the source of field (such as a tank circuit or antenna) and note behaviors of the milliammeter and the adjustments of the oscillator are changed. With the fieldmeter coupled to the tank circuit you know when your outfit is oscillating, and can easily find the combination of adjustments that produces maximum effects. With it coupled to the antenna you know the antenna is radiating and can readily adjust the transmitter to get maximum radiation. Right here let me warn you. Don't let anyone scare you by asking how you know you are not getting "merely the effect of induction", whatever he may mean by that. Assuming we know what he has in mind, part of the answer is that this device shows stronger fields at the ends of a half-wave antenna than it does at the center. At a voltage node it did show nothing, though the current through said node was large and otherwise evident. The device also shows, when used with an antenna having a
thermo-ammeter in series, that maximum radiation and maximum antenna current do not always coincide. In any case this device affects the decrement of your oscillator less than other methods of indicating field, as it takes less energy therefrom. For examples, at 8CMP the fieldmeter is placed near the 20-meter Hertz antenna, away from the direct influence of the transmitter. Then the transmitter is adjusted until the meter shows maximum field radiated. No other meter need be used in the transmitter assembly. Again, at 8CMP, each stage of all crystal oscillator-power-amplifier systems is provided with one of these fieldmeters loosely coupled to the tank circuit, greatly increasing the ease and flexibility of adjustment, and with a considerable saving in cost over meters as ordinarily used.

To use as a wavemeter, plug in a suitable coil wound on the base of a tube and connected to the Fahnstock, loose couple to the meter or oscillator and tune to maximum meter reading. The tuning is sharp and calibration is especially stable, from pick-up coil. Tuning, the wavemeter is accompanied by a very sharp and satisfactory response in the milliammeter. This use of the device, in all bands, is the most important one of all, at least at 8CMP.

To use as a voltmeter, simply plug voltmeter leads into the proper jack for the desired range, pick-up coil removed. In the interior view, one cover removed, the crystal may be seen just above the meter, and the high resistances and jacks just beyond.

Try this device, fellows, and let me know your troubles, successes, or criticisms, please.

**Official Wavelength Stations**

THE Official Wavelength System furnishes a service cooperative with, but differing from, that of the Standard Frequency Station 9XL, which is also operated in accordance with plans made with the O.W.L.S. Committee. Contact with the O.W.L.S. is through Mr. D. C. Wallace, 6AM, who is also chairman of the committee. Mr. Wallace is continuing the practice of checking up all O.W.L.S. to make sure that they are really indicating their wavelength (or frequency) at the end of each transmission—and are doing so with proper accuracy; which is to say 2%. They do this in the course of regular operation and do not send calibration schedules as do the S.F. stations.

The list is as follows:

NKF, 6ZV-6XAO, 6BQB, 7BU, 5MN, nclFC, oz2AC, 2WC, 6AM, 9FF, 8GU-8XC, 9XI, 1CK, 1AWW, 3ZW-3BE, 5AA, 3EQ, 3APV, 4XE, 5ZAQ, 9DXN, 9EGU, 62H, 2MU, 4BY, 92A, 7GE-7ZX, 5SP, 9EB1, 7GQ, 2DS, 1BZQ, 6BGM-6CV0, 2XI, 91G, 7ACI, 1ZL-1AVW, 2CLA, 6ZE, 8GZ-8ZG, 9BQK, eg2NM, 7TL, ncl3NB, 9L, 8APZ, 2ZG, 7QK-7MX, 6LJ, 50X, 9BMR, 6BCP, 1AAC, 1ZO, 8BT, nc3CO, ec2CM, eg20D, 6CAE, 5AGN, 9AXQ, 9CPM, 5EW, 5PH, 1AXA, 9BGH, eg2SZ, 1XM, 6BX, 6BB, nclAE, eg5LF, 1KP, 8DAJ, 1BHW, 9AUG, nce2BE, 6AOI, 9CXU, 2BRB, 8CMN, 4nBT, ec5BG, 4L, 2BO, Ireland 5NJ, 1CCW, 6DHL, 8BAU, 9XL, 6BVH, NRRL-9UZ, 2EF, 9WI, 7XF, 6AKW, 6CDY, 6AY, 6AYC, 9OL, 6BR0, 6CCR, 6BMW, 6CMQ, 4CK, 7AAT, 9AHQ, 9EFO, 6QL, 6BAJ, eg5YK, 6BZU, 1BD, 5NW.

**THE DEVICE AS A WAVEMETER**

One end has been removed to show the interior arrangement.

even when the pick-up coil is varied widely in size or number of turns. Coupling should always be loose. The fieldmeter may also be used (with L in and L out) with any other wavemeter, as an indicator of resonance. In general it is more sensitive and affects the calibration of the wavemeter less than other methods of indication, For example, at 8CMP the fieldmeter is placed several feet from the five-meter antenna, for example when the General Radio wavemeter is placed between the fieldmeter and the antenna, perhaps 3'
 Experimenters’ Section Report

W

ITH this report the “X” Section goes into new hands. Having founded the Section and watched it through its various changes I naturally feel some regret at the parting, especially as many of our wishes and hopes have not been accomplished. We have never as we had hoped, acquired the complete time of one headquarters man to do for this Section what the Communications Manager and his assistants do for message handling. Neither have we been able to keep everyone supplied with outlines and reports as promptly as we desired, though in this regard very nice work has been done by Mr. Ross Hull.

However, the Section has done good work, and has much more than justified its existence and has made good its claim for those things which we have not been able to give it as yet.

In the last two years many of QST’s best articles have been by “Member Experimenters’ Section”. No other group has made an equal showing. Several old and knotty questions of amateur radio have been given their first practical answers by the Experimenters’ Section.

The Section is therefore turned over to Mr. Westman and his sides with some pride as to a good record left behind. To those who aided in the making of that record—goodbye and good luck!

Robert S. Kruse.

Mr. J. Stanton Chapman, “Neverland”, P. O. Box 175, Sewanee, Tennessee, recently sent in a letter which deals with the intriguing subject of r.f. chokes. We are taking the liberty of publishing Mr. Chapman’s letter below.

Use of a Non-Magnetic Meter for Testing R. F. Chokes

In constructional descriptions of transmitting sets it has been standard practice, in the case of the Hartley circuit, to place one r.f. choke in the positive power lead. The question of the efficacy of this choke has been the cause of much grief, and most amateurs have at one time or another made and tested scads of the things.

F. A. Lidbury’s excellent report in the October, 1927, QST gives much worthwhile information, but most of his work appears to have been confined to the antics of one choke, and this at all times in series with a milliammeter. This instrument was, presumably of the usual magnetic type.

Now, in the course of some rather hap-hazard choke tests; both before and after the appearance of Lidbury’s report, I reached the conclusion that an ordinary milliammeter, having of necessity a coil in its inards, must itself act as a choke, and so affect the general efficiency of the circuit.

A simple proof of this is to tune the set for best output then short-circuit the m.a. and watch the aerial ammeter fall. Of course, slight re-tuning will restore the output, or perhaps not, but the point is that shorting the m.a. has made a change which should not have occurred. Evidently some form of non-magnetic meter is indicated for choke testing.

Well, it so happened, that a friend in Europe sent me a hot wire milliammeter. Now, I thought, this thing ought to show r.f. leakage past the choke, as well as indicate the plate current. It did.

I know that hot wire meters are not particularly accurate, also that they read effective values of current when using a.c., but for use in choke testing approximate values of current are near enough. The main thing is that a hot wire meter will give some surprising readings if it is substituted for a magnetic meter in an average set.

The main point of this letter has now been made; i.e., use a non-magnetic milliammeter when testing r.f. chokes in a transmitting set. Now you can skip the rest of this if you happen to have a date; but I will state a few findings and conclusions that might be worthwhile for someone to check up.

About that choke again. Friend Lidbury did not say just how he tested a choke in a transmitting circuit, and I do not know how other folks attack the business, so in order to make my following comments quite clear, this is how I do it: The output leads from the set (feeders, or ant. and c.p.) are disconnected, and various chokes are clipped in. The current shown on the m.a. is noted for each choke. The plate voltage, filament voltage and wavelength are kept constant. (Slight re-tuning of the primary condenser is necessary in most cases to keep the wave the same.) The choke that allows the circuit to oscillate with the least plate current is termed the best one. A further test of this “best” choke is made by seeing how much closer the filament clip can be moved toward the grid end of the coil without stopping oscillation. The output leads are then re-connected and the difference noted in the output and input amps. as compared to the first readings. Al-
lowance is made, of course, for any change in the position of the filament clip.

We will suppose that in this test one choke was used in the positive lead and the m.a. was in the negative lead. The magnetic meter, which reads about forty mills, is now replaced by a hot wire one, having a maximum scale of two hundred mills. The pointer of this meter jumps right off the scale. We then lower the plate voltage and start all over again, forgetting what we thought we knew about chokes.

The above actually happened when testing a ½" diam. 2" long choke wound with 38 wire, with one ux-210 tube on 500 volts, circuit unloaded, and tuned to 20.5 meters. On changing the position of the hot wire milliammeter to the positive lead, it showed a lower reading due to the partial choke effect of the transformer that was blocking the r.f. in the negative lead. (2)

Here are some findings, discovered through the use of a hot wire milliammeter in testing a number of widely varying chokes:

(1) If a single choke is used, its “fundamental” must be half, or a little less than half, the working wave to which the set is tuned. It is very critical as to the number of turns. Ten turns, more or less, will increase the m.a. reading, although the output may not change much; (2) Two chokes are the best bet—one in the positive and one in the negative lead. These are far less critical and need not even be the same size. The indications are that the “fundamental” of each should be below rather than above the working wave. Lidbury’s ½” x 2” choke is good at 40 meters when two are used, but even two of these appear too large on 20 meters. The size of the wire and the diameter of the form (up to 1”) appear to be immaterial if the “fundamental” is about right; (3) one way to check the choke effect of a magnetic meter is to put a hot wire one in series with it, first on one side and then on the other. If there is r.f. current in the line the hot wire meter will read higher when it is between the magnetic meter and the set than when it is on the other side.

I have found that when two good chokes are used, the two meters will read nearly alike, whichever way they are put in the circuit, or in either power lead.

Considered purely from the standpoint of power output (provided that the closed and radiating circuits are reasonably loosely coupled) the difference between a pair of good chokes and a single poor choke with the m.a. doing half the work, is comparatively slight, unless the choke is so bad that the circuit oscillates unsteadily. Probably this is why we have been able to work for so long with any old choke in the set. There, is however, an actual gain in output amps. when using good chokes, and this, together with improved general efficiency not to mention steadier oscillation seems to warrant further work on the choke problem.

Most of the foregoing would seem to apply to chokes in a full wave self-rectifying circuit, as the hot wire meter shows that the two main chokes are critical until a third one is placed in the center tap lead from the transformer. When this is done the input mills drop and the output goes up as before.

However, I have had very little success when trying to use two ux-210 tubes in a full wave circuit on 20 meters. The difficulty is that I can only get a raw a.c. note. The tubes appear to oscillate at slightly different wavelengths, probably due to small differences of construction, but this is beside the point.

In these full wave tests another choke problem was encountered. This time it was the beastly little inter-grid choke. I find that no closely wound choke is any good, whatever the size or number of turns used. Space wound chokes will work, but they must not be in inductive relation to each other. This is on 20 meters of course. On 40 meters 26 turns tapped in the center are all right; but on 20 meters the chokes
must not be wound on the same form. Also, the turns are critical.

I am enclosing a rough curve showing the effect on the plate current of the number of turns of wire on two \( \frac{1}{2} \)" space wound grid chokes used in an unloaded Hartley circuit. I doubt whether this curve has much meaning for any other set, as I do not know how much the other constant grid condenser, blocking condensers, etc., affect the situation, but I am sending it along in case it might be of interest.

In this case, high plate current is taken to mean that very high frequency oscillations between the tubes are using up the power so that the pair of chokes that cut the plate current to the lowest value are the best. If the chokes are too small, the tubes will pull more than the non-oscillating load. The curve shows this. Re: hot wire milliammeters. These things are not so exceedingly hard to make. An alarm clock makes a good case. The spindle and bearings for the pointer come, complete, out of the clock works, or from a dollar watch. Two brass angles (one made with a tongue for zero adjustment) are mounted on hard rubber or on paraffined wood cut to fit the case. A scrap of silk thread, a broom straw for a pointer, a small wire spring and you have everything for the meter except the wire. This can be obtained from the series resistance of a cheap voltmeter. Its diameter will be about .003". Rub two and a half inches of this wire between an ollistone and plate glass, with kerosene, till a mike says it is .0015" diam. This size will read from 40 to 160 mills, .002" wire will read from 60 to 220 mills; .003" wire from 100 to 400 mills. Readings are only approximate as wire and meter construction will vary. I have made several of these things that work quite well. They can be shunted, of course, for use as aerial ammeters.

The dope here set forth may be all wrong, or otherwise not meet with your approval, but here it is for what it is worth.

A.R.R.L. Technical 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.

OUR COVER

The photograph shows KDKA of the 62.5-meter wavelength with Mr. C. W. Horn, Sup't. of the Radio Operations Department, Westinghouse Elect. & Mfg. Co., East Pittsburgh, Pa. “tuning up”.

The radio frequency apparatus is of the crystal-controlled type. The crystal controls the frequency of a 5-watt tube and this is amplified through to a 250-watt stage, one 500-watt balanced stage, one 10-Kw. balanced stage and one 20-Kw. balanced stage. The modulation is accomplished by the constant current system. Coupling to the antenna is by means of a short transmission line, the antenna itself being of the grid vertical conductor type. Transmissions from KDKA on this wavelength have been successfully relayed in England, France, Germany, South Africa and Australia. The quartz crystal as a frequency stabilizer has gone a long way in improving the quality of transmissions at short wavelengths.

We reproduce this photograph through the courtesy of Mr. Horn and the Westinghouse Electric and Manufacturing Company.
Designing Small Transformers

By R. C. Hitchcock*

Three factors used in transformer design can be given in a convenient form by a three column alignment chart. These factors are flux density, core area, and turns per volt. The relation of these is:

\[ N = \frac{E}{4.44 B A f} \]

- \( N \) = turns
- \( E \) = volts
- \( B \) = flux density per unit area
- \( A \) = area (same units as used for \( B \))
- \( f \) = frequency in cycles per second

As an example to illustrate the use of the chart, suppose a transformer to be designed to use 4% silicon steel 1-1/4" wide, and stacked 1-1/4" deep. The area would be 1.25 x 1.25 = 1.56 square inches; this point is located on the second column. Suppose further that the flux density, shown in the first column, is to be 60 kilolines (thousand lines) per square inch. Lining up these two values, the turns per volt for 60 cycles are found to be 3.8. For a 110 volt 60 cycle supply, this transformer should have a primary of 3.8 x 110 = 418 turns, and the other windings are calculated in a similar manner. In the case of secondary windings where a definite voltage must be delivered, a few percent extra turns may be added to compensate for losses, this will be mentioned again later.

**Heat Losses**

The allowable percentage losses for a small transformer are relatively greater than for a large one. That is, a loss of 5 watts is not considered serious if the output is only 20 watts, whereas a large transformer delivering 20 kilowatts would never be designed to have as great a loss as 5 kilowatts. This is explained in part by the fact that the radiating surface increases as the square of the linear dimensions, while the volume increases as the cube. A small transformer has a relatively larger surface to radiate heat, while for the same temperature rise a proportional amount of heat could not be radiated from a large transformer.

The losses in transformers are of two

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1. A. H. Babcock, QST, Oct., 1926, page 29, gave the formula, and a short description of transformer design. It is believed that the present chart simplifies calculation.
kinds, copper and iron losses, the latter being due to eddy currents and hysteresis. The eddy current losses vary as the square of the product of the lamination thickness, induction, and the frequency; at both 25 and 60 cycles. The hysteresis loss varies as the frequency and as the 1.6 power of the induction.

From the above it will be clear that thin laminations and low inductions are desirable to keep down the iron losses. For the small transformers which are considered in this article, accurate calculation of these losses is not absolutely necessary. As a matter of fact, in using a large core to reduce the iron losses by decreasing the induction, the copper losses are increased, due to the increased length of each wire turn. Copper losses can be calculated by $P_R$ as in regular direct current work. The calculation of the best balance between copper and iron losses is not a simple matter, and for small transformers it is considered to be too complicated for the slightly improved results which would occur. To allow for the iron and copper losses, a few extra turns should be added to secondary windings where a definite voltage is desired. These added turns seldom amount to as much as a 10% increase over the calculated value from the turns per volt multiplied by the desired volts, as already mentioned.

