In this Issue—

A New I. F. Amplifier System

More on Directive Antennas
If you haven't already heard, we are talking about Collins' newest arrival, the 30J 250 watt Transmitter. With a power increase of 40% over the 30FXC, the 30J remains in the 30FXC price class. New styling and new mechanical features are a pleasure to the eye and an aid to better operating. Simplified tuning has been the key note of the design. Like all proud parents, we could go on and on, but a glance at the specifications will show you that we are not unjustly proud.

**SPECIFICATIONS**

- **POWER OUTPUT:** 250 watts Phone and CW.
- **FREQUENCY RANGE:** 1.5 to 30 megacycles (.5 mc. to 60 mc. on special order).
- **FREQUENCY CHANGE:** Plug-in coils.
- **POWER SOURCE:** 110 volt, 50-60 cycle, single phase A.C., 1200 V.A.
- **TUBE COMPLEMENT:**
  - 1 - C100D Oscillator.
  - 1 - 807 First Doubler-Amplifier.
  - 1 - 807 Second Doubler-Amplifier.
  - 3 - 807 Third Doubler-Amplifiers.
  - 2 - C101 Final Amplifiers.
  - 2 - 6J5G Audio Amplifiers.
  - 2 - 6F6G Audio Drivers.
  - 2 - C120 Modulators.
  - 2 - C249B Mercury Vapor Rectifiers.
  - 2 - C366A Mercury Vapor Rectifiers.
  - 1 - 5Z3 Low Voltage Rectifier.
- **MODULATION:** High level, Class “B”.
- **CRYSTAL:** “A” cut in 294 or 1A holder.
- **AUDIO FREQUENCY INPUT:** From microphone—40 db at 50,000 ohms.
- **AUDIO FREQUENCY RESPONSE:** Plus or minus 1.5 db from 100 to 5000 cycles.
- **CARRIER NOISE:** More than 40 db below 100% modulation.
- **OUTPUT CIRCUIT:** Pi tank circuit for operation with balanced transmission line or feeder.
- **CABINET DIMENSIONS:** 60” x 20” x 13”
- **WEIGHT:** 300 pounds.
THE Hallicrafters occupy a unique
place in the communications
receiver field. Alone among the ex­
clusive manufacturers of this type
of equipment, they hold both RCA
and Hazeltine licenses.

What does this mean to the purchaser
of a Hallicrafters receiver?

First, it is an indication of the sta­
bility and integrity of the manu­
facturer. In the entire radio industry
there are but a few of the more sub­
stantial organizations who are privi­
eged to hold such licenses.

Second, it means that the manu­
facturer of this equipment has at his
 disposal the fruits of a lifetime of
 intensive radio research, by the finest
 engineering brains in the radio in­
dustry. A thousand is a ridiculously
 modest estimate of the years upon
 years of brilliant experiment by hun­
dreds of engineers and scientists,
 through which radio science has
 been brought to its present state of
 perfection and which is all available
 to the Hallicrafters through their
 patent licenses.

No wonder the Hallicrafters can produce
so advanced a receiver as the New 1938
 Super Skyliner—no wonder the Sky
 Challenger is so outstanding among re­
cievers in the $80.00 price bracket, a chal­
 lenge in itself. There's more in a Halli­
crafters receiver than meets the eye—a
 background of brilliant, revolutionary
 engineering. See these receivers at your
 dealers. Try them out. Compare them.
 And remember, look for the license label
 on any receiver.

Write for Illustrated booklet describing the
 complete Hallicrafters Line.

ALL HALLICRAFTERS RECEIVERS SOLD ON LIBERAL TIME PAYMENTS

Say You Saw It in QST — It Identifies You and Helps QST
Believing that specific technical information about the new 1938 Super Skyrider would be welcomed by most amateurs, we have submitted the reports by three independent laboratories to our limited space permits inclusion only of figures on the amateur bands. The reports were submitted in considerable detail but our limited space permits inclusion only of figures on the amateur bands. The laboratories all commented that image ratio was very good on this receiver.

**OVERALL SENSITIVITY** -- Taken at 50 milliwatts output, measured in microvolts with IF's in sharp position.

<table>
<thead>
<tr>
<th>Frequency (kHz)</th>
<th>Sensitivity (μV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1500</td>
<td>60,000</td>
</tr>
<tr>
<td>3500</td>
<td>28,000</td>
</tr>
<tr>
<td>7000</td>
<td>14,000</td>
</tr>
</tbody>
</table>

**IMAGE RATIO** -- Taken at 3 spots.

<table>
<thead>
<tr>
<th>Frequency (kHz)</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>300 to 1</td>
</tr>
<tr>
<td>7000</td>
<td>200 to 1</td>
</tr>
<tr>
<td>14000</td>
<td>50 to 1</td>
</tr>
</tbody>
</table>

**SIGNAL TO NOISE RATIO** -- Described as equivalent Noise Band Equivalent (E.N.S.E.) is reported at great length but is summarized in 2 reports in the following statements:

1. "The results of the E.N.S.I. are somewhat better than usual."
2. "The values of the E.N.S.I. are somewhat better than usual."

**SELECTIVITY** -- This important set of tests was summarized in one report by the statement "The selectivity in the sharp position is considerably greater than the average for receivers of this type." The selectivity was measured at various frequencies and in different positions.

- **Selectivity in Sharp Position**:
  - 5 kHz: 100 dB
  - 50 kHz: 80 dB
  - 500 kHz: 50 dB

- **Selectivity in Broad Band**:
  - 1 kHz: 70 dB
  - 10 kHz: 50 dB
  - 100 kHz: 30 dB

**Total Band Width**:

- 5.2 kHz: 95 dB
- 8.7 kHz: 85 dB
- 12.6 kHz: 75 dB
- 100 kHz: 65 dB
- 1000 kHz: 55 dB

This last series of figures demonstrates a high order of selectivity, which combined with the new and improved Band Spread, makes the New 1938 Super Skyrider a receiver capable of true communications performance.

Karl W. Miles
Chief Engineer
The Hallicrafters, Inc.

For the engineering-minded amateur interested in technical details, Mr. Karl W. Miles, Chief Engineer of the Hallicrafters, Inc., has prepared the above statement.
The Contents

Editorials ........................................ 9
New Cathode Ray Tubes for Television .......... 10
The Maritime Division Convention .......... 10
1937 A.R.R.L. Field Day Results ............ 11
A 10-Watt Speech Amplifier with Voltage-Regulated Plate Supply .... George Grammer 15
What the League Is Doing .................. 18
A New I.F. Amplifier System with Infinite Off-Frequency Rejection .... Karl W. Miles and J. L. A. McLaughlin 19
Match and Mis-Match ......................... 24
Rewinding an Auto Generator for 110-Volt A.C. Supply H. J. Burchfield, W6JTV 26

Naval Communication Reserve Notes ........ 30
Army-Amateur Radio System Activities ....... 31
How Long Is a Quarter Wavelength? .... J. N. A. Hawkins, W6AAR 32
Notes on Steatite-Type High-Frequency Insulation Hans Thurnauer 33

Making the Most of Directive Antennas Don C. Wallace, W6AM 35
A DeLuxe 100-Watt C.W.-Phone Transmitter with Band-Switching Exciter . George F. Wunderlich, W6DUW 38
How Would You Do It? .................... 42
Announcing—Eighth A.R.R.L. Sweepstakes F. E. Handy, W1BDI 43

Hints and Kinks .................................. 46
I.A.R.U. News .................................. 48
Operating News .................................. 49
A New High-Power Triode ................... 833 90
A.R.R.L. QSL Bureau ......................... 94
Standard Frequency Transmissions .......... 110
Silent Keys .................................... 123
Hamads ........................................... 123
QST's Index of Advertisers .................. 126
Say You Saw It in QST — It Identifies You and Helps QST Here Comes! - The Radio Operator's Handbook
The
Radio Amateur's
HANDBOOK
1938 Edition
IN YOUR STATION
NOVEMBER 1
$1 POSTPAID
$1.25 OUTSIDE OF CONTINENTAL U.S.A.

AMERICAN RADIO RELAY LEAGUE, WEST HARTFORD, CONN., U. S. A.

Say You Saw It in QST — It Identifies You and Helps QST
For Dependable Service

THE new "Super-Pro" with its distinctive design and rugged construction, provides trouble-free "dependable service" so essential to the critical amateur and professional for his important and exacting air activities. Among the "Super-Pro" features that contribute to this superior efficiency is the husky, self-contained tuning unit, with its unique noiseless band-change cam knife switch. Silver plated-knives and contacts insure low resistance contact for each circuit. No moving part carries current to cause noise or provide stray coupling. In addition, the tuning unit has 20 separate coil assemblies, with coils wound on highest grade bakelite and mounted on Isolantite bases. All coils have copper disc inductance adjusters and variable trimming capacitors permitting precision alignment at low and high frequency ends of the bands. The tuning unit also has a shielded 4-gang tuning condenser and 12-gang band spread condenser with soldered brass Midline plates, stainless steel rotor shaft, and steel ball bearings affording smooth and accurate tuning.

Other features of the "Super-Pro" are — two R.F. stages on all bands; calibrated band width (3 to 16 kc.); beat oscillator, audio, and sensitivity controls; direct tuning; high fidelity; variable crystal filter; C.W.-Mod. Standby, A.V.C.-Man., Speaker-Phone switches; relay strip; 8 metal and 8 glass tubes. Crystal or standard types available in table model, rack panel, or console for 7½ to 240 or 15 to 560 meters. Console model has a bass reflex sealed sound chamber and a 15" high fidelity speaker.

See and hear this outstanding receiver today! If you haven't the name of your local authorized Hammarlund dealer, mail coupon below for these data and complete details on the new "Super-Pro."

MAIL THIS COUPON!

HAMMARLUND MFG. CO., INC.
424-438 W. 33rd St., N. Y. City

☐ Please send me "Super-Pro" bulletin
☐ Please send me "Super-Pro" Console bulletin
☐ Please send me dealer listing

Name................................................. .
Address............................................... .
City.................................................. State ............... O-11

Say You Saw It in QST — It Identifies You and Helps QST
Section Communications Managers of the A.R.R.L. Communications Department

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 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.
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.

HIRAM PERCY MAXIM, FIRST PRESIDENT

OFFICERS

President..............EUGENE C. WOODRUFF, W8CMP
State College, Pa.

Vice-President........GEORGE W. BAILEY, W1KH
Weston, Mass.

Secretary............KENNETH B. WARNER, W1EH
West Hartford, Connecticut

Treasurer..............ARTHUR A. HEBERT, W1ES
West Hartford, Connecticut

Communications Mgr...E. EDWARD HANDY, W1BDI
West Hartford, Connecticut

General Counsel........PAUL M. SEGAL
1010 Shoreham Building, Washington, D.C.
WE'VE sat here a half an hour with a sheet of blank paper in the editorial mill, ruminating on a line of thought that has possessed us the past several days, wondering whether it's worth talking about and how to get started doing so. We've decided to sound off. We hope no one will take us too seriously. We'll probably say a number of things that we don't quite mean, just for the purpose of exciting a line of thought and illustrating what's been on our mind.

We wonder if this old game isn't getting a great deal too complicated. We also wonder if we don't make much of this complication for ourselves by hanging onto dead things and dead practices long after they should have received decent burial. Do we amateurs sometimes develop mild cases of muscle-binding of the brain? It seems to us that we don't forget easily enough, nor discard and throw away painlessly enough. And we're thinking both of apparatus and of ideas themselves.

Just as an example, consider the average amateur's attic, generally containing what was once many dollars worth of radio apparatus, now outgrown and stowed away. Stowed away why? Well, in the hope that there will be use for it later. Yet, ten to one, every one of us in his heart knows that we'll never drag that old gear into use again. It just sits there, collecting dust. And distracting us with memories of the days when it was prime. That's it—distracting us. We hang too much onto our dead past. We're not nimble enough to take the mental plunge and get it over with, once and for all. Isn't it possible that we'd be better off if we threw that old junk away and, with it, the very memories of it and everything it stood for, so as to leave mental houseroom for new ideas, new developments, progress? Isn't it probably symbolic of something, this way we hang on to decrepit gear in the attic? Most of mental hygiene is about on a par with this, we often think. Our operating ideas, our social ideas within the amateur picture, are largely those of years that are gone. We do things and think things a certain way because we used to, because we remember so well the successive steps that led to our present practices—and in the process all these separate components of our thoughts and actions take on a certain sanctity and we are prone not to disturb them. So, ask we, what of our vaunted flexibility and mental agility and wideawakeness, this terrific resourcefulness of the amateur?

Here we are, just for another example, engaging in terrible mental gymnastics whenever a group of hams meet, on the simple question of antennas and ways of feeding them. We wind ourselves into the darndest knots over matched impedances and various other aspects of what ought to be a simple problem. Simple because, when it's all said and done, and the job is working, it can be seen to be simple. Yet the way we torture ourselves in the interim proves that the old bean is still loaded down with ancient concepts, the old and clumsy way of looking at things, to an extent that has precluded simplification and easy-does-it. We're the same way about transmitters. So a crystal will give stability at a low power level, will it, and other stages can double frequency and multiply power, and a final can give the power a big boost? Hmmm. And rather difficult neutralization will make the many stages behave, provided they are accompanied by a maze of by-passes and r.f. grounds and resistors serving many purposes, you say? Well, sonny boy, we have to point out that the net result is a monster of many stages, of dozens of dials and meters, and of a positively fiendish complexity. It puts out a grand signal, the swellest we know about, but at what a price in complication, hard work and headaches—and dollars! We suppose we put up with it only because we haven't yet thought out a more rational way of doing the job. But it seems to us that we ought to positively surge with impatience over still compounding the old ideas of a little crystal stage here in the southwest corner, followed by another stage to do this and another to do that, all requiring separate adjustment, until the result is an electrician's nightmare. It's too much of a good thing. We ought to be restlessly seeking some means of kicking the whole kaboodle overboard and doing these things in a new and refreshingly simpler manner. Probably we ought to feel the same way about receivers but most of us buy ours ready-made from a factory and our sense of outrage is somewhat lulled by the fact that somebody else has done the dirty work. Perhaps some day some manufacturer will bring out a factory-built dingbat for transmitters, containing all the generating and doubling and exciting stages and 95% of the soldered connections and headaches, and if that happens we'll probably take it and like it. But ought we to? Shouldn't we still be sick of
such hellish complications, of getting present-day results by compounding little bits of ancient information on top of one another? That genius is an infinite capacity for taking pains is, in this case, sheer rubbish, we think. Outspoken impatience with outworn claptrap is also a virtue. We'd be better off if we were all just seething with a fine indignation at the humiliation of not knowing how to do these jobs in any more effective fashion, and if there burned in us an almost reckless determination to find means to junk these moth-eaten procedures, both in technique and in operating, and to develop modern short-cuts to better results. The whole structure of our technical practices could stand reexamination, searching reexamination in a bitter mood. We need some forthright intensive thinking on how to cut away the debris of the past twenty years; realistic, objective thinking-out of how to accomplish our results in direct fashion. And to this end we need first to denude our minds of their burden of outworn physical concepts and moss-covered theory, of complacent acceptance of rust-encrusted practices, of unwillingness to be impatient! And, of all these, the mental housecleaning is the most important.

Do we hear a call for a psychiatrist? Is it suggested that we are flying in the face of all scientific history, that improvements are to be had only at the expense of complications, with occasional consolidations of new ground gained? And that we forget that man never learns anything except painfully, little bit by little? Well, buddy, our answer is that it's just too long between consolidations, and as for the rest, by heavens we're amateurs and we don't have to content ourselves with orthodox modes of thinking. More power, we say, to the spirit of impatience in this field!

And so we suggest that it is in that direction that will be found the next great increment of amateur progress. We call now for serious thought-taking on this subject. Is there a chance or are we nuts? We'd be glad to have letters from members for our correspondence column. If you're still with us, hop on your megacycle and let's go places!

---

**The Cover**

The dizzy pattern up front this month is the result of popping a camera near the managing editor's desk as this issue was under construction. The gadgets will be recognized as "cutes"—the engravings with which the illustrations in the magazine are printed. Some of the engravers' proofs can be seen under the cuts themselves.

---

**New Cathode-Ray Tubes for Television Reception**

When tubes labeled "television" are made available for amateur and experimental use, it does seem as though that long-awaited type of transmission is coming close to the well-known corner around which it has been these many years. RCA has brought out two new cathode-ray tubes designed for experimental television reception, one having a 5-inch screen and the other a 9-inch; they are shown in the accompanying photograph. They will be known as Types 1800 (9-inch) and 1801 (5-inch), and have been named "Kinescopes."

Both tubes are of the electromagnetic-deflection type. A medium-persistence fluorescent material with which pictures have a yellowish hue is used for the screens. Heater voltage in both cases is 2.5 volts. The 1800 operates with Anode No. 2 voltages up to 7000, Anode No. 1 up to 2000; similar maximum ratings for the 1801 are 3000 and 1000 volts, respectively.

Kinescopes are being released on a purely experimental basis, with no present intention of marketing complete equipment with which they can be used.

---

**The Maritime Division Convention**

The annual Maritime Convention sponsored by the Halifax Amateur Radio Club was a great success. It was well attended and everyone had a good time. The ball started rolling on Saturday afternoon, September 4th, with registration at the Nova Scotia Hotel. The person attending from the greatest distance was W. H. Lord of Chattanooga, Tenn. Another welcome guest was W1VE, a rather appropriate call for the occasion. The total number in attendance was one hundred and sixteen.

The first meeting was addressed by Professor G. H. Burchell, of the Department of Electrical Engineering of the Nova Scotia Technical Col-

(Continued on page 30)
THE Fifth Annual A.R.R.L. Field Day (June, 1937) was by far the most successful outdoor operating activity ever held. 642 individuals participated! Practically all of these were licensed radio amateurs, a comparative few S.W.L.'s and hams-to-be assisting in station installations, in rustling grub, etc. 60 club-groups totalling 465 individuals took advantage of the opportunity for a real radio outing. The remaining 177 participants went out alone, or in most cases in small groups. An activity such as the "F.D." lends itself best to group-participation, although it was fun for all, "lone wolves" and "large gangs" alike.

Interest in portable work and the emergency-preparedness that it encourages is increasing by leaps and bounds. The fact that some 550 different "portable stations" were worked or logged on the Field Day week-end indicates the widespread activity along these lines. Once bitten by the "portable" bug and once experiencing the surprising work that can be done with low power rigs "in the field" there is nothing to do but come back for more—and how the gang comes back each time a Field Day is announced! In some instances "portable-to-portable" contacts on the F.D. ran 30% or higher of all contacts made.

1937 F.D. rules were practically the same as in previous years. However, this year contacts between two stations in the field (portable-to-portable) counted "2 points" rather than the usual 1 point for general QSO's. An extra credit of 10 points was also given for originating not more than one message addressed to A.R.R.L. Headquarters reporting the numbers of operators, the location, conditions and power, all of which data would normally be needed in actual emergency. A good number of these messages reached West Hartford and proved of considerable interest to all parties handling them. Aside from these two features the scoring was unchanged. Multipliers of 2 or 3 depending on whether either or both transmitter and receiver were independent of commercial power sources and "power multipliers" were again used.

We have said it was the most successful F.D. ever. The scores confirm this statement! The Egyptian Radio Club, with twelve operators manning the club station W9AIU-9 at Alton, Illinois, on a 200 foot bluff overlooking the Mississippi River, made a new Field Day record, leading all other contestants—204 QSO’s (168 c.w., 36 ‘phone) . . . 2268 points! Operation was on 3.5, 7 and 14 Mc. C.W. and 1.75 Mc. ‘phone, the majority of contacts being made on 7 Mc. Five separate transmitters and four receivers were used. Two transmitters consisted only of an 802 oscillator. Other rigs were 2A5 crystal, 802 final, suppressor grid modulated by 56-2A5; 42 crystal, 802 final, supp. grid modulated by 76-42; 53 crystal, RK23 final, supp. grid modulated by Breiting speech amplifier. A single button carbon mike was used on all 'phone rigs. Antennas were a 132’ foot end fed Hertz for 3.5, 7 and 14 Mc., 250 foot end fed Hertz for 1.75 Mc., and a doublet for 14 Mc. 'phone. Power supplies were a 110 volt a.c. 300 watt gas driven generator and two 350 volt dynamotors. Input on all transmitters was kept at 20 watts. The results tell a story of good planning and excellent operating on the part of the Egyptian gang. The whole F.C. contingent will join us in extending to them hearty congratulations!

A two-man crew placed second with 1923 points—165 contacts! W6MVK-6, operated on C.W. by T. S. Chow, W6MVK, and on ‘phone

November, 1937
by George Chow, W6OFD, this very creditable showing "on location" 8 miles south of Modesto, California. The C.W. rig was 6L6-6L6 with not over 20 watts input, making 102 QSO's on 3.5, 7 and 14 Mc. The 'phone set was 6L6-6L6-100TH running 55 watts input on the 1.75-Mc. and 3.9-Mc. bands. Power was generated with a 3-horse gas engine driving a 1-kw. 110-volt a.c. generator. Antennas were a doublet for 3.9 Mc., 1/2 wave single wire for 1.75 Mc. and 1/2 wave 7 Mc. for c.w. work. Although these chaps are members of the 100 What Club of Modesto, they worked independently, the club not going "en-body." However, "statistics prove" that very few club groups anywhere near equalled the accomplishments of these two operators. Well done!

The York Road Radio Club, leader in the '36 Field Day, was again in the doings, fighting hard and considerably bettered its previous performance, but this year we find them in third place—1917 points, 156 QSO's. At that, the gang at W3QV-3 gave W6MVK-6 a mighty close race! Ringing Rocks, near Pottstown, Pa., was again chosen by Y.R.R.C. for its F.D. headquarters. The set-up included five transmitters working on the 3.5-, 7-, 14- and 56-Mc. bands. Most contacts were on 3.5 Mc. with 7 Mc. second. Power supplies consisted of several dynamotors and two 100-volt a.c. generators. Top input used was 18 watts. The W3QV-3 staff was comprised of 21 operators.

Third high among club groups (fourth high among all participating stations) is W2DUA-2, the Northern Nassau Wireless Association. This club was represented by sixteen amateurs, twelve doing the operating, the others acting as "aides-de-camp." 7-, 3.5-, 14- and 56-Mc. bands were used, producing points in the order named for a total of 1791 . . . 154 QSO's. Separate transmitters were used on each band, power input never exceeding 20 watts. Power for the several receivers was supplied by a 300 watt gas driven a.c. 110 volt generator. For the transmitting equipment, camp lighting, etc., a similar unit of 1800 watts capacity was employed. These two supplies ran continuously for 27 hours on approximately 15 gallons of gas and three quarts of oil. Veterans of Field Days, the N.N.W.A. gang set up again at Pound Ridge Reservation, Cross River, N. Y.

The South Cleveland Radio Club, operating W8ICS-8 at Hudson, Ohio, placed fourth among the clubs with a score of 1638 from 130 QSO's on 3.5-, 7- and 14-Mc. c.w. and 1.75-Mc. 'phone. Separate transmitters were used on each band and were manned by fifteen operators. Power was from generators and gas driven generators. This club has bettered its position over previous years so watch out, Future!

There are so many excellent scores it is not possible to detail the layout at each station. The complete list of scores gives the essential facts for each participant. However, particularly worthy of note are the results of the Charleston Amateur Radio Club, W8NCD-8, and the Ithaca Mike and Key Club, W8QLU-8, tied at 1548; The Northwest Amateur Radio Club, W9CA-9 . . . 1515. Scores of over 1000 were submitted by twenty stations!

56 Mc. was again used to quite an extent. W2DEJ's work was exclusively 56 Mc. and his score represents an all-time high for "five meter" Field Day Work. He made 74 contacts for a total of 909 points! It should be remembered that this was a one-man expedition, including lugging the gear to the tower at 40 Wall Street, New York City, setting it up and operating! Transmitter was a 45 oscillator modulated by a 2A5. Receiver was a three-tube super regenerative. The Tri-
State Radio Club operated W3GKI-2 on 56 Mc. exclusively at High Point Park, N. J., about 1850 feet above sea level. Four operators made 62 contacts, 846 points, a score that is well up the list. Power was 15 to 18 watts. W1EFN operated 56 Mc. portable atop Mt. Greylock, Adams, Mass., making 513 points, 33 QSO's. Power was obtained from 130 volts of B battery. W6AM's contacts also were all on 56 Mc.—46 QSO's, a score of 468, W1HDQ-1, champion of 56-Mc. in previous Field Days, was handicapped by social engagements, being able to operate only part of the week-end, but even so he made 38 contacts, 432 points. The work at W1BKG-1, W1CLI-1 and W9WJW-9 was exclusively 56 Mc.

Highest Canadian station was again VE3KM, operated by the Hamilton Amateur Radio Club... 1341 points, 113 QSO's. Second high VE was VE3GT, 59 QSO's, 936 points.

Field Days are in a class by themselves among amateur operating activities. The source of unexcelled good operating fun, at the same time providing the joy of outdoor companionship with brother amateurs, they provide the stimulus to perfect our portable/emergency gear against the time we may be called upon to put it to serious use. Like other activities, there is always the planning ahead for the "next time," but this is even more prevalent among F.D. groups since so many combinations of gear are possible and since one experience in the affairs teaches us so much about the requirements of reliable apparatus. It was great sport—the 1937 Field Day . . . and the ones to come will be the same! See you there!!

E. L. B.

Some of the locations chosen for operation have a decided Field Day "flavor." For example: Signal Hill (W6AM-6); Picnic Hill (W3BHE-3); Cow Pasture Hill (W9KWP-9); High Point Park (W3GKI-2); Sunset Peak (W8HTI-6); Hilltown (W9CFB); Crystal Lake (W9AWC-9).

Here are some of the things we (The Northwest A.R.C.) learned from our field day experience: (1) . . . have at least three transmitters operating practically continuously. (2) . . . operate on different bands to take advantage of the best operating conditions. (3) . . . It is difficult to operate more than one transmitter in a group because of QRM; if transmitters can be separated by a distance of 600 or 700 feet and operated from separate power supplies QRM will not be bad. (4) . . . if several transmitters are to be operated from one power supply, the smart thing to do would be to provide a receiving station some distance away and use 56 Mc. transceivers to relay the signals to the transmitters. (5) . . . in order to get away from commutator "hass" on the generator it was necessary to park the generator at a distance of 150 to 200 feet from the scene of operations. We tried filters with no results. (6) . . . it is always necessary to prepare for rain! This is the third field day for the club and we have had a rain storm each time. . . . Field days are lots of work but are lots of fun and valuable experience is gained.—G. R. Hart, W6LBP, Secy.

PORTABLE VE3GT WAS A BUSY STATION

Five transmitters and three receivers did duty for this crew. Left to right: seated—V6JADO, VE3GT, VE3JI, VE3SG; standing—VE3IK, VE3SZ, VE3IX.

We were fortunate in getting the use of a cabin on Connecticut Hill, elevation 2000 feet; it is about 16 miles from Ithaca. With the experience gained in all departments—including culinary—and the interest created, we expect to go to town in the next contest.—Ithaca Mike and Key Club, W9QLU-8.

We operated on Mt. San Rafael. This location was secured by the Los Angeles County Fire Department, who gave the society permission to use the territory for the duration of the contest. The boys were about bowled over when they found that the Fire Ranger, Mr. Knoph, was number 73, and he wore a badge with that number on it. At 2:30 A.M., when everyone was feeling high (altitude 1888 ft. above sea level), the ranger was made an honorary member of the society.—Glendale Amateur Radio Society, W6NOI-8.

The masts for the antennas were put up the Saturday preceding the Field Day, the transmitters installed on June 18th, the "kinks" being ironed out on the next day. Everything worked to perfection with no interference experienced between transmitters. Most contacts were on 7 Mc. Prizes were offered for the operator making the most contacts during his "watch." These were won by W8ATT (first) and W8NLT. The club furnished the eats and the members, when off duty, participated in baseball games, pitched horseshoes and played checkers. A swimming hole was used extensively.—Charleston Amateur Radio Club, W8NCD-8.

Our location was 3 miles northeast of Waterdown, in the same old spot. It overlooks Lake Ontario and the Niagara Peninsula. The rig was 42 crystal oe. and 802 or 8526 amp. with 16 watts input. A good time was had by all.—Hamilton Amateur Radio Club, VE3K.

The equipment was erected just south of the St. Paul City limits on State Highway 13 at a cabin camp located on a high bluff. Two of the portable transmitters and receivers were operated in W6FUZ's trailer coach and two other portable installations were operated from one of the 329 POUNDS OF COOK!

W9TLQ did a bang-up job for the Northwest Amateur Radio Club (W9CA-9), and no one went hungry.
cabin. The source of power used on three of the trans­mitters was a gas driven a.c. generator while the fourth operated off the power lines. In spite of the low power used on all stations in the U.S. and the two in Canada were worked. Our greatest handicap was QRN due to a violent wind, rain and electrical storm.—St. Paul Radio Club, W9FUZ.

The Manteca Radio Club operated atop Pilot Peak, 6100 ft. elevation. Mt. Diablo, 130 miles distant, was worked with a 56 Mc. transceiver! Mosquitoes were bigger and hungrier than ever!—W9EXH.

THE ST. PAUL RADIO CLUB OPERATED W9FUZ-9, INSTALLED IN FUZ’ER’S TRAILER COACH.

These fellows ran up 1256 points. Left to right: W9JIE, W9ZOV, W9RYJ, W9IBD, W9GIB, W9FUZ, W9ORA.

We were located in an ideal receiving spot, at least a mile from even a dirt road for automobiles. Two kerosene lamps and lots of flashlights kept up the illumination during the night. We were going to use a.c. lines but the electric company said they would charge us $750.00 to install it! No a.c. for miles.—Beacon Radio Amateurs, W9BDG-9.

The transmitter and receiver were located in an 8 x 10 wall tent. Battery and generator for the receiver were also in the tent, as was the battery used for lighting the filaments in the transmitting unit. The gas driven generator was located 40 feet from the tent, the engine muffled, and well insulated wire run to the tent.—So. Hills Broadcasters and Modulators, W9FX-8.

An old 136 foot oil derrick was the headquarters of the United Radio Amateurs Club this field day. All bands, including 56 Mc. portable, were worked with the scoring on each band tabulated for reference during future FD’s. The club owes everything to the splendid cooperation and earnest help of every member.—W9TVG-8.

38.8% of all stations worked were operating portable.—W9AYV-8.

The club decided at its last regular meeting before the Field Day to give the operator having the highest number of contacts a year’s free membership, W63MY and W63AH tied for honors with 15 contacts.—Frontier Radio Club, VE3AJY.

We obtained our power from a 3 kw. 60 cycle 110 volt generator driven by an Austin gasoline engine. Since we were about three miles from the nearest power line and kept about 1000 watts of lights burning all night, the farmers from the countryside came up to see what was going on in "them there hills." In fact we had visitors all day Sunday. Those not operating pitched homemade, played croquet, bridge, and as usual there were many "candid camera" enthusiasts.—Winston-Salem Amateur Radio Club, W4MC-4.

Operators were paired by drawing lots and worked in two hour shifts, one man at the key, one logging. Target shooting, fishing, arrow head hunting, tree climbing and other sports were indulged in.—Names Rock Radio Club, W9NGG-9.

While our score is nothing to get excited about it is higher than in previous years, and the gang certainly broke camp with a more satisfied feeling than ever before. Two departures from previous practice seem to account for the improvement—the use of the 7 Mc. band instead of 3.5; and the use of nearly 60 watts instead of 20. Those long, depressing stretches with no QSO’s were eliminated and that was worth the difference in multiplier. Good weather, good radio conditions, a congenial gang, and—well, "eatable" grub, made the 1937 F.D. a pleasure throughout.—Bluefield Amateur Radio Club, W8MCL-8.

The site for our set-up was on a very high bluff on the Ouachita River. A rowboat was hired to carry everyone, and equipment, across the river. Then the fun began. With a motor generator weighing about 140 pounds to take up a steep bluff, at an angle of about 80 degrees—well, just imagine! Everything that one could imagine went wrong with the rig, but we finally got on the air. It was decided to work in one hour shifts through the night. It would have been worth your while to have seen the fun in trying to awaken some of the beds to take their tricks at the key. It was necessary to use calling, shaking, pulling of hair, pouring on of water and sundry other things calculated to drag one from the arms of Morpheus. We departed for home, no sadder and no richer, but much the wiser. We are determined to see how we can do anything we will do in the future to keep a.m. and b.m. days different.—W9JNU-9.

Those not operating pitched horseshoes, played croquet, bridge, and such usual there were many "candid camera" enthusiasts.—Winston-Salem Amateur Radio Club, W4MC-4.

Operators were paired by drawing lots and worked in two hour shifts, one man at the key, one logging. Target shooting, fishing, arrow head hunting, tree climbing and other sports were indulged in.—Names Rock Radio Club, W9NGG-9.

While our score is nothing to get excited about it is higher than in previous years, and the gang certainly broke camp with a more satisfied feeling than ever before. Two departures from previous practice seem to account for the improvement—the use of the 7 Mc. band instead of 3.5; and the use of nearly 60 watts instead of 20. Those long, depressing stretches with no QSO’s were eliminated and that was worth the difference in multiplier. Good weather, good radio conditions, a congenial gang, and—well, "eatable" grub, made the 1937 F.D. a pleasure throughout.—Bluefield Amateur Radio Club, W8MCL-8.

The site for our set-up was on a very high bluff on the Ouachita River. A rowboat was hired to carry everyone, and equipment, across the river. Then the fun began. With a motor generator weighing about 140 pounds to take up a steep bluff, at an angle of about 80 degrees—well, just imagine! Everything that one could imagine went wrong with the rig, but we finally got on the air. It was decided to work in one hour shifts through the night. It would have been worth your while to have seen the fun in trying to awaken some of the beds to take their tricks at the key. It was necessary to use calling, shaking, pulling of hair, pouring on of water and sundry other things calculated to drag one from the arms of Morpheus. We departed for home, no sadder and no richer, but much the wiser. We are determined to see how we can do anything we will do in the future to keep a.m. and b.m. days different.—W9JNU-9.

Cows, cows and some more cows. It was awful. They persisted in being curious, almost to the point of stopping our field day activities. For all the chasing we did, we ’ll bet that farmer got buttermilk when he milked his cows that morning.—Potomac Amateur Radio Association, W9LYT-9.

The big feature was stringing up the Zepp aerial at 1 A.M. with the aid of two small flashlights. Try it some time.—VE9FAT-9.

Minneapolis Radio Club was located on ski tower in Glenwood Park, operating all bands 5.5 to 56 Mc. Wind, rain, flood and famine only obstacles.—W9PZ-9.

The truck which we took on Field Day has a 30 foot body, and has the generator mounted under it permanently. In the cab are places for the Collina 4SA, the FBT and a transceiver. Also were are shack written on the truck to put in antenna masts. The masts are removable and are taken down when the truck is moving. This truck is used to carry the famous Roebling "Alligator," which is a 20 foot catamaran amphibious capable of carrying 40 people either on land, water or through the worst kind of swamp. It is built entirely of duraluminum.—Clear Water Radio Club, W8QPL-9.

The station of the Newark Amateur Radio Club was set on top of a high hill overlooking the town. The equipment was in the back end of a truck, while the antenna was hooked to the top of an oil well derrick.—W6LZ-8.

W4CUE-4 was operated at Avondale Park Villa. This Villa is a huge stone affair on a very high hill overlooking Birmingham. The location was as good as one can imagine with no buildings or wire near and nothing as high as the antenna.—Birmingham Amateur Radio Club.

(Continued on page 68)
A 10-Watt Speech Amplifier With Voltage-Regulated Plate Supply

High-Gain Unit for Use with Crystal or Carbon Microphones

By George Grammer*

THE SPEECH AMPLIFIER

The speech amplifier, the circuit of which is given in Fig. 1, is designed to have ample gain for diaphragm-type crystal microphones. The input circuit also is arranged so that a double-button carbon microphone can be used, working into a resistance load. The switching arrangement permits using either type of microphone without cutting a stage in or out to handle the widely different output levels of the two types.

Aside from the microphone input, the tube and circuit line-up is quite conventional. The first tube is a 6J7 pentode, resistance-coupled to a 6C5, with the gain control in the grid circuit of the latter tube. The 605 is resistance-coupled into a single-ended to push-pull audio transformer which feeds the grids of a pair of 6C5's. These in turn are transformer-coupled to the power output tubes, a pair of 2A3's which operate Class-AB with self-bias. With this type of operation the tubes are rated at 10 watts output; substitution of fixed bias will raise this figure to 15 watts if the increase in output is desirable.

Straight transformer coupling out of the second stage transformer is used, as output transformers in this position have a tendency to cause motorboating. This is due in large part to the low output impedance of the tube stage, but the transformer has the added advantage of matching the amplifier to the load on the other end of the line where full power will be developed by means of the 2A3's in push-pull operation.

THE POWER SUPPLY, EQUIPPED WITH A VOLTAGE REGULATOR FOR THE LOW-LEVEL STAGES

With the cover on, this unit matches the amplifier. It would also make an excellent power supply for receivers, especially those having Class-AB output.

* Assistant Technical Editor.

1 "Battery Performance from the R.A.C. Power Supply," QST, August, 1937.

stage will raise the overall voltage gain somewhat, but simultaneously reduces the low-frequency response. In view of the fact that there is plenty of gain with the resistance coupling as shown in the diagram, we preferred to keep the d.c. out of the transformer primary. In the plate circuits of the first two tubes are RC circuits ($R_7C_7$ and $R_8C_8$) which serve both as decoupling circuits and as additional power-supply filter for the low-level stages. The cathode bias resistor for the 2A3's is contained in the power-supply unit.

Top and bottom views of the speech-amplifier unit are given in two of the photographs. The chassis is 5 by 13½ by 2½ inches, made of black-crackled steel and provided with a perforated metal cover which fits over all the equipment. The 6J7, with a shield cap fitting over the top, is at the left front. Directly behind it are condensers $C_7$ and $C_8$. Next along the front is the first 6C5 with $T_1$ behind it; then the push-pull 6C5's, $T_2$, the 2A3's, and the output transformer, $T_3$. The latter is a plate-to-line transformer designed for coupling out of Class-AB 2A3's, with taps for lines of various standard impedances. On the primary, the 5000-ohm (plate-to-plate) terminals should be used with self-bias operation. The input transformer, $T_4$, preferably should be of the type designed to carry grid current with 2A3's, although grid current does not actually flow except at nearly full output.

The gain control, $R_7$, is mounted on the front edge of the chassis between the 6J7 and first 6C5. On the left edge in the front view are the jack for a crystal microphone and the switch, $S$. Carbon microphone and battery connections are made to a five-terminal connection strip mounted on the rear chassis edge, at the bottom left in the below-chassis view. No particular precautions need be observed in placing parts and wiring below the chassis except to make sure that all ground connections actually break through the paint to the metal of the chassis.

**Bottom View of the Power Supply Unit**

No special arrangement of parts is necessary. The filter condenser is mounted on one edge of the chassis.

A 7-prong socket at the lower right in the bottom-view photograph brings in all supply voltages. These are marked in Fig. 1. The shielded three-way cable outlet and plug at the right are for the audio-frequency line. A shielded two-wire cable is used, the shield being connected through one pin in the plug to the chassis.

**Power-Supply Unit**

Construction of the power supply is similar to that of the amplifier; the same type and size of chassis is used. The circuit diagram is given in Fig. 2. An ordinary condenser-input filter is used, with the tap for the 2A3's taken off ahead of the regulator section to reduce the load on the latter. The first four tubes in the speech amplifier, however, are fed regulated voltage. The circuit will be

![Circuit Diagram of the Speech Amplifier](image)

**Fig. 1—Circuit Diagram of the Speech Amplifier**

- $C_1$, $C_2$, $C_3$—0.1-mfd. paper, 400-volt.
- $C_4$, $C_5$—5-mfd. 25-volt electrolytic.
- $C_6$—0.025-mfd. paper, 400-volt.
- $C_7$, $C_8$—0.025-mfd. electrolytic, 450v-seat (miniature round can type).
- $R_1$, $R_2$—200-ohm, ½-watt.
- $R_9$—1000-ohm, ½-watt.
- $R_3$—1-megohm, 1-watt.
- $R_4$—0.25-megohm, ½-watt.
- $R_5$—5000-ohm, ½-watt.
- $R_6$—0.25-megohm volume control.
- $R_7$—2000-ohm, ½-watt.
- $R_8$—50,000-ohm, 1-watt.
- $R_9$—500-ohm, 1-watt.
- $R_{10}$—10,000-ohm, ½-watt.
- $R_{11}$—500-ohm, 1-watt.
- $R_{12}$—5-megohm, ½-watt.
- $R_{13}$—5-megohm, ½-watt.
- $R_{14}$—5-megohm, ½-watt.
- $R_{15}$—5-megohm, ½-watt.
- $S$—D.p.d.t. mid-fader.
- $T_1$—Audio transformer, push-pull plates to Class-AB grids (Kenyon T-256).
- $T_2$—Audio transformer, output transformer, 2A3 plates (5000 ohms) to line (Kenyon T-301).
recognized as being the same as that in August QST. $R_s$ is the output voltage control; this should be set by means of a voltmeter to give about 275 volts output. $R_s$ is the cathode resistor for the 2A3's.

