QST
devoted entirely to
amateur
radio

LOW-COST
BATTERY-OPERATED
S. SUPERHET
MORE ON
ANTENNAS
ELECTRONIC
PHONE BREAK-IN
The new Collins 18J is a UHF Transmitter specifically designed for use in police patrol cars as part of a two-way communication system.

The transmitter has its frequency controlled precisely by a high-quality quartz crystal and distortion or loss of signal due to frequency drift is thereby eliminated. An improved quality microphone and a low-distortion, high-level plate modulation system faithfully preserves voice articulation.

The power supply unit is unique in that it employs vibrator type converters in place of a dynamotor. The principal feature of the vibrator system is its high efficiency—the total battery drain of the transmitter being less than 30 amperes at 15 watts output at 100% modulation, and this current is required only while the operator in the car is talking.

The entire 18J equipment is arranged for simple and convenient installation. A compact cabinet, 12" long x 6" wide x 9" high, contains the transmitter unit itself and a similar cabinet of equivalent dimensions contains the associated power supply. These two cabinets can be mounted side by side in the rear baggage compartment of the car or they can be separated and mounted in any other available space. There are relatively few adjustments to be made in the transmitter on installation since all of the excitation circuits are locked and tuned at the factory. The antenna circuit is adjusted on installation and locked in position. Practically no special wiring is required for installation of the equipment except when it is desired to shorten certain of the cables to eliminate unnecessary length.

We believe that the new 18J cannot be surpassed in convenience, efficiency and reliability. It is the last word in mobile transmitters.
True progress in any line of endeavor, and this is especially true in building communications equipment, lies in the art of learning how to do things better.

At the Hallicrafters Laboratories, a competent staff of electrical and mechanical engineers spends thousands of hours, not only in developing new equipment, but in searching for ways and means of refining and perfecting our methods of building Hallicrafters receivers and transmitters.

This constant study has enabled us to build better equipment, operating more efficiently and more accurately, without increasing its cost to the radio amateur.

New values and better performance have been added by ingeniously perfecting the art of building communications equipment.

This has always been our objective and will continue to be in 1939 — to keep pace with amateur radio by progressively improving Hallicrafters equipment. The announcement of the 1939 SKY BUDDY on the following page is an example of our efforts in this direction.

W. J. Halligan
President
Now with 10 Meter Band and Electrical Band Spread

How can it be done? Here's a New SKY BUDDY designed to include the 10 meter band and with the same Electrical Band Spread used in higher priced Hallicrafter models, with better all-around performance than ever before—but still selling at the same amazingly low price!

Here's How We Can Do It! The SKY BUDDY was first built as a good junior communications receiver for the amateur and short wave listener with a limited purse. Since then OVER 10,000 SKY BUDDIES have been built. With such widespread acceptance, we have been able to make progressive improvements in this sensational receiver without adding to its cost!

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- 6 Tubes with 8 Tube Performance
- 4 Bands
- Complete Coverage 44 MC to 545 KC
- Covers 10 Meter Band
- Electrical Band Spread
- Separate Band Spread Dial
- Built-in Speaker
- AVC Switch
- Beat Frequency Oscillator
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CONTENTS

Editorials ................................................................. 7
A Six-Tube Battery-Operated Single-Signal Superheterodyne ............................... Don H. Mix, WITS

Splatter ................................................................. 9
Rescue at 11,000 Miles ...................................................... 14
Resuscitation from Electrical Shock ........................................... Clinton R. DeSoto
New Acorn Tubes ......................................................... 15
What the League Is Doing ................................................. 18

A. R. R. L.'s 11th International DX Competition
F. E. Handy, W1BDI ......................................................... 20

Hamdom ................................................................. 23
The "Q" Beam Antenna ......................................................... 24
Modernizing the 56-Mc. Receiver ............................................. 28

Philip C. Murray (W9VYU) ................................................. 31
Eight Years Before the Mike .................................................. 32

What's Your Crystal Frequency? ................................................ 33

Break-In Telephony With Carrier Suppression
S. Kaplan, PAOCM .......................................................... 36

Book Reviews ............................................................. 39

Using Electromagnetic-Deflection Cathode-Ray Tubes in the Television Receiver ......................................................... 40

J. B. Sherman

Landmark Becomes Ham Emergency Center .......................................... 45

Naval Communication Reserve Notes ............................................ 46

Simple Vertical Antennas ..................................................... 47

An Economical Six-Band Transmitter Harold Roberts, W1KUK ................................. 50

New Apparatus ............................................................. 52

1.75 Mc. WAS Party ......................................................... 52

Navy Day ................................................................. 53

Factors Influencing the "Q" of R. F. Coils in Amateur-Band Receivers ........... Dale Pollack ................................. 54

B. C. I. and the Amateur ..................................................... 58

L. C. Waller, W2BRO

How Would You Do It? ....................................................... 60

Hints and Kinks .................................................................. 62

I. A. R. U. News ............................................................. 65

Correspondence Department ..................................................... 67

Operating News .............................................................. 68

Silent Keys ................................................................. 98

Hamads ................................................................. 123

QST's Index of Advertisers ..................................................... 126
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All appointments in the League's field organization are made by the proper S.C.M., elected by members in each Section listed. Mail your S.C.M. (on the 16th of each month) a postal covering your radio activities for the previous 30 days. Tell him your D.A. plans for experimenting, results in 'phone and traffic. He is interested, whether you are an A.R.R.L. member or get your QST at the newsstands; he wants a report from every active ham. If interested and qualified for O.R.S., O.P.S. or other appointments he can tell you about them, too.

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To the HALLICRAFTERS

We wish to take this opportunity to congratulate the Hallicrafters on another engineering triumph. This new 325 watt transmitter, comprising the latest in circuits and advanced developments is an outstanding piece of apparatus. Kenyon is indeed proud to be associated with the name Hallicrafters, just as proud as you will be when your rig is KENYONIZED.

See your dealer today and ask him of the many advantages of our products. Such features as sealed against moisture, completely dehydrated and GUARANTEED make these transformers a natural for your rig. Don't wait. . . GET KENYONIZED!!!!!!

Send for our new 1939 catalog describing our complete line. Mailed free upon request!
THE AMERICAN RADIO RELAY LEAGUE, INC., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

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

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Address all general correspondence to the administrative headquarters at West Hartford, Connecticut.
"IT SEEMS TO US—"

"... AND SUDDEN DEATH"

Here at A.R.R.L. Headquarters we have become dreadfully conscious in recent months of the increasing danger of electrical death or maiming which exists in present-day amateur transmitters. Reduced prices of apparatus make high power a commonplace now, so that tens of thousands of amateur stations have become potential lethal machines. Following upon the death of Ross Hull we have heard of far too many serious accidents to regard the situation with any complacency, and we are obliged to record in this issue the death by electrocution of another of our members. The situation calls for strong measures, and at once.

To show that we are not fighting a straw man, we want to quote from a letter we received recently from a well-known W9 DX man who has had a terrible experience but has been so fortunate as to live to tell about it. Get this:

"On the evening of August 6th I was sitting at the receiver listening to the European DX roll in during the DJDC contest. Upon hearing a D4 blast a CQ, I decided to change frequency and call him. In doing so I forgot to throw the switch on the 115-volt line and, after making a few adjustments, didn't know the juice was on and got across my 3000-volt final, my right hand on the chassis, my left hand on the antenna feeder. I couldn't let go of the thing and so I was blazing away, until my dad came and threw the switch and pulled me off. When I came to, my whole right hand was ... pelted with electricity, my face burned and body full of shock. After calling a doctor a quick call brought the gendarmes and the blue wagon, and so away to the county hospital where I was confined for nearly two and a half months. For two weeks the doctors were doubtful whether the hand would have to be removed but after a determined effort it was saved—both of them, as a matter of fact. However, the index finger was so badly shattered that after two weeks it fell off: the nail had been completely dissolved while hanging on the tank circuit. The thumb was half of what it should have been, and healed that way. The index finger on the left hand is off to the second joint. The thumb, although very gruesome-looking, is still on the hand but can't be bent. Chest completely healed but scarred all over. Must return to the hospital after the holidays to undergo an operation to increase the spread between index finger and thumb. Missed the national convention, though he had a friend in the shack who promptly pulled the switch when he saw that something had gone amiss."

"We know a fellow who took the charge of a filter condenser when a bleeder went out and who sat paralyzed on the floor, alone, for a half an hour, escaping without a mark but with a terrifying story of scarcely a trousers belt were tightly drawn around his chest."

Fellows, if reading that letter makes your flesh crawl, just think what the electricity did to this poor OM, and resolve that you won't let it happen to you. And there are plenty of other cases to cite. The recent death of W9VYU through the breakdown of a small rectifier-filament transformer is reported elsewhere in this issue. One of the best-known experimenters in the country is nursing bad r.f. burns across all the fingers of both hands; he was laying a temporary shunt across an r.f. ammeter while holding a portable key in the other hand, and somehow the key contacts closed. An eastern amateur a few years ago, groggy from too long a vigil, went to sleep with his feet on the power transformer under the table, slipped down a little in his chair, and woke no more. A former director of the League is alive to-day with bad burns only because he had a friend in the shack who promptly pulled the switch when he saw that something had gone amiss."

"We know another, equally fortunate, who took a wire off a 2000-volt metal binding post, felt nothing because he was insulated from earth, didn't know the thing was hot, until he pulled a flaming arc as he removed the wire—but who is now a much wiser man. These narrow escapes only throw into sharper relief the growing number of sadder and less fortunate cases.

Resolved, as we at QST are, that something definite must be done about this situation, we have been having a series of staff conferences on the subject in recent weeks, and we have now to announce that QST embarks upon a pointed campaign to make amateur radio operating safer. We are going to tell you how to make your station safe and sensible and practical and..."
better than reasonably safe, and we're going to
tell you how to conduct yourself to avoid trouble.
We can't go much farther than that, because you
have to build and adjust and operate your gear
yourself. But we're going to do it everlastingl
to you to be careful, and we hope that we may
succeed in making you safety-conscious. If we
can show the way, and if we can then excite you
into a realization of the need for care and into the
development of personal safety practices, we can
take care of this appalling situation. Herewith an
announcement of some of the elements of our
program:

1. First, of course, come personal precautions.
   No rig can be made completely foolproof, because
   it does involve high tension and it does have to be
   adjusted. The most important element is the
course of conduct of the operator — the things he
   should do to avoid danger. We are now engaged in
writing some urgent recommendations to you on
this subject, and expect to publish them next
month.

2. Next come actual constructional considera-
tions in apparatus itself. There is much about our
gear that, from the safety standpoint, runs all
the way from the moderately hazardous to the
supercolloquy. We believe we have been too intent
in the past on performance, not sufficiently con-
scious of safety principles. Choice of circuit, selec-
tion and arrangement of components, protection
of terminals, application of sound electrical prin-
ciples to put earth potentials where they belong
— these are some of the factors now under study.
Result is going to be an A.R.R.L. safety code of
building precepts. It is now in preparation and
will be published next issue.

3. Also receiving detailed study is the whole
subject of special safety devices, intended to sup-
plement the construction code and to safeguard
as far as possible against carelessness on the part
of the operator. A report on this field will be ren-
dered soon, supplemented throughout the year by
as much additional material and as many new
ideas as we can marshal.

4. The American manufacturers of amateur
gear are being asked to cooperate in this safety
campaign by making alterations in existing equip-
ment designs to make them safer and by produc-
ing certain new articles which our studies indicate
should be available for amateur protection.

5. The hundreds of local amateur clubs affili-
ated with A.R.R.L. will be asked to participate
in this movement by appointing safety commit-
tees to inspect local stations and assist their
members in making their stations safer.

6. As we embark upon this new work, it has
been tremendously borne home to us that every
amateur ought to know the technique of admin-
istering artificial respiration. It is the standard
method of resuscitation from electrical shock.
To fill this need we publish this month a special
article on the subject. We plead for its most care-
ful study, absorption and practice.

So much as an outline of our intentions.
Through the months to come we'll give you the
material as fast as we can create it. Be prepared
to be preached at, because we want to save your
life and it depends largely upon whether you'll
listen and heed. One item in particular needs some
 hammering upon right now:

Perhaps as dangerous as any other factor is the
false sense of security hams have concerning
"low" voltages — ranging from the 115 volts on the
a.c. line through the 500- and 600-volt cate-
gory. Elsewhere in this very issue the lethal capa-
bilities of a 500-volt supply are only too tragically
demonstrated. But most of us don't realize that
more people are killed by 115-volt circuits than
any other, and that this applies not only to the
general public but to public-utilities linemen who
work as often on higher voltages as not. It isn't
the voltage that's so important; in fact, the higher
voltages often induce a muscular convolution
which by its own action frees the victim from the
circuit. With the lower voltages one simply
hangs on and can't get free. Then it's a matter of
P.R. loss . . . and the lower brain paralyzes . . .
and your breathing stops . . . and if there's no
one there to apply artificial respiration within the
next 60 seconds or so you die . . .

Gruesome? We mean it to be, because we want
you to realize it's true. It has happened and it will
happen again; whether or not it happens to you
depends largely upon yourself and the precautions
you use.

Many of us, it is true, have "taken" several
hundred volts, and even more, at some time or
other and lived to tell the tale. Often there were
practically no ill effects at all. But this fact, when
analyzed, demonstrates only that contact — the
gateway for the current to enter the body — is
the important thing, far more important than
voltage. If you get bitten and jerk away, you're
safe. If you get bitten and can't jerk away, you're
done.

Confidence based on past experience is often
misplaced. Just because that 1000-volt supply
nipped you once and the only result was a sense of
numbness and nausea and a curious lighthead-
edness — just because you got away with it once
doesn't mean you could do so again. A great deal
depends upon your physical condition. Just what
the relationship is our medical authorities don't
know as yet, but there is one. Weak hearts, of
course, are notoriously susceptible. Next year,
next month, perhaps even the next day, a little
power pack can tie you up in a knot with your
knees digging into your belly and your arms stiff
as iron rods and your consciousness snuffed out like
a candle dropped in a manhole.

Get safety-conscious! ALWAYS BE CAREFUL!

K. B. W.

QST for
A Six-Tube Battery-Operated Single-Signal Superheterodyne

Making Use of the New 1.4-Volt Low-Drain Tubes

BY DON H. MIX,* WITS

To the ham who lives in the city, juice is something that comes from a wall outlet and costs from 2 to 10 cents per kilowatt hour and the supply never (well, almost never) becomes exhausted. To the hundreds who live in the wide open spaces, it is often something that comes in a package and costs about $10 per kilowatt hour! The former has little to worry about, the latter worries plenty. An extra tube in a receiver is a real problem to him — or has been heretofore. In the past, the high cost of battery supply has placed serious restrictions upon those who would design a battery receiver with better performance than the two-tube regenerative receiver which is rapidly passing into history wherever cheap power is available. A battery-operated superhet of the "communications" type has been economically impossible.

The recently announced series of 1.4-volt battery tubes, however, is going to mean a new deal for the ham in an isolated location. These tubes are going to make it possible for him to enjoy some of the refinements in receiver design which his city cousin now considers indispensable. The six tubes in the receiver to be described, for example, draw a total filament current equal to that of one r.f. tube of the 6.3-volt series, and that at the voltage of a single dry cell. Only two 45-volt "B" batteries are required and the total current drawn from these is only 20 ma. The light pentode output stage will deliver headphone signals with a scoop which will delight the most hardened tin ear; a loudspeaker may be operated in good shape.

Circuit

It may be noticed from the diagram that the circuit is essentially an adaptation of the principles of the low-cost single-signal receiver described in QST for October. It is a particularly logical arrangement for the purpose at hand. Regeneration in the mixer stage supplies preselection equivalent to a stage of r.f. without regeneration and, in the i.f. amplifier, provides an inexpensive means of obtaining single-signal selectivity. Variable potentiometers, operating from the 4.5-volt "C" battery required for the output tube, control regeneration in each of these stages by varying the grid bias. Feed-back in the i.f. amplifier is provided by a small grid-plate capacity (C3) formed by connecting a short length of in-

* Technical Department.
sulated wire to the grid cap of the 1N5G and running it down inside the shield near the plate of the tube.

The 1H5G is a combination half-wave diode and high-µ triode in one envelope. The grid circuit of the triode audio section is coupled across the diode load resistance $R_5$. The audio gain control $R_s$ is desirable to reduce signals to comfortable headphone strength when the mixer and i.f. stages are adjusted for maximum selectivity which is accompanied by maximum gain.

The 1A5G pentode, with plate and screen connected together, is used in both high-frequency and beat-oscillator circuits since the 1.4-volt series does not yet include a triode. The grid of the h.f. oscillator is coupled through a small adjustable capacity to the No. 1 grid of the mixer. Because these tubes do not have independent cathodes, the tickler system of feed-back must be used in the oscillator circuits. It should be noted that not all transformer manufacturers list a beat oscillator unit suitable for this circuit.

The power-supply switches are arranged so that opening either the "A" switch (SW1) when turning the receiver off, or the "B" switch (SW2) for stand-by while transmitting, will disconnect the load of the two potentiometers from the "C" battery. A separate "A" switch (SW3) controls the beat oscillator.

The Chasis

Most of the constructional details may be determined by a careful study of the various photographs. In cases where a battery receiver is designed particularly for portable work of the type which requires carrying the equipment on the person, there is justification for compact and light-weight construction. In a receiver intended primarily as permanent station equipment, however, greater weight is desirable so that the receiver will stay in place while operating the controls or plugging in the headphones and a half-Nelson grip or scissors lock on the receiver will not be required when changing coils. Enough panel and chassis space should be available to avoid excessive crowding of controls and to make coil changing convenient. Accordingly a standard cabinet was selected with dimensions which would accommodate batteries of respectable size and a chassis was cut to fit the remaining space. A National NC-80 cabinet has the desired dimensions (17 by 11 by 8 3/4 inches). A standard 45-volt "B" battery such as the Burgess No. 22308 or Eveready No. 485 and a 1½-volt No. 6 or Burgess No. 4F2 will fit in at each end of the cabinet with room for a 10½-by-10½-inch chassis. The weight of the batteries will anchor the receiver to the operating table.

The chassis is made from a sheet of 1/4-inch aluminum 12 inches wide and 10½ inches long. Deep scratches should be ruled on each side of the sheet parallel with, and 3 inches from, each of the shorter edges of the sheet to make bending easier. Similar scratches should be ruled parallel with and 3/4 inch from, the longer edges. Notches 90 degrees wide should be cut at the intersection of the lines to permit bending along the scratched lines. Before bending, the parts should be arranged within the 10½-inch square formed by the lines and the necessary holes marked for drilling since it is more convenient to do the drilling before bending the chassis.

At the rear of the chassis, the first i.f. transformer, the 1N5G, the second i.f. transformer, the 1H5G and the beat oscillator unit are arranged in a line from left to right, their centers placed on a line about 1 1/2 inches from the scratch denoting the rear edge of the chassis. If a test oscillator will not be available for aligning the i.f. stages, particular care should be taken not to disturb the original i.f. transformer adjustment. The 1A7G mixer tube, the output audio amplifier tube and the beat oscillator tube are arranged along another line 4½ inches from the rear edge of the chassis. The mixer tube should be placed far enough toward the center of the chassis to permit adjustment of the first i.f. transformer with a small screwdriver.

The three variable condensers from left to right are the mixer tuning, the oscillator bbandspread and oscillator padding or bandsetting con-
COIL DATA

<table>
<thead>
<tr>
<th>Band</th>
<th>Coil Wire Size</th>
<th>Turns</th>
<th>Length</th>
<th>Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.75 Me...</td>
<td>L1</td>
<td>24</td>
<td>70</td>
<td>Close-wound</td>
</tr>
<tr>
<td>1.2</td>
<td>L2</td>
<td>24</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>L4</td>
<td>22</td>
<td>35</td>
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<td>22</td>
<td>L8</td>
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<td>22</td>
<td>L2</td>
<td>22</td>
<td>7</td>
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</tr>
<tr>
<td>22</td>
<td>L6</td>
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<td>18</td>
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</table>

All coils 1½ inches in diameter, on Hammarlund SWF forms. Spacing between coils on same form approximately ½ inch. Band-spread taps are measured from bottom (ground) end of L4. All coils are wound with enamelled wire.

densers. The two outside condensers are mounted with their shafts or centers 1½ inches from each edge. If duplicate condensers are used and the front mounting screw holes are drilled 15/16 inch from the front edge of the chassis, the shafts will extend the correct distance in front of the panel. The coil to the rear of the left-hand condenser is, of course, the mixer coil; the tube is the high-frequency oscillator and the coil to the right, between the two condensers, is in the oscillator circuit. Holes ¾ inch in diameter should be drilled under the center of each of the i.f. transformers for the leads; four ¼-inch holes are required to clear the terminal lugs of the beat-oscillator unit. Clearance holes should also be drilled near the 115G socket, the 1A7G socket and near the rear corner of each of the variable condensers for passing connecting wiring. One or two holes may be drilled at convenient points near the rear of the chassis for long bolts to extend through the bottom of the cabinet to fasten the rear end of the chassis down securely in case transportation is necessary.

All tubes fit standard octal sockets; the mixer coil is wound on a 6-prong form and the oscillator coil on a 5-prong form. Isolantite sockets are used only in the high-frequency circuits. The tube shields are 3-piece standard products 1⅛ inches in diameter, 4½ inches high with a base to fit the mounting holes of octal sockets. If desired, the lower half-inch of the shield may be cut off with tin shears to shorten the shield. Holes for a pair of antenna coil terminals and a chassis ground connection may be cut near the rear of the chassis. This completes preparation of the top of the chassis.

In the 3-inch wide strip which will form the front edge of the chassis, a row of holes should be drilled 1½ inches from the lower edge for the three gain controls and the 'phone jack and another pair of holes ½ inch from the lower edge for the two toggle switches. The gain controls from left to right are in the audio, mixer and i.f. circuits. The two toggle switches are in the negative "B" and beat-oscillator filament circuits, while the "A" switch is attached to the mixer gain control. When the drilling is complete, the sheet may be clamped in a vise and bent along the scratched lines. The ½-inch strips which will be formed along the sides of the chassis effectively prevent buckling of the chassis under pressure.

Wiring

As soon as the bending operation is finished, the parts may be mounted and the receiver is ready for wiring; all of which is carried beneath the chassis. The view showing the under side of the chassis may look complicated, but it is really very simple. The parts are arranged so that all r.f. leads are short and the remainder of the wiring is simply bunched together wherever possible, reasonably avoiding the forward high-frequency section near the front of the chassis. Most of the resistors and by-pass condensers may be supported between the terminals to which they con-

Top view of chassis showing arrangement of units. The chassis is bent from a single piece of 1/8-inch aluminum sheet. See text for details.

February 1939
next by their own connecting wires. Wherever the span is too great, or a loose end must have an anchorage insulated from the chassis, small bakelite terminal strips designed for such emergencies may be used. By-pass condensers should be grounded to the chassis at the nearest available mounting screw. Short pieces of rigid wire are used between the stators of the tuning condensers and the coil-socket terminals underneath. They are protected against accidental short-circuiting against the chassis by rubber grommets fitted into the clearance holes. The oscillator-mixer coupling condenser $C_{11}$ is supported by its short heavy connecting wires and may be seen near the center of the chassis. The lead between the grid of the 1H5G and its coupling condenser is shielded with copper braid against r.f. and hum pick-up. Later, if a stronger beat-oscillator signal is desired, it may be obtained by forming a small capacity from a pair of short insulated wires twisted together and connecting one end of one wire to the diode plate of the 1H5G and the other end of the second wire to the beat-oscillator grid terminal. It should be remembered that the ‘phone jack must be suitably insulated from the chassis. The power-supply wires should be long enough to reach the battery terminals. This length may be determined better after the chassis and batteries are mounted in the cabinet. It will probably be advisable, however, first to test the receiver before fitting it to the cabinet.

**Coils**

Coil dimensions may be determined from the data in the coil table. The receiver is designed to cover the amateur bands only and to provide almost full-scale bandspread on each band. Care should be taken to duplicate the dimensions given as closely as possible. In making the bandspread tap, it will probably be easiest to wind the entire coil first, select the turn for the tap and, if necessary, force the turns apart slightly on each side. A small drill may be inserted between the turns to make the hole in the form. The insulation may be removed with the tip of a knife and a wire pushed through the hole from the inside may be soldered to the turn leaving just enough solder to make the joint secure. Scraping only the top of the wire will prevent solder from filling in between closely-spaced turns. The other end of the tap lead is scraped and passed down through the correct pin in the form. All coil windings should be made in the same direction. Approximately $\frac{1}{2}$-inch space is left between each winding on the same form. On the mixer form, the antenna coupling coil $L_1$ is wound at the bottom, the tickler winding $L_2$ next above it and the grid winding $L_3$ at the top of the form. On the oscillator form the tickler winding is below the grid winding. It is important, in making connections to the coil sockets and form pins to see that the top end of the grid winding connects to grid, the lower end of the grid winding to ground (or $C_3$ in the case of the mixer winding), the upper end of the tickler winding to plus "B" (or the "plate" terminal of the first i.f. transformer in the case of the mixer) and the lower end of the tickler to plate when the coil is inserted in its socket.

A small hole for the lower dial mounting screw should be spotted and drilled in the front edge of the chassis so that the dial may be mounted temporarily while testing before placing the receiver in the cabinet.

**Tuning—i.f. Alignment**

The receiver is most easily tuned up with the aid of a modulated test oscillator. If one is not possessed, the next best thing to do is to take the receiver and batteries to a service man and let him align the i.f. circuits to 456 kc. The job shouldn't take more than ten minutes of his time. If a test oscillator is available, it should be set at 456 kc, and its output terminals connected between the grid cap of the 1N5G and chassis with the transformer connecting cap removed. With $R_3$ set near the ground point, $R_5$ at full gain toward $C_{10}$, beat oscillator off but the volume of the receiver turned on and the headphones plugged in the secondary, and then the primary of $T_2$ should be tuned carefully to produce the loudest signal. If test oscillator is not modulated, the transformer may be tuned across the hiss of the test oscillator and set at its center. The test oscillator output should be adjusted frequently to maintain a low signal level for most accurate tuning. With $T_2$ tuned, the test oscillator output terminals should be transferred to the grid of the 1A7G, removing the cap connection, replacing the normal grid connection to the 1N5G and inserting a coil in the mixer coil socket. After $T_2$ is tuned in the same manner, it may be advisable to check again the tuning of $T_2$ with the test oscillator output still connected to the input of the 1A7G. If no test oscillator or service man is available, the original factory alignment will have to be depended upon. Coils for a band in which plenty of activity may be expected should be plugged in and the antenna connected. The 3.5- or 7-Mc. band in the middle of the evening is almost always good for tests. $C_1$ should be set at maximum capacity.

**Setting the Beat Oscillator**

Connect a piece of push-back or other insulated wire to the grid of the 1N5G i.f. amplifier tube and push the insulated portion down between the shield and the tube, taking care that the insulation does not slide back on the wire and allow the lower end to come in contact with the shield. A piece two or three inches long should provide enough feed-back to permit oscillation, indicated by the familiar "plopping" sound, when $R_3$ is turned near ground. With the i.f. amplifier oscillating, turn on the beat oscillator and turn the

12 QST for
tuning control on the top of the unit until the beat oscillator signal is heard. It should be an unmistakably loud howl.

**Spotting the Band**

Now that the beat oscillator is tuned near the correct point, the feed-back wire should be removed from the 1N5G and R3 set at the ground point. C14 is the oscillator padding or bandsetting condenser. With the bandspread condenser C13 set at minimum capacity, the object is to set C14 to tune to the high-frequency end of the band. When this has been done, the bandspread condenser should tune across the band. Approximately correct settings for C14 are 80, 75, 95, 90 and 45 per cent of the total capacity of the condenser for the 1.7-, 3.5-, 7-, 14- and 28-Mc. bands respectively. If the 3.5-Mc. band is used for the test, the high-frequency edge of the band is most easily located by tuning C12 to minimum capacity and then tuning C14 very slowly from maximum capacity until the 4-Mc. phones are heard.

**Tuning the Mixer**

During this process, R1 should be set at about mid-position or one-quarter above ground and C2, the mixer tuning condenser rotated frequently to keep this circuit tuned. Correct tuning is indicated by an increase in background noise. If two such spots are found, the correct one is towards

---

**Fig. 1 — Circuit diagram of the battery-operated receiver.**

C1 — 70-μfd. mica trimmer (Hammarlund BBT-70).
C2 — 50-μfd. midget variable (National ST-50).
C3 — 0.005-μfd. mica.
C4 — 0.1-μfd. paper.
C5 — 0.1-μfd. paper.
C6 — 0.0001-μfd. mica.
C7 — 0.1-μfd. paper.
C8 — 0.0001-μfd. mica.
C9 — 0.1-μfd. paper.
C10 — 0.1-μfd. paper.
C11 — 30-μfd. mica trimmer, isolantite insulation (National M30).
C12 — 0.0001-μfd. mica.
C13 — 35-μfd. midget variable (National ST-35).
C14 — 50-μfd. midget variable (National ST-50).
C15 — 0.01-μfd. paper.
C16 — 0.00025-μfd. mica.
C17 — 0.1-μfd. paper.
R1 — 5000-ohm potentiometer (Centralab 72-110 with d.p.s.t. switch cover K-12).
R2 — 200,000 ohms, 1/2-watt.
R3 — 5000-ohm potentiometer (Centralab 72-110).
R4 — 50,000 ohms, 1/2-watt.
R5 — 500,000 ohms, 1/2-watt.
R6 — 500,000 ohms, 1/2-watt.
R7 — 100,000 ohms, 1-watt.
R8 — 500,000-ohm volume control (Centralab 72-105).
R9 — 50,000 ohms, 1/2-watt.
R10 — 50,000 ohms, 1/2-watt.
R11 — 50,000 ohms, 1-watt.
SW1 — D.p.d.t. switch on mixer control.
(See R1.)
SW2 — S.p.d.t. toggle "B" switch.
SW3 — S.p.d.t. toggle, beat oscillator switch.
T1 — Sickles No. 6504 (456 kc.), iron core.
T2 — Sickles No. 6521 (456 kc.), iron core.
T3 — Melsser No. 6779, air-tuned beat oscillator unit (456 kc.).
the high-capacity side. Following this procedure, it should not be difficult to locate the 3.5-Mc. band.

**Rechecking I.F. Alignment**

When the band has been located, tune down into the c.w. section of the band and pick out a signal of reliable strength and go to work on it. The first step is to check the alignment of the i.f. amplifier, if it has not been previously aligned with a test oscillator. Leaving the secondary of $T_2$ set, tune the primary carefully for maximum signal. If the alignment throughout is sufficiently good to allow a definite background noise to be heard, adjustments can be most accurately made by tuning $C_{13}$ to an unoccupied spot in the band and working for maximum background noise. This is done with the beat oscillator off. Now progress to $T_1$, adjusting first the secondary and then the primary for best response. Turn now to the mixer adjustment.

**Mixer Regeneration**

As mentioned previously, tuning $C_2$ should produce at least one point of increased response; if two occur, the higher-capacity setting is correct. With the mixer tuned to the correct point, $R_1$ should be carefully adjusted towards ground. This should cause an increase in response and an increase in i.f. image rejection (rejection of undesired signals at frequencies approximately 900 kc. removed from the desired signal) which will also beat with the high-frequency oscillator signal to produce an i.f. signal unless rejected ahead of the mixer tube) until the mixer tube breaks into oscillation. Oscillation should not be permitted; regeneration should be adjusted near the point of oscillation but not so close that other slight adjustments will cause the mixer to break into oscillation. It is possible that oscillation will occur if the mixer is tuned too close to the high-frequency or low-frequency side of resonance, sometimes even with the control backed entirely off, but this is of no practical consequence since it should not oscillate at the correct setting. If it is found impossible to stop oscillation at any setting of $R_1$, an adjustment of $C_1$ may remedy the difficulty, otherwise it may be necessary to reduce slightly the size of the tickler winding. On the other hand, if oscillation cannot be obtained, an adjustment of $C_1$ or a slight increase in the size of the tickler winding should do the trick.

It may be noticed that adjustment of $C_2$ has some effect upon frequency at frequencies above 7 Mc. This "pulling," often masked by ganged tuning controls, is characteristic of most superheterodines. If objectionable, it can be minimized by decreasing the capacity of $C_{1h}$, although best mixer operation occurs at the higher frequencies with $C_{1h}$ at maximum capacity (plates together). Ordinarily, one setting of $C_2$ will suffice for an application.

*Continued on page 108*
Rescue at 11,000 Miles

Amateurs Copy QST de XFBSAB

Perhaps you heard him telling W8CRA and some of the other DX men about it, or perhaps you had to wait until the December issue of QST, to read in "How's DX?" that "FBSAB will be at St. Paul and New Amsterdam Islands signing XFBSAB, so don't let the call bother you." If you're DX-minded, you've kept half an ear out on the 14-Mc. band for XFBSAB; if not, you promptly forgot about him. Perhaps you were interested enough in geography to drag out the atlas and find that St. Paul Island is a barren rock located in the South Indian Ocean at 77° 31' E 38° 43' S and, according to newspaper reports, noted only for bleakness, cold, surrounding waters abounding in lobsters that have long been a challenge to fishermen, and the scene of four unsuccessful fishing expeditions.

Why was well-known F. Paul Bour, FBSAB, going to St. Paul? Perhaps the chance to join an expedition to an uninhabited island was too much of a lure for a confirmed DX hound, or possibly other factors not so obvious were appealing, but nevertheless Bour joined the de Boers expedition when it put in at Madagascar. It wasn't a particularly wise choice. John de Boers is a Dutchman who last year began dreaming of the fortune in lobsters he might take out of the cold waters at St. Paul and New Amsterdam. According to reports, de Boers deserves no credit for a well-organized expedition — from the start it was poorly supplied and manned. A Newfoundland trawler, L'île Bourbon, was transformed into a floating refrigerator, a motley crew assembled, and not enough coal put in the bunkers when the ship left France last May. By the time it reached Madagascar, via the Suez Canal, many of the crew, including the radio operator, had mutinied because of continual fighting among and about the women aboard. At this time Paul Bour joined the crew, to set off for cold St. Paul and the contemplated fortune in lobsters.

At 8:45 on the morning of December 18th, E. R. Gibson, W7DWG of Bremerton, Wash., picked up a weak TS signal at 7015 kc. calling "QST," and pieced together a strange message: "QST DE XFBSAB XFBSAB AND PARTY OF 48 ARE STRANDED HERE AT ST PAUL ISLAND AND WILL BE GRATEFUL TO ALL OF YOU TO QSP AS EARLY AS POSSIBLE TO MADAGASCAR THAT WE RAN SHORT OF COAL THRU BAD WEATHER AND WE DID NOT HAVE ANY CHANCE TO FIND COAL AT THE ISLAND WE BEEN CALLING MADAGASCAR BUT NO LUCK OF REPLY WE CAN HEAR TANANARIVO BROADCAST FAIRLY WELL AT 15 GMT SO WOULD LIKE SUGGEST THAT CALL US HERE TOMORROW AND DAYS AFTER WE WILL BE LISTENING FOR ANY MESSAGE OR NEWS HAD PLENTY WORRY SINCE WE LEFT AND HAD MY RECEIVER BURNED NOW USING SMALL SCHNELL SET HARD COPY PLENTY QRN KEEP ON LOOK OUT FOR ME AGAIN CONFIRM THAT WE ARE ON STEAMSHIP ILE BOURBON"

After trying in vain to raise XFBSAB, Gibson gave the message to NPC and the U. S. Coast Guard at Seattle by telephone, and, via the Army Net (W7CQI), the French Consul at San Francisco was notified.

On December 19, Neil Taylor, W6MUS at Coronado Beach, Calif., raised XFBSAB at 6:20 A.M. and was told that he was the first station worked by the ship in 33 days. Bour repeated his story to Taylor. Irving Astman, W6OMR, and W7DWG also copied the message. W6MUS assured XFBSAB that he would do everything he could to help, signed with Bour, and then talked it over with W6OMR.

It was decided that since Astman was with the government airways at Norden he was in the best position to give official notification, but apparently he wasn't, and he ended up by buying a 65-word telegram to the Coast Guard at San Francisco, asking that the French Consul and steamship lines be notified. At the same time, the 13th Naval District Commanding Officer had, on W7DWG's request, informed Naval Operations at Washington, D. C., of the situation.

The Navy Department at Washington passed the message on to the French government through official channels. The French government ordered a rescue ship to sail at once from Madagascar. And thus amateur radio supplied the vital link in the chain of rescue from St. Paul to Madagascar via Bremerton, Washington and Paris, France.

That's as far as we go. FBSAB will have to take you the rest of the way, when he returns.

B. G.
We consider it vital for every amateur to absorb the substance of this article. It may enable you to save a fellow amateur’s life. Instructing others about it may save your own. We recommend that amateurs practice artificial respiration upon each other. We commend the subject to the attention of all radio clubs.

**Resuscitation From Electrical Shock**

**Important Information**

**By Clinton B. Desoto, W1CDB**

**Procedure**

Every amateur should memorize the following rules for procedure in case of electrical accident. Members of the family and associates should be instructed, if only in general terms. The rules themselves should be copied and prominently posted in the shack.

1. Turn off the current if possible (but don’t waste time in fruitless search for the switch). Free the victim from contact with the live conductor as quickly as possible — protecting yourself while doing so. Use a dry non-conductor to pull the body free. The victim’s loose clothing (if not moist with perspiration) will serve, if care is taken not to touch metal objects such as buttons, nails in shoes, etc. If the bare skin must be touched before rescue, protect yourself with rubber gloves, your own coat or vest (if dry), etc. Preferably, stand on a board or matting and use only one hand.

2. Immediately after the victim has been freed from contact he should be stretched out on the floor or ground, in a position permitting adequate ventilation. Quickly feel with your finger in his mouth and remove any foreign body (tobacco, false teeth, etc.). Pull out his tongue (with a handkerchief) so it does not interfere with breathing. If the jaws are locked tight do not waste time trying to force them open; this can wait until assistance arrives. The important thing is to commence artificial respiration as quickly as possible; every moment of delay lessens the chance of recovery.

3. Lay the patient on his stomach, one arm extended directly overhead, the other arm bent at the elbow, with the face turned outward and resting on hand and forearm so that the nose and mouth are free for breathing. (See Fig. 1.)

4. Kneel, straddling the patient’s thighs, with your knees placed at such a distance from the hip bones as will allow you to assume the position shown in Fig. 2.

5. Place the palms of the hands on the small of the back with fingers resting on the ribs, the

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Artificial respiration, as demonstrated by employees of the Hartford Electric Light Co.

Fig. 1, left, shows the position in which the victim’s head and arms should be placed. Fig. 2, top right, illustrates the location of the operator’s hands and body. Fig. 3, center, shows the end of the downward pressure movement, with the full weight of the operator on the victim’s rib structure. Fig. 4, bottom right, is of the end of the cycle, the operator having swung backward snappily, releasing the pressure.

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QST for
Electrical Shock
What to Do and How To Do It

little finger just touching the lower rib. The thumb and fingers should be in a natural position, with the tips of the fingers just out of sight. (See Fig. 2.) Be sure the pressure is on the rib structure and not on the lower organs, or possible injury may result. If properly applied, full force can be exerted on all but the frailest subjects without danger of injury.

6. With arms held straight, swing forward slowly so that the weight of your body is gradually brought to bear on the patient. The shoulder should be directly over the heel of the hand at the end of the forward swing. (See Fig. 3.) Do not bend your elbows. This operation should take two seconds.

7. Now immediately swing backward so as to completely remove the pressure. (See Fig. 4.)

8. After two seconds, swing forward again. Repeat deliberately the complete cycle of respiration and release at a frequency of twelve to fifteen times per minute. As a substitute for a timing count, repeat slowly in synchronism with Movements 6 and 7: “Bad air out. Good air in.” The sound of air being expelled will be clearly audible; if it isn’t, the tongue or some foreign object is blocking the throat.

9. If another person is present, medical assistance should immediately be summoned. The physician will probably instruct that the fire department be called on to provide an inhalator, pulmotor, etc. If alone with the patient, your only consideration should be to provide artificial respiration. Do not halt this process for the purpose of calling for assistance for at least one hour.

10. Continue artificial respiration without interruption until natural breathing is restored and consciousness regained, or until a physician arrives. In any event continue for at least four hours or until rigor mortis sets in. Recovery has been known to take as long as eight hours; under no circumstances despair after working only an hour or so.

11. As soon as assistance is available and while artificial respiration is being continued, any tight clothing about the patient’s neck, chest and waist should be loosened. Instructions concerning opening the patient’s mouth, etc., should be complied with if this has not previously been done. The heels and soles of the patient’s feet (shoes on) should be rapped smartly 20 or 30 times with some suitable object. The underside of the arms can be massaged toward the shoulders. During all this, keep the patient warm. If the body is wrapped in a blanket, it should be arranged not to hamper resuscitation or breathing. Main-
tain free air circulation about the patient's head. Do not administer any liquids whatsoever by mouth until the patient is fully conscious.

12. To avoid strain on the heart, when consciousness returns the patient should be kept lying down and not allowed to stand or sit up. If no physician has arrived the patient should be given a stimulant, such as one teaspoonful of aromatic spirits of ammonia in a small glass of water, or hot coffee or tea. No alcohol should be given. The patient should be kept warm.

13. A brief return of natural respiration is not a signal for stopping artificial aid. Rather, the rhythm of the operator should be carefully adjusted to the rhythm of natural breathing. Above all, do not apply artificial respiration too rapidly, or you will defeat the very purpose sought. Artificial respiration should not cease until consciousness is regained. Even then the patient must be watched, for he may without warning stop breathing again. Artificial respiration must then be resumed.

14. Under no circumstances should the patient be moved until he is breathing normally of his own volition, and then only in a prone condition. If for some reason earlier movement is unavoidable, resuscitation should be maintained continuously during the process.

15. When it becomes necessary to change operators, as one tires or for some other reason, the change must be made without losing the rhythm of respiration. The two operators should count together, the relief operator taking over during the release period.