**FLUX DENSITIES**

For a 25-watt transformer a flux density of 50,000 lines per square inch is suggested. For transformers of higher power where the relative heat loss should be less, the lower flux density of 50,000 lines would be preferable. For small transformers supplying less than ten watts, as filament transformers for the new a.c. receiving tubes, a flux density as high as 70,000 lines would be possible. With the present grades of transformer iron, 80,000 lines per square inch is the upper limit, while for the poorer grades of iron a density of about 30,000 lines is the maximum without causing undue heating. All the flux densities suggested allow for a possible ten percent loss of space due to the inability of stacking the core iron tightly. On the chart, core area is given in both Metric and English units. The flux density is given in both systems of units. The third column of

| 2. A thin and close-fitting shield may heat by reason of induced currents in it, therefore simple thickness and clearness are advisable. Any closed shield tends to reduce cooling, therefore it may be desirable to fill the shield with transformer oil or to omit it where strong fields can do no harm—that is to say where no tube or other circuits are affected.  
4. E. G. Reed, Transformer Practice, page 32.  
5. The Radio Amateur's Handbook also gives this material pp180-187. | turns per volt is given for both 60 and 25 cycles per second.  
An effective shield should surround transformers, especially those which are run at high flux densities. A complete shield of 1/16" iron is good, and is improved if an inner shield of 1/32" copper is also used. These precautions apply especially to transformers used near radio receiving sets, where the stray power field would cause an objectionable hum.  
The chart is intended only to give a quick answer to the problem of the necessary turns per volt for various small sized cores, and for the usual flux densities. The calculations for losses have not been included, but may be found in handbooks. For constructional details, carrying capacities of wires, and turns per inch, the various engineering handbooks may be consulted.

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**A Correction on the Double Detection Receiver**

Through an error in drafting, the coil L6 in the diagram Fig. 1 on page 10 of the March issue was enclosed in the oscillator shield. This of course made it quite impossible for the coil to function as a "pick-up coil", feeding the oscillator output to the first detector. The corrected diagram is shown herewith. Note that L6 is now in the same compartment with L4 and L5, which is as it should be.

Referring to the photograph and accompanying label on page 10 of the March issue (Below Fig. 1) will explain the corrections more fully.

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**Strays**

For the benefit of those who may not know it, the word, "transceiver" used in the cut label on page 52 of the March, 1928, issue is a trade name coined to describe a combined transmitter-receiver as manufactured by the Chicago Radio Laboratory of Chicago, Ill., about eight years ago.
Santa Paula Flood Work

Two amateurs in particular and amateur radio in general gave the honor for the speed and dispatch with which the Red Cross supplied and assistance to the survivors of the recent Santa Paula flood disaster in the San Francisco Valley.

The wall of water released when the dam broke, swept over the lower section of Santa Paula at 2:30 in the morning. Telegram and telephone lines were torn down and communication with the outside world was cut off. It was imperative that Red Cross headquarters in San Francisco be notified immediately so that supplies and equipment could be rushed into the stricken area. Officials approached C. A. Primmer, 17 year old owner of 6BYQ, a little doubtful if he could get the message through. It did not take them long to revise their opinions, after Primmer had sent a hurried CQ. W. A. Hammond, 6ALX, veteran Sixth District radio instructor, was at 6AUX, the Roosevelt High, and his willing Oakwood hook 6BYQ after his CQ. Primmer asked him if he had heard about the disaster. When 6ALX replied in the negative the other man had evidently rushed off in a hurry and forgot to come back. A little later 6BYQ came on the air again and CQ’d SOS, and was again hooked by 6ALX. 6BYQ shot through a message to the Red Cross Headquarters in San Francisco, which was immediately phoned by Hammond, and a message returned announcing that a train load of workers and supplies would be rushed in a short time. 6ALX inquired about a Roosevelt school teacher at Santa Paula, and Primmer was able to give him the information as she was standing by his side at the time. Later 6BYQ hooked Whitlcer and Los Angeles, giving the press, which was copied for San Francisco by 6ALX. Then 6BYQ replied to 6ALX (suggesting that every fast work was accomplished because both men were real operators.

No one shirked his job. Primmer was on at 4:30 AM and stayed at the key continuously until 5:00 PM. 6DCJ then relieved him for an hour, when 6BYQ went on again until 10:30 that night. The following three BYQ stayed home from school in order to be on the air. The key used was a 7/8 with 350 volts of "R’s". The total of important messages handled was about 50, not counting replies.

LeRoy Potter, 6AKW, let his work slide and got on the air on 10 meters. He tried to hook Santa Paula, Oxnard, and Ventura, but unfortunately was unable to establish communication.

6BLH of Los Angeles, notified a good many people of the disaster. The A.R.R.L. had dope all over the United States by 8ALY and put out some messages for 6BYQ. From 10 PM on they were mostly personal messages. 32 out of 40 radiograms got through same day. All day there were many Los Angeles ops standing by, so there was no worry about delivery.

This whole thing was just another exhibition of the tremendous spirit and willingness to let every thing slide when there is a possibility of his being of service in an emergency. Excellent work was done by many of our west coast fellows, and hearty congratulations go to them all.

-T9CR and 6AM

Ten-Meter Results!

Within one month from the date of the opening of the new ten-meter band by the Federal Radio Commission, the enthusiasm of a number of individuals was so great as to result in fairly good use of the new band. Ten-meter DX was a new blast for many, and most of the early operators were still learning how to operate on the new band. The results of this type of operation on ten meters were not so good as on other bands, but are considered to be rather promising. The new band was not used during the first week of its opening, but it was actively worked on the following week. The results of the first week of operation on ten meters were not so good as on other bands, but are considered to be rather promising. The new band was not used during the first week of its opening, but it was actively worked on the following week. The results of the first week of operation on ten meters were not so good as on other bands, but are considered to be rather promising.

Ten-Meter DX-Party Coming

Attention, experimenters! Get ready for the first QSO party to be held on the new ten-meter band.
The dates set for opening the new band by a test are May 19, May 20, May 26 and May 27. Mark them up on the calendar now and don't forget to be on deck. Messages have been sent to foreign amateur societies with the hope that they will participate. Information on late developments will be sent out from HQ through the Official Broadcasting Stations and 1MK.

Here's the information which tells how to participate. Just get on the air with a receiver that will cover the band between 7.39 meters (30,000 Kc.) and 70.71 meters (28,000 Kc.) and a transmitter working between the wavelengths stated. If you haven't a wavemeter for this order of wavelength measurement you can calibrate a condenser-coil combination roughly using 20-meter wavemeter receiver, a standard 20-meter wavemeter, and finding the 10-meter harmonic on the 10-meter tuner. The second harmonic employed near the top (the tenth harmonic near 20-meter amateur band) is a great help in getting the receiver and transmitter properly adjusted, lacking equipment for accurate measurement. Many five-meter tuners and condensers are in use in QSO's shown in the log. It is suggested that when there is any delay in making a transmission to 1MK in the "general" periods that messages be given to some of the stations with which 1MK has regular schedules.

A list of 1MK-scheduled followers, each station acting as a collection and distributing point for traffic: (time given E. S. T.)

1AHV (80) Roslindale, Mass. Mon. and Fri. 7:30 p.m.
1APL (50) Springfield, Mass. Sunday 7:00 p.m.
1BQD (60) Newport, R. I. Mon. and Fri. 9:00 p.m.
1VB (80) Newtown, Conn. Tues. and Fri. 7:45 p.m.
cq2RR (50) Fort Worth, Que. Sunday 9:45 p.m.
2CP (50) Forde's N. J. Sunday and Thursday 11:45 p.m.
2GP (50) Richmond Hill, L. I., N. Y. Mon. and Fri. 9:30 p.m.
3BP (80) Washington D. C. Mon. and Thurs. 7:15 p.m.
3BP (80) Philadelphia, Pa. Mon. and Thurs. 7:00 p.m.
3ZS (80) St. Petersburg, Pa. Mon. and Thurs. 7:45 p.m.
4IE (80) Sarasota, Fla., Thurs. 11 p.m.
4XE (80) Winter Park, Fla. Sunday 7:30 p.m.
4ZA (40) Atlanta, Ga. Tuesday 11:00 p.m.
4NX (40) San Jose, Calif. Monday 11:45 p.m.
4CJ (40) Manchelenn, Mich. Sunday 9:45 p.m.
8AYB (80) Buffalo, N. Y. Tuesday 11:30 p.m.
8DED (50) Holland, Mich. Tues. and Thurs. 9:30 p.m.
nc9AL (50) Toronto, Ont. Canada Tues. and Fri. 7:15 p.m.
9APY (80) Chicago, Ill. Tues. 9:00 p.m.
9DG (40) Galesburg, Ill. Fri. 11:45 p.m.
9DNG (40) Lawrence, Kansas Mon. and Fri. 11 p.m.
9ENM (40) Pueblo, Colo. Mon. and Fri. 11:15 p.m.
9OX (50) Louisville, Ky. Sun. and Thurs. 11:30 p.m.
9X1 (40) Minneapolis, Minn. Mon. and Fri. 11:30 p.m.

Official Broadcasts to A.R.R.L. Members are sent from 1MK simultaneously on 41.93 and 83.86 meters. Sunday, Tuesday, and Thursday 8 p.m. and Midnight, Monday and Friday 8 p.m. and 10:00 p.m. Other foreign traffic is being cleared very efficiently through 9DNG. In this manner the greater portion of the operating time is available for work with A.R.R.L. members. It is possible that a period on Wednesday may be set aside for work with members outside the U. S. and Canada at a later date though the present arrangement is working out most satisfactorily.

The periods for schedules are completely filled. Additional requests from reliable stations will be held on a waiting list and added when opportunity offers due to changes in the present line-up.

Whenever you want to QSO A.R.R.L. Headquarters, look for 1MK in the "general" operating periods (which were listed last month) and give us a call. OM.

F. E. H.

OFFICIAL BROADCASTING STATIONS

Additions

6AGR, 6BRJ, 6BRO, 6CH-A6DN, 9AAO-SCFP, 9BGQ, 9DNG, 9DUD, 9ENM.
Reporting a Boat Race
By J. E. Dadswell, 4FF

An unusual short wave and broadcast tie up was
afflicted at Sarasota on March 9 and 10 during
the American Motor Boat Association races in
Sarasota Bay, Fla.

A portable short-wave transmitter was installed
on the 18-foot A.A.E.L. in charge of A.A.E.L. man
when the boat race was time and a half.

The transmitter was a Grebe 200 watt set, fed
by a 1500 volt generator coupled to the engine of
the boat. The call is A.I.M., and amateurs copy-

The Morrissey VOQ, will soon be under way again.
Earl Manley will be the operator, as before, and the
radio equipment has been considerably improved.
In the way of transmitters there is a self-rectified job
using two 204-A's, a crystal control unit using 210's
in slot of the crystal and fly doublet stages with DC
on plates, and 862's and 204A's in a self-rectified
arrangement with five cycle AC on the plates, in
the second doubler and PA stages. An attachable
unit is a portable "transceiver" with B Batteries for sup-
ply, and the receiving equipment consists of the faithful
Clayton-Westman job, and 86L superhet.

A Grebe short wave set and a Grebe Syncrophone
receiver. VOQ will use waves of 20.1 and 32.3 meters,
the former between 6PM and midnight EST, and the
latter from midnight to 6PM EST. VOQ is expected to
have several good Pacific Coast contracts, but
especially hopes that stations in eastern U. S. will
be able to QSO on 20.1 meters in evening EST.

The broadcast tie up was caused by a short wave
broadcast in the city. A motor truck expedition, sponsored by General
Motors South African, Ltd., recently left CapeTown,
South Africa, enroute to Egypt, Manama, Tientsin,
and Port Said. A Grebe short wave set and an
an Army

Fifth Corps of Engineers have been issued
broadcasting equipment for the duration. The
army, as a matter of fact, has been

excellent foreign work.

A motor truck expedition, sponsored by General
Motors South African, Ltd., recently left CapeTown,
South Africa, enroute to Egypt, Manama, Tientsin,
and Port Said. A Grebe short wave set and an

radio equipment and an operator. A Mullard
200 watt tube, fed by a 1600 volt generator coupled
to the engine of the car, is used in a flexible 20-40
wireless transmission. An Army Signal Corps
squad, operating from a dynamo will also be cabled,
and on both sets, either telephony or telegraphy may
be used at will. The expedition is expected to
have several good Pacific Coast contracts, but
especially hopes that stations in eastern U. S. will
be able to QSO on 20.1 meters in evening EST.

WNF
WNF (Rec'd via 1FL) nr. 577, March 22 To F. E.
Handy, A.A.E.L. Harford, Conn. Started to list
all new stations worked this month but the list
grew too long nearly two columns of calls worked
were new ones. March started out well with QSA
signals on twenty meters. Then a gale hit us on
the 3rd and a blizzard on 4th and 5th which kept
the noise level about 10. The rest of the month
has been filled with snow squalls and wind and a
great deal of noise. Storms seemed general over
the U.S.A., and we had the dickens of a time
trying to find stations who could read our signals.
Then was quite consistent during periods when the
noise was not too bad.

May 1, 2, and 3 the Shriners attend their con-
vention at Miami. uu4CK will be on 20, 40, and
80-meter bands with seven ones. The station
will be on the air 18 hours each day and wants
schedules with points all over the country. Please help in
handling this traffic, everyone!

ARMY AMATEUR NOTES

SECOND CORPS AREA—all the Red Network have
been reorganized into Service and Signal Group
sections. The new group and Signal Group
micromanipulation bulletin is distributed to the
various members. The schedules are kept every Monday night, on the
75-76 meter band, and the increased interest of AA
has brought about a traffic total ten times greater than
normal. There is still room for amateurs in New
York City. E4Eg, E4Am, E4Ea, E4El, E4El, E4Fq, etc.,
are still interested. You can be of service by
scheduling messages that may be sent to your
S.E. to call Signal Officer, Governor's Island,
N. Y.

THIRD CORPS AREA—6G1, SAGO, 8P9D, 8DNU,
have been successful in every schedule with the
N. C. S. New members are 3A1U, 3A6E, 3SN, the
N. C. S. has been doing some excellent foreign work.
WINDY CORPS AREA—CO2B, CO2D, CO2R, CO2C,
CO2K, CO2L, CO2M, CO2P, CO2Q, CO2R, CO2S,
CO2T, CO2U, CO2V, CO2W, CO2X, CO2Y, CO2Z,
CO2A, CO2B, CO2C, CO2D, CO2E, CO2F, CO2G,
CO2H, CO2J, CO2K, CO2L, CO2M, CO2N, CO2O,
CO2P, CO2Q, CO2R, CO2S, CO2T, CO2U, CO2V,
CO2D, CO2E, CO2F, CO2G, CO2H, CO2J, CO2K,
CO2L, CO2M, CO2N, CO2O, CO2P, CO2Q, CO2R,
CO2S, CO2T, CO2U, CO2V, CO2W, CO2X, CO2Y,
CO2Z, CO2A, CO2B, CO2C, CO2D, CO2E, CO2F,
CO2O, CO2P, CO2Q, CO2R, CO2S, CO2T, CO2U,
**20 METERS**

QST FOR MAY, 1928

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* The following should have been included last month—the SINS 17, 64, 125, 296; SDFS 40, 11, 165, 216.

*9A1N wins the coveted honor position this month with 6AJM and 8AHC close contenders. These stations have all total in excess of six hundred messages—mysterious and consistent operating work, FB!*

*op HR, 1MK, 69MM, 9E8K, 1BLG, and 1CRA all boast of more than 100 deliveries in the message month. Once again we can say that it is schedules—fine reliable schedules with pieces both far and near that are respected for the fine showing of all the stations making the B.P.L. this month. A total of 200 messages handled or just 50 deliveries will put you on the honor roll. Why not plan to be there next month, OM?*
ELECTION RESULTS

Valid nominating petitions for Section Managers in the Southern New Jersey Section of the Atlantic Division, in the Alaskan Section of the Northwestern Division, in the Alaska Section of the Western Division, and in the Northern Texas Section of the West Gulf Division were filed, in each case, naming but one candidate for the office. As provided by our Constitution, Section Managers in one candidate is named in one or more valid nominating petitions, that candidate shall be declared elected. Messrs. M. J. Lotay, B. B. Wilson, E. J. Taylor (nominated by A. H. Keith Russell, 5 Mail Building, Toronto, Ont., Canada. To be valid, petitions must be filed with him on or before the closing dates named.

Members of the A.R.R.L. in the Utah-Wyoming Section of the Rocky Mountain Division and in the Philippine Section of the Pacific Division have failed to take any action. As no valid nominating petitions have been received in response to our previous notice, the closing dates for the receipt of nominating petitions were set ahead to the dates given herewith:

Utah-Wyoming Section .......... May 28
Philippine Section .............. July 28

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of By-Law No. 4.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League in their Section as candidate for Section Manager. The following form for nomination is suggested:

(****)

Communications Manager, A.R.R.L.
1711 Park St., Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the Section of the

Division hereby nominate, as candidate for Section Communications Manager for this Section for the next two-year term of office:

Five or more signatures of A.R.R.L. members are required.