**BELOW-CHASSIS VIEW OF THE SPEECH AMPLIFIER**

Grid-circuit leads to the 6J7 should be shielded. In operation, the chassis of the amplifier should be connected to a good ground.

With the components specified, the output voltages are as given on the diagram. The terminals marked "360" on the transformer should be connected to the 83-V plates. The cathode current flowing through $R_s$ develops about 60 volts of bias, leaving 300 for the plates.

The physical layout is shown in the two views of the power supply unit. In the front view, the power transformer is at the left, with the chokes next to it. The knob on the top of the chassis operates the voltage control, $R_v$; this need not be touched after having been set for the proper output voltage. The neon lamp is mounted in a 110-volt socket in the near right-hand corner. The 6J7, 2A8 and 83-V are along the rear edge. The on-off switch in the 110-volt line is mounted on the front edge of the chassis.

All output connections are brought to a 7-prong socket shown on the left edge in the bottom view. This is wired identically with the socket in the amplifier. A 5-wire cable, plus two heavy wires for the 2A3 filament leads, are wired into 7-prong plugs, one at each end, using corresponding pins for each wire. This permits removing the cord from either or both of the units.

The reason for using separate wires for the 2A3 filament power is simply that the wire in the ordinary cable is too small to carry the current without excessive drop, when a length of six feet or so is used. It is highly important to measure the actual voltage at the sockets to be sure it is within 5% of 2.5 volts; low filament voltage is sure to result in a drastic reduction in the power output that can be obtained without distortion.

The neon bulb (1-watt size) should have its base resistor removed. The gas-flame method of softening the cement is about the simplest.

**OPERATING DATA**

Provided the constructor follows the circuit faithfully and makes good connections, no troubles need be anticipated in getting the two units to working properly. The one difficulty we encountered in trying them out was that of low filament voltage on the 2A3's, mentioned above, which was corrected by installing leads of ample cross-section. If an audio oscillator of good waveform and an oscilloscope are available, the amplifier may readily be checked for distortion, and the power output likewise can be checked by connecting a resistor of the same value as the output impedance chosen across the output terminals. Measurement of the a.c. voltage developed will give the power output $P = \frac{V^2}{R}$ using the

(Continued on page 116)

1 Waller, "Amateur Applications of the 'Magic Eye,'" QST, October, 1936.
Conferences  This is a winter of international conferences on radio, and a considerable part of the energy of A.R.R.L. headquarters for many months to come is going into the representation of amateur radio at these affairs.

November sees a meeting at Habana to which are invited all the countries of the Americas, and it may be desirable to review again here the functions of this conference as they may affect us. While broadcasting holds the center of the stage, the intention is to negotiate an agreement for the American region concerning all of the spectrum. Of course above about 4000 kc. this agreement must and will follow the Madrid table faithfully, but in the lower frequencies there is room for some departure from Madrid if there is agreement throughout the American region. We are chiefly interested in seeing the reaffirmation of all the amateur bands as exclusively amateur in the Americas, and we expect it, while at the same time it is probable that this conference will change our 1715-2000 band to 1750-2050, a proposal to which we have given our consent. There is the question of 7-Mc. 'phone in Latin America, and it will be a real difficult one. It is also at this conference that we have proposed the concluding of a uniform agreement between the American nations permitting the free interchange of amateur third-party messages of a type that would not normally go by a paid service. The conference is expected to last all of November. Warner and Segal are representing us.

Meanwhile preparatory meetings are going on all over the world for the Cairo Conference, which opens in February. The United States government has had four committees at work at a series of meetings, examining the proposals of foreign governments. All of the American interests are participating in these conferences, including ourselves. One by one the proposals are examined and classified. At this writing the work has not been finished but we think it safe to say that the U. S. A. will oppose all the hostile proposals towards our bands. What will happen on the other side is a different story, for it is apparent that a large number of nations are espousing proposals to increase the allocations of short-wave broadcasting and of the aeronautical services, and the old squeeze is going to be felt somewhere. That is the reason A.R.R.L. has been working so hard on this subject the past several years, and we think we’re now well prepared to take care of ourselves.
A New I.F. Amplifier System with Infinite Off-Frequency Rejection

By Karl W. Miles* and J. L. A. McLaughlin*

Beyond a doubt the trend of basic developments in amateur receiving equipment is towards the reduction of extraneous noises (improved signal-to-noise ratio) as well as the elimination of off-frequency interference. At the present time our receivers are certainly sensitive enough and in the Single-Signal type, selectivity has reached a higher order for c.w. reception. However, for 'phone reception the selectivity characteristics of our receivers still leave much room for improvement. With a crystal filter adjusted to the "sharp" position, the selectivity characteristic is much too peaked at the nose to be useful for good, intelligible 'phone reception. In the broad crystal position the nose of the curve may be about 1500 cycles wide at 2 times down, which is suitable for obtaining the minimum of interference with fair intelligibility. However, the skirts at 1000 times down may be so wide as to permit a signal five kilocycles off resonance to produce serious interference with the desired signal. It is obvious that there is something lacking the shape of our selectivity characteristics.

Our present method of obtaining extreme high i.f. selectivity with transformer coupling consists fundamentally of cascading resonant circuits using high-Q coils in sufficient number to achieve reduction of unwanted signals at some predetermined number of kilocycles either side of the resonance frequency. The resultant selectivity curve is roughly triangular in shape, the apex occurring at resonance frequency. However, signals within 10 kc. or so of the resonance frequency undergo proportionately less attenuation than those farther from resonance, and the only way which we

*The Hallicrafters, Inc., 2111 Indiana Avenue, Chicago, Ill.
can achieve sufficient attenuation of signals in the region closer to resonance is by making the slope of our selectivity curve so steep at the nose that intelligible 'phone reception is impracticable. It is obvious, then, that if we are going to achieve noteworthy improvement in the elimination of unwanted interference by means of extreme selectivity and yet retain a band width at the nose adequate for intelligible 'phone reception, we must attack the problem of providing a selectivity characteristic radically different from the ones we are now using. The ideal shape, of course, would be rectangular rather than triangular. To achieve this desired rectangular shape, we will have to go to some other method than the one of cascading resonant circuits using high-Q coils with present conventional couplers.

We have recently been working on an i.f. amplifier using a system which we believe is a step in the right direction; one which is a radical departure from the conventional coupling circuit. This system was originally developed by Garrard Mountjoy, License Division Laboratory, R.C.A., New York City. In this system couplings are used which are individually infinitely selective in rejecting off-frequency interference.

THE INFINITE ATTENUATION CIRCUIT

Fig. 1 shows the essential circuit diagram of one form of this infinite adjacent-channel attenuation
coupling system. It will be observed that coupling is provided by the mutual inductance, $M$, between $L_1$ and $L_2$ and the capacitive coupling, $C_3$. The circuit in itself does not look very startling but the operation of it is.

Mutual inductance $M$ and the capacity coupling $C_3$ are so chosen that at some determined frequency off resonance, the voltage induced through $M$ is opposite in sign to the voltage induced in $C_3$ and will therefore cancel out. In other words, no coupling exists at this particular frequency. In order to achieve infinite rejection at this undesired frequency, correction for power factor in the circuit must be made. Resistor $R_1$ in the diagram is the power factor corrector. The rejector control $C_3$ can be made variable and tuned over a fairly wide frequency range of rejection without noticeable interlocking effect on the i.f. frequency. For proper operation, resistor $R_1$ should be variable; but once the infinite rejection point has been found, it need not be touched again.

In the experimental i.f. amplifier diagrammed in Fig. 2 we make use of two of these infinite attenuator couplers ($T_1$ and $T_2$) so that the rejector “slots” can be placed either side of the carrier frequency. The graphs and the oscilloscope tracings illustrate graphically just what happens when the two rejectors are set at different frequencies off resonance.

Fig. 3 shows a single rejector circuit set to reject a frequency 4.5 kc. off resonance. The rejector slot, as is apparent, goes to infinity at this frequency and its action is very similar to the rejection in a crystal filter. Fig. 4 shows two rejectors in use, placed 9.5 kc. plus and minus the resonant frequency, while Fig. 5 is for rejection at plus and minus 5 kc. Some especially interesting effects obtainable with this rejection system are illustrated by Figs. 6 and 7. In Fig. 6, one rejector is set at 5.5 kc. above resonance and the other is set at 10 kc. above resonance. As will be noted, in all of these graphs the slope of the resonance curve is entirely different from that obtained in a single crystal filter circuit. The nose of the resonance curve is well rounded and the slope of the curve on the rejection side varies only approximately 2 kc. from ten times down to infinity. In Fig. 7 we have brought one of the rejectors to plus 3 kc. off resonance, leaving the other one still at plus 10 kc. This gives us an even steeper slope on the rejector side although it also brings the skirt “hump” on this side to 140 times down.

In a three-stage i.f. amplifier it is entirely possible to use four infinite attenuator couplers. Placing two on either side of the resonance frequency (each as in Fig. 6) would give us a curve 10 kc. wide at approximately 5000 times down, and 6 kc. wide at ten times down—plus the virtue of a well-rounded nose. If three of these rejectors are left fixed, two at plus and minus ten kilocycles off resonance and the other one at say plus 5 kc. with the fourth rejector variable, we should have
UN-RETOUCHED FREQUENCY-SWEEP CATHODE-RAY RESONANCE

curves illustrating the qualitative behavior of the i.f.-rejector system for infinite attenuation adjustments close to resonance. It should be noted that the i.f. tube gain was adjusted to give nearly full-screen amplitude for each curve, since the resonance response is considerably reduced with close-in rejection. The scale on each illustration is in kc.

(a) REJECTION AT APPROXIMATELY -1 KC. AND + 2 KC.

(b) REJECTION AT -2 KC. AND SLIGHTLY LESS THAN + 1 KC.

(c) REJECTION AT -0.5 KC. AND -1.5 KC.

(d) REJECTION AT -0.5 KC. AND -2.5 KC.

(e) REJECTION AT -1 KC. AND +1 KC.

(f) REJECTION AT -0.5 KC. AND +0.5 KC.

...of approximately three kilocycles—and, still further, provide the benefits of a variable rejector of infinite attenuation for removing heterodyne carriers within this band width.

ADJUSTMENT

Getting the circuit to work, is fairly simple. C1 and C2 are adjusted to 465 kc. as is done in conventional superheterodyne practice. Next, C3 is adjusted to the frequency of desired rejection and then resistor R1 is adjusted, together with slight readjustments of C3, until infinite rejection takes place at this frequency. It is best to make these adjustments with a sensitive microammeter in the diode load circuit and no modulation on the...
signal generator carrier. For infinite rejection, $R_1$, is quite critical. Inasmuch as the rejection notch is only a few hundred cycles wide, it takes very precise adjustments of $C_3$ and $R_1$ to achieve this. To find this infinite rejection point satisfactorily, a microammeter with a range of zero to fifty microamperes is found necessary. Once the best rejection setting for $R_1$ is found, it stays constant for fairly wide changes of $C_3$.

The fixed rejectors ($C_5$) are small Hammarrund 25-$\mu$fd. variable condensers. For the variable rejector control, $C_5$, a condenser of the same type was stripped of all its plates with the exception of one rotor and one stator to give a measured capacitance of 1 $\mu$fd. This was connected across $C_3$ of the second coupler and was found to have sufficient range to vary the rejector notch from plus 10 kc. to minus 10 kc.

The two fixed rejector controls are shown in the top view of the i.f. amplifier. They are in the two small round cans alongside the two i.f. transformers. The two variable resistors $R_1$ are on the other side of the same two i.f. transformers, one resistor having an extended shaft with a knob on it. In the bottom view, the condenser mounted on the bracket with the insulated coupling to the control shaft is the small two-plate variable $C_3$, which is across $C_3$ in the second i.f. coupler.

It should be noted that the skirts of the resonance frequency curve of this three-stage i.f. amplifier without rejection are somewhat broader than we normally use in amateur communications receivers. By reducing the inductive coupling between stages, these skirts can be appreciably cut down with noticeable improvement over the curves shown. However, as stated in the opening of this article, this is simply an experimental set-up of a new and certainly interesting attack on the problem of achieving more nearly rectangular selectivity characteristics in our amateur communications receiving equipment. We believe we are not too optimistic in stating that with more work on this system and further refinement, it will be quite possible to arrive at a curve shape which is rectangular to all practical purposes and of but a few kilocycles width from the nose of the resonance curve to better than ten thousand times down. The result may well be a receiving system of improved signal-to-noise ratio and freedom from off-frequency interference.

**Strays**

Picked up somewhere by W11KC:
"You're so dumb I wouldn't call you a ham."
"Why not?"
"A ham can be cured."
We doubt it!

November, 1937
Match and Mis-Match

Some Pertinent Pointers on Transmitter Loading and Antenna Feed Systems in General

By Stuart W. Seeley,* W2JOA

Oh, boy! Have I got my line matched up swell? I've got my pick-up coil a good six inches from the tank and does she 'draw'? Just about all the 'soup' is gone from the tank coil. And boy! does the plate meter walk up scale. Have I got a match or have I got a match?"

Such was the gist of a gleeful burst of exuberance that bubbled forth from the depths of the 20-meter 'phone band a short time ago. Who it was we have no idea for he was soon drowned in the QRM. But it had touched a sore spot with us — this idea of wanting to get all the "soup" out of the final. It also indicated very plainly that a "match" had not been effected in any sense of the word. This article was conceived at that moment.

"Efficient" Tank Loading

The final tank circuit of a transmitter must be considered as a source of power, in many respects equivalent to a generator or even a battery. If a six-volt storage battery were "loaded" with a 1-inch copper bar across its terminals all the "soup" would be gone from the battery; the voltage across those terminals would be practically zero; but — the power output and the efficiency would also be practically zero. If we wanted to get the last possible watt out of that battery we would load it with a resistor of such a size that it took just half the "soup" away — in other words dropped its terminal voltage to just 3 volts. Under these conditions the power output (in the form of heat) would be at an absolute maximum — and the efficiency would be just 50 per cent. How long the poor battery would last under these conditions is, however, problematical. Undoubtedly it would soon have buckled plates and be completely worn out.

If a final tank is loaded until the voltage across it has dropped to half its unloaded value (usually determined roughly by the length of arc which can be drawn), the final stage efficiency will be less than 50 per cent and the tubes may groan and give up the ghost. The output load of a transmitter should not be "matched" to the final tank, in the sense that the load resistance is made equal to the driver resistance, any more than the six-volt storage battery should be loaded with a resistance equal to its internal resistance, which results in the half-voltage condition mentioned above.

How then can we determine when a "match," as we commonly understand it, has been effected at the transmitter end of the antenna system? If the grid, or grids, of the final stage are being properly driven and if the plate current, with the antenna load removed and tank condenser tuned for minimum dips to one-quarter or less of the loaded value, the plate milliammeter can be made to tell the story.

First, however, it is necessary to determine what the loaded value should be. The plate voltage times the plate current is equal to the input power to the final. In a well-designed transmitter 55 per cent to 65 per cent of this power will be delivered to the antenna, 10 per cent to 20 per cent will be lost in the combined tank circuit and feed system, and 25 per cent to 30 per cent will be dissipated as plate loss in the tube. Manufacturers usually specify the allowable plate dissipation, so if the above division of power holds good we may safely operate with an input of from $31\frac{1}{2}$ to 4 times the rated plate loss for the tube.

In a 'phone transmitter the lost power must be modulated as well as that which is delivered to the load, so the available modulating power may limit the total input to something less than would otherwise be the case. The simple rule still holds — the input plate power which can be 100 per cent modulated in a Class-C amplifier is equal to twice the available undistorted audio power, arguments to the contrary notwithstanding. Furthermore it is a mistaken notion to believe that an excess of Class-C input power, over and above a value which can be modulated 100 per cent, will prevent side-band spreading. Whether the distortion, which results in the high-frequency (wide side-band) components, comes from an over-loaded modulating stage, or an over-modulated stage, the result is the same.

Having determined what the final input power should be, it should be divided by the plate voltage and the result will be the plate current, in amperes, at which the final should operate. Then it becomes a simple matter to adjust the antenna load coupling until this value of plate current results, bearing in mind that the tank tuning condenser may have to be readjusted slightly for each value of coupling to dip the plate current to its minimum value. Having done this we may rest assured that the maximum permissible amount of power is leaving the final tank and entering the load circuit and that an output "match," in the

---

* 40-01 231st St., Bayside, Flushing, L. I., N. Y.
only applicable sense of the word, has been ob­tained.

It is probably well to mention here that a slight change in setting of the plate tank condenser may be necessary to maintain “dip” current when the load is applied. This change is perfectly normal and is not necessarily a sign that the feed system or the antenna are out of tune or “mis­matched.” If a pure resistance was connected across the pick-up coil or across a portion of the tank, to act as a load, it would be found that the total tank capacity would have to be increased from its no-load dip position in order to minimize across the pick-up coil or across a portion of the er may be necessary to maintain “dip” current circuit.

The only possible exception to this is in the case of a two-wire spaced line of extreme length when operated at 28 Mc. or above.

With single-wire feeders a large amount of the energy may be radiated directly from the feed system, in which case it may be desirable to eliminate standing waves on that part of the load. This may require altering the point of connection between line and antenna, and may also necessi­tate some change in the antenna length. The question then is how to tell when the standing waves have been eliminated. Of course an r.f. current meter may be inserted successively at three points along the line, one-eighth wave apart; but unless three like meters are available the job becomes laborious and necessitates cutting and splicing the line a great many times. A better way is to take a piece of wire of the same diameter as the feeder, cut a piece about one-quarter wave long and add it in series with the line. This will necessitate running the feeder by a more circui­tous route to the transmitter (for the test) and care must be exercised to see that its exposure to grounded objects is approximately the same with the piece in or out. When the length of the antenna and the point of connection between line and an­tenna have been properly adjusted, insertion or removal of the additional quarter-wave of line will make little or no difference in the final plate current or tank tuning. Under these conditions there will be no standing waves on the feeder and radiation from it will be at a minimum.

It is well to point out here a fact which a good many amateurs overlook. The power input to a transmission line or feeder system which is totally devoid of standing waves is equal to the square of the current flowing into that line times its surge impedance. If that current happens to be, say, 2 amperes and it is flowing into a 500-ohm line, the apparent power would be \(2 \times 2 \times 500\), or 2000 watts. If the input power to the final is only 150 watts, obviously there must be standing waves on the line. However, if the current were only 0.45 ampere the apparent power would be \(0.45 \times 0.45 \times 500\) or 101 watts, which is more in line with the actual value. This latter condition must not, how­ever, be taken as a sure indication that there are no standing waves on the feeders for there may still be a point a quarter-wave or so further out toward the antenna where the current is many times higher than that measured at the trans­mitter. If this is the case, it was just happenstance that the average value of that standing wave showed up at the transmitter.

**HOW IMPORTANT ARE STANDING WAVES?**

But radiation and losses in open double-wire lines are usually negligible in any event, regardless of whether standing waves are present or whether the lines are transposed or not, unless the currents in the two wires are not equal—which will allow the line to radiate appreciably. If the center of the pick-up coil is grounded, or the two wires are

(Continued on page 70)
Rewinding an Auto Generator for Portable-Emergency 110-volt A.C. Supply

By H. J. Burchfield, W6JTV

Following the article Practical Organization and Equipment for Emergency Operation, by the S.A.R.O., February 1937 QST, we are now pleased to present practical details on modification of automobile generators to obtain 110 v.a.c. There is nothing better than a full-fledged self-powered supply to keep your whole station on the air "as is" in emergency. Read the previous information; then Section Manager Burchfield's excellent account of how to build an inexpensive first class portable-emergency supply; then make one so you are properly emergency equipped (and ready for the next Field Day)!

As this appears in print Section Managers are extending the A.R.R.L. Emergency Corps, appointing Emergency Coordinators in the larger centers. Throughout the Emergency Corps registrations of all amateur facilities will be conducted. Station schedules for emergency will be planned. Important places will be held by all those self-powered and really prepared. Read on, and build or secure self-powered power supply today. Prepare now. Register promptly in the League's Emergency Corps.—EDITOR

WITH a separately-excited automobile generator rebuilt for a.c., it is entirely possible, by pushing a little, to get a full 1000 watts. On the self-excited jobs, it is entirely possible to get 350 watts of good 110 volts at 60 cycles. This article will deal entirely with the separately-excited rewinding job, as we have found need for more than this output for other uses than emergency transmitters and receivers.

I should like to give my sincere thanks to S. W. Duncan, who has so graciously let me use extracts from his book, Auto Power. To fellow hams who contemplate building one of these generators, it represents a dollar well invested. Also my appreciation to Mr. O. L. Day, W6OBI, and Mr. J. W. Babcock, W6ZA, for their wholehearted cooperation.

The photograph of the completed unit shows the six-volt d.c. generator used to provide the field excitation. The whole unit is immediately transportable by two men, weighing somewhere in the vicinity of eighty pounds including the 1-h.p. gasoline engine, the rebuilt generator and the six-volt field-exciter. This set-up will provide dependable, economical, a.c. power for emergencies, field-days—or even to heat up an electric iron to press your trousers while camping. Its uses are manifold.

But to get down to business. The first thing is to beg, borrow, steal, or otherwise obtain one old Dodge 12-volt generator. These generators were made by the Northeast Manufacturing Company and are known as Type "Ga." They operated as a combination starter and generator. Whether found open-circuited, burned-out or in good shape, they are equally useful for our purpose, since all the original windings, both field and armature, must be "stripped." First remove the armature, being careful to keep all parts such as bearings, nuts, bolts, etc. We found that the easiest way to strip the armature was to use a hacksaw on the windings, sawing carefully up close to the laminations, and in towards the shaft. A pair of pliers is used to pull the old wire from the slots. The...
first two or three top wires are the toughest. Once these are removed, the rest of the windings literally fall out.

If it is intended to use the old commutator for one side of the a.c. output, be careful not to mar or damage the bars. If slip-rings are to be installed, it is not necessary to be so careful. Merely use a small chisel to work the old bars away from the shaft, and strip them clean. We used the slip-rings, finding they gave us a better output wave-shape, without a troublesome ripple that develops when using the commutator and the shaft for the terminals. Mr. Duncan explains in his book how the commutator is used. If it is intended to use slip-rings, make a transverse cut with a hacksaw along the shaft. This will cut through the retaining rings holding the commutator bars in place, and they then clean up easily.

A small quantity of 0.010-inch insulating paper is required for re-insulating the slots. Strips are cut the width of the slot and long enough to give a slight overlap when pushed into the slots. This overlap will, to a large extent, protect the windings on the armature from being cut through by the abrupt turns into the succeeding slots. Twenty-four of these pieces are needed.

The field coils require 4 pounds of No. 17 s.e.c. enamelled wire. The armature for the separately-excited job needs 3 pounds of No. 15 s.e.c. wire. This ordinarily can be bought from a local armature or motor rewinding company, as can also the insulating paper. Also required are a couple of pieces of horn fiber, $\frac{1}{8}$- or $\frac{3}{16}$-inch thick and as long as the slots. These pieces are to be used for tamping the windings into a compact mass in the slots. (At the same time, if it is explained to the company from which you obtain the wire and insulating paper, they can give invaluable aid in construction hints.) About the last of the supplies needed will be insulating varnish (approximately a gallon will be more than sufficient), and a piece of $\frac{1}{2}$-inch wooden dowel rod. This can be obtained from a local carpenter or cabinet-making shop. The insulating varnish is on the completed fields and armature windings. Also needed is about twenty feet of $\frac{3}{16}$- or $\frac{1}{2}$-inch cotton tape. The tape is used to wind around the completed field coils, to bind each into one whole and to keep the windings from separating.

**WINDING THE ARMATURE**

The armature winding is started from the side from which the commutator was stripped. (If the roll of wire can be placed above your head and to the right, it will unroll easily and still be out of the way.) You may start with a piece of twine, so as to get the winding sequence straight in your head. The string can be removed when you get the general idea of the winding sequence. First, insert the 24 pieces of insulating paper, one in each slot. This will leave one extra slot to be taken care of later. Leave a piece of wire about eight inches long for one end of the a.c. output. Coil it up so the end will not be in the way while the turns are being laid. Start in any slot, figuring it as No. 1. In the next slot put a piece of the $\frac{1}{4}$-inch dowel. This is shown in the photo of the completed winding of the armature. It serves to hold each section of the winding in place. The slot occupied by the dowel is No. 2. From No. 1 slot go around No. 2, under the dowel, and come back out No. 3 slot. In this winding put 21 turns, using the piece of fiber to tamp the turns down about every six or seven turns. These slots fill up surprisingly fast, so the tamping must be faithfully carried out, or the last two or three turns won't lie in place.

The sequence of these windings is shown in Fig. 1. After the first pair of slots is filled, bring the wire around in the same direction as though to continue. This winding is started up through what is No. 25 slot, the last of the slots if you count around the armature. Continue the same winding direction, through No. 26 slot, around under the first winding and the dowel, and back towards yourself through No. 4 slot. Continue winding and tamping this winding for twenty-four turns. After completing this section, bring the lead around in the same direction as in the two preceding coils, in No. 24 slot, through it, around under the dowel, then through the first two windings, and back towards yourself through No. 5. Twelve turns go in here—and be careful to tamp these 12 turns down as carefully as the preceding windings, because there are twelve more turns to go in the same slot. When this winding is completed, one pole of the armature is done. Since these three
windings are all in the same direction, remember to start the windings away from you; that is, with the long part of the armature shaft pointed toward you.

Now the next pole must be reversed, and this is simplicity itself. The end of the last coil is toward you. From No. 5 slot go to slot No. 9, through this slot, away from you, around No. 8 and back towards yourself through slot No. 7. Then, back around slot No. 8 and up through slot No. 9 again. There are 21 turns in this pair of slots. Don’t forget to use your piece of dowel in slot No. 8, winding your turns under it. After 21 turns are completed here, run the next winding (still away from you) up through slot No. 10, around and under the first coil and the dowel, and back through slot No. 6. There are 24 turns in this winding. After this is wound, proceed in the same winding direction up through slot No. 11, and back through slot No. 5.

You already have 12 turns in this slot, and 12 more go in on top, the only difference being that you have now reversed the winding direction. This leaves 12 turns in slot No. 11, which is right and proper. Make the last turn of the preceding windings away from you up through slot No. 10, around and under the first coil and the dowel, and back through slot No. 6. There are 24 turns in this winding. After this is wound, proceed in the same winding direction up through slot No. 11, and back through slot No. 5.

24 T
21 T
12 TURNS

24 T
21 T
12 TURNS

24 T
21 T
12 TURNS

24 T
21 T
12 TURNS

FIG. 1—SHOWING START AND WINDING SEQUENCE OF EACH POLE OF THE ARMATURE

The ¾-inch dowel goes in slots 2, 8, 14 and 20. No windings in these slots on the separately-excited job. Reproduced by permission of Mr. Duncan from his "Auto Power" booklet.

28 QST for
strips will serve a two-fold purpose, to keep the windings from falling out when the machine is "revving," and for extra tightness in the windings themselves. Although not absolutely necessary they are a definite refinement. If a lathe or some other means of balancing the armature in a free-turning jig is available, a free running job with but little vibration will result. These things are supposed to turn over at 1800 r.p.m., and while this is not excessively fast, still things are liable to happen. Inserting pieces of brass \( \frac{1}{4} \)-inch round stock in the odd slot will bring the armature to a fairly good balance, so that no part of the whole thing will be heavier on one side than the other. That's just another refinement. Use your own judgment. Possibly other ways of balancing will suggest themselves; if so, all well and good.

THE FIELD COILS

Four field coils are necessary, and while the winding isn't so critical as that of the armature, still some care must be exercised to get a finished coil that is flat and compact. First it is necessary to make a form that will have the same dimension as the core of the old field coils. The field poles removed from the old field coils must fit snugly into the new field coils. This form is very simple to make, as described fully by Mr. Duncan on page 19 of his booklet, "Auto Power." First the wooden block that will serve as a center is cut to fit loosely in the old field form. This center is long enough so that it can be used as a spacer for the exact thickness of the old coil. Drill through this in the exact center with a \( \frac{1}{4} \)-inch drill. Then two blocks of wood are cut to about 6 inches by 4 inches, and these in turn are drilled through the exact center with a \( \frac{1}{4} \)-inch drill. A \( \frac{1}{4} \)-inch stove bolt is run through one block, through the center form spacer, and through the other block. A plain washer is put on next, then a lock washer, and the whole thing drawn tightly together with a nut. The projecting end of the \( \frac{1}{4} \)-inch bolt can be gripped in the chuck of a breast-drill held in a vise, or in a lathe, to make the turns.

The field coils are wound with No. 17 s.c.e. wire. In starting the winding, leave a good length of wire over the edge of the form to serve as a lead. It would be a good idea to put a piece of sleeving over this lead. Start the turns slowly, for a few turns, keeping the turns as uniform as possible.

ILLUSTRATING THE GENERAL CONSTRUCTION OF THE CARRY-ALL FRAME AND MOUNTING OF THE PARTS

The 6-volt d.c. generator is in center, driven from a pulley that does not show. The battery makes for a little better a.c. regulation, but is not necessary. The cable shown in back is made up of 4 lengths of rubber covered No. 14 wire, one pair for a.c. output, the other pair for remote voltage adjustment.
NAVAL Communication Reserve radio drill activities are now underway for the current season. These drill activities are divided into four networks classified as A, B, C and D. The first network is the national net which consists of Naval Radio Arlington in charge, and includes the master and alternate control stations in every Naval District in the United States, Canal Zone and the Hawaiian Islands. The next classification is known as the District or B network, which includes the training stations in the Districts plus the various section control stations of which there are several in every Naval District. The next step is within the section, these C drills being conducted by the section headquarters radio stations for the benefit of their unit stations located in armories, post office buildings and other government quarters. The last group, known as the D net, is made up of the unit stations located in armories and includes the individual amateur station owned by each Reserve.

Heretofore there has been considerable interference in congested localities between amateur stations engaged in purely amateur communication and the various radio drill nets of the Naval Communication Reserve. In spite of the very best of cooperation between individuals and the Communication Reserve there has always been a certain amount of unavoidable interference, particularly on the 3500-kc. band. Some years ago the master and alternate control stations were assigned government frequencies for their training circuits and for the past eight years have operated on 4045 and 3475 kcs. About a year ago the section control stations and the B network were placed on government frequencies between 2000 and 3000 kcs., but the unit stations and individually owned amateur stations remained on amateur frequencies. As there are several thousands of these stations belonging to the Communication Reserve, there still continued to be some unavoidable interference.

This year, for the first time, Navy frequencies have been assigned to the C and D networks. This means that every Naval Reserve-amateur radio station will be assigned a government frequency for official use on drill circuits. A number of years ago the Navy also worked out a system of special Naval Reserve call signs which has been in effect, and these call signs will also be used on these government frequencies. Of course this plan will have to be operated for nearly a full season before its benefits will be felt. It will require some time for Reserve-amateurs to convert their equipment to operate on the new channels between 2000 and 3000 kcs. Some will wish to buy crystals and some will wish to use electron-coupled or master-oscillator power-amplifier circuits. Because of the fact that United States ships use some of these frequencies, it is important that the transmitters be carefully calibrated and that their frequency stability be very good.

The Naval Communication Reserve has never made any attempt to handle a great amount of traffic over the training circuits. It has always taken the position that its mission was to train operators for service with the Navy in case of national emergency and that its primary object was to give radio operators the opportunity to learn naval procedure and methods. In order to do this its radio training circuits are operated in accordance with the requirements of the Naval Communication Service. Many interesting problems are carried out on these circuits and instruction is given in practical navigation, handling charts and other similar exercises. It is interesting to learn that some of the personnel who received instruction of this kind during the past year were able, when assigned to a Navy ship for training duty, to assist in the navigation of the ship and were able to plot positions from radio bearings.

The national competition last year was won by the Communication Reserve of the District of Columbia which is under the command of Lieutenant James H. Nicholson, C-V(S), U.S.N.R. This officer is well known to amateurs in New England and many parts of the United States, as he is connected with the Bureau of Air Commerce in the Department of Commerce and in his capacity as radio engineer for the Airways System, he travels all over the United States.

During the summer Lieutenant Commander W. J. Lee, U.S.N.R., who is on duty in Washington in connection with the administration of the Communication Reserve, traveled through the North Atlantic States and visited many communication organizations in Maine, Massachusetts, New York, New Jersey, Pennsylvania and Delaware.

Commandants of all Naval Districts have recently been authorized to form a Merchant Marine Unit in each Naval District to be composed exclusively of Communication Reserve officers and radiomen who are actually employed at sea in the capacity of commercial operators. Any members of the Communication Reserve who are so employed will eventually be attached to such a unit in their home District.

Recruiting has started up again after the summer lull, and anyone who is interested in joining the Communication Reserve can easily make arrangements to apply by communicating with a

(Continued on page 94)
ARMS AMATEUR RADIO SYSTEM ACTIVITIES

Always the American Radio Relay League - ARRL

November, 1937 31

AT 7 P.M. and 10 P.M. on Thursday, November 11th, a message from the Chief Signal Officer to all A.A.R.S. amateurs will be broadcast. As has been customary in the past, the broadcast will be made the subject of a competition among Corps Area Army Amateurs. The Corps Area having the largest number of members clearing will be announced as the winner. Handicap factors based on quota membership will be applied.

ALL AMATEURS are invited to copy this message which will be broadcast by WLM on 3497.5 and 6900 kc. and by W3CXL on 14,030 kc.

Since the announcement by N.C.R. that drills would be held outside the amateur bands, the question has been raised as to why the A.A.R.S. does not do the same. A few words of explanation may answer this question.

Members of the A.A.R.S. are not part of the Army. They are affiliated voluntarily with the Signal Corps, U. S. Army, for training in handling traffic using Army procedure and for disaster relief communications.

Two special frequencies, 3497.5 and 6900 kc., are assigned to the A.A.R.S. These are obviously not sufficient for 1500 stations. Under present regulations the A.A.R.S., not being a part of the Army, cannot be assigned the use of War Department frequencies for drills.

Last season the office of the Chief Signal Officer sent out a memorandum outlining the change in net organization of the A.A.R.S.

The old organization provided for the Army net, Corps Area nets, state nets, district nets and local nets. The new plan calls for the abolition of the district and local nets whenever practicable and having all stations within a state operate on the state-net frequency. States with large memberships such as New York, Massachusetts, Pennsylvania and California are divided into two or three sub-state nets. The memorandum states in part as follows:

"For some time the organization of local and district nets and the assignment of frequencies in the amateur band has been a problem. The idea that all stations drill on a certain night has contributed largely to the demand for numerous nets and frequencies. The necessity for drill on a certain night also has kept many amateurs from joining the A.A.R.S., due to the fact that certain individuals are not able to drill on the night decided upon. The following plan will eliminate some of these difficulties and provide a more flexible organization in time of emergency. The efficiency of state net organizations has been proved by the operation of nets of the V Corps Area in handling flood traffic.

"Most states do not have a membership so large that it is impossible to work on a spot frequency. In these few large states, district nets can be used.

1. All stations in a state will work on the state net frequency.
2. Hours of operation of the net will be decided upon by the Corps Area.
3. Nets will operate each night in the week.
4. Sufficient alternate state NCS will be appointed to handle the net, during the week, these alternates to work under the SNCS who will designate the station to take his place when he is unable to be present.
5. Local stations in the net will be divided up to operate on certain nights in the week so that all stations will not be on the air together. A definite schedule of locals or net periods can be maintained. This would not prevent locals from coming into the net on nights, other than when he is scheduled, to get rid of traffic."

Local stations of a state should be divided so as to schedule a group of stations to operate a certain hour each night instead of certain nights of the week. This will allow a station to come on the air any night on schedule and will do away with the former necessity of reporting Monday nights for drill to obtain credit for attendance.

The advantages of having stations within a state on a spot-frequency are obvious. In an emergency the local station has a much greater chance of contacting his net control station or at least another station within the net, and the net can be quickly put on the alert. Cutting down the number of nets also releases numerous frequencies in the amateur bands. This will also tend to keep the state-net frequencies clear, due to the number of stations using that frequency.

Although the change has not been completed in all Corps Areas, considerable progress is being made. The advantages of this system have already been proven. The Fifth Corps Area which comprises the states of Ohio, West Virginia, Indiana and Kentucky was already set up for state-net spot-frequency operation and used it with excellent results in the flood of January, 1937.

Several references have been made to the nine Corps Areas into which the United States is divided. For the information of all concerned the following shows the states comprising each Corps Area and the headquarters of each:

I. C.A.—WISC, Army Base, Boston, Mass.—Maine, (Continued on page 98)
How Long Is a Quarter Wavelength?

Some Practical Figures for the Velocity of Wave Propagation in Antennas and Transmission Lines

By J. N. A. Hawkins,* W6AAR

The growth in the use of quarter-wave and half-wave matching sections in modern transmission-line fed matched-impedance antenna systems requires an answer to that perennial problem, "How long is a quarter wave?"

Experience with "end effects" in radiating antennas indicates that electrical length and physical length of a conductor are not necessarily the same thing. Although resonant matching lines are ordinarily free from "end effects" they still are subject to a shortening effect which reduces their mechanical or physical length below the electrical fraction of a wavelength which they simulate.

The cause of this shortening is the reduced velocity of propagation of radio frequency energy through a conductor. Radio-frequency energy ordinarily travels through free space with the speed of light, close to 300,000 kilometers or 186,000 miles per second. If the velocity of the energy were the same in copper wire that it is in free space, a half-wave resonant line cut for exactly 7000 kc. would be slightly over 70 feet long. But the actual velocity of propagation through a typical half-wave section consisting of No. 12 wires spaced six inches (600 ohms characteristic surge impedance) is only about 97.5 per cent of the velocity in free space, so that 7000-kc. energy will only travel 97.5 per cent of 70 feet during one-half cycle of oscillation. Thus the 7000-kc. half-wave section would only be about 68.5 feet long.

In a half-wave radiating antenna operating at 7000 kc. the "end effect" takes about 2.5 per cent off each end of the antenna so that it becomes about 95 per cent of 70 feet long, or about 66.5 feet in length.

It must particularly be noted that the "end effect," which shortens a radiating antenna, only affects the "outer" quarter-waves on the ends of the antenna; the shortening effect is not evenly distributed throughout the length of the antenna.

Thus for antennas greater than one-half wave long, the standard antenna length formula becomes

$$L_{feet} = \frac{492(K - 0.05)}{F_{Mc.}}$$

Where \(L\) is the length in feet; \(K\) is the number of half wavelengths in the antenna and \(F\) is the frequency of operation in megacycles. Some experiments have shown a constant of 0.04 instead of 0.05; but 0.05 appears to fit most practical cases.\(^1\)

Resonant Transmission Lines

Now the effect which causes a somewhat similar shortening effect in transmission lines and resonant matching sections differs from the above effect in that the effect is evenly distributed throughout the length of the line or matching section. Thus a half-wave resonant matching section is always exactly half as long as a full-wave section of the same construction. This differs from a radiating antenna since a half-wave antenna may be something less than half as long as a full-wave antenna resonant at the same frequency.

The only point about which care must be taken, in determining the physical length of a matching section, is to make the proper correction for reduced velocity of propagation. This varies with the nature of the conductor and the dielectric surrounding it.

Another point about the velocity of propagation is that it varies somewhat with frequency, and increases slightly as the frequency increases. However, for typical amateur use this variation with frequency can be neglected between 3 and 15 megacycles. Table I shows the average velocity of propagation of r.f. energy through lines of typical construction. The velocities are shown as percentages of free space propagation and are termed the factor \(V\) in the length formula shown below.

Line A is a conventional two-wire open line using wire sizes between No. 10 and No. 16 with spacings between two and six inches. It is also

(Continued on page 96)

\(^1\) The correction factor 0.05 gives the same length in feet for a half-wave antenna as the \(1.56 \times \text{wavelength-in-meters}\) and the \(469,000/F_{Mc}\) formulas for average length given in the A.R.R.L. Handbook for a number of years. See J. J. Lamb, "What Length Antenna?" QST, Oct., 1928—Edison.