Circulatory System

In most cases of electrical shock the heart action and blood circulation continue. Where the victim is across a high-current source under good contact for an appreciable time, or when his physical condition is not favorable, the heart may suddenly cease to pump blood. Under such circumstances only a physician can render direct aid. The layman can only carry out the instructions given above, depending on the stimulus to circulation to restore heart action.

The patient's color is not a satisfactory symptom of his condition. Victims of shock usually appear blue, although on occasion they may be very white. The body may stiffen and become rigid during the early stages of resuscitation. This condition should not be confused with rigor mortis and is not a signal to stop work; it is purely a reaction to shock, and recovery in such cases has been accomplished.

Burns

The treatment of burns should be postponed until after respiration has been fully restored.

Two kinds of burns may be encountered in cases of electrical shock. These due to the passage of current through the body are the most serious and dangerous, resulting in a searing or cooking of the tissue along the path taken by the current. Since this tissue is burnt and destroyed, it must be replaced, and the healing process is therefore a slow one. Such burns are usually more extensive internally than they appear on the surface. Competent medical treatment is imperative.

Burns due to electrical flash, r.f., etc., are much more apparent, but they are usually not deep and the injury is largely superficial. The skin will be reddened or blistered in such cases, but little tissue will be destroyed. Emergency treatment is based on the principle that a raw or blistered surface should be protected from the air. Remove the patient's clothing; if it sticks, do not peel it off — cut around it. Saturate such adherent pieces with picric acid (0.5 per cent solution). Apply cotton or other soft dressings to the remaining exposed surfaces and saturate with the same solution. If picric acid is not at hand, use a solution made of one teaspoonful of baking soda to a pint of water. Alternatively, the wound may be protected with vaseline, olive oil, castor oil, clean machine oil, etc. Cover the dressing with cotton, gauze, clean waste, clean handkerchief, etc., held tightly in place with a bandage. Almost any preparation for the treatment of burns can be of some value.

In the case of a dry charred burn, the same type of covering should be lightly bandaged over it, but without wetting the burned region or applying oil to it.

New Acorn Tubes

The RCA 957, 958, and 959 are acorn tubes of a new series having low-current filaments of the coated type. These tubes are designed for use by amateurs and experimenters working at the ultra-high frequencies. Their economy of filament and plate power, as well as size, make them particularly useful in compact portable and other battery-operated equipment where size and weight are important factors.

The filament of each of these types can be operated without series resistance directly from a single flashlight dry cell. The filament power required by the 957 or 959 is only 0.063 watt; that required by the 958 is only 0.125 watt.

The 957 is a triode having a moderately high amplification factor. It may be used as a detector, amplifier, or oscillator.

The 958 is a triode especially designed for transmitting service as an oscillator and radio-frequency amplifier. It may also be used as an audio power output tube to operate a sensitive loudspeaker.

The 959 is a sharp cut-off pentode intended for use as an r.f. amplifier or detector. It may also be used as a resistance-coupled a.f. amplifier.
ELECTION RESULTS

The incumbent directors in the New England and Northwestern divisions were returned to office in the autumn elections of 1938, and new directors were chosen in the Rocky Mountain and West Gulf divisions where the incumbents were not candidates for reelection. An alternate director was also chosen in the Northwestern. The Executive Committee’s findings by divisions are as follows:

New England Division

Percy C. Noble, W1BVR, was returned to office for another two years by a handsome majority:

<table>
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<th>Votes</th>
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<tr>
<td>Mr. Noble</td>
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<td>Raymond W. Woodward, W1BAO</td>
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<td>Clayton C. Gordon, W1HRC</td>
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Northwestern Division

The Northwestern’s director, Ralph J. Gibbons, W7KV, was similarly reelected by a wide margin:

<table>
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<td>Mr. Gibbons</td>
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<td>A. L. Smith, W7CQR</td>
<td>114</td>
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<tr>
<td>Stanley J. Belliveau, W7AYO</td>
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The Northwestern also engaged in spirited balloting for alternate director, the winner being W. N. Wintler, W7KL:

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<td>Niilo E. Koski, W7LD</td>
<td>132</td>
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<tr>
<td>Wilbur L. Miller, W7AAN</td>
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</tbody>
</table>

Mr. Wintler is a life underwriter for the Northwestern Life Insurance Company at Eugene, Oregon. In amateur radio since 1919, he has recently served as an assistant director of the Northwestern division, is a past president of the Valley Radio Club and is an O.R.S.

Rocky Mountain Division

By the narrowest possible plurality, a margin of but one vote, Glen R. Glasscock, W9FA, becomes the new director of the Rocky Mountain, where the incumbent, W9ESA, was not a candidate for reelection:

<table>
<thead>
<tr>
<th>Director</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Glasscock</td>
<td>71</td>
</tr>
<tr>
<td>C. Raymond Stedman, W9CAA</td>
<td>70</td>
</tr>
</tbody>
</table>

Mr. Glasscock, for many years our S.C.M. for Colorado, is a studio engineer for N.B.C. at Denver. He holds a commission as lieutenant in the U.S.N.R. and is an O.R.S., O.B.S. and O.O. He was the founder and president of the San Isabel Radio Club and has been in ham radio for over twelve years.

West Gulf Division

The well-known “Soupy” Groves, W5NW, was not a candidate and the balloting lay between William A. Green, W5BKH, and David H. Calk, W5BHO. Mr. Green won handily:

<table>
<thead>
<tr>
<th>Director</th>
<th>Votes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr. Green</td>
<td>203</td>
</tr>
<tr>
<td>Mr. Calk</td>
<td>125</td>
</tr>
</tbody>
</table>

Mr. Green is a district meterman for the West Texas Utilities Company at Abilene and chairman of their safety council in their District A. In amateur radio since 1921 and a former W1, he is an O.R.S. and holds a commission in the N.C.R. QST congratulates the winners in the elections and expresses the thanks of the League to Messrs. Groves and Stockman for their years of service on the Board.

K4 CLASS C

We recently reported that K4 holders of Class C living in Puerto Rico proper would have to appear for personal examination at San Juan before April 1st. Seems we were wrong about that. F.C.C. intends to permit existing Class-C licenses in P.R. to run their course until it is necessary to modify or renew them, at which time the Class B exam must be taken.

2000-2050 KC.

Because of difficulty in finding suitable replacement frequencies for services now operating between 2000 and 2050 kc., F.C.C. has experienced delay in shifting our 1715-2000 band to 1750-2050 kc. but still hopes to accomplish it before the winter is over. Good news for 'phone men: When the shift is made, the added kilocycles will be open to 'phone, so the 'phone portion will read 1800-2050 --- F.C.C. has assented to this at the request of the A.R.R.L. Board of Directors. One of the emergency calling channels in our new rules now reads 1975-2000 kc., intended to be the last 25 kc. of the 'phone band. When the shift is made, this emergency calling segment will also be altered to 2025-2050 kc.

(Continued on page 108)
PERIODS for competitive work by either radiotelegraph or radiotelephone operation are again provided. Both come in the month offering the best in DX that the season affords! Rules for contest exchanges will be the same for both periods, except that no quota plan applies in the phone period. The quota (See Rule 5) is 3-per-country in the c.w. period, as usual, except it will be “1” for D, G and VK (not VK7). We expect entries to be in one period or the other — but one can take part in both, if he likes. Scores are independent for each period. All reports in the radiotelephone section of the contest must be voice-to-voice. Similarly in the telegraph contest period only telegraph-telegraph QSOs will count.

Now that we have new F.C.C. regulations, that might require the invoking of restrictions in the 3500-4000- and 1715-2000-kc. bands in the event and mindful of the fact that in 1936 we had some degree of QR on between an emergency in one area, and DX operations in the low frequency bands, we are this year modifying the contest so that no contacts made on the 3.5- and 1.7-Mc. bands will count in any fashion. All other bands may be used at will, but not frequencies out of the bands.

Disqualifications

Disqualifications were made last year and in previous years for off-frequency operation, improperly modulated notes, and the like. Violations of government regulations will again be penalized in this fashion. Enforcement of sportsmanship as well as the vital duty of the League in protecting amateur rights requires this. Official Observers will be asked to keep to the line, reporting all violations to the contest committee. Two accredited O.O. reports will disqualify. Monitoring cooperation is requested of the F.C.C. itself. Any stations known to have been logged in violations by the F.C.C. during the contest will also be disqualified automatically . . . a single citation only, required. Likewise, W1AW will engage in frequency measuring, to insure fairness to participants and add to the data on which disqualifications are based. The interest of all amateurs requires strict observance of frequencies, d.c. power supply regulations, etc.

Amateurs of all nations must work in the frequency bands assigned them or regardless of nationality, must be disqualified if checked in the contest period as off-frequency with sufficient evidence to prove a deviation to the award committee. It makes little difference what nationals are out of bounds, we are not going to allow any practices to be built up that would constitute grounds for complaint against the amateur service at the coming Rome conference. The interest of all amateurs in their frequency bands is too precious to risk by any yielding to selfish desire of the few to build contest scores by unfair means.

The idea also is to make the ‘phone report part of the five numeral groups, so it will be quite unnecessary to say “readability” and “strength” or other indication before the first two numbers in the serial number group.

Alaska, Hawaii, Philippine Islands, Cuba, Porto Rico, and Newfoundland. In fact, all localities using PREFIXES other than W or VE will receive QST mention and awards based on their work with W/VE stations.

This QST carries a complete list of the sections of the A.R.R.L. Field Organization.

Consult the list of call-prefixes for different countries of the world as given in Jan. '39 QST, page 62. This will be used as the official list.

Page 21, May 1937 QST discusses this “DX Competition Policy.”

The number of scores submitted this year, surviving the handicap of possible off-frequency disqualification for out of band operation, etc, is expected to be used for similarly determining the quotas for different regions in future contests.
Operating Hints

Listening is a first essential. You have to hear them before you can work them. Tuning specifically "from the middle to the end" as well as "from either end toward the middle" should be a useful practice. Crowding the band edges is just an invitation to be disqualified! Operating points, personal efficiency, and the "man behind the station" (most of all) count! W/VE hams not wanting to show themselves "lids" will avoid all use of "CQ DX." No distant stations will waste time answering such calls when one call from "outside" will bring hundreds of answers from more efficient operators. All stations should try to work BREAK-IN for real operating efficiency. Hams outside W/VE urge more speed, asking W/VEs to shoot the number along first before anything else. U.S. and Canadian amateurs approve continued use of CQ by all stations in remote localities, but plead that these CQs be made short — with so many U.S. A. — Canadian stations competing for each one! CQ DX is "out" for W/VEs.

Remote locations participants: Please sign often in CQs or calls. Use QHM, QML, QLM, QMH for each sub band segment as a calling indicator.

General Contest Plan

Operators with the prefixes W and VE will be taking part in a QSO Party with amateur stations in all parts of the world. When they effect DX QSOs, they will exchange self-assigned serial numbers (two 3 or three-figure reports plus three self-assigned numbers that stay the same for all stations). This whole group is entered in the contest report. From this record each station will submit its score, from the scoring (which the "contest Committee will verify by cross-examination of logs) the winners will be determined for each locality, and certificates awarded. Three points can result from a full exchange in any band, but no more can be obtained from the same station unless both stations connect in another band for additional exchanges. (No 1.8- or 3.5-Mc. band work counts at all, of course.) Contacts with non-participants can count. Where you explain the system, refer to this announcement if necessary, and the operator assumes (and sends you) a serial number for his records and your report.

Those amateur stations outside the U.S. and Canada will try to work as many W and VE stations as possible to exchange serial numbers. Stations in all localities need only take part on the dates announced and report results at the end of the tests to receive credit in QST, and be eligible for awards.

Each operator’s main competition comes from amateurs in his immediate A.R.R.L. Section in the case of W and VE stations, and in the case of all other amateurs it comes from the individual operators in their country or locality using the same prefix. The W/VE awards are for the operator running up the best record for each Section under the Rules. Comparison of scores between remote Sections and points is not indicative because of the different conditions under which stations work.

Separate certificates will be awarded the c.w. winner and the "phone winner," for each country, and likewise for each A.R.R.L. Section. It’s a chance for 14- and 28-Mc. "phone work." The transmitter must be kept on c.w. or 'phone, too. It is unethical to shift to c.w. to call a station, or send numbers, when taking part in the 'phone period (and vice versa), and disqualification will be made of offending stations. Likewise, whistling of code for numbers (or similar means) is regarded as improper. Counting of consecutive numbers, spelling of the letters that constitute numbers, using word lists from the Handbook, etc., are regarded as the proper methods.

The Contest Period

The exact local starting and ending time for our DX competition is given in the table below. These times are based on "Greenwich," and should be computed by any part of the world from the Greenwich meridian. The contest runs (First Period) from Saturday March 4th, through Sunday, March 12th (until Monday March 13th, G.T.); and (Second Period) from Saturday, March 19th, through Sunday, March 26th (until Monday, March 27th, G.T.).

Serial Numbers

The first digit of the serial number sent shall constitute the Readability — Strength and Tone reports of the station to which the number is sent. Every operator taking part in the contest assigns himself a distinctive threenueral group, used by him throughout the contest as the last part of each number exchanged (sent). Try to send and receive one complete serial number with each DX station.

Time Limit

For 90 hours' total contest operation or less (for either period) there is no penalty, and nothing to do when computing your score. Should you operate 100 hours (for example), your gross score should be multiplied by the fraction 90/100 to give your net or "corrected score." This plan permits the average ham to plan for his working day for meals, for 8 hours daily sleep, etc. Cross-examination of logs makes it possible to check the operating time submitted. It may be necessary, of course. Keep track of the time you start and stop operating your station. This must be shown in your log report. What constitutes "contest operating hours?" Not hours keeping local sleeds within the U. S. A. and Canada. Not time spent in local rag chews, swapping DX results. If you listen for DX with the ability to call DX stations when you hear them, that time counts, whether you do any calling or working or not. The whole period is to be charged against "contest operating time," not just the time after you started transmitting! Be properly sporting and fair in entering your time on the air.

<table>
<thead>
<tr>
<th>Time</th>
<th>Start</th>
<th>Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenwich</td>
<td>4th 18th</td>
<td>12th 26th</td>
</tr>
<tr>
<td>A.S.T.</td>
<td>6:00 P.M.</td>
<td>8:01 P.M.</td>
</tr>
<tr>
<td>E.S.T.</td>
<td>8:01 P.M.</td>
<td>10:02 P.M.</td>
</tr>
<tr>
<td>M.S.T.</td>
<td>10:02 P.M.</td>
<td>12:13 P.M.</td>
</tr>
<tr>
<td>P.S.T.</td>
<td>12:13 P.M.</td>
<td>2:24 P.M.</td>
</tr>
<tr>
<td>March</td>
<td></td>
<td>21st 26th</td>
</tr>
<tr>
<td>4th 18th</td>
<td>6:00 P.M.</td>
<td>8:01 P.M.</td>
</tr>
<tr>
<td>3rd 17th</td>
<td>8:01 P.M.</td>
<td>10:02 P.M.</td>
</tr>
<tr>
<td>3rd 17th</td>
<td>10:02 P.M.</td>
<td>12:13 P.M.</td>
</tr>
<tr>
<td>3rd 17th</td>
<td>12:13 P.M.</td>
<td>2:24 P.M.</td>
</tr>
<tr>
<td>12th 26th</td>
<td>6:59 P.M.</td>
<td>8:59 P.M.</td>
</tr>
<tr>
<td>12th 26th</td>
<td>8:59 P.M.</td>
<td>10:59 P.M.</td>
</tr>
<tr>
<td>12th 26th</td>
<td>10:59 P.M.</td>
<td>12:59 P.M.</td>
</tr>
</tbody>
</table>

February 1939
Awards

Certificate awards will be given: (1) Two in each remotely located country — to one c.w. winner, and one phone winner, in either contest section, all hams in the one territory defined in the official country list compete for an award. (2) Two certificates likewise will be awarded in each of the 67 A.R.R.L. Sections of the mainland U.S.A. and Canada, to the telegraph, and one to the voice-operated station winner. All operators in the same country will be in competition with each other — and similarly each A.R.R.L. section-boundary circumscribes a competing group. DX-transmission characteristics being the same for all operators in each award-area, and in each period, the chances of being a winner depend on operating ability and stations and are equally fair to all.

Club Participation

To encourage local participation additional certificate awards (besides the A.R.R.L. Section awards) will be made through each club where three or more individual club members, or local hams invited by such a club, take part. For a club to rate a c.w. winner's certificate award on behalf

(Continued on page 110)

LOG, 11th A.R.R.L. INTERNATIONAL RELAY COMPETITION (Example, W6ZAA Serial No. 545)

C. W. Entry March 4th-12th (Logs from W or VE, show, for each band)

<table>
<thead>
<tr>
<th>Bands</th>
<th>7</th>
<th>14</th>
<th>28 Mc.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Different Stations and Countries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nr. DX Stations QSOed</td>
<td>3</td>
<td>5</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Nr. Countries QSOed</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Station Time Record</th>
<th>Operating Time</th>
<th>Date and Time</th>
<th>Station Worked</th>
<th>Country</th>
<th>Worked Record of New Countries for Each Freq. Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar. 3rd, 4:01 P.M.</td>
<td>4:02 P.M. P.S.T.</td>
<td>G6NF</td>
<td>G.B.</td>
<td>1</td>
<td>568,543 478,001</td>
</tr>
<tr>
<td>Mar. 5th, 7:45 P.M.</td>
<td>8:40 P.M. P.S.T.</td>
<td>G2MI</td>
<td>G.B.</td>
<td>10</td>
<td>578,668</td>
</tr>
<tr>
<td>Off 10:00 P.M.</td>
<td>5 h. 59</td>
<td>FABA</td>
<td>Netherlands</td>
<td>2</td>
<td>488,543 488,111</td>
</tr>
<tr>
<td>Mar. 6th, 7:38 P.M.</td>
<td>8:35 P.M.</td>
<td>VK2TI</td>
<td>Aust.</td>
<td>1</td>
<td>579,543 579,287</td>
</tr>
<tr>
<td>Off 11:55 P.M.</td>
<td>4 h. 55</td>
<td>ZL1MR</td>
<td>N. Z.</td>
<td>3</td>
<td>487,543 488,585</td>
</tr>
<tr>
<td>Mar. 12th, 12:00 A.M.</td>
<td>3:00 A.M. P.S.T.</td>
<td>VK2RA</td>
<td>Aust.</td>
<td>20</td>
<td>588,543 577,000</td>
</tr>
<tr>
<td>Off 4:05 A.M.</td>
<td>4 h. 05</td>
<td>VK5RM</td>
<td>Aust.</td>
<td>1</td>
<td>499,543</td>
</tr>
<tr>
<td>Off 1:30 P.M.</td>
<td>2:30 P.M. P.S.T.</td>
<td>PY2AC</td>
<td>Brazil</td>
<td>4</td>
<td>487,543 486,852</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>17 h. 28'</th>
<th>Multiplier = 2 + 4 + 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2411 X 7 (countries) = 168 score</td>
<td></td>
</tr>
</tbody>
</table>

I hereby state that in this contest, to the best of my knowledge and belief, I have not operated my transmitter outside any of the frequency bands specified in, or in any manner contrary to, the regulations my country has established for amateur radio stations; also that the scoring points and facts as set forth in the above log and summary of my contest work are correct and true.

Signature of operator(s)

9 Add second column in log to give total operating time.
10 "Countries" for W/VE Participants. Change to read "Districts" or "Licensing Areas" on all reports from other parts of the World. A progressive record of the number of new countries (or licensing areas) is kept in these columns. A notation is made for each station worked but the figure increases numerically only as additional prefixes (or areas) are added on a certain band. The last number notation in each column added to similar numbers in other columns gives the "multiplier." Counting the "number of notations" in each of these columns gives the number of different contacts on each band for information for the log heading.

11 Total "Points" multiplied by the number of
(1) Countries or localities (prefixes) for all bands or
(2) U.S. and Canadian licensing areas for all bands equals the SCORE ....... (This is the final score unless the operating time exceeds 90 hours.)
THERE has been a persistently recurrent rumor in Hamdom in recent years. One ham would say to another, "Didja hear that Amos of 'Amos 'n' Andy' is on the air with a ham rig?" "Bzzz bzzz bzzz." "Yeah, got his ticket last month, I hear." And then there would be a check-up, and the rumor would be disproved, and that would be that.

But the fact that these rumors kept recurring indicated that there must be a little fire under the smoke—that, if nothing else, Amos could occasionally be found sitting in at some ham shack. Now, however, truth has overtaken rumor, and, quite without general fanfare, Freeman F. Gosden ("Amos" every evening on your b.c.l. set) is on the air from his Beverly Hills home with the call W6QUT.

It started about the first of November, when illness confined Gosden to bed at all times except when he was actually on the air. He got hold of a young ham in Los Angeles named Raymond Grammes. Gosden studied code with Grammes three hours a day for two weeks, and on the fourteenth day he took the examination and passed—with a high mark, incidentally.

This was not Freeman Gosden’s first experience with radio, or even with the license examination. He was a radio operator in the Navy during the War, stationed at WQV at Virginia Beach. He went through the radio school at Cambridge. Although active in the broadcasting end of radio practically to the exclusion of other activities for twelve years, a yen to rejoin the ham ranks had been in his mind for the past five years. The two weeks’ practice with Grammes brought back his old code knowledge. The toughest part, of course, was to brush up on modern radio theory and regulations. Since it is a characteristic of Gosden to be expert in every pursuit he undertakes, he did a thorough job in training himself for the examination.

The layout at W6QUT (in case you don’t get a chance to ask over the air!) is a kilowatt rig built to Gosden’s specifications by Forrest Wright, W6LFC. A custom-built job was dictated by the strenuous daily régime that Amos ‘n’ Andy undergo, confining them either to the broadcasting studios or the office where they write the material for their daily episodes except for odd moments between broadcasts and during the late evening.

A "General" rotary beam with both reflector and director is rotated by motor and compass at a point three hundred feet from the transmitter.

Amos hopes to enjoy many QSO’s with fellow hams around the country. He’s still a little mike shy—despite twelve years of Amos ‘n’ Andy broadcasts, he claims he is still nervous about going on the air over a ham rig!—so take it easy, gang. You know, in some ways it’s harder to be an amateur than a professional—even for a top-ranking professional who is one of a team that, according to N.B.C.’s publicity staff, has "from their own imaginations and two speaking voices created a little world of mythical characters whose humorous, human ways are known to a nation and whose malaprops have become a nation’s slang.”

What does Andy think of it all? Well, he’s not a ham yet, but it looks as though he was on his way. At least, he has a radiotelephone license under which he operates the transmitter in the Stinson Reliant which he flies in and around Southern California. That the Amos ‘n’ Andy establishment as a whole is thoroughly saturated with amateur radio is evidenced by the fact that Amos’ Christmas gift from their capable secretary, Louise Summa, was his A.R.R.L. membership entry.

Turning now from radio matters, Gosden’s background is a colorful one. Born in Richmond, Va., in 1899, he was schooled at Richmond and Atlanta. Brief experiences as a salesman of tobacco and later of automobiles were interrupted by the World War and Navy radio. In 1920 he joined a firm which staged amateur theatricals around the country, working as a director of home talent productions. It was on this job that he met Correll. As "Sam ‘n’ Henry" over WGN and then later as "Amos ‘n’ Andy" on N.B.C.—the first daily 15-minute network show on the air—they established many records.
IN GENERAL, a fixed antenna should have vertical and horizontal characteristics which give optimum results over a wide range of distances and directions. Antennas such as the single longwire radiator, the "V," and the horizontal diamond restrict the radiation in the horizontal plane so that one or more sharp lobes having fairly high gain are produced. However, 15 to 20 degrees removed from the beam the signal strength is down several "S" points. To meet the average amateur requirement of wide-range long-distance transmission on the higher frequencies, the antenna should have a broad horizontal characteristic and low-angle vertical directivity, unless the system is rotatable or there is sufficient room for several antennas having sharp horizontal beams.

An antenna approaching these specifications has been developed by G. H. Brown.\(^1\) Basically, it consists of a pair of closely-spaced elements excited with currents 180° out of phase. The resulting radiation is maximum in the plane of the elements and broadside to them, when the spacing between the elements is 0.5 wavelength or less. The maximum gain is essentially constant for spacings between 0.125 and 0.20 wavelength. The curve of Fig. 1 shows the variation of gain with spacing for a two-element beam antenna where each element is one-half wavelength long (equation 50 of Brown's article). The radiation pattern may be shifted either by changing the spacing of the elements, the phase relation between the excitation currents, or the electrical length of the elements.

\* Chief Engineer, E. F. Johnson Company, Waseca, Minnesota.

The "Q" Beam

The "Q" beam antenna, Fig. 2, is a two-band matched impedance antenna for two adjoining harmonically-related bands. It consists of two half-wave radiators spaced \(\frac{3}{4}\)-wave apart and fed 180° out of phase by means of individual quarter-wave "Q" sections. The radiation pattern is bi-directional, maximum broadside to the radiators, and has a fairly wide horizontal angle. The gain over a half wave is approximately 4 db on fundamental operation and over 6 db on second harmonic operation.

Since the voltages or currents on opposite conductors of a balanced open-wire line are 180° out of phase, the 180° phase relation between the two elements is obtained very simply by reversing the connections at the center insulator of one element. Thus the right half of one element and the left half of the other element are connected to the right-hand tubing of the associated "Q" sections, and vice versa. The two "Q" sections are fed by a 600-ohm balanced two-wire transmission line. The bottom connection between the two sections should not be more than one or two inches at frequencies above 56 megacycles. At the lower frequencies this connection is not so critical, but should be as short as possible.

When two antennas or elements are so spaced as to have appreciable mutual reactance, the resistance and reactance of each antenna (as measured at a current loop) and the gain of the system will change with the spacing and the electrical length of the antennas. It is apparent that as the spacing approaches zero the mutual impedance approaches the self-impedance of each antenna and the directivity is the same as for one radiator alone, while at a very great spacing the mutual impedance is negligible.

The self-impedance of a half-wave horizontal
The radiator is 73.2 + j42.5 ohms. This result indicates the necessity for decreasing the length a little (5 per cent) to obtain a non-reactive load. The inductive reactance of each half-wave element, when two elements spaced 0.2 wavelength are used, increases from 42.5 ohms to 56.8 ohms. This increase in inductive reactance was verified during testing of the "Q" beam, as it was found necessary to decrease the length of each half-wave element to 94 per cent of the length in space instead of the usual 95 per cent.

With fundamental operation the radiation resistance at a current loop decreases from 73.2 ohms to approximately 21 ohms, which was determined by evaluating equations 33 and 34 of Brown's article. The proximity of surrounding objects and the height of the antenna will change the value to some extent. The radiation resistance of the elements will be equal only when 0° or 180° phasing is used and the power is divided equally between the elements.

The Matching Section

The "Q" sections, a quarter wavelength long, which feed the individual half-wave elements at a high-current point, must match the 21-ohm impedance at the center of the elements to 600 ohms at the opposite end of each "Q" section. The 600-ohm transmission line is then correctly matched, since the two "Q" sections are connected in parallel.

By solving the following equation:

\[ Z_0 = \sqrt{Z_A Z_L} \]

where

- \( Z_0 \) = Characteristic impedance of "Q" sections
- \( Z_A \) = Resistance of each half-wave element (21 ohms)
- \( Z_L \) = Twice characteristic impedance of transmission line (1200 ohms)

it is found that the "Q" section characteristic impedance must be 158 ohms. The characteristic impedance of a "Q" section having \( \frac{1}{2} \) inch conductors spaced 1 inch center to center is 158 ohms. It may be computed from the formula

\[ Z_0 = 276 \log_{10} \frac{S}{d} + \sqrt{\frac{S^2 - 1}{d^2}} \]

where

- \( S \) is the distance between centers of the conductors (1 inch)
- \( d \) is the diameter of the conductors (\( \frac{1}{2} \) inch)


Second Harmonic Operation

When the antenna is operated on the second harmonic it becomes a two-section system, since the electrical length doubles and each element now consists of two half-wave sections fed at the ends (high-voltage points). Since the half-wave sections in one element connect to opposite sides of the "Q" matching section, they are effectively fed in parallel but 180° out of phase. The electrical spacing between the two elements also becomes twice as great and increases to 0.4 wavelength.

There is an interesting change in the matching characteristics of the "Q" sections, which become \( \frac{1}{2} \) wavelength long at the second harmonic. A line which is exactly \( \frac{1}{2} \) wavelength long has identical voltage-current relationships at each end, regardless of the characteristic impedance. Since an impedance is simply the ratio of voltage to current at a point in a circuit, the \( \frac{1}{2} \)-wavelength line therefore has the relation

\[ Z_L = Z_A \]

and the property of one-to-one transformer. If the line is terminated at either end by 600 ohms, for...
example, measuring equipment will indicate 600 ohms at the opposite end.

The impedance to ground at the end of a half-wave antenna is approximately 2200 to 2900 ohms and, disregarding the mutual coupling, it is to be expected that since the two half-wave sections of each element are connected in parallel

The impedance to ground at the end of a half-wave antenna is approximately 2200 to 2900 ohms and, disregarding the mutual coupling, it is to be expected that since the two half-wave sections of each element are connected in parallel

the impedance at the high voltage point where the "Q" sections are connected will be around 1200 ohms. The 1200-ohm load is reflected through the half-wave "Q" section, which means that the impedance at the transmission-line end of the "Q" section is identical to the impedance at the antenna end. Since the two 1200-ohm impedances are connected in parallel at the ends of the "Q" sections, the 600-ohm transmission line is again terminated in to its characteristic impedance. It is probable that the impedance of each half-wave element due to the mutual coupling of the other three elements changes, although a satisfactory mathematical solution was not obtained. The standing-wave ratio on a transmission line for second harmonic operation was 1.4 to 1, which indicates that impedance at the center is not far from 1200 ohms.

The radiation resistance of each half-wave section at the second harmonic increases from 2.1 to 3 times the value at the fundamental due to the increased spacing.

Effect of Frequency Shift

Because of QRM conditions, variable-gap crystal holders and variable frequency oscillators often are employed to change the transmitter frequency, thus permitting a satisfactory QSO. With this thought in mind, the curves of Figs. 3 and 4 were taken. These curves indicate the standing-wave ratio on the transmission line as the frequency is varied from the resonant frequency of the antenna. Referring to Fig. 3, for fundamental operation (28 Mc.), the transmitter frequency may be varied over a band of 0.5 megacycle on either side of the resonant frequency with satisfactory results. This curve is rather sharp because of the low resistance of each element. As the antenna resistance is increased the curve becomes broader, which is verified by the curve Fig. 4, for second-harmonic operation. The standing-wave ratio was indicated by a sensitive thermocouple meter connected in a tuned circuit and coupled to the transmission line by a single-turn loop. The entire assembly was mounted on the end of a bakelite rod and the coupling held constant by means of an insulated hook.

The ratio of maximum to minimum current or voltage on a mismatched transmission line is proportional to the ratio of the load impedance to the surge impedance of the transmission line. Thus a standing-wave ratio of 4 means that the load resistance \( Z_L \) is either four times or one-fourth the surge impedance \( Z_0 \) of the transmission line. Mismatching a transmission line by a certain impedance and then by the reciprocal will displace the maxima and minima of current and voltage by 180°. Thus in the former condition a maximum current indication will be found at the same position as minimum current in the latter case.

Whether the load impedance presented by the "Q" section to the transmission line is higher or lower than the characteristic impedance of the
transmission line can be determined readily by means of a low-scale r.f. meter or neon bulb which is moved along the wire from the junction of the transmission line and the "Q" section toward the transmitter. If the load impedance is low the meter reading will decrease or the neon bulb become brighter as they are slid along the line. For a higher load impedance, the indications will be reversed.

It is general practice to attempt to fulfill the condition \( Z_L / Z_0 = 1 \). At this condition the line copper loss is minimum. The power lost in a well constructed line, when \( Z_L / Z_0 = 1 \), is a very small percentage of the power delivered to the load. Considering a 600-ohm line of No. 12 copper wire 100 feet long, terminated in its characteristic impedance, the power at the receiving end will be approximately 97 per cent of the power delivered to the transmission line at 14 megacycles. Fig. 5 compares the power losses in unmatched and matched transmission lines for various ratios of mismatch.\(^6\) \( P_m \) = the power lost in the line when \( Z_L / Z_0 = 1 \); \( P_{unm} \) = power lost in the unmatched line when the same amount of power is delivered to the load as in the matched case; \( Z_L \) = load impedance; \( Z_0 \) = transmission line impedance. When the transmission line is mismatched as much as 2 to 1 the increase in power loss over the matched condition is negligible. A mismatch as much as 4 to 1 can be tolerated. The foregoing discussion applies only to the power dissipated in the copper losses and neglects the radiation losses. A properly-balanced transmission line will radiate a small amount of power, which is increased if the transmission line is not balanced.

The maximum radiation from the "Q" beam is at 90 degrees to the axis of the radiators in the horizontal plane. The nulls off the ends (along the line of the antenna) are very pronounced. On the second harmonic, the gain over a single half-wave antenna is still 5 db 15 degrees off the line of maximum radiation, as compared with over 6 db in the optimum direction; on the fundamental, the gain is still 3 db at 30 degrees from the maximum, or only 1 db down. The useful width of the beam is probably about 35 degrees in each direction broadside in the former case, and about 70 degrees in the latter.

The radiation in the vertical plane varies with the height above ground, but with the "Q" beam is maximum at a lower angle than in the case of a single half-wave antenna because of the out-of-phase currents; the antenna may be placed at heights of a half- to a full-wave above ground with satisfactory results. The lower angle of radiation results in more consistent DX reports. The "Q" beam has been used at W9LFU for almost a year with excellent results.

The "Q" beam can be operated on the fourth harmonic although the gain is reduced due to the wider spacing (0.8 wavelength) of the elements, and it is probable that the radiation pattern is multi-lobed. Each element then consists of two full-wave sections fed at the ends. The end impedance to ground of a horizontal full-wave antenna is of the same order as that of a half-wave antenna, and it is to be expected that the impedance at the receiving end of the "Q" section will be in the neighborhood of 1200 ohms.

Since the "Q" sections at the fourth harmonic have an electrical length of one wavelength, they function as two one-to-one transformers in series. The 1200-ohm impedance, therefore, is reflected to the transmission line end of the "Q" section as explained under second harmonic operation. Fourth harmonic operation was not attempted, and no calculations were made of either the gain or field pattern.

**Acknowledgment**

Considerable credit is due Fred Hager, Jr., W9DRG, for doing the experimental work, checking the original calculations and determining the radiation patterns.

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**Strays**

"Said the electron to the amplifier grid, "Greetings and excitation."" — W4DZB

According to a news item found by W1KTX in a small Mass. newspaper, one of the local citizens "was recently granted a license for an amateur broadcasting station and assigned a wavelength for his special use."

No poaching, boys!

\(^6\) From an unpublished paper by G. H. Brown.
Details of construction of the r.f. section are shown in this end-on view of the receiver.

Modernizing the 56-Mc. Receiver

BY JACK WAGENSELLER, W3GS

An Economical 56-Mc. Superheterodyne Receiver of Excellent Performance

The shortcomings of the popular five-meter superregenerative type receiver are no doubt realized by every amateur using a receiver of that type. It is unselective, generates an extremely undesirable background hiss, prevents the reproduction of good audio quality and in most cases re-radiates, causing interference to all nearby amateurs operating in the same band. On the other hand, the superregenerative receiver has always been very popular on the 56-Mc. band because of its simplicity of construction, good selectivity, low cost, and last but not least, its capability of receiving the broad, frequency-modulated signals so prevalent in this band in the past.

Now that the day of unstable 56-Mc. signals is at an end, so must the day of the 56-Mc. superregenerative receiver, with its many disadvantages, come to an end. With this idea in mind, the writer set out to design and construct a five-meter superheterodyne receiver which would be so far superior to the superregenerative receiver as to eliminate all reasons for existence of the latter.

The receiver described herewith is the result of this objective, after many weeks of extensive experimental work.

Now that regulations demand good frequency stability of 56-Mc. transmitters, the necessity for an extremely broad receiver no longer exists. This in turn eliminates the most outstanding point upon which the very existence of the 56-Mc. superregenerative receiver has been based all these years, and also removes the only argument which has in the past been against the use of a five-meter superheterodyne receiver.

The receiver described herewith was found to be more sensitive than any superregenerative receiver with which it was compared. It is sufficiently broad to receive, perfectly, any form of stabilized modulated oscillator, and even properly-operated unstabilized oscillators, (now outlawed on 56 Mc.) while at the same time possessing the selectivity required for reducing interference from nearby stations operating near the frequency to which the receiver is tuned. As a matter of fact, in most cases no interference could be noticed from nearby high-power stations operating within 30 kc. of the frequency to which the receiver was tuned in the 56-Mc. band, while on a superregenerative receiver the same stations apparently took up half of the band. The selectivity, sensitivity, lack of background noise and improved audio quality provided by this receiver make 56-Mc. operation comparable with operation on the lower frequency bands.
Tubes and Circuit

The r.f. stage provides plenty of gain. Both 954 acorn and 1851 tubes were tried. The 1851 was found to provide more gain, and at the same time it has the advantage of being less expensive. The r.f. stage tunes quite sharply, but not sufficiently so to necessitate the use of a tracking condenser to prevent loss of gain. Both inductive and capacitive methods of coupling the r.f. stage to the detector were tried. Using a 954 r.f. stage, the inductive method of coupling was preferred, but with the 1851 the gain is so great that oscillation of the r.f. stage could not be prevented while using this method of coupling. The capacitive method was therefore used by reason of necessity.

The 954 acorn was found to be far superior to other tubes for use as a mixer. This is not hard to understand when it is realized that acorn tubes are especially designed for ultra-high-frequency work. In order to reduce capacities to a minimum and therefore enable the use of as large an inductance as possible in the grid circuit of the detector for greater sensitivity, it was decided to prune the detector grid coil to resonance rather than to use a padding condenser across the coil. It might be well to state at this time that all coils are very critical and should be made exactly as specified. This is especially true of the detector coil, since it must be adjusted to exact resonance only by compressing or expanding the turns.

A 955 acorn was chosen as a high-frequency oscillator since its characteristics make it particularly adaptable to this application. The use of a very low LC ratio makes the oscillator extremely stable. The 955 will oscillate more freely with a low LC ratio than other tubes tried, and its internal capacity changes less with heating than other tubes, thereby minimizing frequency drift. The stability of the receiver is surprisingly good, being better at 56 Mc. than many other receivers were found to be at 14 or 28 Mc.

The I.F. Amplifier

A 1600-ke. intermediate frequency was chosen to provide the desired band width without sacrificing gain. A higher frequency would reduce gain and a lower frequency would not provide adequate band width or good image suppression. Using the 1600-ke. i.f. with a 6K7 pentode tube and iron core i.f. transformers, it was found that one i.f. stage was quite satisfactory. It was found necessary to use maximum i.f. gain only on extremely weak DX signals. The choice of proper transformers as specified is important, since the particular brand of i.f. transformers used is made in three types at 1600 ke.

A regenerative second detector was chosen for two reasons. First, it provides an economical means of permitting reception of c.w. signals on the receiver. It might be well to mention that plenty of c.w. 56-Mc. signals can be heard, too, although the user of a superregenerative receiver might be apt to think that c.w. signals do not exist on 56 Mc. Secondly, the regenerative feature provides increased sensitivity in the reception of phone signals and increased selectivity in the reception of c.w. signals. Sensitivity and selectivity increase as the regeneration control is ad-
vanced toward the point of actual regeneration, the most sensitive point being right before regeneration begins. With the regeneration control "off" (extreme counter clockwise position) the second detector operates in the same fashion as in any conventional superhet receiver. A high-impedance choke instead of a resistor is used as the plate load of the second detector, to minimize voltage drop and variation of plate voltage with changes in regeneration control setting.

One 6F5 audio stage provides sufficient loudspeaker volume for all practical purposes. The original model of the receiver has no audio gain control, volume being controlled entirely by means of the i.f. gain control. However, a 500,000-ohm potentiometer can readily be substituted in the grid circuit of the 6F6 for use as an audio volume control if desired.

Since fading on 56 Mc. seems to be a minor consideration as compared to other bands, and since even the strongest signals did not block the first detector, the extra expense and complications of adding a system of a.v.c. were considered unnecessary at this time. When fading does occur on 56 Mc. it seems to be very slow and gradual and can easily be followed by manipulation of i.f. gain control.

The entire receiver is constructed on a chassis measuring 8½ inches deep by 12 inches long by 2 inches high. This size was chosen to allow sufficient depth for ganging r.f., detector and oscillator condensers without cramping the components. Adequate separation is provided between these stages to eliminate any possibility of undesirable coupling or interaction. The chassis was chosen of such length as to permit the i.f., second detector and audio stages all to be sufficiently isolated from the high-frequency circuits.

**Notes on Construction**

The most important details of construction pertain to the assembly and wiring of the high-frequency stages. Parts are arranged to permit extremely short r.f. leads and direct by-passing of all r.f. circuits. This is accomplished by mounting the acorn sockets on vertical aluminum partitions. A general idea of this construction can be had from the photograph. At the front of the chassis, at the right-hand end, are the oscillator stage and its component parts. The 955 tube is mounted on a vertical partition 2¾ inches high by 2¼ inches wide. The socket is arranged with the cathode terminal facing towards the upper right corner of the partition, making a short and direct lead for the tap on the coil, and placing the grid terminal in a position which will allow a short and direct connection to the grid end of the oscillator coil through the 100-µfd. grid condenser.

Fig. 1 — 56-Mc. superhet circuit diagram.
The midget air oscillator padding condenser and oscillator coil are mounted directly on the oscillator tuning condenser.

Directly behind the oscillator stage is the first detector. This complete assembly is made up on a 1-inch wide by 2¾-inch high aluminum partition.

The 954 acorn tube is mounted to the left of the tuning condenser with its plate terminal protruding through a ½-inch hole for short direct connection to the coupling condenser from the plate of the r.f. stage. This aluminum partition, in addition to offering support for all the component parts of the detector stage, also provides adequate shielding between stages. In the case of the r.f. stage, only the tuning condenser is mounted on the aluminum upright. This upright is 2½ inches high by 2¾ inches wide, and likewise shields the r.f. coil and tuning condenser from the detector stage. The 1851 tube is mounted directly to the left of this assembly, making a short grid lead to the coil and at the same time assuming a position which allows a short lead to the coupling condenser, which is fastened directly to the stator terminal of the detector tuning condenser.