The candidate and five or more signers must be League members in good standing or the petition will be thrown out as invalid. The complete name, address, and station call of the candidate should be included.

All such petitions must be filed at the headquarters office of the League in Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit on the number of petitions that may be filed, but no member shall sign more than one such petition.

4. Members are urged to take initiative immediately, filing petitions for the officials of each Section listed above. This is your opportunity to select the man of your choice in office to carry on the work of the organization in your Section.

-- F. E. Handy, Communications Manager.

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Rotten QSR

SEVERAL times in the past three or four months, I have heard stations handling traffic addressed to me. I have copied the message and patiently waited for those to arrive by airmail. But I am still waiting for three such messages that I copied three months ago.

It is hard to see how some of the gang can be so careless. Perhaps these messages were garbled by the address. There is no excuse for a message "dying" when there are stamps, envelopes and paper still on the market. Can any one tell me what happens to lots of traffic that is toll for use? It is copied by someone who takes it as code practice and throws it in the waste basket.

If the individuals responsible will accept their share of personal responsibility, they have no intention of handling due to temporary operation of their station or similar good reasons, (2) passing on traffic: good reasons have been accepted for QSR, (3) mailing to destination in accordance with the R & R when it is 48 hours old or when it is known that press traffic will prevent station operation for a few days, conditions will be greatly improved. When a message leaves a station, there is no reason in the world for its failure to be delivered, so remember that, gang, and do your share and we will all profit by it.

--O. W. Viers, 7AAT, SCM, Montana.
DIVISIONAL REPORTS

ATLANTIC DIVISION

EASTERN PENNSYLVANIA—Acting SCM, E. L. Hahwy, has this report up in career as SCM of the East. Pa. Section, and want to thank you all for your cooperation. You'll hope you'll all give 39P your full support as he's a capable man and will do the job right with your help.

SABK threatens to knock 40 for a row. 3ZP bate them out.

7th St. 3QM did a hasty job on QSR.

8BYZ was married last July but we just found it out. Congrats. 8WJ is a SADE, poor Lew, snuff, sniff.

SCWO is a new boy in Scranton. 3LO is a quiet lad. 3ADQ is at last on 40.

7PZ is active on 38.5 meters.

H. M. Layton, 3SA, Del. is still very active. 3SAQ has his chem rectifier going at last. 3A2H reports BCL QRN again.

3WJ reports the only CC set in Del. and is craving traffic. 3AIS is active on 38.5 meters and is anxious to QSO all active stations in the Section.

MARYLAND: 3APX is now using zaw AC as one of their rectifiers went west. 3CFS desires to arrange a sked with some active D. of C. station as he has lots of traffic. 3BBW blew another tube and is off until a replacement arrives. 3GCG will soon be on the air again.

3A2E reports QRN from bad power leak preventing him from pounding brass.

3AT, Columbia: 3BWT reports everything running smoothly at present but expects to QRT for the summer.

4SBYZ moved to 528 W.

SOUTHERN NEW JERSEY—Acting SCM, E. G. Raser, 3ZI—Nine stations reported to the acting SCM this month, seven of them being ORS. This is by far Mr. Loysch, 3GG, has been elected your new SCM and will take office immediately so please report to him next month. 3ZI made the BPL at last after a long wait. 3SGC is back on traffic.

3AOC is doing good work on low power and keeps skeds with 2PF and 3Z1. 3SJ complaints of number of 3ZI's and says not much doing. 3BJW is back from West Point and has been on the sick list.

3BSD raised a new 50 foot tower and is sure some happy now. 3VS of Burlington, and 3SAO of Riverside are to watch for DX again. 3SGC is trying to catch up.

Trinity: 3ZI 273, 3FCG 214, 3AOQ 138, 3IV 11, 3SJ 3, 3HWW 22, 3BSD 4.

WESTERN PENNSYLVANIA—SCM, G. L. Crossley, 3XE—SCNZ reports plenty of traffic but few DX. 3SOR is still non DX and is still pounding brass at KDO and is now on the west coast.

3VE is very QRW with medical school but still does some work on 40 and 21 meters. 3XZM has some marine traffic with Nicaragua and is using both 80 and 40 to do it. 3DKS is building a new rectifier and is off the air while he is doing it.

3SC is using 2812 on for residents in school. 3SCG is using a 50 watt master oscillator.

3CSS is having trouble with QRN and QRM. 3SHM has had pneumonia and is in hospital for at least a month. 3SGI says it is time to get out the nickle polish and polish up the antenna cause there is too much QRN.

3SAU worked the yacht Fortuna out of Negoy, Fla. the other day. 3SOA to be married on May 9. Congrats.

3FZG is operating in Erie on 75 meters. 3BDJ has passed the first class tests and now holds that license. 3CAQ is holding classes for Boy Scouts and they are getting along fine.

3SHM is using a 220 on 20 meters. 3SLS has moved to Erie. 3SVF is putting in an 882. 3SCG repairs BCL sets. 3XE is very busy on the convention. 3XE has a crystal oscillator and is operating high frequency of 1000 kc, and any ORS in the section found off-wave will have the ORS cancelled.

3GST is using a new set on 820. 3SCG has a new station.

CENTRAL DIVISION

OHIO—SCM, H. C. Sterock, 8BYN—8BEV had time for plenty of DX. 8CPL and 8CNO complain of too many rubber stamps. 9RN is leaving shortly and 9FDV wonders if the BPL is going to be rebuilt. 8QZ has been blowing condensers. 8DSY kicks about the QRN. 8SDK made the BPL. 8BAU is rebuilding. 8CAU is on 80. 8CDX is starting on 40. 8AQX reports the ORS seems to be good as 20 m. 8SCM is now Official Observer.

QST FOR MAY, 1928

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ININDIA—SCM, D. J. Angua, 9CQV—SAIN runs off the traffic totals for the state again. 9EZ is trilling him close and 9CRV and 9CMV are trying to tie for third place. 9AIN does it with schedules. 9IBL is having an exam at 9CRV is now on xtal control. 9EZ, Culver Military Academy station, works the whole world on 21 and 89. 9AJV and 9AEL have put in for new schedules. 9FPJ is an old timer and is selling out. 9LR lost his pole trying to move it. 9AAI, 9AMZ, 9BIA, 9APE, 9AQJ, 9BAA, 9BIA, 9CMV, 9ABF and 9LA are new to the part of the Fort Wayne Radio Club's program to have them report on its operation and whether anyone can understand them. 9DQJ is rebuilding. 9EVA is putting in half-watt schedules. 9DQX is a new call in the South Bend Dist. 9AXZ is on 20, 40, and 80. 9PDG is a small 5 watt portable at the Dodge school at Streak, 36. 9QFJ has been experimenting with 90-up. 9DPPJ is an old timer and is selling out. 9LR lost his pole trying to move it. 9AAI, 9AMZ, 9BIA, 9APE, 9AQJ, 9BAA, 9BIA, 9CMV, 9ABF and 9LA are new to the part of the Fort Wayne Radio Club's program to have them report on its operation and whether anyone can understand them. 9DQJ is rebuilding. 9EVA is putting in half-watt schedules. 9DQX is a new call in the South Bend Dist. 9AXZ is on 20, 40, and 80. 9PDG is a small 5 watt portable at the Dodge school at Streak, 36. 9QFJ has been experimenting with 90-up. 9DPPJ is an old timer and is selling out. 9LR lost his pole trying to move it. 9AAI, 9AMZ, 9BIA, 9APE, 9AQJ, 9BAA, 9BIA, 9CMV, 9ABF and 9LA are new to the part of the Fort Wayne Radio Club's program to have them report on its operation and whether anyone can understand them. 9DQJ is rebuilding. 9EVA is putting in half-watt schedules. 9DQX is a new call in the South Bend Dist. 9AXZ is on 20, 40, and 80. 9PDG is a small 5 watt portable at the Dodge school at Streak, 36. 9QFJ has been experimenting with 90-up.

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TRAFFIC: 9DPM 508, 8BYN 428, 8BEV 417, 8CF7 321, 8RN 308, 8CN0 295, 8BBR 226, 8GZ 175, 8SDS 148, 8D30 122, 8CAU 107, 8SCD 73, 8TQ7 71, 8SCB 45, 8AS 89, 8BAC 80, 8SB 76, 8SCQ 24, 8CNU 18, 8AXV 16, 8CSG 14, 8DTN 14, 8AVL 12, 8ALW 10, 8IQ 10, 8DHS 9, 8PL 9, 8HAI 8, 8GDN 7, 8SHE 6, 8AYO 5, 8AZO 6, 8CTD 4, 8SDQ 1, 8BMK 1, 8V1 1.

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WISCONSIN—SCM, C. N. Crape, 9VD—9DL leads again with the largest total he has ever reported. 9EK are still busy with their airplane transmitters. 9ELH has two wave operators on board—each tuned to one of his transmitting waves. 9BPW is holding down four schedules on 80. 90E originates—beck every month but can't seem to get QSRs. 9AHM has schedules on both 20 and 80. 90DLQ reports good traffic and DX. 9SO is keeping three sheds and collects his share of traffic. 9SFM has a second hand Ford which accounts for the drop in traf. 9SDN says his station is putting out a decent signal and expects to boost his totals. 9BPA is scheduling DX work 80, 20, 10. 99AAS, 9SOK, 90DCT took an unexpected drop but won't let it happen again. 9EEF gets a few messages occasionally. He is still having trouble with the BCLs but hopes to eliminate it by getting down to 20 meters. 9AZN gives us a small total and is too busy to spend much time on the air. 9BWO lost his Wadio after a natural disaster and possibly cannot suffer. 9AZX will be on the lakes all summer. 9FES is building a new Aero Coin transmitter. 9EGW does double duty and keeps the other end going. He is a new station at Argyle using 4 301As. 9BJS just bumps along merrily and plays with an RF amp. 9SPL is putting out a good signal on 40. This wanderer is sending through a few messages between broadasts. 9CVI is getting so he attends nearly all the club meetings now. 9BQIU is on another coast and has some DX. 9ELD splits his traffic between his home and the Journal station. 9CPT has a little time for traffic on 20. 9FRW is working on the DLX only on the weekends last month. 9BWZ had to cancel all his schedules. 9EUU worked WPX for 30 mins. and 101PE.

Traffic: 9DDL 472, 9KE 286, 9DTR 248, 9BFW 188, 9EBO 170, 9ABM 126, 9DLEQ 118, 9ISO 107, 9DSE 86, 9EMD 53, 9DND 82, 9CCT 25, 9EEF 24, 9LV 19, 9AZN 19, 9BWO 19, 9AZY 17, 9HFS 14, 9BQG 12, 9BGR 6, 9CPT 6, 9DOS 5, 9DEE 4, 9AFZ 3, 9BWZ 2, 9EUU 2, 9CJU 7.

MICHIGAN—SCM. Dallas Wise, 9C2E—9CDS has any report of any Michigan station and has a fine bunch of schedules. 9EAY reports the QRN getting bad up his way. 9AYR still works his daily shed. 9EAX's time was limited and now he is doing his work with the SCM. 9GEE keeps the station he has the last 20 meters of his shed working good when the ban came. 9AMS is rebuilding the set into a tuned plate—tuned grid outfit. 9AJL has been getting out well with the low power set. 9URD is putting out a good signal on 40 with his 210. 9DJR is having trouble getting a good antenna system. 9AUB has been doing some testing and is interested in moving outside now and has the crystal working on 41:6. 8UC is QRW with school work. 8RE has been on the sick list so hasn't been able to do much. 8KN now has two of his 3CAT 2900 but blew his transformer. 8CU has been doing some fine low power work. 8DSF says he finds it hard to keep shed work in the game for a few weeks. 8SCZ has been on quite regularly. 8AAT has been busy getting two new hams in the game. 8BZK has a new shed working and going on to move but won't back until next fall. 8LSZ has the message box at the shed keeping the four ops busy. 8CM has moved and is just getting the outfit in shape again. 9GEE is on regularly but says the DX tests reduced his traffic. 8ASO was QSO WPX and is now working 20 meters. 9BQH has just started reporting earlier this month. 8BR is silent most of the time due to the death of his brother, 8CYT and to his own illness.

Traffic: 9EAY 11, 9AYE 8, 8DKX 8, 8AFL 8, 8AHM 5, 8DJR 12, 8AUB 100, 9CMI 81, 8GK 8, 8KN 1, 8SCAT 3, 8UCZ 8, 8DSF 32, 8DIV 2, 8BSR 14, 8CKZ 2, 8AAT 25, 8DQA 250, 9CEX 7, 8ZP 294, 9CM 4, 8SCM 27, 9CZE 30, 8ZJZ 16, 8CT 23, 8ASO 14, 8EYQ 5, 8CEP 39, 8DED 1154.

DAKOTA DIVISION

SOUTHERN MINNESOTA—SCM, D. F. Cottam, 9YJA—9UCS is on both 40 and 80 for fun. 9YJA's shed is kept two weeks of the time except Sundays. 9XI is going once more and they will have xtal control soon. 9SLE says his station is doing spectactular DX work. 9KXM is going back to work soon. 9ELD is doing some very nice work. 9EEF is still doing his spectacular DX work and keeps a number of skeds. 9BFW is shoving 50 watts into a 310 and works DX well. 9BKW has been keeping DX skeds and DX work for a while. 9SDDP is changing location of his station. 9ERT is on with three good ops. 9AIRbanes one business message that came to real money. 9GH is not on very much, too QRW. 9EYL, a new station here, is getting a nice start and hopes to be a real traffic station. 9DMDA gets reports of 87 from Europe. 9DM0I's operating at Waukegan, Ill. 9DEQ has another fellow interested in ham work so we may have another new station soon. 9FZL would like to hear from hams troubled with shifting to 20, also those trying 10 meters.

Traffic: 9SCOS 256, 9BN 168, 9EFK 66, 9BFW 56, 9RJF 26, 9PSB 18, 9AFL 16, 9DRI 10, 9RIK 10, 9DBM 10, 9DWA 16, 9LEF 9, 9AIR 8, 9DHE 5, 9ELY 2, 9DMA 2, 9DBC 1.

NORTH DAKOTA—SCM, H. L. Sheets, 9DMF—9EFN was forced to give up the SCM duties on account of work and wi needs. 9SOM will carry out his duties. 9BJV has been doing some fine work but has decided to go back to 40 and 80. 9BRR is getting out consistently with his new IQS layout. 9BQQ is still interested in ham work and is not on much. 9BVF has been hitting the ball. 9CUT is QRW school work but expects to be station soon. 9DZL would like to hear from hams troubled with shifting to 20, also those trying 10 meters.

Traffic: 9SCOS 256, 9BN 168, 9EFK 66, 9BFW 56, 9RJF 26, 9PSB 18, 9AFL 16, 9DRI 10, 9RIK 10, 9DBM 10, 9DWA 16, 9LEF 9, 9AIR 8, 9DHE 5, 9ELY 2, 9DMA 2, 9DBC 1.

SOUTH DAKOTA—SCM, F. J. Beck, 9DB—9DIY has a fine 222 R.F. amplifier. 9AGL built a new receiver and received an A.A certificate. 9BQF is busy on farm QSM. 9CPH has a new 20 meter circuit. 9KBK has a new 50 watt and a new converter which works DX FB. He reports the Rapid City Radio Club's station is doing some very fine work. 9DSE put over a quick QSR on Army-Amateur test messages. 9AFJ's put power leak took a rest. 9EUH keeps a bunch of skeds. 9DES put in a big msg report without any skeds. 9BQF-9BRI has a weekly sked with sk-7MN on 20. 9AQD worked gig-i and has applied for an ORS. 9DGR's new 882 bird is doing fine. 9DBN keeps the station on 20 and says he is busy with skeds and YLS.

Traffic: 9WDN 139, 9DGR 129, 9AQD 129, 9BOW 112, 9DSE 81, 9EUD 78, 9AFP 45, 9DNS 46, 9KBK 38, 9DB 32, 9BCT 4, 9AGL 4.

NORTHERN MINNESOTA—SCM, C. L. Barker, 9WC—9HAE finally finished the shed and loads the Section. 9EGF comes in second. 9AKO rates third place. 9EEO does not give any news to include in these reports. 9BAY is still doing Army-Amateur work and 9CWMH works on 20 meters almost entirely and likes it better all the time. He assisted 9EGU in getting his crystal set going. 9KV is on 10 meters Sunday. He says that 10 meter is the girl-har laxness of "KV" has been noted for. Hi. 9DPB did some two-way 10 meter work with 6UF. 9GZ has started reporting again. 9EHI, a new ORS prospect works on 20, 40, or 80 but 80 is on again and sends in reports after 9EGF hounded him enough about it. 9DKX is a new station working on the 40 meter band. 9DBW is on 20 all the time. 9BHT has been very busy with the seed business. 9CWA is still QRV with...
9CIY. 9CTW celebrated the second anniversary of his station by QSOing on--his J-3A DS parks right along with the rest. 9QT has been somewhat inactive, nearly all the traffic being handled through 9BA. 9AM now 20 and 80 meters now. 9BVH is also on 10 meters some in addition to his regular 20 meter wave. 9BMR is getting ready for an 852 soon. 9BVS is on 10.06 meters Saturdays and Sundays. 9DUG is all chasing QRM as relief operator. 9CIY says he will have to put on inactive list for the summer. 9BDJ also has to go on inactive list till fall. 9EGU has his QOS-set ready, using a 410, cc, 268A frequency doubler, and 852 output tube.