---

*2807 Eighth Ave., Los Angeles, Calif.
Notes on Steatite-Type High-Frequency Insulation

By Hans Thurnauer*

Contrary to a more or less general impression, "steatite" is not a registered trade name for the products of any particular manufacturer, but is simply a good dictionary word meaning (according to Webster) "A massive variety of talc . . .—called also soapstone." In the United States, a number of organizations, including American Lava, General Ceramics and Insulnite, manufacture what are called "true steatite bodies" containing at least 80 per cent, and usually 85 per cent to 90 per cent, steatite. There is considerable difference of opinion in trade circles as to the relative high-frequency efficiency of products sold under the different brands of the various manufacturers, resulting in confusion to the amateur consumer and a general headache all around. Part of this confusion seems to be traceable to the fact that quantitative figures on loss factor vary widely, even for the same material, apparently because the methods and conditions of measurement are not uniformly the same. Moreover, the fact that loss factor alone is not the sole criterion of insulator loss is generally overlooked. The total power loss in the dielectric is also dependent on the total volume of insulation in the high-frequency field—which brings the mechanical properties of the insulation into the picture. A small piece of higher loss-factor insulation which has adequate mechanical strength for a given job may be preferable to a lower loss factor material which must be of greater volume because it has less mechanical strength. In an effort to cast some light on the situation, we have sought information as free from bias as possible and have obtained the following article on the general subject of steatite-type insulation. Further information and comments of practical interest to amateurs will be welcomed.—EDITOR

WELL-CONSTRUCTED high-frequency apparatus, transmitting as well as receiving, must fulfill at least two requirements. The dielectric losses of the apparatus have to be as low as possible, to assure high efficiency, and the construction has to be absolutely rigid to maintain constancy under any operating conditions.

To have a high-Q tuned circuit, the low-loss coil and condenser are of first importance; but all other components must be considered also to get satisfactory results. As a matter of fact, the better the coil and condenser, the more noticeable are losses introduced through additional components, such as terminal strips, insulating supports, tube bases, sockets, etc.

The other day we read an editorial in one of the radio magazines and found the following thoughts, which illustrate the point: "Engineers give plenty of thought to the Q's of the component parts of circuits, but how many times have you ever seen anything on the resultant of hanging a good coil across a fairly good condenser, then hooking the whole works to a 'molded-mud' socket. Obviously something happens to the otherwise excellent Q exhibited by the coil—by itself."

We know what happens to our circuit if we use unsuitable insulators; dielectric losses are introduced which cut down selectivity of receivers and cause heating in transmitters.

Let us consider briefly what is understood by dielectric loss. Take a condenser consisting of two metal plates and a dielectric medium between the plates. If this condenser is subjected to the potential of a r.f. field, a current will flow through it; and if the dielectric is ideal, the phase difference between current and potential will be exactly 90°. There is, therefore, no energy loss. A perfect insulating material is vacuum; and also perfect for all practical purposes is air.

If a liquid, or solid, dielectric is used, however, the case is different. Some of the energy is consumed by the insulating material. The phase difference between current and potential is not 90° but 90°—σ, where σ is called the loss angle. The tangent of σ (tan σ) is called the power factor, usually represented in per cent.

The power factor is not the only material constant that has to do with the dielectric absorption of power. The power loss per unit volume of a material is proportional to the frequency, the square of the voltage gradient, and the product of the power factor and the dielectric constant of the material. This shows that not only the power factor, but also the product of power factor and dielectric constant should be used as a measure of the dielectric loss of a material. This product is called the loss factor.

If a condenser with a high capacity is needed, a material with a high dielectric constant will give the desired capacity with a small condenser volume; but the power loss per unit of volume is increased in proportion to the dielectric constant.

For insulation of high-frequency circuits, especially where voltage and frequency conditions are severe, a material with low dielectric constant and low power factor should be selected to provide low energy absorption per unit volume.

In high-power short-wave transmitters it is absolutely necessary to use low-loss insulators, because otherwise heating from the high frequency currents due to dielectric losses may result in actual explosion of the insulator.

Air with a dielectric constant of 1 and a power

November, 1937

* American Lava Corp., Chattanooga, Tenn.
factor of 0 is the ideal insulator from the electrical point of view. Air, however, is not so easy to use as an insulator. Insulators not only serve as dielectrics; they also have to support or space metallic conductors and therefore have to be of a solid nature.

What the radio engineer needs, therefore, is an insulating material with these properties:

- High mechanical strength and rigidity.
- High electrical resistance (ohmic resistance).
- Low dielectric loss over the whole frequency range of its application.

Among the natural minerals we only know of one possessing all these properties. That is quartz. Quartz has been regarded as the ideal material for radio insulation and insulators made of clear quartz glass (which is obtained by melting quartz crystals in the electric arc) have unsurpassed electrical properties. But quartz glass insulators are very limited as to sizes and shapes and their cost of manufacture eliminates quartz or quartz glass as a practical high-frequency insulator.

There are some low-loss materials among organic resins, especially in the polystyrol group. They lack, however, one important property—rigidity.

To find an “all-around” high-frequency insulating material we have to look among the ceramic materials and here we find the steatite bodies. They combine the desired mechanical and electrical properties and can be manufactured in quantities at economical prices.

What is understood by the term “steatite bodies”? So much confusion exists about these materials that it may be well worth while to give a brief description.

A steatite body is a high quality ceramic mater-

COMPARATIVE PROPERTIES OF SOME MATERIALS USED FOR HIGH FREQUENCY INSULATION

(These data represent average values and vary according to composition, size, shape, method of manufacturing and firing)

<table>
<thead>
<tr>
<th>Type</th>
<th>Porosity (Percentage of water absorption)</th>
<th>Tensile Strength lbs. per sq. in.</th>
<th>Compressive Strength lbs. per sq. in.</th>
<th>Modulus of Rupture lbs. per sq. in.</th>
<th>Softening Temperature (Degrees F)</th>
<th>Dielectric Strength volts/mil</th>
<th>Volume Resistivity ohms-cm/cu. inch at 75° F</th>
<th>Dielastic Constant between 1 and 10 Mc.</th>
<th>Power Factor per cent between 1 and 10 Mc.</th>
<th>Loss Factor per cent between 1 and 10 Mc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Commercial&quot; Steatite</td>
<td>.07-nil</td>
<td>6500-10,000</td>
<td>80,000-100,000</td>
<td>18,000-22,000</td>
<td>2600</td>
<td>300</td>
<td>Over 10 14</td>
<td>6.5-6.2</td>
<td>0.20-0.18</td>
<td>1.24-1.08</td>
</tr>
<tr>
<td>&quot;Low-Loss&quot; Steatite</td>
<td>.07-nil</td>
<td>8000-10,000</td>
<td>80,000-100,000</td>
<td>19,000-22,000</td>
<td>2550</td>
<td>200</td>
<td>Over 10 14</td>
<td>6.5-6.0</td>
<td>0.02-0.04</td>
<td>0.36-0.23</td>
</tr>
<tr>
<td>Dry Process Porcelain</td>
<td>Up to .25</td>
<td>1000-2000</td>
<td>30,000-50,000</td>
<td>8000</td>
<td>2100</td>
<td>40-100</td>
<td>Over 10 14</td>
<td>7</td>
<td>0.7-15</td>
<td>5.2-105</td>
</tr>
<tr>
<td>Quartz Glass</td>
<td>Nil</td>
<td>Above 10,000</td>
<td>282,000-30,000</td>
<td>10,200</td>
<td>3100</td>
<td>100</td>
<td>10 18</td>
<td>4.2</td>
<td>0.026-0.028</td>
<td>0.11-0.118</td>
</tr>
<tr>
<td>Glass-Bound Mica</td>
<td>.035</td>
<td>.</td>
<td>25,000</td>
<td>20,000</td>
<td>60</td>
<td>.</td>
<td>8.5</td>
<td>0.19</td>
<td>1.62</td>
<td>.</td>
</tr>
</tbody>
</table>

VARIOUS INSULATING PARTS MADE OF "LOW-LOSS" STEATITE AND USED FOR HIGH-FREQUENCY APPLICATIONS

3 MgO. 4 SiO₂. 1 H₂O. Talc, as used in face powders, is practically the same substance, with the only difference that face-powder talc is usually not pure enough to go into steatite insulation manufacture.

A true steatite body has to be made of at least 80 per cent talc or soapstone.

For making steatite insulators, the raw materials are finely powdered and carefully mixed with certain fluxes. Despite the fact that these fluxes

(Continued on page 98)
DIRECTIVE antennas have been used consistently at W6AM for a number of years. The present lay-out has been up for approximately three, and although other antennas are planned for the near future we shall confine the present description to those now in use. As to what can be done with them:

Often five continents will be worked on 'phone during the course of a single evening, sometimes in as short a period as two hours; all six continents were worked on three different nights during the 'phone portion of the last DX contest. Schedules have been maintained with CE1BC at Chafaral, Chile, for over a year without a miss, except for three times when he had to be absent for business reasons. Over a period of five months, weekly schedules were maintained with Manila on 20-meter 'phone without a break. Europe was worked on 'phone every night the station was in operation for a period of three weeks, and over a period of four months there were only three misses on any night Europe was called on 'phone. For two and one-half years schedules have been maintained with W2NB in New Jersey with never a complete miss during that time. These things are mentioned to show that with effective antennas 'phone becomes more than a hit-or-miss skip proposition but takes on the characteristics of a consistent communication—and we are all interested in two-way communication.

The beam antennas are universally used for reception as well as for transmission; to do this a changeover relay transfers the antenna in use (the various antennas are selected by manual switches) from the transmitter to the receiver. This gives an equivalent power gain on the other fellow in receiving and eliminates the necessity for requesting checks on various antennas when the direction of the station contacted is doubtful. It is surprising how accurate the operator can become in determining just where a station is long before it signs off. A quick trial of the various antennas soon indicates the direction, and the characteristics and frequency of the station usually will furnish the balance of the data necessary. On an average, the direction from which the station comes and its approximate location can be guessed nine out of ten times and often as high as nineteen out of twenty times. This is always interesting to visitors at the station.

THE COMPLETE ANTENNA SYSTEM

Using this antenna as a basis, the construction of other antennas followed whenever an opportunity offered. They are all bi-directional, and we have gradually come to entitle them:

**14-MC. ANTENNAS**

The 20-meter 'phone antennas number five. Four of these come off one pole like the spokes of a wheel and the fifth originates at another pole. Two poles only are used for the entire seven antennas (two are on 7 Mc.). Trees, swings and any other convenient points of attachment are used for the far ends of the arrays.

The first honest-to-goodness 20-meter beam was designed by W2NB when he was visiting here and it was put up so that W2NB and W6AM could have a weekly schedule at some time convenient to both of us. The antenna is an adaptation of the Sterba curtain, mounted horizontally to get the benefit of horizontal polarization in reducing local-noise pickup. It consists basically of eight half-waves in two tiers of four each. The radiating elements are all 95% of a half wave in space and the feed-line portions are all an actual half-wave long. The total impedance at the feed point appears to be something like the total of all of the half-wave sections; that is, considering each half-wave section as having a resistance of seventy-two ohms, the termination at the end is something like 8 times 72, or 576 ohms. It happens that No. 14 wire spaced four inches (a standard spreader length) has a computed impedance of 576 ohms, which to all intents and purposes is a natural match and makes matching transformers unnecessary.

If the feed lines are properly terminated it will be found that there is little if any interaction between the various antennas. Once in a while a little inter-action creeps in, which is not surprising since four are attached to one pole and at the other end of the lot there are three more. This means a lot of antennas in a small space, some of them crossing over others. In addition, the feed lines converge to one spot and for the most part go through the same window.

In order to check the results obtained by using different types of feed lines, a line of approximately 800 ohms was used on the same antenna with noticeably poorer results.

---

*4214 Country Club Drive, Long Beach, Calif.

---

1. New York, Australia

I.e., length in feet = 468/freq. (Mc.).
2. London, New Zealand  
3. South Africa, Cuba, Hawaii, South Africa  
4. Alaska, Seattle  
5. Buenos Aires, Chile—Japan, China, Manila 

1. Manila, Orient—Mexico, South America  
2. New York, Chicago—Australia

In addition, the forty-meter Manila antenna (two half-waves in phase) is used as a half-wave antenna on eighty meters. For ten-meter operation, a vertical antenna consisting of two half-waves in phase is used. And on top of one of the 90-foot telephone poles (there are two on the lot) is a Johnson Q antenna used for five-meter work. This makes nine antennas in use, all of which have their lead-ins brought directly into the station. Sometimes two or three antennas are used at once, although this procedure usually pulls energy out of the direction desired so it is not done except on rare occasions.

Each 14-Mc. antenna covers at its best point a region varying from 3½ to 5 degrees either side of the direction toward which it is pointed. This gives a strong ten-degree beam in two directions. Each antenna is approximately thirty degrees from the next adjacent one, so in between is an area of reduced utility, although these areas are given a signal about equivalent to that from an ordinary half-wave antenna. Having ten directions at one's disposal, however, is productive of some interesting operation, as can well be imagined. Since putting up the complete layout there has only been a single 1½-hour period when the twenty-meter band was not good for DX—by which we mean something three thousand miles or over.

All of the antennas are not of the type described above; the drawings show seven in use.

Reducing Interference

Directive antennas have several interesting features not ordinarily considered by the average amateur. For instance, QRM is minimized. With ten separate directions available, strong QRM becomes considerably less than what it would be on one antenna. Although the antennas respond in two directions, usually, because of the characteristics of the twenty-meter band, one direction is skipping out while the opposite direction is at its best. This is not always true, but it is true enough of the time for us to take advantage of it.

It is far quicker to switch from antenna to antenna by means of switches over the receiver than it would be to rotate an antenna, consequently more stations can be spotted and called.

FIG. 1—THREE DIRECTIVE ANTENNA ARRANGEMENTS USED FOR 14-MC. WORK AT WSAM

All consist of phased elements, the line of maximum propagation being broadside to the line of the antenna.
All stations naturally cannot be in the strongest part of the beam, but even at an angle of about fifteen degrees from the optimum direction the signal strength is comparable to that obtained with a half-wave antenna—and beyond that there is another antenna to switch in. Sometimes two antennas are used simultaneously when the population of the United States—and likewise probably 70% of the amateur stations. This is a busy region, and QRM conditions are almost as bad on that antenna as on a half wave.

GETTING DIRECTIONS RIGHT

Many amateurs who have put up directive antennas try them out and say, disgustingly, “Oh, it doesn’t work as well as my old antenna.” In every case that I have personally run down I have found that the particular amateur did not know the real direction in which the antenna was pointed. He laid it out by guess and by gosh, and simply had not gone to the trouble to determine his directions exactly. This was very strongly brought home at the time the first European antenna was put up here. It happens that the two poles on the lot are so placed that if a broadside antenna is strung up between them it appears to be directed toward Europe. I put up four half-waves in phase between the two poles, thinking I would get Europe—Sweden, Denmark and Finland were very easy to work on this particular antenna—countries that ordinarily were not heard on any other antenna on the place—but after a week’s listening it was found that no London signals had been heard, nor any French nor German. A correction was made by running a long guy wire from the pole over to a tree so that one end of the antenna could be swung around approximately seven degrees, upon which it was found that London amateurs were plentiful, as well as French, German, and even some Italians and Swiss. However, since the antenna has been moved out no more Swedish or Danish stations have been heard. A seven-degree correction changed the European situation entirely. The present set-up is used because there are many more twenty-meter ‘phones in the London area than in any other part of Europe.

(Continued on page 106)
A Deluxe 100-Watt C.W.-'Phone Transmitter
With Band-Switching Exciter

By George F. Wunderlich,* W6DUW

W6CLT came to us recently with an order for a transmitter involving some features which he believed would make for convenience of operation. The requirements were as follows:
1. Band switching from 1.75 to 30 Mc., including all stages up to the final plate tank coil.
2. Fixed neutralization.
3. Simplicity of operation.

Believing that the resulting transmitter has features which may be of general interest to the amateur fraternity, the constructional features are described in this article.

R. F. SECTION

A glance at the tube line-up of the radio-frequency portion of transmitter (Fig. 1) will disclose a quite conventional choice of tubes. Starting with the crystal oscillator, we have the 6A6 serving as oscillator and doubler. Provision is made for selecting any one of five crystals by means of a Centralab bakelite five-point switch. Plate coils in the oscillator circuit are switched at the “hot” ends, using the new Centralab isolantite wafer switches. L1 covers the 1.75- and

![Circuit Diagram](image-url)
3.5-Mc. bands, and L2 7 Mc. SW1 is a single-section 2-pole 5-position switch. With SW1 in Position 1, 2 or 3, 1.75-Mc., 3.5-Mc. or 7-Mc. excitation, respectively, is furnished to the grid of the 807 stage. For operation on 1.75, 3.5, 7.0 and 14-Mc., SW2 is left on Position 1. It will be noted that for 14-Mc. operation the 807 functions as a doubler, working from the 7-Mc. crystal. For 28-Mc. operation, SW1 is turned to Position 5 and SW2 to Position 2. This puts excitation on the second triode portion of the 6A6, applies plate voltage to that circuit, and switches the grid of the 807 from the oscillator plate circuit to the 6A6 doubler plate circuit. Thus on 28 Mc. we have a 7-Mc. crystal oscillator, 14-Mc. 6A6 doubler, and the 807 doubling 28 Mc.

Because of stray capacities attendant to band switching, it was found advisable to operate the 807 as a "straight-through" amplifier on 14 and 28 Mc., since excessive regeneration was encountered. This arrangement does not result in a lack of excitation, however, because the 807 operates so well as a harmonic generator, plate efficiencies of 50% being obtained from the tube in doubling. Actually, it was found that the 807 amplifier could be over-driven with excitation on all bands; hence the excitation control condenser C6 was included in the set-up.

The band-switch arrangement in the plate circuit of the 807 is quite conventional, and switching here is again accomplished with a Centralab isolantite wafer-type switch. Positions 1, 2, 3, 4 and 5 cover

THE COMPLETE TRANSMITTER READY FOR OPERATION

Controls, reading from left to right, are as follows: Top Row—Crystal plate, doubler plate, buffer plate, amplifier plate. Second Row—Crystal selector switch, oscillator plate coil switch (SW1), doubler switch (SW2), Buffer plate coil switch (SW5), excitation control (C6), tune-operate switch (SW7).

Bottom Row—Audio gain, CW, Phone (SW6), filament supply (SW3), plate supply (SW4), modulator (SW5), 110-120 volt line switch (SW8), 6E5 overmodulation indicator.

THE R.F. UNIT REMOVED FROM THE FRAME

November, 1937
the 1.75-, 3.5-, 7-, 14- and 28-Mc. bands, respectively.

No coil data are specified in this article, since different layouts will affect stray capacitance and inductance a quite appreciable amount. To the constructor who contemplates duplicating an exciter of this type, let me point out that the strays are quite high, resulting in what may look like too high a ratio of C to L. Actually, despite this necessary compromise, 15 to 25 watts of excitation are available; so let us not allow purist arguments to overrule expediency or convenience, since we accomplish our purpose finally.

A word as to coil forms. Ordinary moulded or ceramic forms of the 1-inch or 1½-inch diameter variety are quite satisfactory anywhere in the exciter, excepting in the 28-Mc. coil position. At this frequency we cannot recommend too highly the use of an “air-supported” coil. Even coils wound on good-grade ceramic forms were found to be inferior to “air-supported” coils.

The final amplifier, using plug-in coils in the interest of highest efficiency and space-saving, contains nothing unorthodox. Requirements called for 100 watts of carrier power on all bands, and this was met easily by the 3S7 used here. Its low interelectrode capacity aids materially in maintaining “fixed neutralization,” besides insuring an efficient L-C ratio at 28 Mc. Power input to this tube runs around 150 watts.

**AUDIO SYSTEM**

Referring to Fig. 2, it will be seen that the audio system consists of a 6F5 speech amplifier, 6N7 phase inverter, push-pull 6C5 drivers, and a pair of 6L6G Class-AB modulators. By raising the plate voltage slightly and increasing the bias and load impedance on the 6L6 stage, it is possible to realize 70 watts of good clean audio with sine-wave input.

R.f. feedback evidenced itself in the audio portion, particularly on 14 and 28 Mc. A small cast dural box housing the microphone jack and its associated r.f. choke removed this difficulty.
addition, 17ST dural is available in square, round, hexagonal and rectangular bar stock and can be used in place of brass for those shaft couplings, neutralizing condensers and similar gadgets which we usually "home-brew." Any of the above materials take on a very nice appearance when bright-dipped and coated with clear lacquer. This operation can be performed quite cheaply by your local plating works.

So, to get back to our story, all chassis were made from 52S dural. As may be seen from the photographs, only the two ends of the chassis are bent down. Half-inch dural angle has been riveted all around the front and back, inside of the chassis, and a sheet of dural riveted on the front face of the chassis. On the back side, a piece of ¼-inch natural sheet bakelite has been screwed, to form the back side and terminal strip in one. The framework was made from 1 by 1 by ¾-inch 17ST dural.

MECHANICAL CONSIDERATIONS

Weight being a consideration in the design of this transmitter, dural has been used throughout in all the metal work. At this point allow me to digress to one of my pet subjects. The majority of amateurs use either a cadmium-plated steel or half-hard aluminum chassis. Both have their objectionable features. Those who do not have access to drill presses find it a tough job to machine a steel chassis, particularly where a number of socket holes are needed. Then, too, after machining the chassis a number of unplated areas are left exposed, with rust spots sure to set in. Aluminum, while easy to machine, does not work "cleanly"; that is, it has a tendency to be gummy and to raise burs. In my opinion the use of dural overcomes all these difficulties. The so-called "52S-½ hard" sheet dural machines cleanly and easily, is stiffer than aluminum, and is readily bent at angles without cracking. For panels, gusset plates and angle stock for racks, the 17ST (heat-treated) grade is the metal to use, since it is one of the hardest of the aluminum alloys. In

The negative-peak overmodulation indicator, comprising the 879 and 6E5 tubes, is the one described by Mr. L. C. Waller in Nov., 1936, QST. It is a remarkably sensitive device and a little juggling of C17 will produce quite a variety of time constants in the action of the 6E5 indicator. It has proved to be far superior to an oscilloscope for overmodulation monitoring, since a transient peak shows up for about a second, where it would be of too short duration on the oscilloscope to be perceptible to the eye.

FIG. 3-Terminal Connections

J1—Key jack.
J2—Oscillator plate current meter.
J3—807 buffer grid current.
J4—Buffer plate current.
J5—35-T final grid current.

November, 1937
The various solutions submitted in response to Problem Number 9 differed only slightly in theme. As you may remember, the problem was to find a simple, yet effective system for arranging spare parts and workshop materials so each could be located quickly without the necessity for turning the workshop upside down.

The general idea submitted by most of the contestants is a system of boxes or compartments, suitably labeled, into which spare parts and materials are consigned according to their classifications. The arrangements vary from a collection to the name of the article. Every piece of spare material and the quantity of each is listed in the file. The file card indicates in which box the desired part will be found. Whenever a part is taken out for use or sale, it is taken off the list and the date of the removal and the purpose for which it was removed are recorded. Similarly, when parts are added, they are added to the file. Thus, a continuous record of parts on hand is available, so that, when a new piece of construction is contemplated, it takes but a few moments to determine what new parts must be purchased.

Second prize is awarded to E. N. Fuertes, K4EDS for his sketch of a novel portable hinged box arrangement, shown in the drawing of Fig. 1. The box may be placed on the work bench where it will not occupy much space and where everything for the job will be at hand. When not in use, it can be folded closed and kept in any out-of-the-way corner of the shack, attic, basement or closet.

As will be noted, the completed job is formed by two boxes approximately 6" by 18" by 30", hinged together to form one unit. The sides, top and bottom of each individual box are cut from ¾ " plywood. The backs, shelves, stops and partitions are cut from variously sized plywood. The sides, top and bottom pieces (Continued on page 118)
Announcing—Eighth A.R.R.L. Sweepstakes

Contest for W, VE, K, KA, CM and VO Hams—Nov. 13th–14th, 20th–21st

‘Phone or C.W. Any Ham Band(s)—Test Stations—Proves Operating Supremacy—Medallion Awards to the C.W. and ‘Phone Leaders in Each Section’—Certificates in Each Club—Gavel Trophy to Winning Club

F. E. Handy* WIBDI

Telegaphing operators will work and compete with other telegraphing operators. ‘Phone hams will compete with other ‘phone hams. The event is the annual “SS!” Don’t miss it.

New medallion awards will be made by the League to the winners in each group in each A.R.R.L. Section. The illustration hardly does this bronze medallion (likeness of T.O.M., Maxim) full justice. Winner’s call will be engraved on each award. They’re beauties.

Many will also complete their QSL-card record and achieve “WAS” honors through this year’s SS. Whether you wish to “work all states” or all A.R.R.L. Sections (even tougher) this is the prime chance of the year to progress toward that objective. The basic idea of the contest is to see how many stations can be worked in such a brief time. The points derived from this will be multiplied by the number of different A.R.R.L. Sections worked with at least a complete one-way exchange in the contest. Message swaps are not required in proof of QSO this year. All essential contest information is sent in the form of a standard preamble. Exchanges are for the record sent to Hq. New hams may also add to their knowledge of the way preambles to A.R.R.L. messages are sent and acknowledged, and fills requested, accuracy of ‘phone communication assured, etc., if they take part and follow the standard practices set forth for these things in the new edition of The Radio Amateur’s Handbook. Some emergencies of late years have found amateurs unfamiliar with good operating practices resulting in delays, garbles, and inability to write or take a message in standard form. We hope that the “SS” will help both new and old timers to improve and perfect operating technique at the same time all make new station records.

All contest exchanges can be logged directly on the sheet that you send Hq. or a report. Paper work will be completed as you go along with nothing to do but total and summarize points and send it in. Mimeographed contest forms will be sent gratis to anyone who sends a radiogram or drops a card for the same. Use of our sheets is not required nor is advance entry necessary. The purpose is to help participants keep a uniform log. It is necessary that the arrangement or form shown with this announcement be followed. Draw your own columns on your own paper if you like . . . or ask us for the prepared sheet.

The “S” schedules operating in two week-ends with a time limit; 33 hours of two week-ends have been specified. You can work more than 20 hours on one of the two week-ends, but in no case will any entry of more than 40 hours’ total operating in the two contest periods be accepted. Use any amateur frequency bands you choose. This timing plan permits the average ham to plan for his time for meals, for 8 hours’ daily sleep, etc. Cross examination of logs makes it possible to check operating time.

Effective choice of and use of the available operating hours, the different amateur bands, and operating proficiency will take one a long way toward success. Single-signal selectivity and high sensitivity will win and bring in the stations at distant points calling you. However, results mainly depend on the man behind the station.

THE GENERAL CALL

“CQ SS CQ SS CQ SS de W . . . W . . .” is used by stations looking for contacts in the Sweepstakes. A single, snappy CQ SS will bring good results! You will test station perform-

* Communications Manager, A.R.R.L.

1 Including Cuba, Porto Rico, Hawaii, Alaska, P. L., etc. Amateurs in Newfoundland are included in the Maritime Section of the A.R.R.L. field organization.

2 See the complete list of the 70 Sections in the A.R.R.L. organization page 7 of this issue of QST.
The contest period

<table>
<thead>
<tr>
<th>Time</th>
<th>Starts</th>
<th>Ends</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.S.T.</td>
<td>Nov. 13 &amp; 21, 7:00 P.M.</td>
<td>Nov. 15 &amp; 22, 4:01 A.M.</td>
</tr>
<tr>
<td>E.S.T.</td>
<td>Nov. 13 &amp; 20, 6:00 P.M.</td>
<td>Nov. 15 &amp; 22, 3:01 A.M.</td>
</tr>
<tr>
<td>C.S.T.</td>
<td>Nov. 13 &amp; 20, 5:00 P.M.</td>
<td>Nov. 15 &amp; 22, 2:01 A.M.</td>
</tr>
<tr>
<td>M.S.T.</td>
<td>Nov. 13 &amp; 20, 4:00 P.M.</td>
<td>Nov. 15 &amp; 22, 1:01 A.M.</td>
</tr>
<tr>
<td>P.S.T.</td>
<td>Nov. 13 &amp; 20, 3:00 P.M.</td>
<td>Nov. 15 &amp; 22, 12:01 A.M.</td>
</tr>
</tbody>
</table>

Proof of QSO

At least a one way complete six part exchange must be completed and acknowledged between two stations as "proof of QSO" before points or Sections can be claimed.

It is not essential that each station worked be taking part in the contest to make your points count. Any operator who needs information can be referred to this announcement. First, ask the operator to take your preamble and come through with like information in preamble form.

Power factor and scores

If the power input to the final stage (plate current times plate voltage - $E \times f$) is:

3 Send the letters CK and just the three number RST report. In phone exchanges only two numerals need be used in the report, the first always "readability," the second "strength."

Instead of just the state (which is the same as the Section in many cases), identify your A.R.R.L. Section as, for example, Salem, Eastern Mass.; Prov., R. I.; Buffalo, W. N., Y.; Omaha, Neb.; Oakland, E. Bay, etc.

4 There is no point in working the same station more than once in the contest period if two points have been earned by an exchange. If but one point is made the first time, you can add a point by working this station again for exchange in the opposite direction. Underline all such exchange entries in your "list," identify them by showing parenthetically the call of the correspondent station. Leave right or left report columns blank so that other pairs of exchanges completed in one contact are side by side.

(a) Up to and including 100 watts - multiply score by 1.5.

(b) Over 100 watts - multiply score by 1.

Operating in both low- and high-power classes at different times is still permitted, but scoring rules do not permit Sections worked on high power to be used in the low-power classification. Points of some kind are credited for every QSO with a bona fide exchange, whether the station worked is a leading "SS" man or a ham outside the contest. If one breaks his power class, however, the Total Score is the sum of scores separately computed for each power class and added.

Scoring system in brief:

All contacts:
One point for each QSO when "receipt" is completed for an exchange one way.

Two points for each QSO when the required information is exchanged both ways.

For final score:
Multiply totaled points by the number of different A.R.R.L. Sections worked, that is, the

5 There is no point in working the same station more than once in the contest period if two points have been earned by an exchange. If but one point is made the first time, you can add a point by working this station again for exchange in the opposite direction. Underline all such exchange entries in your "list," identify them by showing parenthetically the call of the correspondent station. Leave right or left report columns blank so that other pairs of exchanges completed in one contact are side by side.

Power factor and scores

If the power input to the final stage (plate current times plate voltage - $E \times f$) is:

3 Send the letters CK and just the three number RST report. In phone exchanges only two numerals need be used in the report, the first always "readability," the second "strength."

Instead of just the state (which is the same as the Section in many cases), identify your A.R.R.L. Section as, for example, Salem, Eastern Mass.; Prov., R. I.; Buffalo, W. N., Y.; Omaha, Neb.; Oakland, E. Bay, etc.

4 There is no point in working the same station more than once in the contest period if two points have been earned by an exchange. If but one point is made the first time, you can add a point by working this station again for exchange in the opposite direction. Underline all such exchange entries in your "list," identify them by showing parenthetically the call of the correspondent station. Leave right or left report columns blank so that other pairs of exchanges completed in one contact are side by side.

(a) Up to and including 100 watts - multiply score by 1.5.

(b) Over 100 watts - multiply score by 1.

Operating in both low- and high-power classes at different times is still permitted, but scoring rules do not permit Sections worked on high power to be used in the low-power classification. Points of some kind are credited for every QSO with a bona fide exchange, whether the station worked is a leading "SS" man or a ham outside the contest. If one breaks his power class, however, the Total Score is the sum of scores separately computed for each power class and added.

Scoring system in brief:

All contacts:
One point for each QSO when "receipt" is completed for an exchange one way.

Two points for each QSO when the required information is exchanged both ways.

For final score:
Multiply totaled points by the number of different A.R.R.L. Sections worked, that is, the
number in which at least one bona fide S.S. point or exchange has been made.

Multiply this by 1.5 if you used 100 watts or less for transmitter input.

ADDITIONAL RULES

1. Information in contest exchanges (six parts) must be sent in the order indicated, that of the A.R.R.L. message preamble. Incomplete exchanges or wrong order of sending justifies disqualification.

2. Entries should be (a) in the low-power class, or (b) high-power class, or submitted as the sum of separately computed work at one station falling in each class. Sections worked on high power do not count in the multiplier for low-power score and vice versa. Logs must show the power used for each QSO or for groups of QSOs.

6 If the power was changed between (a) or (b) during the contest, separate scores must be kept for each power class, and the two added together for the total.

3. Reports must show operating time for each period spent on the air in the "SS," and the total of such operating time.

4. Logs must be marked for "Phone" or "C.W." entry, grouping all work by either method together as one score.

5. All work must fall in the contest period.

6. Decisions of the award committee of C.D. staff members shall be accepted as final.

7. Reports must be received at A.R.R.L. Hdq. from all stations except those in Alaska, Hawaii, and P. I. on or before noon, Dec. 24, 1937, to be considered for certificate awards. From outlying points, reports must similarly be received on or before Jan. 20, 1938.

CLUB PARTICIPATION

Certificate awards (besides the 'phone and telegraph Section awards) will be made through each club where three or more individual club members, (Continued on page 118)

| FREQUENCY (ME.) | TIME ON OR OFF AIR | 3:5 | 12:10 | 12:20 | 13:00 | 13:10 | 13:20 | 13:30 | 13:40 | 13:50 | 14:00 | 14:10 | 14:20 | 14:30 | 14:40 | 14:50 | 15:00 | 15:10 | 15:20 | 15:30 | 15:40 | 15:50 | 16:00 |
|-----------------|--------------------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| STATION W/VE1... SUMMARY OF EXCHANGES 8TH A.R.R.L. ALL-SECTION SWEEPSTAKES |
| FREQUENCY (MC.) | TIME ON Or OFF AIR | 3:5 | 12:10 | 12:20 | 13:00 | 13:10 | 13:20 | 13:30 | 13:40 | 13:50 | 14:00 | 14:10 | 14:20 | 14:30 | 14:40 | 14:50 | 15:00 | 15:10 | 15:20 | 15:30 | 15:40 | 15:50 | 16:00 |
| STATION W/VE1... SUMMARY OF EXCHANGES 8TH A.R.R.L. ALL-SECTION SWEEPSTAKES |
HINTS and KINKS for the Experimenter

Regulated Plate Supplies

A GREAT deal of interest has been shown in the subject of voltage-regulated plate supplies of the type described in our August issue. Since amateurs are indefatigable experimenters, it is only natural that several suggestions for changes and improvements have been forthcoming. Here are some from B. P. Hansen, W9KNZ, who has contributed a good many items to these columns:

"The regulated power supply described on page 17 of the August issue has proved thoroughly satisfactory here. Built up exactly to specifications, its performance is nothing short of remarkable. I'm using it on my receiver and the improvement in stability and reduction of hum over the old elaborately-filtered supply is something to crow about. However, there are a few small improvements which could well be used to advantage in it.

"First, in this location there is a sharp 120-cycle buzz that comes from any sort of power supply. It can be eliminated by connecting one side of the incoming 115-volt supply to ground (chassis) through a 0.1-µfd. tubular condenser, C9, in Fig. 1. The condenser also will reduce many line noises.

"Second, R6 will keep the neon tube ignited through excessive line surges that would otherwise extinguish it. With the resistor installed, the only effect of such a surge is a momentary hum that fades right out. By using this resistor it is possible to maintain regulation and still draw a little more current from the unit before regulation is lost. Loss of regulation manifests itself by the appearance of the hum mentioned in the article.

"Third, if the last audio stage is tapped into the supply at the point shown—that is, ahead of the regulator tube—the current drain on the regulator will be greatly reduced. Picking up the supply for the power audio this way does several things: it allows the application of higher voltage to the plate of the power stage; it reduces hum, contrary to expectations, because it reduces the load on the regulator unit; regulation is improved, perhaps due to the bleeder action of the power audio stage ahead of the regulator.

"Fourth, I frequently use headphones, and the first time I used headphones with this supply, I noticed a hiss that wasn't present on the old supply. An 8-µfd. condenser across the output reduced it but it could be completely eliminated by connecting a 0.1-µfd. tubular, C8, across the neon tube. Investigation with the oscilloscope bore out the guess that the neon tube with its associated resistors was oscillating at some high frequency. The by-pass condenser stopped this and the audio quality cleared up.

"Fifth, while working on the hiss, I decided that the hum level old elaborately-filtered supply is something to crow about. However, there are a few small improvements which could well be used to advantage in it.

"First, in this location there is a sharp 120-cycle buzz that comes from any sort of power supply. It can be eliminated by connecting one side of the incoming 115-volt supply to ground (chassis) through a 0.1-µfd. tubular condenser, C9, in Fig. 1. The condenser also will reduce many line noises.

"Second, R6 will keep the neon tube ignited through excessive line surges that would otherwise extinguish it. With the resistor installed, the only effect of such a surge is a momentary hum that fades right out. By using this resistor it is possible to maintain regulation and still draw a little more current from the unit before regulation is lost. Loss of regulation manifests itself by the appearance of the hum mentioned in the article.

"Third, if the last audio stage is tapped into the supply at the point shown—that is, ahead of the regulator tube—the current drain on the regulator will be greatly reduced. Picking up the supply for the power audio this way does several things: it allows the application of higher voltage to the plate of the power stage; it reduces hum, contrary to expectations, because it reduces the load on the regulator unit; regulation is improved, perhaps due to the bleeder action of the power audio stage ahead of the regulator.

"Fourth, I frequently use headphones, and the first time I used headphones with this supply, I noticed a hiss that wasn't present on the old supply. An 8-µfd. condenser across the output reduced it but it could be completely eliminated by connecting a 0.1-µfd. tubular, C8, across the neon tube. Investigation with the oscilloscope bore out the guess that the neon tube with its associated resistors was oscillating at some high frequency. The by-pass condenser stopped this and the audio quality cleared up.

"Fifth, while working on the hiss, I decided that the hum level was too high for comfortable head- phone operation, quiet though it was on the speaker. Installation of C4 (0.25-µfd. tubular), across the junction of R1 and R2 to the grid of the control tube took the hum down several db. A further slight but worth-while improvement was effected when C3 was connected from one side of the 2A3 filament to ground. It is essential that this condenser be connected to the proper side of the filament—one side the hum is increased, on the other it is reduced.

"The above suggestions are simply gadget improvements, but taken all together, they do accomplish a substantial improvement in the opera-

FIG. 1—REGULATED PLATE SUPPLY WITH CHANGES SUGGESTED BY W9KNZ

C9, C5—0.1-µfd. tubular paper.
C8—0.25-µfd. tubular paper.
R6—3 megohms, 1-watt.
Other constants are the same as in Fig. 5, page 17, August QST.

1 "Battery Performance from the R.A.C. Power Supply," August, 1937, QST.
tion of the supply. I also installed another double
8-µfd. filter condenser, just doubling up on the
filter already installed, and I feel that this im-
provement was worth the extra expense and trou-
bble."
In connection with W9KNZ's fourth point,

FIG. 2—KEY-CLICK FILTER FOR CENTER-TAP
KEYING
oscillation of the neon tube may either be stopped
or made worse by the installation of the con-
denser (!5, depending upon the conditions exist-
ing. In one case where a supply of this type was
used for a speech amplifier, the condenser was
responsible for motor-boating. The oscillation
frequency no doubt varies with different sup-
plies; we encountered one case where the neon
tube was responsible for a "hash" which located
itself in the broadcast band and could be picked
up in nearby receivers, although it could not be
heard in the s.w. receiver with which the supply
was used. Radiated interference of this type
usually can be cured by installing C2.
Another experimenter recommends the use of a
1-µfd. condenser connected between the filament
of the 2A3 and the grid of the control tube (as
shown in Fig. 1 of the August article) as a further
means of reducing hum. A good paper condenser
should be used.
Neon bulbs without resistors in the bases can
be obtained from G.E., although few dealers carry

FIG. 3—AUDIO OSCILLATOR WITH RESISTANCE
STABILIZATION
R1—50,000-ohm potentiometer (volume control).
R2—500,000-ohm variable (feedback control).
R3—30,000 ohms.
R4—1,500-ohm cathode resistor.
C1, C2—0.1-µfd.
T—Audio transformer (Thordarson R-100).
them in stock. They are provided with bayonet-
type bases such as are used with auto headlight,
to distinguish them from the regular type. The

1/2-watt neon tube, without the resistor and with
a head-light-bulb base, is also included in RCA's
special types and is known as the 991. It should be
large enough, since the actual current through
the neon tube is quite small.

Key-Click Filter

FIG. 2 is a variation of the usual resistance-capac-
ity key-thump filter as applied to center-tap
keying. In ordinary practice the grid leak or bias
supply return is to ground; in this case it is made
to the junction of the resistor and condenser.

This suggestion, which comes from W8EWM,
o doubt also can be applied to circuits having
parallel grid feed as well as the series arrangement
shown.

Stabilized Audio Oscillator

THE circuit of Fig. 3 is a resistance-stabilized
audio-frequency oscillator, which is simple to
construct and so far as can be judged by ear, has a
good waveform. It is used here for code practice,
but since quite respectable volume can be ob-
tained, it probably could also be used for i.c.w.
on the ultra-high frequencies.

The circuit is one that has been used exten-
sively by the telephone companies to test their
circuits, and has been analyzed by F. E. Terman
in Electronics, July, 1933. The distinguishing
feature is that it has a feedback resistor con-

(Continued on page 114)
WAC Rules:

You would think that everyone in the world knew about WAC by now—close to 5000 certificates having been issued. Maybe they do know about WAC, but nevertheless every once in a while we receive a letter demanding to know why the rules for the issuance of WAC certificates aren’t given in QST.