Initial adjustments, after construction is completed, are made as follows: The i.f. transformers are padded and adjusted to 1600 kc. Then with tuning condensers set at half capacity, the oscillator padding condenser is adjusted until a signal of approximately 58 Mc. is heard. A test oscillator is helpful, although a signal from the transmitter can be used, or perhaps some local 58-Mc. signal can be heard. If coils are made in accordance with specifications, the oscillator padding condenser will fall at a point slightly less than half meshed. The r.f. coupling condenser is then adjusted and the r.f. and detector coils pruned for maximum signal strength. As previously mentioned, the coils are pruned by compressing or expanding turns slightly, and when adjusted for the middle of the band will track sufficiently well over the entire band. The antenna trimmer condenser is also adjusted for best sensitivity with the particular antenna with which the set is used.

The background noise in the set will be found to be extremely low, and the actual operation very similar to any of the familiar superhet receivers in use on lower-frequency bands, with the exception of the regeneration control. The sensitivity will be surprisingly good and the operation very smooth. Any well-filtered power supply delivering approximately 250 volts at 70 ma. will be satisfactory.

Strays

(Continued on page 98)

The fatal short circuit—had the chassis been grounded, the lethal potential could not have existed and probably the only damage would have been a blown line fuse.
Eight Years Before the Mike


W9BSP will, no doubt, be remembered by many amateurs as long as they live, for it is from this station that hundreds of amateurs have received the thrill of copying their first bit of international code.

The station, owned and operated by Marshall H. Ensor and his sister Loretta Ensor (W9UA), has served as an A.R.R.L. Volunteer Code Practice Station every year, with the exception of one or two since 1930. During the last season, cards were received from 550 individuals who were following the course. Many others who did not report by card or letter are believed to have been copying the fifty lessons which constituted the course. Mr. Ensor is an instructor in the Industrial Arts Department of Olathe High School.

The station dates back to 1917 when a brief period of operation with a spark transmitter was interrupted by the War. It was not until 1922 that activities were resumed, this time with a self-excited c.w. transmitter using 202's powered by a ½-h.p. gasoline-engine-driven generator. The following year CB8 in Argentina was worked for the first Argentine-W9 contact. During 1925 and 1926 both 160-meter 'phone and 40-meter c.w. were used regularly. By this time a pair of 203-A's and a 4-h.p. engine had been acquired. Forty-meter operation was dropped in 1929 and a new 250-watt 'phone rig was built with a 1200-volt storage battery furnishing plate supply. Many fine contacts were made during the year.

In 1930 volunteer code practice work was started. W9BSP was one of the first to volunteer for this work and has since been one of the foremost in the field.

The latest transmitter, shown in the photographs, has been in service since October. It was designed for 80- and 160-meter 'phone operation. The hard-board panels and shelves are supported by a steel frame. Over this is placed a quickly-removable three-section walnut cabinet to protect the equipment from dust and to give a finished appearance. Each unit of the transmitter is placed on a shelf by itself and the r.f. stages are all link-coupled. The upper shelf supports the 1-kw. Class-C amplifier, incorporating a pair of T814's in push-pull link-coupled to the antenna pick-up coil. On the next lower shelf is the 6L6 oscillator, T756 amplifier and 845 driver. The T822 modulators may be seen on the second shelf. Behind these are a Thordarson speech-amplifier unit, filament-heating transformers and the bowler used for code practice transmissions.

The lower shelf supports two power supplies. One 600-volt unit supplies the oscillator and first r.f. amplifier while the other is used for C bias on the r.f. stages. The power supply for the driver, modulator and final r.f. stages is located in the basement. It consists of two 1½-kw. pole transformers and a pair of 872 rectifiers. Each section of the filter has a 3-kw. pole transformer primary for swinging choke. All transformers run in oil and show no rise in temperature after long periods of operation. The filter condenser for the modulator has a capacity of 9 µfd., while 13 µfd. are used in the section supplying the r.f. stages. This power supply delivers 1600 volts at 600 ma. for the final amplifier.

Several features of this station may be of interest. A 30-inch neon rod throws a glow which is visible for a quarter-mile when modulation takes place. A Dupont oscilloscope is link-coupled to the transmitter and shows either trapezoidal or envelope pattern of the signal on all transmissions. Three voltmeters are used in conjunction with switches to indicate filament, plate and grid voltages. Three milliammeters are used with plugs to check currents. A resistance unit imbedded in a concrete block is connected in series with the filament supply to keep the filaments at one-half operating voltage during stand-by periods. It is located under the operating table and serves admirably as a foot-warmer in cold weather.

(Continued on page 94)
What's Your Crystal Frequency?

Discussing the Factors Which Can—and Do—Make the Actual Frequency Different from That on the Label

During recent DX contests it has been the writer's duty, as an Official Observer, to check the frequencies of amateur stations operating outside or very near the edges of our bands. A surprisingly large number of stations were operating outside the international assignments. It was hard to believe that so much off-frequency operation could be deliberate: consequently an investigation was started to determine the cause.

In the case of W stations measured off frequency, they were asked for an explanation. Here is a sample of the replies received: "I can't see how it is possible that I was off: why, I just had my frequency checked by so and so"; or, "I check my frequency regularly using a broadcast station for a standard, so I couldn't be off without knowing it"; "Maybe something might be wrong with your measuring instrument." Analysis of the reports received indicates beyond all reasonable doubt that a majority of these operators do not fully understand what to expect of crystal-controlled oscillators. It is the purpose of this article to point out in ham language just what happens to crystals under various conditions.

Considerable data are available about crystals relative to temperature coefficients, variable load impedances, stray capacities, crystal holds, plate voltages or other factors, but how many operators consider these variables when they purchase crystals? It is an actual fact that they expect the crystal frequency to be exactly marked under any and all conditions! They assume that a crystal never changes frequency—or, if it does, that the change is so small as to be negligible.

When such a man is finally convinced that his crystal is off frequency, he immediately blames the manufacturer, although about 99 per cent of the time it may be the operator's own fault.

Temperature Effects

One major trouble is the frequency change caused by temperature. For example, an average X-cut crystal (average crystal, not all of them) has a temperature coefficient of minus 23 cycles per million cycles per degree centigrade. Let us elaborate on this point a little: It simply means that the crystal can be expected to change its fundamental frequency from the calibrated frequency by subtracting 23 cycles for each degree centigrade of temperature rise for each million cycles. A 3.5-megacycle crystal would therefore change 3.5 times 23 or 80.5 cycles for each degree temperature rise.

Right here is where we want to stop and think a bit. Probably you will say, "In my shack or room the temperature seldom varies much from 70 degrees Fahrenheit or 21.1 degrees centigrade, so why should I worry about temperature?" The answer is that the crystal probably is being used as a power oscillator with 300 or 400 volts on the oscillator tube plate, and with some 5 to 50 watts plate input. Certainly all of the power going into the oscillator does not appear in the output circuit, therefore the crystal must be dissipating a portion of this power, and where power is dissipated heating occurs. To prove this point, turn a crystal oscillator on (with a power level of this order) and let it run for a time. Then feel the crystal holder, or measure the temperature rise. The temperature often will rise to well over 100 degrees Fahrenheit even though the room temperature is only 70 degrees. What does this mean? What if it does rise that much? Well, if the temperature of a 3500-kc. X-cut crystal increases 20 degrees centigrade, then the crystal frequency will be outside the band by 1610 cycles! You might say, "But my crystal never gets that hot." It is suggested that you measure it yourself under actual operating conditions. We believe that you will then agree that a 20 degree change can and does happen frequently—too frequently.

We have no justification in taking a chance near the edges of a band with a crystal having

It shouldn't be necessary to explain what this is all about—not to anyone who has read the Editorial in January QST. If you haven't read it, dig out last month's QST and get yourself in the right frame of mind for appreciating this article. Remember, there's a DX Contest coming next month—those who slide over the edge may have a lot of fun, but they won't get any of the glory!
1610 cycles, more or less, frequency drift. If you insist on using this particular kind of crystal, then we recommend staying several kilocycles inside the band to allow a reasonable safety factor.

But you may say, “I like to operate near the edges. What kind of crystal could I depend upon?” Certainly not an X or Y cut. You could approach somewhat nearer with a good low-drift type such as the A, B, or V cuts, but even here one must be absolutely sure of his drift. A crystal operated very near the edges (but not nearer to the edge than 700 cycles) should have a temperature coefficient not exceeding 2 cycles per megacycle per degree centigrade for the 20-degree temperature rise estimated previously, assuming that the output frequency was 14 Mc. For 28-Mc. operation, using the same crystal and temperature range, it should be at least 1400 cycles inside the band. Table I is a tabulation of frequency versus temperature for crystals having different temperature coefficients. These figures represent drifts caused by temperature only. It is suggested that the table be consulted to find how many cycles your particular crystal will vary, to determine how close you can approach to the edge with safety—after also taking into account factors to be discussed later.

Thus far we have talked principally about X-cut 3500-kc. crystals, and assumed operation on 80 meters. Suppose we take this same crystal and by means of doublers go on down to 40, 20, 10 and 5 meters and see what happens to our output frequency there. Our 1610 cycles drift on 1.5 Mc. becomes 3220 cycles on 7 Mc.; on 14 Mc. the error is 6440 cycles; on 28 Mc. it is 12,880 cycles off; and on 56 Mc. it is 25,760 cycles off. Whew—that is a lot of cycles to be off! You could come back with, “But I am not using an 80-meter crystal. I use a 40- or 20-meter plate.” You still must multiply the temperature coefficient (23 cycles for X cuts only) by 7 or 14, which is equal to 161 and 322 cycles per degree C.

There is another side to this frequency drift picture—the receiving end. Have you ever had a very weak DX station drift from a clear channel to plenty of QRM and lose him? Have you

### TABLE I

**Frequency Drift in Cycles from Original Calibration for Crystals Having Different Temperature Coefficients**

**For a 10-Degree Centigrade Temperature Rise**

<table>
<thead>
<tr>
<th>Frequency in Mc.</th>
<th>Temperature coefficient 2 cycles</th>
<th>Temperature coefficient 4 cycles</th>
<th>Temperature coefficient 10 cycles</th>
<th>Temperature coefficient 25 cycles</th>
<th>Temperature coefficient 50 cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.700</td>
<td>170</td>
<td>391</td>
<td>850</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.000</td>
<td>200</td>
<td>460</td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.500</td>
<td>140</td>
<td>350</td>
<td>1750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.000</td>
<td>160</td>
<td>460</td>
<td>2100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.000</td>
<td>250</td>
<td>700</td>
<td>2800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.000</td>
<td>200</td>
<td>1400</td>
<td>5600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.000</td>
<td>1150</td>
<td>4400</td>
<td>12,880</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.000</td>
<td>600</td>
<td>6000</td>
<td>28,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Cycles per megacycle per degree centigrade.

**For a 15-Degree Centigrade Temperature Rise**

<table>
<thead>
<tr>
<th>Frequency in Mc.</th>
<th>Temperature coefficient 2 cycles</th>
<th>Temperature coefficient 4 cycles</th>
<th>Temperature coefficient 10 cycles</th>
<th>Temperature coefficient 25 cycles</th>
<th>Temperature coefficient 50 cycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.700</td>
<td>255</td>
<td>586.5</td>
<td>1275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.000</td>
<td>280</td>
<td>690</td>
<td>1500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.500</td>
<td>825</td>
<td>1207.5</td>
<td>2825</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.000</td>
<td>625</td>
<td>1380</td>
<td>3000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.000</td>
<td>420</td>
<td>2415</td>
<td>5250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.000</td>
<td>480</td>
<td>2318.5</td>
<td>5475</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.000</td>
<td>2100</td>
<td>4830</td>
<td>10,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.000</td>
<td>840</td>
<td>4968</td>
<td>10,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.000</td>
<td>3840</td>
<td>10,050</td>
<td>21,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60.000</td>
<td>9000</td>
<td>19,220</td>
<td>45,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Cycles per megacycle per degree centigrade.
ever tried to read a signal with your crystal filter at maximum selectivity and have the signal drift so much that it was necessary to retune continually? It is difficult for the receiving operator to pull through such a signal, and in a good many cases they don't even bother. It is a great asset to have a perfectly stable note, one that does not creep all over the dial, one that is much easier to copy at the other end.

"I cannot afford a better crystal than the X or Y cuts; what am I to do?" If you cannot afford a good stable crystal then you have absolutely no right to operate near the edge of a band. The difference in cost between an X or Y and an A, B, or V cut is very small and it pays dividends. It may be interesting to know that a zero temperature-coefficient crystal requires extreme care in cutting and grinding, and an X-ray spectrometer must be used if the coefficient is to be much less than four cycles. Not many hand-made or home-made crystals have this stability.

Other Causes of Frequency Shift

Another cause for frequency variation is changing load impedance. By doing nothing more than tuning the oscillator tank condenser, you can shift the frequency from a few cycles to several kilocycles. We suggest that you listen to your monitor to check this, particularly in the 10- and 20-meter bands. If you happen to be using a Tri-tet circuit, the cathode tank has an appreciable effect, and its tuning can be expected to change the frequency by as much as two kilocycles at 14 megacycles.

Stray circuit capacitances, while reasonably constant in their values, cause deviations in frequency from that marked on the crystal by the manufacturer. Manufacturers usually give circuit conditions and specifications with a crystal in an attempt to reduce the error. However, it is impossible to predict what the stray capacitance is under all conditions. An attempt is made to test a crystal under "average" conditions using circuits most common to amateur practice, but because of

(Continued on page 116)

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For a 20-Degree Centigrade Temperature Rise

<table>
<thead>
<tr>
<th>Frequency in Mc.</th>
<th>Temperature coefficient 2 cycles *</th>
<th>Temperature coefficient 4 cycles *</th>
<th>Temperature coefficient 10 cycles *</th>
<th>Temperature coefficient 20 cycles *</th>
<th>Temperature coefficient 50 cycles *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.700</td>
<td>68</td>
<td>136</td>
<td>840</td>
<td>782</td>
<td>1700</td>
</tr>
<tr>
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<td>80</td>
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<td>840</td>
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<td>2000</td>
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<tr>
<td>3.000</td>
<td>140</td>
<td>230</td>
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<td>1000</td>
<td>3000</td>
</tr>
<tr>
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<td>160</td>
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<td>1400</td>
<td>7000</td>
</tr>
<tr>
<td>7.000</td>
<td>250</td>
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<td>2300</td>
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<td>6000</td>
<td>20000</td>
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<tr>
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<td>20000</td>
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<td>2240</td>
<td>4480</td>
<td>11,200</td>
<td>11,200</td>
<td>56,000</td>
</tr>
<tr>
<td>60.000</td>
<td>2400</td>
<td>4800</td>
<td>12,000</td>
<td>12,000</td>
<td>60,000</td>
</tr>
</tbody>
</table>

* Cycles per megacycle per degree centigrade.

For a 25-Degree Centigrade Temperature Rise

<table>
<thead>
<tr>
<th>Frequency in Mc.</th>
<th>Temperature coefficient 2 cycles *</th>
<th>Temperature coefficient 4 cycles *</th>
<th>Temperature coefficient 10 cycles *</th>
<th>Temperature coefficient 20 cycles *</th>
<th>Temperature coefficient 50 cycles *</th>
</tr>
</thead>
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<td>425</td>
<td>977.5</td>
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<tr>
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<td>9125</td>
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<tr>
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<td>3000</td>
<td>6000</td>
<td>18,000</td>
<td>18,000</td>
<td>75,000</td>
</tr>
</tbody>
</table>

* Cycles per megacycle per degree centigrade.

The deviation may be either plus or minus except in the case of the X cut, which is always minus.

February 1939 35
The progressive increase in the number of amateur transmitting stations has resulted in heavy overcrowding of the comparatively narrow frequency bands reserved for these stations. Since there is a natural limit to the selectivity of receivers, even the most up-to-date superheterodyne receivers with quartz filters afford only a partial alleviation of the difficulties accruing, and under favorable conditions of reception the bands frequently have to carry such a heavy load that satisfactory communication becomes quite impossible. Some form of international control is highly desirable to bring order out of this chaos, either by subdividing the frequency bands available according to their suitability for specific traffic, or by reserving special bands for radio telephone traffic, etc. But as no move for an international control on these lines has materialized, other means must be found to arrive at a solution of this vexing problem. A very coarse and simple method for improving the audibility of a transmitter is to increase its power output and simply swamp out any other transmitters operating on an adjoining wavelength, but this would afford no permanent solution, for, in the first place, it would result in a race for power output, and, secondly, a limit is set by the restriction in plate input which has been imposed on amateur transmitting stations in the majority of countries.

Assume, for the moment, that of the large number of amateur transmitters each pair in communication is operating on the same frequency; this would have the net result that each frequency would be fully utilized, the demand on the frequency band in question would in consequence be considerably reduced and the safety factor for each specific link would be made much greater. The A.R.R.L. has recently endeavored to popularize this method of working by issuing a number of specifications for exciters which permit a rapid frequency change. This idea can, however, be further developed if two transmitters communicating with each other engage in break-in traffic, which apart from convenience naturally also affords an enormous saving in time and hence a still greater reduction of the load on the frequency band under discussion.

**Break-in Requirements**

The problem of break-in traffic on the same frequency imposes the following requirements:

1. For telegraphic transmission the transmitter must be keyed in such a way that during the receiving period the transmitter is inaudible; i.e., keying must take place in the initial stages

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*Fig. 1—Essentials of the transmitting control circuit. V1 is a doubler or buffer stage in the transmitter line-up; circuit values here are conventional. In the control circuit proper, T1 is a modulation transformer with a third winding giving an audio voltage of the order of 100 volts at negligible power.

Representative values in the control circuit are as follows:

- C1, 0.001 µfd.; C2, 0.1 µfd.; C3, 1 µfd.; C4, 1 µfd.; R1, 250,000-ohm potentiometer; R2, 0.5 megohm; R3, 1 megohm; R4, 100,000 ohms; R5, 20,000 ohms; R6, 100,000 ohms; R7, 300,000 ohms; R8, 10,000-ohm potentiometer. V1 may be a 6F6, V2 a 6X5, V3 two 6L6's in parallel (with screens tied to plates for triode connection) to control a 6L6 at V4. A small (receiving-tube type) Class-B driver transformer may be used at T2.*

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*Natuurkundig Laboratorium of N. V. Philips' Gloeilampenfabrieken, Eindhoven, Holland.*
2. For telephone traffic, conditions are made more complex by the fact that the carrier wave must be suppressed during the receiving periods. This could be achieved, for instance, by modulating and switching the transmitter frequency-control stage, but all succeeding stages must then naturally be designed on Class-B principles. The efficiency would then suffer a serious reduction, and it becomes essential to retain Class-C amplification.

3. During the transmitting periods, the home receiver must be automatically made idle.

As the second requirement enumerated above is the more complex it will be discussed first, and the other two requirements dealt with subsequently.

Assume that carrier suppression is to be applied to a three-stage transmitter. This transmitter consists of a control stage, a frequency doubler and a power amplifier, the last two stages being designed as Class-C amplifiers with modulation taking place in the last stage. Two desiderata must be satisfied for break-in traffic on the same frequency, viz.: (1) During the receiving period the transmitter control must be inaudible. This can be realised either by detuning, or by reducing the power rating of the control stage to such a level and providing such adequate shielding that the signal remains permanently inaudible.

After a long series of investigations we are convinced that it is much more convenient to employ the second method, since detuning the control transmitter reduces the frequency constancy and in addition supplementary apparatus, which adds to the total cost, is necessary to effect automatic detuning. If the transmitting frequency is the fourth harmonic of the control frequency, and if the control stage is made as small as possible and together with its plate-voltage rectifier is satisfactorily screened, it will remain inaudible even on a superhet receiver with a sensitivity of 0.5 microvolt placed at a distance of only one meter from the control transmitter.

The second condition, that the amplitude of the carrier wave shall be zero during the no-

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**Fig. 2** — By means of this circuit, a small part of the r.f. output of the transmitter is rectified and applied as grid bias to receiver grids to silence the receiver when the transmitting carrier is on. R1 and R2 (1-megohm potentiometers) afford adjustment of the biasing voltage; the coupling between the tuned pickup tank in the rectifier circuit and the transmitter tank circuit proper should be adjusted so that about 50 volts is developed across R1 and Rs. Rs and C1 should have a small time constant; 5 megohms and 100 μfd. are suggested values. The r.f. and i.f. tubes also can be biased to cut-off by applying the rectified voltage to the a.v.c. line of the receiver through Rs. Tube V is a 6L6; the other tubes are the diode rectifier and audio voltage amplifier of the conventional super.

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**Break-in 'phone operation should help relieve congestion in 'phone bands and make for more satisfactory conversations, by reducing the necessity for repeats and by enabling the receiving operator to come back immediately with a reply to a question. Imagine not having to wait ten minutes, taking notes all the while, for the fellow who has the air to get everything he can think of off his chest! Here is a system which not only puts the transmitter on the air when you start talking, but also silences the receiver at the same time. A short pause shuts down the transmitter and the receiver simultaneously snaps into action. It works on low-power stages, and no relays are needed.**

February 1939
relay can, for instance, be inserted in the anode, the screen-grid or the control-grid circuit. The great disadvantage of this method is that the relay will always respond suddenly and superpose the carrier with a sharp impulse, an abrupt action which is extremely undesirable during reception. Nevertheless, this method is employed in small, inexpensive transmitters because of its very simplicity. The difficulty of realizing steady reception thus lies in superposing the carrier rapidly but not impulsively and to suppress it suddenly yet with a finite delay. It should be possible to adjust the transmitter in such a way that it is cut out, for instance, between successive sentences but not during the intervals between words. This off-period must be capable of adjustment according to the speed of speaking. The use of tubes to eliminate all relays appears feasible for this purpose, since a tube can be cut in as quickly or as slowly as required, as compared with the closing time of a relay which is a mechanical constant.

Transmitter Control Circuit

A circuit satisfying the requirements just set out is shown in Fig. 1. In addition to the secondary winding the output transformer of the modulator has a third supplementary winding. The modulating voltage obtained in this winding during speaking is passed through the potentiometer \( R_4 \), the condenser \( C_1 \) and the resistance \( R_3 \) to the grid of a pentode \( V_1 \). Resistance \( R_5 \) serves as a grid leak. The screen-grid voltage is made very small, so that the grid bias likewise can be small. When a modulating voltage of a specific amplitude reaches the grid, grid current commences to flow. The grid current remains low with a small modulation voltage, but becomes so heavy when the voltage increases that a breakdown of the tube may even result; therefore resistance \( R_3 \) is provided to limit the grid current. At the same time this resistance also restricts the plate-current amplitude. By keeping the screen voltage low and using resistance \( R_3 \), modulating amplitudes above a certain value are limited in both directions (upwards and downwards). If \( C_1 \) is made too large it will acquire a large negative charge when grid rectification occurs, and this will adversely affect the action of the tube. For this reason the capacity of the condenser must be made very small, a measure which, however, cuts out to some extent the low frequencies, although this is unimportant in the present case as will be seen immediately below. A very high resistance is inserted in the plate circuit of the pentode, and this in turn acts as a powerful brake on the amplitude of the plate voltage in the upward direction (second limitation). The net result is that the alternating voltage at \( R_4 \) is practically independent of the amplitude of the grid voltage, if the latter is so great that grid current commences to flow. We have thus realised an amplifier which in the grid-current range furnishes an alternating voltage independent of the frequency and the grid amplitude. This alternating voltage is passed through condenser \( C_2 \) to the primary winding of the transformer \( T_3 \). It is evident that if a sufficiently high modulation voltage is available, which is in fact always the case, the capacity of \( C_1 \) can be very small. Experiments have shown that, for instance, from 10 volts alternating grid voltage up to 300 volts the alternating plate voltage remains absolutely constant. The lower limit of 10 volts can be displaced in either direction by means of suitable grid bias.

The constant alternating voltage obtained as described above is taken from the secondary side of transformer \( T_2 \) and rectified by a diode \( V_2 \) with low internal resistance. A constant direct voltage is then obtained at condenser \( C_2 \), so that, on starting to speak into the microphone a constant direct voltage is immediately obtained at this condenser. To make the charging time of the condenser as short as possible, the diode must, as stated above, have a low internal resistance. Condenser \( C_2 \) is bridged by resistances \( R_6 \) and \( R_7 \). The discharge-time constant is thus determined by the product \( C_2 \times (R_6+R_7) \). If \( C_2 \) is taken as 1 µfd. and \((R_6+R_7)=1 \) megohm, the time constant will be one second, i.e. one second after ceasing to speak \( C_2 \) will be roughly half discharged, which is already sufficient to cut off the succeeding tube.

\( V_3 \) is a high-\( \mu \) triode with low internal resistance. With the aid of \( R_5 \) the grid bias is regulated in such a way that the plate current is just reduced to zero. If condenser \( C_3 \) is charged, a positive impulse is applied to the grid of the triode \( V_3 \), this impulse persisting during speaking and being of such amplitude that the tube immediately operates in the grid-current range, and allows a heavy plate current to pass. Resistance \( R_6 \), which fulfills the same function as \( R_3 \) with valve \( V_1 \), serves for limiting the grid current (third limitation). On ceasing to speak, condenser \( C_3 \) is discharged through \( R_6+R_7 \) and the plate current in tube \( V_3 \) again becomes zero. If \( V_3 \) is located in the plate-voltage feed of a transmitting stage, this stage will as a result be connected and disconnected.

The delay in the cut-out can be controlled by suitable choice of \( C_3, R_6 \) and \( R_7 \). The switching-in point can be adjusted with the aid of the potentiometer, \( R_1 \), the delay being determined by the time constants of \( R_4, T_2 \) and \( V_2 \) together with \( C_2 \). This delay is made very short, but not so short that charging is instantaneous. The delay in the cutting out is determined by the ratings chosen for \( R_6 + R_7 \).

Tube \( V_3 \) switches the intermediate stage 1 of

\[1\text{ We see no urgent reason for confining the control to a buffer stage, which permits the oscillator to run continuously and necessitates exceptionally good shielding when the incoming signal is on the same frequency as the home transmitter. The average crystal oscillator will start readily enough, and if a self-excited oscillator is used for frequency} \]
the transmitter in and out and hence does not have to be large, since the plate current of this stage usually is relatively small. A power triode can therefore be used for the switching tube. Since in all amplifying stages the plate current becomes zero on the absence of the excitation voltage (Class B or C), it is sufficient to control only one of the preliminary stages with the switching triode.2

By means of the arrangement described above, it is thus directly possible to obtain effective carrier suppression by using only three tubes. The same circuit can be used for telegraphy when \( R_2 \) is not connected to \( C_2 \) but through a key to a positive voltage.3 A very smooth keying action entirely free from clicks is then obtained.

**Receiver Disabling**

The third requirement indicated above, viz., the automatic cutting in and out of the receiver, can be satisfied quite simply. The circuit used for this purpose is shown in Fig. 2, where a diode rectifier tuned to the transmitting frequency is coupled to the output circuit of the transmitter. This coupling must be tight enough so that with the transmitter switched on, the slider of \( R_1 \) is adjusted so that no signal is audible in the receiver. Since, when this occurs, the plate current of the tube is zero and the plate voltage of the oscillator or detector increases, which may result in a frequency shift, it is desirable to use the first audio tube for this purpose, because its plate current is low and in consequence reacts not at all or only slightly on the rectifier in the receiver. When the plate output of the transmitter is relatively high, it is advisable to control the r.f. and i.f. stages as well, since under these conditions these tubes may be damaged by the very powerful signal sent out by the home transmitter. For this purpose, the direct voltage of the control diode is applied to the a.v.c. diode of the receiver. \( R_3 \) is usually grounded, control it should be possible, by using good design and keeping the input low, to maintain satisfactory stability for reliable communication even though there are periods of idleness. Control of a low-power stage likewise simplifies the constructive problems. — Edtron.

2 This assumes, of course, that fixed bias sufficient for plate-current cut-off is used on the succeeding stages. — Edtron.

3 Keying should be through a well-insulated relay, since the key is at the plate potential above ground. The same also applies to the heater circuits of \( T_2 \) and \( V_4 \), as well as to the supply furnishing bias through \( R_3 \) to \( V_4 \). The secondary winding of \( T_2 \) should be insulated for the plate voltage on \( V_4 \). \( R_3 \) should not be adjusted with the plate voltage on. — Edtron.

but is here connected to the sliding contact of \( R_2 \). To obtain a low time constant the capacity of condenser \( C_2 \), which is usually of the order of 0.1 \( \mu \)fd., must be reduced. The slider of \( R_2 \) is so adjusted that with the transmitter switched on the r.f. and i.f. stages are cut out entirely. The receiver can without hesitation be connected to the transmitting aerial at a no-voltage point, e.g., to the center of the coupling coil.

The practical use of the system described is extremely simple and convenient. If a station is heard with which it is desired to communicate, the home transmitter can be tuned to its frequency by means of the monitor while the other station is calling. Once communication has been established, neither the transmitter nor the receiver need be further switched over. If the other transmitter is equipped for break-in traffic, communication is very rapidly set up automatically; should this not be the case the usual procedure is followed. If a general call is transmitted from the home station, other stations can at the same time be requested to change over to the same frequency or, to avoid interference from a series of distant stations, a similar request can be transmitted on receiving the first reply signals. For the sake of greater convenience a new Q abbreviation should be devised for the signal: "Change over to my frequency."

**Book Reviews**


This is a new edition of a book which has a long record of popularity with those who wish to qualify for various types of commercial licenses or whose work lies in the fields of commercial, aviation and police radio. The author's background of long association with the Federal Communications Commission — he is Assistant Chief, Field Section, Engineering Department, of that body — enables him to write authoritatively on the many phases of radio applications. In this Third Edition, approximately one-third of the text is devoted to electrical and radio principles, with the other two-thirds covering commercial radio equipment and its operation, international and domestic regulations, and license information. The "principles" section forms a rather good-sized text book in itself, covering in detail the operation of vacuum tubes and their application in oscillator and amplifier circuits. Sample calculations for predicting tube performance are worked out in almost every case, with the accent on practical engineering. The amateur who likes to dig under the surface a bit will find much meat in this part of the book.

It would be hopeless to attempt to describe in a few words the ground covered by the "operating" part of the book. Sufficient to say that there are innumerable illustrations and descriptions of the latest commercial equipment, that such things as broadcast transmitters, police transmitters and receivers, marine direction finders, auto alarms, transport aircraft and ground station transmitters and receivers are discussed at length. F.C.C. regulations and the general (Continued on page 93)
Using Electromagnetic-Deflection Cathode-Ray Tubes in the Television Receiver

Scanning, Synchronizing and Power Supply Circuits and Construction for Five- and Nine-Inch Kinescopes

By J. B. Sherman*

This article describes the construction of synchronizing, scanning, and power supply equipment for use with 5-inch and 9-inch Kinescopes of the electromagnetic-deflection type. The 9-inch outfit was shown in the photograph of the receiver in Mr. C. C. Shumard's December article, and the 5-inch outfit is equally well suited for use with the same receiver. Another 5-inch Kinescope arrangement, with electrostatic deflection, will be described in a subsequent article.

Scanning Circuit

Fig. 1 shows the circuit of a scanning unit suitable for use with either Type 1801 (5-inch) or 1800 (9-inch) Kinescope. A composite signal consisting of both vertical and horizontal synchronizing impulses of negative polarity is supplied from the receiver to the post marked “sync. input.” The constants of the circuit associated with the first 6N7 are so chosen that the vertical impulse alone is delivered to the vertical oscillator and the horizontal impulse alone is delivered to the horizontal oscillator. A good discussion of the operation of the blocking oscillator, discharge tube, and output circuits used to generate sawtooth deflecting currents in the deflecting yoke will be found in the bulletins on the RCA 1800 and 1801, and will, therefore, not be repeated here.

The apparatus of Fig. 1 is mounted on a chassis 8 x 17 x 3 inches, with a front panel 8¾ x 19 inches, as shown in Figs. 2 and 3. This is suitable for rack mounting, or the unit may be mounted back of a wooden panel in a cabinet with the balance of the receiver. Of the various controls required, it is desirable to place on the front panel the two fine-speed (frequency), the two size, and the two centering adjustments, making six panel controls. The rest of the controls may be screwdriver adjustments located on the rear of the chassis. Fig. 4 shows the layout of parts on the scanning chassis. The deflection outputs are brought to a socket mounted at the rear, into which is plugged a 4-wire cable from the deflecting yoke in the Kinescope unit. Each of the two pairs in this cable should be twisted.

The horizontal centering control is a 50-ohm General Radio Type 214A potentiometer which has been center-tapped. The tap can be easily made to a single turn raised about ½ inch with a small screwdriver. The raised portion is cleaned and a light flexible lead attached with ordinary rosin core solder. A small square of cambric slipped under the raised turn will insulate and support the connection.

The peak voltages between the 6L6G plate and other socket connections are very high and the usual wafer socket will almost surely break down. A good ceramic socket should be used for the 6L6G tube.

The scanning power-supply requirements are moderate, and therefore this supply is conveniently incorporated into the scanning chassis. A separate transformer with 1500-volt insulation is used for the filament of the 1-V tube and is mounted on the underside of the chassis.

Kinescope Power Supplies

The scanning unit described will provide ample deflecting currents for either the 5-inch or 9-inch Kinescope. The 5-inch tube is operated at 3000 volts second anode, the 9-inch tube at 6000 volts. The circuits of the power supplies for the two Kinescopes are shown respectively in Figs. 5 and 6. The Kinescope itself is housed separately and

In this article, picture-reproduction systems alternative to those described in October QST are presented from the practical circuit and construction standpoint. The circuits are for magnetic-deflection television-type tubes as contrasted with the oscilloscope-type tubes previously considered, and dovetail into the receiver circuit described in the December and January issues. The larger screen area (five- and nine-inch diameter as compared with three-inch and smaller oscilloscope tubes) naturally makes for better picture reproduction. In a subsequent issue similar information on using the new electrostatic-deflection tubes will be given.

* Research and Engineering Dept., RCA Manufacturing Co., Harrison, N. J.

connected to its power supply by a cable enclosed in grounded copper braid, and to the scanning unit by the 4-wire cable mentioned previously. The high-voltage cable requires four wires for the 1801 and five for the 1800. The second-anode leads for both tubes, and first-anode lead for the 1800, should be automobile high-tension wire.

Figs. 7 and 8 show the external appearance of the 1801 and 1800 supplies respectively; and Figs. 9 and 10, the undersides of the chassis. The chassis are 8 x 17 x 3 inches, with front panel 8 3/4 by 10 inches. It will be noted that thorough precautions have been taken to safeguard the operator against the high voltages used. The primary leads of the power transformer run through two pairs of pin jacks which open the 110-volt circuit when the cover is removed from the underside of the chassis. Similar interlocks are located on the Kinescope housing. In addition, a gravity-operated relay with coil connected to all transformers except 1-V.

![Diagram](attachment:diagram.png)

Fig. 1 — Synchronizing and scanning circuit for the 1801 and 1800.

- C1, C2, C5 — 0.25-mfd., 400-volt paper.
- C3, C21 — 0.05-mfd., 200-volt mica.
- C4 — 0.1-mfd., 400-volt paper.
- C5 — 0.005-mfd., 100-volt mica.
- C6 — 4-mfd., 450-volt paper.
- C7 — 0.02-mfd., 200-volt paper.
- C8, C9, C10 — 8-mfd., 450-volt electrolytic.
- C11, C12, C13, C14 — 25-mfd., 250-volt electrolytic.
- C15 — 5-mfd., 50-volt electrolytic.
- C17 — 0.002-mfd., 450-volt mica.
- C19 — 250-mfd., 400-volt mica.
- C20 — 600-mfd., 200-volt mica.

- C25, C24 — 16-mfd., 450-volt electrolytic.
- C26 — 0.05-mfd., 400-volt paper.
- C30 — 250-mfd., 5000 volts.
- C34 — 4-µfd., 450-volt electrolytic.
- C35 — 0.02-µfd., 1-volt electrolytic.
- C36 — 0.002-µfd., 250-volt mica.
- C37 — 0.5-µfd., 5000 volts.
- C38 — 0.002-µfd., 400-volt mica.
- C39 — 250-µfd., 400-volt mica.
- C40 — 600-µfd., 200-volt mica.

- R17, R18, R22 — 5000 ohms, 1/2-watt.
- R10 — 5000 ohms, 1/2-watt.
- R21 — 50,000 ohms, 1-watt.
- R22 — 50-ohm center-tapped potentiometer (GR 214A center-tapped).
- R23 — 15,000-ohm potentiometer.
- R24 — 350 ohms, wound.
- R25, R26 — 100 ohms, 1/2-watt.
- R27 — 10,000-ohm potentiometer.
- R28 — 500 ohms, 1/2-watt.
- R29 — 100 ohms, 1-watt.

- T2 — 5-volt filament transformer (Jef­ferson No. 464-221).
- T3 — Vertical oscillation transformer (RCA No. 9834).
- T4 — Horizontal oscillation transformer (RCA No. 9835).
- T5 — Vertical output re­actor (RCA No. 9833).
- T6 — Horizontal output transformer (RCA No. 9836).

L1, L2 — 20 henries, 90 ma., 400 ohms (UTC).

Yoke — Deflecting yoke (RCA No. 9031).
across the power-transformer primary shorts the high-voltage output when the 110-volt supply is disconnected. The chassis itself should be securely grounded. While these precautions may seem elaborate, the subject of high-voltage protection certainly deserves all the attention possible.

The only control located on the high-voltage supply is that of focus. The potentiometer for this job is mounted on a strip of bakelite set back from the front of the chassis, and an insulating coupling is inserted in the controlling shaft. The resistors for the high-voltage divider are mounted on the same bakelite strip. In the case of the 1801 supply, the 879 rectifier tube is also mounted on this strip. This horizontal mounting is permissible only if the tube is mounted with the filament pins in a vertical plane, that is, one above the other. In the case of the 1800 supply, horizontal mounting of the 878 is not permissible, and a convenient and safe arrangement is to support the rectifier inverted in a kind of chimney, so that the plate connection is available beneath the chassis, from which side the tube is inserted. A National 4-pin socket mounted on the cover of the chimney by means of the standoff support supplied with this socket makes a very satisfactory arrangement. The filament leads are brought down alongside the tube. The chimney shown in Fig. 8 is a 3-inch aluminum tube with \(\frac{1}{4}\) -inch wall, 6 inches long. Small holes are drilled in the cover and around the base for ventilation. The hole in the chassis is slightly less than the diameter of the aluminum tube.

The output voltages are brought to a bakelite terminal board equipped with General Radio pin jacks, the leads from the Kinescope being provided with pins for easy disconnection. The other end of the supply cable is connected permanently at the Kinescope housing.

Fig. 2 — Panel view of the scanning unit shown schematically in Fig. 1.

Fig. 5 — Power supply circuit for the 1801.

- \(C_1\) = 0.025-µfd., 4000-volt (Combined in one unit, RCA No. 9840).
- \(C_2\) = 0.05-µfd., 3500-volt (Combined in one unit, RCA No. 9840).
- \(R_1\) = 3 megohms, 1-watt (3 1-meg., 1-watt units in series).
- \(R_2\) = 0.5-megohm, 1-watt potentiometer.
- \(R_3\) = 0.25-megohm, 1-watt.
- \(L_1\) = 1500 henrys (RCA No. 9838).
- \(T_1\) = Power transformer (RCA No. 9839).
- \(LA\) = Neon-type lightning arrester (Branch No. 27A).
- \(RY\) = High-voltage shorting relay, gravity-operated.

Fig. 4 — Chassis layout drawing for the scanning unit.
Kinescope Housings

Fig. 11 shows the housings for the 5-inch and 9-inch tubes. Shelby seamless iron tubing, which is available from metal-products distributors in a large variety of sizes and weights, is used for the purpose of providing shielding of the Kinescope from stray static and magnetic fields as well as for safety reasons. The 1801 requires a piece of tubing 10½ inches long and 5½ inches inside diameter. A wall of 1/16 or 1/8 inch is suitable. For the 1800, tubing 15 inches long and 5½ inches inside diameter is used with a conical section cut from thin aluminum. The photograph shows a front fitted with safety glass; this provides mechanical protection to the tube and to the viewer.

It is important that the iron tubing used for shielding should not be magnetized, in order to avoid interference with both focus and deflection. Should demagnetizing be necessary, a suitable coil consists of about 500 turns of No. 18 enamel cotton-covered copper wire random-wound on a 7-inch cardboard form to make a coil about 1½ inches long and ¾ inch deep. This may be connected directly to the 110-volt, 60-cycle supply. In operation, while voltage is applied to the coil the iron tubing is passed through the coil and carried several feet to one side before the voltage is removed.

Instead of iron tubing, aluminum tubing can also be used for shielding. The magnetic shielding afforded will not be as effective, however.

The Kinescope socket is mounted in the center of a 1/16-inch iron disc 7½ inches in diameter, as shown in Fig. 12. A convenient arrangement which permits rotation of the socket is indicated in Fig. 13. A National socket (5-pin for 1801 and 6-pin for 1800) is mounted on a bakelite strip which has been drilled a single hole to clear the springs, and the mounting plate furnished with the socket is inverted and placed over the top of the socket. Spacers between the plate and the bakelite allow the socket to rotate freely. A bakelite plunger through the hole in the center of the socket rests on a snap switch mounted beneath the socket. This is a Hart and Hegeman switch which snaps closed when pressed. It is connected in series with the high-voltage transformer primary, and thus acts to disconnect the high voltage when the Kinescope is removed from its socket. The reason for this is evident: The second anode lead, carrying the highest voltage, can easily be reached from the front of the tube housing if the Kinescope is removed; this is probably the most accessible high-voltage point in most television receiving equipment and therefore merits particular precaution. The tube housing is fastened to the iron base with angles and wing-nuts, and also carries pin-jack interlocks in series with the snap switch mentioned. Thus the high voltage will be disconnected if the Kinescope or its housing is removed.