Traffic: 9ABY 212, 9EGF 123, 9AOK 93, 9EOH 51, 9AY 47, 9GWN 36, 9KQ 31, 9DPB 29, 9GZ 27, 9EHI 25, 9BRF 18, 9CF 15, 9FDK 12, 9BIW 11, 9BHT 11.

DELTA DIVISION

TENNESSEE—SCM, L. K. Runch, 4KM—This section is showing more activity at present than ever before. More good reports are coming in and it is sure to be good to see you fellows taking an interest. 4SP is laboring with xtal control and hopes to make it work. The Knoxville Radio Club is right on the job with many active members. 4ADZ is a new ORS and can show others the traffic game. 4FX, reports them. 4SP, 4GL and most all the other stations in Knoxville have installed two line voltage feed Hertz antenna. 4AKI is working with desired cycle note and is looking for a 6 phase mercury rectifier. 4ADJ is rebuilding. 4ABR sends in an interesting letter. 4DLX still seeks elusive DX and traffic and gets it. 4KM lost 2nd p 4FX--he just dropped out of sight.

Traffic: 4ABZ 40, 4ABR 17, 4IX 14, 4SP 9, 4FX 8, 4ADJ 2.

MISSISSIPPI—SCM, J. W. Gullett, 5AEP—5API is using phone altogether now on 175 meters. 5AYB is not sure that he has been very busy trying to make a living this month. 5AGS has put in a chemical rectifier and it helps some. 5FQ gets mobs of good RA reports also he is using raw AC. 5ANP reports them. 5GR is not leaned on the traffic much because of his health. 5AAI is still on the schedule on account of sickness in his family. 5AJJ says that 9QRN has been terrible on the coast this month. 4ARF continues to work foreigners on 20 meters.

Traffic: 5AEP 80, 5AYB 32, 5FQ 29, 5API 14, 5ANP 6, 5AJJ 6, 5AGS 4.

ARKANSAS—SCM, W. L. Clippard, 5API—5ABH continues to lead the list. 5AQX is very active in Hot Springs and sends in his first report this month. FB, 5KP is back with us and 5ABD is on the air one evening a week, there will be 5ATU quiet radio and took up motion picture taking. 5ANN has a new 20 meter antenna and times a good QRM. 5SKR and 5API are getting ready to ship next June.

Traffic: 5ABI 50, 5CK 8, 5AQX 8, 5SS 6, 5JK 1.

LOUISIANA—SCM, C. A. Freitag, 5UK—5BD seems to be having a hard time establishing a QSO. 5PM was reported heard by 5PK off the coast of China and is still sending press to 5PK each night. 5NS has again changed his circuit to modified Coft's and reports better results. 5ANC reports 5KH and 5APA back in Shreveport. 5IE has been sick most of the month. 5KH still does farm work and says high frequency does not get him very much. 5FA, 5GJ, and 5UK in addition to working on short waves are also doing some farm work on the 160 meter band.

Traffic: 5PM 12, 5EB 10, 5LV 6, 5NS 5, 5ANC 4, 5UK 6.

HUDSON DIVISION

NEW YORK CITY & LONG ISLAND—Acting SCM, J. R. Kilpatrick, 2EV—Manhattan: 2BCB has been working nights 2BOX is using a 294A now 2DR has been going on 20, 40 and 80 meters now. 20V has had consistent QSO with Port Blair. 2BLA (ex 2SC5E) had some QRM with BLC and now uses a 50 watt. Bronx: 2AET is a new ORS and is jarring the ether with his new Vibroplex. 2AEG's transformer went to sleep. 2ALP has been on 10 meters. 2BAD is going strong on 20 meters now. 2BRH's low power fone on 20 meters has been QSO all USA and several foreign countries. 2CXX is back from Porto Rico now. 2JA is now on 75m.

Brooklyn: 2ABP had lots of hard luck with set and BCL and says he is on 80 meters from now on. 2ADZ has a 2nd op while he is away. 2ANG is active in Army Net. 2ASK is a 4200DXG and is hearing on 160.

Traffic: 2ABY 25, 2BCU 5, 2BDJ 7, 2BOX 17, 2EV 54, 2KZ 23, 20V 5. Bronx: 2AET 5, 2AFV 28, 2AJ 11, 2ATZ 24, 2AVR 11, 2CJD 5, 2BD1 7, 2CXX 118, 2JA 9. Brooklyn: 2ABP 19, 2ADZ 4, 2AND 26, 2APD 2, 2ASB 12, 2ATZ 21, 2AVR 110, 2BAZ 28, 2GZ 26, 2KSB 20, 2KSB 20. Long Island: 2AIZ 59, 2AIS 10, 2AY 26, 2BY 18, 2CTY 18, 2DF 28, 2WC 10, 2WZ 32. Staten Island: 2AFO 42, 2AVF 20, 2CPG 15.

NORTHERN NEW JERSEY—SCM, A. G. Wester, 2WR—The ORS of 2BLB has been cancelled. 2BDF is a new ORS. 2ATZ, 2CP, 2AVF, 2BDJ, 2AVK make the BPL. All traffic is being handled on 80 meters. 2ATZ collected all traffic thru working schedules. 2CP has been handling some QRP with business to get on the air. 2WR is stopping out in all directions. 2DX is another having hard time getting on the air. 2TW is working on his air after the arrival of long-due licenses. 2JC installing new MOPA transmitter. 2FCJ is out of work so has plenty of time to try. 2KA is QSO a yacht EDWU off Miami, Fla. 2AZS is a new transformer which puts him back on the air. 2G0D is bothered with YL QRM. 2BW has the misfortune of cracking three crystals. 2IEJ is learning to be an aviator. 2JG has a fine signal on 80 meters with good pep. 2AGN is disgusted with a chemical rectifier and is installing a 1,000 microammeter. 2LDJ is installing a mercury arc. 2MDJ is increasing power to 250 watts crystal controlled. 2CTQ has the misfortune of blowing up an 852. 2CGJ expects to drop to 2 meters on Noel and 10 meter on DX. 2BDH, 2CNJ is trying to receive trouble which knocked out all her schedules. 2GV has installed a new mast and will be heard very shortly. 2BHJ is the proud possessor of a WAC certificate. 2IS has just installed a new MG which will help him get on again. 2AVK is having fine QSO with all European countries. 2BDL is on another trip to the South. 2JX's oscillator works but has a hard time raising any stations. 2AOK works our RA every night on 30 and 40 meters. 2AIH is trying to make the BPL. 2BDF has had fine QSO with foreigners. 2ABE is still having trouble with the antenna coming down.

Traffic: 2WR 1, 2AT 192, 2CP 314, 2CW 8, 2DX 6, 2AU 24, 2FCG 15, 2KA 29, 2LWS 12, 2AGN 9, 2MD 111, 2CTQ 1, 2CXX 25, 2BY 7, 2BI 2, 2AVK 4, 2ADL 119, 2JX 1, 2AOF 218, 2BW 44, 2BDH 15, 2ATE 16.

MIDWEST DIVISION

NEBRASKA—SCM, C. B. Diehl, 8SGV—4SFJ tinkers with 20 meters. 9ANZ has had any traffic these days. 9KY is QRY planting his crops. 9HEW doesn't say a word. 9DFR has a new fifty and expects to be QSOing 20 meters. 9DI is still away at school. 9BOQ is also planting his crops. 9CHB has been laid up with the flu but is improving now. 9DUH is experimenting with shielded grid tubes. 9SHS missed a tornado by inches the other day. 9CCH has a lot of work piled up and

G Q T FOR MAY, 1928
can't find time to pound his key. 9EGJ has increased his power a bit and expects to go from here. 9CJI works overtime at the office but still finds time to radio some. 9DR 9 ECD 7, 9GFI 4, 9GFF 23, 9CJI 43, 9VD 76.

KANSAS—F. S. McKeever, 9DNG—Beginning now all ORS in Kansas must average at least ten messages per month. This is easily done, fellows. You can originate ten messages. The SCM put one runner on the gang by winning the traffic contest with 408 messages. 9HL took second place and 9CFN third. 9CFN and 9HL have a whack of swedes. 0DS with sick for work, and 9DFP and 9DPL on the other side of Africa. 9DHI and 9GFT were on with 9DPL worked So. Georgia Is. Which is on the other side of Africa. 9DHI and 9GFT were on with low power this month. 9CCS is away at college and 3 YLa keep nightly skeds with him. 9CV and 9HBR are asleep it seems. 9CFW is putting in Resto- buton in his new bug, with his new SWL. 9BHY was among those with YLita. 9LN is keeping a sked with OA-7LJ. Will all ORS send schedule dope to KB-9BFX as soon as you can.

Traffic: 9ANZ 26, 9QY 8, 9EEW 36, 9DFJ 2, 9BYG 2, 9DJI 2, 9DBC 7, 9CBT 5, 9BBS 4, 9FGJ 22, 9CJI 43, 9VD 76.

Handlin g 141 messages.

Traffic: 9ANZ 26, 9QY 8, 9EEW 36, 9DFJ 2, 9BYG 2, 9DJI 2, 9DBC 7, 9CBT 5, 9BBS 4, 9FGJ 22, 9CJI 43, 9VD 76.

NEW ENGLAND DIVISION

MAINE—SCM, Fred Best, 1B1G—A newcomer, 1BAY, of Portland, leads the list this time with a fine total. 1A1JX reports some very good work on the 20-meter band. 1A1T reports very poor conditions on 80 meters most of the month. 1AINH is being issued an 20, 15, which has worked hard for and which he deserves. 1IDX still works his daily schedule with 1AWQ ably he was off for two weeks on account of having turned-out field winding in his motor-generator. 1BFEZ has been working on 20 meters. 1A1S1S1s in a mighty fine report on conditions in his neck of the woods. Active stations in Houliston reported by 1AYE. 1A1E1E1 is a first time reporter. 1IOI has been a receiver all month, and is doing very well. 1BEZ has increased his power a bit and expects to go from here. 1B0S1 and also applies for ORS. 1BZTV is getting out to QM's. 1IOI11 is expected to take the 250. 1BET reports a bunch of ors at NHU. 1AOF handled his share thru had QRM from school. 1AEP is doing good DX and traffic with 1A0S1. 1ATK is back on the air in Hampton. 1ION is QRV traffic all week daily. 1AVT is trying for WAC and needs just S. America. 1BSE was QSO the Mariner in Nicaragua. 1ANS reported his traffic but not new.

A report was received from 1AID. 1ATP who is op on the C. G. Cutter “Tuscarora” was the boy who answered the SOS from the Robert E. Lee. 1FQ-OH. 1Q1A is getting Spring Fever and cancelling their schedules but most of the fellows will still take on a QRM nights each week. The Jr. op at 1ATJ sends 27 to the SCM.

Traffic: 1IP 166, 1BT 127, 1ATJ 136, 1AOQ 78, 1AEP 70, 1ANK 19, 1AS 17, 1IN 17, 1ANS 35.

VERMONT—SCM, C. T. Kerr, 1AJJ—Is anyone to hear off 1MT1S1S1s this month? 1BMT is trying to work on the 200 RE bugs as they were donated by an interested OM for them. 1MTW handled his share thru had QRM from school. 1AEP is doing good DX and traffic with 1A0S1. 1ATK is back on the air in Hampton. 1ION is QRV traffic all week daily. 1AVT is trying for WAC and needs just S. America. 1BSE was QSO the Mariner in Nicaragua. 1ANS reported his traffic but not new.

A report was received from 1AID. 1ATP who is op on the C. G. Cutter “Tuscarora” was the boy who answered the SOS from the Robert E. Lee. 1FQ-OH. 1Q1A is getting Spring Fever and cancelling their schedules but most of the fellows will still take on a QRM nights each week. The Jr. op at 1ATJ sends 27 to the SCM.
RHODE ISLAND—SCM, D. B. Fancher, 1BVF—Hereafter, all hams calling on 1BVF will find him located on that DX. SCM says things haven't been so good with him this month. 1BAT hands us a good total. 1BUL is using a new SW. 1BMD is working the old SW. 1BQD says FB on 40. IAQP has been busy building a new transmitter. 1AAL is another with a dandy total. 1CKB hasn't had much time for radio this month. 1BZQ has been moving the old DXB but moving everything. 1BQD and 1BLS are the two star stations this month.

Traffic: 1BLS 236, 1BQD 275, 1BIL 91, 1BAT 87. 1AAL 97, 1BVF 44, 1AWF 15, 1AQP 11, 1MO 11, 1BQD 9, 1LG 6.

CONNECTICUT—SCM, H. E. Nichols, IBM—MKM is showing some of the best of operation with their new set. 1MY did a nice little piece of message delivery recently for an ex. 1CKP has finally come up to 100 meters. 1IPK has made the move to 2PL with his first report as an ORS. 1CTT's totals have suffered due to sickness of some of his star stations. 1IVE, 1LM and 1BFK have been doing quite a little Army-Amateur work and report things fairly active. In this line, 1AMG-1AUK handled some QRR traffic recently and was commended by the railroad folks for his service. 1AFB reports a QSO with a ship off the coast of China recently on 20 meters at 4 pm. 1ZL worked nC4AW at Whitehorse, Yukon thereby having worked every Canadian district. 1IV has made the move to a new transmitter and has scored over 20. 1BQH has received new call letters for his station at Boston and is all ready for traffic. See you at the N. E. Div. Convention, OMA.

Traffic: 1CKP 23, 1BQH 28, 1BIL 14, 1LMW 6, 1BWM 4, 1IAO 3, 1LAMC 2, 1BGC 2, 1TD 2, 12Z 2, 1LM 2, 1IASD 1, 1AMG 1, 1MY 4, 1AFB 3, 1BFK 5, 1PFE 6, 1IYF 108, 1ATG 108, 1ADW 112, 1IVE 123, 1ICTT 139, 1BMW 250, 1MEY 477, 1VP 16.

EASTERN MASSACHUSETTS—SCM, E. L. Batten, IBM—DZQ has been cancelled to various reasons. 1CMZ is a new ORS. 1AKS, 1LM, 1CRA, 1KY and 1WV made the BPL. 1KY is doing nice work as RM. 1UBS has been rebuilding. 1AGS is a new FM and power leak. 1IAK has not much done after tests. 1BZQ is working nights so has only wee small hours for radio. 1ASI is working 1CMZ with ORS in every state. 1IOG has been very busy with convention plans and Naval Reserve work. 1CRA has the measles. The new tone regulations enable 1APK and some of the other local boys to work again on SW. 1LMW has a new key-clemonizer. "DM" of 1PL is now working at Headquarters in Hartford and except for interim. 1KMZ is now "DM" but expects to remain until a new location in Hartford is secured. Navy traffic is helping 1LMW's totals much. 1PB expects to be on very shortly but he has not been at home for some weeks. 1ADW has made much YL QRM for 1AKS. Hi. 1CMZ will accept traffic for west coast for QSR same night as received. 1GP, 1RF and 1BQ are kept QRP with their lessons at school. 1BKV is busy repairing BCL receivers. 1WV made the BPL and worked a wonderiful bunch of DX all in the QRM month. 1IPF owns a flip-up permanently with a fifty watter after five months of none too consistent operation. 1IKH took a trip out west to Kansas City and Dallas and climbed 1AAH, 5BG, 6JX, 5AK, 5AKN and 6DJ en route.

Traffic: 1AKS 221, 1PL 396, 1LM 175, 1CRA 144, 1KY 101, 1WY 151, 1JR 60, 1ACH 63, 1CMZ 60, 1YC 78, 1IVY 81, 1LAKS 25, 1AGS 26, 1UBS 26, 1BMK 24, 1BZQ 21, 1IAO 20, 1IKH 9, 1IN 5, 1APK 7, 1IPF 4, 1IKH 14, 1PB 15.

WESTERN MASSACHUSETTS—SCM, A. H. Carr, 1FH—1DAG is rebuilding his UX210 outfit again. 1AKZ QSO'd ce-2NX and surprised him by speaking in his native tongue. 1ANZ will be on the air during the next 24 hours. 1AMZ has been hard at work on schedules. 1APL says ham activity in Springfield is on a rapid increase. 1IOH, 1GCR, 1KY, 1ACH and 1CRB assisted 1DAG on their latest attempt at 20 meters. 1AHD has been keeping schedule with WNP, 1BKQ says that 1AOF paid them a visit and showed a fine new shielded receiver using new screen grid tube. 1BYR did a lot of DX work on his last vacation. 1IWQ is using a mercury arc rectifie. 1BWV have completed their 80 watt wattmoter. 1BGM sends a good report for a non-ORS.