It might be a good idea, therefore, to reproduce the detailed set of rules recently adopted by the I.A.R.U. and incorporated in the Miscellaneous Rules appended to the Constitution, at the same time that we list the names of those to whom certificates have been issued in the half-year ended June 30th. This list will appear at the end of the department next month. The rules follow:

4. (a) In recognition of outstanding achievement in international two-way amateur radio communication there shall be issued by the Union, under the auspices and at the expense of the Headquarters society, certificates to be known as ‘WAC’ (‘Worked-All-Continents’) certificates, commemorating the establishment of two-way communication between an amateur station and other amateur stations in each of the six recognized continental areas of the world.

(b) Applications for the issuance of such certificates shall be transmitted by the applicant, accompanied by adequate proof, to the headquarters of the member-society for the country in which he resides. The headquarters of the member-society shall then examine the proofs and, if they are found satisfactory, shall so attest to the Headquarters society, which shall thereupon issue the certificate and deliver it directly to the applicant. If applicant resides in a country not represented in the Union by a member-society thereof, the application shall be transmitted direct to the Headquarters society of the Union.

4. (c) Where the applicant resides in a country which is represented in the Union by a member-society thereof, it shall be necessary for him to hold membership in such member-society in order to be eligible for the award. Where applicant resides in a country not represented in the Union by a member-society thereof, it shall be necessary for him to pay to the Headquarters society the sum of fifty cents ($0.50, U.S. funds) in order to receive the award.

(d) Member-societies shall acquaint the Headquarters with the precise geographical boundaries of the areas in respect of which they are organized, so that the Headquarters may be reliably guided as to the right of non-resident applicants to obtain certificates upon payment of the stipulated fee.

(e) Proof of the essential qualification for the issuance of WAC certificates, i.e., two-way amateur radio communication with the six recognized continental areas, shall be in the form of QSL cards or equivalent written evidence clearly indicating the fact of two-way communication, or by an examination by competent authority of the log of the station claimed to have been worked. Such an authority can ordinarily be regarded as an official of another member-society of the Union.

(f) By international agreement, the following boundaries have been adopted as officially indicating the six recognized continental sub-divisions of the world:

North Pole along 180° West—Wrangel Island—
Intelligent handling of a station, not only in emergencies, but all the time, is a vital essential that ought to be required of all amateurs on the air in our crowded bands today. The year ‘round we receive communications about improper operating. Sometimes the complaints relate to simple lack of common courtesy to a brother ham. One story is about the W1 ham who holds the record for sending 148 CQs without signing, for transmitting VP6, then 14 more CQ’s, his call once, and back to CQ’s to a total of 412 before the sign!” There are complaints about the pest who always gives his QTH and expects to swap and give complete addresses each time regardless of whether you are way ahead with use of a well thumbed call book or not! Another relates to the chaps so superior they take a message only if a matter of life and death—the spirit of selfishness and irresponsibility replacing normal amateur display of friendship, fraternalism, and cooperation. But why add to this list. We know them well enough.

Listening on 56 Mc. recently we heard one operator apologize for a newcomer—explain how he would be able to talk at length after a while. The “newcomer” made a better impression on us than the speaker. It seemed to us that far better communicating ability might be developed by learning to state thoughts clearly and concisely, and in a manner to avoid phonetic misunderstandings. We should be proud of what we have to say, and the impressions that can be given others, rather than striving to create monologues or talk at undue length. Certainly wordiness is not the objective. Our stations are prohibited to operate. Let us make the 1938 season one noted for intelligent handling of stations, and new highs in cooperative station endeavor. Make worthwhile progress in the operating effectiveness of our hobby-station an aim!

1937 PA DX Contest

THE N.V.I.R., Dutch I.A.R.U. Society, announces a DX contest to be held on the week-ends November 20th-21st and November 27th-28th, from 1500 G.T., Saturday to 2400 G.T., Sunday. Code-system: First QSO, RST report followed by 001; second QSO, RST followed by 002; and so on. Only PA stations will transmit a code. Stations in other countries are requested to please confirm these codes by cards or by logs. Only one contact per week-end is permitted with the same PA station, unless additional contacts are established on different bands. The highest scorer in each country will receive an award.
PRIZES FOR BEST ARTICLES

The article by Mr. Sam K. Brown, Jr., W8NWZ wins the C.D. article contest prize this month. Each month entry to the next interest article will be received marked "for the C.D. contest." Contributions may be in any phase of amateur operating or communication activity (DX, 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a 1937 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 today!

The Amateur Is Balanced

By Sam K. Brown, Jr., W8NWZ*

The time has come, I believe, when we as radio amateurs should try to present ourselves before the public with a little more dignity and self-respect than has been done in the past. The old saying, "Oh, so you're one of those radio managers," should be done away with. In one sense, we cannot blame John Public for saying this. After all, to many, radio is still a scientific mystery only vaguely understood. However, on the other hand, we as amateurs are partly to blame for the opinion. With the hope that we might better our prestige, let's read the following paragraphs:

"Our Hero," after receiving his ticket, naturally starts in radio with a tremendous bang, and, of course, much midnight oil is wasted away. For three consecutive nights the ether is warm with the incessant brass pounding of our hero's rig. Mother, somewhat worried, decides to permit this indulgence? In hopes that the lure would gradually die down.

Months pass, our hero now both experimenter and operator is still spending his entire leisure time with radio. His mind is crammed full of everything from soup to nuts pertaining to radio. You meet him on the street and ask him some question concerning the present strike situation and he looks at you entirely blank. The conversation turns, and you find he can tell you to the kilocycle where GSB can be found or what frequency Trunk Line X operates on. You ask him and knowledge seems in-finite, but it remains to be said that other than radio he is quite similar. Can you wonder at the public opinion that is warm with the incessant brass pounding of our hero's rig?

Mother, somewhat worried, decides to permit this indulgence. In hopes that the lure would gradually die down.

Psychologists say that one should drop his favorite line of work, mental or otherwise, for a while and try something new. Cases show that one returns to his favorite line with new visions, and some have returned with ideas of great importance to their own interest. In other words, let's allow our mental processes to take a vacation from radio more often, and use discretion in regard to radio as a hobby. Thus, I believe, public opinion as well as ourselves will be better off. The fifth law in our code is "The Amateur Is Balanced."

BRASS POUNDERS' LEAGUE

(August 16th-September 15th)

The annual Navy Day message to Radio Amateurs from the Secretary of the Navy will be transmitted October 27th on the following schedules:

From NAA, Washington: 9:00 P.m., E.S.T., simultaneously on 4045 and 9090 ke.

From NPG, San Francisco: 7:30 p.m., P.S.T., simultaneously on 4045 and 9090 ke.

It is expected that letters of commendation signed by the Secretary of the Navy will be sent to all amateurs submitting perfect copy of the text of the message, as sent from NAA or NPG. It is not necessary to submit copies of both stations. A list of all operators submitting copies will appear in QST. Copy what you hear and send what you get to A.R.R.L. Communications Dept., West Hartford, Conn., for grading. Don't guess or recopy! Simply send what you're able to copy as you copied it!

*30 South Street, McGraw, N. Y.
DX Century Club

WE TAKE pleasure this month in announcing the first members of the A.R.R.L. DX Century Club. Membership in this club represents the highest honor in DX circles to-day. Complete details may be found on pages 59 and 60, September QST. The award is made to amateur operators who submit satisfactory proof that their amateur stations have been in communication with at least 100 different countries. To date but five amateurs have qualified. Several others are well on the way to the "Century" mark with 75-or-more "confirmed countries." In presenting the first listing, or 100-or-more for Century Club membership. The list will be brought up to date from month to month in announcing the first award is made to amateur operators who have already qualified for DX Century Club membership. The list will be brought up to date from month to month in announcing the first confirmations only. Confirmations of this type will be checked under the following conditions:

(1) Sufficient confirmations of other types must be submitted so that these, plus the DX Contest confirmations, will total 75 or more. Those who have already qualified for DX Century Club membership are permitted so that these, plus the DX Contest confirmations, will total 75 or more. Those who have already qualified for months listing in QST need only request check of the additional confirmations.

(2) Look up the contest results as published in QST to see if your man is listed in the foreign section. If he isn't, he did not send in a log and no confirmation is possible. Logs for the 1935, 1936 and 1937 contests only are available. Results of these contests appear in the September, 1936, September, 1936, and October, 1937, issues of QST.

(3) Give year of contest, date and time of QSO.

(4) In future DX Contests, do not request confirmations until after the final results have been published, usually in one of the early Fall issues. Requests before this time must be ignored.

If the contact is checked, your total of countries worked will be increased accordingly in the next available issue of QST. Please don't ask us about stations not listed in the contest results, and don't expect replies to letters requesting DX competition confirmations. The QST listing will give the answer.

MEMBERS, DX CENTURY CLUB
Frank Lucas, W8CRA—112 different countries
Douglas H. Borden, W1BUX—105
Jefferson Borden IV, W1TW/W1CMX—104
Henry Y. Sasaki, W6CXX—103
H. A. Maxwell Whyte, G8WY—100

The following are on the road to membership, having submitted proof of contacts with 75-or-more different countries:

W1SZ ........... 92 W8KKG .......... 78
W1TS ........... 89 G2DZ .......... 77
W2GTZ .......... 88 W8YX .......... 88
W2GW .......... 88 W9ADN .......... 76
W8KA .......... 84 VE3EE .......... 75
W1DUK .......... 79

IMPORTANT! PLEASE NOTE WELL!
In view of the difficulty of getting other forms of confirmation from certain countries, No. 5 in the list of rules for the DX Century Club (pages 59 and 60, September, 1937, QST) is amended to permit acceptance of confirmations from foreign logs for the A.R.R.L. International DX Contests only. Confirmations of this type will be checked under the following conditions:

(1) Sufficient confirmations of other types must be submitted so that these, plus the DX Contest confirmations, will total 75 or more. Those who have already qualified for monthly listing in QST need only request check of the additional confirmations.

(2) Look up the contest results as published in QST to see if your man is listed in the foreign section. If he isn't, he did not send in a log and no confirmation is possible. Logs for the 1935, 1936 and 1937 contests only are available. Results of these contests appear in the September, 1936, September, 1936, and October, 1937, issues of QST.

(3) Give year of contest, date and time of QSO.

(4) In future DX Contests, do not request confirmations until after the final results have been published, usually in one of the early Fall issues. Requests before this time must be ignored.

If the contact is checked, your total of countries worked will be increased accordingly in the next available issue of QST. Please don't ask us about stations not listed in the contest results, and don't expect replies to letters requesting DX competition confirmations. The QST listing will give the answer.

Code classes for beginners and advanced amateurs and those interested in commercial operating are conducted from 7:30 to 9:30 P.M., Monday to Thursday, at Harlem Evening Trade School, 138th St. and 5th Ave., N. Y. C., under the Board of Education.

W7AOL, Salem, Oregon, was tenth high W participant in the 1937 Canada-U. S. A. Contest. In September QST W8HJT was erroneously listed in tenth place. W7AOL's score was 9828.

Inadvertently omitted from the DX Contest Results (Oct. QST), W4CPZ, Gaffney, S. C., made a score of 5775.

Suggestions for "an amateur radio course of study" suitable for club work, a "sample constitution" containing many useful suggestions and helps for newly formed groups, and "how to organize and maintain interest in the radio club" are all available to any amateur group on request. Also already organized clubs that may be interested in establishing an affiliation with the American Radio Relay League are invited to write for the suggested "resolution" to be considered by their organizations as a first step in bringing the subject before the A.R.R.L.'s Executive Committee for action.

Hamfest: The Finger Lakes Transmitting Society will hold its 10th Annual Banquet and Hamfest at the Osborne Hotel, Auburn, N. Y., on Saturday, November 6th. Registration, 5 P.M.; Banquet, 6:30 P.M. sharp. The committee is working on what it hopes will be something new and original in the hamfest line. Program will include speakers, an auction of ham gear, contests and some real entertainment. Entire cost including food and all—$1.50. In keeping with the custom of the Society the affair will be strictly stag. Make reservations with the chairman, W8BDV, 39 Mattie St., Auburn, N. Y.
How's DX?

How:

With the whole world organizing and reorganizing, it's not surprising that the DX boys have eventually come around to a little combination of their own. At least that's what it will amount to, if the plan evolved at the Hudson Division Convention works out. Yes, there have, of course, been dumfounding up-on-from time to time by the local lads who get hold of a choice station and then pass him around until everyone but you has added him to the list. Legitimate stuff, of course, and nice cooperation, but not exactly open competition, which is what DX should be. Well, the boys down at the Hudson affair had a real swell DX rag-chew, led by W2IOP, and one of the suggestions that came out of it was that some station act as a general clearing house for DX information.

The plan would work like this: As a member of the group, you have on file with the central office a number of self-addressed penny post cards. When you, or another member of the group, hear a rare piece of DX you whip a card into the central office with all the pertinent dope—call, frequency, time, and tone—and the central office immediately mails out this dope on the cards that are filed with him. You then have a crack at the DX the next night or so, depending on how long it takes you to get the card and warm up the rig. No guarantee that you'll work him of course, but a nice way to know what's going on. Like most things in ham radio, its success will depend upon the full cooperation of the whole group.

Far from being in the nebulous stage, it has been arranged for W3JXH, Harry Whiting, 125 East 74 Street, New York City, to act as the central office. There's the arrangement. It will work with your cooperation. And don't worry about some of the nice cooperation, but not exactly open competition, that W3JXH thinks that the time is ripe for some of the DX stations to get together and work the same. It seems to specialize in working the screwkoo calls, says that you have on file with the central office a number of self-addressed penny post cards. When you, or another member of the group, hear a rare piece of DX, you whip a card into the central office with all the pertinent dope—the call, frequency, time, and tone—and the central office immediately mails out this dope on the cards that are filed with him. You then have a crack at the DX the next night or so, depending on how long it takes you to get the card and warm up the rig. No guarantee that you'll work him of course, but a nice way to know what's going on. Like most things in ham radio, its success will depend upon the full cooperation of the whole group.

Where:

Because few stations have been active in Greenland, it has long been on the hard-to-get list. However, the Mac-Gregor Expedition, now stationed near Etah, is responsible for OX2QY (14,375 kc., T9) being on the air, and a mad scramble has been apparent on the band with everyone lining up to work him. Gerry Sayre, W2QY, is the operator, and the signal gets down here beautifully via a rhombic and 100 watts to a 6L6 oscillator, has been heard (on both c.w. and W6GPB on c.w., both report good DX coming through, including LU, OA, HK, VK, ZL, and many Europeans. W6NLZ thinks that the time is ripe for some of the Asians to get together and work the same. It seems to specialize in working the screwkoo calls, says that you have on file with the central office a number of self-addressed penny post cards. When you, or another member of the group, hear a rare piece of DX, you whip a card into the central office with all the pertinent dope—the call, frequency, time, and tone—and the central office immediately mails out this dope on the cards that are filed with him. You then have a crack at the DX the next night or so, depending on how long it takes you to get the card and warm up the rig. No guarantee that you'll work him of course, but a nice way to know what's going on. Like most things in ham radio, its success will depend upon the full cooperation of the whole group.

Anytime we can give one of the QRP gang a plug we like to do it. Q8DB for example, goes merrily along with 1 watt input (100 volts at 10 milliamps). He works and the pond pretty well, according to W2IEN. For a new country on 'phone, try HIC1JB (14,120 or 14,435 kc.). W6FF reports him.

Who:

Anytime we can give one of the QRP gang a plug we like to do it. Q8DB for example, goes merrily along with 1 watt input (100 volts at 10 milliamps). He works and the pond pretty well, according to W2IEN. For a new country on 'phone, try HIC1JB (14,120 or 14,435 kc.). W6FF reports him.

When:

The 28-Mc. band is back, and although signals haven't yet reached their peak, the band has some choice boys worthy of your consideration. The nicest one we've heard of is OQ8A (28,050 kc., T6), worked by W2DTB and the rest of the gang around noon, E.S.T. W2IXY, on 'phone and W6GPB on c.w., both report good DX coming through, including LU, OA, HK, VK, ZL, and many Europeans. W6NLZ thinks that the time is ripe for some of the DX stations to get together and work the same. It seems to specialize in working the screwkoo calls, says that you have on file with the central office a number of self-addressed penny post cards. When you, or another member of the group, hear a rare piece of DX, you whip a card into the central office with all the pertinent dope—the call, frequency, time, and tone—and the central office immediately mails out this dope on the cards that are filed with him. You then have a crack at the DX the next night or so, depending on how long it takes you to get the card and warm up the rig. No guarantee that you'll work him of course, but a nice way to know what's going on. Like most things in ham radio, its success will depend upon the full cooperation of the whole group.

Anytime we can give one of the QRP gang a plug we like to do it. Q8DB for example, goes merrily along with 1 watt input (100 volts at 10 milliamps). He works and the pond pretty well, according to W2IEN. For a new country on 'phone, try HIC1JB (14,120 or 14,435 kc.). W6FF reports him.
THE 28-MC. RIG OF VU2CQ, BOMBAY, INDIA

Well known on 14 Mc., VU2CQ is now on 28 Mc., and may give many their first chance at a ten-meter WAC. The rig uses p.p. 800's in the final.

months, during which time he has worked 101 countries. Some of us hear at HQ have been thinking of passing a law against him—he took HS1BJ away the other morning. But on a countries per watt basis, we think that’s a pretty sweet piece of work. . . . W6IES says that V01Y (14,040 kc.) would like to work a few more W6's and that PK4AK (14,110 kc.) is now the only PK4 on the band. 4K0 having gone to Europe for a time. . . . W2IXY has the toughest luck. The electric light company put in a new pole and rather than bother to cut away the old pole they left it in her back yard. So now she’s the owner of a 40-foot cedar pole which will no doubt be cut up for firewood. Oh, yeah?

The first returns from this year’s JDJC indicate that W9TB will be winner for the U. S., with W3GVX second. W9TB was high W last year, you know. And 1X3BXX had about 500 QSO’s to make him high German station. . . . From several sources we hear rumors of a “YU” DX contest now going on. Having received no official word, we can only suggest that you send in your scores, via the QSL Bureau for Jugoslavia. . . . W1ZB has been doing nicely on his sked with WCEPT, now over near Singapore, but also finds time to work XUSAZ (14,240 kc.), HZSNJ (14,420 kc.), and XU63 (14,420 kc.) . . . . W2IOF says he got a QSL from AC4YN, but gives no dope as to whether it was the first QSO, or his frequency.

WAC:

Latest 'phone WAC's are to W1AIAK (28 Mc.), YV5AK, W7DNF, G5CY, V82AG, G5VM, PA9LDS, W5FAM, V89HC, W4C0Q, W4DIRD, W8CHC and C6CGL, secretary of the R.S.G.B.

—W1FE

Father Hubbard Arctic Expedition

Amateur station K7GJ started operation the first of October on King Island, Alaska, for the Father Hubbard Arctic Expedition. K7GJ operates daily between 2:30 and 10:00 P.M. P.S.T. Schedules with west coast amateur stations are desired, also cooperation in handling traffic and schedules. Special expedition QSL cards will be sent to stations worked. Frequencies used: 1885, 1905 and 28,700 kw., c.w. and voices; 3650, 7205, 7175 and 14,350 kw., c.w. Please report for K7GJ and report work with this and other expeditions to A.R.R.L.

The Schooner General A. W. Greely, W4WG, of the MacGregor Arctic Expedition, may be heard daily on schedule with WCC giving position reports, traffic, etc., W4WG on 15,580 kc., WCC on 16,800 kc., at 11:00 A.M. E.S.T.-

Members of the Amateur Transmitters’ Association of Western Pa., and the Mon-Yough Amateur’s Transmitting Association maintained communications at the Sun-Telegraph’s outboard motorboat regatta in North Park, Pittsburgh, on August 28th—29th, keeping officers informed on developments in the judges’ stand, at the pits, in the police boat, and at the far end of the course. W8OP0, W8ONW, W8PTY, W8QC and W8NDP, alternating at the controls of the 56-Mc. ‘phone installation at the judges’ stand, flashed the official results of each heat to WSCUG and W8UK located at the police boat. The information was then relayed by telephone (also installed by the amateurs) to the two pits for the guidance of the pit masters and inspectors and the edification of the drivers. An installation on the police patrol boat manned by W8BBO enabled the officials at the judges’ stand to direct the movements of the boat in picking up overturned or stalled boats and transporting officials and notables from the clubhouse or pits to the stand. At the far end of the course a portable 56-Mc. outfit operated by W8AMP did duty in notifying the judges’ stand of spills and stalls. W8OLW supervised and directed installation and operation of the system.-

The papers said that Father Comet could be seen with a good pair of glasses. So armed with a good glass a ham gazed skyward and beheld the Comet in all its glory. It seemed large enough to see with the naked eye. He tried it and found that he had gazed rapturously at the long white insulator in his antenna reflecting street lights.

—W8SG

General Traffic Period

For moving traffic without schedules we recommend the period 6:30 to 8:00 p.m. (your local time). Use this period to move your traffic through reliable stations. Operators who sign “ORS,” “TIS,” or “RM” after their call are keenly interested in traffic and are sure to be reliable. The use of directional CQ’s will be enforced during this period. Include the hour. Also watch for stations calling “1Q Tis,” which indicates that they are looking for radiograms to handle. USE THE TRAFFIC HOUR—6:30—8:00 P.M.

The Sacramento Valley Amateur Radio Club was fortunate in securing space for an exhibit at the California State Fair, September 3rd—12th. W9QT-6 was operated on 3.5 and 7-Mc. c.w. and 1.75-Mc. ‘phone. Equipment of various local amateurs and old-time spark equipment loaned by the Western College of Radio of San Francisco went into the making of a very attractive exhibit, which drew hundreds to the booth daily. Message blanks were furnished through the courtesy of the Sacramento Chamber of Commerce; 391 messages were handled. Amateurs on duty at W9QT-6 were W6AYZ, BVK, ESZ, EWB, GZY, IBH, IMJ, KME, KQQ, NRZ, N5L, MGC, OLB, W7EN-6 and W6KLL. The State Fair presented the club with an exhibitor’s plaque in recognition of the exhibit. The S.V.A.R.C. extends thanks to all who cooperated in handling traffic.
The following are new members of the A.R.R.L. 20-Year Club: W1AYB W1BB W2EMY W2HTU W2IP W3GHL W3WS/AAJ W5CVQ W6EA W9EIX K6ONM W9AB W9DQM W9RSA W9ZJ. Membership in this club is open to any amateur who held a license 20-or-more years ago and holds a call today. If you can qualify as one of the real "old timers," send in a brief chronology of your ham career, particularly the date you started in amateur radio, dates of your license, license number, and any other information held during the years and the call you hold today. The write-ups submitted will be used from month to month as space permits.

Rudolph W. Ackerman, W2EMY: "Learned Morse Code in 1904. Set up auto coherer outfit in 1909 with no results except interference to QRM. Heard first real signals from ships with electrolytic detector antennas and phones in 1911. Copied press from the New York Herald Wireless station at the Battery, New York, in 1911 sent in Morse and received first real signals except microphonic QRM. Heard first real signals in 1911. Copied press from the Still hold. 1918 to 1930 in Minneapolis and from 1930 to date in Continental. Used Electro Importing Company catalog as a bible and registered my first call RWA with E. I. Co. in 1911. Set up my first transmitter in 1912 using E. I. Co. 100-mile spark coils and electrolytic interrupter with best DX out of the back yard. First Government license 2AMA issued in 1915. Discontinued the beginning of the World War. Second license issued in 1920 was 2BJO, which expired in 1926. Third license W2EMV—1926 to 1932. My call has been WA and Call VV bands."

Ivan H. Anderson, W2DSM: "First call 1A in 1912 at Minneapolis, Minn., then 9HZ until the War. After War was assigned 9DGW and then W2DQM, which I still hold. 1918 to 1930 in Minneapolis and from 1930 to date at Anchorage, Alaska. Have held Commercial tickets since 1911. W2ANW, W2ANJ W2APW, etc."

E. A. Beasley, W9FRC: "GDJ issued in 1914—spark coil, DX 30 miles on batteries collected from garages. Then Packard ½ kw., Rotary gap, Murdock condensers, E. I. Co. osc. trans., 2-wire flat-top ant. Station closed during War while opr. was radiating in A.F.E. Opened up as soon as possible with 9RQ, then NU6ECU and W9FRC since the War. Operation has been on 200, 40, 80, 20 and 10 meters. First transmitter was a Tesla type. Used two salsa sockets in transmitter containing whole transmitter in 1928."

Bernard J. Biscotti, W3FLH: " Held calls 3PT in 1915—3APE in 1920. Would like to know how many, if any, of my former buddies of the 321st and 102nd Field Signal Bns. of the late War hold ham tickets."

Howard Blower, W2AX: "First on the air about 1913 with the call HB. Later got license and call 2AX—original license number 24, which I have held since it was issued. After the War was assigned same call. Have been active ever since. Present transmitter Collins 50 watts input and ACR-135 receiver. Mostly on 14-Mc. band. CW. Have been member of A.R.R.L. since early 1920s."

Thomas W. Bridwood, W3HGL: "Started with a spark coil and single slide tuner, plus a carbonudoe detector in 1912 at Angelse, N. J. used the call letters '2Z'—later used a larger spark coil on 110 volts with electrolytic interrupter (this caused all the lights in town to blink). 1913 obtained license and call 2IY... operated on second class license and in 1914 received first class... graduated to loose coupler and 14-kw. Thordarson with rotary gap and got out 900 miles... operated station until closed down with entrance of U. S. in World War... resumed operating after War under call 3B, in meantime had obtained Commercial License in 1918 and became ship operator... operated 3BA between trips and then finally got away from ham radio... kept in touch through QST and in 1938 returned to hams and hopped with call W3GHL, which I now operate when I get home between trips. Was pre-war member of A.R.R.L."

A. L. Budding, WIJFN: "First receiver in the winter of 1911-12; first transmitter, a Ford spark coil. In 1912 I called W4 in Washington, D. C.; took number two exam in 1917 and got the operator ticket, but missed a station call to go with it by a few days, account of the War; after the War, receiver experimentation, and a joint station with 'Stu' Seaton in Washington, call now forgotten; then 1A8W in 1924; 1BUD almost exclusively."

Ottis M. Davis, W5CVQ: "Bought first spark transmitter using Ford spark coil, and operated the transmitter with self-assigned call OD. This transmitter and also several subsequent spark transmitters were used at Hyde Park, N. Y. During 1913 received my first license with call 5DJ. First 'phone' was a Spark transmitter using an Acme transformer, Murdock condensers, Murdock quenched gap, rotary gap, r.f. hot wire ammeter, edgewound oscillation transformer, aerial change-over switch with third blade on transmitting side arranged to start rotary gap and close 110 a.c. circuit to key and primary. The aerial was used as an eight-wire flat top of the T type. Aluminum aerial wire was used, and spindlers were made of bamboo. This transmitter was used until the end of 1915 when license was renewed, mostly due to the unsatisfactory experiences which I had when I tried C.W. The first vacuum tube I used for receiving was a DeForest Audion which was arranged with two filaments, one for receiving and the other for driving a crystal detector. During 1934 I built a short-wave receiver, and the bug got me again after listening to ham stations a few evenings. Without much delay I took the Class B exam and was assigned my present call W2JHT. The present rig operates with an input of 450 watts C.W. and 250 watts 'phone."

R. N. Eubank, WIWS (WIAAJ): "Remember when Navy man came around to put seal on rig, which was under call ACBZ using 2-inch 'Bull Dog' spark coil purchased from Wm. B. Duck catalog. Family would let no lead come to house so had rig in wood shed, using crystals; detector made by Tierney, with Murdock (hair puller) 'phones. Six blocks was DX.' Geo. W. Ewing, W2DFB: "Interested in receiving in 1913, '14 and '15. VA in 1915—call QW, then 9EH. Later got call W9FQ and the call W2HTU. The pre-war call received was a DeForest Audion which was arranged with two filaments, one for receiving and the other for driving a crystal detector. During 1934 I built a short-wave receiver, and the bug got me again after listening to ham stations a few evenings. Without much delay I took the Class B exam and was assigned my present call W2JHT. The present rig operates with an input of 450 watts C.W. and 250 watts 'phone."

W. J. Halligan, W9WZE: "Started in the amateur game prior to 1914—with no other amateur anywhere around—so the work and study was my own. First call W3FT in 1915—call 9RQ, then NU9ECU and W9FRC since the War."

Stephen A. Griffin, WDDGM: "Got my operator license, Feb. 16, 1917, and the call W2ING for my Amateur License. Joined the Army and became a W2IP. At present most operating is on 14 and 28-Mc. 'phone and C.W., and 5-Mc. 'phone."

Thos. W. Braidwood, W3GHL: "Received my first class license and graduated to loose coupler and single slide tuner, plus a carbonudoe detector in 1912 at Angelsea, N. J. The first call used was 3CEB using 2-inch 'Bull Dog' spark coil and photo-plate condenser and hefu::. 'The first call used was 3CEB using 2-inch 'Bull Dog' spark coil and photo-plate condenser and helix. The first call used was 9G. Started in Portland, Me. Continued with crystal receivers and spark rigs; first license and call of FX received in 1915. Closed up in 1917 on account of the War. After the War was over college took care of four years. In 1926 back in the game with call lAHY, which is the one held at the present time. Also held 1FVY when portable calls were needed."

W. J. Halligan, W9WZE: "I became interested in wireless around 1916, getting my ham ticket around January or February of 1916 to call W26. Lived at Westfield, Mass., and held call W26EM. The first War came around 1918 and I had the call 1AHY. I continued until the War, serving in the Naval Reserve, and after the War I had the call 1UL. After the War, around 1923 or 1924, I served as New England Division Publicity Manager for the League, and kept about 10 watts of C.W., working in my kitchen for a couple of years. I have now been operating in the first District."

Joseph C. Hamilton, W8IZ: "Started in 1911 at Port Chester, N. Y. Spark received 1912 for QST for 54
Howard F. McIntosh, K80NM:

"My first ticket, 1916, SDD. Have held the following licenses: 5DD 1916, 5ABK 1920, 1CTZ 1921–22, 5BN 1923, 5WNH 1931–32. Present call—WSCVQ."

... H. B. Miller, W6AB and Vern S. Gouker, W6DM:

"We started in together, and still chew the fat together when we can get away from the XYL's and second ops. for a few minutes. Started QSO's a few years back. Graduated in 1914 and spent time down for War period and served in Army as radio op. overseas and at Fort Hancock, N. J., radio station WUB. Away from amateur radio after War for 5 yrs. Held Commercial ticket 1925. Back in the game again 1925 with call 2BH. Have held the following calls: 2BH 1925, 2RH 1926, 2BR and 3RH. Started with 1/4-inch spark coil and double slide tuner with silicon detector, operating under call of 5IY. Secured license in fall of 1914 and operated under call of 5IY. Installed 4-inch spark coil, glass plate condenser and helix in 1915 which has been operating a 1-kw. transmitter with good DX conditions. My next venture started in November 1936, at Cheyenne, Wyo., under the call of W7GCO, and I am still going strong. I am now using a 6L6 tri-tet, driving a pair of 6L6's in parallel, and a receiver with two-slide tuner, etc. Followed by a long time to come. What's a little QRM when there're continents to span."

... Gordon W9AB and David Harrell, Jr., WSZS:

"I started in together, and still chew the fat together when we can get away from the XYL's and second ops. I started amateur wireless in fall of 1908 with iron pyrites and a receiver with two-slide tuner, etc. Followed by a long time to come. What's a little QRM when there're continents to span."

... John H. Stenger, Jr., WS2Z:

"Wound the first call in 1910, Used a spark coil and SQG as call letters. The first
license that I can locate in my files is dated 1914 and call is 8NR. In 1915 I was granted 8ZS with 2500 watt spark outfit. In 1917 I enlisted in the U. S. Navy and went aboard the U. S. Mail Ship St. Louis to England. Attached to the Royal Navy Air Service I considered training there and then to the Destroyer U. S. S. Aylton. When the Destroyer Shaw was rammed by the Quintana with a loss of 30 lives, I was sent to Portsmouth, England, to rebuild the radio outfit. Brought the Shaw back and joined the U. S. S. Showboat (replaced by the Lusitania) for the Trans-Atlantic Flight Unit of that operation year in Cuba. Aviation experimental. Then to NSS (Annapolis), then to N.A.A. (New York Harbor), then to Sandy Hook, N. J., where I rebuilt the radio station there. Came home in 1921 for a rest. On April 29, 1922, I was granted broadcast station W8ZS and renewed the W8ZS. While I rarely operate W8ZS, you will find one of the staff on 20 meters with a short wave transmitter; made up a crystal detector using silicon, a single slide tuning coil and a single telephone receiver, and the station would come on the air using the call ES. When the Colorado Wireless Association was organized in 1912 the members decided to add the letter C to their calls to indicate they were members, so my call for the next few years was CES. Improvements were made to my station from time to time and power increased. In 1914 I was using a 1-kw. rotary spark transmitter and a single Audiotron detector in the receiver, nearly every piece of equipment being home-made. In August 1914 ES was given a W8ZS which I had used on the amateur waves before the War, and this was renewed for two years after the War and then I dropped out of the game for a few years. In September 1920 I was assigned 8ZSA, later W8ZSA which I held at the present time. While in the Signal Corps of the Army during the War as radio operator and have virtually grown up with amateur radio right here in Denver . . . . .

Jack Taft, W6IT: "In 1909 at Woodburn, Oregon, I built a crystal detector from an article in a dime how to build it", by Paul M. Janke (?). This consisted of two sharpened carbon blocks nailed to a piece of wood, across which a darning needle was placed. The plate of an old Jess opp. 56 motor was connected to the carbon blocks, the aerial being connected to one side and the ground to the other. I listened patiently for hours without end, but could hear nothing in the way of wireless signals even after connecting 25 of 30 worn-out auto ignitor cells in series, so my greatest distance with the Packard was dropped for a few months until I moved to Salem, Oregon, where I became acquainted with Adair Lockwood signing ES. I graduated to 80 May and June

1937-38 1.75-Mc. DX Tests

By S. S. Perry, W1BB

For all amateurs interested in working DX on 160 meters, the 1.75-Mc. tests which have been conducted for the past five years will be repeated this year under a slightly different schedule. Two tests will be held each week-end during December 1937 and January 1938.

First Test—each Saturday morning, 0:400-0:600 G.T. (11:30 p.m., Friday to 2:30 a.m., Saturday, E.S.T.); divided into ten-minute transmitting and receiving periods, as follows:

(a) All W /VE stations call "CQ DX" (signing call frequently), starting at 0:400 G.T., stopping at 0:410. Listen for DX and W /VE stations.
(b) All "DX" stations (other than W /VE) will listen during W /VE transmitting periods, and transmit "DX" (signing call frequently) during W /VE listening periods, i.e., listen 0:410-0:440 G.T.; transmit 0:440-0:450, etc., repeating this same schedule sequence each hour until 0:570 G.T.
(c) All "DX" stations (other than W /VE) will listen during W /VE transmitting periods, and transmit "DX" (signing call frequently) during W /VE listening periods, i.e., listen 0:410-0:440 G.T.; transmit 0:440-0:450, etc., repeating the schedule sequence each hour until 0:570 G.T.
(d) DX and W (or VE) stations may work each other, instead of calling "CQ DX" or "Test DX" during their proper transmitting periods, provided no local sending occurs in a local listening period. Be sure to catch clock accurately Friday evening before the tests and adhere carefully to the schedules above!

Second Test—each Sunday morning, 0:400-0:730 G.T. (11:30 p.m., Saturday to 2:30 a.m., Sunday, E.S.T.).

This will be a "free for all" period, with each station calling and work DX as one chooses without the fixed ten-minute schedules of the previous night. Stations that "contacted" on Saturday can, of course, make schedules to "work" each other on Sunday.

W /VE stations should remember the suggestion issued each year with the "International DX Contest" to the effect that the way to work more DX is to listen for DX and then call the specific DX station heard. Don't CQ DX in the Second Period. In this way local QRM will be kept at a minimum and on the whole much better results will be obtained.

DX and W stations are advised that the best period of the band to be heard and worked by W /VE stations is between 1725 and 1775 kc. However, 1715-1800 kc. will be scanned carefully by W /VE C.W. listeners. Previously, participants in these tests have used 100 C.W. Phone amateurs are also welcome and should work on exactly the same schedule as announced above.

At the conclusion of the test, please make a summary of the data heard and DX worked and forward to W1BB, who will prepare a composite report to be published in QST. Any unusual condition observed or results obtained should be noted and reported. Comments, suggestions, criticism of the tests and advice as to whether or not they are desired again for the next year are also requested.
Hamfesters Hold Huge Picnic

Sixteen hundred hams and their friends gathered together August 8, 1937, at Justice Park Gardens, just southwest of Chicago, for one of the biggest hamfests ever staged in those parts. The Hamfesters Radio Club, Inc., was the host and lived up to its name (Hamfesters) in grand style. Activity started with the traditional ball game at 11 A.M., and at 10 o'clock the program got under way in earnest. Among the various events was an amateur show divided into two parts, one for the youngsters and one for the oldsters. Numerous games were designed to hold out the interest of the participants while the entertainment was staged. The pie-eating contest was a classic. W9OTY displayed unsurpassed technique in this, and was his face "blue." The grand prize, an RME-69, was won by A. Hallik, strooper at the shack of W8SLB. W6SLB won the RME-69 at the Central Div. Conv. Second prize, a Sky Buddy receiver, was won by W9RGO. Other grand prizes were an Electro-Voice mike and a 15-inch self-starting electric clock, won by W9MJQ and W8WQY respectively. Among those present were W9TSF, Asst. Director, Central Division, A.R.R.L.; W9KJY, S.C.M. Illinois; and that genial pair of Al's, Cox and Knodell, W9UAQ and W9TLQ, business manager and editor of Harmonics. After dancing to a nine-piece orchestra until late evening, the last of the tired but happy throng left for home. It was a great day and everyone is looking forward to the Hamfesters' Fifth Annual Picnic, August 7, 1938.

Amateur radio assisted the English Public Schools Exploration Society (G5XY) during its visit to Newfoundland when a member of the party met with an accident. VO3X heard G8XY calling "CQ VO Urgent." Making contact he was advised that a student had fallen over a cliff, that they could not reach him and help was needed. There was no means of communication other than amateur radio. VO3X took a message for the Game Warden at Trout River asking him to come at once and put it on the G.P.O. lines. The Warden arrived at the scene of the accident and, although the student met his death in the fall, amateur radio did its part in summoning aid. VO4Y also participated in the work, keeping in daily touch with G5XY and finally making funeral arrangements.

Chess by Radio

A series of chess games by radio was inaugurated on July 14th between Washington, D.C., and Arlington, Va. The purpose of the series is to develop a procedure and methods which will insure the successful and peaceful playing of games by radio this fall when players in and near Washington will engage in games with players located in Boston, New York, Philadelphia and elsewhere.

Four players met at W5CAB (3570 kc.), Washington, D.C., and four players at W8EEN (3790 kc.), Arlington, Va. Two games were played, which allowed two players in consultation playing each side in each game. The results were highly satisfactory. In the past, chess matches have been played by radio but in many cases they dragged, difficulties arose and interest did not continue. The present tryouts, in which a careful study will be made of the environment of the games, it is believed will lead to methods and handling which will result in continued success of chess via radio and the sustained interest of all participants. By early October it is expected that regular matches between clubs and players in distant cities can be reliably scheduled and carried out on a fully tested basis.

---W5CAB---

The Monterey Peninsula Radio Club participated in the open house festivities at Pacific Grove, Calif. A lighted boat parade was staged from Monterey to Pacific Grove. The boats were all beautifully decorated and lighted. There were also fireworks from some of the boats. On board the Abacoos, which is the Fish and Game Commission boat, W6COO operated a receiver to determine the location of various officials of the affair described what was going on. W6NSTU operated a receiver at the Pacific Grove pier. The received signals were amplified by a P.A. system so that the immense audience could hear everything from the boat.

---W6IV---

November, 1937

57
Alberta Hamfest

The Northern Alberta Radio Club Hamfest held at Edmonton, July 10th and 11th was favored with one of the largest registrations ever recorded in Alberta. A good number of Saskatchewan fellows put in an appearance as well as a quite general representation from all of Alberta—although there was an almost complete absence of Calgary hams, with only one who was holidaying in the district putting in an appearance. The program got under way with the technical session held at the University of Alberta. Lectures by Dr. Cornish of the University faculty and Roy Usher, VE3EA, were well received, as well as a humorous lecture by VE4HT. A demonstration of radio and electrical equipment and a visit to the Electrical Engineering Dept. of the University concluded the session.

The banquet was attended by 85. The evening program included a talk by Cyril Waites, Vice-President of the Astronomical Dept. of the University, a demonstration and lecture on "Splitting of the Atom," by local hams, Prevaricators' Club yarns; and the highlight of the evening, an enlightening demonstration and lecture on "Ham History as one of the finest amateur radio plays queer tricks—like sending a message 5000 miles to cover a distance of 80 miles (and the case we're referring to isn't one of "rotten relaying" either!). K4EEO was QSO LJ0BV on 28-Mc. 'phone. After a little rag-chew, the K4 remarked that he'd like to contact another LU. So LJ0BV called K4EEO, who came back to say that he had a message for K4EEO. Hearing what was going on, K4EEO advised LJ0BV that he had a message for K4EJG. LJ0BV relayed it via LJ0BV, and K4EEO sent an answer back via the same route. Although K4EEO and K4EJG didn't hear each other, they were able to exchange messages "via 5000 miles," which proves there is more than one way to kill a cat, or something!