The deflecting yoke is supported directly by the Kinescope; felt strips can be used to keep it firmly in place. The yoke is connected to the scanning chassis by a 4-wire cable and plug previously mentioned. Two connections, grid and cathode, are required from the Kinescope to the

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Fig. 6 — The 1800 power supply circuit.
C1, C2 — 0.03-µfd., 6000-volt.
R1 — 5 megohms, 5-watt (5 1-meg., 1-watt units in series).
R2 — 0.5-megohm, 1-watt potentiometer.
R3 — 0.25-megohm, 1-watt.
R4 — 0.25-megohm, 1-watt.
L1 — 1500 henrys (RCA No. 90418).
T1 — Power transformer.
LA — Neon-type lighting arrester (Brach No. 27A).
Ry — High-voltage shorting relay, gravity operated.

Fig. 3 — Chassis view of the scanning unit.
Fig. 7 (above) - Chassis view of the 1801 power supply. Fig. 8 (below) - Rear view of power supply for the 1800. The rectifier tube is enclosed in the cylindrical metal container.

Fig. 9 (top) — Under-chassis wiring in the 1801 power supply. The rectifier tube is mounted horizontally from a bakelite strip.

Fig. 10 (bottom) — Below-chassis view of the 1800 power supply.

Fig. 11 — The Kinescope assemblies. Seamless iron tubing surrounds the cathode-ray tubes.

Fig. 12 — The 1801 unit open to show the parts in the assembly.

Fig. 13 — Rotatable Kinescope socket with high-voltage disconnect. A plunger-type switch is kept closed so long as the tube is in the socket, but opens the primary circuit of the high-voltage transformer when the tube is removed.

The function of the scanning unit is to supply linear sawtooth deflecting fields to the Kinescope, and the uniform distribution of a received picture requires this linearity. After the outfit has been built, the linearity of scanning can be checked by the method described in the October QST, page 106.

(Continued on page 106)
Landmark Becomes Ham Emergency Center

The Smyth observatory tower in Manchester, N. H., has long been a landmark of New Hampshire's largest city. Inspired by his travels in England and Scotland, it was built during 1888-1890 by the Hon. Frederick Smyth, a former governor of the state.

In the intervening years it fell into disuse and the interior was largely destroyed. Two years ago there was a move to have the city take over the observatory and its associated 11-acre tract for a municipal park. The move failed.

Now, however, thanks to W1HPM and his crew of Manchester Radio Club hams, the tower is being renovated and equipped by WPA labor. The object is to make it a headquarters for amateur radio in the city and, for that matter, in the state. Fitted with up-to-date radio equipment, having its own gasoline-engine emergency power supply, the observatory will not only be a luxurious home for the ham club but an emergency communication facility of great potential value to the community.

The project started late last autumn when J. Brodie Smith, W1HPM, backed by the 35 licensed amateurs of Manchester, appeared before the Mayor and Board of Aldermen. He presented a proposition whereby Mrs. Marion C. Smyth, widow of the former governor, offered the land and tower as a gift to the city. The proposal was accepted. Arrangements were then made with the WPA to carry out the work of restoring the interior of the structure. Some 15 to 30 men were taken from relief rolls and set to work during favorable weather. This work was begun in mid-November and is expected to be completed during February.

Restoration of the tower includes installing new floors, a new roof, stairs, windows and doors. The inside walls are being lined with insulating board. A chimney is under construction, toilet facilities are being installed and an automatic oil burner heating installation is being provided. An automatic pump with 30-gallon tank attached is to be installed in the basement for water supply.

There are three floors and the roof. The basement, of course, houses the pump oil heater and gasoline-driven 115-volt generator. The first floor will be a suitably furnished reception room and lobby. The operating room will be on the second floor, with transmitters covering all amateur bands from 5 meters through 160, 'phone and c.w. The third floor will be used as storage space. Atop the roof a weather observation station is being installed, to be operated by the 172nd Field Artillery.

The 11-acre site affords plenty of room for antennas. The principal wire will be supported by 60-foot poles, which will bring it well above any land in or near the city of Manchester.

Building activity will not be confined to the tower itself. The road leading to the tower from Smyth road is being rebuilt, a distance of some 600 feet, 16 feet wide, with a gravel surface. The entire site is being cleared and drives and paths are to be established. Then, too, there is the laying of 120 feet of 1 1/4-inch pipe from the well to the tower.

(Continued on page 54)
As outlined in the November issue of QST, the United States is divided into Naval Districts. This month’s Naval Communication Reserve story is of the First Naval District.

The First Naval District comprises the New England States with the exception of Connecticut. The Naval Communication Reserve in the First Naval District is subdivided into seven sections, each section being composed of several units. At present there is a total of thirty-eight units. The organization covers the major portion of the District, with the largest membership in the coastal areas.

The Naval Communication Reserve Commander, First Naval District, is Lieutenant R. B. Meader, C-V(S), U.S.N.R. (WIKG). The Section Commanders are:

- Section I, Maine, Lieut. (jg) L. C. Greene, C-V(S), U.S.N.R. (W1ACF).
- Section II, New Hampshire, Lieut. R. T. Smith, C-V(S), U.S.N.R.
- Section III, Northern Massachusetts, Lieut. (jg) R. W. Hart, C-V(S), U.S.N.R. (W1AAE).
- Section IV, Southeastern Massachusetts, Ensign D. M. Stanier, C-V(S), U.S.N.R. (W1EOZ).
- Section VI, Rhode Island, Lieut. (jg) H. Young, C-V(S), U.S.N.R. (W1CAB).
- Section VII, Western Massachusetts, Lieut. (jg) C. J. Green, C-V(S), U.S.N.R. (W1ASW).

On 1 July, 1938, Lieutenant Meader relieved Lieutenant-Commander C. C. Kolster, C-V(S), U.S.N.R., as N.C.R., Commander, First Naval District. Lieutenant-Commander Kolster devoted himself wholeheartedly and unselfishly for ten years to the work of building up the Naval Communication Reserve in the First District, and has seen it develop from an unorganized group of radio enthusiasts to an efficient and coordinated military command. Though press of business in his capacity as Inspector in Charge, Federal Communications Commission, Boston, Mass., motivated his decision to turn over the command, he is maintaining his interest in the Naval Communication Reserve, and is acting as Liaison Officer on the new Naval Communication Reserve Commander’s Staff.

With the expansion of the Naval Communication Reserve, it soon became evident that the administration of this rapidly growing organization was more than a “one-man” job. In 1935, a staff was formed to aid the N.C.R. Commander. The personnel of the staff has been changed from time to time in order that officers might rotate in the various duties. As of 1 July, 1938, the N.C.R., Commander’s Staff is as follows:

- Lieut. Comdr. C. C. Kolster, C-V(S), U.S.N.R., Liaison Officer (W1KF).
- Lieut. M. D. Chace, C-V(S), U.S.N.R., Personnel Officer.
- Lieut. G. L. Burrows, C-V(S), U.S.N.R., Signal Officer.
- Ensign R. K. Bullard, C-V(S), U.S.N.R., Operations Officer (W1AN).
- Lieut. (jg) N. L. Abbott, C-V(S), U.S.N.R., Assistant Operations Officer (W1ATO).
- Lieut. L. G. Cummimg, C-V(S), U.S.N.R., Supply Officer (W1FB, W1BV).
- Lieut. (jg) A. E. Linell, C-V(S), U.S.N.R., Executive Officer (W1AJK).

All units are active throughout the year. During the nine months period from September 1st to July 1st, the District sponsors an annual radio competition patterned after the National Competition, with a trophy awarded at the conclusion of the active drill season in June. Each year a military drill competition is held, the winner of which receives the District Military Efficiency trophy.

The training program for the Naval Communication Reserve includes not only procedure practice for radio drills but also military drill and instruction in duties on board ship. Active duty at Naval Stations and on board men-of-war is also provided to a percentage of the personnel each year. During this past summer, eight officers and forty-six men of the N.C.R. have performed two weeks of active duty with pay on board the following ships: U.S.S. Badger, Dickerson, Hamilton, Roper, Schenck, Tattnall and Tillman — all destroyers of the Training Detachment, U. S. Fleet, and at Naval Radio, Boston, Naval Reserve Aviation Base, Squantum, Mass., and the various Radio Direction Finder Stations of the First Naval District.

The District publishes monthly a paper devoted to the activities of the Communication Reserve, called the Intercept. Instructional material, general information regarding the Navy, and

(Continued on page 108)
Simple Vertical Antennas

BY T. M. FERRILL, JR.* WILJI

Simple top-load capacity for low-frequency vertical antenna. A four-foot diameter ring of \( \frac{1}{4} \)-inch copper tubing with copper wire spokes forms an effective disc for top-loading capacity.

Practical Construction Methods for Low- and High-Frequency Bands

During recent years, little attention seems to have been given vertical antennas, and only in the past few months has interest in them been revived. Probably one large reason for their unpopularity is the vague impression that construction of a vertical antenna involves big pipes and large strain insulators. Also, to obtain a height above ground of \( \frac{1}{2} \)-wavelength (height necessary for resonance of vertical grounded antenna) a structure about 125 feet high is required for the 160-meter band, and one about 65 feet high is required for the 80-meter band.

With the vertical antenna, radiation at low frequencies along the surface of the earth is much increased, while the radiation at high angles which causes fading (and doesn't contribute much toward communication at long or short distances) is greatly reduced. Amateurs 40 to 100 miles apart who have had difficulty with fading interference on 100 and 80 meters can make a large step toward improvement of communication over these distances, as well as over real DX for these bands, by changing to vertical antennas.

The impression that pipes, large rods, or metal trusswork masts are required for vertical antenna installations is incorrect; a wood pole or simple wood structure may be used to support a vertical wire, either from a short horizontal crossarm and insulator, or from a 3- or 4-inch porcelain stand-off insulator mounted directly on the pole. A similar crossarm or insulator may be used at the bottom to keep the wire tight. Since the horizontal pull of the more usual antennas is eliminated with this type, the pole or structure need be only rigid enough to withstand any winds likely to be encountered.

Antennas for the Low Frequencies

There is an easy way to shorten the required height of 160- and 80-meter vertical antennas to more reasonable heights for amateur installations. Much interest and inquiry was occasioned by the appearance in 1934 of information on use of capacity and inductance top loading to make effective radiators of vertical antennas of \( \frac{1}{2} \)-wavelength and greater heights. The article published at that time, however, dealt more with theory of operation and results obtained, than with practical amateur construction angles.

In Fig. 1 are shown four effective vertical antennas. The antenna of Fig. 1-A is tuned to the transmitter frequency by the series coil and condenser. If the height of the antenna is approximately \( \frac{1}{4} \)-wavelength — about 125 feet for the 160-meter band, 65 feet for the 80-meter band, or 32 feet for the 40-meter band — the coil and condenser connected in series with the antenna and ground will be approximately the values used for a plate tank circuit for the band of operation. If the height of the antenna is less than \( \frac{1}{4} \)-wavelength, the inductance of the coil should be increased well beyond the size of a coil ordinarily used for the band, and the condenser capacity also should be increased.

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* Technical Department, QST.


Top-Loaded Systems

The odd-looking combination of Fig. 1-B is a "top-loaded" antenna—one in which a lumped capacity is supported at the top of the antenna, and connected to it through a coil. The capacity provided by an open disc and the inductance connected in series effectively lengthen the antenna to a quarter-wave height just as does additional capacity and inductance at the base of the antenna of Fig. 1-A. The effect on the current in the antenna produced by the top load is markedly different from that produced by the bottom loading, however, and is much more favorable. Furthermore, top loading decreases the flow of current between the antenna coupling coil and ground, and thus decreases the ground resistance loss. Experiments have shown field strength obtained with a top-loaded antenna approximately equal to that obtained with the more conventional type (that of Fig. 1-A) 1/4-wave high. For 160-meter band operation, this means a height of 50 feet instead of 125 feet.

Construction of Loading Capacitor

Capacity for top loading may be provided by a circle of 1/4-inch copper tubing to which are soldered radial wires. The illustration shows a unit designed for loading a 160- and 80-meter vertical antenna 50 feet high. Capacity of approximately 40 µµfd. is obtained with a diameter of slightly less than four feet for the effective disc. A piece of 1/4-inch copper tubing approximately 12 feet long is bent into a circle with four flattened points drilled for the top screws of 1½-inch porcelain standoff insulators. Two joined 4-foot pieces of 1-inch by 2-inch pine provide the rigid backbone and mounting for the capacitor, and five insulators are mounted on the ends and the center of the crossed pieces. The center insulator holds soldering lugs to which are brought twelve 14-gauge wires from soldered points evenly spaced around the circle. This junction is also used as the terminal for connection of the antenna or the load coil.

For 160-meter operation of a 50-foot antenna with this capacitor, a coil of 65 turns of 14-gauge wire, spaced wire diameter on a 5-inch diameter form, should be used. Such a coil may be wound on celluloid sheet slipped over a large mailing tube. For 80-meter operation of the same antenna, a 30-turn coil otherwise similar to the above may be used. A weatherproof housing of metal or other material should be used to protect the coil.

If the provision for adjustment of the loading inductance from the ground is desired, a second wire spaced three to eight inches from the radiator may be used, with upper end making no connection. The proper spacing may be maintained with feeder separators; the 6-inch commercially available spreaders are excellent for this purpose. For antenna heights of 1/4- to 3/4-wavelength, an inductance should be connected between the lower ends of the two wires, and the inductance may then be adjusted readily without taking down the antenna. This arrangement is shown in Fig. 1-C.

Adjustment of Top-Loaded Antenna

Adjustment of the antennas of Fig. 1-B and -C
is slightly less convenient than that of other antenna types. Instead of using instruments connected directly to the antenna, the operator must rely on cooperation of a friend with a meter or tuning-eye-equipped receiver 200 to 1000 feet from the antenna. Just enough wire should be connected to the antenna post of the receiver to give a low signal strength reading from the antenna with the inductance shorted, and the assistant, who may be a “non-radio-minded” friend, should be instructed to report the effects of changes in adjustment on the transmitting antenna. The assistant should be warned to make no changes in the receiver adjustment during the tests. With this set-up in operation, and the antenna coupling tank circuit tuned to resonance and coupled to load the transmitter properly, the clip on the antenna inductance should be removed from the position of coil shorting and replaced to connect a few turns of the coil in the circuit. With the antenna coupler adjusted for resonance and correct transmitter load, the second receiver reading should be obtained from the assistant. The operations should then be repeated with a few more turns of the antenna loading inductance connected in the circuit, and so on. When an increase of the inductance in the circuit is found to cause a drop in the signal strength at the receiver, the tap should be moved back a few turns for slightly less inductance, and left in this position. The point on the coil should be marked, so that one adjusting process will serve for all operation on the band on which the adjustment is carried out.

Good Ground Connection Important

Although this system has as one of its major advantages the effect of decreasing the current to ground and thus the ground connection resistance loss, at least one iron or copper pipe, and preferably three or four, should be driven in the ground to a depth of a few feet and connected with low-resistance contacts to the point shown in the diagram of Fig. 1-B or -C. The hours spent in construction and adjustment of this system for 160- and 80-meter operation are more than justified by the excellent performance shown by the antenna.

Link Coupling the Transmitter

It will be noted that in Fig. 1-A, -B, and -C, the coupling coil of the antenna is shown coupled.

(Continued on page 90)
An Economical Six-Band Transmitter

A Two-Tube R.F. Circuit for Either C.W. or 'Phone

BY HAROLD ROBERTS, W1KUK

Many are the hams who day dream during classes or business hours about building a rig for all bands, only to be rudely awakened by the fact that the wide open spaces of their pocket books won't permit it. I know, for I too was aroused from much peaceful slumber.

However, after much experimenting, a circuit was finally arrived at that incorporates efficiency, flexibility and economy. The lineup simply consists of two stages, an RK49 oscillator driving a TZ20.

The Oscillator

As the diagram, Fig. 1, shows, the RK49 can be used in three different circuits: (1) as a tetrode crystal oscillator, (2) as a Tri-tet oscillator, and (3) as an electron-coupled oscillator. To switch over from Tri-tet to tetrode, one need only close the cathode condenser, which shorts itself out since a corner of one of the plates is bent. A plug switching system made up of banana plugs and jacks mounted on bakelite was installed in the cathode circuit. Thus, to switch over from crystal to e.c.o., one simply changes the position of one of the plugs and substitutes a small condenser, C10, in place of the crystal.

The correct amount of output with minimum crystal current is obtained by choosing the proper value of screen voltage for the RK49. This is accomplished by means of a potentiometer, Rs, placed in the screen circuit. The method of adjustment is described later.

The Amplifier

The TZ20 in the final stage is used as a straight amplifier from 160 to 10 meters inclusive, and as a doubler on 5 meters. The balanced output circuit uses a split-stator condenser that was rebuilt from an unused General Radio condenser. The original condenser had 500-µfd. capacity; splitting it in two resulted in 250 on each side, which, with the sections in series, results in a total of 125 µfd. Nearly every ham's junk box contains a similar condenser which can readily be changed into a split-stator. The only equipment needed is a hack saw and a supply of "elbow grease." The minimum capacity of the condenser is quite low, which permits a good L/C ratio to be obtained on 5 meters.

When the transmitter is used on c.w., the key and the keying r.f. filter or lag circuit are connected in series with the TZ20 filament center-tap. This type of keying was found to be highly satisfactory and adds to the stability of the rig since the oscillator operates continuously. Fixed battery bias is used on the amplifier, and its plate current drops to zero when the key is opened.

Operation

The efficiency of a straight amplifier is approximately 70 per cent and that of a doubler about 33 per cent. In view of this fact, the TZ20 is made to double only when five-meter operation is desired. If a ten-meter crystal is available, the tube can operate as a straight amplifier on 56 Mc.

When operating the oscillator in the electron-coupled circuit, greater frequency stability is obtained if the plate circuit is tuned to the second harmonic. We wish to emphasize the fact that the greatest care must be exercised when one adjusts and operates a self-excited oscillator, especially on 'phone. Many beginners attempt to use self-excited signals without the use of a good monitor and an accurate frequency meter, thereby needlessly jeopardizing their amateur privileges.

Following is the method of operation on the various bands. On 1.75 Mc., a 1.75-Mc. crystal...
The chassis layout is straightforward, as shown by this rear view. The jack strip in the cathode circuit is mounted on small standoffs at the extreme right. The other top-of-chassis components are easily identified.

is used in the tetrode crystal circuit. The electron coupled oscillator also can be used. This is the only band, however, where the grid circuit of the e.c. oscillator is tuned to the operating frequency. On 3.5 Mc., a 1.75-Mc. crystal is used, with doubling in the plate circuit of the Tri-tet oscillator. The e.c.o. may be used with the grid circuit of the oscillator tuned to 1.75 Mc. and the plate circuit doubling to 3.5 Mc. On 7 Mc., a 3.5-Mc. crystal may be used in the Tri-tet circuit, doubling in the plate of the oscillator. Also, a 7-Mc. crystal may be used in the tetrode circuit. The e.c.o. may be used with the grid circuit tuned to 3.5 Mc. and the plate circuit doubling. On 14 Mc., a 7-Mc. crystal is used in the Tri-tet circuit, doubling in the plate of the oscillator. Alternatively, a 14-Mc. crystal may be used in the tetrode circuit. For e.c.o., the grid circuit is tuned to 7 Mc., and the plate circuit of the oscillator is tuned to 14 Mc. For 28-Mc. operation, a 14-Mc. crystal is used in the Tri-tet circuit, doubling in the oscillator plate. On 56 Mc., the 14-Mc. crystal again is used, doubling in the plate circuit of the Tri-tet oscillator and doubling once more to 56 Mc. in the TZ20 amplifier. If a 28-Mc. crystal is available, it could be used in the Tri-tet circuit, doubling to 56 Mc. in the oscillator plate circuit.

The method of adjusting the screen voltage of the oscillator is as follows: First, raise the screen voltage to a high value by means of the potentiometer. Then tune up the transmitter in the usual manner. The oscillator should be tuned for highest TZ20 grid current. The screen potentiometer should then be turned in the high resistance direction until the amplifier grid current drops to normal (17 ma. for c.w. operation and 22 ma. for phone) with the TZ20 loaded to its normal plate current of 75 ma. As the screen voltage is lowered, the crystal current will drop appreciably.

A link coupling system of about 2 turns on each end is used between the final tank and the antenna tuning unit.

Coil data are given in the accompanying table.

When using the electron-coupled oscillator, the exact location of the tap on the grid coil is a matter of cut-and-try. The tap should be moved toward the ground end of the coil to a point just above where the output of the oscillator

![Circuit diagram of the two-tube six-band transmitter.](image)

The cathode plug is inserted in jack B for e.c. operation and in jack A for Tri-tet. The cathode is connected to ground when the plug is in C; the same connection can be made by bending over one plate of C5, so that it shorts when set to maximum capacity, leaving the plug in A for quick change from tetrode to Tri-tet crystal oscillator.

February 1939
COIL DATA

<table>
<thead>
<tr>
<th>Band</th>
<th>1.1 Diam.</th>
<th>1.2 Diam.</th>
<th>1.2* Diam.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1/4 inches</td>
<td>1/2 inches</td>
<td>1/2 inches</td>
</tr>
<tr>
<td>1.75 Mc.</td>
<td>56 turns No. 18, closewound. tap 3 t. from ground for e.c.</td>
<td>55 turns No. 22, closewound</td>
<td>45 turns No. 16, closewound</td>
</tr>
<tr>
<td>3.5 Mc.</td>
<td>10 turns No. 18, length 1 inch, e.c. tap 3 t. from ground</td>
<td>26 turns No. 18, length 1 1/4 inches</td>
<td>35 turns No. 14, length 2 1/4 inches</td>
</tr>
<tr>
<td>7 Mc.</td>
<td>6 turns No. 18, length 1 inch, e.c. tap 2 t. from ground</td>
<td>17 turns No. 18, length 1 1/4 inches</td>
<td>16 turns No. 12, length 2 1/4 inches</td>
</tr>
<tr>
<td>14 Mc.</td>
<td>8 turns No. 18, length 1 1/4 inches</td>
<td>10 turns No. 12, length 2 inches</td>
<td></td>
</tr>
<tr>
<td>28 Mc.</td>
<td>4 turns No. 18, length 1 1/4 inches</td>
<td>5 turns No. 12, length 2 inches</td>
<td></td>
</tr>
<tr>
<td>56 Mc.</td>
<td>2 turns No. 12, length 2 inches</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Wound on National XR-13 forms.

drops below the required value. The lower the tap, the greater is the stability of the oscillator.

When switching over from 'phone to c.w. one must not forget to short out the secondary of the modulation transformer since the energy stored in it would cause arcing in the plate circuit of the final stage.

With normal input to the TZ20, a power output of about 40 watts is obtained on all bands except 56 Mc., where the output as a doubler is about 20 watts.

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New Apparatus

Concentric Transmission Line

A new type of construction using spun glass spirally wound on inner conductor is the feature of a new concentric transmission line, No. 600, made by Communication Products, Inc.

This line incorporates No. 16 gauge copper wire in a 1/4-inch outside diameter copper tube, with a dielectric constant of 6.3 at 1 Mc. and characteristic impedance of 70 ohms. The power handling capability of the cable is 300 watts maximum transmitter output. An interesting feature of this type of construction is the fact that such a small diameter concentric line is suitable for a bend of three-inch radius, a point which makes it extremely attractive for difficult installations.

Thus the efficiency of a 100-foot length of this line is approximately 80 per cent at 30 megacycles.

Loss figures are given by the manufacturer as follows:

<table>
<thead>
<tr>
<th>Frequency in Mc.</th>
<th>Db Loss Per 100 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
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</tr>
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<td>1</td>
<td>0.19</td>
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<td>3</td>
<td>0.32</td>
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<tr>
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<td>0.41</td>
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<tr>
<td>10</td>
<td>0.60</td>
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<tr>
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<td>0.84</td>
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<tr>
<td>30</td>
<td>1.00</td>
</tr>
<tr>
<td>60</td>
<td>1.50</td>
</tr>
</tbody>
</table>

This new transmission line is available with end seals which include ceramic-insulated binding post terminals for center conductor. The impedance value makes it an excellent match for center connection to half-wave radiators.

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1.75-Mc. W.A.S. Party!

Feb. 18th-19th

Here's an activity designed especially for our 160-meter brothers. It's a fraternal activity for testing stations and giving the band a thorough workout. You can see for yourself how many states can be worked in a given time using a transmitter on the 100-meter band only. Rules. Simplicity is the watchword. Work other 100-meter stations; exchange signal reports and the name of the state you are located in. List in three columns the time, the call of the station worked, and his state. These facts can be cross checked as logs are received at Hq., of course. A given station may be worked but once for contest credits.

Add the number of stations, or count one each for contacts, and multiply the result by the number of different states worked. (The District of Columbia will also count for Maryland.) This product will be your score. The activity is open to all amateurs, wherever located.

All contest or party operations must take place in any twenty hours of the following 35-hour period:

160-METER PARTY

Starts Ends
3 P.M. 1ST, 4 P.M. MST, 12:01 A.M. PST, 1:01
5 P.M. C.S.T. or 6 P.M. 1:01 A.M. EST, SATURDAY, CST or 1:01 A.M.EST, Feb. 18th
MONDAY, Feb. 20th

There's been a deplorable tendency to under-rate the capabilities of the 1715-2000-kc. amateur band. This last month proved that some of our stations on "160" could be heard in England, and we feel sure that a surprising number of states can be "bagged" in a little party dedicated to that worthy purpose. Let's all give it a whirl, and let's know how you make out.

— F. E. H.
Navy Day—1938

Radio Amateurs Participate in Annual Celebration

1938 was the fourteenth consecutive year in which amateur radio operators of the United States participated in the celebration of Navy Day, October 27th. On this day each year A.R.R.L. has staged a Receiving Competition, consisting of a message from the Secretary of the Navy, with awards to those making the most accurate copy.

In the 1938 competition the Navy Department offered letters of appreciation to those operators making perfect copy. The message was transmitted from Radio Washington (NAA) and Radio San Francisco (NPG) at a speed of 2.5 w.p.m. 647 operators submitted copies, 33 per cent of them with 100 per cent accuracy. The percentage of perfect copies is considerably lower than for the 1937 competition (57 per cent), due probably to an increase in length of the message and speed of transmission.

The Secretary's message was copied in 44 states, the District of Columbia, Alaska, Hawaii, Canal Zone, Cuba, Puerto Rico, and four Canadian provinces. A table showing participation by Naval Districts, indicating number of N.C.R. members submitting copies, etc., is presented for the general information of all and to show the relative standings of the various Districts. 56 per cent of all participants were members of the Naval Communication Reserve.

The Honor Roll lists all contestants by Naval Districts in the order of rating within their re-

(Continued on page 112)

1933 Navy Day Message

This year in celebration of Navy Day it is again my pleasure to transmit a message of greeting to the radio operators of the United States and of our insular possessions. In all Naval Districts the Naval Reserve has opened its Reserve Air Bases and Armories to the public in celebration of Navy Day and a number of Air Squadrons and Divisions of the Naval Reserve have engaged in aerial exercises and parades which have been carried out based upon commands transmitted over Naval Reserve radio circuits from Washington to certain Naval Districts. This is the first time that our Reserve radio training circuits have been used as command circuits indicating the great progress that has been made by the Communication Reserve in its knowledge of Naval radio communication procedure. With conditions disturbed abroad the Navy Department is well pleased to know that we have available in case of need a large force of communication experts whose services are also available when needed in connection with emergency communication for the Red Cross when hurricanes and other disasters occur. I extend again the best wishes of the Navy Department to our American radio operators.

Claude A. Swanson
Secretary of the Navy

(This is the text of the message transmitted from NPG. NAA's text was a paraphrase of NPG's.)

<table>
<thead>
<tr>
<th>Naval District</th>
<th>Number of Participants</th>
<th>Number Making Perfect Copy</th>
<th>% Perfect Copies</th>
<th>Number of Copies Submitted</th>
</tr>
</thead>
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<tr>
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<td>N.C.R.</td>
<td>Non-N.C.R.</td>
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<td>N.C.R.</td>
</tr>
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<td>21</td>
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<td>4</td>
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<tr>
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<tr>
<td>Sixth</td>
<td>8</td>
<td>6</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Seventh</td>
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<td>6</td>
<td>25</td>
<td>8</td>
</tr>
<tr>
<td>Eighth</td>
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<td>34</td>
<td>61</td>
<td>11</td>
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<tr>
<td>Ninth</td>
<td>72</td>
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<td>3</td>
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<td><strong>Totals</strong></td>
<td><strong>364</strong></td>
<td><strong>283</strong></td>
<td><strong>647</strong></td>
<td><strong>118</strong></td>
</tr>
</tbody>
</table>

1 The number of N.C.R. and non-N.C.R. member participants was determined as accurately as possible by examination of copies received.
Factors Influencing the "Q" of R.F. Coils in Amateur-Band Receivers

*BY DALE POLLACK*

**Effects of Wire Size, Length/ Diameter Ratio, Dimensions, Winding Forms and Insulation**

It is well known that the performance of radio equipment, particularly of receivers, is dependent upon the merit of the coils employed in the tuned circuits. The quality of a coil is most conveniently expressed in terms of its ratio of reactance to resistance, denoted by Q, or symbolically,

\[ Q = \frac{X}{R} \]

The higher the Q of a coil, the lower its resistance, and in general, the better is the coil.

The use of high Q coils in receivers is desirable for at least two reasons. The first, and most apparent, reason is that the voltage amplification of a radio frequency amplifier is directly dependent upon the Q of the coils in the tuned circuits. The second reason, which is perhaps more important than the first, is that the selectivity of the amplifiers is largely determined by the Q of the inductances. One of the defects encountered in most superheterodyne receivers at frequencies above 2 or 3 megacycles is the lack of selectivity ahead of the first detector, where, usually, only two tuned circuits are found. When such selectivity is inadequate, the image response of the receiver, caused by unwanted signals on the wrong side of the oscillator frequency, is excessive and the operation of the receiver is correspondingly impaired. In addition, the noise output of the receiver is directly related to the pre-mixing selectivity.

Very little information is available in the literature upon which to base the design of coils for use at frequencies above the broadcast band. What little work has been done has not been correlated and arranged for convenient use for design purposes. The author, consequently, recently undertook a study of high-frequency inductances with the view of obtaining and presenting this information. The results of this study, insofar as they apply to the design of coils for amateur band receivers, are given here.

The value of the inductance, \( L \), is determined by circuit considerations, such as the frequency range to be covered, and therefore is fixed by specification. The data presented here are concerned mainly with the Q of the coil. The highest Q consistent with practical limitations — such as those of cost and space — is the desideratum. The magnitude of the coil losses is determined by the construction, the factors which should be considered in designing a coil being:

1. Coil dimensions: length and diameter.
2. Wire: material, insulation, and size.
3. Coil form: material, insulation, and size.
4. Location of coil with respect to metallic and dielectric bodies.

The design problem is to proportion these factors so that the resistance of the coil will be minimum.

A large number of tests were made and these tests were correlated with mathematical analysis to deduce general rules for the design of coils. The investigation was confined to small single-layer solenoids of the type commonly employed in high-frequency receivers. The results of the study which are of interest to amateur band receiver designers are summarized in the following paragraphs. For the usual types of coils these conclusions may be applied to the frequency range between 4 and 25 megacycles, which includes some of the most important amateur bands.

**Wire Size**

An experimental set of curves illustrating the variation in Q with wire size is shown in Fig. 1. Some of the information contained in this article is from a paper entitled "The Design of Inductances for Frequencies between 4 and 25 Mc.," published in Electrical Engineering for September, 1937, and in the RCA Review for October, 1937. The experimental work involved in the study was carried out in the Marellius Hartley Laboratory of the Electrical Engineering Department of Columbia University.
The optimum wire size, as obtained by calculation, is

\[ d_o = \frac{b}{\sqrt{2N}} \]  

(1)

The wire, therefore, should be spaced to occupy approximately 0.7 of the total winding length. The test coils were wound on bakelite forms with enameled wire, typical of the construction used in practice. In most cases a good experimental agreement with equation (1) was found, and it may be concluded, therefore, that there is an optimum size of wire for any given coil, whose value is readily computed. The curves indicate, also, that the value is not critical and some departure from the optimum may be made without materially reducing the Q.

**Length/Diameter Ratio**

The determination of the proper ratio of length to diameter is more difficult. Wide variations in conclusions on this point have been reached by various investigators. The apparent inconsistencies result from the fact that different variables are considered in different studies. The solution which is reached must always depend upon the geometric or economic limitations which are assumed. The coil volume, surface area, wire length, or any of several other factors may be assumed constant, depending upon the nature of the problem. It should also be noted that either the wire size may be kept constant or the optimum value may be employed, although for design purposes the latter is preferable.

The effect of changes in ratio of coil length to diameter, for a certain group of coils in which the coil diameter, wire size, inductance, and frequency are held constant, is shown in Fig. 2. A similar set of curves, except that the coil length is held constant, instead of the diameter, is given in Fig. 3. For the specifications for which these curves are obtained, namely, the wire size, inductance, frequency, and either the diameter or length constant, it appears that the optimum ratio of length to diameter is between 0.5 and 0.3.

**Coil Dimensions**

It should be noted particularly that in the curves of Figs. 2 and 3 the wire size was kept constant. For design purposes the variation in Q with the coil dimensions, when the optimum wire size of equation (1) is used, is of greater importance, since higher Q's may be obtained in this way. It has been found that the coil Q is proportional to

\[ Q' = \frac{D}{102 + \frac{45}{S}} \]  

(2)

provided that the wire size is maintained at the optimum value. This equation is plotted in Figs. 4 and 5. Fig. 4 illustrates how the Q varies with length and diameter of the coil and Fig. 5 shows the variation in Q with the length/diameter ratio for a constant coil diameter. In the derivation of this relationship the effect of radiation was neglected and consequently equation (2) holds only when the maximum coil dimension is very small compared with the wavelength at which the coil is to be used.

It appears from equation (2) and from Fig. 4 that, when no economic limit is placed upon the coil dimensions, the Q increases as the diameter and length of the coil are increased. For a constant diameter of coil the Q increases with increasing coil length, but the increase is less rapid as large values of \( b/D \) are obtained. If the \( b/D \) ratio is kept constant, the Q increases directly as the diameter of the coil.

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For details of the analysis reference should be made to the original paper. See Footnote 1.

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Fig. 2 — Experimental curves illustrating the variation in Q with coil diameter/length ratio, when the diameter is constant. For this set of curves, \( f = 17 \) megacycles, \( b = 1.5 \) centimeters, \( L = 3.6 \) microhenrys.

Fig. 3 — Experimental curves illustrating the variation in Q with coil diameter/length ratio, when the length is constant. For this set of curves, \( f = 13 \) megacycles, \( b = 1.5 \) centimeters, \( L = 3.6 \) microhenrys.
Frequently, the maximum coil dimensions are fixed by the size of the coil shield, which, in turn, is limited in size by the space available in the apparatus. The presence of a coil shield usually reduces the Q, because of the increased eddy current loss. It has been shown by several experimental and mathematical studies that, if the coil diameter is less than half the shield diameter, and the ends of the coil are separated by at least a coil diameter from the ends of the shield, the Q of the tuned circuit is not reduced by more than 5 to 8 per cent. This restriction may be employed to determine the size of a coil enclosed in a shield.

**Number of Turns**

The number of turns, for a given inductance, when the diameter and length of the coil are known, can be calculated from

\[ N = \sqrt{\frac{L(1028N + 45)}{D}}. \]  

This equation will usually give the correct value within about 5 per cent and the coil, when wound, can be adjusted to the required value in any of the

![Fig. 4](image1)

**Fig. 4** — Plot of equation (2), showing the variation in Q with length and diameter of coil, when the wire size is kept at the optimum value.

![Fig. 5](image2)

**Fig. 5** — Plot of equation (2), showing the variation in Q with the length/diameter ratio, when the wire diameter is optimum and the coil diameter is constant.

![Fig. 6](image3)

**Fig. 6** — Per cent loss in Q resulting from grooved bakelite form. For this figure, \( L = 3.6 \) microhenrys, \( D = 2.5 \) centimeters, \( b = 1.5 \) centimeters; wire size, No. 18 B. & S.

![Fig. 7](image4)

**Fig. 7** — Per cent loss in Q resulting from heavy cardboard form and grooved bakelite form. For this figure, \( L = 3.6 \) microhenrys, \( D = 5 \) centimeters, \( b = 1.5 \) centimeters; wire size, No. 18 B. & S.

![Fig. 8](image5)

**Fig. 8** — Per cent loss in Q resulting from groove in bakelite form. (No measurable loss resulted from the use of a smooth bakelite form.) For this figure, \( L = 1.1 \) microhenrys, \( D = 2.5 \) centimeters, \( b = 1.9 \) centimeters; wire size, No. 14 B. & S. Groove approximately 0.04 centimeter deep.

![Fig. 9](image6)

**Fig. 9** — Per cent loss in Q resulting from enamled wire insulation. For this figure, \( L = 1.1 \) microhenrys, \( D = 2.5 \) centimeters, \( b = 3.4 \) centimeters; wire size, No. 18 B. & S.
usual ways. The "Lightning Calculator," which is familiar to most amateurs, is also convenient for computing the number of turns and may be used instead of equation (3).

Dielectric Losses

The magnitude of the dielectric losses in the coil form and in the enamel wire insulation for typical coils at high frequencies was investigated. Examples are given herewith. To measure the dielectric losses in the coil form two similar coils of 2.5-centimeter diameter were wound, one using a grooved bakelite form with a groove about 0.04 centimeters deep, the other wound self-supporting, except for three narrow celluloid strips to which the wire was fastened with collodion. The percentage loss in Q resulting from the grooved bakelite form is shown in Fig. 6. At 14 megacycles, the loss is less than 10 per cent.

The curves of Fig. 7 are for a set of three similar coils, of 5-centimeter diameter, one wound without any supporting material—similar to the coil described in the preceding paragraph—one wound on a grooved bakelite form, and the third on a grooved cardboard form about one centimeter in thickness; worse than any case one would expect to find in practice. The groove in each case was about 0.04 centimeter deep. At 13 megacycles the reduction in Q resulting from the grooved bakelite form was 27 per cent. A wood form, used for another coil, gave results similar to those obtained for the cardboard. The loss in Q resulting from the grooved bakelite form was 19 per cent at 13 megacycles.

To measure the dielectric loss in the coil form at higher frequencies, a group of 1.1-microhenry coils was wound, one on a smooth bakelite form, one on grooved bakelite with a groove about 0.04 centimeter deep, and one without a supporting form, as described previously. The difference between the smooth bakelite and the air-core samples was smaller than the experimental error. The loss in Q resulting from the groove in the bakelite is plotted in Fig. 8, and amounts to 13 per cent at 20 megacycles.

To investigate the dielectric loss in the enamel wire insulation, two similar coils were wound on smooth bakelite forms, one using enameled wire, the other bare copper wire carefully cleaned to remove corrosion. The per cent loss in Q resulting from the enamel is plotted in Fig. 9 and amounts to about 6 per cent at 20 megacycles. This result is quite reasonable, since the dielectric path in a spaced winding is largely in air. Below 5 megacycles the dielectric loss in the wire insulation is difficult to detect. After a time bare copper wire corrodes and the dielectric loss in the enamel insulation may become smaller than the loss resulting from corrosion.

These data indicate the relative unimportance of the dielectric losses in determining coil performance. The choice of coil-form material, within reason, and the use of enameled wire have little effect on the merit of the coil. A loss of less than 10 per cent or 20 per cent can be expected for small diameter coils, if a deeply grooved form is used. A shallower groove may be used with little sacrifice in rigidity and an improvement of a few per cent in the figure of merit. An ungrooved bakelite form causes very little loss in Q up to 20 megacycles.

A.R.R.L. QSL Bureau

For the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine United States and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 10 stamped envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner.

W1 — J. T. Steiger, WLBGY, 35 Call Street, Willimansett, Mass.
W2 — H. W. Yahnel, W2SN, Lake Ave., Hel¬metta, N. J.
W3 — Maurice Downs, W3WU, 1311 Sheridan St., N. W., Washington, D. C.
W4 — G. W. Hoke, W4DYB, 328 Mell Ave., N. E., Atlanta, Ga.
W6 — Horace Greer, W6TI, 414 Fairmount Ave., Oakland, Calif.
W7 — Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.
W8 — F. W. Allen, W8GIER, 324 Richmond Ave., Dayton, Ohio.

(Continued on page 88)
B.C.I. and the Amateur

Some Do's and Don'ts for the B.C. Interference Problem

BY L. C. WALLER, W2BRO

The theme song of this story should be, "Ignorance is the greatest enemy of peace." The writer suggests that this axiom be added to the amateur's list of useful proverbs.

Although a recent issue of QST carried one of the "Our Hero" problems pertaining to broadcast interference, that is not what furnished the inspiration for this story. The inspiration was supplied by the fact that W2BRO recently installed a 250-watt 10- and 20-meter 'phone station in a 45-family four-story apartment building with instructive, if not pleasant, results. The affinity of some broadcast receivers for short-wave 'phone signals is amazing.

Of course, no ham objects to an occasional case of trouble with B.C.I. That is just another technical problem, and is normally to be expected, even though the transmitter is perfectly designed, adjusted, and operated. But in the light of recent experience at W2BRO the toughest case of B.C.I. imaginable is a mere trifle compared to a tough B.C.L. In the opinion of the writer, we hams need to perfect a suitable method of attack on the latter problem far more than we need information on the mechanics of B.C.I. elimination—although we can always do with more of that, too.

In view of the foregoing considerations, the recent experiences at W2BRO have resulted in the evolution of a suggested plan of procedure which is believed to have considerable merit.