Traffic: 1AA4 C, 1AKZ 10, 1IAN 101, 1APL 145, 1AWW 19, 1AZD 76, 1BIV 2, 1BQK 11, 1BYR 1, 1EO 8, 1UM 5, 1IWQ 25, 1BWY 8, 1BGM 18.

NORTHEASTERN DIVISION

OREGON—SCM, R. H. Wright, 7PP—7AKK makes the BPL this month, by 24 hour operation ORS is out in come of skill. 7TAH, the Ore. State College, uses 250 w. 7GTP on 40 and Hartley on 80. 7PES is on occasionally as he is QRV much of the time. 7TAH is now, hence more distraction from ham work. 7TAH is QRX but says that as soon as his junior op grows up, we will hear some real operating. 7TAF has returned to 40 PL with some unexpected success. 7TQ has handled traffic for the Wilkins Expedition. 7PL is rebuilding for higher power. 7QV has his new up and is putting up copper pipe. 7UN is a new ORS and a promising traffic station.

Traffic: 7TAK 214, 7AEC 145, 7FU 50, 7MH 45, 7TB 36, 7PE 29, 7EO 24, 7AHS 3, 7QO 9, 7ACG 5, 7AHE 2, 7PL 2, 7STJ 264, 7UN 25.

MONTANA—SCM, O. W. Viers, 7AAT-QT—7HP kept his promise and sent in a report that made the SCM's eyes twinkle. The replies to these reports are eagerly awaited and ORS is a little bit tough this month as well as 7HP. 7STJ also turned in a dandy report for such a new ORS. 7EL pounds through fine on 41.5 meters and gets a dandy ICW note from his new motor. 7STJ says that 7EL has no money and the junk is about due for the annual cleaning." 7ZU has been very QWV teaching college but he is going to surprise us some day with his QRP. 7BIM has his 50 watt crystal set receiving KF7-3 from OH, and the 1/2 kw only gets E8! 7AEP is very busy with his new electric shop but is making good. 7AEP has used all his radio batteries in his freezer so now the station is one of the battery-less type. 7AAT-QT has lost a lot of hours due to bad weather conditions. 7AAT-QT has been in good shape but is improving now. 7FB is being repaired and is doing another fine job. 7AAT-QT has been doing schedules. Other RM appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly.

Traffic: 7TAF 118, 7BB 84, 7TQG 49, 7ACR 47, 7AEV 40, 7ACA 40, 7MX 23, 7LX 26, 7ACS 15, 7BM 14, 7MP 9, 7NO 6, 7AFAQ 4, 7VJ 3, 7GW 3, 7FD 2, 7TX 2.

PACIFIC DIVISION

EAST BAY SECTION—SCM, J. Walter Frates, 6CZE—Due to discrepancies in the records, all ORS, OOS and RMS have been cancelled. 6IP has been appointed Chief SCM and is hard at work on schedules. Other RM appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly. 6CGR is working the BPL this month. 6CGR sends the SCM a good report and is working on schedules. Other ORS appointments for various parts of the country will be announced shortly.
on 20 meters now. 6EY expects to depend on 80 for plenty of traffic work in future as too much QRM on 40 now. 6IT, reappointed an OS, has the main requisites of his work, a good receiver and wave-noting. 6CMG reports himself QRV with the lines in college. 6ZX is making his 15s up trans-Pacific fades right up to 70. 6CQW and 6DPV handled some business on this same week's strenuous work on International Tests. 6CCK is QRV with 1928 Pacific Div. convention work, after his election as convention manager. 6KJ is disappointed this time not to be present at the entertainment end things. 6WJ is in the process of being rebuilt for extensive traffic work. 6CZ will be on with 50 meters. 6CQW has moved from 40 as op on the Sonoma. 6APA has moved to Marin County. 6DDA is back after a cruise on WKJ and reports the Pacific Ocean off Canal Zone great for listening. 6CQW is in France and 6PFB as second op. 6ALV reports DX R zero and power leak R12 in Alameda. 6DTM is a new QRV and handled with oh. 6BZU at Concord has a slide with Ukiah.

Traffic: 6CQG 154, 6BQ 73, 6BG 84, 6DPT 28, 6GAT 26, 6BDE 23, 6AMI 15, 6DPV 12, 6CCK 12, 6DCL 12, 6BZU 10, 6OT 10, 6ALY 9, 6BZT 7, 6CLZ 5, 6BXU 2.

HAWAII—SCM, F. L. Fullaway, oh6CFQ—6BHE kept skeds with ac2AB, ac1CL, op ICW, ntl6ABG and 6DJG has only been keeping up with local QRM. 6DQQ asks all Honolulu stations to QSO as he always has traffic for Hu. 6ADH has a 60 with a senni antenna and keeps skeds with 6DJG. He is still getting 30 and 20. 6CJL handled several test messages in the contest. Has skeds with ntl6DBM. 6ALM has a slide with Ukiah. 6BZU has moved from 40 as op on the Sonoma.

Traffic: 6BOE 72, 6DEY 63, 6DQQ 62, 6ADH 40, 6DJU 38, 6CLJ 24, 6ALM 17, 6DB 16, 6DLR 11, 6DCU 4, 6CFQ 23.

SAN DIEGO—SCM, G. A. Sears, 6BG—6AJM leads in traffic and has 8 daily schedules. 6AKQ is a new ORS having daily schedules with oh. 6BAM finds plenty of skeds on the 6DZU. 6DJL has daily schedules on 15 meters daily QRV traffic. 6EC still has a daily schedule with ntl6NQC. 6BZU works daily schedules with oh. 6GAT has daily schedules with 6DQQ, 6HWT, and NJN. 6PQ is on the air again with a brand new station. 6DGY is off temporarily until now power transformer is available. 6DNS junked a new 60 watt TP and TG set. 6CQW says new ops at the High School keep him QRV. 6OX is on occasionally. 6DGW is a new convert to the ORS set up by the 6CQW. He has no power at the 6CQW's control set. 6QX has eliminated all interference and can be heard only on his own wave. 6CNK says his motor cycle keeps him off the air. 6BZU has been junking 6CQW. 6EFB is still junking 6CQW as 6AKZ has been on the air with his portable recently. Your SCM recently had letters from former San Diego man. 6BAM has bought a new car. 6BEC is using low power. 6CQW two would like a site at 6BFQ and 15 watts and 6BZU has a slide with Chicago on 20 meters. 6BHR, 6DPK, 6BVT, 6DLK and 6BGC send in reports as usual.

Traffic: 6BZJ 209, 6BSN (Feb) 206, 6BPO 196, 6BSN 195, 6BZI 146, 6AM 130, 6DOX 66, 6HBU 63, 6AY 83, 6PFB 61, 6BP 49, 6BZJ 38, 6ABK 36, 6DXX 35, 6DQ 35, 6CPX 31. 6GZ 28, 6BDX 25, 6BUM 17, 6ANN 16, 6DQW 14, 6AKW 13, 6CMQ 11, 6CHT 10, 6ALR 9, 6DCH 9, 6CUH 9, 6DKG 8, 6BRO 7, 6CQA 7, 6DPY 6, 6Ps 5, 6DHH 2, 6CNJ 2, 6AIO 1, 6BHR 1.

ARIZONA—SCM, D. B. Lamb, 6ANO—6CDT delivered a msg to a certain party and a few days later he received a pair of white gold engraved cuff links as appreciation of the msg. delivered from here. P. T. is still operating 6CMQ and 6CQW says no serious intentions of getting married. 6CPX reports that of 17 msg's, sent, only 5 were delivered. 6AM reports his 21'4p 6CQW is on the air. 6BZT is now in Channel 8. 6EFB is still junking 6CQW as 6AKZ has been on the air with his portable recently. Your SCM recently had letters from former San Diego man. 6BAM has bought a new car. 6BEC is using low power. 6CQW two would like a site at 6BFQ and 15 watts and 6BZU has a slide with Chicago on 20 meters. 6BHR, 6DPK, 6BVT, 6DLK and 6BGC send in reports as usual.

Traffic: 6BZF 16, 6CBJ 27, 6AZM 4, 6CPX 48, 6BWS 54, 6CDU 38, 6ANO 54, 6DRH 82, 6CDQ 10.

SACRAMENTO VALLEY—SCM, C. F. Mason, 6CIS—6CGG is strong with low power. 6FHJ had been in England and regularly in Australia but has never been able to hook up with them due to interference around him. 6EH is putting 100 watts into a 210. 6DPR is still waiting for his 80 watt. 6CTJ is on the air sometimes but work interferences with hamming. 6BAM continues to be very busy in a new location. 6AYT is now building a set for 40 meters. 6DQW is busy with school work. 6CDK is working schedules on 15 meters. 6GK reports DX scarce. 6BRU is building a 7.5 watt Hartley. 6امر想过 on a 7.5 watt transmitter using Acro coils.

Traffic: 6CIS 169, 6CDQ 100.

PHILIPPINES — Acting SCM, J. E. Jimenez, op1AT—There was no written report sent in this month for P. L. nothing except traffic.

Traffic: op1DR 128, op1HR 505, op1DL 113, op1GZ 9.
NEVADA—SCM, C. B. Newcombe, 6UO—6LB has added a UX210 to his set and is increasing power. 6D0K worked 6DJJ who says that the air-mail op at Las Vegas is going on the air soon on 40 meters. 6AEM takes off the air all month but expects to be back soon.

Traffic: 6CDZ 8, 6LB 37, 6UO 40, 6CHG 23.

ROANOKE DIVISION

VIRGINIA—SCM, J. F. Wohlford, 3CA—SC6B is making his headquarters blowing his own watters. 3ANB is off also due to QRQ officers at fort. SEC is using MG now. 5ARD is a new station. SH is in charge. The air is alive there. SKU seems to have jumped into the BFL at last. 3WM reported as working all continents. 8TN is going strong on 80 meters. 4JT is on the air. 8UR is a new station at Houston. 6NM QSK all skeds account of QRM school work. 3ASE is a new station at Charlottesville. 3DVE is at Fort Monroe, WAC—has 21 hours left to his credit. 3BGS expects to have his power by July 1st. 8BZ operates on 40 meters. 5AKM is the old timer back on the job. 4SKL continues to run his station with 16. 3ANY continues to improve his station. 8API says his location is rotten. 4CEL handled one for Calcutta direct to France after 48. 3ASO and 3ALS are asking for ORS. Send in three consecutive reports.

Traffic: 3CEB 22, 3KU 225, 3WM 20, 3TN 99, 3ACG 6, 8BG 9, 8HZ 1, 8AKM 8, 8SKL 4, 3ANV 15, 8CEL 7.

WEST VIRGINIA—SCM, C. S. Hoffman, 8HD—The traffic this month was done by 8CNZ, 8EP and 8ACZ. 8FQ reports a big increase at station by keeping eight schedules for traffic. 8AUL, 8DCM and 8DPO seem to be the DX outlooks for the state. 8ATL and 8DCQ worked five hundred times. 8DPO works oh-4ADH consistently. 8SD is putting in a big set. 8CLQ does some good work when not QRMoch, but some of his德尔 are relying and under low power. Glad to hear from 8CDY, 8BBM and 8RBJ. The gang will be sorry to hear that 8CNZ is now an ORS in Pittsburgh. 5CYR, 5SWK, 5D0I, 5BUB and 5UKK have had various reasons.

Traffic: 8CNZ 92, 8EP 35, 8ACZ 42, 8DCQ 25, 8DPO 29, 8CLQ 9, 8DEW 16.

NORTH CAROLINA—SCM, R. S. Morris, 4JR—Please give him your cooperation. 4JS is back on the air. The layover of 4JM has been trying too and reports fair luck. 4HV has been on 20 but reports that it can't be depended on every night. 4AEC is doing well with a 112 in a TOTT report. 4AR reports less traffic due to failure of a favorite schedule. 4TS is back on with a MOPA set. 4OH says heavy QRM from tennis and dancing lessons. New station at Washington is experimenting on 20 and 80 with his crystal set. 4LV reports less traffic due to a little DX hunting before summer. 4ADJ put a message to New York City and got a reply in minutes. 4AEEW is a new station in High Point. 4ADQ is beginning to step out with his 210. 4DO, the station of the Charlotte Amateur Radio Club, is going strong with fitter weather. 4JR has been working on 20 quite a bit due to heavy QRM on 40 and 80.

Traffic: 4AB 56, 4JS 17, 4HV 14, 4OH 15, 4MF 9, 4JQ 9, 6EC 8, 4ADJ 7.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, C. R. Stedman, 9CAA—9EAM carries off the honors again this month which makes the third month in succession this has happened. 9BLY has his own ham set and reports a fair total aloho his ORS was cancelled at his request recently. 9CSR has applied for an ORS certificate at Pueblo and the Pueblo Amateur Radio Club has an 8BS. 9ERM sends in his first report and adds that at present his station is mostly community-owned but that the borrowed goods will soon be returned. 9DQD is this month's ANDY and 9BRB reports that his station is picking up some. 9EANM and 9CWA have a regular schedule and are handling gob of traffic. 9CWA is putting in voice power. The Commerce Club at Pueblo has given the club the three free use of their rooms. 9DRW, 9EXV, 9EVK, 9EFD and 9FBE are all active Pueblo stations. 9FEM is the latest addition. 9ESA is a new Denver station. 9DKM blew up about $25.00 worth of equipment trying to cure QRM at BCLA. 9SCM says this may be next year but the fellows don't wait for her to act. 9CDE is much pleased with his latest DX and also likes the Zep antenna. 9CAA will have a mercury arc due to its stuff by the time we receive this. Leaving the KFEX job the first of April. 9CTP is doing most of his work on 20 meters now. 9EEA lost a 96' tower in a high wind and which recently visited Denver. 9EQO says he will be on as soon as he gets a job. The Associated Radio Operators of Denver are planning another trip to Pueblo for a Joint club meeting.

Traffic: 9EAM 256, 9EYW 24, 9HYC 24, 9CSR 25, 8ERN 6, 9DQD 81, 9CAT 8, 9ENM 10, 9CAW 51, 9SCM 8, 9EAM 81, 9CTP 17, 9CM 7.

SOUTHEASTERN DIVISION

FLORIDA—SCM, C. E. Foulesque, 4LK—For the information of the new fellows, please list your traffic according to the type: originated, delivered, relayed and total. This will assist the SCM in giving you proper credit. 4NL will have a DX op very soon. FB. Sickness kept 4CK off the air some this month but still has a big traffic total. 4SDK pushes in 9, sometimes on 10 and over Europe consistently. 4FM sure has a large total for one day's work on 80 meters. 4BCL sets keep 4HE on the go. 4TK and 4RM are doing well and 4WJ maintains a DX feeling.

Traffic: 4SE 12, 48CF 14, 49Y 12, 49C 9, 8A7 3, 4KE 2, 8NE 7.

ALABAMA—SCM, A. D. Trum, 5ADF—SAXN is busy these balmy days and gets little time to pound brass. 5AV has been on the air regularly and handles traffic in veteran style. 5BAB is a new ham. The gang of 5DJ, 5FX, 5BAB and 5AV visited recently and cut some ice with 5DL, 5OA, 5JP and the other fellows at 5BY. 5YAL was reported R-9 in ec for his first time. 5GP has moved to Anniston. 5AUB back in the saddle after a delay. 5WHZ reports less traffic due to failure of a favorite schedule. 5ATS is now working regularly. 5MCL and 5CN are doing splendid work on 40. 5MCL is rebuilding and trying to improve his transmitter and hopes to have a better and stronger note on the air next month. 5JP is re-building and dormant. 5NL is in status quo now.

Traffic: 5FY 163, 5ATJ 4, 5ADA 14, 5ATS 15, 5UV 31, 5AAD 7, 5AYL 14, 5CP 50, 5AV 40, 5AX 46.

GA-S. C.-CUBA—SCM, H. L. Reid, 4KU—4ABS sends in a nice report from his station where he is usually counted on for but has been on consistently. 4NQ-4FE and 4PA are all on and doing good work. 4KL is back on the air after 4RM has been getting in for a bit and can be counted on for the Atlanta traffic. 4KU sold his receiver to a BCL and is waiting the arrival of a new one.

Traffic: 4ABS 24, 5KL 12.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, J. H. Robinson, Jr., 5AKN-BG—The Dallas gang is trying to corner the market on ham apparatus. 5ACL heads the traffic list, an at 4RM's benevolence. 5DQO is another busy one. 5AKQ is another at 5DQO is another busy one. 5AKQ is another busy one. 5AKN-BG is handling traffic from 12 am to 5 am each morning. 5BRG is still trying to make the northern ham bers a coming. 5DQO is using C. D. on 378. 1K8H visited Dallas this month and gave us the lowdown on radio around Boston.
6AM is getting lined up right. Old 5UD is back with us again. Fellow's, there's a UX222 for the first northern Texas station setting in the BRT. Traffic: WDDY 12, 5AKN-BG 10, 5AQ 7, 5G 24, 5JDY 6, 5JZ 4.