Amateur radio plays queer tricks—like sending a message 5000 miles to cover a distance of 80 miles (and the case we're referring to isn't one of "rotten relaying" either!). K4EEO was QSO LJ0BV on 28-Mc. 'phone. After a little rag-chew, the K4 remarked that he'd like to contact another LU. So LJ0BV called K4EEO, who came back to say that he had a message for K4EEO. Hearing what was going on, K4EEO advised LJ0BV that he had a message for K4EJG. LJ0BV relayed it via LJ0BV, and K4EEO sent an answer back via the same route. Although K4EEO and K4EJG didn't hear each other, they were able to exchange messages "via 5000 miles," which proves there is more than one way to kill a cat, or something!

On a recent schedule K5AA and W4PL each had one message to transmit. After receiving W4PL's message, W5DJ, who was transmitting his own, it was suddenly apparent to K5AA that both messages were of the same Check, and that while one originated in Rochester, N. Y., the other was destined for the same city!

Station Activities
See Pages 100, 101, 104, 105

"Five-Meter Expedition" between August 16th-21st; results are not given in detail. "Ultra High Frequency News" is a bulletin published by W3AUY, W4EO and W3DJ, all of Philadelphia. It is chock-full of data of interest to 56-Mc. enthusiasts, particularly those in and around Philadelphia. All "five meter" men within normal range of Philadelphia will find it worth investigating. On the eventful night of Sept. 10th, W3AUY worked W2HEF, W2TVK, W1AVV and W2CHV; he heard a score of W2's and several W1's.

When Case Company dealers of the San Joaquin Valley went to a meeting in Racine, Wis., they were kept in constant contact with home through W6NHF, installed on the special train which transported the party.

The "service message" is a useful implement in improving amateur message handling. The service message may be used to test various routes. It may refer to non-deliveries, to delayed transmission, errors, or to any phase of traffic work. Should a message you originate receive poor service and you are interested to know why it happened to it, start a service message along the original route making inquiry. Rather than condemn everybody concerned, make an actual check-up and find out what really happened and where to place the blame.

56-Mc. Notes

Scattering reports of good DX work on 56 Mc. during August and September, when conditions were excellent on that band, continue to come in. W1DJU, Warren, Maine, heard W9CLH, Elgin, Ill., several times on the evening of August 9th, strength 7-8. W3CKAY, Akron, reports receiving W9CLH between 7 and 9 p.m., Sept. 6. W3DQI, Philadelphia, reports the band open the night of September 10th, with first and second district stations coming through 55 to 88. W3AC, portable at High Point Park, N. J., came through 87 while using 18 watts input to 112's. WIBCR, Providence, R. I., was heard 87-8. On Sept. 6 at 2:00 p.m., while on the Skyline Blvd., about 25 miles south of San Francisco, at an elevation of 2300 feet, W6JOP worked W6IDF (Los Angeles), an airline distance of about 550 miles. W6JOP was using two 42's in transmitter, portable-mobile rig, about 3 watts into an ordinary fish-pole antenna. Not at all bad! W81PD sends a photo of his installation at W81PD-1, Mt. Washington, N. H., where he and VE8AF conducted a
Little White (?) Lies

151 Tiffany Place, Irvington, N. J. Editor, QST:

... I have always been strict in giving reports—indeed, I have sometimes been accused of being a crank because of the strictness with which I gave my tone reports. On the other hand, there were probably many times when I was careless in giving reports. But when I read this letter (QST, March, 1937, "I Cannot tell a Lie," by W9RSE) I resolved to paste a copy of the RST system on the front of my call book and use it before giving a single report. ... Now let me tell you what happened as a result of my resolution.

One evening W1— came back to my CQ and after carefully consulting the RST scale I gave him a tone report of T4. W1— came back, indignantly demanding the meaning of the T4 report. "Why," he said, "I've been working boys right along who gave T5 and T9. There must be something wrong with your receiver."

Just to make sure my receiver was O.K., I tuned around the band and heard some T9x notes—you know the kind, clear, pure ringing tones—then I tuned back to W1—'s frequency and heard his sig with a pronounced ripple. Let me say that my receiver pack is well filtered and by-passed for tunable hums, etc., so that the chances for a.c. at my end were very slim indeed. And not only that, there were plenty of other sigs which were T9 in my opinion. But to continue, I went back to W1 and smoothed things over as much as possible, saying the trouble might well be with me, but that for his benefit I suggested that he check his rig over. Finally W1— proposed that I stand by and listen to the report he got in answer to his CQ. And here is the pay-off—some other W1 came back and reported him 599x! Well, W1— told his contact that he was talking to W2FXV who reported a T4 but, since the report was really T9, everything was FB. How do you like that?

I suppose this is just another case of human nature and hams being human will listen to what they really want to hear, not what is actually the truth! I don't know what can be done about this situation and I can't suggest a cure, because, heaven only knows you have pleaded enough. If I am hardboiled and read 'em off the sheet I am sure to arouse resentment. On the other hand, I want my reports to mean something. Maybe what I should do is be strict and then apologize for it.

The only thing I can hope to accomplish by this letter besides letting off steam is to wake up some of the boys and hope they will get wise to themselves. So, gang, why not pull out March QST and read what W9RSE has to say—once, twice, three times if necessary. Make every report mean something and be honest when giving 'em out.

—Wm. Nastuk, W2FXV

Canadian QSL's

Box 705, Yarmouth, N. S. Editor, QST:

I wonder if you would drop a word of advice through your magazine to those hams sending QSL cards. Cards to Canada call for a two-cent stamp. If sent with a one-cent stamp we have to pay two cents before we even get a look at them. This doesn't make us any too keen about spending two more cents to send a return card.

—Clyde L. Robbins, VE1DW

Lightning Doesn't Need to Strike Twice

147 Canton Ave., Milton, Mass. Editor, QST:

Direct lightning strokes on amateur aerials are perhaps sufficiently unusual so that you would be interested in an experience I have just had along that line.

I have a Johnson "Q" ten-meter long-wire antenna which I use for receiving purposes. One end of the antenna is made fast to a chimney of the house; the other end is supported by a rope rove through a pulley made fast to a branch of a big elm with a counterweight on the other end of the rope.

Last Thursday, lightning struck the elm. The bolt struck in the uppermost branches, came down the tree to the limb (which is about forty feet off the ground) to which the antenna is made fast, and then jumped horizontally about ten feet to the antenna. The antenna, which is of No. 12 hard-drawn wire, was burned off at the strain insulator. As a matter of fact, there are two insulators in series, a cheap porcelain one and one of National's Isolantite 4" insulators. The former was pretty well shattered; the latter
shown no signs of grief except that there is a liberal deposit of copper burned into the glass at each end where the holes go through.

The bolt travelled the length of the antenna wire to the aluminum-tube matching transformer. At that point, it flared outward on one side to the other and came on both feeder wires. These were No. 14 wire covered with porcelain insulators. The feeders were protected by two glass broadcast-receiver-type lightning arrestors. Both of these flashed over, one of them sufficiently violently to crack the glass and burn off the paint inside for about a quarter of an inch. This discharge took most of the "nock" out of the bolt, but some of it came on into the house. I have four receiving antennas arranged with jacks into any one of which I can plug a receiver. The bottom jack connects to a long wire receiver on one leg and to ground on the other. This jack is six inches removed from the Johnson jack. These jacks flashed over heavily, indicating a voltage of at least 20,000 at this point. The flash reached some curtains, which were heavily charred but not actually set on fire. The ground wire from the aerial goes through the floor into the basement where it is tied to a 2/0 house lighting ground. The point of connection of the house fuse box was sufficiently "above ground" to burn out most of the fuses.

There were several interesting collateralis.

For example, the connection between the Johnson transformer and the antenna was made with tinned copper braid. These are very good but such a high r.f. resistance that the lightning jumped from wire to wire rather than follow the tortuous path involved in the bridging. I have always heard that braid has a high r.f. resistance and this experience certainly proved it. The second point that crossed my mind was the fierce heat involved at any point where an arc occurred. Witness the burning off of lightning arrestor prongs and the burning in two of No. 12 wire.

The third significant point is that a ground wire may be at zero potential for ordinary use, but when a bolt of lightning is trying to find its way home the voltage is far, far removed from ground, even a few feet from the low end.

Finally, I can now ponder on what would have happened if any instruments, such as receiving sets, had been connected to the antenna, or if there hadn't been lightning arrestors in good working order in the system. As it was, I missed a fire by the narrowest of margins.

You can get some idea of the currents that flowed on the house side of the arrestors when I tell you that two small meters hooked into various pieces of apparatus on my desk were wrecked although neither had any direct connection to the aerial. Further, the steel case of an oscilloscope, which was located about a foot from the ground wire, was sufficiently magnetized to give a permanent deflection to the beam of nearly an inch.

All in all, I have come out of the experience with a pretty wholesome respect for a bolt of lightning and a determination to be sure that things are "cut clear" when a thunder storm is in progress. . . .

Theodore Clark

W9 Calls


Editor, QST:

I'd like to see this query answered in QST.

After W9ZZZ is reached will the F.C.C. start licenses with W9AAAA?

—Raymond M. Bell, W9RFG

Editor's Note—No.

Fighting Galoots

Scottville, Mich.

Editor, QST:

I am a new ham. In fact I have only had my ticket about two months. I have worked several years to gain enough "wisdom" so I wouldn't be too much of a lid when I went on the air.

Before I got my ticket, the Handbook, the License Manual, and all the rest kept telling me what an unsatisfactory and swell bunch of fellows were in amateur radio. So, I got my license. Yes, I got my license—and what do I find? I find a mess of fighting galoots, some who do not appreciate the advantages of a kilowatt, some who think the low-powered fellow is under the sum of the crop, others who like nothing better than to yell about QRM, and so-called "rotten" sign.

Are we going to have 40,000 hams peacefully ragchewing or are we going to have this same number QRMMing our bands with fighting over who's who and what's what? I agree with W9RG: "It was hot before a lot of you were in and it is going to be here when you're making a feast for the worms."

—Forest J. Pinkerton, W9QYL

Plea for 1.7-Mc. DX

2 Highland Ct., Far Rockaway, L. I.

Editor, QST:

. . . It seems to me, if I can recall F.C.C. regulations correctly, there is from 1715 kc. to 1800 kc. a band with great possibilities but no activity. DX tests in past years have proved the possibilities of this band, but the lure of the higher frequencies has diverted the interest of many who may have operated here to the other bands. This leaves a nice empty space occupied only by a few Canadian 'phones. True, we cannot expect what we get on ten, twenty, or forty, as far as consistency in DX goes, but we can, by increasing the activity in the right direction, have some real enjoyable and novel contacts for this band.

Let me explain what I mean by "increasing activity in the right places." Due to the fact that it is possible to work from the east coast, consistently out to the middle west and as far as Florida, just after sunset, with a few good signals operating night after night scattered around the country anyone would obtain some pleasure out of operating this band. As it is now, you have to wait hours and sometimes days before there is much activity simply because everybody thinks nothing is coming through when actually there is no one operating. In other words, we need someone to make a start and this can be done type sending interest in the band.

Just let some of those fellows up in Newfoundland, Mexico, Cuba, the West Indies or Bermuda (if their local regulations permit) put some good equipment on the 1.75-Mc. band with suitable antennas and I'll wager that they will put swell signals in here. Don't forget that with the band in its present condition we do not have to contend with QRQ. Also, why not continue the DX tests that used to prove so interesting in years gone by? Let some of those European countries kick up interest and watch the way transatlantic reports will be exchanged as in days of old, . . .

—Marvin Kronenberg

A Professional Comment

P. O. Box 503, Drummondville, Que.

Editor, QST:

With reference to your editorial in the August number of QST, your second item regarding the transmission of the international code and the straightforward criticism you make regarding its awful mutilation by a large number of amateurs is very opportune and, if I may say so, much delayed.

Now why is it such conditions exist? How on earth do these men ever pass their code examination? The regulations must be very, very elastic and the examiners very lax and indifferent.

Admitted there are stations being handled in a very exemplary manner, but these are in the minority.

I have considered going "on the air" for some time, but when I listen to the awful telegraphy on the amateur bands I wonder if it is worth the time and expense.

Perhaps a little advice to those of you amateurs who (Continued on page 68)
There are two commonly used methods of matching the impedance of a transmission line to that of an antenna system: the concentrated transformer network and the quarter-wave section. The latter is most popular in amateur installations and is usually either a quarter-wave matching stub (in which the transmission line is tapped off some distance from one end) or a linear transformer, alias "Q-bar." Of the two, the Q-bar type seems to be the most favored by wide usage. It is an extremely effective and practical method, and kits of parts have long been available from practically all dealers.

Our own objection to the Q-bar system has been a mechanical one. Namely, that the coils of soft tubing and adjustable insulators supplied in the usual kit have been somewhat haywire. It is almost impossible to get the coiled tubing straight, and the feat is scarcely worth the trouble in any case since the tubing is not stiff enough to support its own weight and immediately kinks again. The adjustable insulators are likewise subject to involuntary adjustments.

For our use at W1HRX, we decided to design a rigid, non-adjustable assembly. This has proved so entirely satisfactory that arrangements have been made to sell the parts commercially. Thus does history repeat itself, for the original disk-type neutralizing condensers too were first built as a private folly at W1HRX, using disks left as scrap when socket holes were punched in aluminum chassis. These have been widely copied, even to the use of a socket-sized disk.

However, to get back to the Q-bar. The particular dimensions which we chose were designed to match 72 Ohms to 600 Ohms, or in other words they matched a center-fed half-wave antenna to a feeder using No. 12 B&S wire and 6-inch spreaders (such as National AA-3 spreaders). It obviously will not match other sizes of wire, etc., but in our experience it is a lot easier to buy No. 12 wire than it is to adjust an adjustable Q-bar.

Once a system of fixed dimensions is decided on, it becomes very easy to build a rugged assembly. Stiff, thin-walled, seamless duralumin tubing is made in exactly straight lengths up to fifty feet long, though for ease in shipping it usually is not handled in lengths more than fourteen feet long. Most radio dealers will carry some of this tubing in stock in the near future, together with fittings for splicing lengths of tubing end to end.

The spacers become the simple Isolantite blocks pictured above. They are simply slipped over the duralumin tube to the position desired. To hold them in place, a small hole is drilled through the tubing opposite the small hole in the Isolantite block and a screw is driven home, holding both together. Preferably this screw should be a 6 x 32 machine screw, which will require tapping the duralumin tube. A wood screw can be used however. Connections to the system can be conveniently made with ground clamps.

James Millen
YAXLEY

Push-Button Switches

We haven't said much about them but you will find Yaxley Push-Button Switches in almost every station. They are ideal for meter shunt service, as well as for set analyzers, tube checkers and other test equipment.

Mallory Push-Button Switches have numerous outstanding features, such as:

1. Accurate workmanship.
3. Coin silver contacts.
4. Heavy cadmium-plated frame.
5. Self-wiping contact action.
6. Hot tinned soldering lugs.

Available in both locking and non-locking types with a large variety of spring contact arrangements. See Yaxley Push-Button Switches at your distributor's.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS INDIANA
Cable Address—PELMALLO

(Continued from page 60)

"know" the code but cannot "handle" it will not come amiss.

In the many years that I have been reading QST, every polite "dig" has often been made at the commercials from the pens of your members, but if you chaps want to hear the code as it ought to be sent, listen to some of the commercials who take a pride in their sending. There are many "styles," but the delivery is good, sensible and readable. Readability is the first thing and speed the last.

A few minutes ago I heard two "bugs" going at it hammer and tongs, and I marvel at the ability of these two to understand each other. Of course there is a "kill" about every 4th word, but what do they care—look at the speed!

Now my suggestions are these. Forget the "bug" type of key for about five years; by that time you will have mastered the "straight" key. When I say "mastered" I mean mastered, not a mere burst at 20 w.p.m. for a couple of minutes but say, for an hour and with no erasures. Listen to a good commercial station. I don't mean auto stations, but honest to goodness key punchers such as PCH, GKT, BAL, GLD and to your own two splendid stations WCC and WSC. Time is dimming my memory as to others but these will suffice. Listen to their style and copy them. You will then be in a position to call yourselves Operators. You will say, "But they are commercials, we are amateurs." Don't let that worry you, for imitation is the highest form of flattery and the commercials don't mind you copying them.

I think amateur operating is the ideal hobby. It can be done from one's own fireside. It is instructive and entertaining. The urge to get back on the air is very strong, but until I feel that I am not going to get a headache trying to decipher what someone sends to me when I tell him to "shoot" and he goes and "squirts" or another hru, to be told in "Please repeat all the dashes have received only the dot," I think I will get more satisfaction by continuing to be just another observer.

—John K. Holland

"Our Hero's" Dilemma

Bradner, Ohio
Dere Eddy:

I yam settin br hitin mi fingernailos and wishing I dared say sompin I dont dare say on acct of the mikes open an I dont want FCC hopin over me fer brakin regulashuns. But I'm tellin ye sompin gotta be dun abt it. Jr wuz me a law abidin, peace lovin, brass pounder that wuz havin a FB time chasin the rag on 80 & 40 and liken it. Then all of a sudden a weezel pops outa the board pile and landed rit on my op table. It scared me so bad I passd out a minnut and wen I wok up I yad a new ham shak all deked out and rise wheer the majestik ole sidewipper used to set wuz a bran new xl milk, and it wondr of wondrs the ole either chopper had ben all turned inside out an rit ther in front of mi eya. I never will forgive the guy wot tore the codin out of the in and put this dude affair in its place. I'm gettin homeskik for itt believed dah dit dah dit anbrother U kin luk fer some mity Jonesum CQs in cw. Ther wuz all of a sudden a hev'nly 2543 S. Avers Ave., Chicago, Ill. P.S.—I wan you shud no 2 tt thos

Ham Silencer

2543 S. Avers Ave., Chicago, Ill.
Editor, QST:

Well, here it is September, 1937, the second anniversary since you published my article, "Hormones & Restriction," and the trend is still the same to the present day.

The hams are still crying about "High Power," "Flea" (Continued on page 116)
THEY'LL STAND THE OVERLOADS...

Because of the Proven Superiority of the IRC Cement Coating

A coating that withstands temperatures beyond 250° C... 

... A coating that stands up under all kinds of moisture and humidity—even salt water immersion...

... A coating applied to the resistor without the intense and oftentimes damaging heat which weakens the construction of old style wire wound resistors.

That is the story behind the famous IRC Transmitting Power Wire Wound Resistors with their exclusive IRC Cement Coating. That is why, throughout the world, you'll find them specified for those exacting jobs where there MUST be no failure.

Fixed and adjustable types for every requirement

INTERNATIONAL RESISTANCE COMPANY
401 NORTH BROAD STREET, PHILADELPHIA, PA.
Factories or Licensees in Canada, England, France, Germany, Italy, Denmark and Australia
MAKERS OF RESISTANCE UNITS OF MORE TYPES, IN MORE SHAPES, FOR MORE APPLICATIONS THAN ANY OTHER MANUFACTURER IN THE WORLD
TIME PAYMENTS! BIGGER VALUES! 4-HOUR SERVICE!

ORDER NOW
Easy terms on orders for parts, sets and tubes, $60.00 or more. We have all the new amateur sets as soon as released by manufacturers, on our convenient 6% Credit Plan. No matter what set you want, we can furnish it. All the standard makes in stock for immediate delivery. Before you buy, WRITE Us. You'll SAVE MONEY!

All Standard Sets and Parts Available on Time Payments. Buy Now...Pay Later!

SENSATIONAL VALUES
1938 "THORDARSONS"

PLATE TRANSFORMERS for Amateurs
Fully shielded — air cooled construction — tapped primaries — porcelain terminals.

DC DC, Net

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-16F07</td>
<td>$5.25</td>
</tr>
<tr>
<td>T-16F08</td>
<td>$6.00</td>
</tr>
<tr>
<td>T-16F09</td>
<td>$6.50</td>
</tr>
<tr>
<td>T-16F10</td>
<td>$7.50</td>
</tr>
<tr>
<td>T-16F11</td>
<td>$8.50</td>
</tr>
<tr>
<td>T-16F12</td>
<td>$9.50</td>
</tr>
</tbody>
</table>

FILAMENT TRANSFORMERS

CHOKES—Input

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-16C20</td>
<td>$7.50</td>
</tr>
<tr>
<td>T-16C21</td>
<td>$8.00</td>
</tr>
<tr>
<td>T-16C22</td>
<td>$8.50</td>
</tr>
</tbody>
</table>

SMOOTHING

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-16C23</td>
<td>$9.00</td>
</tr>
<tr>
<td>T-16C24</td>
<td>$9.50</td>
</tr>
</tbody>
</table>

NEWARK ELECTRIC COMPANY
226 W. MADISON ST. Dept. Q CHICAGO, ILL.

1938 Newark Catalog! Just off the Press. Hundreds of New Items! Bigger Values! Lower Prices! Write for your copy NOW!
A FEW months ago these two NATIONAL receivers were unknown. Today they are considered to be the CHAMPIONS of the field by amateur owners everywhere. Their many amazing new features plus stability of signal and ease of operation are the sterling qualities which caused NEWARK to take pride in being the first NATIONAL FRANCHISED dealer to offer these CHAMPION RECEIVERS at the sensational price of only $88.00. Or — $18.00 down — $12.68 a month for six months or $8.53 a month for nine months, or $6.44 a month for twelve months. (Complete with Tubes, Crystal Filter, 8" PM Speaker Chassis.)

Newark quick service and unexcelled time payment plan is known the world over. AVOID DELAY — Order these new receivers from NEWARK. Send for the free NEWARK PARTS CATALOG.

NEWARK ELECTRIC COMPANY
226 W. MADISON ST. Dept. Q
CHICAGO, ILL.
NOW THAT CONVENTIONS ARE OVER

AND WE ARE THROUGH WORRYING whether we’re one of those unfortunate who go home empty handed — or one of the “lucky” bunch who gets some prize we don’t need — let’s settle down and see whether we can get a little more out of our rig than the other fellow claimed he got. Of course this may require some new equipment and that hurts, but “Old Doc LEEDS” prices will sure ease the pain.

RAYTHEON BEAM Power Tubes
Less than two watts will drive them
RK-47, 100 watt output. Net $17.50
RK-48, 235 watt output. Net $27.50
Raytheon Improved Periodic RK-20A: No neutralization required, 0.9 watt excitation required; 80 watt class “C” power output. Net $15.00

CARDWELL CONDENSERS
Now with G.E. Mycalex as standard insulation on all type “T” — “X” and midway condensers
XG-110 KD. 110-110 mfd. 6000 v. for p.p. tanks $10.58
MT-150-GS midway 16-150 mfd. 3000 v. peak $3.53
NA-6 NS — H.P. neutralizer for low capacity tubes 4-6 mfd. $2.12
We carry a complete stock of CARDWELL condensers

LEEDS LD-5 CRYSTALS
Mounted in metal holder to fit standard 5 prong socket, cut to your specified frequency, at extra cost, in the 40-80 and 160 meter bands. Unconditionally guaranteed. Net $3.50

The New TAYLOR
T-355 low C — low impedance 400 watts
- $13.50

LEEDS CONDENSERS
Oil impregnated: Non Inductive: Hermetically sealed
4 mfd. 1000 v. Net $2.00 1 mfd. 3000 v. Net $2.50
Unconditionally guaranteed.

LEEDS TRANSFORMERS
ENTIRELY SHIELDED — HIGH VOLTAGE
150-1000-1500 each side C.T. at 300 ma. Net $6.75
2500-1500-2500 each side C.T. at 300 ma. Net $10.95
500-425 each side C.T. at 250 ma. 5 v. at 3 amp; 2.5 v. at 3 amp. $2.95
2.5 v. C.T. at 10 amps; 5000 v. insulation for 2-866 tubes $1.65

LEEDS SHIELDED CHOKES
to match the above transformers.
20 H. 200 MA 115 ohm $1.45 25 H. 200 MA 115 ohm $1.45
20 H. 300 MA 95 ohm 2.85 25 H. 300 MA 95 ohm $2.85
20 H. 400 MA 85 ohm 3.45 25 H. 400 MA 85 ohm $3.45
20 H. 550 MA 55 ohm 4.95 25 H. 550 MA 55 ohm $4.95

LEEDS
The Home of MIDDY
LEADS THE FIELD
World Wide Service to Amateurs
45 Vesey Street
New York City
Tel. COrtlandt 7-2612
Cable Address "RADLEEDS"

Adding Ideas to Ham Radio
P. O. Box 600, Madera, Calif.

Editor, QST:

I’m another guy who has been silent a long time and am now ready to say my piece. I don’t know but what I agree nearly 100% with W9RQS’s letter in September. QST. If any buger [rancher] like me has an opportunity to make non-ham acquaintances from all over the country, cattle buyers travel considerably and come here from many different states. A number of them have seen my shack. They all have complaints about our amateur stations. “What good are they?” “What are they talking about?” “How come the government doesn’t do something about it?” Those are the kind of questions they ask me about it.

Why should ham spend so much time in QSO’s where nothing is said but “Hello sir, with what call do you have?” or “Hei hi wI gess nm hr so 73”? What good does that do for anybody? When this is carried on on phone, what is the public going to think about us? As for the technical side, anyone can experiment with circuits and construction with dummy antennas and accomplish just as much as if they try experiments on the air. Electrical engineers are constantly doing research far beyond the average ham. When something is developed off the air, it could be tested and proven on the air while doing something useful such as handling traffic. I see no reason why a ham should have college education to get his license. Such things as a T report on your signal can be found by listening on a simple monitor. Why clutter the air up asking a fellow “QRR” and when he says “R5797x,” saying, “QRX while I see if I can improve my note,” followed by holding the key down and making QR with all the time you are resuming or testing your outfit. If your note isn’t 79, you should know it before you get on the air. A few of the operators try watching your monitor when using a dummy antenna. If it isn’t 79 you shouldn’t be on the air—it is against the law.

W9RQS’s letter exposured the asinine, silly activities of hams and we won’t list any more here. They are like a bunch of little kids playing in the mud, making mud pies. Their “RST 550 wr qrU” transmissions and their continual re-building, staying up all night, fusing with deep theory is costing them money, not helping anyone but manufacturers, and giving the public a bad opinion. Let them build their big rigs, B.S. Supers, etc. I’ve got a pair of 49’s in push-pull with 45 watts input and a 3-tube receiver of the t.r.f. type. My antenna is just a straight wire 133 feet long, 15 feet high, and runs through trees, power lines, telephones wire, and near buildings. With my station I have got 90 reports in Asia, Australia, Africa, and all over the American continent, have worked WAC on 40 meters and twice on 20, have kept skeds with KA, KG, K7 and handled traffic with them successfully over a long period of time, and I have only changed my rig once in over 5 years. Let them have their k.w. inputs and let them build their big masts and fuse with their transmitters.

I would like to see amateur radio work towards international peace, emergency relief, traffic handling, and world wide friendship—and they could do it, too. A few hams have done it now, but I have never been able to make friends with a DX station because they won’t talk about anything except QSL and QRU and theory. I haven’t been able to make many real friends in this country, because all they will talk about is RST, DX they worked, their xmr or rev, and QRU. Usually they want to QRT as soon as they are contacted.
Here is another outstanding development by Bliley—a mounted 40-meter crystal that is really superior. All time-worn ideas concerning crystal design were thrown aside in the design of this new dependable 40-meter crystal.

The B5 unit for 40 meters is a better crystal* safely carrying 35% more current than the popular Bliley LD2 40-meter unit which it now replaces at no increase in cost. Compare the performance of this new crystal unit—your distributor has them in stock for $4.80.

**New Low BLILEY PRICES**

- **TYPE BC3**: 40-80 METER BANDS \( \ldots \) $3.35
- **TYPE LD2**: 80-160 METER BANDS \( \ldots \) $4.80
- **TYPE B5**: 40 METER BAND \( \ldots \) $4.80
- **TYPE HF2**: 10-20 METER BANDS \( \ldots \) $5.75
- **TYPE B5**: 20 METER BAND \( \ldots \) $7.50
- **TYPE VF1**: 80 METER VARIABLE FREQ. \( \ldots \) $7.50

Bliley, the pioneer in the development of high frequency quartz crystals, now brings new standards to 20-meter crystal control with the B5 20-meter crystal unit. This crystal has a drift of less than 4 cycles/MC./°C. and possesses a high activity. It can be used in conventional crystal oscillator circuits and is directly interchangeable with the lower priced, medium drift Bliley HF2 20-meter unit.

The B5 unit is available in the complete range from 14.0 to 15.0 MC. for use in the 20-meter band and for multiplying to 10 and 5 meters—your distributor has them in stock for $7.50.

**BLILEY CRYSTAL UNITS**

*Say You Saw It in QST—It Identifies You and Helps QST*
The club in general certainly enjoyed the Field Day and Traffic skeds are hard to get too, considering the number of hams on the air.

Sure, some guy is going to have a letter in next month’s QST saying I overlooked the great action of the amateurs in the flood relief, the great amount of traffic handled, and other accomplishments. You can’t kid me. I listen on all the bands and, out of hundreds of signals on the air, a few are doing something useful or something sensible, while the others are all foolishness. Ragchews are OK if ideas are exchanged and friendships are made, and if they are sensible ragchews, not just “hi hi” and “73” and “QRU.” Experimenting has its place too, if it isn’t “QRX while I change a gadget in my set,” followed by holding a key down for 5 minutes, or saying “123456789” in the mike or whistling on a phone station.

I’d like to have a sked with some guy in a foreign country every day and talk about things other than radio part of the time. In that way international friendship would be boosted and likelihood of war reduced. Both me and the other fellow would learn something from each other about the other country. Ideas would be exchanged. Also, performance of apparatus could be checked over a long period of time, day after day, as after season. Ideas on radio would add to each other’s knowledge some and become a good thing too, if not made the sole topic of discussion. But no, they all just want to say “Ur sigs rst blah blah wi qru 73 CUL sk cq cq cq dx de-etc.” Where does that get anybody?...

Talking won’t do any good. I’d like to see somebody do something about it. No regulations, but conscientious effort on the part of all hams. Let’s hear some ideas to kill the old “wi QRU hr 73” baloney. —Keith O. Daulton, W6EPQ

Field Day Results
(Continued from page 14)

although we did not score very high, that is of secondary importance compared to the kilowatts of fun we derived.


We used a 55, 802 rig running 8 watts input on ‘phone and 15 watts on c.w. Power was from an a.c. generator run from the car fan belt. And what a gas bill! We were located on Saddle Peak Road up in the Malibu Mts.—W6ESX, W6NCC, W6KL.

We set up at Hills town, Iowa, on the highest hill we could find. In the wee hours of the morning had to move the rig inside the truck due to a heavy dew. Transmitter: 12A crystal, 41 amp., 315 volts B batteries.—W6CFB, W6YFW.

Transmitter was 6L6, e.c. or c.c. Receiver, t.r.f. using 6 volt tubes. 56 Mc. rig: 6A6 and 6L6 mod. Of 72 QSO’s, 33 were with other portables.—W90FB, W9YWW.

W6HJT-6 was located on the side of a mountain neat Wildwood, Calif. The antennas were a vertical 66 foot Zepp and a 132 foot end fed wound around trees. Operation was on 7, 14 and 3.5 Mc.—W6HJT, W6IES, W6JPE.

We learned a great deal on our field day test. Most important points are (1) keep equipment in convenient units, easily carried and using plug-in connections; (2) necessity for rapid band changing; (3) proved to our satisfaction that 110 volt 60 cycle a.c. makes best emergency power supply. —WBFBO, WSJNJ, WSLEV.

The rig was set up on top of a mountain about 4½ miles south of Ola, Ark. The transmitter was a 71A TNT and a pair of 71A’s in parallel 44 amp. Power supply consisted of four B batteries and car battery. Receiver used 32, 32 and 33.—W6FJR-6.

This surely was a popular field day, at least in this section, and we’re looking forward to the next.—W6EEZ, W6JRZ.

We operated W6UFP-6 from Copernicus Peak. It goes up at an angle of 45 degrees and the distance from our cars to the “lookout” was about 400 feet by the trail. We hauled by the “sweat of our brow” nine storage batteries, twelve heavy duty B batteries, gas engine, HRO receiver, Sargent receiver, phone transmitter for 28 Mc., 30 Mc transmitter and receiver on all tubes, speakers, tools, junk, blankets, food, gas stove, antennas, etc.—W6CEO, W6CHS, W6ULS, W6UF.

The second day of operation at the Connecticut location revealed the 244th Field Artillery, New York Nat'l Guard, testing in the neighborhood of 56 Mc. A call and QSO brought to Elig’s location one Army radio truck, one car
New ideas may come and go. But there remains an unfailing source of dependable portable power—Burgess Batteries.

In this case, it’s a radically new type of stratosphere balloon. In another, it may be revolutionary communication systems, television, or exploration techniques. Whatever the requirements, they have usually been anticipated by Burgess.

Burgess is an old name in this ever progressing scientific world—kept young and virile by constant development—unfaltering research.

Burgess Battery Company
Freeport, Illinois
Say... 
RADIO AMATEUR!

Remember the time you were ready to put up that new Radio Tower?

You could not do it by yourself —
Your first turn for help was to your Fellow Radio Amateurs — They were glad to give you a lift — Together you raised the tower, and had a good time doing it.

YOUR MEMBERSHIP IN 
YOUR A.R.R.L. helps raise the towers of AMATEUR RADIO

THE BOARD OF DIRECTORS 
A.R.R.L.

and one field set. They very kindly cooperated in constructing a 14 Mc. antenna, using the Army portable antenna mast. — W6EIC-1.

Our antenna mast was made from three clothes props and "C" clamps. It worked out very fine. — W8OIX-8.

The rig was set up in a tent on a small mountain about five miles from our home station in Nutley, N. J. — W6DEN-8.

From 8:30 p.m. Saturday to about 3:00 a.m. Sunday a terrific electrical storm raged, causing the lean-to shack in which we were operating to leak like a worn-out sieve. Lightning struck a giant oak about a hundred feet from the shack and split it to pieces. — W7WGP-9.

The location was in a "little red school house" built back in the early 1800's. It sure was swell, on the side of the Watchung mountains. — W6DLH-8.

We were located in a house trailer on top of a hill 7½ miles northwest of Pinedale, Wyo., approximately 110 miles from a railroad. The only sign of civilization was the highway to Yellowstone Park. — W7EMG-7.

For antenna supports we used our portable transmitters towers, which are composed of three sections of 2 x 2 bolted together, about twelve foot lengths so can carry on car. — W8SP-8.
The smooth Centralab Control offers maximum resistor length for case diameter... close uniformity between resistors... accurate tapers... uniform current distribution... better power dissipation and longer life.

Mr. George Rohr of 67 Thorne St., Jersey City, N. J. hands us the above bouquet along with some other very flattering statements in a recent letter! Thanks Mr. Rohr... thousands of other servicemen feel the same way about Centralab.

In fact, set manufacturers and experimenters as well as servicemen have for years shown their preference for Centralab... and they have said it with generous orders. We suggest, you too specify CENTRALAB.

DIV. OF GLOBE-UNION INC., MILWAUKEE, WISC.
Canterbury Rd., Kilbourn
London N.W. England
118 Avenue Ledru-Rollin
Paris
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-set 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.

RADIO ENGINEERING LIBRARY

especially selected by radio specialists of McGraw-Hill publications—
to give most complete, dependable coverage of facts needed by all whose fields are grounded on radio fundamentals

For home-study and reference. Contains a revised selection of books culled from latest McGraw-Hill publications in the radio field.

5 volumes, 3064 pp., 2000 illustrations

Special Low Price and Easy Terms

Bought singly, the five volumes comprising this library would cost you $25.00. Under this offer you save $1.50 and, in addition, have the privilege of paying in easy installments beginning with $2.50, 10 days after receipt of the books, and $3.00 monthly thereafter. Take advantage of these convenient terms to add them to your library now.

SEND THIS ON-APPROVAL COUPON
McGraw-Hill Book Co., Inc.
330 W. 42nd St., New York, N.Y.

Send me Radio Engineering Library, 5 vols., for 10 days’ examination on approval. If, in 10 days I will send $2.50, plus few cents postage, and $3.00 monthly till $23.50 is paid, or return books postpaid. (We pay postage on orders accompanied by remittance of first installment.)

Name ____________________________
Address __________________________
City and State _____________________

Position __________________________

Company __________________________

QST-11-37

(Books sent on approval in U.S. and Canada only.)
WIN NEW RCA APPARATUS FOR YOUR STATION! 200 PRIZES WORTH $1,300!

Offered FREE in Easy Contest!

Just tell us in your own way what you think of RCA Tubes! Nothing for you to buy!

HERE'S ALL YOU DO TO ENTER!

(1) Get contest entry form and letter of instructions from your nearest distributor of RCA transmitting tubes.
(2) Fill out entry form. Then write a letter (500 words or less) telling (a) "Why I use RCA Tubes in My Transmitter", or (b) "Why I Don't Use RCA Tubes in My Transmitter". A duplicate set of prizes will be awarded on each subject. You have an equal chance to win a prize whether you use RCA Tubes or not.
(3) Mail entry form together with letter to RCA at the address below. Envelopes will be provided. No postage required.

Contest Closes December 15, 1937
All entries must be post-marked not later than that date!

Prizes will be awarded as quickly as contest judges determine winners. Contest open only to licensed amateurs in continental United States. Employees of the RCA Manufacturing Company, Inc., are not eligible. Judges' decisions will be final.

Here's a great chance for you to win valuable apparatus for your station! It's an easy contest—doesn't cost a cent to enter. There's nothing for you to buy—no box tops or labels to send in. We even pay the postage!

RCA is offering 200 prizes—worth $1,300—because RCA is always looking ahead, always planning products that will further the enjoyment and widen the scope of amateur radio. From your contest answers will come ideas. They will enable RCA to make products even more suited to your requirements. They will help RCA create tubes to step up the performance, increase the pleasure of amateur radio.

Get in this contest today! You've got just as good a chance to win as the next fellow.

Identical prizes will be awarded winners in each of the two groups in this contest. 100 prizes will be awarded for the best answers on "Why I use RCA Tubes in My Transmitter". 100 prizes will be awarded for the best answers on "Why I Don't Use RCA Tubes in My Transmitter".

Winners may choose other RCA products as substitute prizes if they wish. List Prices of the RCA products they select, however, must not exceed that of the "official" prize. Official prizes in this contest are as follows:

<table>
<thead>
<tr>
<th>PRIZES</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1—ACR-111 (16-Tube Receiver)</td>
<td>$189.50</td>
</tr>
<tr>
<td>2—ACT-20 (less accessories) (20-Watt Trans.)</td>
<td>129.50</td>
</tr>
<tr>
<td>3—ACR-155 (9-Tube Receiver)</td>
<td>74.50</td>
</tr>
<tr>
<td>4—Two RCA-806 (450-Watt Triode)</td>
<td>44.00</td>
</tr>
<tr>
<td>5—One RCA-803 (250-Watt Pentode)</td>
<td>34.50</td>
</tr>
<tr>
<td>6—Two RCA-805 (215-Watt Triode)</td>
<td>27.00</td>
</tr>
<tr>
<td>7—Two RCA-808 (40-Watt Triode)</td>
<td>15.50</td>
</tr>
<tr>
<td>8—One RCA-906 (3-Inch C.R. Tube)</td>
<td>13.50</td>
</tr>
<tr>
<td>9—One RCA-834 (15-Watt u.h.f. Triode)</td>
<td>12.50</td>
</tr>
<tr>
<td>10—One RCA-809 (16-Watt Triode)</td>
<td>7.75</td>
</tr>
<tr>
<td>11—20—One RCA-802 or 807</td>
<td>3.50</td>
</tr>
<tr>
<td>21—50—Pair RCA-866</td>
<td>3.00</td>
</tr>
<tr>
<td>51-100—RCA Metal Tube. Cigarette Lighter 1.00</td>
<td></td>
</tr>
</tbody>
</table>
NDISPENSABLES

√ your receiver
√ your transmitter
√ your F.C.C. licenses
√ your LICENSE MANUAL!

It's against the law to operate an amateur radio station without the required federal licenses for station and operator. The maximum penalty for so doing is a $10,000 fine and two years in a federal penitentiary.

That's the broad basic picture. But within the scope of the federal licensing machinery are many detailed regulations, the violation of any one of which can lead to suspension, cancellation of licenses, or even fines or imprisonment. These regulations change frequently, in step with the rapidly developing art of radio.

There is only one way for the amateur to keep at his finger tips these changing legal requirements—short of maintaining his own Washington legal bureau. That is to keep the latest edition of the Radio Amateurs License Manual in the shack at all times. New editions always contain the latest regulations—and when a new edition appears it means that changes in federal regulations have made its predecessor obsolete.