While the B.C.I. problem, per se, is purely technical, the B.C.L. problem is almost purely psychological. In Fig. 1 is shown a new type of "characteristics curve," which is based entirely on personal experience. It is practically self-explanatory. At the beginning, the curve naturally starts at 100 per cent (point A) and tapers off very gradually at first. After about eight days the slope increases more rapidly for a time. Points B and C, between the third and fifth weeks, again slope more sharply downward. This part of the curve may be defined as the "boiling point" section. That is, if the average B.C.L. has had his pet programs smeared for three consecutive weeks, he most assuredly will have reached the boiling point. Therefore, if the amateur does not take suitable action until the B.C.L.'s curve drops to some place between B and C, he stands roughly a 50-50 chance of securing some positive cooperation, or a negative amount. The conclusion is self-evident—do not allow point B, or any lower point, to be reached if it is physically possible to prevent it. The section CD pretty definitely corresponds to complaints put through the F.C.C., and to a greatly reduced chance of securing reasonable cooperation. Of course, the F.C.C.'s form letter to the B.C.L.'s tends to put most (but not all) of them back up on the curve to a point somewhere between 50 per cent and point A. However, there is no good reason that any amateur should let the B.C.L. go until this backing-up action is required. The specific reasons against it are excellent: (1) It means more work and trouble for the amateur. (2) It is not fair to the B.C.L. (3) It means more work for the F.C.C. (4) And most important, it does not help to convince the general public that amateur radio is a service which exists by reason of public welfare and necessity.

The plan evolved from these considerations may be summarized as follows:

1. When you move into a new location, first put your transmitter into operation in full compliance with all rules and regulations, and then operate it (on all of the bands you contemplate using, if possible) for several days at various hours.

2. Do not try to keep your identity and location a deep secret from the neighboring B.C.L.'s. Instead, actually go around and solicit B.C.L. complaints in the immediate vicinity of the station, and explain the whole story in the most friendly way possible, even at the expense of lost operating and personal time.

3. Offer to eliminate the interference and then...
do so promptly (not a week later)—but do not use the expression, “I will fix your radio for you.” Some B.C.L.’s have modern, expensive sets, and the word “fix” immediately conjures up in their mind a mental picture of a lad with a saw, a hammer, a screw-driver, and a crow-bar tearing up their nice radio and possibly ruining it. Quickly explain that the radio itself does not, in the vast majority of cases, have to be touched; that the installation of an r.f. choke, low-pass filter, or a wave-trap is made in the antenna lead-in circuit, and does not in any way harm the receiver or the standard programs received.

(4) When you are invited in to the B.C.L.’s home, be sure that you are presenting the best possible personal appearance—it will help you to make a good first impression and will make the job easier. Do not barge (that well describes it) immediately over to the radio set and start removing vases, electric clocks (the writer dropped one once), books, etc., with only a curt word or two. Put it in a more tactful way, and may decide that he does need a better receiver after all. If he intimates as much in any way, be quick to offer to help get a good one. You know what to look for, in a given case, and you should be sure that he realizes he has some expert advice handy, free of charge.

(5) If you have a flock of cases to work on, explain this in a nice way, and point out that it is a rather costly proposition for you; and that if they would be willing to pay the very small cost of the actual gadgets required, it would seem to be a fair arrangement all around and a big help to you. In most cases, nice people will do this gladly and without question. If they object on “the principle of the thing” (i.e., you are causing the trouble, why should I pay you to eliminate it?), try and get them to put themselves in your position. If they cannot or will not do this, do not press the point any further; just smile pleasantly and say, “All right, then, I’ll put the gadgets on an indefinite loan basis, because I really don’t want you to be interfered with on account of my hobby.” In many cases, a pleasant capitulation of this kind will win them over, in the end. They may feel just a little bit ashamed of themselves. The Radio Law or the F.C.C. do not demand anyone in particular to pay for the gadgets. However, in stubborn cases, the amateur can well afford to give in, graciously. After all, the stubborn cases will be in the minority if rule No. 2 is carefully observed.

(6) If a B.C.L. is willing to cooperate fully, and you have a bit of trouble in determining the exact treatment necessary, ask him if he will let you take the receiver to your station to locate the cause of the r.f. pick-up (not to fix it). Point out that you have meters and other test equipment at home (mention an oscillograph if you have one, for the psychological effect), and that by taking the set home you can do a bang-up job of eliminating the interference. If you can eliminate it at that close range, obviously it will be perfect in its normal location—he can see that.

(7) If some B.C.L. has suffered interference for a considerable time, in spite of Rule No. 2, he may be at the “boiling point” by the time you get to him (that is why Rule No. 2 is of paramount importance). In this case, you will need all the tact and diplomacy at your command, and then some. If he shouts at you and says nasty things, take it quietly and wait until he cools off. Put yourself in his shoes, and think how many of his pet programs have been utterly smeared. Sympathize with him 100 per cent. Tell him that it is a darned shame, that you know exactly how he feels, and that you don’t blame him one bit for being upset (not “angry,” or “nasty,” etc.). Tell him about Rule No. 2, and that it was entirely unintentional on your part that he was overlooked in the original survey. In connection with this possibility, it might be a good plan occasionally to announce over the air (if you have a phone transmitter) something like this: “Attention all broadcast listeners (repeat this several times). If anyone’s radio program is being interfered with, please notify at once ‘Mr. John Doe,’ located at No. 000 ‘Doe’ St., Podunk, N. J., or

(Continued on page 88)
In Problem No. 23, set forth in QST for December, Our Hero asked for suggestions on methods of automatically maintaining the input to his final amplifier essentially constant at some desired value, even though the loading or tuning of the final amplifier might vary within reasonable limits. In certain contests, a multiplier bonus is given to those operators who limit the power input to the final amplifier to some specified value. Our Hero, being a conscientious individual, was in search of some scheme which would insure that the input to the final would not exceed the specified limit even though he tuned the transmitter hastily.

Three practical solutions were submitted. Several contestants suggested the simple expedient of using a resistance in the plate-voltage supply lead to the final amplifier which will have a ballasting effect over a fairly wide range of plate-current values. This scheme, shown at A, Fig. 1, should be quite satisfactory in cases where the power limit may be obtained at about half the normal plate-voltage supply or where a higher-than-normal plate-voltage supply is available. As an example, an input of 100 ma. at 1000 volts is taken as normal for a limit of 100 watts. The effective resistance of the tube is, therefore, 10,000 ohms. If a 5000-ohm series resistance is used, the voltage drop through the resistance at 100 ma. will be 500 volts and, to maintain 1000 volts at the plate of the tube, a 1500-volt supply will be required. If the plate current is changed by variation in loading or tuning, the effects will be those shown in the following table.

<table>
<thead>
<tr>
<th>Plate Ma.</th>
<th>R Drop</th>
<th>Effective Plate Voltage</th>
<th>Amplifier Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>350</td>
<td>1150</td>
<td>80.5</td>
</tr>
<tr>
<td>80</td>
<td>400</td>
<td>1100</td>
<td>88</td>
</tr>
<tr>
<td>90</td>
<td>450</td>
<td>1050</td>
<td>95</td>
</tr>
<tr>
<td>100</td>
<td>500</td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>110</td>
<td>550</td>
<td>950</td>
<td>104</td>
</tr>
<tr>
<td>120</td>
<td>600</td>
<td>900</td>
<td>108</td>
</tr>
<tr>
<td>130</td>
<td>650</td>
<td>850</td>
<td>110</td>
</tr>
<tr>
<td>140</td>
<td>700</td>
<td>800</td>
<td>112</td>
</tr>
</tbody>
</table>

If the series resistance is changed to 20,000 ohms, the drop at 100 ma. will be 2000 volts and a 3000-volt supply will be required. The difference in results may be determined from the following tabulation.

<table>
<thead>
<tr>
<th>Plate Ma.</th>
<th>R Drop</th>
<th>Effective Plate Voltage</th>
<th>Amplifier Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>1400</td>
<td>1600</td>
<td>112</td>
</tr>
<tr>
<td>80</td>
<td>1600</td>
<td>1400</td>
<td>111</td>
</tr>
<tr>
<td>90</td>
<td>1800</td>
<td>1200</td>
<td>108</td>
</tr>
<tr>
<td>100</td>
<td>2000</td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>110</td>
<td>2200</td>
<td>800</td>
<td>88</td>
</tr>
<tr>
<td>120</td>
<td>2400</td>
<td>600</td>
<td>72</td>
</tr>
<tr>
<td>130</td>
<td>2600</td>
<td>400</td>
<td>52</td>
</tr>
<tr>
<td>140</td>
<td>2800</td>
<td>200</td>
<td>28</td>
</tr>
</tbody>
</table>

If, however, the resistance is made equal to the effective plate resistance of the tube (10,000 ohms), the drop at 100 ma. will be 1000 volts, a 2000-volt plate supply will be required and the effects are as follows:

<table>
<thead>
<tr>
<th>Plate Ma.</th>
<th>R Drop</th>
<th>Effective Plate Voltage</th>
<th>Amplifier Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>700</td>
<td>1300</td>
<td>91</td>
</tr>
<tr>
<td>80</td>
<td>800</td>
<td>1200</td>
<td>96</td>
</tr>
<tr>
<td>90</td>
<td>900</td>
<td>1100</td>
<td>99</td>
</tr>
<tr>
<td>100</td>
<td>1000</td>
<td>1000</td>
<td>100</td>
</tr>
<tr>
<td>110</td>
<td>1100</td>
<td>900</td>
<td>99</td>
</tr>
<tr>
<td>120</td>
<td>1200</td>
<td>800</td>
<td>96</td>
</tr>
<tr>
<td>130</td>
<td>1300</td>
<td>700</td>
<td>91</td>
</tr>
<tr>
<td>140</td>
<td>1400</td>
<td>600</td>
<td>84</td>
</tr>
</tbody>
</table>

Fig. 1 — A — Series-resistance ballast. B — Vacuum-tube regulator. C — System using variable flux regulator. See text for details.
The interesting part of this tabulation is that not only is the variation from the 100-watt limit least with the resistance equal to the effective tube resistance, but also that under no circumstances will the input exceed the specified limit. This assumes, of course, perfect power-supply voltage regulation and sufficient excitation to maintain Class C operation. Poor power-supply regulation will itself cause a certain degree of compensation, the output voltage dropping with an increase in load current. The first tabulation shows that a lower value of series resistance causes a drop in input with a drop in plate current. Therefore, in practical application, a value of series resistance somewhat less than the effective plate resistance will give the best results. An adjustable resistance with a maximum equal to the effective tube plate resistance could be used adjusting it experimentally to the best value for the power-supply characteristics.

To determine whether this system could be used with the equipment available, divide the highest available plate voltage by two; divide the power limit desired by this voltage to determine the required plate current and from these values of operating plate voltage and plate current, determine if a suitable tube or combination of tubes is available. The value of series resistance to be used will be equal to the reduced plate voltage divided by the plate current. As an example, if a 1500-volt plate supply is available and the power limit is 100 watts, the operating plate voltage will be 1500 divided by two or 750 volts; the maximum plate current will be equal to 100 divided by 750 or 0.133 amperes, and the series resistance to be used will be 750 divided by 0.133 or 5600 ohms.

A second scheme proposed by several is shown at B. Here a triode, such as a 45 or 2A3 and resistor are connected in series with the high-voltage d.c. line. The grid of the triode is connected back to the negative high-voltage end of the resistance so that plate-current flow through the resistance will develop a bias which is applied to the grid of the control tube. Since any change in the plate current of the final amplifier will cause a change in bias to the control-tube grid, and since this change operates to increase the resistance of the control tube whenever the final-amplifier plate current tends to increase, or vice versa, the control tube will keep the input to the final amplifier at an essentially constant input. The control tube must be capable of handling the maximum final-amplifier plate current to be expected. Tubes may be connected in parallel in the control position, if necessary. This system should cause less voltage drop than the resistor method and it is quite probable that the input will be held within closer limits when correctly adjusted since the control tube acts as a variable resistance.

W9YOX suggested three different methods which may be used. One of those which has interesting possibilities is shown at C. Here we have T1, the tube to which the control is applied, V2 the control tube, T1 the regulating transformer, T3 the plate transformer whose primary is fed through T1, and T2 an auto transformer which compensates for the voltage drop through the windings of T1, R1 is a bias resistor and is tapped also to provide bias for V2 while R2 is a decoupling resistor.

The tap on R1 is the control adjustment and is adjusted so that V1 is drawing the desired current at the desired voltage. With the plate voltage constant, a change in plate current should cause a change in the voltage drop across R1 and, therefore, the bias of V2. This will cause an opposite change in the plate current of V2 and also in the control coil of T1. There will also be a change in voltage across that part of R1 which is common to V1 and V2, but with V1 operating Class C, it will have very little effect on V1. However, the current change in the control coil of T1 will cause a change in the impedance of the a.c. coils and, as they are in series with the primary of the plate transformer T3, there will be a change in the voltage applied to the plate of V1 which will be opposite to the change in plate current. As a change in the plate voltage of V1 will cause a corresponding change in its plate current, and as this change in plate current causes an opposite change in the plate voltage, the voltage change will be limited by the plate characteristics of V1. As the plate characteristics of V1 vary with excitation and plate loading, the plate voltage will also vary with excitation and loading. Therefore, as the control adjustment is set at the point that will give some definite power input, any change

(Continued on page 66)

PROBLEM NO. 25

With the approach of Spring, Our Hero is giving thought to the problem of providing adequate protection against damage by electrical storms. He knows that an antenna system may be a hazard or a protection, depending upon the manner in which it is installed. He would like to have some suggestions on simple, yet adequate methods of providing protection against lightning.

Fig. 2 — Meter calibration for use with manual control.
PUTTING THE ANTENNA BACK ON THE POLE

If an antenna halyard breaks, or if the pulley fastening breaks, the unfortunate ham is usually confronted with a big problem. At VE5DG, with the ground frozen and all the rigging fallen to the ground, prospects looked none too pleasant to the operator upon his return after a long absence. The poles were too tall and slender to be climbed, and the condition of the ground was added to the usual obstacles against taking down the poles. Suggestions from sympathizing friends ranged from kites to monkeys trained for such jobs, but none of these was considered practical.

After much searching, a method for replacement of the rigging was found; and with the necessary materials gathered together at a pole, less than twenty minutes were required for the complete operation.

A few 1-inch by 2-inch pieces of wood are used to carry rigging to the top of the pole. A hole is bored through the upper end of the first piece, and through it is passed a short length of stiff wire which is then bent to form a loose circle about the lower portion of the pole. Three hooks bent from soft copper wire and suspended from this hoop support a slip rope snare in which is placed the new pulley. Short pieces of wire are tied between the stiff wire hoop and a point on the stick a few inches above it, to carry the weight of the slip noose and insure that the loop remains horizontal throughout the climb to the top of the pole.

This assembly is then pushed up the pole by a member of the crew on a long ladder leaned against the pole, and the top of a second piece is then nailed to the bottom of the first. At this joint is fastened a second loop of wire around the pole, and the operation is repeated.

A sketch of the arrangement of the rigging at the top of the first stick is shown in Fig. 1-A. The completed assembly raised to the top of the pole is diagrammed in Fig. 1-B.

The tackle is sent up the pole one 1-by-2 length, ladder high, at each step in the process. Particular care is exercised to prevent enthusiasm from allowing the loop to be pushed past the top of the pole. As insurance against such a calamity, it is desirable that someone view the closing operations from a point some distance from the bottom of the pole, since it is possible to be deceived by viewing the top of pole from directly beneath.

When the top loop has reached the proper point near the top of the pole, a pull simultaneously applied to the two ends of the rope through the pulley is used to straighten out the soft wire hooks supporting the noose, and to tighten the noose on the top of the pole.

When the pulley is in place at the top of the pole, the sticks are lowered in steps and taken apart, and are then ready for similar use elsewhere.

Although the pole on which this method was used is unguyed, it may readily be applied to guyed systems as well. The top guys provide insurance against overrunning the top of the pole and on a calm day, the intermediate guys may be unfastened from the stakes (if the pole is reasonably rigid) and pulled tight down to the base of the pole while the new rigging is run up.

William Lowry, VE5DG

INCORRECT USE OF 110-VOLT LAMPS TO TERMINATE RHOMBICS

In a number of contacts with amateurs using rhombic antennas, dissatisfaction with them in many cases was found to arise from termination in 110-volt lamps. A Mazda lamp cal-
culated by Ohm's law at 330 ohms was used for a series of resistance measurements at different power dissipations, and it was found that the resistance of the unheated filament is approximately 60 ohms, less than one-fifth of the heated value.

Thus, many of the installations making use of lamps have actually presented terminating impedances far from the expected values, and have resulted in improper operation of the systems, probably more often than not dissipating disproportionately large parts of the transmitter output, and leading to standing waves on the rhombic and feeders.

Even though lamps are carefully chosen for proper resistance at the working load, keying the carrier results in rapid change of the terminating resistance, and thus in the radiation of the system. This means that satisfactory use of lamps for termination is almost entirely limited to 'phone operation with output power confined to narrow limits.

— L. F. Sherwood, WII4AS

SIMPLIFIED METER SWITCHING

To obtain meter economy, provide rapid meter circuit and range shifting, eliminate meter jacks, and avoid necessity of drilling many large holes in front panels, amateurs are now making wide use of meter switching. The installation at W3GKP incorporates a single 0-1 d.c. milliammeter in an arrangement for voltage and current measurements at the turn of a single knob. This simple system should interest fellows with multi-stage transmitters and limited measuring equipment.

The meter, a Weston model 241 with 38 ohms internal resistance, would require shunt resistance of 0.165 ohm for 200 ma. and 0.006 ohm for 500 ma. in the arrangement ordinarily used for milliammeter range multiplication. In view of the expense of such resistors, and of the errors which would be introduced by an ordinary tap switch in series with the shunts, the higher-resistance arrangement of Fig. 2 is considered simpler and less expensive. A combination of series and shunt resistor values may be chosen which will permit use of stock sizes, and thus will make the cost of additional ranges only a few cents each. The resistor values should be held to reasonable limits, however, determined by permissible voltage drop across the milliammeter system.

Since a low-current milliammeter may conveniently be used for measuring electrode voltages, it was decided to incorporate a voltmeter in the switching system. The resulting voltmeter-milliammeter combination circuit is given in Fig. 3. Although there are shown only three voltage and three current ranges, the number which may be provided is limited only by the number of switch contacts and the available resistors.

With this switching arrangement, all of the transmitter circuits involved are left in operating condition with the meter system connected, and the meter may be moved from one circuit to another, voltmeter or milliammeter, without interference to the transmitter operation.

The current shunt resistors, \( R_4, R_5, \) and \( R_6 \) are all 10-ohm 1-watt carbon units, except \( R_6 \) when used for 500 ma., which then should be a 5-watt wire-wound resistor. The values of voltmeter series resistors, \( R_1, R_2 \) and \( R_3 \), and the milliammeter series resistors, \( R_7, R_8, \) and \( R_9 \), may be obtained from the table below:

<table>
<thead>
<tr>
<th>Potential Range</th>
<th>Series Resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 volts</td>
<td>0.1 megohm</td>
</tr>
<tr>
<td>200 &quot;</td>
<td>0.2 &quot;</td>
</tr>
<tr>
<td>500 &quot;</td>
<td>0.5 &quot;</td>
</tr>
<tr>
<td>1000 &quot;</td>
<td>1.0 &quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Range</th>
<th>Series Resistor</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 ma.</td>
<td>200 ohms</td>
</tr>
<tr>
<td>50 &quot;</td>
<td>450 &quot;</td>
</tr>
<tr>
<td>100 &quot;</td>
<td>1000 &quot;</td>
</tr>
<tr>
<td>200 &quot;</td>
<td>2000 &quot;</td>
</tr>
<tr>
<td>500 &quot;</td>
<td>5000 &quot;</td>
</tr>
</tbody>
</table>

All of the above may be 1-watt carbon resistors except the one megohm resistor for the one thousand volt range, which should be two 1-watt carbon 0.5-megohm resistors in series, so that not more than 500 volts is placed between the ends of any resistor. Also, for each voltage range above 500, a carbon 1-watt resistor of 5000 ohms should be connected across the pair of switch points used.

One-watt carbon resistors can be obtained in a wide range of even values and have a reasonable constancy when not subjected to overloads. They can be supplied with tolerance of 5 per cent upon request, or the constructor may select accurate resistors by means of a calibrated ohmmeter.
This provides an overall meter accuracy well within 10-per-cent limits, an accuracy quite suitable for most amateur purposes. An exception to this is the measurement of current and voltage of an amplifier of more than 900 watts input.

— William L. Smith, W3GKP-N3GKP

RECEIVER-OPERATED RELAYS

It is often found desirable in the amateur station to make use of received carriers for relay operation. This may be applied to interstation noise suppression, where relay contacts may be used in series or in shunt with the voice coil of a speaker, or it may be applied to automatic reception of code with a fast-operating relay.

Two simple and thoroughly practical circuit arrangements for carrier-operated relays are shown in Fig. 4.

The circuit shown in A is that of a grid-leak detector, the plate current of which is decreased by reception of a carrier. The armature of the relay is thus held down until a carrier is received, at which time the grid bias of the tube increases, the plate current decreases, and the armature is released. The type of relay shown — single contact closed with no current — may be connected in series with the voice coil of a speaker, to make the latter inoperative during no-carrier periods. This type relay contact is also suitable for keying an automatic recorder or for retransmission of telegraph signals.

R_W is a small d.c. relay designed to operate at approximately 8 milliamperes. Resistor R_2 is adjusted to give sufficient screen voltage to maintain the relay contact open without received carrier.

B is the circuit of a plate detector arrangement which operates in the reverse fashion. The plate current of the tube is normally insufficient to operate the relay, but reception of a carrier results in an increase sufficient to pull down the armature. In this arrangement, resistor R_W, the bias resistor, is used to control the plate current for proper operation of the relay. If this is used for keying another transmitter, or for other devices requiring a circuit-closing effect by carrier, a relay which makes contact with increased current should be substituted for the type shown.

— James A. Eberhart, W3KKW

USE FOR METER BOXES

A measure of protection for meter and for operator results from a simple and ready use of the boxes in which meters are purchased. These boxes are usually provided with cardboard insert with large hole for the body of the meter.

In order to place the meter in immediate use, the meter and the small envelope of mounting screws are first removed from the box. A hole of 1/4- to 1/2-inch diameter is then punched in one side near the bottom, and the meter connecting wires are carried through the side, then through the front of the box, and connected to the meter. The meter is then replaced in the box, and a sharp instrument is used to punch three small holes in the positions of the three meter-mounting holes.

The three mounting screws are then pushed through the front of the meter into the holes, in which they should make a firm fit. A sketch of the assembly is shown in Fig. 5. This “boxed” meter is suitable for horizontal or vertical use on the operating table, and danger of having the connections contact metal objects or stray wiring is eliminated.

— George H. Jette, W1LEW, U.S.N.

Landmark Becomes Ham Emergency Center

(Continued from page 43)

The project is being carried on in conjunction with the general park program of the city, and the local hams give all credit to municipal and WPA officials whose cooperation made it possible. Among the amateurs who have been active in promoting the development, as incorporators of the Manchester Radio Club, are J. Brodie Smith, E. Stuart Davis, Carroll A. Currier, Louis E. Robitaille and Maurice H. Deschenes.
South Africa

With the new provisions in international radio introduced at Cairo that make it permissible for countries outside the Americas to allow broadcasting in 7200-7300 kc., there has been some conjecture in amateur circles as to what conditions will be like when the high end of 40 becomes the new 8outh African regulations. They have log-book requirements quite similar to ours. Further, it is stated in the regulations concerning d.c. power supply, harmonic and spurious radiation, keying transients and percentage of modulation are quite similar to ours. Further, it is stated in the regulations that an amateur station shall be equipped with an efficient transmitter, a selective receiver and a monitor or wave-meter.

Mr. Kent also included with his letter a copy of the new South African regulations. They have some interesting points and, if you'll bear with us, we'll make some rambling comment on them. They have log-book requirements quite similar to those in the United States, requiring the logging of all essential information.

Regarding antennas, "the aerial system shall conform to any by-laws laid down by Municipal or other local government bodies." Direct coupling is forbidden except where matched impedance coupling is used, and "the coupling shall be loose in order to prevent the emission of double waves."

Every licensee must own a frequency meter or monitor capable of accurately measuring the frequency of transmission, and this meter must be accurately calibrated to within 0.5 per cent.

All of the Cairo bands are available for c.w., and 'phone is allowed in 1715-2000 kc., 3650-3900 kc., 14,150-14,250 kc., 28,000-30,000 kc. and 56,000-60,000 kc., as well as in 2½-meter and 1¼-meter assignments duplicating those in the U.S. Music transmission is allowed for test purposes, not to exceed a period of three months, followed by complete cessation of music transmission for at least five minutes. An amateur is not allowed to use telephony until he has been actively engaged on c.w. for at least twelve months. Duplex telephony is limited to half an hour in any two hours.

Their regulations concerning d.c. power supply, harmonic and spurious radiation, keying transients and percentage of modulation are quite similar to ours. Further, it is stated in the regulations that an amateur station shall be equipped with an efficient transmitter, a selective receiver and a monitor or wave-meter.

The initial annual license entitles the holder to use a maximum input of 50 watts and radiotelegraphy. The second annual license allows him to use 50 watts input and c.w. and 'phone, and the third and any subsequent license entitles him to 100 watts and c.w. and 'phone. In every case where more than 50 watts of power is used the oscillator shall be crystal-controlled or electron-coupled. Portable transmitters may use only one-fourth the power permitted the home station. Portable operation, when authorized, is allowed within the license area under the regular call and, after receiving written permission from the Postmaster General, portable operation is allowed in any license area under the regular call and, when authorized, is allowed within the license area under the regular call sign followed by the "break sign," the letter P, and the district number.

Every applicant for renewal of a license must satisfy the Postmaster General that the station has been reasonably active during the preceding year or in the event of inactivity furnish good reasons therefor. Unless the amateur station has been inspected by a duly authorized officer, the
licensee must forward with his renewal application his station log book covering the past year’s activities.

As in most British countries, communications “… must be limited to messages relating to the experiments and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telegraph service would be out of the question.” Communication must be in plain language, which in Africa means Afrikaans, English or French, or in the Q code.

The most marked difference in the regs, at least to us, is the portion governing procedure. For example, a call or CQ is not to be called more than five times before signing, and this is not to be repeated more than three times. (What a blow that would be to some of the CQ-chumps in the U.S.!) The letter K follows both calls and CQ’s. Provisions are included for ‘phone procedure, and when calling on ‘phone the called station is named twice and then the calling station is named twice, repeating for as long as thought necessary to raise the station. Differentiation is made between domestic and “DX” procedure; “CQ DX” may be called ten times on ‘phone before signing (not more than ten times), all to be repeated not more than three times.

Apparently just anyone can’t speak over the microphone of an amateur station. The regs read: “A British subject, who has proved to the Postmaster General his ability to transmit and receive Morse signals at the regulation speed of twelve words a minute, or who is a member of an amateur radio organization recognized by the Postmaster General, may be allowed by the licensee to operate the key or microphone for periods of short duration under the supervision of a licensed amateur with the object of instructing such person in the operation of a transmitter.” However, this does allow an unlicensed person to get actual code practice on the air before he has obtained his license.

The S.A.R.R.L. enjoys excellent contact and relations with the Postmaster General and his staff. Most of the revised and new regulations are the result of a two-days’ joint meeting of the government representatives and the S.A.R.R.L. council.

**HERE AND THERE**

**Sweden:** Interest in amateur radio is steadily increasing, and the S.S.A. is growing stronger. Newly-elected and re-elected officers include Erik Lofgren, president; Costa Siljeholm, SM5SI, vice-president; Arne Lindberg, SM5VR, secretary; and Hans Eliasson, SM6WL, editor of *QTC*.

**Switzerland:** There are now 101 licensed amateurs here, with 92 of them active. The USKA is working towards more c.w. and less ‘phone, in view of the extremely bad conditions in Europe …… **Greece:** Amateurs have been requested to “pipe down” until the new regulations are formulated …… **France:** A very strong editorial in *Radio-REF* by President G. Barba, F8LA, inaugurates a “c.w. campaign” in an effort to clean up the unfortunate situation and intolerable conditions brought about in France by allowing “no-code” licenses for ‘phone operation. The REF intends to clean up their bands so that the future of amateur radio will have a better chance …… **England:** The Senior B.E.R.U. Contest will run from February 4 to February 7, and the low-power (Junior) Contest will run February 9th to February 12th. The Contest, you know, is open only to British subjects living within the British Empire and British Mandated Territory who are members of the R.S.G.B. or a British Empire society, so don’t waste the time of the entrants by calling them during the period of the Contest.

**How Would You Do It?**

(Continued from page 61)

in excitation or loading will cause the plate voltage to change to a value that will give approximately the same power input.

Various types of manual control of input were suggested by some but, of course, these do not meet the specified requirement of automatic control. One idea which seems worthy of mention, however was submitted by W80MM. He suggests the use of a variable autotransformer, such as a G.R. Variac feeding the primary of the plate transformer for regulating the power input to the desired point. A plate milliammeter and voltmeter are used to indicate power input to the final amplifier. To eliminate the necessity for calculating power input from the current and voltage readings, he suggests furnishing each of the meters with an auxiliary calibration as shown in Fig. 2. Voltage and current scales are given similar numbers at points where the product of the two gives the desired input. For instance, for an input of 100 watts, the 500-volt point on the voltmeter and the 200-ma. point on the milliammeter will be labelled 1; the 600-volt point and the 166-ma. point will be labelled 2; the 700-volt point and the 142-ma. point will be labelled 3. Equal numbers will also be marked on the scales at 800 v., 125 ma.; 900 v., 111 ma.; and 1000 v., 100 ma. Then it is necessary only to adjust the autotransformer until the meters have equal readings according to the new scales to set the input to the desired 100 watts.

**Prizes**

First Prize: C. A. Peckham, W9YOX.

Second Prize: Philip Reich, W2HUG.

We wish also to thank the following for their contributions: W1JB, 2LOM, 3EEI, 4DNA, 4EMF, 5EQQ, 7BHE, 7FGQ, 8BYU, 9EHD, 9TFS, G2IS, GM6IZ, K. Brown and A. Faulkner.
CORRESPONDENCE FROM MEMBERS

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

SWEEPSTAKES SUMMARY
2815 34th St., Astoria, L. I., N. Y.
Editor, QST:

Thank heaven it's over! It's been nigh onto fifteen years since I entered a contest (if my memory doesn't fail me it was the trans-cons) but, boy, what a kick I got out of the tough competition the young squirts gave me!

Sleepless days and sleepless nights ... home QRM ... constant CQ's by the XYL ... baby trouble ... and a host of other complications — but at the end I was still there, if just a bit groggy.

For hours after the darn thing was over dots and dashes continued to emanate from doors ... faucets ... coffee cups ... pillows ... what not. Some fun!

Please rush me the necessary forms to accommodate upwards of 400 contacts with 67 or more sections.

— Gene Turney, W2AP'T

EDITOR'S NOTE. — Remember the old Crystal detector and those Turney spiderwebs? Well, it seems here's one old-timer who hasn't lost his touch. It is a remarkable commentary on amateur radio that a man of W2AP'T's background and experience should still get such a kick out of the game after all these years.

INSIDE-OUT B.C.L.s

S/S Greathope, Copenhagen, Denmark
Editor, QST:

What are the best things in amateur radio? The spirit that dares to try what has never been done before: the spirit that reaches over seas and mountains to distant lands; the quiver of excitement we get from our first QSO; the mature feeling of accomplishment we get later from operating a more complex outfit, conscious of all the little niceties of adjustment and all the little courtesies of operating; the happy thoughtful silence that sometimes falls unbidden on the congenial group in a shack late at night when the last SK has been sent — these things cannot be wrapped in cellophane and sold for so much a dozen.

What are the worst things in our hobby? Stereotyped QSO's? The QSL card situation? Thoughtless, inconsiderate operating? Petty squabbling within our ranks? We have always put up with these things, but I think the most discouraging is that apparently about a third of our number at the present day are not amateurs at all, but merely B.C.L.'s turned inside out. What about the man with more money than sense who buys a high-power commercially-made station and uses it to broadcast drunken parties, who sneers at the clumsy efforts of the beginner next door when he himself has never made the simplest piece of apparatus and sends his own back to the factory when anything goes wrong with it?

For years there have appeared in our Correspondence columns criticisms of the trend towards manufactured apparatus, not components but ready-made units for the "amateur amateur" whose only contribution to the design of his station is the placement of it in the living room. Let us by all means take advantage fully of the splendid array of new tubes and components made available by commercial research. It is not this that spoils the amateur game; it is the availability of "amateur" transmitters and receivers, now sold not only by the old firms from whom we have been buying parts for so long, but by others who suddenly realize the existence of a new lucrative field. Some of these jobs (not all) are well-engineered units. But if the A.R.R.L. is still an amateur organization it should do something to discourage this particular type of commercial expansion. Already it is leading to agitation for the removal of code requirements for five metres; this can only be to enlarge the market for manufactured transceivers. None of us wants to kill legitimate business when it is legitimate, but if the manufacture and sale of complete units continues at the present rate these "amateur amateurs" will grow in number until they can outvote the rest of us in our own organization, the A.R.R.L. Then good-bye, code test; good-bye, operating efficiency; good-bye, emergency organization; good-bye our spirit of research, progress, and brotherhood. Ten million bored stiffs will sit in front of ten million identical rigs; "Amateur Radio" will be a bigger business then ever before, but its soul will be dead.

My proposal is that QST should ban advertisements of complete units from its pages as a measure of discouragement. The loss of revenue would only be giving up something it ought never to have had. If any big firm threatens to withdraw...

(Continued on page 68)

February 1939 67
Sportsmanship. These individuals deserve our whole-hearted condemnation whenever and wherever we find them:

The ham with the wabbly chirpy voice, who inconsiderately parks right on top of the station we're working.

The chap who gets caught off frequency and then squawks about injustice and tries to produce alibis.


The message pusher who has too much false pride to ask for needed fills, garbles deliveries, or is so unreliable he delays or loses TFC for which he has accepted responsibility!

The confirmed testers who seldom sign, but bust up good QSOs for their betters.

The buzzards that never QSL under any circumstances.

The man with the tough note with whiskers who uses a big slice of band.

The voice station that consistently overmodulates to bust thru.

The radiotelephone operator who so far forgets the proprieties as to allow transmission of any doubtful character to enter the public domain (and cause reflections on the amateur service by his action).

The fellow with BCL QRM who lords it over his neighbor, talks him down, and creates an enemy-to-the-last for the whole amateur service.

The fellow who goes in for awards in operating or activities and who then doesn't want to abide by the rules that govern the hobby.

The DXer after tin-god fame, that cheats to get Century Club cards by going out of band for short periods to grab countries.

Sportsmanship is an exhibition of traits characteristic of sportsmen. A sportsman is one reputed to be "fair" and "generous," a good loser, as well as a graceful winner.

The good amateur is engaged in a hobby that is for short periods to grab countries.

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Irresponsibility of the few unfortunately always reflects against the many. Within our bands, there is a growing spirit of intolerance toward the individuals who are incon siderate, and value their transmitting privilege lightly. The operating instincts within the brotherhood have in recent years been strongly aroused against those who because of carelessness or intent were logged off frequency in many major activities. It is a correct tendency, the growth of this kind of intolerance. The courtesy signal, the incon siderate tester, the fellow who has no real generosity or helpful spirit within bands, pales to insignificance when we consider the dangers that beset all of us in possible future increases in restrictions, and possible loss of privileges from carelessness, miscalculation, or wanton amateur operating that has an effect outside our bands and with neighbors and citizens outside our amateur circle.

The object of this little review of some of our less handsome operating furniture is to focus a little light on the obvious practices that ought to be speedily driven out of amateur radio by outraged amateur opinion in direct contact with these practices.

When you hear a bad note tell the operator about it, and that you don't think much of it! Live up to a high set of operating standards and look frankly to other amateurs to do the same! When you hear a ham sneak out of the band for a QSO and hop back in, tell him about it. Warn him. Make your low opinion of this sort of work clear, and make it clear that your effects and his are going to know about his unpersons work, too! Use your influence on the side of perpetuating amateur radio. Be utterly intolerant of the transmission "parties" suggestive allusions or stories. As many amateurs as possible should instantly "null" such things and "rid offenders unmercifully." Also, any off-frequency operation is potentially dangerous, likely to cause interference, and trespass on other people's frequencies and rights. Call on amateurs out of the band limits to check up and move in! Likewise, amateurs with general coverage coils can do the fraternity a service by checking up on the harmonic shadows of bands at 21 to 21.9 Mc., 7.3-8 Mc., 10.5-12 Mc. and the like. Start messages or postal cards to any amateurs heard in such regions asking their immediate cooperation. You will be doing them, and Amateur Radio (which includes yourself) a real service. All the things listed at the start of this dissertation, and which many members write Headquarters about time and again, are subject to remedy by exercise of the proper degree of personal intolerance directed from many sources at the chief offenders. Do your part in a better operating program. A more sportsmanlike and enjoyable amateur radio will result for all.

F. E. H.

1.75-Mc. Trans-Atlantic Contacts

A special "160 meter c.w." test arranged via radio by G6WY and others for January 7th-8th resulted in many W-G contacts. Conditions were excellent and the band was literally teeming with G's. VE1EIA worked G5JO, G5RI, G6XJ, G2RC, G5QY, G2CF, G6G9, G6IQ and G6Hl; heard G6GM, G6GL, GA1H, G5MY. W1BB worked G9RI, G2PU, G5QY and G6WY. W1AW worked G6WY, G6MK, G2PU and G5QY; heard G5PR, G6GL, G21Z and G2CF. W1DIZ, with 8 watts input, established contact with G6WY, W1BB and VE1EIA each receiving one report of SS. Reports at both W1BB and W1AW averaged S8. All this was between 11:00 p.m. and about 2:00 A.M. EST, when signals faded out.

With such work as the above being reported the February 1.75-Mc. Trans-Atlantic Tests (see page 90, January QST) are expected to be most successful. Please report all "160 meter" DX contacts or reception to A.R.R.L.

"Hello CO"

W9ONI tells of the inquiry received at a local broadcast station (WEBEC) regarding the whereabouts of station L-O-C-Q.

February 1939

69

PRIZES FOR BEST ARTICLE

The article by Mr. C. J. Buck, W3LVU, wins the C.D. article contest prize this month. Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX, "phone, traffic, racing, surfing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1938 bound Handbook, QST, Binder and League Emblem, six logs, eight pads radiogram blanks, DX Map and three pads or any other combination of A.R.R.L. supplies of equivalent value. Try your luck. Send your contribution to-day!

"Please QRS"

BY C. J. BUCK, W3LVU*

Quite a few members of the amateur fraternity have a complex in regards to their receiving ability, and wish the other operators to believe they could copy better if there were no interference. Generally they will give you a report that indicates your signals are readable, but then they tell you that QRM was on you and consequently they did not get a thing that you said. But when you slow down to bare six or eight words per minute they can receive you solid!

In my estimation, from twenty-five years of Western Union and railroad telegraphy and ham radio experience, it is not a thing to be ashamed of to be a slow receiving operator. I have found that some are natural operators, while to some it is an uphill climb to become a first-class man. It would save time, labor, cost of power used and also the patience of the sending operator if the slow men would shove their pride into the background and ask for a QRS if not able to receive at the speed the operator is sending.

Another thing that has been sticking is the man with a bug, who, wishing to impress some, one that he is a fast operator, sends at speeds that he is unable to copy himself! Then he will run up against some one who can travel along at his keying speed and send back to him at the same rate. In most cases these fellows cannot come anywhere near copying at the speed at which they transmit and the result is generally that they cry "QRM." This may seem a good excuse to cover up poor copying ability, but after a fellow has put in many years in code work he can tell in most cases whether or not it happens to be QRM or vanity.

I would suggest that the fellows concerned use QRS or slow down their bugs. Bugs can be adjusted to send slow or fast. Try to make your key-

* Hiborn Ave., Tiro, Ohio.
Dear [Name],

I hope this message finds you well. I am writing to you about the importance of accurate and timely communication in the amateur radio community. As a member of the Radio Club of America (R.C.A.), I want to emphasize the significance of clear and concise transmissions.

I have noticed a trend among some operators who are sending messages that are not only inaccurate but also overly wordy, leading to confusion and delays in communication. It is crucial that we all strive to be more efficient in our transmissions, not only to save time but also to maintain a level of respect and professionalism among our fellow operators.

One aspect of this is the proper use of punctuation. I recently read an article in QST that highlighted the importance of using new punctuation symbols in our messages. The International Telegraph Regulations, as revised at Cairo, 1938, made certain changes to the International Morse Code to address the need for clearer and more efficient communication. This included the introduction of new symbols for punctuation, which are now being widely adopted by amateurs around the world.

As an operator, it is important to familiarize yourself with these new symbols and to use them in your transmissions. This will not only make your messages clearer and more readable but also help to reduce the amount of QRM (QRM stands for “Questionable Radio-Morse”) that we are currently experiencing. QRM can be caused by operators sending messages that are too long or too complex, which makes it difficult for other operators to understand and copy.

I encourage all R.C.A. members to practice good communication habits and to support the use of new punctuation symbols. By doing so, we can help to improve the overall quality of amateur radio communications and ensure that our messages are getting through in the most efficient and accurate manner possible.

Thank you for your attention to this matter. I look forward to hearing your thoughts on this important topic.

Yours sincerely,

[Your Name]
F.C.C. Regulations on Emergency Communication

For the amateur service, the recently enacted Federal Communications Commission regulations give greatly increased assistance, looking to the larger general emergencies necessitating radio communications. The problem of the isolated operator or station in such circumstances has been by no means overlooked. Increased opportunity and responsibility in communications emergencies should be welcomed by amateurs. There is no sounder basis than service contributing to the public welfare for justification of a liberal government position in defense or extension of our allocations. The restrictions mitigating against casual conversation, testing, or any operation not pertinent to the court, not more than $500 for each and every day of a violation.

What will be expected of amateurs? Note the pertinent regulations well.

152.54. Operation in emergencies. -- In the event of widespread emergency conditions affecting domestic communication facilities, the Commission may confer with representatives of the amateur service and others and, if deemed advisable, will declare that a state of general communications emergency exists, designating the licensing areas or areas concerned (in general not exceeding 1000 miles from center of the affected area), whereupon it shall be incumbent upon each amateur station in such area or areas to observe the following restrictions for the duration of such emergency:

(a) No transmissions except those relating to relief work or other emergency service such as amateur nets can afford, shall be made within the 1715-2000 kilocycle or 3500-4000 kilocycle amateur bands. Incident activity testing or working, including casual conversation or remarks not pertinent or necessary to constructive handling of the general situation shall be prohibited.