OKLAHOMA—SCM, K. M. Ebre, 5APG—5AXX reports for the first time. 5HAG of the Veterans Hospital at Muskogee also reports for the first time and managed to bag a few mos. 5LAN still works sheds on 20 and reports a new shed with 5HSM two nights a week. 5LAN emphatically states that he has been married for 16 years and has a 12 year old daughter and that he says his QST got balled up about him chasing YLs and says it's a good thing the OW doesn't read QST. Hi. He reports 5ADO has blown up—an other good man gone wrong. 5ABR has tested all and says the old Hartley for him. 5AMO says calculus QRM fierce. 5VH reports shed with 3VR who is ex-6FR. 5AKG not doing too well and has QSO with 5BR. 5ASO also reports QSO with 5VR. 5AIR lost his 180 meter antenna in a big blow but says the 20 and 40 meter sets still going strong. 5AKG says the 180 meter is his permanent love. 5AEH has a new ham in Okla. City. 5QL is still off the air building the big crystal set. 5SW worked a Belgian on 20 meters. 5FX moved in his new home and is arranging for a pole raising bee. 5AAW lost his mast but has a better one and is doing good work. 5APG had good hunting and grinds a crystal but says he put lower on his power reducers. 5AXB reports QSO with a man on 180 meter fone.

Traffic: 5APG 23, 5AYO 13, 5AIR 16, 5SW 6, 5NL 11, 5AWX 19, 5AXO 14, 5ADV 4, 5BAG 16, 5EY 14, 5AAV 8.

SOUTHERN TEXAS—SCM, E. A. Sahm, 5YK—Reports came in well this month. Everyone seems to be doing something worth while. We have a new station in 5ATM. 5IP is another.Southern Cal who wired his usual prompt report. He reports 5FQ accidentally shot himself but is getting along nicely. 5HE is back on the air and will send longer reports in a nice report and indicates there will be another Hamfest this year. 5AMG reports that he has not been on much due to being sick. 5FX is doing good work and 5AVL reports that he delves a good deal of time in the Army. 5ALW says he has been off the air since the end of the Tests but is going on again soon. 5SWF has been on 20 meters most of the time.

Traffic: 5EWW 33, 5QX 6, 5HS 5, 5cherche 9, 5ATM 73, 5AHF 4, 5LP 43, 5ABQ 82.

CANADA

ONTARIO DIVISION

ONTARIO—SCM, W. Y. Sloan, 5JF—Eastern Dist: We are sorry to report that Mrs. Hochmuth, 5WX, who has been such a representative and correspondent, has had to go to Montreal to join her husband. F. A. Goodier of no-8XQ will carry on this work. 3XQ and 3MD are running an advertisement in a small local paper looking for a tube or two. 5AMC and 5ML, using a five wattener, has been QSO a good list of stations at considerable DX. 3RT is back on again now. 9CC is broadcasting Morse signals from the Ottawa Observation tower on 15 meters each week day.

Central Dist: 3GM has done some excellent work this month on medium power. 3MA has been keeping us scheduled up on 20 and 40 meter bands. 3DF has been running a series of tests using old antennas on 20 meters with excellent results. 3LF worked all U. S. Districts one evening in less than 4 hours on 40 and 52.5 meters. 3CF and 3DFY constructed a 2 meter beam transmitter at the Central Tech. 3M2's tube is developing a little bit of fatigue and he has managed to keep some schedules anyway. 3EL leads the whole Section in DX this month. He has worked a whole bunch of stations on 30 and 20 meters. 3AZ is our star traffic station this month and he got all it by keeping schedules. 3AR and 3ET are on the air in Parry Sound. 3BL is doing first class work and is making good schedules on 20 meters. 3IN is on the air once more and using a 250 watt on 40 and 52.5 meters. 3BC is using 52.5 meters mostly and keeping schedules with 3DG in western Ontario. 9AL still keeps several schedules and works everything in sight on 52.5 meters (crystal controlled). 3UC is also crystal controlled on 52.6 meters and should be accepted as the upper boundary on this band. 3FC has been doing quite a bit of work this month.

Traffic: 5NH 12, 5AKN-BG 10, 5AQ 7, 5G 24, 5JDY 6, 5JZ 4.

QUEBEC DIVISION

QUEBEC—SCM, Alex Reid, 2BE—The largest Hamfest of all time was held on March 3rd at station 2BE. There were 24 present, 20 of whom were active hams. There was some hams in the gang who are leaving their subscriptions to QST lax. This won't do, fellows.

Traffic: 1AD 33, 1AX 21, 1AK 23, 1AY 2, 1AM 17.

VANALTU DIVISION

BRITISH COLUMBIA—SCM, E. S. Brooks, 5BJ—SCM has two Vanalta skeds. 5AR is convivial and the guest of 5ACA. 5CC is broadcasting Canadian signals from the Ottawa Observation tower on 52 meters each week day.

Traffic: 5EWW 33, 5QX 6, 5HS 5, 5cherche 9, 5ATM 73, 5AHF 4, 5LP 43, 5ABQ 82.
GERMANY

"Receiving conditions seem to have improved a good deal during the last month. European stations were heard with remarkable signal strength at times, as were more distant stations, particularly those in the U.S.A.

"Some tests on the transmission of pictures between southern and northern Germany gave fairly good results.

"Many of our amateurs are interested in investigating the relationship between reception conditions and the weather and should appreciate any co-operation which foreign amateurs may be able to lend. 4YAE and 4ACI have developed a device which gives very pure reproduction of phonograph records.

"Our Berlin amateurs are very pleased to have nu2BDQ among them. It is expected that he will be on the air under the call of ek4CJ in a few days time.

"Our next annual convention will very probably be held in Dresden during April or May. The exact date has not yet been set."

—Curt Lamm.

HUNGARY

"We are extremely pleased to announce that on the second of January there was founded at Budapest, the Magyar Rovidhullam Amateurok Egyesulete, or Hungarian Shortwave Amateur Society. The address of the Society which may also be used for the forwarding of QSL cards is: MRAE, Budapest, II, Buday Laszlo utca 5/c.

"At the general meeting at which our organization work was accomplished, the following officers were elected: President, Istvan Fodor; Vice President, Istvan Kemeny and Secretary, Kurt Nekolny.

"Up to this date there are but three licensed amateur transmitters. These are: ewH1, Kurt Nekolny, Engineer, Budapest, II, Buday Laszlo utca 5/c; ewH2, Istvan Kemeny, Engineer, Budapest, V, Szemelynok utca 21/23; ewH4, Denes Bibo, Enying, Hungary.

"There are about twenty unlicensed stations working at the present time whose calls may be recognized, as they all use the intermediate 'ew' followed by two addi-

Tional letters; such as ewAA. There are about one hundred and forty short-wave listeners who are scattered all over the country. Their calls start with the letter 'H' followed by three numbers; i.e., H091 (H zero 91). They are commonly referred to as 'H boys'.

"Our kindest greetings go to you all."

—J. Molnar.

JUGO-SLAVIA

"It has been impossible to get legal license to operate in our country, in spite of which we have been on the air for more than two years. However, just a few days ago our transmitting was stopped by the Government and for the moment we are silent. We are not giving up, though, but are resorting to legal measures by which it is hoped that we will be able to obtain licenses for our activities. It is not thought that this will be a difficult task and we are hoping to be back on the air again in a month or so. See you then!"

—U. J. R. A.

NORTHERN IRELAND

"At the time of writing this (early in March) conditions here have taken a decided turn for the better, at least as far as transatlantic work is concerned. Several of our low powered stations have 'sent across' during the last few weeks.

"GYW has worked several NU stations on both 23 and 32 meters in addition to working Iraq twice and being heard in India. All this with an input of about seven watts! 6WG and 5WD who are located in Coleraine and are using hand driven generators have worked many NU stations. They used the

(Continued on page 74)
Radio Frequency Chokes

Room No. 3006, Bureau of Eng., Navy Dept., Wash., D. C.

Editor, QST:

There has been much said and written on the subject of r.f. choke coils. Some of the dope was good as far as it went and some was not so good.

I have long hesitated about "breaking into print" but Mr. Binneweg's article on page 46 of the November QST was the last straw that crippled the proverbial camel.

The formula for inductive reactance is:

$$X = 2\pi f l$$

where \(2\pi\) is a numeral constant, \(f\) is the frequency in cycles and \(l\) is the inductance in henries. The resultant \(X\) is the reactance in ohms of the subject inductance to the passage of current of the frequency \(f\), through that inductance.

Theoretically, we should use a choke which has an infinite inductance, hence an infinite inductive reactance in ohms, which would pass zero r.f. current. Unfortunately, we run into difficulties; namely, the ohmic resistance of the wire and the distributed capacity of the windings, that is, the capacity between turns. The detrimental effect of the ohmic resistance of the wire is self evident. The distributed capacity of the windings results in a parallel tuned circuit, just as if we had an inductance having no distributed capacity and shunted it with a condenser. This is just what Mr. Binneweg suggests and as he says, we can resonate the choke-condenser circuit to the frequency we wish to prevent from passing through, or we can build our choke so that its distributed capacity equals the capacity of an external condenser and it will resonate at the frequency we wish to prevent from passing through; the result is the same.

The impedance of such a parallel tuned circuit from the plate of the tube to the source of power is theoretically infinite, granted, but the impedance of the same series circuit, that is, the circuit from the inductance through the condenser and back to the inductance is nearly zero and results in power losses due to the high circulating current in this circuit.

Mr. Binneweg's "tuned" r.f. choke is really a tank circuit from which plenty of power could be taken to drive an antenna or what have you, and the resultant circuit is a combination Hartley and tuned plate-tuned grid.

Likewise, the recently published articles which give detailed instructions for making choke coils which have "a natural period equal to the frequency of your transmitter" are all wet. We don't want any distributed capacity in a choke coil, but if some is there by necessity, we want it as small as possible and we, about all, don't want that distributed capacity to be such that in conjunction with the inductance of the coil it will resonate at the transmitter frequency and serve as a tank for our precious power to "chase itself around in a circle".

The reference article reported that resonating this tuned choke "noticeably reduced" the harmonics. Certainly it did and it also reduced the fundamental about fifty percent. Half of the available power was playing merry-go-round in the "tuned choke" and was being dissipated therein in the form of heat.

R.f. chokes should be made to incorporate maximum inductance and minimum capacity and with minimum Ohmic resistance. To accomplish this, they should be wound on small diameter forms and the wire spaced one diameter. An even better method is to use tiny duo-lateral wound coils, pancake shaped about an inch in diameter and mounted on a quarter-inch bakelite rod. Three or four of these coils should be mounted on such a rod, connected in series and spaced about an inch from each other.

I repeat again; the distributed capacity of r.f. choke coils should be kept at the smallest possible minimum and above all, neither the whole choke nor any part of it should resonate at the transmitting frequency.

—E. N. Dingley, Jr.,

Associate Radio Engineer, Bureau of Engineering, Navy Department.
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Editor, QST:

Mr. E. N. Dingley, Jr., in his letter to QST is simply repeating what we already know of the parallel-resonance circuit. It was stated that this arrangement as used, functioned as a wavetrap.

Certain factors in design which limit the losses and certain practical considerations have evidently been overlooked by Mr. Dingley in his letter. These will be considered later.

The simple formula for inductive reactance unfortunately does not hold at all at the short waves. It will be necessary to use some mathematics to show that a "properly-designed and properly-operated" (as stated in the contribution to the Experimenters' Section) choke isn't so very "wet" (to quote his letter) after all.

Starting with a parallel circuit consisting of a condenser, with comparatively negligible resistance, in parallel with a coil having appreciable resistance, it can easily be shown mathematically that the loss in a tuned circuit of this nature is given approximately by:

\[ E^2 \left( \frac{C}{L} \right) R \]

where \( E \) is the voltage across the circuit, \( R \) is the resistance of the inductance and \( C \) and \( L \) are the capacity and inductance of the parallel arrangement. For a given resonant condition, the loss may be decreased by increasing the LC ratio; the resistance of the coil increases as its inductance increases but not in the same proportion. By using a large LC ratio the circulating current may be reduced. We do not want a "power tank" for this purpose.

In a parallel circuit, the higher the LC ratio for a given resonant condition, the broader the tuning, aside from the increase of resistance, so that the trap does not tune so sharply as was explained in the contribution to the Experimenters' Section. Such a circuit, moreover, may be tuned near the resonance condition on either side as may be desirable; an adjustable choke is convenient.

Several Pacific coast amateur stations have tried out such a parallel circuit and in each and every case, troublesome local interference was entirely eliminated. Such an arrangement may not be the only solution but it is something that furnishes a practical need; nothing else in a transmitter is at present more of a guess-work proposition than the choke. Until something arrives which will "always work" (and at widely different frequencies) or, preferably, more circuits are designed where chokes are unnecessary, or may be placed at positions of low potential, the tuned trap will serve well for many installations, and the losses, in general, will be less than those occurring by the use of
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Starting with, say, 40 turns of fine wire, each other section added should have an additional ten turns or so; the idea is to have an arrangement doing some business at almost any frequency. Possibly someone will furnish some measurements.

Mr. Dingley states that a good procedure would be to space the turns about one wire diameter apart and wind them on a small diameter tube. The inductance...
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of a spaced winding is unfortunately rather low and a spaced winding is difficult of construction when there is a lot of it and fine wire.

The contribution besides suggesting a practical solution is evidently bringing to light, as it were, men who are interested in the same problem. May we have some comment, possibly in the form of an article, in the near future from Mr. Dingley and others?

The problem, as all problems appearing in the Experimenters' Section of the magazine, is merely off to a good start and is far from solved; there are many angles. There is no doubt that a "properly operated and designed" tuned choke has many advantages.

—A. Binneweg, Jr.

Editor, QST:

I have just received this morning from Mr. Binneweg, Mr. E. N. Dingley, Jr.'s letter of November 1st, 1927, on the subject of r.f. chokes.

I don't know whether the seventh paragraph of Mr. Dingley's letter has reference to my report in QST, October, 1927, page 27. Practically, Mr. Dingley's conclusions are the same as mine (loc. cit., page 29, numbered paragraph 2). He is, however, very indifferent at the idea of using such a choke at its natural frequency; on the other hand my measurements indicated clearly that such chokes worked best at and near that frequency.

Perhaps we mean different things by the term "natural frequency". I was careful to define it as the frequency "at which the choke has no effect when shunted across the tuning condenser of an oscillating receiver". I am inclined to think however, that we mean the same thing.

If we do, I should like to ask Mr. Dingley whether he considers that such chokes should be worked above or below their natural frequency; and whether he can adduce any experimental evidence to back up his opinion.

My guess is that he got a little confused, and can't see the wood of impedence because he has got his eye glued exclusively on the tree of circulating current losses. After all, however much damage Mr. Binneweg's condenser may do, his inductances would not be very efficient r.f. stoppers by themselves!

In any event, the question of the efficiency of chokes around their "natural period" is fortuitously susceptible of determination by measurement. An abstract of the experimental evidence indicating efficient operation around this point was published in the article above referred to; and I shall await with interest any experimental results which Mr. Dingley can adduce which indicate the contrary.

—F. A. Lidbury, SBAG.
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More on Rubber Stamps

431 East Willow Grove Ave.,
Chestnut Hill, Philadelphia, Penna.
Editor, QST:

On page 68 of the February, 1928 number of QST there is a letter from Mr. Theo. R. Lowenthal, of Chicago, under the heading of "Rubber Stamp" which, to me, deals with a subject worthy of consideration and careful analysis.

Two or three stations in this vicinity who are O. R. S. and, therefore, pledged to forward all messages received within forty-eight hours have become very fussy on the subject of so-called rubber stamp messages. Their attitude, I gather, is that if a message looks to them to be one of this class, then it automatically drops off the table into the wastepaper basket, so that their hands won't be soiled thereby. Incidentally, these stations are the poorest local traffic handlers, and couldn't be paid to run a daily schedule for even one month.

While my sentiments are the same as those of Mr. Lowenthal, I want to emphasize one point more strongly: Messages moving by amateur radio are definite communications from one person to another. How well the sender knows the addressee is not known to any station handling that message, nor can these stations be aware of any special significance of any of these messages, which, actually, are private and personal missives.

Who, then, is so highly informed that he can be the censor of ideas passing between two persons? Who is so intellectually perfect that he can read the full meaning from the words of a passing message and, being one of this higher type of beings cast this message aside as containing some inferior idea?

If we were all perfect message writers, a millennium would have been reached, but we're not. You know how sore it would make you if some crank filed one of your messages in the trash. Be reasonable and helpful instead of short-sighted and watch the gang follow a good example.