WE ARE NOW SUPPLYING THE EIGHTH EDITION
TAKE A LOOK AT YOUR COPY!
25 cents postpaid

AMERICAN RADIO RELAY LEAGUE
West Hartford, Connecticut, U. S. A.
IT'S IN HERE, O. M.!

The STANCOR HAMANUAL

New...complete...practical! 16 complete circuits from microphone to antenna post... transformers for all tubes....Don't build or re-build until you have seen the Stancor Hamanual....It has all the latest dope!

Ask Your Jobber for Your Copy!

STANDARD TRANSFORMER CORPORATION
850 BLACKHAWK STREET CHICAGO

Say You Saw It in QST — It Identifies You and Helps QST
NEW PORTABLE
"EVEREADY"
RADIO BATTERIES

No. 722—2-cell, 3-volt "A" Battery. Length 2 11/16 in., Width 1 1/2 in., Height 4 3/8 in., Weight 11 oz.
No. 723—4-cell, 3-volt "A" Battery. Length 2 3/4 in., Width 1 1/2 in., Height 4 3/8 in., Weight 1 lb. 5 oz.
No. 724—8-cell, 3-volt "A" Battery. Length 4 in., Width 2 3/4 in., Height 6 in., Weight 2 lbs. 4 oz.
No. 733—4.5-volt "B" Battery. Tap at + 22 1/2 volts. Length 3 1/2 in., Width 1 1/2 in., Height 4 3/4 in., Weight 1 lb. 2 oz.
No. 738—4.5-volt "B" Battery. Tap at + 22 1/2 volts. Length 3 1/2 in., Width 2 1/2 in., Height 4 1/2 in., Weight 1 lb. 4 oz.
No. 744—7 1/2-volt "C" Battery. Tap at - 4 1/2 volts. Length 2 15/16 in., Width 1 1/8 in., Height 1 3/8 in., Weight 2 oz.

Descriptive sheet mailed on request to:
BATTERY HEADQUARTERS
NATIONAL CARBON COMPANY, INC.
30 East 42nd Street, New York, N. Y.
Unit of Union Carbide and Carbon Corporation

What the League Is Doing
(Continued from page 18)

Handbook.” This question has been brewing for some years, being marked last year by a pirated Spanish edition of our 1935 Handbook. This work was unauthorized by the League and was a poor translation and wretchedly produced. The “Revista Telegrafica” people are so favorably known to Spanish readers that no further assurance is necessary as to the goodness and reliability of the job that will now be done with the League’s approval. The Spanish edition is expected to be ready about the first of the year. While of course the main distribution will be made from Argentina, U. S. readers will be able to obtain it from Hq.

Match and Mis-Match
(Continued from page 85)
tapped to points equidistant from the “cold” center of a double-ended tank, and the antenna is symmetrical, the currents will be equal. The only exception to this is in the case of an excessively high-inductance pick-up coil with one end exposed to a “hot” part of the tank in such manner as to allow considerable “capacity pick-up.”

To say that standing waves on an open double line are generally of no consequence as far as efficiency and radiation are concerned is directly to contradict an old and generally accepted belief to the contrary. But such is the case. The average open double-wire line as used by the amateur is so nearly loss free that seldom will more than 0.5 db loss result when it is sufficiently mis-matched at the antenna to cause 60% of the power flowing out from the transmitter to be reflected back down the line instead of entering the antenna, a condition which results in standing waves of about 8-to-1 ratio in maximum to minimum currents. Of course, if the line is several hundred feet long and is operated at either 28 Mc. or 56 Mc. the losses will run up. Recently a 200-foot 2-inch spaced line was measured at 50 Mc and was found to have an attenuation due to loss and radiation combined of 1.1 db. Had this line been operated at that frequency with severe standing waves the attenuation would have amounted to several db.

Energy reflected back down the line from the antenna can be said to change the apparent input impedance of the line at the transmitter so that more power flows out toward the antenna. Thus some of the energy actually makes several round trips up and down the line; but still the line losses are usually low enough so that practically all of it eventually gets into the antenna and is radiated. Consider the case of the so-called Zepp feeders. Here the transmission line is deliberately “mismatched” at the antenna so that at least 85
"A CHAIN IS AS STRONG AS ITS WEAKEST LINK"

You know the old adage about the chain and its weakest link. It's easy to see how that fits here.

A "sour" tube will destroy all possibility of maximum results, even though your equipment is the finest obtainable. Your transmitter, regardless of how it is constructed, will deliver better performance with Eimac tubes.

They defy their own ratings and welcome an extra heavy overload. RED HOT yes... WHITE HOT; they'll take it. Completely degassed tantalum electrodes, a new type thoriated filament, no internal insulators, elimination of "getter". These and other Eimac features—applied the Eimac way—explain why these transmitter tubes are far ahead of all others.

Eimac Tubes for every transmitter from 50 watts to 5000 watts

35T 100T 250T 450T 750T

See Your Dealer or Write for Information

EITEL & McCULLOUGH, INC. • San Bruno, California
Whether or not you use OHMITE rheostats to control the filaments of your transmitting tubes depends upon whether you have a "commercial style" rig or a haywire job. Almost invariably you will find them in the transmitters of the "thousand watters" for the same reasons that the broadcasting stations use them — they are the utmost in dependability and fine control.

Special alloy wire is wound over porcelain, and all but the contact surface vitreous enameled. The turns are permanently held in place, and the metal-graphite contact, touching each of the many turns, provides smooth, close adjustment. And yet you can buy an OHMITE power rheostat for surprisingly little. Your parts jobber stocks them.

OHMITE MANUFACTURING CO.
4831 FLOURNOY STREET, CHICAGO

per cent of all the power starting out toward the antenna is reflected back down the feeders from the antenna junction point toward the transmitter. This results in standing waves often as high as 50 to 1 in ratio between maximum and minimum currents; and yet Zepp feeders too may be made to operate with good efficiency.

If it has not already been inferred, it is probably well to mention here that standing waves on the line cannot be altered by changes in the so-called "match" at the transmitter end of the line; also that they cannot be eliminated unless the antenna and line are actually matched, in the sense that the impedance of one is made exactly equal to the impedance of the other at the junction point of the two.

It would be a mistake to take the foregoing as an invitation to throw together most any type of poorly constructed open-wire line with a feeling of, "Well, what's the difference?" Good workmanship and attention to detail have not ceased to pay dividends even though they may not always be in the form of more miles per watt.

It so happens that losses in most all types of lines used by the amateur are almost exactly proportional to frequency. This means that they may be rated in terms of "db per wave length" and such rating will hold good for any frequency of operation. The average of several open two-wire lines which were measured was 0.12 db per wave length. This means the average 66-foot air-spaced pair (if no standing waves were present) would produce a loss of about 0.12 db at 14 Mc., 0.06 db at 7 Mc, and only 0.03 at 3.5 Mc. Twisted pairs and other types of rubber-dielectric lines have considerably more attenuation, but they also have other electrical and mechanical characteristics which make them preferable to open-wire lines in some installations, particularly where the distance between transmitter and antenna feed point is not over one wavelength.

RUBBER-INSULATED PAIRS

The best of such low-impedance lines have an attenuation of about 1 db per wavelength. The loss in the very poorest ones is about twice that amount. Ordinary twisted lamp cord has a surge impedance of 140 ohms and shows a loss of approximately 1.4 db per wavelength when dry. Of course it will not stand the weather; the losses increase tremendously when it is soaking wet; but it may be useful, if properly handled, for inside work. Two pairs of such wires, each of exactly the same length, connected in parallel will form a line of about 70 ohms impedance. Unfortunately the loss in such a combination is not halved but remains at the same value as for a single pair. Needless to say the "polarity" of connection of such a combination must be the same on both ends. In other words, if the coded conductor of one pair is joined to the coded conductor of the other at one end, the same must be true at the opposite end. Ordinary parallel moulded rubber lamp cord has a surge impedance of 120 ohms and produces somewhat less loss than the fabric covered twisted type. It may stand weather conditions
A CRIME may be imminent ... Life and property may be endangered! A telephone call to police headquarters will speed a radio cruiser to the scene ... in defense of law and order.

In such crises, radio messages must be sent quickly and received clearly. Isolantite* ceramic insulators are important factors in keeping radio equipment operating efficiently.

In police radio transmitting equipment, Isolantite insulators increase output by reducing dielectric losses. Isolantite co-axial transmission line delivers power efficiently to the Isolantite-insulated antenna, from which the voice is carried to the remotest cruiser. Police receivers insulated with Isolantite hold their tuning accurately, and never fail, because of drift, to hear the command to action.

Long experience in the manufacture of ceramic insulators for radio equipment enables Isolantite engineers to offer valuable assistance in the formulation of economical insulator designs. This experience is at your service for the asking.

*Reg. Trade-name for products of Isolantite, Inc.
Western Electric

304 B

TRIODE

More and more amateurs are recognizing that the Western Electric 304B is the greatest thing on the market for 5 meter work. Next time you design an ultra high frequency transmitter consider these features—

Upper frequency limit: 400 megacycles; Maximum voltage: 1250 volts; Nominal power output, Class C, unmodulated: 85 watts at 60 megacycles, 60 watts at 100 megacycles.

The 304B gives outstanding performance as oscillator, buffer, doubler or final amplifier. For full information on this and other Western Electric tubes for amateur use, consult your dealer—or write Graybar Electric Co., Graybar Building, New York.

somewhat better than other types of lamp cord although no data in this respect are available at the moment.

It must be remembered that the above figures for attenuation are those which apply when the power travels but once along the line. If there is reflection from the load end (which produces standing waves) the loss increases. Naturally the more round trips the energy makes before entering the antenna (load) the greater the loss. That is a rather "loose" statement but serves to stress the point.

Because of the fact that twisted pairs and other rubber dielectric lines inherently waste more of the power as loss than do open wire lines, it is somewhat more necessary to operate them in such manner that the energy traverses them but once; in other words, without standing waves. However even with these a two-to-one mis-match in resistance at the antenna end causes a barely perceptible increase in line losses. To give an example, one type of widely used twisted pair was measured recently and found to have an attenuation constant equivalent to 1 db per wavelength. Thus a 60-foot piece operating at 14 Mc. without standing waves would put 1 db less power into the antenna than the transmitter put into the line. If 250 watts entered the line, 199 watts would be fed into the antenna. The power lost would be 0.87 watt per foot at the near end, gradually decreasing to 0.69 watt per foot at the outer end. The total loss is, of course, 250 minus 199 or 51 watts. However, that particular transmission line has a surge impedance of just 100 ohms and had the 66-foot piece been inserted directly into the center of a half-wave doublet whose resistance was 50 ohms (a not uncommon value) there would have been a 2-to-1 mis-match at the outer end. Under these conditions the total loss would have increased to 60 watts with a maximum of 1.49 watts per foot near the transmitter. There would be several points along the line at which the loss per foot would be less than when perfectly matched, since with standing waves on a "dielectric loss" line the losses are greatest at points of highest voltage and least where the voltage is low and the current high. This accounts for the fact that the total dissipation only increased 18 per cent but the loss per foot at some point near the transmitter increased 58 per cent.

It is readily apparent, then, why "hot" lines are encountered in amateur practice. If mis-match had been 3-to-1 (meaning the load would be either 33½ ohms or 300 ohms) the loss would have increased to 72.5 watts or to 1.5 db and maximum head loss per foot at some point near the transmitter would have increased to slightly over 2 watts. If the line were handling the output of a kilowatt rig under such a condition it would become more than just luke warm, but still would be operating with fair efficiency.

In the above examples the mis-match is assumed to be the result of incorrect resistance only. If the antenna length is not reasonably close to resonance, or harmonic resonance, a certain amount of reactance is introduced which will
Announces a complete line of

TRANSMITTING CAPACITORS

OIL — PAPER
and
MICA TYPES

Write for Complete Catalog

SOLAR MANUFACTURING CORP.
599-601 Broadway, New York, N. Y.
cause standing waves on a line even though the resistance is correct. With our harmonically related bands and wide-spread information as to correct lengths for antennas there is little excuse for anyone attempting to feed a non-resonant antenna with a low impedance transmission line. The Q or sharpness of resonance of a good antenna is low enough, however, so that the operating frequency can usually depart by several percent before the reactance at the feed point becomes comparable to the resistance. Thus the term “reasonably close to resonance” should not be taken as substantiation of the too prevalent belief that antennas must be cut to the exact inch or that departure from the exact frequency of resonance by a few kilocycles will alter the radiation capabilities of the radiating system.

One interesting fact about low-impedance lines is that a wave travels along them more slowly than it would on an open-wire line. Actually the velocity is equal to the speed of light divided by the square-root of the effective dielectric constant of whatever material is between the two wires. This constant is one for air, so, if it were not for spacers in open-wire lines, the energy would travel along them at almost exactly 300,000,000 meters per second. The dielectric constants of the different insulating materials used in several types of low impedance lines which were measured were apparently all very nearly the same for in every case the “velocity of propagation” was between 57 per cent and 63 per cent of the speed of light.

This is important to know if we wish to add an additional quarter-wave of line to our feeders to check for standing waves (by the method outlined above in the case of the single-wire feeder), because the “electrical length” rather than the physical length of the added piece should be $\frac{1}{4}$-wave. Thus the piece we would cut would be only 60 per cent as long as would otherwise be the case. For instance, at 14 Mc. it should be about 10 feet long rather than 17 feet or so. It is also interesting to note that the “electrical length” of the 66-foot line operating at 14 Mc., used in the examples above to illustrate the effect of mis-match at the antenna, was approximately one and three-quarters wavelengths. The figures for attenuation are given in terms of physical or “tape measure” length.

A year or so ago some data were widely published indicating the “loss” due to mis-match between a line and its load. These did not apply to antenna feed systems, however, for one simple reason; the input to a transmission line, at the transmitter will change as the load on the outer end is varied; but the coupling to the final tank can always be readjusted so as to absorb the same power from the transmitter regardless of the load impedance. Some of the assumed “loss” in the published data was actually a decrease in power input to the final stage which would result if the coupling had not been readjusted as the load was altered.

1 For further data on line wave velocities, see “How Long Is a Quarter Wavelength,” by J. N. A. Hawkins, elsewhere in this issue.—Enron.
**Increase Transmitter Efficiency**

**with New**

**TRIPPLET**

**ILLUMINATED THERMO-AMMETERS**

Model 446 with Front Illumination. New Four Inch Square Modernistic Instrument featuring extra long scale. Available also in ammeters, milliammeters, microammeters, voltmeters, millivoltmeters, etc., A.C. and D.C.

**PRICES GREATLY REDUCED**

All amateurs know that the sure way to get the most out of your rig is to install a Thermo Ammeter in your antennae circuit. Now you can get a Thermo Ammeter with front illumination. Illumination attachment is extra. Does not affect meter and light bulb can be easily replaced. Perfect distribution of light.

Triplett Thermo Ammeters are sturdily built to carry high overload capacity and to give long life. The thermo couples are external to the meter and connected to it by 2 ft. leads. The thermo couple can be located where convenient while the ammeter is placed on the panel.

All Thermo couples are designed to work on any size Triplett Thermo Ammeters.

2" Model No. 241 complete with Thermo Couple, not illuminated...$5.83
4" Model No. 446 (as illustrated) illuminated, with thermo couple...$7.83
Thermo Couple for all sizes. Each..............................$2.67

Thermo Ammeters are available in the following ranges:— 0.5, 0-1, 0-1.5, 0-2.5, 0-5.

The Triplett Electrical Instrument Co.
2511 Harmon Ave., Bluffton, Ohio

Please send me more information on Model 486.
I am also interested in

Name...........................................................................
Address...........................................................................
City......................................................State...............
The ratio of maximum to minimum currents or voltages on a low-loss transmission line is equal to the mis-match ratio between antenna and line if the antenna load is resonant (pure resistance). Thus if we find the maximum current in an open two-wire 500-ohm line feeding a resonant antenna is just 4 times the minimum current, we know the antenna load is either 150 ohms or 2400 ohms. The position of the “nodes” and “loops” and a little common sense would tell us which of these two values is the correct one.

For those who may be mathematically inclined the following expression is given for the efficiency of a transmission line operating with a resistance mis-match at its load (antenna) end in terms of the efficiency of the same line when operating without standing waves.

\[ \eta = \frac{4K}{M + \frac{1}{M} + 2 - \left( \frac{1}{M} - 2 \right)K^2} \]

Let there be any mistake it should be stated that throughout this article wherever the term efficiency is used it means the ratio of power output to power input. For convenience a table of db loss and per cent efficiency is given herewith.

<table>
<thead>
<tr>
<th>db Loss</th>
<th>Efficiency</th>
<th>db Loss</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100%</td>
<td>3.0</td>
<td>50%</td>
</tr>
<tr>
<td>.25</td>
<td>94.5</td>
<td>3.5</td>
<td>44.5</td>
</tr>
<tr>
<td>.5</td>
<td>89</td>
<td>4.0</td>
<td>40</td>
</tr>
<tr>
<td>.75</td>
<td>84</td>
<td>4.5</td>
<td>35.5</td>
</tr>
<tr>
<td>1.0</td>
<td>79.5</td>
<td>5.0</td>
<td>31.5</td>
</tr>
<tr>
<td>1.25</td>
<td>75</td>
<td>6.0</td>
<td>25</td>
</tr>
<tr>
<td>1.50</td>
<td>71</td>
<td>7.0</td>
<td>19.5</td>
</tr>
<tr>
<td>1.75</td>
<td>67</td>
<td>8.0</td>
<td>15</td>
</tr>
<tr>
<td>2.0</td>
<td>63</td>
<td>9.0</td>
<td>12.7</td>
</tr>
<tr>
<td>2.5</td>
<td>66</td>
<td>10.0</td>
<td>10</td>
</tr>
</tbody>
</table>

Rewinding an Auto Generator

(Continued from page 19)

The tor is to be used for one a.c. return, be sure and tape it too. Then the coils and armature are dipped in the varnish. Afterward, let them drip for a half-hour or so, so as to remove the excess varnish. Then either bake them, or let them air-dry, as may be required by the particular varnish used.

**FINAL ASSEMBLY**

For final assembly, lay the completed field coils in a line with the end wires toward you. To connect them for proper polarity, assume that the first “finish” is to be a field lead. Then the four will be connected, “start” to “start,” “finish” to “finish,” and “start” to “start,” leaving the remaining “finish” as the other field lead. In other words, they will be connected inside to inside, outside to outside, and inside to inside.

Next, the completed fields are placed in the
To hams everywhere, the name Taylor Tubes stands for the tops in fully guaranteed ace-high quality transmitting tubes. Actual tube performance, long tube life and a complete line are the reasons for this record. Specific tubes for each class of radio service means better performance because each service requires different tube characteristics for efficient results. Get the actual facts, not fancy promises, when you buy transmitting tubes. Compare—and you, like thousands of other amateurs, will buy Taylor Tubes.

**T-125**
Carbon Tantalum Anode
125 watts plate dissipation. Amateur Radio's new sensation. Over 300 sold in three months. Conservatively rated 400 watts input plate modulated on all amateur frequencies.

*Easy to Drive*

$13.50

**T-55**
The sales champion. The most widely used medium power transmitting tube ever produced. Now after only 17 months 8,000 T-55s are in operation. No testimonial is needed to prove the tremendous popularity of this outstanding performer. Ease of operation certain on all frequencies.

$8.00

**866**
The world's fastest selling 866. The absolute tops in quality. Sales talk is unnecessary when you mention these tubes. Over 25,000 Taylor 866's in daily service, do their own talking by giving highest performance and long operating life.

$1.50 New Low Price

**FREE LAPEL PIN FREE**
Ask your distributor for details about the Taylor Tubes Distributor celebration offer. Beautiful WINDNF Lapel Pin with your own call letters free. Every ham should own one.

---

**FREE**
Big Taylor Tubes Manual and catalog. Get your copy today from your Taylor Tubes distributor or write us. It's a complete amateur handbook in one big volume.

---

**More Watts Per Dollar**

*Taylor HEAVY CUSTOM BUILT DUTY Tubes*

TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS

Say You Saw It in QST — It Identifies You and Helps QST
JOBS for HAMS

Rapid expansion on the part of the nation's airlines has made it imperative that they employ more and more radio operators who are well-versed in Airline radio operating procedure. The supply of qualified men is virtually exhausted.

With the cooperation of experienced, actively employed Airline radio operators and communications personnel, we have established and developed our highly specialized, thoroughly practical course in Airline radio operating.

RESULT: Many more calls for our men than we are now able to supply!

As an amateur you have an invaluable advantage in favor of early employment. But we have found from experience that the average "ham" is inclined to be skeptical of such optimism. We welcome the strictest investigation. This "checking" has rewarded several "hams" and it can be to your advantage, too.

Some of the more active and widely known "ham" operators who have joined their radio experience with Midland training include:

W9LHQ
W9YCT
W9HON
W9IQI
W9DFY

These hams, together with many others, are already employed in fine, highly respected, responsible positions with leading U.S. airlines.

If you are between 18 and 30, have a high school education, are free of uncorrected physical defects, and really like radio operating, it will be to your advantage to get in touch with Norm G. Souther immediately. Write or wire

NORM G. SOUTHER
MIDLAND TELEVISION, INC.
(Midland Broadcasting Company Affiliate)
Dept. 130, 29th Floor Power and Light Building
KANSAS CITY, MISSOURI

frame, with the leads toward the armature end of the shaft. Insert the field poles in position and draw them up snugly with a good-sized screwdriver. Now connect each field winding as outlined above, remembering the proper sequence of connections. This is vitally important. After they are connected temporarily, run current through them from a six-volt battery and check with a magnetized piece of steel for polarity. One field should attract, the next repel, etc. After making sure that the polarity is correct, make permanent connections with a good soldered splice and wrap with friction tape thoroughly. The loops are daubed with some more of the insulating varnish and tucked snugly away between the fields, so that no "Irish pennants" will get in the way of the revolving armature. The two leads are brought up through a piece of bakelite (1/4-inch FB), to a pair of binding posts. These will be for the external field connections to a 6-volt battery or d.c. generator, as the case may be.

Now put the old bearings in place, remembering to put the sealed side of the bearing in toward the winding except on the pulley end. On the pulley end, put the sealed side out to keep dust and grit from the bearing. If the old bearings show wear, it would be best to replace them with new. The Fafnir No. 203 "One" and No. 205 "One" are the proper replacement bearings for the Dodge generator. The old-type tapered bearings can be taken up by pushing the outer race in toward the armature; but if they are badly pitted, they should be replaced. After everything is shipshape and the unit is assembled to your satisfaction, turn it over with a motor to a speed of 1800 r.p.m. This is the proper speed for 110-volt output, and good a.c. should be obtained from the slips, or the commutator and shaft combination, with the field excited. For voltage adjustment, a 5-ohm 10-ampere rheostat may be connected in series with one field lead.

In our own case we were bothered to some degree with a flicker in the lights, but this was entirely eliminated by the use of a four-pound fly-wheel. The flicker was noticeable with the slips, and quite troublesome with the old commutator. At the time the fly-wheel was turned on the lathe, two grooves for "V" belts were also machined in. This gives positive drive from the 1-h.p. gasoline motor, the size motor recommended because of the power reserve available. Although these motors are rated at 1 h.p., we have been drawing 800 and 900 watts from them—while, as you know, a horse is 746 watts. The engines are very conservatively rated. Both Montgomery Ward and Sears Roebuck sell 1-h.p. jobs. Some fellows like one, others are impressed with the other. Any one of various makes of 1-h.p. engines can be bolted to the "carry-all" frame easily, are light, and readily portable. They will run a good four hours on one gallon of gasoline. The V-belts used for drives are standard fan-belts. The pulleys on the gas engine are standard, and can be obtained from almost any well-supplied hardware store.

The six-volt generator used for field-excitation
NEW!! GROSS CB-350
RADIOPHONE TRANSMITTER

More and more operators are realizing that only in a GROSS Transmitter can they obtain APPEARANCE, QUALITY, PERFORMANCE and VALUE such as they receive in the CB-350. A really high power phone at an Amazingly low price. Truly the "more watts per dollar" slogan takes on a new significance.

- R.F. TUBE LINE UP — 6L6G crystal oscillator, buffer or doubler one T55, class C amplifier two T55s
- POWER SUPPLIES — 1400—1500 volts at 300 M.A. 700 volts at 200 M.A.
- SPEECH AMPLIFIER — Four stage high gain for use with high impedance microphones, self contained power supply
- MODULATOR — Two RK31s are used in the class B modulator. 100% modulation, separate heavy duty power supply
- ANTENNA UNIT — Self contained antenna tuning unit included
- FREQUENCY COVERAGE — 1.7 Mc. 3.5, 7, 14 and 30 M.A.
- POWER — 350 to 400 watts input
- CABINET — Beautifully finished in battleship gray wrinkle lacquer

Bulletin upon Request Giving Full Details and Amazingly Low Price

NEW! BM-100 CLASS B 100 WATT MODULATOR

TUBE LINEUP: 3-6C5; 1-6N7; 2-6A3; 2-TZ201; 3-83.

INPUTS: One High and One Low Level High Impedance Input.

The BM-100 Class B Modulator Speech Amplifier will modulate 100% transmitters with inputs up to and including 230 watts input. The unit is completely self contained on the one chassis and includes high gain Speech Amplifier and Dual heavy duty Power Supply. The class B output transformer will match R.F. loads of 3300, 4400, 5000, 5880 ohms. Chassis size: 12" x 11" x 4½. Weight 70 lbs.

The BM-200 Modulator used in CB-350 Radiophone Transmitter is here illustrated, the BM-100 is very similar in appearance.

Completely wired and tested in our laboratory, les tubes. $59.00
Matched set of tubes. $12.50

WRITE FOR FREE NEW CATALOG ON HAM AND P. A. EQUIPMENT

GROSS RADIO, INC., 51 VESEY STREET, NEW YORK CITY

Say You Saw It in QST — It Identifies You and Helps QST
BIRNBACH IMPROVED STANDOFF INSULATORS

Are the Favorites of the Experts

Because they are made of better ceramic. Come in a complete range of heights, for condenser, coils, tube sockets, etc. Can be mounted with a minimum of labor. White glaze.

<table>
<thead>
<tr>
<th>No.</th>
<th>Height</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>430</td>
<td>4&quot;</td>
<td>16c</td>
</tr>
<tr>
<td>431</td>
<td>5&quot;</td>
<td>18c</td>
</tr>
<tr>
<td>432</td>
<td>6&quot;</td>
<td>20c</td>
</tr>
<tr>
<td>433</td>
<td>7&quot;</td>
<td>25c</td>
</tr>
<tr>
<td>453J</td>
<td>1½&quot;</td>
<td>1Oc</td>
</tr>
<tr>
<td>453J</td>
<td>2&quot;</td>
<td>25c</td>
</tr>
<tr>
<td>453J</td>
<td>2½&quot;</td>
<td>50c</td>
</tr>
</tbody>
</table>

NEW LOW PRICES ON Transmitting Sockets

It pays to buy the best so specify "Birnbach"

<table>
<thead>
<tr>
<th>No.</th>
<th>Height</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>434</td>
<td>50</td>
<td>$1.25</td>
</tr>
<tr>
<td>435</td>
<td>10</td>
<td>$.85</td>
</tr>
</tbody>
</table>

Special Low Prices in Large Quantities
Ask your jobber

INTRODUCING Glassmike

"A FIXED CONDENSER THAT STAYS FIXED"

Keep that rig of yours on the air! Don't let condenser breakdown interrupt an important Q S O! Here's a "glass walled" by-pass condenser that's absolutely impervious to moisture, guaranteed for 2 years, that will free your rig of condenser trouble from now on. It's absolutely new and different in construction, and costs no more than an ordinary condenser. Ask for Glassmike!

Ask your jobber to show you "Glassmike"

CONDENSER PRODUCTS CO.
1369 NORTH BRANCH STREET
CHICAGO • ILLINOIS

may be of any type you can pick up in the junk yards. Be sure that the direction of rotation is the same as that of the engine used to drive the a.c. generator and exciter.

The "carry-all" frame is about forty inches long and 30 inches wide. The handles on each end make it possible for two men to handle the whole thing easily. The weight is fairly well distributed.

The six-volt generator is mounted between the a.c. generator and the gas engine, and is driven from a third and shorter V-belt. Two V-belts are used to drive the a.c. generator, although one will do the trick. Two seem to give a little better traction, however, as well as a little better safety factor. If one breaks, the other will still run the generator. If desired, the d.c. generator may be eliminated, and the field excitation may be taken from a 6-volt car battery. The field current is on the order of 2½ amperes, not a great deal to worry about.

Some of the fellows around here have used the idea of jacking up one wheel of the car, putting a pulley on the wheel, and driving the generator from that. Another has mounted his under the hood of the car, and drives it from the fan-belt. Another fellow, up country, has made himself a hydraulic drive using a water-ram.

The actual frequency is somewhat higher than 60 cycles, really measuring about 75 cycles. The frequency can be easily checked, using an ordinary electric clock for the purpose. Adjust the field excitation for the desired voltage, put on the clock and let the job run for fifteen minutes or a half-hour. If, in a half-hour stretch, the clock shows a gain of seven and one-half minutes, then the generated frequency is 75 cycles. As all our a.c. receivers and transmitters are made for 60-cycle supply, this higher frequency is really to be desired. The extra 15 cycles gives a peculiar note on a c.w. signal, unlike anything ordinarily heard on the air. The receivers seem to work a little better, too, on the higher supply frequency.

Various makeshifts and schemes will occur to you as you go along, even as with us. If you do run into any difficulty, a little common sense will help you out. I advise getting a copy of Mr. Duncan's book, "Auto Power." There are a lot more jobs in there besides this one, and it is all practically worked out.

The whole thing represents quite a few hours of work, and probably a few well-chosen cuss words, but the results obtained more than justify the expenditure of time and money. Off-hand, I should say that using the best of parts, the whole thing should not run into more than seven dollars and a half at the most.

Strays

W2JVC and W2IJC have exactly the same name, each being Wm. J. Schoenberger. Despite the fact that the name is uncommon, JVC doesn't know IJC.
For Stamina Demand

THORDARSON

TRANSFORMERS

Guaranteed performance every hour of the day and every day of the year, is yours when you specify Thordarson transformers for your “Rig”! Precision manufacture and a strict adherence to high engineering ideals builds stamina into every Thordarson Transformer. Demand the best. Use Thordarson Transformers. They can take it and then some.

A ship down at the head—A giant airliner lost in heavy fog—these make sensational moments when transmission must go through. Amateurs need the same assurance of dependable performance that is demanded by Air lines, Governments, Broadcast stations, Laboratories, and Communication Systems. Equip your Rig 100% Thordarson for peak operation—at all times—under all conditions.

FREE See your parts distributor, or write us today for catalog No. 400A.

THORDARSON ELECTRIC MFG. CO.
500 W. HURON ST., CHICAGO, ILL.
Demand "Power by Thordarson"
WHY WAIT!

The New
1938
SUPER
SKY
RIDER

BUY YOUR
New Receiver NOW on
Easy Time Payments!

YOU can enjoy fine reception by an
improved modern receiver while you are
paying for it on Hinds and Edgarton "Easy
Payment Plan"—the lowest terms you can
obtain anywhere. We guarantee satisfaction
and you'll get the kind of personal service
that has made friends for us everywhere
in the country. Here's what one amateur says
about Hinds and Edgarton service:—"It is
indeed a pleasure trading with you. Your
interest in seeing that one gets satisfaction
is surely appreciated."

MAIL THIS COUPON TODAY!

HINDS & EDGARTON
19 So. Wells St. (Est. 1914) Chicago, Ill.
Please send me catalog and complete details on
time payment plan.

Name ....................................... .................................
Address .......................................................... W9WR

GULF RADIO SCHOOL
Radiotelegraphy
Radio Servicing
SECOND PORT 1007 Carondelet Street
U. S. A. NEW ORLEANS, LA.

UNIVERSAL MICROPHONES

LIST $22.50

(1) Hand Model Crystal for amateurs, p.a.,
special events, etc. [Desk holder $2.50 extra].
Incl. 25 ft. cord. Output — 65 db.

(2) Crystal Stand Model. For use where mike
should be mounted on desk or door. [Desk mount
$1.50 extra], incl. 25 ft. cable. All crystal models
under patent of Brush Development Co.

(3) Ribbon Microphones. Plug in and use. Self energizing.
No polarizing voltage. Semi-directional. High impedance direct
to grid and all other impedances. Use on amplifiers of not less
than 65 db. gain. Incl. 10 ft. two-conductor cable.

Microphone Division

UNIVERSAL MICROPHONE CO., LTD.
424 Warren Lane
Inglewood, Calif., U. S. A.

A New High-Power Triode

An unconventional type of construction is
utilized in a new power tube just released
by RCA. To be known as the 833, the new tube
is of the high-µ type and is intended for use as an
oscillator, amplifier, or Class-B modulator. The
tube structure is intended to minimize internal
lead inductance and reduce the amount
of internal insulation required, and is
said to provide high-efficiency opéra­tion at moderate
plate voltages.

Filament leads
are brought out to
heavy rod-type con­
nectors, one of
which has one side
flattened so that the
tube can be inserted
in the socket in only
one way. This pre­
vents reversing the
grid and plate ter­
minals, which are
at the top of the
tube. The overall
length of the tube is about 8 1/2 inches. In Class-
C service, the tube is rated at a maximum input
of 1250 watts at all frequencies up to 30 mega-
cycles, and may be used with reduced input up
to 100 megacycles. Characteristics and maximum
ratings are as follows:

- Filament voltage 10 volts
- Filament current 10 amperes
- Amplification factor 35
- Grid-plate capacitance 6.3 µfd.
- Grid-filament capacitance 12.3 µfd.
- Plate-filament capacitance 8.5 µfd.
- Max. plate voltage 3000 volts
- Max. plate current 500 ma.
- Max. grid current 75 ma.
- Max. plate dissipation 300 watts
- Max. plate input 1250 watts

At ordinary frequencies, a plate efficiency of
80% can be obtained with rather low driving
power. For example, one set of typical operating
conditions shows the driving power required as
25 watts for an output of 925 watts with 2500
volts and 475 ma. on the plate. The tube should
run easily at a kilowatt input.

The Maritime Convention

(Continued from page 10)

lege. He spoke briefly on impedance matching to
antennas, and an interesting period of discussion
and questions followed.

At eight o'clock the banquet got under way in
the Georgian ballroom of the Nova Scotian Ho­
tel. A. A. Stephens, VE1EC, President of the
Acoustic networks and particularly the Jensen Bass Reflex Principle now conceded by leading engineers to be the feature of 1938 Radio Receivers.

Says a recent engineering publication in effect: "The really new thing for 1938 is the Jensen Bass Reflex System."

And so 1938 Receivers will generally establish new high standards of acoustic performance.

Jensen Peri-dynamic Reproducers Models KM, with either 8, 10, 12 or 15 inch speaker, all incorporate Bass Reflex and are ready now. Ready for the owner who has been dissatisfied with ordinary loud speaker performance; who wanted brilliant highs and middle highs and a low frequency range extended in range and improved in quality. Low frequency response where the fundamentals predominate—not the harmonics.

Model KM-15 with 15" speaker as illustrated, is ideal for those who have high quality radio receivers and want real improvement in loud speaker performance. The receiver can easily be set on top of the Reproducer.

Available in Kits
Model KM is shipped in knock-down kits. Each kit consists of speaker and knock-down enclosure, packed in separate corrugated box containers, shipped together. All necessary screws, bolts, grilles, brackets, etc., included for assembling. Assembly instructions are complete. No tools necessary except an ordinary screw driver. Enclosures are finished with two coats of French Gray. Model KM with 8-inch speaker has a list price of only $22.00.

There is a Jensen Peri-dynamic Reproducer for all known loud speaker applications. Model KM as described above is ideal for general public address use; Model KV is recommended where speech reinforcement is the chief requirement.

Ask Your Jobber...Write For More Information

JENSEN RADIO MFG. COMPANY
6601 S. Laramie Avenue, Chicago, Ill. QST-1137

Please send me more information on Jensen Models KM and KV Peri-dynamic Reproducers.

Name..................................................
Address...........................................
City..................................................State

Say You Saw It in QST — It Identifies You and Helps QST
National offers a new Isolastite insulator for a fixed-ratio Q-bar transformer to match a center-fed half-wave antenna to a feeder using No. 12 B & S wire and six-inch spreaders (72 ohms to 600 ohms). They are designed for use with rigid duralumin tubing with an outside diameter of \( \frac{3}{4} \) inches, and are simply slipped over the tubes. The complete assembly is rigid, efficient and tidy as well as convenient to handle.

Q-Bar Insulator, Type QB, Net Price ........... $0.21

NATIONAL COMPANY, INC.
Malden, Mass.

Save Time and Costly Experimentation
Build the PROGRESSIVE III

450 WATT INPUT, C.W., AND PHONE ON 10-20-40-80-160 METER BANDS.

The radio amateurs - your country's reserve communications system - right now should be given every cooperation towards obtaining high power at low cost.

"PROGRESSIVE III" - Build it yourself - and you'll be ready when DX weather comes. Ingenious design has kept circuit capacities extremely low, permitting full power input either C.W. or phone - even on the 10-meter band. The circuit remains neutralized, permitting fast, easy band changing with plug-in coils.

It's easy to build, "step-by-step" if you wish, from standard parts on panel and chassis completely drilled with sockets installed. Circuits, diagrams, directions, etc. in AMATEUR TRANSFORMER MANUAL, 25¢ from your Jobber or Amateur Press, 333 S. Throop St., Chicago.

GENERAL TRANSFORMER CORP.
1288 W. Van Buren Street
CHICAGO

ASK YOUR JOBBER OR WRITE FOR FREE BULLETIN 44

Halifax Amateur Radio Club, handed the controls over to Major Borrett, VE1DD, who acted as master of ceremonies. The convention was officially welcomed to Halifax by Alderman Dr. S. H. Keshen, representing the Mayor. Alex Reid, VE2BE, of Montreal, Canadian General Manager, spoke briefly on the Bucharest and Cairo conventions. Joe Fassett, the grand old man of amateur radio in eastern Canada, formerly VE1AR, recalled some amusing anecdotes of the early days of radio.

After the brief speeches were over the ballroom was cleared for the contests. The code copying was won by VE1EC and the code sending was won by VE1HK. The silver cup for the VE1 who worked the largest number of foreign countries during the past year was again won by VE1CR. The humorous contests brought many laughs and were enjoyed by everyone. The convention adjourned after the presentation of prizes for the contests.

Sunday morning a large party of the convention were taken on board the Berengaria, which was in Halifax on a Labor Day cruise from New York. In the afternoon a picnic, with outdoor sports, was held at St. Margaret's Bay. The weather was rather cool, but three of the picnicers went in swimming and reported the water warmer than the air. During the afternoon the five-meter band was very active since many of the cars were equipped with transceivers.

Early Sunday evening the crowd returned to Halifax and scattered to visit the shacks of the local amateurs, but reassembled to attend the midnight show at the Capitol Theatre. After the show an opportunity was provided to visit the projection rooms and examine the sound equipment through the kindness of SCM VE1DQ.

After a very few hours sleep (for some) the hams again assembled in front of the Nova Scotian Hotel on Monday morning for the five-meter contests. These proved to be one of the best features of the whole convention, and hunt after hunt followed in succession. VE1HJ was in charge of the hidden transmitter and put out a good signal, in fact so good that he was found too quickly by VE1MA the first time. The second hunt lasted longer because the hidden transmitter was located in the centre of a large cemetery. In the afternoon different ones acted as the hidden transmitter and were located by the fleet of mobile five-meter stations cruising the narrow streets of old Halifax.

This concluded the convention, and the VE1's returned to their various QTH's. They all feel that the Halifax Club deserves to be thanked and congratulated for sponsoring such a successful and enjoyable hamfest. Orchids are specially due VE1 EC, AW, EF, FQ, FO, HJ, EK, Ed McLaughlin and, last but not least, the ladies' committee.

J. M. Morton, VE1JM/VE8ALK
These A.C. solenoid relays are ideal for remote control of transmitters, for control of crystal ovens, and for any general remote control application except for keying. **THESE RELAYS WILL NOT OPERATE IN KEYING SERVICE.** Silver-to-silver double-break contacts are used throughout.

The maximum contact rating is 10 amp. at 220 v. or 3 amp. at 550 v. The relay coils are wound for 115 volts 60 cycle alternating current. Relays for other voltages can be supplied on special order. Use coupon below.