(b) The frequencies 2800-3000, 3500-3525, and 3875-4000 kilocycles shall be reserved for emergency calling channels, for initial calls from isolated stations or first calls concerning very important emergency relief matters or arrangements. All stations having occasion to use such channels shall, as quickly as possible, shift to other frequencies for carrying on their communications.

(c) A 5-minute listening period for the first 5 minutes of each hour shall be observed for initial calls of major importance, both in the designated emergency calling channels and throughout the 1715-2000 and 3500-4000 kilocycle bands. Only stations isolated or engaged in handling official traffic of the highest priority may continue with transmissions in these listening periods, which must be forcibly observed. No replies to calls or assumption of routine traffic shall be made in the 5-minute listening period.

(d) The Commission may designate certain amateur stations to assist in promulgation of its emergency announcements, and for policing the 1715-2000 and 3500-4000 kilocycle bands and warning noncomplying stations noted operating therein. The operators of these observing stations shall report fully the identity of any stations falling, after due notice, to comply with any section of this regulation. Such designated stations will net in an advisory capacity when able to provide information on emergency circuits. Their policing authority is limited to the transmission of information from responsible official sources, and full reports of

(Continued on page 88)
**How: DX?**

_Ever since a certain individual ruthlessly told us there ain't no Santa Claus we've been an old skeptic. But because we know that there are countries where everything isn't smooth sailing, and because a lot of you are interested in OY4C, we're going to quote the message from OY4C to us that was relayed by W3EEW. It sounds pretty sincere._

The text: "... Dec. 29th, I ask you to print my following report in QST. I am a well known station to a great number of USA amateurs and others in the whole world. I have worked WAC all USA and VE districts, has USA contact on 14 Me., 7 Me., 3.5 Me., and out very nice. My station is a 90 watts Hartley for all bands antenna 38 mtr Fuchs receiver is OY42 so, I am very sorry to tell you the following news. It is my duty as a ham to let you know who is OY4C. I do not want to be called a phoney. For I am a foreigner in my country it is impossible to get a license, you all know that a real ham must work and so I took my own license with the call OY4C. What would you do in my case? I believe the same! I tried to get and send QSL via EDR Denmark or direct via the address S. Nipen, Ferras, Faeroes, but in vain without success. My own address I cannot tell you for it would be too dangerous for me, a very bad luck! Believe me hams I am very unhappy in my situation here. I would be very pleased if I could QSL sure. The given QTH with Faeroes is nearly true, more I cannot tell about. I have worked from about June till December 1938 with the call OY4C. Before my time here I was licensed in my motherland, and I intend to leave my present country very soon to get a license elsewhere. So I know that you understand me and excuse me. OY4C is now OY4C for all future. At last I will tell you that I will send you the QSL cards all together to the QSL Bureau of the ARRL direct, I also ask you to take the QSL's for other countries and mediate them. But wait still some months, they shall come sure! I am very unhappy that I can't get your cards but I can't help. I will still tell you that I always get the QST here. I wish all hams good luck and hope to see you in some time under new licensed call sig OY4C."  

_A nd best of luck to you, OM._

**Where:**

W8HWE worked ZL2MA (14,300 T9) at 10 one morning, and was told that the QTH is Keeling Island, QSL via the VK Bureau. Keeling is the same name sometimes given to the Cocos Islands, so he's probably well worth looking for. He will not answer Spanish Morocco or the Balearic Islands you go straight on the Nf'w. (htlnea and Papua stations. The activating station now ZOE in the commercial bands and ZD9AB in 4100, our card from VK9BW you'll be pleased to know that he is S. Austin, General Delivery, Lanchow, Kansu; and AN9AA a couple that are honeys if they're legit: AC4XX (14,025 T9), 44,430 T8) via the same route .... , W6NHA worked a DX for the east coast. ... However, honors go to G6WV. He is on nightly at 0350 GT, worked V2UAN (3920), and needs only South America for 25-Mc. WAC. DX on 40 isn't bad at all, mainly because the average denizen there completely ignore it. But fellows like W3ATR look a little more closely and come back with all kinds of Europeans, some of the rarer variety like US, LA and others. Not to be outdone, W2ATK worked OY4C, AK1AS (7235), YR5CJ (7285) and H86GF (7275), and heard ZBIU and CX649H ... W1AJ reports YR6PK (7275), SPIYX (7215), G80K (Channel Islands) and HI2S ... W5BOD got HR2WC (7305), CTT2R (7196) and HI2S (7250) as well as the more common ones, and heard HI3AS (7020) and a lot of VK and ZL ... For Asiatic stuff we refer to W6PBP, tells of UX8NA (7205 T9), UX6G (7125 T8) and lots of Jn, KAIAX (7155 T8), and KAIAS (7021).  

No one will talk about 10 except W1WV and then only in a mild sort of way. At any rate he had a flock of 'phone contacts with Europe and Central and South America. After being mighty close to pesky for several months, 20 took a diving, so by the time you got to us we don't know how it will be. But here's some of the stuff you have missed in December and part of January ... W3UVA returned to the DX racket, and celebrated with VK9BW (14,370 T9), HR7WC (14,420 T9) and JK9G (14,370 T9) ... W8HWE worked VU2KK (14,440) and X6FD (14,410), the portable of UX9MK ... At W4RF, KAIAX (7001), ZD2H (14,360) and CN8MI (14,370) got cards which they think, if they're leg...
There is much interest at present in the application of the new Gammatron "24s" to high frequency oscillator and amplifier circuits. We have been having a lot of fun ourselves, with a pair of them as class C RF amplifiers on both the five and the ten meter bands. The RF output from a standard NTE-A exciter, is ample for excitation. The NC-600 neutralizing condensers have more than enough capacity and voltage range for the job as well as being of just about ideal mechanical proportions. For the output circuit, we are using the AR16 "air wound" coils, (to which line has just been added both 160 and 5 meter band units) along with one of the new small TMH35D 3000 volt split stator variables. The maximum capacity per section of this new condenser is 35 mmf. and the minimum 6 mmf.

And now let's return to where we left off last month on "suggestions received" for the better application of some of our products. By the addition of another hole, (diametrically opposite one of the end mounting holes) of the XR-13 and XR-13A coil forms, it becomes possible to rigidly mount these two forms by means of small angles or "spade lugs" to a chassis or to any of the PB-10A plug-in bases. Also, by enlarging the two end mounting holes slightly of the XR-16 Isolantite coil form this form can be readily fitted when desired with the standard small size GR banana plugs without the necessity of using an intermediate adapter or plug-strip. Of course, we still think that the best way to mount this form is on the PB-16 plug of our own! But then —

Incidentally the XB-16 base or socket strip, with its two small Isolantite cone shaped stand-offs makes a handy mounting for a pair of R-100 chokes where they are used in the grid or input circuit to a capacity coupled RF amplifier. The illustration above gives the general idea.

Of late, we have had quite a few calls for the old "40-75" frequency meter condenser. The answer is "yes" — we still make them and the net price is $3.30. Also in this same connection, a single section version of the special condenser that we designed for our NC-81X Receiver is available for separate sale for frequency meter use. The type number is PW-81X-1, the net price $3.00, the maximum capacity 25 mmf., the minimum capacity 6 mmf., and the frequency range approximately 1.07 to 1.00 for straight line frequency tuning with normal circuit padding. (7% frequency change or approximately the width of either the 10 meter or the 40 meter band.)

James Millen
A New Type of Push Button Switch

for Meter Switching on Test Equipment, Analyzers, Tube Checkers and Radio Transmitters

The Mallory-Yaxley Type 2190 non-shorting switches provide new convenience, simplicity and economy in the construction and operation of radio test equipment. Through it a single current reading meter may be used to measure a number of circuits ... the insertion of the meter in the circuit being accomplished merely by depressing a button. Other circuits connected to the switch remain closed and uninterrupted. Mallory-Yaxley Type 2190 switches are also suitable for meter switching on low and medium power radio transmitters, and public address systems where they replace with added safety, conventional jack and plug systems.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA

Use
MALLORY
APPROVED RADIO PRECISION PRODUCTS

Use
YAXLEY
APPROVED RADIO PRECISION PRODUCTS

(14,300 T9) ... W2KZP added to his log things like TF5C (14,000 T9), CN9AV (14,100 T9), VP5BR (14,140 T9), NY1AB (14,050 T9), YV4AE (14,035 T9) and HII5L (14,320 T9). He doesn't believe the J9CB (14,440 T9), and we don't blame him ... W2YIO added JSCA (14,340 T9), JSCJ (14,370), JSCD (14,365 T9), XU6AM (14,380 T9), Y4UQ (14,350 T9), Y6AO (14,350 T9) and VP8AD (14,330 T8c) ... For the 'phone men, 8SWK1 has some tips in VS7GJ (14,100), CN1AF (14,270), PF6XX (14,000), ZB1L (14,110) and HIIA (14,275), and W2CHK found ZS6W, ZS6F, ZS8X, ZS6HR and ZS6ER between 14,050 and 14,100. W9YDY says TP3C (14,130) uses 'phone as well as cw, so there's your Icelandic contact ... W8ITH reports VTKL (14,045) and C52CO (14,100) a couple of new phones coming through rather well.

What:

We made a mild pass at bum c.c.o.'s last month. Apparently it's a touchy subject with some of the lads, by the looks of their comments, and well it might be. We never knew anyone to be touchy about something he knew was right - it's only when one is just barely getting by, or not getting by at all, that he rises to defend himself at the slightest provocation. Which leads us to believe that too many have adopted the viewpoint that "So-and-so gets away with it - I guess I can." What an attitude!

Don't get us wrong. We're all in favor of quick-frequency-change and all the rest. It's just that we don't like to see the illusion we once had - that the DX men were the cream of the technical hams - shattered by having to listen to signals that weren't considered good even in 1930. Not that the c.c.o.'s give the only bum signals - there are plenty of poor c.c.'s, ones with clicks and chirps - but they just seem to be more prevalent. Maybe we're trying to be a purist or something, but the regs say that "The frequency of transmission shall be as constant as the state of the art permits," and if the art permits some of the present signals it's in a helluva state.

(Jeeves, take away that thermometer. I'm not running a (temperature))

Who:

W5VV heard URAK9 the other night, and called him just so he could say, "You are not a cousin, you are a rat!" The BL really appreciated it, and said that Wilmer was the first in 51 contacts to catch on. We doubt if the BL will ever catch on ... G8MF (14,385 T9) in the Channel Islands has QSL'd everyone he has worked, so got an envelope over to your QSL Manager if you haven't the card yet ... The Ft. Worth (Texas) Radio Club and the Chattanooga (Tenn.) Amateur Radio Club combined cash, skill and discount to build a compact phone-c.w. transmitter for Carrol Stegal, Q6QA, the African missionary ham, on vacation in the country ... W8ITH is quite happy he's lucky because WAC was represented in the first 12 cards he received during his first two months back on the air. (If that isn't luck we're going to throw away our printing press!) ... Charles Cowden, VP4GA, is back in the States at 177 N. Hill, Pasadena, Calif. ... Here's hoping you haven't judged HR7WC too harshly. There has been a delay in shipping his cards via W8EEN, but they'll be sent very soon. HR7WC tries to be on 7200 every Monday, Wednesday and Friday at 7 P.M, in case you're looking for him ... Alan Erich, W8IQG and operator of WCFT, is now W7HFF at Melville, Mont. ... You might go after the DX rag-chewing record of W8NBK and ZL4MR some time. He found ZS3F, ZS2X, ZS6BR and ZS6J between 14,050 and 14,100. W9YDY says TP3C (14,130) uses 'phone as well as cw, so there's your Icelandic contact ... W8ITH reports VTKL (14,045) and C52CO (14,100) a couple of new phones coming through rather well.
JT is not only what you see in the Raytheon RK 866, but also those features you cannot see that amaze countless commercials, airlines and amateurs that such a quality tube can be sold at such a price.

The long painstaking exhaust (not done on automatics), the elements meticulously processed, the few drops of double distilled mercury, and the careful testing of each tube. These are the hidden values in the Raytheon RK 866 that insure a long, trouble-free life. Yet it costs no more than any other 866. At your Parts Jobber for only $1.50.

Don’t forget your copy of the “Handbook of Amateur Tube Uses.” It is just the thing to help you improve that old rig or build a new one. Your jobber or the nearest Raytheon office has a copy for you. Price 50c.
Don't Compromise!

Don't compromise with make-shift changes and costly additions. Bring your station up-to-date with a new Harvey 100-T Transmitter — a profitable investment because advanced engineering guarantees performance and high trade-in value.

The modern cabinet, with hinged top, rounded corners, chrome trim and gray wrinkle finish, is only 19 inches high by 14 inches deep. When you listen to its signal on the air you'll agree that the 100-T delivers the "goods." We have a handsome new 1939 catalogue ready for you, which will give complete information on the 100-T. Write to Harvey Radio Laboratories, Inc., 25 Thormdike Street, Cambridge, Mass. Export: 25 Warren St., New York City.

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Hamfest, Rochester, N. Y.

The Rochester Amateur Radio Association will hold its annual hamfest and banquet on Saturday, February 4th, at the Seneca Hotel, Clinton Ave. South, Rochester, N. Y. Registration begins at 4:00 P.M. A turkey dinner will be served and several speakers will provide a program of interest to all amateurs. Tickets are $2.00. For advance registration and further information communicate with Mr. William Humph, 154 Forbush Rd., Rochester.

Second Eastern DX Round-Up

The Telside Radio Club will be host to the second eastern DX Round-Up at the Telephone Building, 101 Willoughby St., Brooklyn, N. Y., on February 25, at 8 p.m. William J. McGonigle, president of the club and of the Veteran Wireless Association, is general chairman; Arthur Lynch, W2DKJ, toastmaster; Ralph Thomas, W2UK, chairman of the reception; and Dorothy Hall, W2XX, secretary. There will be several speakers who are outstanding in the radio field. Admission will be twenty-five cents, to cover the cost of the coffee and sandwiches. As in the custom, all DX-minded hams are cordially invited — no others need apply.

Exhibit Station — Schedules Wanted

Amateurs of New Bedford, Mass., plan to again have an amateur radio exhibit at the Hobby Show held in that city each February. Emergency rigs and equipment will be on display and in operation under the leadership of C. Lee Riley, Jr. (WlJJY), Regional Coordinator and R.M. E. Mass., and an outlet for traffic will be available through station WlJJY, remote-controlled from the booth. Provision is being made for operation on 20-Mc. phone (WlVZF) by remote control, and for an actual station at the Hobby Show in addition to JJY and IZF. Schedules are requested to facilitate efficient traffic handling. WlJJY will use 3745 kc. (E. Mass. O.R.S. Net frequency). Any operators interested in arranging schedules for handling the Show traffic should get in touch with WlJJY (43 Sycamore St., New Bedford, Mass.) by February 1st.

A study by W6KMK of WoKFC's log covering operation during the '38 SS Contest shows that all states were worked in 27 hours, 7 minutes operating time. This somewhat betters W6MYK's '37 SS record (all states in 29 hours). During the April '36 O.R.S. Party W6KFC worked all W districts in 44 minutes.

W8AVF and W8GW, both of Penn Yan, N. Y., have been hammering together for about eight years. For the past year W8AVF has needed Arkansas and Mississippi for W.A.S. One night in December he got on Mc. and hooked W8GW, who for his first Arkansas QSO. A few nights later on the same band he raised W8AVF for first Mississippi contact.

On the afternoon of December 18, 1938, W3VB's QSO on 3620 kc. resulted in a QSO with W1VB. At the end of this contact, another station was heard calling W1VB and W3VB and signing W8VB. Result: A three-way between W1, W3 and W8VB.
Centralab fixed capacitors consist of a thin wall ceramic tube spacing two tubular condenser plates, electroplated on the ceramic. Capacitance remains permanent under all life and aging tests. Centralab capacitors do not depend upon pressure fit for contact at any point, but have a positive soldered joint between plates and wire leads. All capacitors are vacuum impregnated with wax and coated with a moisture-proof film of low power factor resin.

A special bulletin showing engineering data available on request. Specify Bulletin 630

Centralab
DIVISION OF GLOBE UNION
Milwaukee, Wisconsin
IN WORKING CLOTHES!

We have designed IRC Power Wire Wound Resistors for hard work and dressed them in working clothes. Their winding forms are tough, non-porous ceramic. Their rugged cement coating is dark and rough for rapid heat dissipation, but it protects the winding in the most severe humidities. We fit them with stout terminals that won't break off. There is no firing process to bake the temper out of the windings and terminals. In short, they are not designed for beauty, but to do their job—to dissipate heat and stay put.

In aircraft radio and submarine signalling equipment, where there must be no failures, they furnish the extra margin of safety.

Your IRC parts jobber carries them in standard ranges, from 10 to 200 watts. Use them and see for yourself why they are preferred in the most critical services.

INTERNATIONAL RESISTANCE CO.
401 N. BROAD ST., PHILADELPHIA, PA.

MEMBERS, DX CENTURY CLUB

The following have submitted proof of contacts with 75-or-more countries.

PA9QF ... 99 W8KRG ... 89 SM6WL ... 79
W1CC ... 99 W3AZT ... 89 W9AOO ... 70
W1TW ... 99 PA9QZ ... 88 W9SOK ... 70
W1AG ... 98 W8BGN ... 88 W6LJD ... 70
W1EF ... 98 W8BL ... 88 W8LJ ... 70
W1GDY ... 95 W4CHC ... 87 G8YR ... 78
F8SAB ... 93 W9AEH ... 87 V2GC ... 78
G6Q ... 98 WL ... 88 W9TS ... 78
W2EF ... 93 W2IOP ... 86 W6T ... 78
W1RGY ... 93 W5AU ... 86 W9AT ... 78
W1G ... 93 W3KT ... 86 W6K ... 78
W1TI ... 93 W5PHL ... 86 W9FMS ... 78
W8BES ... 93 W6FZ ... 85 W9MT ... 78
W6BAM ... 93 VK9BA ... 84 W9BX ... 78
W6GHT ... 93 W2GRG ... 84 W1CA ... 78
W8BOX ... 93 W3AG ... 84 W8AM ... 77
W8XO ... 93 W3OP ... 84 W6G ... 77
Z6ML ... 92 W4CPD ... 84 W8TT ... 77
H10RE ... 92 W8BSF ... 84 G6XF ... 76
Q8NE ... 91 W9DYU ... 85 W9FS ... 76
WIGNE ... 91 G6ZO ... 85 W8LZK ... 76
W6DOD ... 91 S1AR ... 83 ZEJJ ... 76
U3Q ... 90 W2BM ... 83 W6K ... 76
W1RY ... 90 W5ARG ... 83 PA9JW ... 76
W5KRTW ... 90 W1BPT ... 82 S6LP ... 75
W5C ... 90 W3OP ... 82 W9KUT ... 75
G5BD ... 89 W2FMA ... 81 W9H ... 75
H9OX ... 89 W3Q ... 81 W8DAE ... 75
W3Z ... 89 W9RO ... 81 W60 ... 75
W8TH ... 89 W2ER ... 80 Radiotelephone
W8AJJ ... 89 W8BYN ... 80 W4CYU ... 78
W8AU ... 89 W9E ... 80 W9B ... 77
W8CJ ... 89 W3GEH ... 80 W6TH ... 76

G5QY (No. 103) ... 100

U8L7AZ ... 79
THE safest, surest and most simple method of realizing high frequency stability in an amateur transmitter is the use of correctly ground quartz crystals. A tried and proven method of obtaining proper quartz crystals is to specify BLILEY.

Question any experienced amateur as to what company manufactures the most complete line of quartz crystal units; what company has accomplished the most in developing new cuts, high frequency units and variable frequency units; and what company is continually striving to improve existing quartz crystals or to develop new ones to meet new demands as radio communication progresses. Invariably you will receive one answer — BLILEY!

Your Bliley distributor can give you full information on any crystal unit which you may require (or send for circular A-6). For your guidance, the complete line is listed below.

<table>
<thead>
<tr>
<th>Band</th>
<th>Range</th>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 meters</td>
<td>±43 cycles/mc./°C.</td>
<td>HF2</td>
<td>$5.75</td>
</tr>
<tr>
<td>20 meters</td>
<td>±20 cycles/mc./°C.</td>
<td>HF2</td>
<td>5.75</td>
</tr>
<tr>
<td>20 meters</td>
<td>±4 cycles/mc./°C.</td>
<td>B5</td>
<td>7.50</td>
</tr>
<tr>
<td>40 meters</td>
<td>±4 cycles/mc./°C.</td>
<td>B5</td>
<td>4.80</td>
</tr>
<tr>
<td>80-160 meters</td>
<td>23 cycles/mc./°C.</td>
<td>LD2</td>
<td>4.80</td>
</tr>
<tr>
<td>40-80 meters</td>
<td>±3 cycles/mc./°C.</td>
<td>BC3</td>
<td>3.35</td>
</tr>
<tr>
<td>160 meters</td>
<td>80 cycles/mc./°C.</td>
<td>BC3</td>
<td>3.35</td>
</tr>
<tr>
<td>40-80 meters</td>
<td>(variable frequency)</td>
<td>VF1</td>
<td>7.50</td>
</tr>
</tbody>
</table>

BLILEY CRYSTAL UNITS
UNQUESTIONABLY a new high in panel instrument value was registered when we introduced the expensive bridge type construction and soft iron pole pieces at prices no higher than you formerly paid for ordinary instruments. But now even these great values have been further increased by the sensational price reductions listed here:

R. F. AMMETERS

Internal thermo-couple radio frequency ammeters (1, 1 1/2, 2, 2 1/2, 3 or 5 Amps.) $4.59 Your net price...

HIGH RANGE VOLTMETERS

D. C. plate voltmeters, complete with external resistors, (1,000 - 1,500 - 2,000 - 2,500 - 3,000 or 4,000 volts). Your net price.......

3,000 or 4,000 volts. Your net price.......

(5,000 volt range, $12.00 net.)

DECIBEL METERS

Rectifier type volume level indicator

Your net price...

Other Outstanding Values Are:

- D. C. plate milliammeters (all popular ranges from 0-5 to 0-12000 milliamperes) list $8.35; net price to you $4.15
- A. C. filament voltmeters (0-10 or 0-15 V) list $8.35; net price to you $4.15

Illustrated data for all popular ranges, including 6 V. lamp and socket, 50c net additional.

ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below:

(The list gives the Sections, closing date for receipt of nominating petitions for the Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the Sections listed below, by the closing date specified, the incumbent continues to hold his official position and carry on the work of the Section, subject to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Nominations must be in West Hartford on or before noon of the dates specified.

Due to a resignation in the Eastern Massachusetts Section, nominating petitions are hereby solicited for the office of Section Communications Manager. The incumbent was elected on March 14, 1939, for the term of office starting on the date given. The closing date for receipt of nominations is February 15, 1939.

Section Closing Date Present SCM Present Term Of Office

No. New Jersey Feb. 1, 1939 Fred C. Read Feb. 15, 1939
Arkansas Feb. 15, 1939 H. E. Veile Feb. 15, 1939
Eastern Mass. Feb. 15, 1939 Sam Gross
(Nebraska) Jan. 15, 1939

Vermont Feb. 15, 1939 Alvin H. Battison Apr. 15, 1939
Nebraska Feb. 15, 1939 R. C. Wallace Aug. 17, 1938

Election Notice

San Joaquin Feb. 15, 1939 George L. Richard Oct. 15, 1938
Valley East Bay Apr. 3, 1939 H. J. Burchfield Apr. 15, 1939
New Mexico Apr. 3, 1939 Joseph M. Ankord Apr. 15, 1939
Elko Island Apr. 3, 1939 Grant K. Layton Apr. 15, 1939
Western Mass. Apr. 3, 1939 Ellis R. Curry Apr. 15, 1939
Indiana Apr. 3, 1939 Noble Burkhard Apr. 15, 1939
New York City Apr. 14, 1939 Edward L. Baumbach Apr. 22, 1939
Long island Apr. 14, 1939

San Francisco May 15, 1939 Alan D. Whitaker, Jr. May 28, 1939

* In Canadian Sections nominating petitions for the office of Section Manager must be addressed to Canadian General Manager, Alex Reid, 107 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be countersigned by the incumbent and the closing date is March 15, 1939.

ELECTION RESULTS

Valid nominating petitions nominating a single candidate as Section Manager were filed in a number of Sections, as provided by the A.R.R.L. Constitution and By-Laws, electing the following officials, the term of office starting on the dates specified:

Quebec Lindsay G. Morris, VE2CO Dec. 14, 1938
Oregon Harold W. Johnston, W7TDXF Dec. 15, 1938
Colorado Carl C. Drumeller, W9EHC Dec. 17, 1938
Louisiana Eugene H. Treadaway, W5DRR Jan. 14, 1939

In the Georgia Section of the Southeastern Division, the elections were held on or before noon of the closing dates as specified in our previous notices. The closing dates for receipt of nominating petitions are hereby extended to February 15, 1939, in all Sections concerned. Ballots will be mailed to members as or the closing dates specified above, and the elections will be held in each of these Sections in accordance with the provisions of the By-Laws.

Section Commutations 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 the By-Laws.

Section Managers for the next two year term of office for the Sections named are hereby solicited. Five or more signatures of A.R.R.L. members residing in the Sections concerned, signed in the space provided, are required.

No. New Jersey Apr. 3, 1939 Fred C. Read Apr. 15, 1939
Arkansas Feb. 15, 1939 H. E. Veile Feb. 15, 1939
Eastern Mass. Feb. 15, 1939 Sam Gross

See our announcement of the new Simpson "Hammetter" on page 85.
To Radio Amateurs:

This is an invitation to every "ham" in the world.

Most advertisers in magazines, newspapers, etc., tell you how to spend your money. This is not that type of message.

I have always contended that the credit for most of the major developments we have in radio have been due to the American amateur. The radio industry's enormous laboratories have done little but refine that which the amateur discovered. The Zenith Radio Corporation is always ready to reward amateurs who send us suggestions that we have not before had, if we adopt them.

We haven't an engineer in our laboratory over forty years old - they're all ex-"hams," progressive and very much open-minded. To them nothing is impossible. We have found that it is not always the fellow who knows all the rules of why things won't work that produces real results. As a matter of fact, the contrary is usually true.

If you want to see an example of development, drop into a Zenith dealer's store and examine the Wavemagnet model of radio, just put on the market, using no antenna, ground or battery. This is not a set built for "hams." This job was suggested by an amateur and the improved shielded loop was refined by our laboratory. If you know how to build this loop better, tell us and, if your suggestion is novel and we adopt it, we will reward you.

So, you see this was not an ad telling you how to spend your money. It is just an invitation for more of you to correspond with us on further developments.

Cordially yours,

HC
Mr. Leland W. Smith, W4AGI, and Mr. Jimmie Walker, W4VX, were nominated. Mr. Smith received 59 votes and Mr. Walker received 32 votes. Mr. Smith’s term of office began November 29, 1938.

**F. C. C. Emergency Regulations**

(Continued from page 71)

...noncompliance which may serve as a basis for investigation and action under section 502 of the Communications Act. Policing authority extends only to 1715-2000 and 3500-4000 kilocycle bands. Individual policing transmissions shall refer to this section by number, shall specify the date of the Commission’s declaration, the area and nature of the emergency, and briefly and concisely. Policing observers shall not enter into discussions beyond essentials with the stations notified, or other stations.

"(c) These special conditions imposed under this section will cease to apply only after the Commission shall have declared such emergency to be terminated."

**HOW THE REGULATIONS APPLY**

As soon as the F.C.C. is informed of a threat of some state of emergency involving communications, it carefully examines all the facts, to determine the seriousness of the situation, the area concerned and the desirability or need for an emergency declaration. To act promptly, the plans must have automatically been concerned with emergency traffic. The Commission may confer with the American Radio Relay League, the American Red Cross, and government agencies concerned in arriving at a decision to meet any emergency situation.

Assuming that the situation warrants the recognition of a state of communications emergency, the F.C.C. will act immediately, exactly in accordance with its stipulations under Section 152.54 of the Rules Governing Amateur Radio Operators and Stations, and “declare” a state of general communications emergency. The press, broadcasting stations, A.R.R.L., etc., will be notified, to give legal force and practical effect to the announcement. The representative amateur organization, your A.R.R.L., will consult its always-ready records of appointees and officials working by particular bands and modes in order to recommend to the Commission, the amateur stations in the best position to be designated by the F.C.C. to promulgate the emergency announcement in the different band segments, and for thereupon policing these bands, warning non-complying stations, and reporting fully on their operations and observations to the Commission for the whole period of a particular emergency. There is a constant state of change in personnel and activity, and only a thoroughgoing national organization such as A.R.R.L. is in a position to maintain the Emergency Corps registration, frequency band information, and monthly station activity data in a sufficiently up to date state so that at any given moment proper recommendations may be formulated.

How will you know that emergency regulations are in effect? Perhaps from your local paper, or direct from W1AW “GIST,” or you may hear some stations handling emergency traffic (in which case you shut down and listen until you get confirming or contrary information). You will undoubtedly hear one of the 60 or 70 F.C.C.-designated stations refer to Sec. 152.54 by number exactly as specified in 152.54 (d).

What to do. First off, if you have a license of whatever class, you should already be registered in the A.R.R.L. Emergency Corps, and familiar with the plans that would automatically be concerned with emergency traffic. The Commission may confer with the American Radio Relay League, the American Red Cross, and government agencies concerned in arriving at a decision to meet any emergency situation.

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Guaranteed!

never to fail—as a result of gas released internally

The use of specially treated tantalum for grids and plates—long severe exhaust—complete elimination of "getter" and the development of a new type thoriated tungsten filament makes Eimac tubes practically failure proof. The source of premature failure—GAS—has been removed by an exclusive process. Eimac tubes provide an extra degree of safety—stand accidental or intentional overloads of 400% to 600% without damage. Results speak for themselves. Everywhere—in every kind of application—Eimac tubes are establishing astounding records for dependability. See your dealer or write.

Eimac 250T Gas-free tube having wide application in types of transmitter. Power output 800 watts...very low interelectrode capacity...high electrical efficiency...250 watts plate dissipation...radiation cooled.

EITEL-McCULLOUGH, INC.
SAN BRUNO, CALIFORNIA
Responding to the demands of many of our good friends in the H.P. amateur phone group, we are glad to present two new multi-section condensers, designed to yield efficient balanced capacity values for the 10-, 20- and 80-meter phone bands. The basic diagram indicates the maximum capacities per section and the effective maximum capacities of the 3 balanced (series-parallel) groups.

Reference to manufacturers’ tables of required capacities to resonate with such standard tank inductors as E. & W., Coto etc., disclosure how nicely these effective ranges match their coils for 10-, 20- and 80-meter phone and 40-meter C. W. bands.

**1000 WATT Multi-Band**

**TYPE TL-70-50-UQ**

- Frame — "T" type commercial (heavy N.P. brass construction)
- Airgap — 0.94" thick aluminum, buffed and polished
- Plates — 0.050" thick aluminum, buffed and polished
- Insulation — G.E. Myclex
- List Price .................................................. $40.00
- Amateur Net Price ........................................... $24.00

**500 WATT Multi-Band**

**TYPE XG-70-50-XQ**

- Frame — "X" standard, N.P. brass, sturdy construction
- Airgap — 0.11" thick aluminum, buffed and polished
- Plates — 0.040" thick aluminum, buffed and polished
- Insulation — G.E. Myclex
- Length — 13 inches back of panel
- List Price .................................................. $19.00
- Amateur Net Price ........................................... $11.40

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Do not fail to read T. M. Ferrill’s article on page 37, December 1938, "OCT", on how to properly block D.C. from tank condensers. And see Taylor Tubes 1939 catalog, page 36 for a 10- to 80-meter, 150 watt, plate built around the Cardwell XE-160-70-XO Multi-band condenser, which many of you are already using.

**THE ALLEN D. CARDWELL MANUFACTURING CORPORATION**

82 Prospect Street, Brooklyn, New York

---

Should there not be a Coordinator, work direct with agencies served is in order, with careful respect for the priority of official and public aid messages. S.C.M.’s are aiming to apportion coordinators to resonate the amateur services in every city or town, where a live amateur capable of doing organization work is available — and will appreciate your help and suggestions.

You have contacted the Coordinator, and carefully reviewed the situation. He has been busy modifying his tentative plans, based on studies of “possible” local contingencies, to make the most effective disposition of local amateur resources possible to meet this “exact” communications emergency situation. He has been in touch with other amateur operators — the broadcasters, the wire services, the police, airways and agencies served. Even the first set up must be modified from hour to hour to meet changes in the situation, reach new points, reduce local interference, cover the important circuits with the more skilled and efficient operators. If you have been registered in the A.E.C. much that you have done is what you expected to do. If not, you may have been able to help, self-powered or not, but you may have had to pick up a lot of the local plans and situations right from scratch, without the benefit of previous discussions.

One thing certain, however: You have refamiliarized yourself with every word of the F.C.C. emergency regulation so that 152.54 is much more than a number to you — more like carefully observed “religion.”

The communications bands for emergency purposes become 1715-1975, and 3525-3705 kcs. In the 20 kc. on the bands, such as 152.54 (150-160 kcs.), and 152.56 (250-260 kcs.), only calling is permitted. These band segments are reserved by the F.C.C. for emergency calling. The routine calls that precede traffic transmission and other emergency communications work are all in the communications band, not in the “calling” frequencies.

The listening period. Everyone engaged in operating in these low frequency bands with relief and emergency traffic must stop and observe the five minute hourly quiet period (0000-0005) unless his particular message is of utmost priority, or of life-and-death urgency. The purpose of the listening period is to enable every participating amateur to “bear down” on looking for calls from isolated, low power emergency stations, that might otherwise be buried, QRM and unable to get through. Only such stations, with the priority that first news of a dire plight, and other stations with extremely important, over-due official messages, should use listening periods to send a call of any kind! The one-in-a-thousand amateur station that should use the listening period to transmit must use intelligence too, and make his QO or QRR directional or specific as to his situation so the stations not in the proper spot to help will keep quiet and do the interference down. All calls may be answered until the first five-minutes listening periods are over.

Note how specific the Commission’s prohibition or restriction of 1.8- and 3.5-Mc. band work is! Casual conversation, unrelated (but connected to the emergency calling) traffic, or working, remarks not pertinent to constructive handling of the communications emergency situation, “shall be prohibited.” The F.C.C. designates some assisting amateur stations (152.54 d), and these will report stations failing to comply with any part of the emergency rules. While there are limitations on the authority of the observer-policing stations, and they act when possible in an advisory capacity (not conflicting with the more vital authority of the coordinators in the areas affected) there is the expressed intention of the Commission to fully examine the reports of the designated operators, taking any necessary disciplinary investigations and action for delinquencies noted. A few individuals have shown an improper, unconstructive attitude, or lack of cooperation on a few occasions in past emergencies, and the large body of organized amateur radio, cheerfully making itself ready to serve in emergencies, will heartily and eagerly accept the regulations that have been set up to deal with such cases as the future may bring.

The spirit of the day requires that every amateur give thought to Preparedness to serve in emergencies, by personal training in formulating, and systematically handling traffic, and by the acquisition of self-powered equipment where possible. The new regulations cover a lot of ground and every ham should familiarize himself with every portion of them. Also we again invite every licensed amateur to get his equipment registered in the A.R.R.L. Emergency Corps as soon as he can drop a card for the necessary blank, if not already a member.

— F. B. H.
The first self-contained, pocket portable instrument built expressly to check high voltage and all component parts of transmitters and receivers.

3,000 VOLTS—SELF-CONTAINED
No external multipliers necessary

The happy thought of a 3,000 volt instrument has been spoiled for many amateurs by a sidelong glance at the price tag. But now the thought is all happy. We wish there were some way to hide the price of this new “Hammeter” until you have read this brief description and seen the instrument. If that could be done, you would have the surprise of your life.

The heart of the “Hammeter” is the time tested Simpson D’arsonval movement with costly bridge-type construction and soft iron pole pieces—a meter so good that it can be guaranteed accurate within 2% on D. C. and 5% on A. C. current. A copper oxide rectifier is built into the meter for A. C. voltage ranges, and a battery is provided for both ohmmeter ranges—a real self-contained unit.

It is shock-proof in every detail—completely encased in Bakelite. The special test cables are insulated for 5,000 volts—a wide margin of safety. Insulated tips are provided for plugging into jacks. Alligator clips with rubber insulating sleeves as illustrated, provide a safe means for making high voltage connections.

No picture could do justice to its beauty and workmanship. The panel is black Formica with gold characters. A knife-edge pointer gives sharp readings along a handsome silver-etched scale with clear red and black characters. The typical Simpson beauty of design is seen in a glance at the illustration. It is small—measures only 5¼ x 2½ x 1¼” and weighs only 20 ounces.

Get on the air—stay on the air—

Here is the instrument that will save many hours during construction and assure basically correct steps—an instrument that will ferret out the trouble. Note the ranges above. See it; examine it—and the Hammeter will become your trouble shooter.

Order from your jobber
SIMPSON INSTRUMENTS THAT STAY ACCURATE
SIMPSON ELECTRIC CO., 5216-18 W. KINZIE ST., CHICAGO

See Our
SENSATIONAL ANNOUNCEMENT
on page 80
New LOW PRICES on
PANEL INSTRUMENTS
NOW
this high-powered radio engineering library

sent to you for 10 days’ trial—at a special price and terms

These books cover circuit phenomena, tube theory, networks, measurements, and other subjects—give specialized treatment of all fields of practical design and application. They are books of recognized position in the literature—books you will refer to and be referred to often. If you are a researcher or experimenter—if your interest in radio is deep-seated and based on a real desire to go further in this field—you want these books for the help they give in hundreds of problems throughout the whole field of radio engineering.

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3. Chatee's THEORY OF THERMIONIC VACUUM TUBES
4. Hund's PHENOMENA IN HIGH-FREQUENCY SYSTEMS
5. Henney's RADIO ENGINEERING HANDBOOK

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(Continued from page 67)

all its advertising as a result, let it go and be hanged to it. Has any reader a better suggestion?

—G. S. Light, ex-V53ABW

Editor’s Note. — We don’t think there is room for worry about abandoning the code test. In the first place the international treaties (Madrid, Cairo, etc.) absolutely require it before amateur licenses are issued, regardless of an individual government’s possible attitude. The A.R.R.L. stands for code tests, a few years ago got the minimum raised from 10 to 15 w.p.m. Moreover, in North America at least, government support of amateur radio is largely based on expertise in telegraphy. True, there has been some talk of a u.h.f. band on which code knowledge wouldn’t be required, but this was for the deliberate purpose of dissociating bootlegging and public-utilitarian inclinations from amateur radio—and that move flopped completely, too.

RSTC

64 Marshall St., Fitchburg, Mass.

Editor, QST.

Considerable interest seems to have been aroused by the comparison of “C” report suggested by W1LJE in his DX column some months ago. Such a report undeniably has merit. But why confine its use to DX contacts only? The present RST system, while perhaps the best that can be devised for general use, falls down when it comes to telling us how our signals stack up with others on the band. Why not, therefore, tack on the “C” and use it for all contacts, both domestic and foreign? RSTC rolls off the key or bug quite painlessly. Try it!

A nine-point scale seems to be rather cumbersome and unnecessary. A five-point scale such as the following would do the trick quite nicely:

“C” 1—much weaker than average
2—weaker than average
3—average
4—stronger than average
5—much stronger than average

This scale is easily memorized, simple, and serves the purpose.

Why not give RSTC a try, gang? Wouldn’t you like to know how your sigs compare with the rest of the world? Yours for an RSTC 599x5 signal?

—E. W. Hill, WJXN

THE BATTLE AHEAD

Battams Rd., Payneham, South, Australia

Editor, QST.

For many months I have been listening to rumors from more or less reliable sources regarding the outcome of the forthcoming Rome conference in regard to our amateur frequencies. The digest of these rumors can only mean one thing unless something is done immediately, and that is the writing of “Finis” to the pages of amateur radio in many countries.

In these days when nations are apparently arming against each other, what better token of ham radio could be put forward than the hams of all nations arming themselves against a common menace—the loss of their hobby and ability to serve their country and humanity?

In the past A.R.R.L., R.S.G.B. and a few others have taken up the sword in defense of their amateur frequencies. Looking at the thing logically, what can be expected when the ever-growing demands of the commercial are met with numerically weak opposition, however hard and enthusiastically the above societies may defend their case?

I would suggest that each country be ably represented at the forthcoming conference by a counsel capable of putting arguments as they should be put, not a body of hams but a lawyer trained in all the technicalities of argument.

I have approached a good percentage of hams in my district and have put the following suggestion to them:

That each licensed ham desirous of continuing as such should contribute a voluntary fee of five to ten shillings per year (one to two dollars). This would provide adequate funds for each country to be fully represented at the forthcoming convention.

Periodically we are called upon to elect a body of men to represent us in our various parliaments. How often have you approached these men to air any of your own views?
THE NEW "HQ-120" amateur communications receiver has been designed from the standpoint of obtaining peak performance on all bands. Special circuit arrangement and tuning condenser construction has made it possible to maintain practically uniform sensitivity throughout all amateur bands. It is no longer necessary to confine your activities to certain bands because of receiver limitations. This high, uniform sensitivity coupled with the new variable crystal filter is a very desirable combination. The bandwidth of the filter can be adjusted to permit full benefit of sensitivity even in the most crowded phone or CW bands. Sensitivity and selectivity must be combined for perfect results. One without the other is useless. In addition, the "HQ-120" has many other outstanding features. The antenna compensator permits perfect circuit alignment, maximum sensitivity and maximum image rejection on all bands with all popular types of antennas. The special 310° band-spread dial calibrated in each of the amateur bands from 80 to 10 meters permits the operator to tell at a glance the frequency of the incoming signal, or that of his own transmitter. Those who are troubled with automobile ignition interference will welcome the new and efficient noise limiter circuit which limits automobile ignition interference and all similar disturbances. This feature is especially desirable in the 10 and 20 meter bands. The calibrated "S" meter is extremely accurate due to the overall uniform sensitivity of the receiver. It is calibrated in "S" units from 1 to 9 and up to 40 db above "S-9". Ask your jobber to demonstrate the new "HQ-120."