--John B. Morgan, 2d, 2 QP.

Budget

109 West Third Street,  Long Beach, Calif.

Editor, QST:

It seems to me that a good many amateurs do not have a definite policy as to their plans and actions with regard to amateur radio. Certain plans and procedures have been worked out for station 6AM which may prove of interest to others.

First, a definite sum or budget is set aside each month to spend on the radio set. Originally, this sum was five dollars a month, and with five dollars a month station 9DR was built. Later, it was changed to ten dollars a month and with this amount radio station 9ZT came into prominence. The amount has now been raised to twenty-five dollars per month and 6AM is the result.

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Electrostatic Condensers for All Purposes
All of this has worked out far better than trying to spend a certain definite sum without the intention of spending more from time to time. A certain amount spent each month for radio rather than for other things in the entertainment line will be conducive to further interest inasmuch as one who has it, can always think ahead a little bit and know just how he is going to spend that money to best advantage. The main thing is to spend it after the budget has been fixed. What has been the problem here for the most part is to determine just where the money should be spent, inasmuch as the set is rather complete at all times.

Certain other definite policies should be incorporated into the play of the station. For those who have other interests besides amateur radio, a definite time to stop amateur radio is necessary. The stopping of all amateur interests at 8 p. m. works very well for a married man, we find. Just about that time, Mrs. 6AM gets through washing the dishes and then we have the evening free. It does not interfere in the slightest with the operation of the station and, in fact, merely whets the appetite for further operation at other times.

Usually by getting up half an hour early in the morning, several foreigners may be worked before breakfast. This also does not interfere with the household arrangements. One night a week is set aside for all-night operation. This naturally falls on Saturday night here, and thus can be counted on. With one night a week all-night operation, maximum interest and results are assured. A few hours on 20 meters on Sundays rounds out the week in fine shape.

We all know how amateur radio gets the best of all of us at some time, and some amateurs have found it necessary to discontinue their amateur sets altogether because of the fact that it could not attend to their business or school work or whatever else they had to do because of the over enthusiasm shown in their amateur work. A suitable compromise such as outlined above will solve this and still keep the station in active operation.

It is a well known fact that every man should have a hobby and amateur radio is, without a doubt, the best hobby possible. A few rules of good sense as applied to the particular individual making them, will make that hobby even more interesting and useful.

—Don C. Wallace, 6AM.

Correction

Editor, QST:

I my paper published in the March issue of QST entitled "Radio Applied to Petroleum Prospecting," I gave the impression that time measurements accurate to one-fifth of one second were sufficient for correct interpretation of records. As a matter of fact, this is not exactly correct, and I should like to amend it. In actual practice, an accuracy within .01 of a second is usual. This, of course, in no way affects the principle of operation as outlined, but is a technicality which should be corrected.

—Gerald R. Chinaki.
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I. A. R. U.
(Continued from page 60)

45-meter wave and inputs of approximately ten watts. 5WD has distinguished himself by working eleven NUS in one night. Among them were stations located in five of the nine districts. 5MD is now permanently on 23 meters using about 200 volts ‘slop rectified’ a.c. with five to ten watts input. He has worked an NUS as well as several nearer stations with this outfit. It must be remembered that all of these stations are using receiving tubes of a type similar to the 201-A.

“2IT, whose signals are familiar to amateurs in almost every district of the U. S. A., has built a new crystal-controlled transmitter to which he will shortly add a quarter-kilowatt amplifier stage to operate from r.a.e. While on 20 meters recently, he worked nufUF.

“6MU reports conditions as being good on both 20 and 40 meters and he has heard several fifth, sixth and seventh district stations on 40 about 0800 G.C.T. He hopes to be back on 20 by the time these notes appear but will be QRW till after June.”

—E. Megaw, egioMU.

QSL SECTIONS

Austria—Radiowelt, QSL Bureau, Wien, III, Rudengasse 11, Vienna.
Belgium—Reeseu Belge, QSL Section, 11 Rue du Congress, Bruxelles.
China—c/o H. B. Wilson, P.O. Box 266, Shanghai. (Under cover)
Czechoslovakia — Ceskoslovensky Radionklub, Praha II, Slovansky ostrov 5, Czechoslovakia. (Under cover)
Denmark—Experimenting Danish Radio-amateurs, c/o Radioposten, 10, Snaregade, Copenhagen.
Estonia—Mr. Olof Leesment, Parnu, Atlan 6, Estonia. (Under cover)
Finland (Suomi)—K. S. Sainio, Merikatu 3 A, 10, Helsinki, Suomi.
France—Robert Larcher, 17 Rue Fessart, Boulogne-Billancourt, (Seine).
Germany — Deutscher Funktechnischer Verband, QSL Section, Berlin W. 57, Blumenthalstrasse 19, Germany.
Hungary—M.R.A.E., QSL Section, II, Buday Lazzlo, utca 5/c, Budapest.
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<th>CATALOGUE NUMBER</th>
<th>PRODUCT</th>
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(Continued from page 61)

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(Heard during February)

80-and Meter Band
121 2ev 2ev 2ijx 2ijn 17m 18ly 17an 18l np 1ly2 laiw lcbx lecl lecm 1anmx 1bck 1ckc 1lmx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx 1jxjx

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FROST-RADIO ANNOUNCEMENT

At the Radio Trade Show in Chicago the week of June 11 Frost Radio will announce a new and improved line of Quality Parts. This new line will be well worth waiting for. Descriptive literature will be ready for release on or before the opening of the Show. Have us place your name on our list to receive this literature. Write us about it today, using coupon below. Our two famous booklets, "What Set Shall I Build?" and "For Better Reception" will be sent you immediately by the other literature to follow.

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Elkhart, Indiana

Chicago
New York City

HERBERT H. FROST, Inc.
100 North La Salle Street, Chicago

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Name ________________________________
Street Address _______________________
City ________________________ State ______

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Say You Saw It In QST — It Identifies You and Helps QST

80

The NEW CHI-RAD Short Wave Coils

20—40—80 Meter Band

Designed by Chi-Rad engineers to meet the demands for an extremely efficient short wave coil. Complete with mounting, hardware and three interchangeable plug-in coils to cover 20, 40 and 80 meter wave bands. These coils are noteworthy for their convenience in design, neatness in appearance and smoothness in construction. All parts have positive contact.

Chi-Rad Short Wave Coils Complete for 20, 40 and 80 meter band ........ Net Price $7.50

Extra coil for broadcast band .... Net Price $3.45

Designers and Set-builders—write for further details and coils.

Chicago Radio Apparatus Co.
418 South Dearborn St.
Chicago, Ill.
High Resistance Voltmeter

(For the Set Owner)

In the adjustment of his B-eliminator voltages the set owner has been at a disadvantage because of the excessive cost of reliable testing instrument of sufficient sensitivity to give accurate results. This disadvantage has been recently eliminated by the introduction of the Jewel Pattern No. 139 high resistance voltmeter.

Although the price of this instrument is low, it is of the D'Arsonval or moving coil type with the movement swung between genuine sapphire jewels. The full scale value is 300 volts, the scale having 30 divisions. Movement parts are silvered and the scale is silver etched with black characters. The series resistance is wound with fine wire and accurately adjusted to give correct readings at all times. The instrument throughout is of the very highest grade of workmanship.

Dealers carry this instrument in stock, or a descriptive circular No. 1103 may be obtained by writing us direct. Ask for a copy.

Jewell Electrical Instrument Co.
1650 Walnut St., Chicago
“28 YEARS MAKING GOOD INSTRUMENTS”

Master the Code

Wireless or Morse quickly at home with the TELEPLEX
Code Instructor

No better method for self-instruction exists. Quickly - Thorough. Endorsed by U. S. Navy and leading Technical and Telegraph Schools. The only instrument that RE-PRODUCES actual sending of expert operators. Sends messages, radiograms, etc. Any speed. Complete course (4 tapes) FREE. 30 times as many words as any other instrument. Tapes cannot be memorized. Last indefinitely. Avail yourself of the TELEPLEX for a quick mastery of the code. Write for booklet RL.

TELEPLEX CO., 76 Cortlandt St., New York

Here’s a Handy Dooflicker!

TABLE TYPE CLAROSTAT
REG. U.S. PAT. OFF.

Just the thing for that short-wave receiver, especially on very short stuff. Gives you remote control of plate voltage, regeneration or stabilization. In fact, you can use it wherever you require variable high resistance of limited current-handling capacity. Just as your broadcast friends use it to control loudspeaker tone and volume from table, easy-chair, davenport or elsewhere.

Finished in statuary bronze and nickel. Full bottom. Bakelite knob. Two conductor cords and connecting block for series or shunt resistance. Resistance range of practically zero to 500,000 ohms, in several turns of knob. Micrometric adjustment. Stays put. Watt rating. Yours for $2.50, complete.

Ask your dealer to show you the Table Type, Volume Control, Standard and Power Clarostate—resistance for all your requirements. Or write us direct for the dope.

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Specialists in Variable Resistors
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Our new 1928 catalog is jammed full of the newest offerings of nationally known radio parts, kits, sets, accessories, table and console cabinets, etc. Whatever your radio need may be it’s in our 1928 catalog. Also containing Short Wave Section showing the finest receiving and transmitting apparatus. Write for this big catalog—and for our confidential discount sheet—but write immediately.

SHURE RADIO CO., 351-H West Madison St. Chicago, Ill.

Say You Saw It In Q.S.T.—It Identifies You and Helps Q.S.T
SANGAMO ELECTRIC CO. 
SPRINGFIELD, ILLINOIS

To Make Your Set 100% Efficient 
You Should Use 
Patented Non-Magnetic "VAC-SHIELD" 
On Your Radio Tubes

These prevent intergrate coupling, eliminate stray capacities, stop tubes from vibrating and heating and increase distance between points of use. "VAC-Shield" are adjustable, made of heavy gauge metal fittings soughly found by laboratory test to be most efficient. 

Ask your dealer for Supers and Short Wave Sets.

Each ORDER by Mail Post Paid $1.00 or sent C.O.D. $1.10. Agents wanted.

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250 McKinley Ave. East Orange, N.J.
For your new

Frequency

Meter

GET your house in order! Make your plans now for building the new frequency meter for 1929 which you will need in conforming with the Radio Commission's ruling to keep within the narrower transmission band. Your frequency meter should be equipped with a Weston Thermo-Galvanometer because its low internal resistance is absolutely independent of frequency; and its overload capacity of 500 milliamperes gives protection against meter burn-outs caused by excessive momentary overloads—due to too close coupling.

Weston Thermo-Galvanometers are made in two sizes—of the usual inimitable Weston quality in design and construction. These Galvanometers—Model 425, 3/4 in. diam. and Model 507, 2 in. diam. are made in flush type, finished in dull japan with silver etched scales. The electrical characteristics of these instruments are identical and their resistance is 5.2 ohms.

WESTON ELECTRICAL INSTRUMENT CORPORATION
602 Frelinghuysen Avenue, Newark, N. J.

Model 425—
3 1/4 in. diam.
$15.00

Model 507—
2 in. diam.
$14.00

For your new Frequency Meter—
to meet the 1929 requirements

Model "N" Vario Denser

Pep Up Your Set With X-L Products

Tune quickly—adjust accurately—eliminate distracting noises—get correct tube oscillation—with X-L VARIO DENSERS in your circuit.

Designers of all latest and best circuits specify and endorse.

MODEL "N"—Micrometer adjustment easily made, assures exact oscillation control in all tuned radio frequency circuits, Neutone Roberts 2-tube, Browning-Drake; Silver's Knockout. Capacity range 1.8 to 29 Mfd. Price $1.80.

MODEL "G"—gives the proper grid capacity on Cockaday circuits filter and intermediate frequency tuning in super-heterodyne and positive grid bias in all sets. Capacity range. Model G-1 .0002 to .001 Mfd. Model G-5 .0001 to .003 Mfd. Model G-10 .003 to .005 Mfd. Price each with grid clips $1.00.

X-L PUSH POST—NEW! Bakelite Insulated. Push it down with your thumb, insert wire, remove pressure, wire is firmly held. Vibrations will not loosen, releases instantly. Price each 15c.

FREE—New up-to-date book of wiring diagrams, showing use of X-L units in all popular hookup's, also the General American Detector Circuit, applicable to any set; adds a stage without added tuning controls. Write today.

X-L RADIO LABORATORIES
Chicago, Illinois

THE Great New VIBROPLEX
Reg. Trade-Mark: Vibroplex-Bug-Lighting Bug
No. 6


Famous Improved Vibroplex

Used the world over because of its ease and perfection of sending. Over 100,000 users.

Special Radio Bug

Japanned Base $17
Nickel-Plated 19

X-L PUSH POST

X-L PUSH POST

THE VIBROPLEX CO., Inc.
825 Broadway NEW YORK
Cable Address: "VIBROPLEX" New York


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New!

Centralab
Power Rheostat

This new unit is a knock-out for warp-proof, heat-proof performance. Its construction permits continuous operation at temperatures of 425° F. and beyond. Resistance wire is wound on metal core, asbestos-insulated; core expands with wire, insuring smooth action. Narrow resistance strips give small resistance jumps per turn, further assurance of even regulation. Compact 2" di- ameter. Order 75, 90, 105, 120, 150, 180, 220, 300, 440, 600, 900, 1200, 1500, 1800, 2200, 3000, 4400, 6000, 9000, 12000 ohms. Price $1.25. Can also be furnished as a poten- tiometer. At dealer's, or C. O. D. You need this new Power Rheostat. Send postcard for new circuit literature.

CENTRAL LABORATORY RADIO DIVISION
20 Keefe Avenue
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Genuine Bakelite Panels

3/16" Thick, Color Black
38x3" reg. price $29.00, Special at $9.75 per panel
30x3" reg. price $21.00, Special at $7.25 per panel

American Sales Co., 19-21 Warren St., N. Y. City

ROBERT S. KRUSE
Consultant and Technical Writer
103 Meadowbrook Road, West Hartford, Conn.

Telephone Hartford 45327

Say You Saw It in QST — It Identifies You and Helps QST

12


E. F. JOHNSON COMPANY
WAASECA, MINNESOTA

R. Dezerelle, 46 rue St. Laurent, Lagny, S. et M.,
Francois.

(Heard between Oct. 28, 1927 and Feb. 1928)

... E. F. J O H N S O N  C O M P A N Y  W A S E C A ,  M I N N E S O T A

A genuine two button stretched dia- phragm type, a
ready in use in many broadcast stations, but selling
at a price within the reach of the amateur—only $40.00.
E. F. JOHNSON COMPANY
WAASECA, MINNESOTA

3/16" Thick, Color Black
38x3" reg. price $29.00, Special at $9.75 per panel
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Say You Saw It in QST — It Identifies You and Helps QST
This will acknowledge receipt of yours 15th inst and we are pleased to say that the ESCO motor-generator sets used by us at WDAK, our broadcasting station, have given the best of service.

While we have never attempted to overload any of our apparatus we find that the ESCO machines working right at their limit have given excellent satisfaction and take pleasure in recommending them to anyone in need of such machines.

Trusting we will find it possible to assist you in placing machines in the future, we are

Yours truly

THE NATIONAL CYCLE COMPANY
By radio operator and engineer of WDAK

You Can Quickly Become An
EXPERT RADIO OPERATOR
The Candler System of Training in
High-Speed Telegraphing Shows How
Theo. McElroy, World's Champion Radio Operator, endorses no other system. Read what he says—"At the Pageant of Progress, Chicago, I copied 56 words per minute for 5 minutes, establishing a new radio record, which I still hold. I owe my Skill, Speed and Steady Nerve both in sending and receiving to The Candler System." What this system has done for McElroy and thousands of others—it will do for YOU.

FREE Booklet explains system fully. Send for it TO-DAY. A post card will do. Send Now!
THE CANDLER SYSTEM CO., Dept. AR
6348 So. Kedzie Ave., CHICAGO, ILL.

Power Transformers
Guaranteed—Mounted—Complete

1 Kw.-2000-2400 v. each side .......... $30.00
1 Kw.-2500-3000 v. each side .......... 35.00
600 watt 1000-1500 v. each side .......... 14.00
600 watt 2000-2500 v. each side .......... 21.00
250 watt 550-700 v. each side .......... 10.50
250 watt 25 cycle 550-700 v. .......... 14.00
700 watt 25 cycle 2000-2500 .......... 28.00
Add $2.00 for SSL winding.

9CES F. GREBEN
1927 S Peoria St., Pilsen Station, Chicago, Ill.
NEW CROSLEY JEWELBOX
Genuine neodyne AC receiver, 140 volts on plate of last tube gives full natural tone. Very sharp and selective. Write Dept. I 8 for information.

THE CROSLEY RADIO CORPORATION
Powel Crosley, Jr., Pres.
Cincinnati, Ohio
Licensed only for Radio Experimental and Broadcast Reception.
Prices slightly higher in far western states.