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Poles</th>
<th>Normally Action</th>
<th>Circuit Diagram</th>
<th>Price Open</th>
<th>Price In Cab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A107</td>
<td>1</td>
<td>Open SP ST</td>
<td><img src="image1" alt="Diagram" /></td>
<td>$3.50</td>
<td>$4.50</td>
</tr>
<tr>
<td>A117</td>
<td>1</td>
<td>Closed SP ST</td>
<td><img src="image2" alt="Diagram" /></td>
<td>4.50</td>
<td>5.50</td>
</tr>
<tr>
<td>A127</td>
<td></td>
<td>Open and Closed SP DT</td>
<td><img src="image3" alt="Diagram" /></td>
<td>5.00</td>
<td>6.00</td>
</tr>
<tr>
<td>A137</td>
<td>1</td>
<td>Open SP ST</td>
<td><img src="image4" alt="Diagram" /></td>
<td>4.00</td>
<td>5.00</td>
</tr>
<tr>
<td>A147</td>
<td>1</td>
<td>Closed SP ST</td>
<td><img src="image5" alt="Diagram" /></td>
<td>5.00</td>
<td>6.00</td>
</tr>
<tr>
<td>A157</td>
<td></td>
<td>Open and Closed SP DT</td>
<td><img src="image6" alt="Diagram" /></td>
<td>5.50</td>
<td>6.50</td>
</tr>
<tr>
<td>A167</td>
<td>1</td>
<td>Open SP ST</td>
<td><img src="image7" alt="Diagram" /></td>
<td>6.50</td>
<td>7.50</td>
</tr>
</tbody>
</table>

**ORDER BLANK—MAIL WITH REMITTANCE TO**


Enclosed find money order for $...for which please send me, shipping charges prepaid, the following items:

- **Name:**
- **Address:**
- **Volts:**
- **Cycles:**

*Say You Saw It in QST — It Identifies You and Helps QST*
Precisely so. 600 v. D.C. working. The added margin of safety makes these handy electrolytics great favorites among "hams" and experimenters who build rigs to last. Write for new 32-page catalog.

Precisely so. 600 v. D.C. working. The added margin of safety makes these handy electrolytics great favorites among "hams" and experimenters who build rigs to last. Write for new 32-page catalog.

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. 8 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, W1BGY, 35 Call Street, Willimansett, Mass.

W2—H. W. Yahnel, W2SN, Lake Ave., Helmetta, N. J.

W3—R. E. Macomber, W3CZE, 418 10th St., N. W., Washington, D. C.

W4—B. W. Benning, W4CBY, 520 Whiteford Ave., Atlanta, Ga.


W6—D. Cason Maat, W6KHV, 423 East E St., Ontario, Calif.

W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.

W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.


VE1—J. E. Roon, VE1FB, 84 Spring Garden Rd., Halifax, N. S.

VE2—C. W. Skarsted, VE2DR, 236 Elm Ave., Westmount, P. Q.

VE3—Bert Knowles, VE3QB, Lanark, Ont.

VE4—George Behrends, VE4RO, 186 Oakdean Blvd., St. James, Winnipeg, Manitoba.

VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.

K4—F. McCown, K4RJ, Family Court 7, San Juan, Porto Rico.

K5—John J. Carr, K5AV, 75th Pursuit Squadron, Albrook Field, Canal Zone.

K6—James F. Pa, K6LBH, 1416D Lunarillo St., Honolulu, T. H.

K7—Leo E. Osterman, K7ENA, Customhouse, Wrangell, Alaska.

KA—George L. Rickard, KA1GR, P. O. Box 849, Manila, P. I.

Naval Communication Reserve Notes

(Continued from page 30)

friend who is in the Communication Reserve, or by communicating with the Commandant of the Naval District in which he may be located. The addresses of the Commandants are as follows:

Commandant,
First Naval District,
Naval Yard,
Boston, Massachusetts.

Commandant,
Third Naval District,
Naval Yard,
New York, N. Y.

Commandant,
Ninth Naval District,
Naval Training Station,
Great Lakes, Illinois.

Commandant,
Eleventh Naval District,
Naval Operating Base,
San Diego, California.
HAMMARLUND "MTC" CONDENSERS

A low-priced transmitting condenser with every feature necessary in quality transmitters of all kinds—that's the new "MTC" condenser by Hammarlund! Here are some "MTC" features—maximum rigidity, light weight, isolantite insulation, table or shelf mounting, Beryllium cushion-disc front bearing, rear ball bearing, silver plated wiping contact, heavy wide spaced aluminum plates, round edges for higher voltages, 19 sizes, 20 to 500 mmf., voltages from 1000 to 10,000, and prices range from $2.40 to $8.50! Use the MTC transmitting condensers and watch the QSL's come in!

For best results use Hammarlund, and to be sure you get a genuine Hammarlund product, look for the name—it's stamped on every product. Send for MTC bulletin for further details.

HAMMARLUND MANUFACTURING CO. 424-438 West 33rd Street, New York

Radio Operator’s Course
Telegraphy—Telephony
Aviation

PORT ARTHUR COLLEGE has been teaching Radio for twenty-eight years, and during this time it has never been our policy to guarantee positions to prospective students, directly or indirectly. We believe it wisdom at this time, however, to go on record in our QST advertising to say that it is impossible for us to even come near to supplying the demand for Radio Operators received by our Employment Department. We do not mean by this that all students who enroll will automatically secure positions. The demand is for graduates—good men who deserve and are qualified to hold positions. The graduates of our Radio School, so far as we know or can learn, are employed 100%.

It is possible for every student who enrolls at the P. A. C. Radio School and completes the course in keeping with our standards to receive employment as a Radio Operator for our station K P A C at the transmitter, in the control room, as trans-radio press operator, or announcer, and not only earn more money than he pays for the training but to also continue his training as a post-graduate student in advanced work and prepare himself to secure and hold operating positions in the upper bracket of broadcasting, marine work, announcing, or airways.

Port Arthur College advertises primarily to Radio Amateurs, and the training is too technical for the average student who has not selected Radio as his life's work. We know the opportunities for positions and advancement are unlimited for men who are interested in Radio and who plan to make this their career and are willing to make the sacrifice and effort necessary to master our training. P. A. C. maintains strict collegiate rank—only high school or college graduates are eligible for enrollment.

If interested in details about Radio Course, write for bulletin R

PORT ARTHUR COLLEGE . PORT ARTHUR (World-known port) TEXAS

Say You Saw It in QST — It Identifies You and Helps QST
This Much Is Certain. . . Cornell-Engineers have the interests of 
at heart. It may be because so many men on 
the C-D staff are "Hams" themselves. At any rate, they know 
the problems of the "ham."

It seems to us, that C-D engineers have uncovered "a real 
one" this time. You know of course, the sometimes lethal 
effect of a charged condenser. FOR YOUR SAFETY the 
Capacitors are supplied at no extra cost.

For complete details send for catalog No. 151-A.

CORNELL-DUBILIER ELECTRIC CORPORATION
South Plainfield, New Jersey

MATCH TIPS

Yes, but just as "hot" tips and 
far more profitable ones are to be 
found in Volume Two of

HINTS &
KINKS

50¢ postpaid from
AMERICAN RADIO RELAY LEAGUE, INC.
West Hartford, Connecticut

Army-Amateur Radio System Activities

(Continued from page 81)

New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.

II. C.A.—W2SC-WLN, Governor’s Island, N. Y.—New 
York, New Jersey, Delaware and Puerto Rico

III. C.A.—W8SN-WLQ, Baltimore, Md.—Pennsylvania, 
Maryland, District of Columbia, and Virginia.

IV. C.A.—W4IR-WLR, Atlanta, Ga.—North Carolina, 
South Carolina, Georgia, Florida, Tennessee, Alabama, 
Mississippi and Louisiana.

V. C.A.—W2ZQ-WLJ, Columbus, Ohio.—Ohio, West 
Virginia, Indiana and Kentucky.

VI. C.A.—W9ANR-WLT, Chicago, Ill.—Illinois, Wis­
consin, Michigan.

VII. C.A.—W8NT-WLU, Omaha, Nebraska.—North 
Dakota, South Dakota, Minnesota, Iowa, Nebraska, Kan­
sas, Missouri and Arkansas.

VIII. C.A.—W5OW-WLJ, Fort Sam Houston, Texas.—
Colorado, Arizona, New Mexico, Oklahoma and Texas.

IX. C.A.—W6NLL-WLV, Presidio of San Francisco, 
Calif.—Washington, Oregon, Idaho, Montana, Wyoming, 
Utah, Nevada, California.

Anyone desiring information on the Army 
Amateur Radio System can obtain it from the 
Signal Officer of the Area in which he lives. This 
list will also be helpful to A.A.R.S. members in 
competitions.

How Long Is a Quarter Wavelength?

(Continued from page 82)

assumed that this line is held several feet away 
from large conducting or dielectric bodies.

Line B consists of a two-conductor parallel 
tubing line using copper or aluminum tubing of 
diameters between $\frac{3}{16}$- and $\frac{3}{8}$-inch and tubing 
spacings between $\frac{3}{4}$ inch and 2 inches. This group 
includes the Collins “Multiband” and Johnson 
“Q” sections.

Line C consists of a concentric transmission 
line using No. 12 copper wire inside of a $\frac{3}{8}$-inch 
copper tube with Isolantite spacers every few 
inches along the line. Incidentally, the measured 
surge impedance of this line was considerably less 
than the calculated value of approximately 75 
ohms.

Line D is the conventional twisted pair of the 
“low-loss” type. This type of line should never
80-T TRANSMITTER

- Covers all bands from 10-160 meters on phone and cw.
- Has all necessary controls and meters, yet is simple to operate.
- Compact in size and well proportioned for restricted space.
- Reasonably priced and may be purchased on easy payments through your dealer.

YOU PROTECT YOUR INVESTMENT when you buy an 80-T transmitter because it becomes the foundation unit for our 700-R transmitter when higher power is later desired. We allow you the full purchase price of your 80-T when the larger transmitter is acquired, thereby eliminating any depreciation on your initial investment. This feature alone is well worthy of your consideration.

Write for Information and Prices

HARVEY RADIO LABORATORIES, INC.
25 Thordike St., Cambridge, Mass.

Press Lever—

Semi-Automatic Key Does the Rest

Insist on the Genuine Martin

VIBROPLEX

Semi-Automatic Key

PRECISION CRYSTALS

Highest quality crystals, one inch square, carefully ground for frequency stability and maximum output. Be sure of your transmitter frequency—use PRECISION CRYSTALS.

Low frequency drift crystals (Type LTC) supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750 and 1500 kc. bands — $3.50 each, 7000 kc. band $4.50 each. Holder $1.00.

(Holder as illustrated to fit G.R. jacks or round holder to plug into a tube socket can be furnished. G.R. jacks to plug illustrated holder into — $1.25 pair.)

*X" cut PRECISION Crystals carefully ground for maximum power supplied within 0.1% of your specified frequency and calibrated to within 0.03% are priced as follows: 1750, 1500 and 7000 kc. bands — $4.50 each. Add $1.00 if holder is desired.

"AT" cut crystals for commercial use quoted at your request. When ordering our product you are assured of the finest obtainable. Now in our seventh year of business.

PRECISION PIEZO SERVICE
427 Asia Street
Baton Rouge, La.
TWO "ALADDINS"

One had a lamp—

...remember the story of Aladdin and how he could work miracles by just rubbing his magic lamp? Well, today there's another "Aladdin" that works miracles, too, but not with a lamp...

The Other Has POLYIRON!

Like a modern genie, Aladdin "Polyiron" I.F. Transformers bring you an almost unbelievably higher degree of SENSITIVITY AND SELECTIVITY INCREASED GAIN - LOWER NOISE LEVEL - LESS LOSS - BAND EXPANSION. If you haven't a magic lamp to rub, see your jobber or write us for FREE TECHNICAL BROCHURE showing how and why Aladdin components greatly improve reception.

∗ ∗ ∗

ALADDIN RADIO INDUSTRIES, INC.
466q W. Superior Street, Chicago, Illinois
Licensee of Johnson Laboratories, Inc.

These devices manufactured under one or more of the following U. S. Letters Patents:
1,887,380 1,940,228 1,978,568 1,978,599 1,978,600 1,982,690 1,982,691 1,997,453 2,002,504 2,005,203 2,018,626 2,028,534 2,032,580 2,032,914 2,035,439 2,051,012 2,059,393 2,082,587 2,082,589 2,082,590

MAC AUTO, Finest Electrical Transmitter—Only 69.00
MAC PRACTICE SET, $2.95, MAC HUMMER... 1.50
MAC OSCILLATOR, Tone and Frequency Control... 4.50
MAC STRAIGHT KEY, Best Ever. Real Balance... 1.50
New 1938 Deluxe Semi-Automatic MAC KEY... $9.50
New 1938 Standard Model Semi-Auto. MAC KEY... 7.50
MAC STRAIGHT KEY, Best Ever, Real Balance... 1.50
MAC OSCILLATOR, Tone and Frequency Control... 4.50
MAC PRACTICE SET, $2.95, MAC HUMMER... 1.50
MAC AUTO, Finest Electrical Transmitter—Only 69.00

At Last!
A Perfected AUTOMATIC SENDER
only

$12.50 Postpaid in U. S. A.

Gardiner-Levering Co.
New Jersey, U. S. A.

EVERY RADIO OPERATOR

Wishes He'd Bought His MACKEY Long Ago!

Find out for yourself! You, too, will send faster, smoother code. Every MAC KEY designed, balanced and tested by Champion McElroy himself. Beginners and advanced operators everywhere are improving their speed and technique. Here are the most amazing values in telegraph history. See them at your jobbers. Get your MAC KEY now. You'll always be glad you did.

2 See also, "Match And Mis-match," by S. W. Scoley, elsewhere in this issue.—Enron.

Notes on Steatite-Type High-Frequency Insulation

(Continued from page 94)

constitute only a very small portion of the steatite body, they are the determining factors for the properties of the finished article and, by varying these fluxes, the ceramic engineer can produce specific properties in the finished body.

The mixture of talc and fluxes is plastic enough to be pressed by steel dies into desired shapes. By adding some water to the dry mixture, higher plasticity is obtained which makes it possible to extrude the body into tubular shapes or rods, through high pressure extension presses. After drying, these extruded pieces are just hard enough so that they can be machined similar to steel, brass or wood; and it is possible to drill holes or cut threads before the pieces are fired, or, as the ceramist says, "while the pieces are green".

The firing process, which takes place at very high temperatures in specially designed kilns,
NEW CANDLER COURSE!
Always the Short-Cut to Code Skill—NOW IMPROVED 50%!

If you REALLY want to be a speedy, accurate code operator, you have the most amazing opportunity in all code history! Walter Candler, maker of champions, will teach you everything you need to know to get your amateur or commercial license — and teach you in half the usual time! Don't go on just wishing to be a code expert when Candler training is so easy and so inexpensive. Today can be the turning point in your radio career. All you have to do is mail the coupon below. Why delay! Mail it now!

Walter Candler will train you personally, at home, to qualify as an expert operator. His phenomenal success with thousands of others guarantees your own proficiency. Candler knows the short-cuts. He'll save you months of laborious practice. Mail the coupon for proof.

MAIL COUPON TODAY FOR FREE BOOK

CANDLER SYSTEM CO.
Dept. Q-11, Asheville, North Carolina, U. S. A.
Send me your FREE book right away! My present speed is... w.p.m.
NAME...........................................................
Address..........................................................
City..........................................................State.................................

MAIL COUPON TODAY FOR FREE BOOK

CONDENSERS
THAT FEATURE:
HALF-LENGTH ROTOR SHAFT — putting inductance where it belongs, in the coil.
LOWER MINIMUM CAPACITIES — giving a greater tuning range.
BUILT-IN COIL MOUNTING — stator, link, and centertap terminals.
BUILT-IN NEUTRALIZING CONDENSERS — optional. No mounting problems.
SHORTER OVERALL LENGTHS FOR GIVEN PLATE SPACINGS AND CAPACITIES.
IMPORTED LEADLESS MYCALEX RF INSULATION — strength and low losses.
HUSKY CONSTRUCTION THROUGH-OUT — clean appearance.
CERAMIC STANDOFF INSULATORS — for ungrounded, grounded, or bypassed-to-ground rotor assembly.
BEAUTIFULLY POLISHED PLATES — 3/16 inch thick, with rounded edges.

You get all this, and more, in an ATKINS & BROWN condenser. The lower distributed inductance and lower minimum capacity enable a well designed ten or twenty meter transmitter to work on five meters — an added band. For any band — from 5 to 160 — there is nothing better. Get the Best!

ATKINS & BROWN
W6VX • 215 Fourteenth Street, Oakland, California • W6HB

Say You Saw It in QST — It Identifies You and Helps QST
**Station Activities**

**CANADA**

**MARITIME DIVISION**

**QST** for the coming winter and will relieve in an alternate capacity. Other stations desiring to hook in with these stations are requested to communicate with them. IP is turning his attention to transmitter alterations. OL recently acquired a new receiver, KE is looking over microphones. ZF keeps busy on 14-. 4 to 14-Mc. e.w. QC now uses his R2K3 as a buffer amplifier. The GMD is again in operation, RF is now able to put one of the rigs on 28 Mc. with a doubler, and all interested are welcome to meet every third Saturday afternoon.

**ONTARIO DIVISION**

**QST** for the coming winter and will relieve in an alternate capacity. Other stations desiring to hook in with these stations are requested to communicate with them. IP is turning his attention to transmitter alterations. OL recently acquired a new receiver, KE is looking over microphones. ZF keeps busy on 14-. 4 to 14-Mc. e.w. QC now uses his R2K3 as a buffer amplifier. The GMD is again in operation, RF is now able to put one of the rigs on 28 Mc. with a doubler, and all interested are welcome to meet every third Saturday afternoon.
cooler and has decided to move the rig to 14 Mc. OK has left Winnipeg for an operating post at The Pas in the North country. We wish him the best of luck. NI will be rebuilding with a T125 Class B modulator. The Winnipeg Radio Club has elected new officers, and the club will look forward to future activities.

Traffic: VE4AAW 15.

MAINE—SCM, Fred Skalof, VE4EL—AAA, operated by members of the S.A.R.C., has been on 14 and 56 Mc. The past seven months, “SWX” has resumed publication. IQ is running a pair of T20’s in final of new rig. L1 is working out FB on 3.5 Mc. with the new bug. MB, PN, PQ, UD have been fooling around with 50-Mc. equipment. QZ now has relay rack using 6L6G crystal osc. and ‘10 doubler-amp, with about 20 watts input. The S.A.R.C. staged a very successful show for members and preliminary to the club’s program of entertainment for the coming season, RJ has been operating 28-Mc. ‘phone. TW has visited his brother, WSFXR. UC is working on 14 Mc. with a T35 final. UD heard V02CQ on 28-Mc. ‘phone one noon. XY is now located in Saskatoon. XB got bitten by the XYL bug and is now operating on 14 Mc.

Traffic: VE4QZ 8 El 5.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, Frederick E. Jr., W1CTI—JXP reports that the Humdinger Net will have augmented outlets and contacts this season. APW had a portable 7-watt rig at summer camp. BDJ resumed schedule with 3BWT. BHI moved. IMX looks for Conn. stations on 1971 3800 to 3900 kc. are covered on QSL cards. Each night at 805 am functions the first and third Sundays of each month on 3840 kc. at 11:00 a.m. The M.Y.A.R.A. held its annual hot-dog and corn roast at Riverhill, and AWU took his initiation into the club. BDR has moved to a new shack. MAS now has a junior op. Congrats, OM. ILN is operating from N.H.U. this winter. KET, a newcomer in Milton, is attempting 700 kHz with 20 watts input. AKL is now located in Claremont and is on 1.7-Mc. ‘phone. FFL has the Antel going in great shape. BGF has an O.P.S. How about doing your share? KRY is ex-WIZK and will be on 7 Mc. some.

Traffic: W1ZB 103 IOT 89 (WLGN 36) AJ 75 IOR 56 JAH 12 DZU-I W6 DZ 20 W7ZB.

NEW HAMPSHIRE—SCM, Carl B. Evans, W1BFET—The N. H. State Traffic Net now meets on Tues. at 6:30 to 7:00 p.m. with BPT as control on Mon., Wed., Fri.; GMM as control on Tues., Thurs., Sat. at 3840 kc. Any and all stations are invited to get in on this. 3800 to 3900 kc. are covered on QSL cards. Each night at 805 am functions the first and third Sundays of each month on 3840 kc. at 11:00 a.m. The M.Y.A.R.A. held its annual hot-dog and corn roast at Riverhill, and AWU took his initiation into the club. BDR has moved to a new shack. MAS now has a junior op. Congrats, OM. ILN is operating from N.H.U. this winter. KET, a newcomer in Milton, is attempting 7006 kc. with 20 watts input. AKL is now located in Claremont and is on 1.7-Mc. ‘phone. FFL has the Antel going in great shape. BGF has an O.P.S. How about doing your share? KRY is ex-WIZK and will be on 7 Mc. some.

Traffic: W1BFET 48 (WLBG 30) KIN 44 GHT 17 HGW 13 IDY 12 CME 11 FIC 85 KBU 2 BFT 3800 to 3900 kc. as well as 3840 kc. any and all stations are invited to get in on this. 3800 to 3900 kc. are covered on QSL cards. Each night at 805 am functions the first and third Sundays of each month on 3840 kc. at 11:00 a.m. The M.Y.A.R.A. held its annual hot-dog and corn roast at Riverhill, and AWU took his initiation into the club. BDR has moved to a new shack. MAS now has a junior op. Congrats, OM. ILN is operating from N.H.U. this winter. KET, a newcomer in Milton, is attempting 7006 kc. with 20 watts input. AKL is now located in Claremont and is on 1.7-Mc. ‘phone. FFL has the Antel going in great shape. BGF has an O.P.S. How about doing your share? KRY is ex-WIZK and will be on 7 Mc. some.

Traffic: W1BFET 48 (WLBG 30) KIN 44 GHT 17 HGW 13 IDY 12 CME 11 FIC 85 KBU 2 BFT 3800 to 3900 kc. as well as 3840 kc. any and all stations are invited to get in on this. 3800 to 3900 kc. are covered on QSL cards. Each night at 805 am functions the first and third Sundays of each month on 3840 kc. at 11:00 a.m. The M.Y.A.R.A. held its annual hot-dog and corn roast at Riverhill, and AWU took his initiation into the club. BDR has moved to a new shack. MAS now has a junior op. Congrats, OM. ILN is operating from N.H.U. this winter. KET, a newcomer in Milton, is attempting 7006 kc. with 20 watts input. AKL is now located in Claremont and is on 1.7-Mc. ‘phone. FFL has the Antel going in great shape. BGF has an O.P.S. How about doing your share? KRY is ex-WIZK and will be on 7 Mc. some.

Traffic: W1BFET 48 (WLBG 30) KIN 44 GHT 17 HGW 13 IDY 12 CME 11 FIC 85 KBU 2 BFT 3800 to 3900 kc. as well as 3840 kc. any and all stations are invited to get in on this. 3800 to 3900 kc. are covered on QSL cards. Each night at 805 am functions the first and third Sundays of each month on 3840 kc. at 11:00 a.m. The M.Y.A.R.A. held its annual hot-dog and corn roast at Riverhill, and AWU took his initiation into the club. BDR has moved to a new shack. MAS now has a junior op. Congrats, OM. ILN is operating from N.H.U. this winter. KET, a newcomer in Milton, is attempting 7006 kc. with 20 watts input. AKL is now located in Claremont and is on 1.7-Mc. ‘phone. FFL has the Antel going in great shape. BGF has an O.P.S. How about doing your share? KRY is ex-WIZK and will be on 7 Mc. some.
changes the soft and fragile article into a stone-like and well vitrified mass. Under the microscope tiny crystals of magnesium silicate can be detected in a fired steatite body. These crystals are known as clinoenstatite by the mineralogist. These crystals interlock each other and give the high mechanical strength to the body, for which it is so well known. They are also responsible for the high electrical resistance and low dielectric losses of steatite materials.

With the thought in mind that a ceramic material with uniform crystalline structure has the lowest dielectric loss, special steatite materials have been developed with an extremely low power factor over the whole frequency range of the short and ultra-short wave spectrum. Such materials are obtained by carefully selecting the purest raw materials available and by employing unusually high firing temperatures to produce a perfectly uniform crystalline structure.

The great progress which has recently been made through the development of low-loss steatite bodies can be best realized by looking over the property table. These figures show, better than words, why low-loss steatite materials are suitable for radio insulation. Of special advantage is the fact that dielectric losses of steatite materials decrease with increasing frequencies, in contrast to organic insulators.

The softening point of these ceramic materials is way above the temperature range at which the material is used. No cold-flow is, therefore, possible and constancy can be maintained.

One of the very important characteristics of an insulating material is its behavior under humid conditions. One of the most difficult problems is to prevent moisture from affecting the insulating resistance and the dielectric losses of an insulating material. Many well known materials, good under dry conditions, become conductors and, therefore, useless if exposed to the moisture of the air.

If the insulator is porous, moisture penetration will take place through the material. The amount of moisture taken up naturally depends upon the porosity of the material, and the humidity and temperature of the surrounding air. To regain the former insulating qualities, it is necessary to dry out the insulator. This is a very slow process and usually it takes a considerable rise in temperature to dry out a porous insulator which has absorbed moisture. Moreover, some insulators, such as mica and organic resins, do not regain their original qualities, even after thorough drying.

Steatite materials which are completely vitrified cannot absorb moisture. It is, however, possible that moisture may condense on the surface of the insulator, forming a continuous moisture film which reduces the surface resistance if it is not broken up into small globules, separated and insulated from each other. Surface leakage through moisture can be overcome by glazing the insulator with a smooth and brilliant glaze. In some cases, and especially where the insulator cannot be glazed all over, it is better to impregnate with a water-repellent wax or varnish. The
The Buffer Coil Form Assembly illustrated at the left is both versatile and efficient. The Coil Form is drilled for leads and may be used alone, mounted on stand-off insulators. The Coil Plug also may be used alone as a base for self-supported coils. Construction throughout is of low-loss material, and contacts are rugged and positive.

SPECIFICATIONS

The Isolantite Coil Form is 1 3/8" diameter x 3 1/2" long. The base shown at the right is of R-39, and has five prongs with heavy side-wipe contacts.

UR-13, Assembly complete, $1.50
PB-5, Plug only ............. $ .45
XR-13, Coil Form only...... $ .66
XB-5, Socket only .......... $ .45

Prices shown above are net prices

NATIONAL COMPANY, INC., MALDEN, MASS.

100-WATT TRANSMITTER

IDEAL FOR HAM OR BEGINNER

1. High power, Design, Engineering, Parts, Construction and operation at Low Power Cost.
2. The identical superlative skill in design, care in construction and the same quality parts which have made famous the Temco High Powered transmitters now operating in the field, are embodied in the Temco 100 Watts.
3. Extremely liberal dealer time payment plans bring this x'mtr within the purchase power of your pocketbook . . . the initial payment, in fact, is as low as the price of most cheap, unassembled, low power kits.

- A post card will bring you a detailed description of the "100", our unusual finance plan and the name of your nearest dealer.
- 100 Watts output.
- Band Switching exciter from 10-200 meters.
- Remote and panel control with simplified tuning.

Transmitter Equipment Manufacturing Co., Inc.
130 Cedar Street • New York, N.Y.

Designers and Manufacturers of Radio Transmitting and Accessory Equipment

Say You Saw It in QST — It Identifies You and Helps QST
on 14-Mc., 'phone. GAN is bandaged up from a recent automobile crash. AHF is a new O.P.S. HOW has again succumbed to the radio fever. JHK operated two weeks for the mobile crash. AHN is a new O.P.S. HOW has again succeeded in rebuilding. IZM is building a log cabin "radio shack." NJ2JB is attending Middlebury College.

Traffic: W1AVP 14 FSY 8 GNP 5 AHN-DPO 4 KJG 3.

HUDSON DIVISION

EASTERN NEW YORK—SCM, Robert E. Haight, W2LJL—LU is on with new rack job; 59-10, 211 final. UL and CL plan trip to visit WELD and WRIL. CC keeps Scarsdale covered. BLU reports GTW home from sea. GXM is trying for DX on 50 Mc. BLU is pushing 100 watts into a 720. ECM attended Hudson Div. Convention. HNI is trying for 14-Mc. "click" band switching, 14, 7, 3.5 Mc. and 4200 kc. ACB is building crystalizer 100 kc. and 2000 kc. for checking frequencies for the boys. JFT and KMC are active on 3723 kc.

Traffic: W2LU 31 UL 34 BLL 11 CO 7.

NEW YORK CITY AND LONG ISLAND—SCM, Ed. L. Thompson, W2ZM—JOLLY is O.P.S. and 81-G, 81-A with UL, ICX is out for R.O.S. appointment. JBL is going to Middlebury College. HMJ has his Class "A" ticket. ECL is working the VK's plenty. IOP is trying 'phone. LGN says he is going to go to sea when he leaves going to England any time. EZ is building a rig for HTX using band switching. ELK can be heard on all bands. JGF is on 14-Mc. 'phone. Flash! HUM brings to Ham Radio a new AMS; one of BHR's "burst" type. CXO has a new rig. ENH is putting up two new poles. ESO has a new receiver and transmitter. CEL moved to Greenville, S. C. Sorry to see you go, CEL. BRK is able to be out again after a long illness. DCY is trying for DX on 3,5-Mc. c.w. during the month. The P.A.M.'s or R.M.'s will be glad to report for you if you don't report direct to me.


SOUTH CAROLINA—SCM, Ted Ferguson, W4BGE— I am proud to be your new S.C.M. and assure you I will do my best. DFT, working 3.5 Mc. 7 to 8 p.m. each night, is looking for S. C. stations. ECG has new Sky Changer. DQQ reports that BCN, CJR, KSA have found QRP and are happy. DQQ is working 'phone with fine results. HQZ class A and is getting ready for 3.5-Mc. work. YEH has a brand new rig and expects to be on 7 Mc. soon. Follows, don't forget your reports each month. The P.A.M.'s or R.M.'s will be glad to report for you if you don't report direct to me.


ROANOKE DIVISION

NORTH CAROLINA—SCM, H. R. Carter, W4OG— I want to take this opportunity to thank the Richmond gang for a swell time at the convention. The Salisbury Club is looking for a large crowd for the hamfest the first Sunday in November at Arts & Crafts. DXK and ETA are attending the Roanoke Division. DQV has a 5-band All-Star transmitter. DOU has entered N. C. State College. VN is working for the N. C. State Highway Patrol installing transmitters and receivers. One of BHR's "banned" "Cox" has moved on with new rack job; 59-10, 211 final. ENF is putting up two new poles. ESO has a new receiver and is going on 3.5 Mc. with increased power. ESB rebuilt his rig. CRL moved to Greenville, S. C. Ensi is using 838's final modulated by 838's Class B (500 watts phone and 750 watts c.w.), an oscilloscope, an HRO, and a Johnson buffer, 211 final on 3710 kc. KOI is new ham on 1.75-Mc. 'phone. Flash! HUM brings to Ham Radio a new AMS; one of BHR's "burst" type. CXO has a new rig. ENH is putting up two new poles. ESO has a new receiver and transmitter. CEL moved to Greenville, S. C. Sorry to see you go, CEL. BRK is able to be out again after an illness. DFT, working 3.5-Mc. c.w. during the month. The P.A.M.'s or R.M.'s will be glad to report for you if you don't report direct to me.

ATTENTIVE PENNSYLVANIA—S.C.M., John Buck Morgan, WBQP—R.M.'s: SAKB, A3QN, 3EBW, P.A.M.: 3EOL. 3E5S won the Main Line Radio Club’s hidden transmitter hunt. SAKB is delivering one-day-old traffic from XU, KA and K5. The A.A.R.L. lines are doing a swell job soothing worried relatives and friends in the Far East. SPCJ is now both N.C.R. and A.A.R.S. 3EHW has rebuilt his receiver. 3E9U has a new 3.5-Mc. full-wave s.s.p with one and in a day, he’s waiting for his 10K Mac. power transformer. KI4U schedules VOII and W10DHA. ONP plans schedule with QBS at C.C.C. Camp. MOL has new Patterson receiver. QZZ and KTB live next door to each other. Hi! QZQ visited ATG and 3C6C. Black Diamond Radio Club (B3RJ) is also in the mountains. For club house, they are building a 1 kw. transmitter. PNE is pres. 3ZZQ secy. LGB treas. NLE, OHW and REP returned from course at Naval Training Base. MCL is now Ensign in N.C.R. KIK has a brand new QST with 7 Mc. Traffic: W5LCN 7 WKW 2 XKU 20 PHY 5 K5J 1 MOL 4 NAII 2.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA—S.C.M., John Buck Morgan, WBQP—R.M.'s: SAKB, A3QN, 3EBW, P.A.M.: 3EOL. 3E5S won the Main Line Radio Club’s hidden transmitter hunt. SAKB is delivering one-day-old traffic from XU, KA and K5. The A.A.R.L. lines are doing a swell job soothing worried relatives and friends in the Far East. SPCJ is now both N.C.R. and A.A.R.S. 3EHW has rebuilt his receiver. 3E9U has a new 3.5-Mc. full-wave s.s.p with one and in a day, he’s waiting for his 10K Mac. power transformer. KI4U schedules VOII and W10DHA. ONP plans schedule with QBS at C.C.C. Camp. MOL has new Patterson receiver. QZZ and KTB live next door to each other. Hi! QZQ visited ATG and 3C6C. Black Diamond Radio Club (B3RJ) is also in the mountains. For club house, they are building a 1 kw. transmitter. PNE is pres. 3ZZQ secy. LGB treas. NLE, OHW and REP returned from course at Naval Training Base. MCL is now Ensign in N.C.R. KIK has a brand new QST with 7 Mc. Traffic: W5LCN 7 WKW 2 XKU 20 PHY 5 K5J 1 MOL 4 NAII 2.

The Washington Radio Club resumed business Sept. 11th. EZN wishes to serve notice to all hams in the vicinity of Wash’n that all their friends will be found at the club on receiving night, the 26th. EZN has been re-built, HBE is working 3.9-Mc. phone. BAK is doing some rebuilding. DRE is building another amplifier stage. DQG is testing out new receivers. AXP has returned to the Penna. Military College, and will resume his schedules with the OM, BAK, at home. DQN/WLMC handled about half of CKL/WLM schedules during the Aug.-Sept. month.

Traffic: WDQN 294 (WLMC 971) CXL 85 (WLM 1010) SN 316 CXL/WLM 4 3EXO 3 FSM.

SOUTHERN NEW JERSEY—S.C.M., Walter Filson, W3BEI—There is room for more good traffic men in the So. N. J. Section in order to give sufficient coverage for the net in the Section. EKL of Pitman breaks out with a brand new rig on air. P.B. is going strong. The Northwest Net consists of: MOT, CUG, GSH and OKS. R.M. KUN acts as link between both nets. DQN/WLMC handled about half of their reception and very proud to have him. New R.M. for Northern District: 8OLV; he assists 8MCL, Southern District R.M., in organizing an A.A.R.L. West Virginia Net on 3700 kc. Your applications solicited. BOW got a job in Greensburg. AAO moved to Canton. ELO and OSU married. Congrats, OM’s. REP is new station in Moundsville. KID is now both N.C.R. and A.A.R.S. 3EWJ has rebuilt his transmitter. HAY is newly licensed ham in Runnemede. ZX is having mast trouble with a 1 kw. trans. BEF, along with ZX, is still keeping schedules with K4ENY. The So. Jersey Net got under way again on Sept. 26th. Regular net sessions on 3700 kc. Tues., Thurs. and Sat. at 7:15 p.m. Net control station 3BEI and later SQL and 3BYR.


WESTERN NEW YORK—S.C.M., Chaas. F. Smith, WSDB—R.M.’s: SUTT, 3BJO, CSOE, SACE, SAMS. P.A.M.: 8CGU, PLA starts the season in fine style by leading the traffic gang. LUPF spends a lot of time rag-chewing. DHC, ADFP and LGE have joined the W. N. Y.-1 Net. PFM, CSOE, LGH, SMOT, 3EQJ, QGH, and WMV at Binghamton Hamfest. GWT, after experimenting for many weeks, is now ready to get on consistently. BFG and KXXA want to get on the 7-Mc. Net suggested by CSE. All interested mail in a line at once. QPS is on with increased power. KXXA reports BKB has passed Penna. Military College, and will resume his schedules with K4ENY, KJSQ and ABN are lining up nice schedules. The former also expects to make daily broadcasts to MJV and JFF, who will be away at college. All O.R.S. and O.P.S. are obligated to report monthly. Failure to do this is going to cause a lot of cancellations in the near future. Let’s get going, FG sends best wishes to ye S.C.M. and promises full cooperation during the coming season. 73.

Traffic: W8PLA 44 LUG 3 QHX 2 DHU-QDP 1.

WESTERN PENNSYLVANIA—S.C.M. Kendall Speer, Jr., W8QFO—R.M.’s: 3SKN, 3KWA, SMOT, P.A.M.: 3SHQ, A3QN, 3BWD, N.C.R.: LIason R.M.: 3KOB. New O.R.S.: 3GSI, OKS, 3BOU-8. Prospective O.R.S.: 3DFY; O.P.S.: 3CQJ. The two O.R.S. Section Nets are going strong. The Northwest Net consists of: MOT, KUN, IOJ, DCD, AXD, KOB and KOB. The Southwest Net consists of: MOT, CMJ, GSH, PWU, UK, GUF, MTW, UK, CUG, GHQ and OSF. R.M. KUN has taken over the W. N. Y.-1 Net. DON’T FAIL TO TAKE PART IN THE W. PA. QSO CONTEST. See September QST for details, Prizes are rolling in, and it looks like they will exceed the Sixty Dollars worth awarded last season. OFO worked his first 3T, ON and HK. KOB made the R.C.C. OBS use his O.R.S. crystal in a trick lock circuit which works FB. KBA will be active on National Trunk Net as well as regular Trunk Line “A.” NDE says the Humdinger Net is going strong again. DDC is teletype operator at the Butler State Police Barracks. IOJ is opening operating nights with his brother, IOI, who uses an RK-20 suppressor grid modulated. MIV was with the American Legion at the New York Convention. MWV has a new rig. The N.C.R. Unit at Farrell is all steamed up for another big year. OAJ is on 28 Mc. phone. IYQ wants to sell his oscilloscope. MUT is pleased with his skyhook he won at the SHH, R.M. HAMFEST. PFO is now on the Engineering Staff of KDQ. QAN received a fine promotion at his firm which may limit some of his radio activities. CMP made two round trips to the West Coast this summer with many side trips: quite a few conventions and gatherings were attended. UK is building a complete new rig using a pair of T55’s in final.

Traffic: W8OMT 391 OFO 108 (WLQY 11) KOB 77 (BD7C 4) PFW 18 GBC 42 KUN 41 OKS 40 KWA 18 NDE 10 DDC 10 UK 8 IOR-MJIE 7 GSH-QVQ 3 A2D 2.

November, 1937
most effective waxes are mineral waxes of low acidity. Waxes with low dielectric losses are available which do not change the good dielectric properties of the insulator. Ceresin wax is widely used for this purpose. The insulator is heated up to the melting point of the wax, dipped into the molten wax and the superfluous wax thrown off by centrifuging. This gives an even and thin coating which is not noticeable to the eye, but an impregnated insulator can be easily distinguished from an unimpregnated one by putting a drop of water on the surface. The water spreads over the surface of the unimpregnated material.

Steatite insulators, and especially those of the low-loss type, have found wide application and are used to advantage in many receivers and transmitters. The introduction of low-loss steatite materials has led to the improved construction of coaxial cables, bases of trimmer condensers, high-quality tube sockets, crystal holders, and plates for air tuning condensers, bases for air inductors and a variety of coil forms. There is hardly any insulating part in a radio set which cannot be made out of these low-loss materials. They are applicable wherever rigid construction is essential and where high electrical resistivity and low dielectric losses are important requirements.

Making the Most of Directive Antennas

(Continued from page 37)

When first putting up these antennas the lot plot was used to determine true north; without correction, a compass is practically valueless. With this as a basis, and using long straight sticks and protractors laid on the ground, the original antennas were put up. Although they were working satisfactorily, after about a year a registered civil engineer was employed to locate the poles with respect to true north and also to locate the trees, swing and other places where the antennas were fastened. A sight on the sun was also taken so that an exact base line could be established on the side of the lot. When the work was finished it was discovered that the New York antenna was 1½ degrees out of line. Originally intended to hit two degrees north of New York so it would also be effective in southern New England, it was actually 3½ degrees north of New York, so that the 5-degree part of the beam cut out some of the twenty-meter phones in the greater New York area. They simply were not as good as they were when the antenna was corrected for this degree and a half. Ever since it has functioned exactly as planned, and the survey was well worth while.

CROSSTALK

There are nine feed lines coming into the radio rooms—eighteen wires in all—accordingly there would be some coupling into the wrong antenna if certain precautions were not taken. These precau-

* Alternatively, a bearing may be taken on the Pole Star, or from the sun at noon as described elsewhere in this issue.
DON'T KICK AND HOLLER
Be Wise —

GOSH! WHY DIDN'T I BUY
KENYON COMPONENTS
INSTEAD?

Ask your local jobber to show you the new Amateur line of audio and power components. One hundred and eighty different items ranging from small pre-amplifiers to 1 KW audio components.

Our Universal line of transformers entirely eliminates obsolescence.

KENYON TRANSFORMER CO., INC.
840 Barry Street, New York, N. Y.