WRITE DEPT. Q-2 FOR 16-PAGE DESCRIPTIVE BOOKLET
TALK ABOUT LOSING BANDS!

To all radio experimenters... I hereby direct the immediate closing of all stations. I direct that the antennae and all aerial wires be immediately lowered to the ground.

SO SMASH GOES HAM RADIO!

That happens at the bottom of page 50... but it's back in full blast by page 59... and this thrilling story doesn't skip a heartbeat in between.

It's the Story of Amateur Radio—TWO HUNDRED METERS AND DOWN—as told by Clint De Soto. This is the book that gives the whole A.R.R.L. story and the whole record of amateur accomplishment.

BETTER READ IT! If your library hasn't got it yet, and you can't borrow it from the ham down the street, and you can't get anyone to read it to you over the air—BETTER BUY IT!

TWO HUNDRED METERS AND DOWN costs $2.00 in the regular book binding—only $1.00 in attractive paper binding. Send your money to the

AMERICAN RADIO RELAY LEAGUE
West Hartford, Connecticut

---

Now is the time each and every one of us have a perfect right to put our complaints to these men and if they find they are up against a body united to a common cause I am sure some good will come of it which will do a lot to pave the way.

I sincerely trust that you will in the interest of amateur radio find room for this letter in your columns as I modestly am of the opinion it should have been done long ago.

-H. N. Bowman, VE3FM

Ennor's Norr. -- In our opinion, Mr. Bowman touches upon the proper approach to this problem in his third-from-last paragraph. After all, the grass-roots of the problem are the attitudes pursued by the administrations themselves. That is why, for example, the I.A.R.U. is constantly working to improve the relations of its member-societies with their respective governments. We also know that, barring the unthinkable, the government of the U.S.A. will support amateur radio to the fullest and will be followed in that position by the other governments of the Americas and those of most of the democracies of the world. But by the same token it is mighty difficult to make a dictator like what he doesn't want to like, all manner of legal arguing notwithstanding. Although our representations at a conference are of immense importance, it is our considered belief that most of the accomplishment that Mr. Bowman seeks is spade-work that ought to be done by amateur societies in their respective countries during the preparatory years before Rome. For a fuller discussion of this subject, refer to September QST, page 20.

A. R. R. L. QSL Bureau

(Continued from page 57)

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B. C. L. and the Amateur

(Continued from page 59)

telephone Mr. 'Doc' at such and such a number. Your interference problem will receive prompt attention." You should not say, "I will fix your radio, etc."

If this is done, as well as Rule No. 2, the cases where the "boiling point" has been reached will be greatly reduced or completely eliminated. Take it from one who has had several "boiling point" cases—it is very much to the amateur's advantage, in the long run, to prevent them. It has been truly said, "An ounce of prevention is worth a pound of cure."

The suggested procedure will not only be to the amateur's personal advantage—possibly even saving him from legal troubles—but it will be to the lasting advantage of amateur radio in general.
THE JOHNSON "Q" ANTENNA SYSTEM

This highly efficient system is applicable to a wide variety of antennas, including the sensational "Q" Beam (QST, September 1938), Radiator-Reflector and Radiator-Director Beams, Harmonic Radiators, "V" Beams and many others. With all these the following advantages are realized:

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ATENCIÓN

Tenemos el gusto de anunciar el acontecimiento que consideramos la segunda más importante contribución a la literatura técnica en la lengua castellana, es decir, la traducción de la edición 1939 de nuestro "THE RADIO AMATEUR'S HANDBOOK," por la Revista Telegráphica de Buenos Aires, Argentina, reconocida como la promulgadora de literatura radiográphica más anciana y nombrada de Sud América.

La Edición 1939 del "THE RADIO AMATEUR'S HANDBOOK" representa una revisión completa del manual standard de la comunicación entre aficionados. El capítulo basado sobre la transmisión ha sido amplificado y contiene datos completos sobre la construcción de unidades que se hallan descritas ahora por la primera vez. Los diseños de las unidades facilitan la construcción de transmisores completos de toda potencia. La sección radiotelefónica ha sido redactada de nuevo, con el fin de aumentar su importancia para el aficionado práctico que desea perfeccionar su conocimiento del ajuste y la operación de transmisores telefónicos. Los datos de modulador, especialmente con referencia a los sistemas del sello de rejilla y de la construcción de transmisores completos de toda potencia, se hallan explicadas, como también material sobre indicadores de afinación y de la potencia de la señal. Las bandas de "u.h.f." no fueron olvidadas.

Los aparatos portátiles, diseñados y construidos especialmente con este fin, están incluidos en el capítulo sobre equipos de emergencia portátiles. Los datos de modulador, especialmente los de regeneración sencillos hasta los aparatos de rayo giratorio más elaborados. El capítulo sobre los puntos cardinales ha sido simplificado. El capítulo sobre la práctica del taller con facilidad y prontitud los datos referentes al sujeto de la operación de equipos probables, el MANUAL DE LABORATORIO MAS EFICACES Y PRACTICOS para el aficionado. Con el auxilio del indicio extensivo, el lector puede encontrar fácilmente y prontitud los datos referentes al sujeto más interesante.

Siguiremos el plan que habíamos adoptado en la preparación de las ediciones anteriores, es decir, de incluir todos los datos relativos a la construcción, transmisión y operación de equipos probables, el MANUAL DE LABORATORIO MAS EFICACES Y PRACTICOS para el aficionado. Con el auxilio del indicio extensivo, el lector puede encontrar fácilmente y prontitud los datos referentes al sujeto más interesante.

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Power Amplifier, High Efficiency Triode

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Filament Current.............. 2.5 amp.
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Plate Current............... 115 max. ma.
Grid Current............... 25 max. ma.
Plate Dissipation........... 40 max. watts
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Mutual Conductance......... 4400 µmhos.

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Grid to Fil. .................. 5.8 µµf
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This instrument provides features herebefore available only in precision laboratory equipment. Designed for precise measurement, it offers a 7'/4" -354 degree dial accurately calibrated for 5 to 100 meter bands, zero adjuster for use with 20 precision calibration frequencies available, A.C. or D.C. operation with voltage and temperature stabilisation of electronic coupled oscillator and amplified monitoring.

It is styled to "dress up" any station priced extraordinarily low designed for precision work.

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Crystals for commercial requirements quoted on your request. Now in our ninth year of business.

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preferred, short crossarms may be used at the bottom and top of a pole or mast. Two pulleys should then be used at the top, one at the joint of the pole and top crossarm, and the other at the opposite end of the arm. The halyard may then be run up the pole, through the first pulley, out the arm and through the second pulley, and then attached to the end of the antenna with an ordinary insulator. A short rope or wire with another insulator may be used to hold the bottom end of the antenna to the lower arm, so that the radiator may be held tight.

Aside from the fact that all vertical antennas of the type mentioned are efficient radiators, giving reasonably uniform radiation field strength in all directions around the horizon and giving desirable concentration of radiated energy at low vertical angles, they offer an outstanding advantage of adaptability to small ground space. The 250-foot length of the 100-meter horizontal half-wave antenna, plus additional length for halyards and guy wires, appears tremendous compared to the radius of 15 to 20 feet needed for an efficient vertical 160-meter radiator. And the 66 feet needed for the 40- and 20-meter antenna, if installed horizontally (with consequent highly directional effect on 20 meters, and thus need for careful choice of position) brings out problems often exceeding those of a light type of construction in the vertical direction.

Book Reviews

(Continued from page 80)

regulations of the Cairo convention are given, along with procedural information of special interest to aeronautical and marine operators. There is also a sample aeronautical operators’ examination.

The new "Sterline" marks the tenth anniversary of the appearance of the first edition. Nearly doubled in size, it is an entirely new book, thoroughly up-to-date, containing many types of information usually to be found only in separate volumes.

— G. G.


In the face of restrictions threatening amateur radio abroad, it is a highly encouraging sign to witness the introduction, by the Radio Society of Great Britain, of a handbook for British amateur radio. As stated in the foreword to the volume, "For many years the British amateur was dependent almost entirely upon American publications, for detailed technical information concerning the more generalized aspects of his hobby." Now, the first British Amateur Radio Handbook affords a comprehensive compilation of similar information, as viewed through British eyes.

The project of presenting amateur radio from the British viewpoint has been handled in exceedingly capable fashion under the editorship of J. Claricoats, G6CL, aided by such well-known technical men and amateurs as VP4TO, G6CH, G6OT, 2B1B, G6CD, G6GR, G6NF, G6LF, G6LL, G5FU, BRS648 and G6WY. The resulting treatment is one that intentionally presents information in practical, realistic fashion, rather than from the standpoint of the academian or theorist.

 Particularly apparent is this attitude in the sections dealing with fundamentals, where the approach is that of dealing with names and phenomena as they are progressively en-
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NATIONAL COMPANY, INC., Malden, Mass.

IN THE INTEREST OF SAFETY

Philip C. Murray, W9VYU (Continued from page 31)

stand firmly. As he moved forward he stepped into a small puddle of water that had formed from snow melting on rubbers which had been left on the floor.

Murray slumped and, with the microphone still in his hand, fell against the wall. Johnson immediately disconnected the electricity and called both the fire department and a doctor. Resuscitation attempts were delayed until their arrival. Although, according to Johnson, W9VYU gasped a couple of times after the current was disconnected, the firemen did not succeed in giving any sign of life at any time. Efforts at resuscitation were finally abandoned when the doctor pronounced Murray definitely dead after nearly a half hour's work.

The subsequent examination of the equipment disclosed that the rectifier filament transformer had broken down, establishing a short-circuit between the 5-volt filament wiring (which was at 500 volts positive with respect to the chassis) and the 115-volt primary. The amplifier chassis was not grounded, with the result that there existed a 500-volt potential between actual earth (through the a.c. line and the wet floor) and the microphone stand (connected to the chassis). It was this potential — 500 volts d.c., pulsating 120 times per second — that proved fatal.

W9DOQ summarized the situation fully in saying, "The sad part is that there was not the usual carelessness in connection with this tragedy. How many of us stop to consider that a microphone could be a danger source, as it was in this instance? The microphone lead did not fall across the high tension wire as it was first supposed. The transmitter proper was not even turned on at the time. . . ."

W9VYU was not the sort of person to be careless in dealing with high voltages. Indeed, safety work was one of his great interests, and he had been actively engaged in company safety meet-
HERE'S HOW TO START 1939 RIGHT
with that NEW RECEIVER you've always wanted

National's
NEW NC 100XA

Notice the big, new type, illuminated dial with direct reading scales for each band. Calibrated in Megacycles. Also continuous tuning vernier dial with band spread readings from 0 to 1000 at all frequencies. Equipped with "S" Meter. Cabinet restyled and enlarged. Yet with all these fine improvements the NC 100XA costs no more! Send only $22.50 with order, pay balance easy terms as listed below. Cash Price $142.50.

CHOOSE any one of the 600 or 800 watt transistor sets in this list and RESOLVE TO HAVE IT... NOW! Write for Time Payment Details with your order. Balance is due in three or twelve months as listed below.

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- HAMMARLUND HQ-10 Complete with Tubes, Crystal and Speaker
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- NATIONAL NC 44 Complete with Tubes, Crystal and Speaker
- HALLICRATER SKY CHAMPION — Model S-20 Complete
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- RME 70 Complete with Tubes, Crystal and Speaker
- RGA-ACR 111 Complete with Tubes, Crystal and Speaker
- HAMMARLUND SUPER PRO Complete with Tubes and 8" Dynamic Speaker
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- HALLICRATER SKY RANGER 5-10 Complete with Tubes and Speaker

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- Conservative Rating
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<td>$57.72</td>
<td>$9.79</td>
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<td>The new HQ-120 ....... 117.00</td>
<td>23.40</td>
<td>8.36</td>
</tr>
<tr>
<td>HQ-120X and NC-101X 129.00</td>
<td>25.80</td>
<td>9.11</td>
</tr>
<tr>
<td>NC-100A .............. 182.00</td>
<td>94.00</td>
<td>8.48</td>
</tr>
<tr>
<td>NC-120X and NC-131X ....... 99.00</td>
<td>19.80</td>
<td>6.99</td>
</tr>
<tr>
<td>Breiting 49 and S16 ... 99.00</td>
<td>19.80</td>
<td>6.99</td>
</tr>
<tr>
<td>Howard 433 ........... 49.95</td>
<td>9.99</td>
<td>3.53</td>
</tr>
<tr>
<td>NC-44 and S-30........ 49.90</td>
<td>9.90</td>
<td>3.49</td>
</tr>
<tr>
<td>Sky Buddy with 28 MC ... 99.50</td>
<td>9.50</td>
<td>3.08</td>
</tr>
</tbody>
</table>

Also HQO, Breiting 9, Howards, Sergents, all others

Similar terms on Hallcocters, National, Harvey, RCA, RME, Temco transmitters and Thordarson, U.T.C., Utah, Kits.

Bob Henry
W9ARA BUTLER, MISSOURI

Silent Keys

It is with deep regret that we record the passing of these amateurs:

Irving G. Campbell, W2GSI, Passaic, N. J.
Robert S. Connavaile, W2KFM, Springfield, L. I., N. Y.
James P. Coyle, Jr., W9YEF, Chicago, Ill.
Charles E. Duncan, Jr., W8FDZ, Barber-ton, Ohio
Glenn O. Dunn, W8CRP, Detroit, Mich.
Lt. Victor D. Gettys, U.S.N.R., W8EJ, Youngstown, Ohio
Ensign Richard C. Hoyt, U.S.N.R., W2FFL, Mt. Vernon, N. Y.
Edgar Gaylord Hubbel, W1ATW, New Milford, Conn.
Arnaldo Alves da Motta, PY2LU, Sao Paulo, Brazil
Phil E. Murray, W9VYU, Cloquet, Minn.
Carl O. Noreen, ex-W8CUN, Louisville, Ohio
Sidney E. Pettit, W5FVC, Monroe, La.
Fred H. Provencial, W9HNS, Nopeming, Minn.
Baron Bonaert de la Roche, ON4HM, Harvengt, Belgium
Thomas Tracey, W8DKE, Dubois, Penna.
Jack Von Tillow, W6DFR, San Francisco, Calif.
Karl E. Weise, W9FZA, Lone Tree, Iowa
Fred L. Wisner, W6ZQ, San Diego, Calif.

ings. He had talked not only on safety in connection with radio work but also on experiences with safety in C.C.C. work, in which he had been engaged for a time.

He was an experienced amateur, and had a well-equipped station. Born in Kansas City, he was 31 years of age at the time of his death. He left no family, having lost his parents at the age of 12, but he was to have been married to Miss Corinne Norlin of Cloquet this coming Spring. He had many close friends among the amateurs and the power men in the vicinity of Duluth and Cloquet.

This account cannot conclude with better words than those of Director of Safety Lounsberry: "If lessons could be learned from his untimely death he would want his amateur friends to benefit from them.

"Are amateurs careful to use high-grade transformers? And I wonder, too, how many amateurs appreciate the importance of insulating their persons from the earth when working on such electrical equipment. Do they, too, all practice resuscitation until the technique of artificial respiration becomes so familiar they can apply it promptly and courageously?"
...8-TUBE TRAFFIC SCOUT
COMMUNICATIONS RECEIVER KIT

As simple as all that! A screwdriver, a pair of pliers, a soldering iron—and a little ingenuity is all you need to build this 8-tube 5-band TRAFFIC SCOUT.

Assemble the component parts of this remarkable kit on the factory-drilled chassis—connect the parts terminals with hookup wire and you are ready to hear its superb clarity, and to marvel at its excellent performance! You'll say it's a honey of a communications receiver! And everything is included except the tubes and speaker! Detailed wiring instruction sheets are extremely easy to read. Steel panel and cabinet are also available.

Read in the adjoining column a few of the desirable amateur features you get in the 8-tube TRAFFIC SCOUT. You'll see why the TRAFFIC SCOUT is one of the finest buys you can make. See it at your Parts Jobber—or write Dept. Q-2, Mt. Carmel, Ill.

NOTE: Meissner Kits are available from 1 to 14 tubes AC operated, battery operated, etc.

FEATURES
• 5-band pre-aligned coil assembly for R. F. mixer and oscillator stages.
• Frequency coverage continuous, 9.25 to 565 meters.
• "All-in-Aire" (Air-tuned) individual coils for each band.
• Connections provided for doublet antenna system.
• 3-gang precision tuning condenser, ceramic insulated-electrical bandspread condensers on same unit.
• Large full-division dial, 5-inch linear scales—two pointers. Accurately calibrated.
• Separate indicator on 0-15 scale for electrical band spread.
• Single stage high gain, super-selective Ferrocore (iron core) I. F. channel.
• Beat frequency oscillator with pitch control.
• R. F. volume control.
• Headphone jack automatically disconnects output stage—volume and tone controls remain operative.

NEW!
120-PAGE INSTRUCTION BOOK!

Easy-to-understand theory and technical data, graphs, charts, pictorial and schematic diagrams, alignment data, construction data and operating instructions for 20 new Meissner receiver kits. Also information on adapters and converters. At your Parts Jobber—or order direct, addressing Dept. Q-2. Price 50c.

MT. CARMEL, ILLINOIS

"A FAMOUS NAME FOR TWO DECADES"
CENTRAL DIVISION

ILLINOIS - SCM, Leslie M. Dickson, W9MRN - IH
worked 42 counties in the first month at his new location.
ACU has new frequency meter, KJY and RMN made a
New Year's resolution not to call CQ during 1959 - O. R. S.
and R. M. parties excepted. TZQ is putting his 35T's in
56 GRS.

ACU has new frequency meter. KJY and RMN made
VEE 76 (WLTG 25) EID 433 BEN 205

TUV 183 KQJ 163 YDJ 161 XZR 154 FCC 125 MQG 120
111 TFA 150 DDO 91 HPQ 85 (WLTI 7) KJY 83 (WLTK 190)
YEE 76 (WLTG 36) TQZ 62 EOG 50 JZY 21 YS 8X 17
DOH 15 ACU 13 BRT 12 NDF 10 SVZ-DOB 7 IHQ 5
EEO-TWP 4 A.R. 131 MIN 1 MIN (WLTG 24).

KENTUCKY - SCM, Darrell A. Downard, W9ARU
The famed KY. QSO parties have started again. Keep
in touch. FSZ, SVC, Darrell A. Downard, W9ARU
is very active in QPU (Police Ops/net. NCH, tackle on
Mount Vernon has gone back from Lakes and is rebuilding shack. REC is traveling
and visiting hams in sunny South. SFO is putting his 28 Mc.
watt on all bands. DUI is doing nice job on QMN. W9V
has ZOU watter on all bands. DUI is doing nice job on QMN.

Traffic: W9NFL 706 (WLTG 25) EID 433 BEN 205

TUV 183 KQJ 163 YDJ 161 XZR 154 FCC 125 MQG 120
111 TFA 150 DDO 91 HPQ 85 (WLTI 7) KJY 83 (WLTK 190)
YEE 76 (WLTG 36) TQZ 62 EOG 50 JZY 21 YS 8X 17
DOH 15 ACU 13 BRT 12 NDF 10 SVZ-DOB 7 IHQ 5
EEO-TWP 4 A.R. 131 MIN 1 MIN (WLTG 24).

QUEENSBORO - SCM, Noble Burkhart, WIJQC -
Scout, Dave Merrell, W9QCH - IH
worked his 80th country and made 22,000 points in SS, JYX
worked his 80th country and made 22,000 points in SS, JYX
was visiting places in the old country.

Traffic: W9WZD 692 W9WDJ 291 NGO-RVE 220 FTW
179 (WLTG 48) AIZ 154 JUQ 147 DYT 128 SH 119 PLC 93
FX 86 DPE 62 NDL 61 KNP 60 SCS 57 DQI 54 CPY 47
OHP 46 SHI 44 VK 43 HIR 41 GUN 39 PI 37 BH 34 MZL
32 LDF 28 A.R. 25 (WLTG 24) SBI 22 NET 20
129 NREL 22 NER 21 SHG 19 HIC 14 KPY 13 CHI 12 GQZ
5 OCC-NUR-DEM 4 JAH 3 NKT 3 LUN-QS 1, W9X 85 YPI 25 CE 7 CWR 5.

OHIO - SCM, E. H. Gibb, W8AQ - Some of the boys
are out in the country this month with SCM, Jim S. Kirk,
PIF, RFF, LVU and UV topping theombo mark. Congrats
to 'em! PIF has been doing bang-up job as Regulars net
controller. RFF remedied the light-dote trouble with new
relay. First word from Gene at UW in long time, SMY 6,
look 6 week vacation and had fun with a 28 Mc.
phone rig. PPI worked New Guinea. We moved to Shreve
and is very active in QPO (Police Ops) nel. NCH, tackle on

Traffic: W8QLZ 120 (WLTG 15) ZTP 204 YXH 103
RUM 7 HGF 61 NMP 2 ONI 16. (Oct.-Nov.; W8KFT 84.)
INDIANA - SCM, Noble Burkhart, WIJQC -
 scattered net.

Traffic: W8SDL 313 W8ASL 256 NGO-RVE 220 FTW
179 (WLTG 48) AIZ 154 JUQ 147 DYT 128 SH 119 PLC 93
FX 86 DPE 62 NDL 61 KNP 60 SCS 57 DQI 54 CPY 47
OHP 46 SHI 44 VK 43 HIR 41 GUN 39 PI 37 BH 34 MZL
32 LDF 28 A.R. 25 (WLTG 24) SBI 22 NET 20
129 NREL 22 NER 21 SHG 19 HIC 14 KPY 13 CHI 12 GQZ
5 OCC-NUR-DEM 4 JAH 3 NKT 3 LUN-QS 1, W9X 85 YPI 25 CE 7 CWR 5.

OST for

Traffic: W8QST 300 (WLTG 15) ZTP 204 YXH 103
RUM 7 HGF 61 NMP 2 ONI 16. (Oct.-Nov.; W8KFT 84.)
INDIANA - SCM, Noble Burkhart, WIJQC -
 scattered net.
worked 8GWG on 1.75 Mc. at 1:15 P.M. with 1½ watts! ZNC is working some DX on 7 Mc.

Traffic: W9A8 8 DJH 17 EOG 23 LDL 40 MYL 112 NGS 29 QG 287 (WLIH 226) SWH 17 TBM 135 VMG 18 YWE 43 NUC 3.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Carl C. Drumeller, W9EHC —

Thanks a lot, fellows, for those votes! Keep the reports coming in, and I'll do my best to get them into QST, and to keep up the high standard set by Glen, the retiring SCM. ZDG heads the traffic list and makes B.P.L. together with BZM, leading the B.P.L. list by a whisker. In fact, all chapters of the Red Cross are being urged to prepare maps showing locations of all services needed in emergencies, including all amateur radio operators. Let's each one make it his personal responsibility to get in ship in A.A.R.S. and get that thing started, even if only one chapter in the Red Cross. If you have an Emergency Coordinator, check with him to see that the information has been turned in; if your region has no coordinator, contact the Red Cross yourself... then write me, giving your recommendation for the person you'd like to see appointed Emergency Coordinator for your region. Arch and Lucile Hanse, GLG and LQO respectively, paid ZUG a visit at the Woodland Park C.C.C. Camp. ESA reports for the Army net. WWB and WZI are pounding out, down at Pueblo, what got a 350's for gas-electric generator, but found it unsatisfactory at his 11,000 ft. QTH; so swapped it off and got a 20-watt six-volt job, which does the work nicely, VGC is proud owner of new 8X17. JWC has been chasing B.P.L. with his 1½ watts, and NWQ joined the A.A.R.S. XZU worked VOIT and NY3AA. HDU is having two element rotary beam installed by UW. YYO's new rig uses 6L0G-RK39-908 and pair of 866 Jr.'s. Nothing unusual about that, JWC... but it holds a promise for future, P.A.R.A. nucleus. YLT is getting to work some 28 on 7 Mc.


UTAH—WYO—AZ — SCM, E. C. Flood, W7CLG —

Oscar, Sollie, and wild bunchen, it's time to turn our eyes to the west. BZM is going to find that Red Cross is operating portable at Ruth, Nevada, WYOMING: 7GEE reports from Newberg, where he will be operating portable for about two months, 7GZG has made application for membership in A.A.R.S. GZU is in N.C.R, and is rebuilding to 76, 6L6, pair of 6R10's. The Utah-Wyoming members and myself wish to take this opportunity to extend Hearty New Year Greetings to all.


WEST GULF DIVISION

NORTHERN TEXAS — SCM, Les Hughes, W5DXA —

Traffic in doing fine job with pair of 35's in the final, 450 input. GJW is working N.C.R. and traffic schedules. GJU works 1.75-Mc. phone and 3.5-Mc. c.w., C.W.....GT reported for first time. BKH is our new West Gulf Director. Congrats, Bill. HFN rebuilt; 6L6 — pair 610's. GDH is handling some reports from 7100 km. DAK is rebuilding to 1.75-3.9 and one for 14-28, working four schedules.


OKLAHOMA — SCM, Carter J. Simpson, W5CEZ —

Santa produced a 260/TH for the final at CEZ. GJT received a new晶体管 and will like to see one of them wind up at the same time. JWC has new 8X17. MAO is working B.P.L. in Oklahoma City deliveries. FOM is holding down the Oklahoma position on T.L. "D," QG. signed up for A.A.R.S. certificate. FB leads complete Navy Training course for Radio Operators. JPO is 2nd Class Second Class Third Class Third Class A.A.R.S. certificate. YLT got a new 28-Mc. 'phone. QG is on 28-Mc. 'phone and 3.5-Mc. c.w. GZU received A.A.R.S. certificate. JPO signed up with A.A.R.S. CEB got a A.A.R.S. certificate and enlisted in N.C.R. DAK has tackled Correspondence Course on Navy Reps. EIO hooked up with the C.W. A.A.R.S. Net after having been with the old 'Phone Net. QG is enjoying his return to work, MRW has been busy with Portable Net, and 866 Jr. is having great luck with his four section 8JK beams, one extender finished and is working on the amplifier and keying. EYN has gone back to crystal control. K9Y runs 50 watts to a 6L6 gas-electric generator, but found it unsatisfactory at his huge trailer, LIU is building new relay rack, LEW has a new 6L6 osc. on 7 Mc.

Traffic: W5QQ 115 D8A 42 FMZ 17 ZG 15 IFN 7 DAK 11 QG 7.

SOUTHERN TEXAS — SCM, Dave H. Calk, W5BOH —

Traffic reports for Galveston, FVP works 7 Mc, DIG, the club transmitter, is back on 7 and 14 Mc. after extensive repairs. BSH W.A.C.'d with 6L6 on 7 Mc. ZG and GDH are on 14 Mc. HSB is working 28-Mc., phone, with 50 watts. BTX works Storm Net from DIG every Sunday morning, BVF moved to Eastland, FZD worked 33 hours in the SS, GNY reports Sabine Radio Club building three new emergency power units, using Dodge generators. GMT is still keeping the 14-Mc. band in order, first drill: GMT, net control station; MDN, program director; ABQ, program director; AHK, GEC, BRO, GST, DYK, FDI. YLT and USR, seniors at St. Mary's Univ., are working lots of 7-Mc. DX. DFL and GFA have been working portable on Peaks River. FMZ is keeping the MN keeps several daily schedules. DVE runs 866 Jr. is on 14 Mc. BFC is on 14-Mc. phone, GMIT organized a phone net on 3.9 Mc. with the following report for first drill: GMIT, net control station; GUE, alternate control; CFX, assistant manager; ABQ, traffic manager; AQG, western manager; AHK, HUX, FBH, BID, BFI, BGO, BJS, BST, DFK, DAS and CMU. The net has selected the name "NEAT NET" (National Emergency (Continued on page 104)
MORE FUN WITH CW!
Learn Code the CANDLER Way!

You double the pleasure you get out of CW when you can read and send FAST code! But to develop a smooth, rhythmic fist, and the ability to read fast code without strain just as you read newspaper print, requires proper training, with the correct fundamentals—the kind of training you get from Candler.

If you’re having trouble with code, if you’re stuck and can’t seem to make progress, don’t be discouraged! Write Candler—and in a short time you’ll find yourself over the “hump” sending and receiving code with the best ops on the air.

Candler teaches you the correct fundamentals and sound consciousness, so that you can copy behind without conscious effort. You’ll find yourself making more real progress in a few weeks than you have with months of undirected practice. Send for your FREE copy of the Book of Facts! Learn how Candler has trained thousands of fast operators. Candler offers advanced as well as beginners’ courses—and they are not expensive. Write today!

CANDLER SYSTEM CO.
Dept. Q-2, Box 331, ASHEVILLE, NO. CAROLINA

The DADDY of them all!

Genuine oil-filled high-voltage condensers were mighty scarce—and expensive—before AEROVOX introduced this HYVOL job.

Now many “hams” enjoy dependable, long-life, trouble-free condensers without straining even the leanest pocketbooks.

So be sure to ask your local supplier for AEROVOX 09’s. Compare the specs. Compare prices. Ask for catalog—or write us direct, at our new giant plant.

Naval Communication Reserve Notes
(Continued from page 46)

news items concerning the activities of the various units are published.

The Naval Communication Reserve of the First Naval District has had a number of opportunities to show what it can do in emergency situations, and in all cases has rendered valuable service to the communities affected. In September, when the hurricane wrought such havoc in New England, not only were emergency radio communications provided where normal facilities were disrupted, but in many cases units were mustered for patrol duty in the areas hardest hit and formed a very welcome adjunct to the overtaxed police in performing rescue work and in the prevention of looting.

The Naval Communication Reserve provides the Communication Officers for the two Aircraft Scouting Squadrons in the District. During the time these squadrons are on duty, opportunity is afforded a limited number of NCR enlisted men for training duty at the Naval Reserve Air Base, Squantum, Mass. October 27th, as a Navy Day demonstration, Reserve Aviation units simulated bombing attacks on Organized Reserve Armories. All communications during the conduct of the exercise were by radio,—handled by Naval Communication Reserve personnel. This was the first such operation, involving all Naval Reserve units, to be conducted, and the results were highly satisfactory.

At the Navy Yard, Boston, NDA, the N.C.R. Master Control Station, operates for the purpose of drilling with NAA at Washington and the other District control stations in the National drills on the first and third Thursday of each month. On alternate weeks it drills with the Section Commanders to provide for District training. The Alternate Control Station for the District, NDR, is located in Portland, Maine. This station takes part in all drills and, in addition, stands by on each drill for emergency operation in case of failure at NDA. In such cases, the alternate station takes over full control for the District.

On the first Thursday of each month throughout the year, the Naval Communication Reserve Commander holds a conference with his staff for discussion of the details of administration and carrying out the District Communication Reserve program. On the third Thursday of each month, instructional meetings are held for the N.C.R. officers for training and instruction in Naval subjects other than communications.

From a skeleton organization of a few men with limited training, the Naval Communication Reserve in the First District has grown in the past ten years to one which is well up at the top when the National standings are compiled. The First Naval District finished in second place in the National Competition last year, losing by a fraction of a point to the Twelfth Naval District.
"How much does it take to drive it?"

— is a commonly discussed subject among amateurs. Taylor Tubes points with pride to the performance of its superior Buffer-Doubler — Final Amplifier Tube — the new popular TZ-40. This wonder tube can be excited to full rated input directly by any crystal oscillator stage and the output will fully drive a class C amplifier at up to 600-700 watts input. Note the technical data on the TZ-40 doubler stage in the H.F. portion of the DeLuxe Dual Unit 275 watt transmitter shown in the 1939 Taylor Manual. This TZ-40 operating at 850 volts — 60 MA with 7 MA grid current through the 25,000 ohm bias resistor delivers up to 80 MA to the Final Amplifier while doubling from 10 to 5 meters. There is no need for high priced tubes when results like this can be secured so easily. Plan on using a TZ-40 as Buffer or Doubler and save up to $12.50 in tube cost in this one stage alone. A T-40 or TZ-40 never requires more than 5 watts excitation in any service. Over 10,000 T-40’s and TZ-40’s in daily service give true testimony to real results.

NEW TAYLOR MANUAL READY

It’s ready — and your distributor is saving a copy for you. Chock-full of tested technical data and the most modern transmitting circuits. It’s yours for the asking.

More Watts Per Dollar

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS
MISSOURI — SCM, Letha Allendorf, W90UD — The

Traffic: W9WYX 3 MZM 4 JAS 3 ZQW 10 ARE 7 NRR

6L6, using a colinear one for antenna. V.I. in charge of the Sioux Falls airway stations, gave an interesting talk on his equipment at a club meeting. MRS needs nine more QSL’s for W.A.S. VQN build addition to his shack; his new aerial will be 75 feet high! SEB will represent the state in a new midwestern net. T.Y worked a H122, MNO is new call in Rapid City, KNV’s new rig with F.P. L60’s final is going places. GOY, ‘phone chats with S.O. ‘phone with 28-Mc., ‘phone: SWY moved to Sundance, Wy., and built a 1.75-Mc., portable ‘phone to take along. CJC moved to Denver.

Traffic: W6EB 210 V81 83 ZOC 75 FOQ 34 WPA 28 VOD 3.

NORTHERN MINNESOTA — SCM: Edwin L. Wicklund, WH6GZ — HEQ wants his new 10X receiver is tops. L3Z’s OOG is building a new 600-Watt modulator using 88’s. YOB is taking a shot at the 28-Mc., ‘phone. SWY moved to Sundance, Wy., and built a 1.75-Mc., portable ‘phone to take along. CJC moved to Denver.

Traffic: W6EB 210 V81 83 ZOC 75 FOQ 34 WPA 28 VOD 3.

DELTA DIVISION

LOUISIANA — SCM: Eugene H. Treadaway, W5DGR — L.R. M’s: 5BN, S5DW, 6CHF, P.A.M.’s: 5AJD, 5CQX, E.C.: 5DQX, O.O.’s: 5FXX, 5GDU. DWW has new rig kicking FB, HAV, new Baton Rouge station, has a Utah transmitter operating on 7, 14 and 1.75-Mc. H5T is kept active at Louisiana Tech. PVD. DAR received his old call back and is active again, WO visited the boys at Louisiana Tech. CHF is active in Springfield, Ill., being R.M., O.B.S., O.B.S., and N.C.S. for A.A.R.S. CHF is putting in a pair of T40’s for full wave bands, 500-watt rig. GUK has a net operating on 1295 kc. ACA is re-building exciter unit. EB2 and EAX report active from Boyce, HJ11 new Kenner station was active on 7 Mc. DKR has new signal shifter. AOY is building high power modulator. AOY will get EB2’s transmitter with new complete new station. AOY is building high power full-wave modulator using 88’s. YOB is taking a shot at the 28-Mc., ‘phone. SWY moved to Sundance, Wy., and built a 1.75-Mc., portable ‘phone to take along. CJC moved to Denver.

Traffic: W6EB 210 V81 83 ZOC 75 FOQ 34 WPA 28 VOD 3.

SOUTHEASTERN DIVISION

ALABAMA — SCM: James F. Thompson, W4DGS — P.A.M.’s: 4DHG, 4BH1M; R.M.’s: 4DS, 4APU; E.C.’s: 4CRO, 4OA, 4ECI; O.O.: 4E6Z. Looks like CRG has a strange hold on the QS0 parties. He took the Dec. 4th party with a total of 160 points made by operating on 5 bands. APJ was second, DQW third. CRG was 51 points ahead of the others. APJ’s rig has a portable 1502 HEN 206 IGZ 9.


TNESSEESE — SCM: W. H. Walker, W4DWS — R.M.’s: 4PL, 4CQX. W4FF wants 7-Mc. contacts in the state and with surrounding states. FD, our E. C. for Memphis, worked V02AJ on 3.5 Mc.; he has completed emergency rig. CHA’s operating on 14-Mc. QRO-Mike has been formed, “The Lookout Radio Club,” composed of young and ambitious hams, who want club rooms, transmitters and such. The Fort Worth (Tex.) Radio Club, and the Chattanooga Amateur Radio Club have combined cash, skill, and discounts to build a compact and semi-portable ‘phone-c.w. transmitter for Carrol Stegall, ON4CST/QQ5AW, the African missionary ham from darkest Congo, who is on vacation in this country. Beautifully made by 5EL, and shipped here, it will be presented to Stegall at a banquet in January, and he will carry it back to Africa. Odd coincidence — the first station worked with it was Z60HS in Africa! DKV bought himself 10 acres of land out from Chattanooga and is going to try 1.75 Mc. ‘phone. Husky is using 300-volt vibrator supply plus 250 volts of battery for plate supply. LSC is active on 14- and 3.9-Mc. ‘phone. VOA is working nice DX on 14-Mc. ‘phone. ACJ is putting in an operate-in-a-net. Day by day, Section is full of real active and live wire stations.

Happy New Year to everyone wherever you are!


Bayer D. E. 150 DFS 168 DFW 160 DWS 152 FFX 58 VK 13 BQK 10 ETD 1.
C-R Tubes in Television Receiver

(Continued from page 44)

Send for FREE pamphlet containing 9 beam diagrams, 22 vertical diagrams and the new Hi-Q Vertical that does not require insulators. The first publication of its kind — yours for the asking.

CONTROL DEVICES

Some amateur concern has been felt that the recent F.C.C. rules legitimatizing the Philco "mystery control" and similar control devices is an entering wedge for some variety of unlicensed communication and that they also offer possibility of interference to our operation. We have made a careful study of this situation at Washington and are convinced there is no room for worry. The rules apply only to control devices; communication circuits will still require license. Permission to use the devices is wholly contingent upon there being no interference to radio communication. We remain fully protected.

COMMERCIAL OP EXAMS

Those of our members who also have commercial tickets may be interested in knowing that F.C.C. has approved new regulations governing commercial radio operators, to become effective May 1st, as an outgrowth of hearings held before the Chief Engineer last July and September. The present radiotelephone third class license will become known as "restricted radiotelephone operator's permit" and the present radiotelegraph operator third class license will be known as "restricted radiotelegraph operator's permit." The proposed rule dealing with "mental, moral and physical qualifications" of an applicant, which caused considerable comment, was deleted; F.C.C. finds it has all necessary authority in this respect under the Act itself. The 21-year minimum age requirement will apply only to radiotelegraph first class operators. Renewals will be issued as follows: Operators who have had three
SMALL PLUG-IN INDUCTORS

Victron insulation, good form factor, and air-spaced bare copper windings give these new coils a high efficiency that makes them ideal for use in buffers, exciters, doublers, and low-power finals. Their compact size (about 1 ½" diameter and about 1 ½" length) adapts them to crowded layouts and portables. The Isolantite plug-in base permits quick and easy band changing. They are available for either push-pull or single stages up to 25 watts and for all amateur bands. A blank unglazed Isolantite coil form (1 ¼" diameter and 2 ¾” long) also fits the same mountings. The 5-prong plug-in base and coil-form may be purchased separately.

NATIONAL COMPANY, INC.
Malden, Mass.

ASTATIC
QUARTET OF CRYSTAL MICROPHONES
Rendering Highly Efficient Service in Amateur, Professional and Commercial Fields the World Over.


MU-2: $29.50  MU-4: $39.50  K-2: $27.50  T-3: $25.00  D-104: $22.50

See Your Astatic Jobber or Write for Literature
Licensed Under Brush Development Co. Patents. Astatic Patents Pending

ASTATIC MICROPHONE LABORATORY, Inc. YOUNGSTOWN, O.
Pioneer Manufacturers of Quality Crystal Products

107
Battery-Operated Superhet

(Continued from page 14)

preciable portion of a band, so that frequent adjustment is not required.
If it is found that the band is located too far toward the high-capacity limit of $C_{13}$, $C_{14}$ should be reduced slightly; if too far toward the maximum limit of $C_{15}$, the capacity of $C_{14}$ should be increased slightly.

Adjusting for Single-Signal Selectivity

The only adjustment now left is that for single-signal selectivity. With $R_3$ set near the ground end, replace the insulated wire connected to the grid of the 1N5G as previously described, adjusting its length and position until the stage oscillates. It should be possible to stop oscillation by adjustment of $R_3$. With no i.f. oscillation, tune in a moderately strong carrier and then turn the beat oscillator off; tune the signal in as accurately as possible using the signal hum or hiss. Now turn on the beat oscillator and adjust to the desired pitch. Careful adjustment near the point of oscillation should now produce a faint ringing sound indicating high selectivity. If a signal is now tuned in, it should be strong on one side of zero beat and very weak on the other side. Maximum selectivity will not always be required and therefore the regeneration control may be backed off to a point producing moderate selectivity for general listening. It is very advisable, once the receiver is adjusted for the first test band, to spend considerable time getting accustomed to the operation of the receiver before proceeding to other bands.

Mounting in Cabinet

With the receiver working properly, it may now be mounted in the cabinet. The battery leads should be marked in some manner for identification and holes for the various controls should be spotted in the front panel of the cabinet from accurate measurements taken from the chassis. The template furnished with the National B dial should be used for locating its mounting-screw holes after the shaft hole has been located. Make all holes in the panel slightly oversize to take care of small inaccuracies. Now remove the chassis deck supplied with the cabinet and also the bottom plate and rear side. The mounting nuts for the various controls should be removed temporarily, allowing the controls to hang by their

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EASY

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Six Types Solve ALL Problems

TYPE A — For problems involving frequency, inductance and capacity, in design of radio frequency circuits. Direct reading answers for size of coils and condensers for any range between 400 kc. and 150 mc. Price, $1, postpaid.

TYPE C — More information on electrical conductors than you could find in a book full of tables. Price, 50c, postpaid.

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TYPE D — Gives decibel gain or loss when input and output voltages, currents or power are known. Price, 50c, postpaid.

TYPE F — Permits measurement of resistance, from 1 ohm to 1 megohm by use of a voltmeter. Makes an ohm-meter of your voltmeter. Price, 50c, postpaid.

AMERICAN RADIO RELAY LEAGUE, INC., West Hartford, Conn.
RCA 1-inch Cathode Ray Oscillograph

Just look at all you can do with this RCA 1-inch oscillograph! You can monitor modulation... check percentage modulation... examine modulated envelope... check hum in power supply circuits... and remember—not only will this RCA Cathode Ray Oscillograph be a big help to you—but it's very inexpensive, too! See it at your RCA Parts Distributor's.