Battery Type Bandbox, $55
Dry Cell Bandbox, Jr. $55

PACENT DUO-LATERAL COILS
For laboratories, experimenters, engineers and for special circuits, Pacent Duo-Lateral Coils are the accepted standard.

A complete line of all standard turn ratios are always in stock.

Write for information and prices
Pacent Electric Co., Inc.
91 Seventh Avenue, New York

THAT'S WHAT THEY ALL SAY

Radio SMZF, Vizgre, Sweden
(Heard between January 11 and February 11)

1vo Imaa 1g1 labd 1bd4 1badf 2baf 2aam 2as 2dp 2aag 2p 2bfy 2bde 2bf0 2a5s 2mew 3a jk 2bce 2amn 2sdey 2sco.

eu-03ra, V. Vostrinakov, U. S. S. R. Moscow 6, Mal.

PRAIRIE DIVISION
MANITOBA—SCM, D. B. Sinclair, 4FV—Nine new stations have appeared on the air since last month. 4DU continued his DX the spending little time on the air. 4DP, 4DW and 4EY have left town. 4GG is going fine and has applied for OBS and ORS. 4GQ and 4GG are putting Winnipeg on the map in fine shape. 4DY and 4DP have decided to quit and sell out. 4CT is in the throngs of moving so had little time for radio. 4BT will be home this week. 4EG had a 50 watt on the air for a while but got better results with a 500 watt. 4DH had a little trouble with his 7 L 4 watt but he is trying to hock the 1st now. 4HH is getting out better with his 7L 4 watt and has arranged, if his face, 4HH turns in a message total and reports being mostly on 20 which he says is fine for traffic, 4AC has been handling traffic with KL at the Gold Lake mines. 4HH is back on again but is having trouble with his MG. 4FFC has been keeping a schedule with VBY at Fort Churchill, both ops at 4CK have their 1st class floats now.

Traffic: 4FF 51, 4GG 8.

SASKATCHEWAN—SCM, W. J. Pickering, 4FC—4BM has been QSO the Canadian 5th Dist. and is trying to hook the 1st now. 4HH is getting out better with his 7L 4 watt, he was in a photo of his layout and includes his face. 4HH turns in a message total and reports being mostly on 20 which he says is fine for traffic. 4AC has been handling traffic with KL at the Gold Lake mines. 4HH is back on again but is having trouble with his MG. 4FC has been keeping a schedule with VBY at Fort Churchill, both ops at 4CK have their 1st class floats now.

Traffic: 4HH 46, 4HS 55, 4AC 25, 4HH 24, 4BM 16, 4CK 6, 4FC 2.

ADDITIONAL AND LATE REPORTS
9ENU reports a new ham in Kansas City, Mo., 2F10. op liad sends in a fine total this month. 68JX is up on 50 meters now. 1BCX is a prospective ORS. 2BOW reports a new ham, 2BKU, coming on in Dobbs Ferry. 2ABY, visited O1K, the SS Lithuania and had a chat with the chief op. 5CNN wins the election in Eastern N. Y. np4FP sold his 500 volt generator so is on 200 volts and 2UX201A tubes now. 8AYH is going to put up a new Zeppelin antenna. 8SR is pleased to announce the arrival of a new YL operator, Lucille Amelia Fitch on March 16. Congrats to you and Mrs. 8SR, OQM. 6CQP is doing radio service work now. 6YVO reports a fine schedule to Arizona working out. 6ADU sends in a good report for this month. 5DQ writes us that 50X accidentally shot himself on Mar. 29 while cleaning his gun but is recovering. 1AHV reported direct this month as he forgot it until too late to send to his SCM. 7AJU is now closed down and is leaving for Los Angeles soon. 8C6K reports that there are two operators at his station and hope to be an ORS soon.

Traffic: 9ENU 165, 68JX 412, 6BTX 22, 1BCX 91, 2BOW 25, 2ABY 20, np4FP 17, 2CNH 14, 6CQP 54, 5BYV 48, 1AHV 41, 7AJU 16, 6ADU 147.

B. W. WALTON TAIL

The Mercury Arc has your rectifier problems solved. Data sheets describe latest developments. Low loss keeps alive, 6 phase arc.

RECTIFIER ENGINEERING SERVICE
4037 ROCKWOOD
CLEVELAND, OHIO

Say You Saw It In QST—It Identifies You and Helps QST
2,000 to 30,000 ohm resistance. List $5, special $2.95.

No. 12 Enamelled copper wire, any length, ft. $0.01
No. 10 Enamelled copper wire, any length, ft. $0.01
Emile Bakelite Panel 10$1.25
Tea—50 Watt Socket $1.45
Myers $5.25 volt Del. Amp tube, complete with mounting clips $0.95
Belden braid 1/4 inch wide, ft. $0.96
Neon tube, type B ultra sensitive. Has sealed in electronics, positive contacts. Best indicator for wave meter $1.50.

**Thordarson Power Transformer**
- $13 Hat—T-126, cap. 100 watt, secondary each side of neutral 350 and 550 volts, $9.85.
- $18 Hat—T-126, cap. 450 watt, secondary each side of neutral 1000 and 1500 volts, $13.95.
- $20 Hat—T-127, cap. 900 watt, secondary each side of neutral 1500 and 1500 volts, $22.50.

**Gridleaks**
15,000 ohms, tapped at 5,000 and 10,000 ohms with 85 watt capacity. $1.50
20,000 ohms, 85 watt for UX552 1.50
5,000 ohms, 85 watts 1.00
5,000 ohms, 20 watt for one UX210 0.75

**Leeds**
45 VESEY STREET
NEW YORK
New York's Headquarters for Transmitting Apparatus

**Cardwell condensers, double spaced for transmitting, $0025 cap.**
Electrad Wire Fixed Resistance, type B, 28 watts, 27" long 5,000 ohm, centre tapped 5.95
10,000 ohm, centre tapped 1.10
Type C, 50 watts, 4" long 5,000 ohm, centre tapped 1.45
10,000 ohm, centre tapped 1.75
Type D, 75 watts 20,000 ohm, centre tapped 2.25

**Acme C. W. 30 Henry choke**
$18 Hat—150 M.A., single, $14.49 also other sizes at special prices.

---

**QST Oscillating Crystals**
New Prices Effective April First, 1928

**AMATEUR BANDS**
Prices for grinding crystals at random frequencies which fall within the bands described below are as follows:
- 1715 Kcs. to 1925 Kcs. $15.50.
- 2000 Kcs. to 2200 Kcs. $18.00.
- 2500 Kcs. to 3500 Kcs. $20.00.
- 3501 Kcs. to 4000 Kcs. $25.00.
- 4001 Kcs. to 7200 Kcs. $30.00.

The frequency of the crystal will be given accurate to better than a tenth of one percent. Immediate delivery.

**BROADCAST BAND**
Prices for grinding crystals to your assigned frequency accurate to plus or minus 50 cycles, $15.50 unmouted, $35.00 mounted. Three day shipment and all crystals guaranteed. This crystal is your usual POWER type. Crystals ground to any frequency between 40 and 16,000 Kcs. Let us quote for your particular requirement.

**SCIENTIFIC RADIO SERVICE**
"THE CRYSTAL SPECIALISTS"
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**AMERTRAN**
Completely wired Push-Pull Power Stage

**GRIDLEAKS**
15,000 ohms, tapped at 5,000 and 10,000 ohms with 85 watt capacity. $1.50
20,000 ohms, 85 watt for UX552 1.50
5,000 ohms, 85 watts 1.00
5,000 ohms, 20 watt for one UX210 0.75

**Postal**
UTILITY RADIO CO.
80 LESLIE STREET EAST ORANGE, N. J.
STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of QST, published monthly at Hartford, Conn., for April 1, 1928.

State of Connecticut as:

County of Hartford

Before me, a Notary Public in and for the State and county aforesaid, personally appeared K. B. Warner, who, having been duly sworn according to law, deposes and says that he is the business manager of QST and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

2. That the owners are: (Give names and addresses of the individual owners, or if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent. or more of the total amount of stock)

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear on the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements, embracing affiant’s full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affidavit has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication, sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.

   (This information is required from daily publications only.)

K. B. WARNER.

Sworn to and subscribed before me this 3d day of April, 1928.

Caroline S. Crisman.

(My commission expires February, 1931.)
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Operates on 6 volts D.C. adjustable to all positions. 1/4" pure silver contacts. Lacquered brass finish. 3 x 5¼" x 1/4" Bakelite base. Maple sub-base. Recommended for 250 watts or less.
PRICE $9.00

THESE RELAYS ARE EXTREMELY FAST. THEY DO NOT LAG NOR DRAG.
MADE BY MAKERS OF THE FAMOUS "LEACH BREAK-IN RELAY"

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693 MISSION STREET
SAN FRANCISCO, CALIFORNIA

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FLECHTHEIM GUARANTEED TRANSMITTING FILTER CONDENSERS

PRICES
2 MFD 1000 v. TEST-800 v. WORKING $2.59
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1 MFD 2000 v. TEST-1500 v. WORKING 2.59
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DUTURE .002 6000 volt 1.95

New type transmitting transformers, special for this month only—Mounted type special combined plate & filament transformer, 550 volt plate winding—Two 7½ volt filament windings with center-taps. Only... $6.89
7½ volt filament transformers...$10.10
100 Watt, 550 & 530 with mid-tap, plate transformer Special $12.90
500 Watt Plate Transformer (as per illustration) 1500 & 2000 volts either side of mid-tap, extra special for this month...$22.45
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REPAIRING AND REXHAUSTING
OF ALL SIZE TRANSMITTING TUBES
PRICES UPON APPLICATION

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When you want to know just how good a resistor is, without having to check up on its characteristics in your laboratory, find out who uses it.

Here are a few of the more prominent manufacturers now using Har-field Resistors in large quantities. We recommend that you write for their opinion of Har-field Resistors.

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The Roanoke Division Convention
(North Carolina Section)

AGAIN, the Charlotte Amateur Radio Association did itself “proud” by staging the second annual North Carolina convention on March 2nd and 3rd. The Division had for its guest of honor Secretary-Editor K. B. Warner of the A.R.R.L., who spoke at length on legislation problems and gave a good talk on the technical difficulties with which the amateurs will be confronted when the new narrowed bands go into effect.

E. J. Gluck, 4Q, also engineer of WBT, had charge of the technical meetings and saw to it that everything moved properly. The gang learned a great deal about meters from the good talk given by Mr. Pollard of the Weston Electrical Instrument Co. Inspection trips were made to the Western Union Telegraph relay office, American Telephone & Telegraph Co. and the Broadcasting Station WBT.

Saturday was, of course, the day of days with contests of all kinds and where clever jokes were played on a number of the gang. 4OC, having succeeded in getting 40 watts output from his crystal controlled set with an input of only 20 was arrested for breaking Ohm’s law. Director Gravely almost cried when they discovered he had a bottle of Castoria in his pocket. Perkins, 4VQ, impersonated Prof. Taurenwerther and his paper on Beam Transmitters showed that the editors of QST will not have to worry in the future for articles.

The banquet which was held in the Chamber of Commerce brought out some real good eats after which G. D. Bruns, President of the C.A.R.A., spoke on the history of the club and a good talk was given by Joe Garibaldi, a newcomer who donated the use of the land on which the club house is located, on wonders of amateur radio. The good friends who advertise in QST were most generous in the donation of prizes for various competitions. The Charlotte Amateur Radio Association wishes to publicly express its appreciation to the manufacturers whose contributions helped make the convention so successful. After the distribution of prizes the fellows did not seem to want to get away and real “rag chewing” continued until long after midnight. We express sympathy to those who could not attend the Roanoke Division Convention.

-R. S. M.

Transformers and Chokes

Of course Acme builds them Acme products are nationally known.
Furnish us with your blue prints and specifications for prices.
We invite your inquiries.
Member R.M.A.
The Acme Electric & Mfg. Co.
Established in 1917
1653 Rockwell Ave., Cleveland, Ohio.

Say You Saw It In Q.S.T.—It Identifies You and Helps Q.S.T.
THE LIFE blood of your set—plate power. Powerful permanent, infinitely superior to dry cells, lead-acid, Ba, B eliminators. Trouble-free, rugged, abuse proof, that’s an Edison Steel-Alkaline Storage, B-battery. Upset electrically used pure nickel conductors insure absolute quiet. Lithium-Potassium solution (that’s no lie). Complete eliminators, Trouble-free, rugged, abuse proof, that’s a trick all welded pure nickel connectors insure absolute perfection. Edison Steel-Alkaline Storage, B-battery. Upset electrically used pure nickel conductors insure absolute quiet. Lithium-Potassium solution (that’s no lie). Complete eliminators, Trouble-free, rugged, abuse proof, that’s a trick all welded pure nickel connectors insure absolute perfection.

(4) Advertising shall be of a nature of interest to radio amateurs or experimenters in their purview 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. It would tend to make into advertisement stand out from the others.

(6) The “Ham Ad” rate is 7c per word. Remittance in advance. Non-returnable.

(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, Ba, B eliminators. Trouble-free, rugged, abuse proof, that’s an Edison Steel-Alkaline Storage, B-battery. Upset electrically used pure nickel conductors insure absolute quiet. Lithium-Potassium solution (that’s no lie). Complete eliminators, Trouble-free, rugged, abuse proof, that’s a trick all welded pure nickel connectors insure absolute perfection. Edison Steel-Alkaline Storage, B-battery. Upset electrically used pure nickel conductors insure absolute quiet. Lithium-Potassium solution (that’s no lie). Complete eliminators, Trouble-free, rugged, abuse proof, that’s a trick all welded pure nickel connectors insure absolute perfection.

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**NOTICE**

Two evenings with your Short Cut raise to 12 and in I TT O 'Reilly reports "Long time anchored at 5 per.

ATTENTION Hams! How would you like to spend your vacation up here where Lake Michigan breezes fan you all summer and at the same time prepare yourself for a future career? For the price of a special trip, we are exclusively for licensed amateurs during July and August. For detailed information write—C. O. Slyfield, 8LA, Frankfort, Michigan.

FOR sale: one Amrad antenna switch, $1; one HP General Electric 110 volt motor, $25; one 500 cycle generator set. 110 volt DC motor, 250 volt 1/2 KW generator $25: two Fleon pillar insulators, $1 each; 1 Jewel pattern 4-4-6 AC transformer, $9; one forty watt UX230 B eliminator transformer, $5; one sixty watt UX 216B half wave B eliminator transformer, $5; Western elect. $4; 240 volt AC motor generator UXLI55 radio frequency sockets, $1; two hundred watt UX 216B full wave transmitting transformers, $12.50; fifty Henry 1018 coil doubling units $5.50. Wm. M. Derryck, 80 Leslie Street, East Orange, N. J.


FOR sale: one Amrad antenna switch, $1; one HP General Electric 110 volt motor, $25; one 500 cycle generator set. 110 volt DC motor, 250 volt 1/2 KW generator $25: two Fleon pillar insulators, $1 each; 1 Jewel pattern 4-4-6 AC transformer, $9; one forty watt UX230 B eliminator transformer, $5; one sixty watt UX 216B half wave B eliminator transformer, $5; Western elect. $4; 240 volt AC motor generator UXLI55 radio frequency sockets, $1; two hundred watt UX 216B full wave transmitting transformers, $12.50; fifty Henry 1018 coil doubling units $5.50. Wm. M. Derryck, 80 Leslie Street, East Orange, N. J.


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A practical book that should enable anyone of average intelligence to pass the Government's theoretical examination given to applicants for a Commercial Radio Operator's License.

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8. the labelled illustrations are invaluable for reference purposes to practicing operators;

The book answers such questions as:

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how would you operate an R. C. A. 500-Watt Tube Transmitter?
how would you place the Independent Arc Transmitter into operation?
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-Etc., etc., etc., etc.

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MODEL AP-935

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Can be permanently placed in the set which will enable the user to apply desired plate voltage accurately to each circuit of his receiver. By means of the front switch three readings can be obtained without disconnecting any wires, namely: the detector circuit, the radio frequency or intermediate circuit, and the maximum or output circuit including last audio tube. Requires little current to operate due to its high internal resistance. Flush Panel Mounting. Zero Adjuster.

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These rectifying tubes operate on a filament voltage from 8 to 10 Volts and draw 1 1/2 amps. They will safely stand an A.C. input voltage up to 750 Volts and pass plenty of current and voltage for the plate of the Transmitting Tubes. They are also very efficient rectifiers for use in "B" Battery Eliminators.

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You Can't Burn Out

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Aerovox Pyrohms (Vitreous enamelled resistors) are unaffected by atmospheric conditions, will not oxidize, will last longer and give better all around satisfaction.

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Complete AERO Transmitting Coils for the 20-40 and 40-80 bands. $20.00. Complete for 20-40, 40-80, and 90-180 bands. $28.00.

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