For finer radio performance — RCA Radio Tubes

Connect leads. Place the chassis inside the cabinet and push the control shafts through the proper holes in the panel and start the mounting nuts on the outside of the panel, but do not tighten them. Replace the rear side of the cabinet and then the bottom plate, inserting the front upturned edge of the bottom plate between the chassis and the front panel. Now tighten up the control mounting nuts, cut off the potentiometer shafts to the correct length with a pair of heavy cutting pliers or a hacksaw, put on the dial and control knobs and the receiver is finished except for placing the batteries in the cabinet and connecting them up.

Space is available for two "A" batteries and the use of two in parallel is advisable since the life of two connected in parallel will be approximately 50 per cent greater than the total life obtainable from two batteries used singly. With operation of the receiver for periods of three to four hours daily, the batteries mentioned previously should last at least three months; with shorter periods of use, much longer. The setting of $C_{14}$ for each band should be noted in some manner so that it may be set quickly when changing bands.

11th DX Competition

(Continued from page 68)

of the club group, at least three reports from c.w. clubmember (First Period) participants must be sent to Hq. Similarly a club "phone winner's certificate" will be issued only when three 'phone (Second Period) entries mentioning the club have been received. Reports must be made direct to A.R.R.L., West Hartford, mentioning the name of the club, to be eligible for the affiliated-club-award. Entrants who mention their club will be eligible for both club and Section awards.

The sum of the scores of all club participants ('phone and c.w.) may be added, and reported by the club secretary, to count for the club itself. A genuine gavel, with engraved sterling silver band, is offered as an award to that club whose officers or activities manager submits the greatest collective score in A.R.R.L.'s 11th International DX Competition.

Rules, Quotas, Etc.

1. Contest work must all take place in the contest period.
2. Reports must show each time of starting and stopping station operation in the log submitted to A.R.R.L. If the total time of station operation exceeds 90 hours (in either period) the proper factor must be applied to the gross score as shown under "time limit."
3. Logs must include date, time of QSO, call of station worked, serial numbers exchanged and other information required, tabulated neatly with the claimed score. (See the log examples for required data.)
4. Scoring: Both the W/VE station and the station in the remote locality receive one point when the W or VE serial number is acknowledged by the station in the remote locality. Each operator similarly, may add two points further when a serial number (to U. S. A./Canada) is acknowledged by a W/VE station.
   (a) For W/VE entries. In computing points, each "received" serial number group counts 2. Each serial "sent" and properly QSL-ed counts 1.
   (b) For entries from stations using any prefixes other than W or VE. In computing points, each serial number "received" counts 1 point, and each number "sent" (with proper acknowledgment) counts 2 points.
5. Logs must be marked for "phone" or "c.w." transmissions with work in a single entry all by one method for one period. Separate entries may be made for both periods if desired. This is optional.

W/VEs: First Period (C.W.) The quota per country (prefix) may be worked in each different band and is the limit to count points toward the score, except that if one way ex-
THE SIMPLEST HIGH-FREQUENCY MONITOR

- FOR Police • Broadcasting • Aeronautical - Two lamps on relay-rack panel; lamps light when transmitter frequency exceeds tolerance...no meters to read; telephone jack for audible frequency check; easy to operate...no critical adjustments; monitors up to four channels; ideal for visual monitoring any radiotelephone transmitter operating between 1600 kc and 45 Mc. Price: Type 775-A Frequency-Limit Monitor $240.00. Quartz Plates $50.00 per channel.

WRITE FOR BULLETIN 354 FOR COMPLETE DATA

GENERAL RADIO COMPANY, CAMBRIDGE, MASS.

SS39 SIGNAL SQUIRTERS ARE DOING THE JOB

W1HX says:

Dear Mims:

Am certainly pleased with the new Signal Squirter and as you can see from the list, I have worked all continents in less than three weeks' time since installation. It works wonders for transmitting and receiving. I have had four contacts with Asia on c.w. and on one I have had R9 plus reports from Europe, Africa, South America and the U.S.A., or Four Continents out of the Six. The power is not doing all that and I feel that the antenna should get all the credit. My installation is only four feet above the peak of the house here and the location is not exceptional although fairly good. Hoping this helps you to know what users of your new antenna are doing, will say best luck and success to you and now I'll sign off.

Cordially yours,
(signed) NORM YOUNG W1HX

Get Ready for the DX Contest—Now

“Put Your Signal Where You Want It When You Want It There”

Write — Right Away

MIMS RADIO COMPANY

M. P. MIMS—W5BDB, P. O. Box 504, Texarkana, Ark.
TO OUR READERS

who are not

A.R.R.L. MEMBERS

WOULDN'T you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only amateur association that does things. From your reading of QST you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on page 6 of this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have the membership edition of QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

* A bona fide interest in amateur radio is the only essential qualification for membership

AMERICAN RADIO RELAY LEAGUE
Hartford, Connecticut, U. S. A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3 in foreign countries) in payment of one year's dues, $1.25 of which is for a subscription to QST for the same period. Please begin my subscription with the . . . . . . . . . . . . issue. Mail my Certificate of Membership and send QST to the following name and address.

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

Thanks

chances with some of these three have been made, more stations can be worked to give not more than 9 points (basic) per country, per band. This quota shall be permitted in each different band.

The quota depends on the number of qualifying entries submitted from each country in the previous year's competition. With few exceptions it is three stations per country. The exceptions: Quota is "4" for those countries where 25- or-more individuals reported and their scores qualified for the official summary of last year's results. Four stations per country is the quota for Germany (D), Great Britain (G) and Australia (VA). Note that Tasmania (VK7) is a separate country from the rest of the VK's and for this and all others, the quota of three applies.

Second Period (Phone). No quota limit on stations per country.

6. W/VEs: Multiplier shall consist of the number of countries (prefixes) worked on one band plus those worked on a second band, plus those worked on a third band, etc.

7. All others: No quota limit on stations.

8. All others: Scoring points shall be multiplied (for total) by the number of U. S. A. and Canadian licensing areas contacted (a possible 14). The multiplier is also increased further by working the same areas on additional frequency bands. (Example: All districts are worked on two bands, possible multiplier is 28: 10, 8, and 5 licensing areas are worked on three bands. The sum, 23 licensing areas, is the multiplier to use to get the gross score.)

9. All entrants agree to be bound by the Rules and Contest Announcements and the regulations of their licensing authority. In a contest of this magnitude, no correspondence can be entered into regarding Award Committee Decisions.

10. The highest scoring individual operator's score is the official score for all awards. Other operator scores must also be submitted separately if more than one operator worked a station. The station score (all points by all countries) may be stated for purposes of comparison, but will not have official significance in making awards.

11. More than one receiver and operating operator in use at one time to log available DX is not permissible and shall be grounds for disqualification.

12. The same station can be worked in more than one band, provided the quota (per country, per band) which applied in the first period only is not exceeded.

13. Cross band work does not count in this contest.

14. Reports and logs from participating stations must be received at A.R.R.L. Hq. from all W/VE stations on or before noon, April 21, 1939, to be considered for awards. From all outlying localities, reports must be received on or before May 25, 1939. Play safe . . . mail your report immediately at the end of each contest period to avoid delay and insure that your results are credited in QST. Show your claimed-score in full, following a tabulation of points in the log-form indicated with this announcement.

15. The entries received after the competition will be passed upon by an A.R.R.L. Award Committee whose decision will be final in all cases.

Warning!

Good notes, not ragged ones are advisable. The F.C.C. monitoring station personnel are acquainted with the dates and times of our DX contest, and will be on the job. You do not want to be disqualified! Nor do you wish discrepancy reports for poor notes and overmodulated signals! Better lose out in some operating hours rather than jeopardize your amateur standing. Let's make it a contest with no bad signals.

Competitions are requested to submit lists, even if they only show a small score to support claims made in logs from other stations.

Navy Day

(Continued from page 58)

spective Districts. Hearty congratulations to the letter-winners! As in previous years many participants lowered their standings through carelessness in recopying and through poor guess work when portions were missed. For the Nh time we urge all operators to submit their original copies in activities of this kind. — E. L. B.

(Honor Roll on Page 114)
NEUTRALIZING CONDENSERS

Steady improvements and additions have made National Neutralizing Condensers outstanding in performance and versatility. Recent improvements include micrometer type thimble and clamp for the NC-800 and an insulated mount for the STN. The NC-600 is small and compact enough to be supported by its own pigtail leads and pre-eminently suited to neutralizing 6L6's and the new Gammatron 24's.

In the group illustrated above in the top row, left to right is the NC-150 (Net Price $3.90) and the NC-500 (Net Price $7.50). In the lower row, left to right is the new STN (Net Price $1.20), the new NC-800 (Net Price $1.80) and the new NC-600 (Net Price $.27).

NATIONAL COMPANY, INC. • MALDEN, MASS.

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18 Boylston Street, Boston
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Established 1899
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Print Your Own QSL cards, stationery, advertising labels, paper, circulars, tags, etc. Save money and time. Sold direct from factory only. Junior outfit $8.95, Senior outfits $17 and up. No popular raised printing like engraving with any of our presses. Print for Others, Big Profits. Pays for itself in a short time. Easy rules sent. Write for free catalog of outfits and all details. Kelby Presses, N-65, Meriden, Conn.

A GOOD NAME GOES A LONG WAY

Ken-Rad Tubes have a good name because of their long-time dependability and high standards of quality and performance.

Ken-Rad Radio Tubes
KEN-RAD TUBE & LAMP CORPORATION - OWENSBORO, KY.
Manufacturers of all types of radio tubes and Ken-Rad Electric Lamp Bulbs
The Radio Amateur's Handbook

The new 1939 edition of the "Radio Amateur's Handbook" is a thorough revision of the standard manual of amateur communication. A tremendous quantity of new equipment was constructed exclusively for this Edition. The important transmitter chapter has been enlarged and has complete constructional data for units now described for the first time. It includes new diagrams with particular attention to determination of optimum L/C ratios and tank-condenser plate-spacings. Unit designs permit the construction of complete transmitters of any power up to the maximum allowed by amateur regulations. The radiotelephony section was rewritten with the thought of increasing its value to the practical amateur who wants to know more about the adjustment and operation of 'phone transmitters. Modulator data (particularly for the grid-bias and plate systems) will be found for each of the lay-outs featured in the transmitting chapter. Power supplies are of course fully covered so that you may pick the most suitable one. The antenna chapter has been expanded to give complete dope on all varieties from the simpler types to the more elaborate arrays. New treatment of feeder systems and the various antennas will make the operation of these more readily understood. Multi-band operation, antennas for restricted space, as well as complete information on rotary beams, is also to be found in this chapter. Other chapters have received equally thorough treatment. The fundamentals chapter has been simplified. The tube chapter has five pages of new tables to make this complete and up-to-date. New kinks will be found in the chapter on workshop practice. Four receivers have been added to the receiver section, including simple regenerative sets as well as superhets. As in the rest of the book, the emphasis is on proven circuits, with performance and economy foremost. Simple pre-selector and antenna-tuning units are described, together with material on tuning and signal-strength indicators. The transmitters to be found in the ultra-high-frequency chapters are of course designed to comply with the new regulations regarding stability; and the receivers to take advantage of this new set-up on 56 Mc. The still higher u.h.f. bands have not been forgotten, both receiving and transmitting gear having been built and described for the first time in this edition. Apparatus designed and constructed and actually used for the purpose, is included in the chapter on emergency and portable equipment. More effective laboratory equipment, practical for the amateur, is included in the instruments and measurements chapter. Of course the new amateur regulations are to be found in that ever useful source of information, the Appendix. With the extensive index, the reader can locate easily and quickly the information on the subject in which he is interested. Following the form of the previous Editions, putting in all information that is pertinent to the design, construction and operation of proven equipment, the 1939 "Handbook" is the most complete and comprehensive yet. Packed with practical information helpful to the old-timer and youngest beginner alike, concisely written in simple, understandable style, it is more than ever before the greatest dollar's worth in radio.

$1 postpaid in Continental U.S.A. — $1.25 postpaid elsewhere
Buckram bound edition, $2.50

American Radio Relay League
West Hartford, Conn.
SHURE 70SW SUPER LEVEL

Used by Amateurs and Professionals in more than 50 countries in all climates 'round the world! Gives clear, crisp speech that cuts thru noise and static! High output level and other extra-value features!

A Satin Chrome head, with built-in Cable connector. 7 ft. shielded cable. Desk Stand in Iridescent Gray.

Model 70SWL. List Price $25
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SEE THE NEW SHURE "ROCKET"

See the beautiful new Shure ROCKET de luxe communication Desk Stand lists at $27.50. Model 706SH, without Desk Stand; lists at $2.

Audio Engineering

RCA Institutes offer an intensive course of high standard embracing all phases of Radio and Television. Practical RCA Institutes offer an intensive course of high standard for anyone with an interest in Radio and Television, offering a stimulating environment for those wishing to pursue further training in the field.

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What's Your Crystal Frequency?

(Radio Engineering)

What's Your Crystal Frequency?

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What's Your Crystal Frequency?

What's Your Crystal Frequency?
As can be seen in the illustration, the log page provides space for all facts pertaining to transmission and reception, and is equally as useful for portable or mobile operation as it is for fixed. The 38 log pages with an equal number of blank pages for notes, six pages of general log information (prefixes, etc.) and a sheet of graph paper are spiral bound, permitting the book to be folded back flat at any page, requiring only the page size of 8½ x 11 on the operating table. In addition, a number sheet for traffic handlers is included with each book. The LOG BOOK sells for 35c per book or 3 books for $1.

**OFFICIAL RADIogram PADS**

The radiogram blank is now an entirely new form, designed by the Communications Department to comply with the new order of transmission. All blocks for fill-in are properly spaced for use in typewriter. It has a strikingly new heading that you will like. Radiogram blanks, 8½ x 7¾, lithographed in green ink, and padded 100 blanks to the pad, are now priced at 25c per pad, postpaid.

**and MESSAGE DELIVERY CARDS**

Radiogram delivery cards embody the same design as the radiogram blank and are available in two forms—on stamped government postcard, 2c each; unstamped, 1c each.

**AMERICAN RADIO RELAY LEAGUE, INC.**

West Hartford, Connecticut
MEMORANDUM

V You need a copy of the new best-yet 1939 Handbook.

V You need a binder for your 1938 QST's — and another for 1939.

V You need the new edition of the License Manual with all new regs.

FEBRUARY, 1939

Crystal Limitations

The power handling capabilities of crystals will vary according to the type of cut, the precision with which they are ground, and the manner in which they are used. In general, A and V cuts will handle more power than X or Y cuts. This may be explained by saying that every crystal has several modes of vibration and that these vibrations sometimes interfere with each other, as for instance, throwing two stones into a still pond of water in such a manner that the wave trains would interfere with each other. These undue strains on the crystal, if of sufficient intensity, will fracture or shatter the plate. Because of the reduction of these unwanted or coupled vibrations in the A, B, and V cuts, they will handle more power. Manufacturers usually specify maximum r.f. current for various types and cuts of crystals, and this information has led many amateurs to believe that they can always operate a crystal up to these limits with no thought as to heat dissipation or temperature rise. It is true that the crystal will operate up to and perhaps beyond the limits usually specified, but considerable thought must be given to the temperature problem. It is unwise to force a crystal to operate at its maximum power level, since in this condition extreme temperature effects can be expected. It is much better engineering to operate the crystal at low power and use another stage or tube for boosting up the power level. This is a requirement in all commercial transmitters where frequency tolerance is of importance.

Burning or spotting of crystal holder electrodes is a sure sign of overload on the crystal. The burning is caused by a corona discharge, and corona can only take place at high voltages. The factors controlling r.f. voltage across a crystal are the plate voltage, the value of grid leak, the type of tube and circuit, the LC ratio and the amount of feedback or coupling between the input and output circuits. When electrodes show dark spots,
TWO GREAT NAMES combine to make these new Hammarlund stand-off insulators outstanding in every detail. The use of Isolantite reduces chipping and breakage and insures long-lasting service. Threads will not strip or wear off as with ordinary porcelains. All hardware is cadmium plated brass and of extra heavy material. The terminal is heavy cadmium plated copper. Available in eight convenient sizes of ½" and ¾" diameters and from ¾" to 3½" long. The Isolantite bars are available separately or with plain or jack type tips and mounting bases. If you are looking for insulators that "can take it" and want to save money, ask your jobber to show you Hammarlund's new "stand-offs." Also included in this new line of insulators are Isolantite beads for insulating heavy flexible connectors and Isolantite feed-through bushings for use with metal chassis.

HAMMARLUND MFG. CO., Inc.
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Canadian Office: 41 West Avenue No.,
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P i e z o - E l e c t r i c C r y s t a l s E x c l u s i v e l y
- Quality crystals of all practical frequencies supplied since 1925. Prices quoted upon receipt of your specifications.
Our Pledge: QUALITY FIRST
SCIENTIFIC RADIO SERVICE
"The Crystal Specialist Since 1925" University Park, Hyattsville, Md.

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The major technical training equipment owned by Port Arthur College and in operation on the college campus consists of the 500-Watt Commercial Broadcast Transmitter of Station KPAC, two-way Television Transmitter and Receiver; Latest Type RCA Marine and Airways transmitter installation complete; SOS Automatic Alarm, Marine Direction Finder; Trans-radio Press Receiving Equipment, and Laboratory complete where students assemble composite transmitters, amplifiers, audio amplifiers, R.F. amplifiers, etc.

If interested in details about Radio Course, write for Bulletin R

PORT ARTHUR COLLEGE • PORT ARTHUR (World-Known Port), TEXAS

119
Are We Right?

You should have at least two of them—one for your complete 1938 file of copies, and one for each 1939 issue as published.

With each Binder is furnished a sheet of gold and black gummed labels for years 1922 through 1941. The proper one can be cut from the sheet and pasted in the space provided for it on the back of the binder.

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West Hartford, Conn.
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T. F. Cushing 349 Worthington St.
WASHINGTON, D. C. 938 F Street, N. W.
Sun Radio & Service Supply Co.

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
In conclusion, the F.C.C. rules specify that, “Sidebands resulting from keying or modulating a transmitter shall be confined within the band used.” We must not operate too near the edge of a band. When, for instance, we work within 500 cycles of the edge at 14,400 kc, we must have the frequency-measuring device, independent of a transmitter, capable of measuring within 0.0000347 per cent, or one part in 28,800. Very few, if any, self-excited oscillators will maintain such an accuracy. Those costing in the vicinity of $500.00 cannot be relied upon for much better than 0.1 per cent! Your meter will be checked if you are ever caught off frequency—and it will be just too bad if you cannot comply.

For safety’s sake the writer would recommend that you use only the best quality low-drift crystals if you intend to play near the edges, and even then you had better be several kilocycles inside to allow for all the variable factors already mentioned in this article.

Frequency

measurements easily and accurately attained with the new type DFS dual frequency crystal which oscillates at 100 and 1000 Kc.

Small, compact, and attractively mounted in a bakelite holder designed for easy mounting. It is a valuable aid to radio servicemen for calibrating receivers, oscillators, etc.

Amateurs will find this new low priced unit invaluable for frequency measurements in the amateur bands.

Net Price, mounted — $7.25

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Holliston, Mass.
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(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in the field.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capitals be used for advertising which would tend to make one advertisement stand out from the others.

(3) The rate for HAM-ADS is 7¢ per word per column inch, except as noted in paragraph (6) below.

(4) In special cases, 3¢ per word may be allowed. No order under 7¢ will be accepted.

(5) The space to be charged for shall be determined by the publisher, who in his judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League, Inc. This advertising is bona fide surplus equipment-owned, used and for sale by an individual or agency commission will be allowed.

(6) In special cases, 3¢ per word may be allowed. No order under 7¢ will be accepted.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products advertised.

QUARTZ—direct importers from Brazil of best quality pure quartz sand, including making and grinding crystals. Diamond Drill Carbide, 719 World Bldg., New York City.

RADIO engineering, broadcasting, aviation and police radio, ser-vice, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Byrd St., Valparaiso, Ind.


QSL's, all colors, cartoons, snappy service. Write for free samples today. W9AM, Box 125, Lowell, Mass.

CALLBOOKS—winter edition now on sale containing complete up-to-date list of radio hams throughout entire world. Also world prefix map, press schedules and new time conversion chart. Single copy 1.25, Canada and foreign 1.35. Radio Amateur Call Book, 610 S. Dearborn, Chicago.

RADIO control—send stamp for circulars showing latest equipment. Lightweight, reliable, guaranteed to perform. Radio Control Headquarters, Granby, Conn.


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LISTEN for high-frequency broadcast station W9X. 24,450 kilocycles, Kansas City. Programs of interest to short-wave listeners and radio amateurs.

QSL'S, SWL'S: one color 45¢, two color 60¢ hundred, prepaid. Samples. W9PTM, 268 Piedmont, Waterbury, Conn.

CRYSTALS: X-cut 1" sq. 80-100, $1.40; mounted, $2.25; 40, $2.50; mounted, $3.25, $3.50 kilocycles. Guaranteed the best. The Ransom Lab., No. Syracuse, N. Y.

QSL'S, Free samples. Printer, Cortland, Iowa.

CRYSTALS, mounted, 80-160 $1.25, V-cut 40-82, $1.90, Crystals, 335 Murray Ave., Arnold, Pa.

QSL'S, SWL'S: 100—3 color 75¢, Lapeo, $34 W. 39th, Indianapolis, Ind.

1000 watt G.E. transformers 1100-2200-4400 volts each side c.t. Guaranteed, $15.00, Dawson, 5740 Woodrow, Detroit, Mich.

QSL's, samples, Meador, Box 1534, Savannah, Ga.

SELL: new 884, 10; used SW-3, A-1 condition, coils, tubes, W9BPK, 1201 So. Liberty, Alliance, Ohio.

QSL'S, Write W3DDE.

SELL: 2000 v. k.w. supply, has auto-transformer to vary power input. Thordarson transformer, swinging choke, pyranol con­trol, and Cardwell TI-80-UD condenser. What am I offered? W9GEX, Box 186, Westwood, Mass.

PHOTOGRAPHIC QSL's from your negative. Holmes Photo Service, 222 Airdrome Blvd., Wilkinsburg, Pa.

FOR sale at your price: standard radio broadcasting equipment. Write for list and make bid. KG2B Broadcasting Co., York, Pa.

QSL'S, WSD11Q will bring more returns. Samples! WSD11Q. Swap welding transformer for xmitter or parts. Lewis Reiber, Rt. 2, W. Middlesex, Pa.


CRYSTALS ground to order. X-cut, 1750-2000; 2500-4000, $0.20 k.c., $1.10 k.c., $1.35-$5 k.c., $1.50. Spot frequency, $2.50. All crystals and blanks cut from best grade Brazilian quartz. Guaranteed to work as good as any crystal at any price. Three small, X-cut, 80 meter blanks, including carbobondum, $1.45. William Thremen, W5FHI, 5071 Moosewood St., Cincinnati, Ohio.

QSL'S. Don't buy until you see our samples. Radio Printer, Union, N. Y.

MUST sell new SX-10 Skyliner, $95. Write Alos Kriipsky, 215 E. 25th, Youngstown, Ohio.

SELLING SX-18 for $50; amateur radio experimenter, excellent condition, with crystal and speaker, express collect or F.O.B. Bridgeport.

Price complete, $95. Peter Clarke, 204 Burrill Ave., Stratford, Conn.

WESTON meters, 35 mostly new, half price and less. Also hundreds of other ham items. Write for list. Henry C. Wing, Greenfield, Mass.

CRYSTALS: Eidson's T1: 40-80 m., $1.00. Holders, $1. C.0.D. accepted. Don't buy any others, W8FLP, 1171 St., No. Y, Cleveland, Ohio.

FOR sell: used omnigraph. Cost $30. new—sell cheap.

W9MYD, Fessenden, N. D.

SELL or swap—transceiver, meters, parts, miscellaneous equipment. List free. W9ZOB, Box 366, Long Prairie, Minn.

SELL: 90 w. public address system, 100 w. transmitter. Send for description. Esme Gold Henry, 1705 Lake Ave., Cleveland, Ohio.

HATE to, but must sell brand-new KM69 with crystal, noise silencer, and tubes. Used two months. Gray finish. $99. W2KTC, 153 Scobin Ave., Brooklyn.

To crystals are setting the pace in high performance, dependable­ness, and economy—try one and be convinced. Satisfaction guaranteed. 40 and 80 meter bands, fracture resisting X-cut, $1.50; 700-7500 k.c. range, $2.00. Improved Ty osman­ham, $1. C.O.D. accepted. Commercial crystal users send for literature. Sold by: Hieunomrswx Radio, 38-34 205th St., Queens Village, N. Y., Van Pelt, Cincinnati, Ohio; 1177 State St., New Orleans, La.; Radio Atlas, Tarasco, Mexico; Henry Radio Shop, Butler, Me.; Frank Anthonoff, 375 W. 44th St., N. Y.; Casa Edison, Cavan, Cuba; and Edison's Temple, Texas.

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CRYSTALS—100, 80 meter low temperature coefficient AT cuts, within five kilocycles. $2.25. 80 meter X cuts, $1.50. HAY, $1. Ham Crystals, 1101 Lincoln Place, Brooklyn, New York.

TELELEXES, instrucographs, receivers, bought, sold. Ryan's, Hannibal, Mo.

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CRYSTALS: airbrushed; 20 m. mounted, $4.50; 160-80 m. lodrift, 40X, $1.95; 40 m. lodrift, $2.75; C.O.D.'s accepted. O-W Mfg. Co., 1170 Esperanza, Los Angeles.


CRYSTALS: mounted; 40X, $1.60; 160-80 $1.25; C.O.D.'s accepted. Pacific Labs., 344 W. 39th, Los Angeles.

SLI, shiftrons, transformers, rotary beams. New and used receivers. Transmiters. New and used transmitting tubes. Crystal microphones. Blye crystals. WSANT.

COMMUNICATION headquarters. Transmitters designed and built to order. Receivers serviced. All phases of high frequency communication. Write to Southern Ohio's only amateur owned amateur business. Jon. N. Davies, WSANT, 2767 No. 6th Rd. Sta., A., Cincinnati, Ohio.

QSL'S: 100—postpaid. Samples. Howe Brothers, Waver, Neb.

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BEST place to get communications receivers is from W9ARA. Best trades, best terms, ten-day trial. I will help you get the best receiver for your use. Write, W9ARA.

QSL'S, W9BZK, Newark, Ohio.

FREE catalog. Order direct or from dealers. 160-80 meter Y crystals, 75¢. Faberadio, Batavia, Ill.

QSL'S. 1939 designs. 50¢ to $2. per hundred. W2FJE, 101 Hanson Place, Brooklyn, N. Y.

HRO power supply, latest model, like new, $180. W2EXR.


SELL: slightly used instructograph. Also 110 volt 150 watt a.c. generator. W8RTE, Rockford, Mich.

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<table>
<thead>
<tr>
<th>CHICAGO, ILLINOIS</th>
<th>KANSAS CITY, MISSOURI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allied Radio Corporation 833 West Jackson Blvd.</td>
<td>Burstein-Applebee Company 1012-14 McGee Street</td>
</tr>
<tr>
<td>Complete standard lines always in stock—W9IBC, W9DDM, W9GEZ</td>
<td>&quot;Specialists&quot; in supplies for the Amateur and Serviceman</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHICAGO, ILLINOIS</th>
<th>KANSAS CITY, MISSOURI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago Radio Apparatus Company 415 South Dearborn Street (Est. 1921)</td>
<td>Radiolab 1515 Grand Avenue</td>
</tr>
<tr>
<td>W9RA and W9PST — Amateurs since 1909</td>
<td>Amateur Headquarters in Kansas City</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHICAGO, ILLINOIS</th>
<th>MILWAUKEE, WISCONSIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wholesale Radio Service Company, Inc. 901-11 West Jackson Boulevard</td>
<td>Radio Parts Company, Inc. 538 West State Street</td>
</tr>
<tr>
<td>&quot;The World’s Largest Radio Supply House&quot;</td>
<td>Complete stock Nationally Known products</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHICAGO, ILLINOIS</th>
<th>MINNEAPOLIS, MINNESOTA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Radio Corp. 1912 Grand Avenue</td>
<td>Lew Bonn Co. 1124-26 Hamon Place</td>
</tr>
<tr>
<td>Complete amateur stock, W9OCG—W9EMS—W9KAY</td>
<td>W9BP—W9LE—W9ZXV—W9DNL—W9VED</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DES MOINES, IOWA</th>
<th>OAKLAND, CALIFORNIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Radio Corp. 1912 Grand Avenue</td>
<td>Offenbach Electric Company 2085 Broadway</td>
</tr>
<tr>
<td>Complete amateur stock, W9OCG—W9EMS—W9KAY</td>
<td>&quot;The House of a Million Radio Parts&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DETROIT, MICHIGAN</th>
<th>SAN FRANCISCO, CALIFORNIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radio Specialties Company 325 E. Jefferson Avenue</td>
<td>Offenbach Electric Company, Ltd. 1452 Market Street</td>
</tr>
<tr>
<td>Ham Supplies — National &amp; Hammerlund Sets and Parts</td>
<td>&quot;The House of a Million Radio Parts&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEATTLE, WASHINGTON</th>
<th>ST. LOUIS, MISSOURI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Radio Company 9208 Fourth Avenue</td>
<td>Van Sickle Radio Company 1113 Pine Street</td>
</tr>
<tr>
<td>W7AWP and W7CR to serve you</td>
<td>W90WD invites you to amateur headquarters in St. Louis</td>
</tr>
</tbody>
</table>

125
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Index to Advertisers

<table>
<thead>
<tr>
<th>Company</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acme Electric &amp; Mfg. Company, The</td>
<td>113</td>
</tr>
<tr>
<td>Aerovox Corp</td>
<td>124</td>
</tr>
<tr>
<td>American Radio Institute</td>
<td>167</td>
</tr>
<tr>
<td>Astatic Microphone Laboratory, Inc.</td>
<td>98</td>
</tr>
<tr>
<td>Barker &amp; Williamson</td>
<td>79</td>
</tr>
<tr>
<td>Biller Electric Company</td>
<td>102</td>
</tr>
<tr>
<td>Candler System Company</td>
<td>108</td>
</tr>
<tr>
<td>Capital Radio Engineering Institute</td>
<td>84</td>
</tr>
<tr>
<td>Centralab</td>
<td>77</td>
</tr>
<tr>
<td>Collins Radio Company</td>
<td>Cov. 8</td>
</tr>
<tr>
<td>Cornell-Dubilier Electric Corp.</td>
<td>96</td>
</tr>
<tr>
<td>Coro-Coll Company, Inc.</td>
<td>94</td>
</tr>
<tr>
<td>Dodge's Institute</td>
<td>122</td>
</tr>
<tr>
<td>Eitel-McCullough, Inc.</td>
<td>83</td>
</tr>
<tr>
<td>Gardner-Levering Company</td>
<td>96</td>
</tr>
<tr>
<td>General Radio Company</td>
<td>111</td>
</tr>
<tr>
<td>Guthman &amp; Company, Edwin I.</td>
<td>92</td>
</tr>
<tr>
<td>Hallcrafters, Inc., The</td>
<td>87, 119</td>
</tr>
<tr>
<td>Hammarlund Mfg. Company, Inc.</td>
<td>120</td>
</tr>
<tr>
<td>Harvey Radio Company</td>
<td>95</td>
</tr>
<tr>
<td>Harvey Radio Laboratories</td>
<td>98</td>
</tr>
<tr>
<td>Henry Radio Shop</td>
<td>122</td>
</tr>
<tr>
<td>Hinds &amp; Edgerton</td>
<td>95</td>
</tr>
<tr>
<td>Houston Crystal Company</td>
<td>91</td>
</tr>
<tr>
<td>Howard Radio Company</td>
<td>112</td>
</tr>
<tr>
<td>Hytron Laboratories</td>
<td>113</td>
</tr>
<tr>
<td>Instructograph Company</td>
<td>122</td>
</tr>
<tr>
<td>International Resistance Company</td>
<td>74</td>
</tr>
<tr>
<td>Johnson Company, E. F.</td>
<td>89</td>
</tr>
<tr>
<td>Kato Engineering Company</td>
<td>116</td>
</tr>
<tr>
<td>Kelley Precision Products</td>
<td>113</td>
</tr>
<tr>
<td>Kenyon Tube &amp; Lamp Corp</td>
<td>8</td>
</tr>
<tr>
<td>Kenyon Transformer Company, Inc.</td>
<td>5</td>
</tr>
<tr>
<td>Mallory &amp; Company, Inc., P. R.</td>
<td>74</td>
</tr>
<tr>
<td>Massachusetts Oceanic School</td>
<td>113</td>
</tr>
<tr>
<td>McGraw-Hill Book Company, Inc.</td>
<td>86</td>
</tr>
<tr>
<td>Melsner Mfg. Company</td>
<td>99</td>
</tr>
<tr>
<td>Mims Radio Company</td>
<td>111</td>
</tr>
<tr>
<td>National Company, Inc.</td>
<td>Cov. 3, 73, 96, 107, 113</td>
</tr>
<tr>
<td>Newark Electric Company</td>
<td>97</td>
</tr>
<tr>
<td>Ohmite Mfg. Company</td>
<td>108</td>
</tr>
<tr>
<td>Port Arthur College</td>
<td>119</td>
</tr>
<tr>
<td>Precise Apparatus Company</td>
<td>118</td>
</tr>
<tr>
<td>Precision Pleo Service</td>
<td>92</td>
</tr>
<tr>
<td>Premax Products</td>
<td>108</td>
</tr>
<tr>
<td>RCA Institutes, Inc.</td>
<td>116</td>
</tr>
<tr>
<td>RCA Mfg. Company, Inc.</td>
<td>Cov. 4, 7</td>
</tr>
<tr>
<td>Radio Mfg. Engineers, Inc.</td>
<td>127</td>
</tr>
<tr>
<td>Radio Shack, Inc.</td>
<td>110</td>
</tr>
<tr>
<td>Radio Transceiving Laboratories</td>
<td>115</td>
</tr>
<tr>
<td>Raytheon Production Corp.</td>
<td>75</td>
</tr>
<tr>
<td>Scientific Radio Service</td>
<td>119</td>
</tr>
<tr>
<td>Shure Brothers</td>
<td>119</td>
</tr>
<tr>
<td>Sickles Company, F. W.</td>
<td>119</td>
</tr>
<tr>
<td>Simpson Electric Company</td>
<td>80, 85</td>
</tr>
<tr>
<td>Solar Mfg. Corp.</td>
<td>110</td>
</tr>
<tr>
<td>Sun Radio Company</td>
<td>92</td>
</tr>
<tr>
<td>Taylor Tubes, Inc.</td>
<td>103</td>
</tr>
<tr>
<td>Teleflex Company</td>
<td>74</td>
</tr>
<tr>
<td>Terminal Radio Corp.</td>
<td>111</td>
</tr>
<tr>
<td>Thoradco Electric Mfg. Company</td>
<td>91</td>
</tr>
<tr>
<td>Triplet Electro Instrument Company, Inc.</td>
<td>124</td>
</tr>
<tr>
<td>Turner Company, Inc.</td>
<td>111</td>
</tr>
<tr>
<td>United Electronics Company</td>
<td>118</td>
</tr>
<tr>
<td>United Transformer Corp.</td>
<td>128</td>
</tr>
<tr>
<td>Valplow Crystals, The</td>
<td>121</td>
</tr>
<tr>
<td>Vibroplex Company, Inc., The</td>
<td>114</td>
</tr>
<tr>
<td>Wholesale Radio Company, Ltd.</td>
<td>113</td>
</tr>
<tr>
<td>Wincharger Corporation</td>
<td>114</td>
</tr>
<tr>
<td>Vauxley</td>
<td>74</td>
</tr>
<tr>
<td>Zenith Radio Corporation</td>
<td>81</td>
</tr>
</tbody>
</table>
"Under the Dust Cover"

We, of RME, have long endeavored to make amateurs conscientiously critical when a decision is to be made on a communication receiver. So we will endeavor, through a series of exposures, to show what is found inside the cabinet of an RME receiver.

Under the condenser dust-cover are located the main tuning condenser, the bandspread condenser, and the dual section resonator condenser.

The stator of the main tuning condenser really consists of six sections. The object is to provide various sectional capacities for high Q circuits over the extended range of the receiver frequency. But without some means of widening the band spectrum a communication receiver would be lacking in a major essential — a low capacity condenser for bandspreading purposes. This bandspread condenser is so designed that removal of one or two stator plates from each one of the three stator sections will provide greater separation between stations, if desired, especially on the higher frequencies.

And to go one step further in guarding against an ever-present possibility — namely, misalignment and consequent low sensitivity of the receiver — every RME instrument has a resonator control. This consists of a two-section variable of approximately 20 µfd per section in parallel with the main R.F. and detector circuits. Usually many padders are utilized in lining up the circuits. These are often difficult to get at and more difficult to keep in trim. What could be more practical than a dozen padders replaced by two air-tuned trimmers adjustable from the front panel.

Every condenser unit is of the highest quality obtainable today.

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RADIO MFG.
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PEORIA • ILLINOIS

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Any modulator tubes to any RF load DC on secondary
S-21 — 110 watts audio power. Net ....................... $6.00
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Primary 115V. — 50/60 cycles
S-48 — 1500, 1250, 1000 volts each side of center tap — 500 MA. Net ................ $0.00
S-49 — 2100, 1800, 1500 volts each side of center tap — 300 MA. Net ................ $10.80

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THE QUALITY LINES are first choice

LINEAR STANDARD

Transformers have guaranteed linear response from 30 to 20,000 cycles, ideal shielding and dependability.

TYPICAL ITEMS:
LS-10X — Tri-alloy shielded, multiple line to grid. Net $12.00
LS-50 — Low level plate to multiple line. Net ........................................... $9.00
LS-55 — 2A3's to multiple line and voice coil. Net ................................. $12.00

HIPERM ALLOY

Units are similar to LINEAR STANDARD components but employ a light-weight case making them ideal for highest fidelity compact equipment.

TYPICAL ITEMS:
HA-100X — Tri-alloy shielded, multiple line to grid. Net $10.00
HA-111 — Crystal mike or pickup to line. Net ........................................ $7.50
HA-105 — Single plate to single grid. Net ........................................ $5.40

VARITRAN

Voltage CONTROL Units

MODEL V-1 — 570 Watts — 5 amp. maximum rating, complete with cord, plug and switch. Net ........................................ $10.00
MODEL V-2 — Same as V-1, but uncased, with terminal strip for rack or panel mounting. Net ........................................ $9.00
MODEL V-3 — 850 Watts maximum rating, 7.5 amps., uncased, with terminal board and provisions for mounting. Net $14.00
Other sizes in stock.

UTC OUNCER UNITS

Weight but 1 ounce yet have high fidelity characteristics. Ideal for hearing aid, concealed service and aircraft.

TYPICAL ITEMS:
O-1 — Line to grid. Net ........................................ $6.00
O-6 — Plate to two grids. Net ........................................ $5.40
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United Transformer Corp.
150 Varick Street • New York, N. Y.
Export Division: 150 Varick Street • New York, N. Y. Cables "ARLAB"

QST for February, 1939, CENTRAL Edition
Progress in the technique of high-pressure injection molding in this country has made it possible to improve the mechanical design of the One-Ten Receiver. The parts shown in the photograph above are made of low-loss Victron. Injection molding has made practical their intricate shapes, thin wall sections and clean appearance. They contribute much to the stability, dependability and high performance of the One-Ten.

These improvements come at a particularly appropriate time. The restrictions placed on 5-meter operation by the new regulations make the 2½-meter and 1¼-meter bands doubly attractive for experimental operation. With high performance down to 1-meter, the One-Ten is the ideal receiver for these bands.
Get 260 watts output with less than 1 watt driving power...with NEW RCA 813

It's not a claim—it's an actual fact! The new RCA 813 will give you 260 watts output in Class "C" telegraph service with less than 1 watt of driving power! Needs no neutralization, and a pair of 813's makes a swell final for quick-band-change, high power transmitters.

Only 7½" long, the RCA 813 employs a new stem structure with very short heavy leads and low lead inductance. This new high power beam tube may be operated at full ratings up to 30 megacycles without neutralization.

$28.50 AMATEUR NET

GET HIGH POWER AND SAVE 4 WAYS WITH THE RCA 810

This tube enables you to save on initial cost—cost of tank circuit capacitors; cost of power supply equipment—and cost of driver stage. And when it comes to high power—you'll say the 810 is FB! For it gives you plenty!

Two RCA 810's, in Class "C" telegraph service, will take one kilowatt of power at a plate voltage of only 2000 volts and a driving power of 24 watts.

PRICES REDUCED!

With prices reduced on the following RCA power tubes you now have an excellent opportunity to save money. Compare these prices!

RCA 203-A was $15.00 Now $10.00
RCA 204-A was 97.50 Now 85.00
RCA 211 was 15.00 Now 10.00
RCA 803 was 34.50 Now 28.50
RCA 837 was 8.50 Now 7.50
RCA 838 was 16.00 Now 11.00
RCA 845 was 15.00 Now 10.00
RCA 849 was 135.00 Now 120.00
RCA 866-A was 4.00 Now 2.50
RCA 872 was 14.00 Now 9.00
RCA 872-A was 16.50 Now 11.00

The RCA 810 is of the high-mu triode type and has extremely high perveance. It features a heavy-duty thoriated-tungsten filament, a filament shield at each end which prevents escape of stray electrons, and large rugged terminals at top and side of the bulb. May be operated at frequencies as high as 30 megacycles at maximum ratings.

Maximum ratings of RCA 810, Class "C" Telegraph: D-C plate voltage, 2000 volts; D-C plate current, 250 milliamperes; Plate input, 300 watts; Plate dissipation, 125 watts.

$13.50 AMATEUR NET


Listen to the "Magic Key of RCA" every Sunday, 2 to 3 P.M., E.S.T., on the NBC Blue Network.

RCA MANUFACTURING CO., INC., CAMDEN, N. J.
A Service of the Radio Corporation of America