Export Department: 25 Warren Street  
Cable Address: Simontrice, New York

SPECIAL TO AMATEURS
Piezo-Electric Crystals — $2.50 EACH POSTPAID
Until supply is exhausted . . . we offer 80 meter band crystals unmounted; accurate calibration, excellent oscillators.

Limited quantity.

SCIENTIFIC RADIO SERVICE
"The Crystal Specialists Since 1925," University Park, Hartselle, Md.

10 VOLTS AC
Anytime! Anywhere! With KATOLIGHT PLANTS
65 Watts AC and 6 Volt DC — $22.60
105 Watts AC and 12 Volt DC — $49.00
1000 Watts AC and 24 Volt DC — $84.00
Portable  — Self-Brushing
Ask for Special Discount to Amateurs
400 watts 115v. A.C. Generator only $12.00
6, 12, 24 and 315 volt Rotary Converters.
AG/AIC and H.I. Generators, Etc., Etc.
Write for Details
KATO ENGINEERING COMPANY
Mankato, Minnesota, U.S.A.

LEARN CODE RIGHT
Tapes for Every Need — Even Airways — Send You Typical Messages by INSTRUCTOGRAPH
It's easy and practical to learn or improve your Radio or Morse Code, any speed. Senior model with 10 tapes and Book of Instructions — $20.25. (Rented at low cost) Junior model with 5 tapes and Book of Instructions — $12.00. (Not rented). Complete oscillator equipment, keys, battery, $6.50. Write for details today.

WARD LEONARD ELECTRIC COMPANY
41 South Street, Mount Vernon, New York

LEARN CODE RIGHT
Tapes for Every Need — Even Airways — Send You Typical Messages by INSTRUCTOGRAPH
It's easy and practical to learn or improve your Radio or Morse Code, any speed. Senior model with 10 tapes and Book of Instructions — $20.25. (Rented at low cost) Junior model with 5 tapes and Book of Instructions — $12.00. (Not rented). Complete oscillator equipment, keys, battery, $6.50. Write for details today.

INSTRUCTOGRAPH CO., Dept. Q-11
312 Lakeside Plaza
Chicago, Ill.

Radio College of Canada
655 Bay St., Toronto


Say You Saw It in QST — It Identifies You and Helps QST
supply for the T-55 stage is made to deliver as high as 1300 volts at shown on page 23 of the June, 1937, issue of QST. The power split stator condenser is used in and sockets, UTC transformers, IRC insulated resistors, SANGAMO and in series on the high frequency bands. All this is accomplished in the base arrangement of the plugs. Since insulation plays an important part in high frequency operation, only the best quality parts are used in this transmitter.

We furnish CARDWELL condensers, NATIONAL coil forms and sockets, UTC transformers, IRC insulated resistors, SANGAMO and CORNELL-DUBILIER condensers, a drilled and punched black crackle chassis (so that all the hard work is finished, and all that remains is a few hours of simple wiring.)

We also furnish a complete kit of coil forms and wire, exactly as shown on page 23 of the June, 1937, issue of QST. The power supply for the T-55 stage is made to deliver as high as 1300 volts at 300 ma. This allows for the addition of another T-55 at some future time. The power supply has a tapped arrangement for 850 volts, 1000 volts or 1300 volts. The smaller supply will deliver 500 volts at 200 ma.

NET PRICES

Transmitter kit...$39.95 Taylor T-55........$8.00
Power supply kit...18.95 Taylor 866 Jr.......1.00
Low voltage kit...9.95 RCA 6L6............1.35
Taylor T-20......2.45 RCA 83............0.96

We sincerely hope that this little story will encourage other amateurs to put up as many directive antennas as they possibly can. The single-wire feed-line type should not be used because of inter-action between antennas, but aside from this precaution we have come to the conclusion that just about as many antennas as a fellow cares to use can be put up on one lot. Several years ago there were fourteen originating from this one station. They were spread out a little more in those days, but made a very satisfactory array.

The more directive antennas that are put up the greater the enjoyment of amateur radio, the more reliable the communication and the less interference caused to stations not in the line of transmission. This means that the amateur with beam antennas is trying to be just as courteous as possible, for in addition to using only one frequency, he uses just the particular slice of air in which he is most interested at the moment.
MORE GOOD HAM NEWS

MORE good ham news means further savings and better hamgear. The supply of 40 M xtals at 99 cents is running low. Our offer of Kenco still holds. Remember we also carry the latest standard radio material in stock.

Broadcast Quality DB Mike and Trans. for $4.95
This Kellogg 501 microphone and transformer was formerly sold to broadcast stations at $90.00. It’s a stretched diaphragm, chamber damped, heavy machined job advertised by Kellogg “practically an equal amplitude from 50 cycles to 5000 cycles.” The Kellogg 900 transformer is added for your convenience.

Guaranteed Tobe Micranol 2000 volt, 2 mfd. for $2.45
We apologize for holding out on the new Tobe Micranols. This Tobe 2 mfd. condenser has been tested and held at 17,000 volts so we feel that an unconditional guarantee is warranted for ham use. We will replace or make a refund on any Tobe Micranol 2 mfd. condenser we sell that has failed in a ham set.

Coto Coil Forms
13c
Real receiver and buffer coil forms:
4 prong standard
5 prong standard
6 prong standard

TAYLOR
MORE WATTS PER $$
T20 .... $2.45
T25 .... $8.00
T125 ... $13.50
T200 ... $21.50

BLILEY
POWER CRYSTALS
LD2 .... $4.80
BC3, New .... $3.35
HF2 — 10 & 20 M .... $5.75

CD
WET ELECTROLYTICS
8 mfd., 475 V .... 30c
16 mfd., 475 V .... 49c

Bassett Concentric
50, 75 and 100 ft. 1 kw cable. Also new low power cable 16c per ft.

OMHTE
RESISTORS & BAND SWITCHES
From the 1 watt to the 200 watt, with slider taps and the amous band switches for 3 and 5 bands in stock.

ALADDIN
POLYIRON INDUCTANCES
You know those if's that are made for 7,600 Kc and 5,000 Kc as well as standard 175 Kc and 465 Kc types.

40 Meter X cut
99c
7200 to 7500 kc
Orders from near and far for these 40 meter xtals are made by nationally known ham... will exhaust our supply by Xmas.

See the new HALLICRAFTER SX-16
This is an unusual receiver capable of chasing out those hibernating DX signals. We are told that the SX-16 has “IT” over any other receiver yet produced and it costs less. We’d rather have you decide. You can be sure of factory alignment when buying from The Radio Shack. Allowances on standard receivers and most favorable time payments may be arranged.

Coto Coil Inductors
Have you seen the two sizes, (A and B) which come plain, link, or variable link? The link is in the inside center of the coil where the pickup is best. The mounting material is a slow burning, low loss material—not celluloid.

Special Speech Amplifier (DRIVE OR LOW POWER MODULATOR)
This high gain speech amplifier with 110 volt AC supply tone and mixer controls, will operate from a high impedance microphone including Velotron, crystal or velocity microphone or phonograph pickup, to 500 ohm load at a good 10 watt level. The quality does credit to phonograph records. Its small size makes it convenient to install. Complete, wired, less tubes, $19.50

MAIL ORDERS PROMPTLY FILLED—SAVE TIME AT THE SHACK
Every DX' er Needs This Clock--
WORLD TIME
at a glance!

GORDON NAME PLATES

ANTENNA TUNING
A complete line of 106 beautiful, chrome plated name plates for Transmitting, Sound and Test equipment.

You're there ON TIME with a World Wide clock! One quick glance gives you Standard OR GMT time--conveniently--for any one of the twenty-four time zones around the world.

This 24 hour time-piece, has a genuine William's movement. Attractively colored dials plainly marked for direct reading. Self-starting. Operates on 110 volt, 60 cycle, AC.

Here is a beautiful, practical instrument you will be proud to keep above your desk and on your test bench. The time displayed is the time set, unless adjusted. Easy to set, easy to read. Get yours today! See your jobber. Inquiries invited.

GORDON SPECIALTIES COMPANY
440 SOUTH DEARBORN STREET • CHICAGO, ILLINOIS

NEW PHONES FOR THE BIG Amateurs! Check your requirements and don't forget the importance of your phones. Get new ones--get better ones--get FEATHERWEIGHTS.

For information, write Dept. R-4
TRIMM RADIO MFG. CO.
1770 Berteau Ave. Chicago, Illinois

THAT PERSONAL TOUCH — by W9ANZ
"The Pioneer 14 Mc. Phone Amateur of the World"

RECEIVERS — TUBES-
1938 Skydrier...$99.00 Victory Tube...$8.00
RME99...151.20 Taylor T20, T22...2.45
Patterson PRR...109.50 Taylor T25...13.50
Billey HO tube...2.35 Taylor T36, A...1.98
Billey LD tube...4.80 Taylor T200...21.50

A card brings catalogue and information.

LEUCK ELECTRIC SERVICE, LINCOLN, NEB.

LOW PRICED! EASY TO ERECT!
STEEIi ANTEENA TOWER

HAMS!—Here's the ideal antenna tower—can also be used as a vertical radiator. Strong! Light! Weight! Extremely rigid! Comes in 20 ft. sections, with 5 ft. big, knocked down, for building towers 25, 45, 65, 85, or 105 ft. high, as you wish. Easy to erect. Easy to climb.

Tower Legs—1/4 x 1/2 x 20 ft. Low carbon 20 gauge steel. Galvanized after fabrication. Cross Bars—1/4 x 1/2 x 12 ft. mild steel, spot welded to form X bracing. Routed black enamel. Bolts—1/4 flats x 5/8-10 x 3. Low carbon steel. Guy Wire—300 ft. No. 9 galvanized with each 20 ft. section. Tower weighs 44 lbs. per foot when assembled.

Order Direct From
WINCHARGER CORPORATION
Dept. QST-11 Sioux City, Iowa

Standard Frequency Transmissions

<table>
<thead>
<tr>
<th>Date</th>
<th>Schedule</th>
<th>Station</th>
<th>Date</th>
<th>Schedule</th>
<th>Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nov. 5</td>
<td>W6XK</td>
<td>Dec. 3</td>
<td>A</td>
<td>W6XK</td>
<td></td>
</tr>
<tr>
<td>Nov. 12</td>
<td>W6XAN</td>
<td>Dec. 10</td>
<td>B</td>
<td>W6XK</td>
<td></td>
</tr>
<tr>
<td>Nov. 17</td>
<td>W6XK</td>
<td>Dec. 15</td>
<td>B</td>
<td>W6XK</td>
<td></td>
</tr>
<tr>
<td>Nov. 10</td>
<td>W6XAN</td>
<td>Dec. 17</td>
<td>B</td>
<td>W6XK</td>
<td></td>
</tr>
<tr>
<td>Nov. 24</td>
<td>BB</td>
<td>W6XAN</td>
<td>Dec. 22</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Nov. 26</td>
<td>BB</td>
<td>W6XK</td>
<td>Dec. 24</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>Nov. 27</td>
<td>BB</td>
<td>W6XAN</td>
<td>Dec. 26</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Nov. 28</td>
<td>BB</td>
<td>W6XK</td>
<td>Dec. 31</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

STANDARD FREQUENCY SCHEDULES

<table>
<thead>
<tr>
<th>Time</th>
<th>Sched. and Freq. (kc.)</th>
<th>Time</th>
<th>Sched. and Freq. (kc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00</td>
<td>3500 7000 4:00 7000</td>
<td>8:00</td>
<td>3500 7000 4:00 7000</td>
</tr>
<tr>
<td>8:08</td>
<td>3600 7100 4:08 7100</td>
<td>8:16</td>
<td>3700 7200 4:16 7200</td>
</tr>
<tr>
<td>8:24</td>
<td>3800 7300 4:24 7300</td>
<td>8:32</td>
<td>3900 7400 4:32 7400</td>
</tr>
<tr>
<td>8:40</td>
<td>4000</td>
<td>8:48</td>
<td>4100</td>
</tr>
</tbody>
</table>

The time specified in the schedules is local standard time at the transmitting station. W6XAN uses Central Standard Time, and W6XK, Pacific Standard Time.

TRANSMITTING PROCEDURE

The time allotted to each transmission is 8 minutes divided as follows:

2 minutes—QST QST QST de (station call letters).
3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W6XAN is "O"; and that of W6XK is "M".

1 minute—Statement of frequency in kilocycles and announcement of next frequency.

2 minutes—Time allowed to change to next frequency.


W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Perry in charge.

Schedules for WWV

For transmissions and schedules of standard time intervals and ionosphere bulletins see "WWV Services Again Expanded," June, 1937, QST.

Each Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station WWV will transmit on three frequencies as follows: 10:00 to 11:30 a.m., E.S.T.; 5,000 kc., noon to 1:30 p.m., E.S.T.; 10,000 kc., 2:00 to 3:30 P.M., E.S.T., 20,000 kc.

A Deluxe 100-Watt Transmitter

(Continued from page 41)

angle, held together with dural gusset plates and rivets.

The front panel is a single sheet of 1/2-inch 17ST dural, with the back side bright-dipped and the front finished in a dark grey lacquer. The designations and dial scales were then engraved through the paint and into the metal. This imparts a commercial appearance to the transmitter and avoids cluttering up the panel with a multiplicity of etched plates, which tend to cheapen the looks of an otherwise attractive panel.

Since finishing this transmitter, a wider variety of isolantite wafer-switch parts have been made
To give you SPECIALIZED PERSONAL SERVICE of genuine value that is not available from other jobbers.
To sell receivers, transmitters, and parts on TERMS arranged to suit you with less interest than heretofore charged.
To take your equipment in TRADE on other equipment at a fair value.

To have the most COMPLETE stock of amateur equipment and give you quicker SERV­ICE, better TECHNICAL HELP, and more complete INFORMATION about equipment.
To allow you to TRY all receivers for TEN DAYS without obligation and to COOPER­ATE with you in every way I can to see that you are entirely satisfied.

**COMPARE BOB HENRY’S TERMS WITH OTHERS**

<table>
<thead>
<tr>
<th>Model of Receiver</th>
<th>Cash Price</th>
<th>Down Payment</th>
<th>12-month Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>RME-69</td>
<td>$151.20</td>
<td>$30.24</td>
<td>$10.81</td>
</tr>
<tr>
<td>Sky Buddy</td>
<td>29.50</td>
<td>3.00</td>
<td>2.20</td>
</tr>
<tr>
<td>Sky Challenger</td>
<td>69.50</td>
<td>13.90</td>
<td>4.15</td>
</tr>
<tr>
<td>Super Skylrider</td>
<td>99.00</td>
<td>19.80</td>
<td>7.11</td>
</tr>
<tr>
<td>PR-15</td>
<td>109.50</td>
<td>21.60</td>
<td>7.75</td>
</tr>
<tr>
<td>Breting 14</td>
<td>108.00</td>
<td>21.00</td>
<td>7.86</td>
</tr>
<tr>
<td>ACR-155</td>
<td>74.50</td>
<td>14.40</td>
<td>5.38</td>
</tr>
<tr>
<td>ACR-111</td>
<td>189.30</td>
<td>36.90</td>
<td>13.51</td>
</tr>
<tr>
<td>Super Pro</td>
<td>238.14</td>
<td>47.62</td>
<td>16.95</td>
</tr>
</tbody>
</table>

Similar terms on all Harvey, RCA, RME transmitters and Stancor, Progressive, All Star kits.

You can reach me by letter, telegram, phone, or visit nearly 24 hours a day, 365 days a year. Write for any information. Your inquiries are invited.

**HENRY RADIO SHOP**
211 North Main St., Butler, Missouri
available, so by changing $SW_1$ and $SW_2$ to 2-pole 5-point switches, and wiring to retain proper switching sequence, it is possible to gang these two with $SW_3$ and so reduce the number of controls.

---

**Silent Keys**

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

- Raymond L. Barbaur, W7EJK, Bremerton, Wash.
- Bernard E. Beatty, W9YTM, Sibley, Iowa
- George F. Corey, W1CMZ, New Bedford, Mass.
- Engle Ellis, W5BWY, Fort Worth, Texas
- George T. Gillogly, W7EJH, Spokane, Wash.
- William Greiger, W8JAS, Lansing, Ohio
- Ruth Jerrett, XYL VO2Z, Brigus, Newfoundland
- John LaValle, W2GWH, Bronx, N.Y.
- Sergio Levi, IlSL, Firenze, Italy
- Carleton W. Moore, W1HOY, Hampton, N.H.
- Max Mousty, ON4MX, Menin, Belgium
- Thomas L. Pettigrew, W6KLF, Compton, Calif.
- Frank W. Paulus, Jr., W9PVW, Sedalia, Mo.
- J. Kenneth Reed, W8BRI, Newark, N.Y.
- Floyd S. Scobee, W7FBC, Blaine, Wash.
- Dr. O. E. Wall, K6DB, Honolulu, Hawaii
- Kenneth D. Wilson, W7AGK, Spokane, Wash.

---

**The 8th A.R.R.L. Sweepstakes**

(Continued from page 45)

or new hams invited and reported by such a club, in addition to sending a contest report have their club secretary write HQ listing their individual calls and scores, and the total of such scores. If there are bothclub ‘phone and c.w. entries, A.R.R.L. will provide two certificate awards for the club to give its leading members. Besides this, the sum of the scores of all club participants (‘phone and c.w.) will be added by the secretary, to count for the club!

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 of “SS” reports when he adds figures reported by individual members. Club members must send in full reports either direct or through the secretary to substantiate the club’s claim on the gavel award! A chance to win honors
BUY FROM THE WORLD'S LARGEST RETAIL RADIO CHAIN!

Famous for Value Since 1879

Davega

Famous HALLICRAFTER SX11
Super Sky Rider
Special $74.50

Never before sold under $99.50


Since the earliest days of radio we have specialized in short wave apparatus. Today at our 63 Cortlandt St. store we have the largest communications receiver department in New York City, with more than 3,000 sq. ft. of floor space devoted exclusively to communications receivers and transmitters. Also, the finest equipped service department for short wave apparatus.

SMALL DOWN PAYMENT
Easy terms arranged on everything, No co-makers.

LIBERAL TRADE-IN ALLOWANCE

Davega offers the very latest in short wave apparatus. Don't fail to see and hear this RME-69.

Also see the RME-DB20 preselector.

Complete line of HAMMARLUND • RME • HALLICRAFTER • RCA 111
RCA 155 • PATTERSON • NATIONAL RCA TRANSMITTERS

Get Our EASY TERMS on Hallicrafters

1938 SUPER SKY RIDER

LIBERAL TERMS
Time sales arranged to suit your convenience. Pay for your Sky Rider in easy instalments.

TRADE-IN ALLOWANCE
Trade in your present apparatus and equipment. We give a generous allowance.

FULL GUARANTEE
Every Sky Rider we sell bears both the guarantee of the Hallicrafters and of Davega.

N. Y. Amateur Headquarters
DAVEGA
63 CORTLANDT ST.
Largest Communications Receiver Department in New York

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

Then you’ll find Johnson Condensers ideal for the new rig. The Types "C" and "D" shown above, already famous for their dependability and low cost, have been still further reduced in price!

Made of the finest materials throughout, including such features as buffed and rounded aluminum plates .051" thick and the exceptional insulation of Alsimag 196. Available in spacings up to 1/2" and in a wide range of capacities, these condensers offer maximum performance at extremely low cost.

See September QST for other Johnson condensers.

Ask your Jobber or write for Catalog 964J

E· F·JOHNSON · COMPANY

THE VALPEY CRYSTALS
Step by Step Precision Made

Type 1MA unit consists of an accurately cut crystal of the low drift type. The frequency drift will not exceed 4 c/m°C. The mounting is of low loss moulded bakelite, employing tube pins for tube socket mounting. The embossed cover gives the frequency accurate to within 0.05% stamped on it. Within 5 kc. of specified frequency in the 1.7, 3.5, 7 Mc. bands ............ $4.50

Type VM2 Crystals — Standard X cut mounted — supplied within 0.05% specified freq. in the 1.7, 3.5, 7 Mc. bands ............ $3.50

Type V2 — Standard X cut crystal, supplied in the 1.7, 3.5, 7 Mc. bands, within 5 kc. of freq. specified ........ $3.25

Complete illustrations and descriptions in our new catalogue. Order direct or see your local dealer.

THE VALPEY CRYSTALS
P. O. Box 321, Holliston, Mass.

MODULATION METER

Approved by Leading Transmitter Kit Manufacturers

BASED ON F. C. C.
BC SPECIFICATIONS
SEE YOUR JOBBER
QSL FOR CIRCULAR

J-M-P MANUFACTURING CO.

$19.75 f. o. b.
3042 No. 34th Street · Milwaukee, Wisc.

for your club and a valuable trophy for the club’s presiding officer to use at meetings!

Competition comes only from operators in one’s immediate Section. Awards are for the operator running up the best communication record for each Section (as indicated by the score). Operators thus have equal DX conditions and operating opportunities. Fullest operating enjoyment is assured. See May QST for full details on the last SS or ask any amateur who took part last year!

REPORTING RESULTS

Report 7 to A.R.R.L., West Hartford, Conn., as soon as the contest is over. Use the log form shown in the example. List all operators 8 whose work at your station is responsible for any part of the score.

All active ham operators are invited to take part and report. You will work a new bunch of stations, make new records for your station, get QSL cards (be sure to send one for each QSO), have a lot of fun, meet new friends, and perhaps rate an A.R.R.L. award at the conclusion. Do your best operating. Send A.R.R.L. the results for QST mention. MAIL YOUR REPORT IMMEDIATELY AT THE END OF THE CONTEST TO AVOID DELAY AND INSURE THAT YOUR RESULTS ARE CREDITED AND KNOWN THROUGH QST.

Hints and Kinks

(Continued from page 47)

can be cleared up without a resistor shunted across the primary of the transformer, it should be omitted. The plate current was 3.5 ma. at a supply voltage of 270. This produced a grid bias of -5 volts and a plate voltage of about 150. According to the article cited above, the output should correspond to that of a Class-A amplifier operating under the same conditions.

—Theo Stoecke, 232£ Telegraph Ave., Berkeley, Cal.

I.A.R.U. News

(Continued from page 48)

Cape Prince of Wales—Alaska—170° East, 50° North—120° W. Equator—South Pole along 120° West.

North Pole along Greenwich meridian—latitude of Bear F—40° West, 60° North, 40° West, 20° North—20° W. Equator—South Pole along 20° West.

North Pole along 80° East—80° North—Boundary between Russia and Siberia—boundary between Russia and Siberia—Caspian Sea—round west coast Caspian Sea to Persian boundary—along northern boundary of Persia and Asia Minor to Black Sea—across Mediter-
PREMIUM QUALITY
(Bridge-type construction and soft iron pole pieces)
without the PREMIUM PRICE

If you know meters, you know that bridge-type construction with soft iron pole pieces is the first essential of lasting accuracy. And if you know prices, you know that such instruments have always been far more expensive than the ordinary kind. But now, incredible though it may seem, this finer type of construction that hitherto has been confined to the most expensive laboratory instruments, is available in a line of meters that are priced no higher than the ordinary run of instruments. The ingenuity of foremost instrument designers, backed by modern large-scale production methods, has made it possible to produce these meters that are undeniably the finest in the world in their class.

This year's sensation—
the Simpson illuminated dial panel instrument

Picture a panel with these beautiful, stream-lined instruments which have a translucent dial evenly illuminated by a built-in, 6-volt lamp. Net price to amateurs of most A. C. and D. C. ranges (including lamp and socket) is only $5.24.

Thermo-couple types at new low prices.
The instrument above mounts in a round, 2¼” diameter hole. Round case, non-illuminated instruments with identical movement are available in most A. C. and D. C. ranges at net price of $4.15.

When you buy Simpson Panel Meters, you buy the type that already have become the first choice of prominent concerns whose engineers have made exhaustive tests in choosing meters that represent the greatest possible value in accuracy and ability to stand up in service. Send the coupon for circular showing the ultra-modern designs that will add lustre to the finest panel board.

SIMPSON ELECTRIC CO.
5216 W. Kinzie Street, Chicago

Mail This Coupon For Facts
Simpson Electric Co., 5216 W. Kinzie St., Chicago
Send facts about Simpson Instruments.
Name ___________________________ Call ____________
Address __________________________

The Famous Temco “100”
Now Available for the First Time Under a Most Liberal
TIME PAYMENT PLAN

The instrument above mounts in a round, 2¼” diameter hole. Round case, non-illuminated instruments with identical movement are available in most A. C. and D. C. ranges at net price of $4.15.

SIMPSON ELECTRIC CO.
5216 W. Kinzie Street, Chicago

Mail This Coupon For Facts
Simpson Electric Co., 5216 W. Kinzie St., Chicago
Send facts about Simpson Instruments.
Name ___________________________ Call ____________
Address __________________________

100 Watts output
Band Switching Exciter from 10-200 meters
Remote and Panel Control with simplified tuning.

SPECIAL TERMS
DOWN PAYMENT AND INSTALLMENTS ON THIS ULTRA MODERN TRANSMITTER

UNDER OUR 20-PAYMENT PLAN
PLACE YOUR ORDER NOW FOR PROMPT DELIVERY

DELAWARE RADIO SALES COMPANY
WILLARD S. WILSON — W3DQ
405 Delaware Ave. ESTAB. 1920 Wilmington, Delaware
YOU BUY RADIO PRODUCTS ON REPUTATION— WHY NOT CHOOSE YOUR JOBBER ON EXACTLY THE SAME BASIS?

Yes sir, when you are looking for amateur radio supplies, an amateur Receiver, X'mtr, Tubes or accessories you first assure yourself of the reliability of the manufacturer. Why not choose your jobber on reputation too? For 15 years Sun Radio has built an enviable reputation for fast, reliable service . . . the kind of service that is built upon a keen understanding of your requirements.

THIS MONTH THE SUN SHINES ON:

- The NEW NATIONAL NC80X complete with Tubes, Speaker and Crystal. Net........ $88
- HALLICRAFTERS NEW SUPER SKY-RIDER complete with Tubes, Speaker and Crystal................................. $123
- Write for information on our time payment plan.

- NATIONAL RECEIVERS CARRIED IN STOCK for immediate delivery. NC100, NC101, NC80X, HRO, HRO JR., SW3. Write for Free Catalog and net prices.
- PREMIER CRYSTAL complete with sealed Holder. 40, 80, 160 Meter......................................................... $4.35
- STANCOR PLATE TRANSFORMER, 1000 volts, 300 ma, 500 volt taps. Net..................................................... $5.75
- JEWEL PORTABLE METER, 1000 ohms per volt. Ranges 7½-300 and 750 volt taps. Each................................. $4.25
- TAYLOR'S LATEST DEVELOPMENT T-125 .... $13.50
  All other types in stock.
- EIMAC, RAYTHEON, RCA, AMPEREX TRANSMITTING TUBES IN STOCK.
- We are distributors for Western Electric Amateur Equipment, Tubes, Phones and Mikes in stock.
- BREAK-IN D.P. DT 110 Volt AC Relay. Net................ $2.75

Fall Bargain Bulletin Now Ready

A 10-Watt Speech Amplifier
(Continued from page 11)

r.m.s. value of voltage, provided the output wave-shape is substantially sinusoidal.

Measurements made on the amplifier showed that at the 10-watt output level distortion was negligible. With the gain fully open, the noise level is approximately 43 db below full output (0.5 milliwatts) most of the noise being tube "rush." Power-supply hum is hardly detectable under these conditions, using a loud speaker for monitoring. With full gain, a peak signal of 0.0017 volt at the grid of the 6J7 will develop 10 watts output. Since the average crystal microphone output is several times higher than this, the actual signal-noise ratio is considerably higher than the minimum figure given above. With normal gain-control setting, noise is practically inaudible, and when any hum is present it usually can be traced to external pickup in the microphone circuit rather than to the amplifier itself.

Frequency response with the components and circuit constants shown is adequate for voice reproduction, dropping between 2 and 3 db below the 1000-cycle figure at 100 and 5000 cycles. There are no humps anywhere in the curve. The frequency range could be considerably extended by using suitable transformers (those specified are...
NOW YOU CAN HAVE CRYSTAL CONTROL ON 5 METERS WITH ONLY TWO STAGES!!

Bliley $5.75
Type BG3, Mounted 40, 80 Meter Xtal, Now...$3.35
Type LD1, Mounted 40, 80, 160 Meter Xtal....4.80
Type HF2, Mounted 20 Meter Crystals, Now...5.75

"X" Cut Unmounted 40 Meter Crystals
Made by nationally known manufacturer. Your choice from our stock, only $1.95. These are 1" square and have high output. Calibration is accurate to .1% Special Bliley 40 meter crystal holders...$0.95

DO you want a good used receiver? Stop in or write. We usually have some on hand.

Transducer Bullet Dynamic Mikes, either high or low impedance, only...$16.17
Complete Stocks of Cardwell, Triplet, Thordarson, etc. The New RK49, A 6LG with 6P1 Isolantite Base only...$2.10

TAYLOR T26 T270..................$2.45
TAYLOR T125....................13.50
TAYLOR 203Z...................8.50
EIMAC 100TH...................13.50
EIMAC 200TH...................24.85
RAYTHEON RK39..............3.95
AMPEX E FM 1000............12.50

THE FINISHING TOUCH!

Gordon World-Wide
GTM and Standard
Time Clock
60-Cycle Self-Starting
Genuine Waltham 24-Hour Movement. Base removable for panel mounting (Hole size 3/4""). Satin Black Finished Base holds clock in reclining position for easy reading. Tells at a glance GMT and Local Standard Time in 24 principal countries around the globe. Tells the time in each of the 24 time zones around the world. And your net cost is only...$9.00

THE NEW 1938 SUPER SKYRIDER
Net Price Complete. Less Speaker and Crystal.....$99.00
Extra for Crystal, $12.00 Extra for Speaker, $12.00
Time Payments on All Hallicrafter Receivers

RME-69. Complete with Crystal and Speaker
Net $151.20

Thordarson Specials
T-16PO1. 810 and 640 V.A.C. Ea. side at 200 mils...$3.88
T-16PO2. 1540 and 1250 V.A.C. Ea. side at 200 mils...7.64
T-16PO3. 2140 and 1740 V.A.C. Ea. side at 400 mils...12.35
T-16PO4. 2950 and 2370 V.A.C. Ea. side at 500 mils...13.67
See Our Ad in October QST for Kenya Specials

TERMINAL Radio Corporation
BILLY FILLER * ADOLPH GROSS 80 CORTLANDT ST. NEW YORK, N.Y.
Type HFM
Portable Crystal Control
7000 — 60,000 Kc.
PHONE — CW — MCW

- Single 40 Meter Crystal for All Bands
- A.C. or Battery Operation
- Complete With Coils for 5-10-20 and 40 Meters

H-F-M TRANSMITTER
$57.60

5 METER DUPLEX TRANSMITTER-RECEIVER

- T.R.F. and Super-Regeneration
- 7 Tubes — 5” Dyn. Speaker
- 6E6 Unity Coupled
- 10 watt Carrier
- 100% Modulation
- Duplex Operation — PHONE • MCW

TRANSMITTER — RECEIVER
$47.70

RADIO TRANSCEIVER LABORATORIES
8627 — 115 Sheet, Richmond Hill, New York

HAYNES RIG CHECKER

Hams all over the world are telling us that these two instruments are the biggest values in radio today. Your station is not complete without one. Circular and instructions for using sent free on request.

BIG RIG CHECKER $17.90
LITTLE RIG CHECKER $9.85

RADIO CONSTRUCTORS LABORATORIES
Dept. Q-1 136 Liberty St., New York, N. Y.

RADIO ENGINEERING, broadcasting, aviation and police radio, servicing, marine radio telegraphy and telephony, Morse telegraphy and railway accounting taught thoroughly Engineering course of nine months duration equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free.

DODGE'S INSTITUTE, Day Street, Valparaiso, Indiana

particularly intended for voice work) and by increasing the capacities of the various coupling and bypass condensers in the resistance-coupled stages. The added expense does not seem economically justifiable in view of receiver selectivity, the frequency response characteristics of the microphones used by amateurs, and the requirements for satisfactory transmission of speech. As a matter of fact, even though the response drops rapidly below 100 cycles and fairly rapidly above 5000, in an air test there is little difference between this amplifier and one having a considerably wider response range, using the same good-quality microphone in both cases.

The power-supply unit, incidentally, has ample capacity for running the ordinary amateur superhet. By operating all tubes except the power stage from the regulated part of the supply, a marked increase in stability will be obtained, especially when the operating voltage varies with the signal. This is the case with a.v.c. when the plate current of the controlled tubes varies with the gain, and also happens when Class-AB output stages draw more current with large grid excitation.

How Would You Do It?

(Continued from page 48)

are held together with good glue and long, thin wood screws. The shelves are mounted over 3/4” by 3/4” cleats with headless finishing nails. The hinges should be strong enough to support the weight without sagging. They are fastened to the box with bolts and nuts.

Door catches and a lock are provided. A pair of handles fitted at the top end makes it easy to carry from place to place. The box may be either mounted permanently on the wall or provided with rubber feet. The cost need not exceed three dollars.

Two or three others submitted kinks which are worth mentioning.

W2KJY uses quart-size mayonnaise jars with screw tops for screws and small parts. The screw tops are fastened on the under side of a shelf or the work bench. The jars are removed by simply unscrewing from the permanently-mounted top.

W1AIJ finds a piece of heavy duck, about two feet square, handy when hunting for some particular screw or other item in a miscellaneous lot. The cloth is simply spread on the bench or floor while the contents of the box are spread over the cloth. When the desired item has been found, the remainder is easily poured back into the box.

W3GGE finds a fisherman’s tackle box just the trick for screws and small parts as well as tools.

W3GZW suggests the use of a utility closet, sold in department stores for the storage of linen, brooms, etc. His is 5 feet high, 26 inches wide and 12 inches deep, has five shelves and cost approximately four dollars.

W8OMM obtained sectional cardboard boxes from his grocer for storing tubes. The boxes are

(Continued on page 188)
WANTED

Mechanical draftsman with sufficient knowledge of Electrical Engineering to assist in Laboratory of Electrical Manufacturer. Location, Chicago.

Address Box 24, Adv. Dept., QST
West Hartford, Conn.

RADIO COURSES

RADIO OPERATING: Prepare for Gov’t License Exam. ○ RADIO SERVICING: Including Short Waves ○ AMATEUR CODE ○ ELECTRONICS ○ TELEVISION ○

Day and Evening classes—Booklet upon request

NEW YORK YMCA SCHOOLS
4 West 63rd Street, New York City

NEW HOLDER DESIGN

15 SECONDS TO INSTALL CRYSTAL

For All Bands

GREATER STABILITY

Plugs in 5 prong tube socket

Beautiful Appearance

MODEL AH HOLDER $1.00

At your dealer

or direct

HIPOWER LOW DRIFT CRYSTALS:

within 10 kc, or Choice of stock

AH-10, 1700-3500 Kc. bands $2.35

AH-10, 7000-7300 Kc. band 3.90

WRITE FOR NEW LITERATURE

Hipower "Low Drift" Broadcast and Commercial

CRYSTALS ARE APPROVED BY F.C.C.

Hipower Crystal Co., 2035 Charleston St., Chicago

SEND FOR LITERATURE on other new Astatic Microphones including unique "GRIP-TO-TALK" Model CD-104, for air-way ground stations, inter-office, inter-factory, amateur and other similar communicating systems.

Licensed under Brush Development Co. Patents

ASTATIC MICROPHONE LABORATORY, INC.
DEPT. G-3, YOUNGSTOWN, OHIO, U. S. A.
Pioneer Manufacturers of Quality Crystal Devices

Say You Saw It in QST — It Identifies You and Helps QST
A directory of suppliers who carry in stock the products of these dependable manufacturers.

**Baltimore, MD.**
Radio Electric Service Company
3 North Howard St.

**Boston, Mass.**
H. Jasper Company
46 Cornhill

**Boston, Mass.**
Radio Shack
46 Brattle Street

**Boston, Mass.**
Wholesale Radio Service Company, Inc.
110 Federal Street

**Bronx, N.Y.**
Wholesale Radio Service Company, Inc.
549 East Fordham Rd.

**Burlington, Vermont.**
Vermont Hardware Co., Inc.

**Greenwich, Conn.**
Mead Stationery Company
252 Greenwich Ave.

**Jamaica, L.I.**
Wholesale Radio Service Company, Inc.
90-08 166th Street

**Montreal, Canada.**
Canadian Electrical Supply Co., Ltd.
285 Craig Street, West

**Newark, N.J.**
Wholesale Radio Service Co.
219 Central Avenue

**New York, N.Y.**
Bruno-New York, Inc.
460 W. 34th St.

**New York, N.Y.**
Sanford Samuel Corp.
136 Liberty St.

**New York, N.Y.**
Terminal Radio Corp.
80 Cortlandt Street

**New York, N.Y.**
Wholesale Radio Service Co.
100 Sixth Avenue

**New York, N.Y.**
Harrison Radio Co.
12 West Broadway

**Philadelphia, Penn.**
Eugene G. Wile
10 S. 10th Street

**Philadelphia, Penn.**
Raymond Rosen & Company
117 North 7th St.

**Philadelphia, Penn.**
M & H Sporting Goods Company
512 Market Street

**Pottsville, Penn.**
Sylvester Radio & Supply Co., Inc.

**Reading, Penn.**
Bright & Company
8th & Elm Streets

**Reading, Penn.**
Sylvester Radio & Supply Co., Inc.
104 North Ninth Street

**Springfield, Mass.**
T. F. Cushing
349 Worthington St.

**Washington, D.C.**
Sun Radio & Service Supply Co.
928 F Street, N. W.

**Albany, N.Y.**
Uncle Dave's Radio Shack
356 Broadway

**Baltimore, Md.**
Radio Electric Service Company
3 North Howard St.

**Boston, Mass.**
H. Jasper Company
46 Cornhill

**Boston, Mass.**
Radio Shack
46 Brattle Street

**Boston, Mass.**
Wholesale Radio Service Company, Inc.
110 Federal Street

**Bronx, N.Y.**
Wholesale Radio Service Company, Inc.
549 East Fordham Rd.

**Burlington, Vermont.**
Vermont Hardware Co., Inc.

**Greenwich, Conn.**
Mead Stationery Company
252 Greenwich Ave.

**Jamaica, L.I.**
Wholesale Radio Service Company, Inc.
90-08 166th Street

**Montreal, Canada.**
Canadian Electrical Supply Co., Ltd.
285 Craig Street, West

**Newark, N.J.**
Wholesale Radio Service Co.
219 Central Avenue

**New York, N.Y.**
Bruno-New York, Inc.
460 W. 34th St.

**New York, N.Y.**
Sanford Samuel Corp.
136 Liberty St.

**New York, N.Y.**
Terminal Radio Corp.
80 Cortlandt Street

**New York, N.Y.**
Wholesale Radio Service Co.
100 Sixth Avenue

**New York, N.Y.**
Harrison Radio Co.
12 West Broadway

**Philadelphia, Penn.**
Eugene G. Wile
10 S. 10th Street

**Philadelphia, Penn.**
Raymond Rosen & Company
117 North 7th St.

**Philadelphia, Penn.**
M & H Sporting Goods Company
512 Market Street

**Pottsville, Penn.**
Sylvester Radio & Supply Co., Inc.

**Reading, Penn.**
Bright & Company
8th & Elm Streets

**Reading, Penn.**
Sylvester Radio & Supply Co., Inc.
104 North Ninth Street

**Springfield, Mass.**
T. F. Cushing
349 Worthington St.

Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
Where to buy it

A directory of suppliers who carry in stock the products of these dependable manufacturers.

WASHINGTON, D. C. 938 F Street, N. W. Sun Radio & Service Supply Co.

CONCORD, NEW HAMPSHIRE 80 N. State Street
Carl B. Evans

JAMAICA, L. I. Wholesale Radio Service Company, Inc.

NEWARK, NEW JERSEY
Wholesale Radio Service Co.

NEW YORK, N. Y.
Harrison Radio Company

NEW YORK, N. Y. Wholesale Radio Service Co.

WASHINGTON, D. C. 938 F Street, N. W.
Sun Radio & Service Supply Co.

 listeonings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
How Would You Do It?

(Continued from page 118)

apparently similar to egg crates, providing separate compartments for each tube which he stores upside down in the compartments.

O. H. thanks, in addition, the host of others, too numerous to mention individually, who came to his rescue.

D. H. M.

And again the contest rules:

1. Solutions must be mailed to reach West Hartford before the 20th of the publication month of the issue in which the problem has appeared. (For instance, solutions of problem given in the March issue must arrive at QST before March 20th.) They must be addressed to the Problem Contest Editor, QST, West Hartford, Conn.

2. Manuscripts must not be longer than 1000 words, written in ink or typewritten, with double spacing, on one side of the sheet. Diagrams and sketches may be in pencil, must be neat.

3. All solutions submitted become the property of QST, available for publication in the magazine.

4. The editors of QST will serve as judges. Their decision will be final.

Prizes of $5 worth of A.R.R.L. station supplies or publications will be given to the author of the solution considered best each month, $2.50 worth of supplies to the author of the solution adjudged second best. The winners should, of course, state the supplies preferred.

Strays

New 2-Inch Cathode Ray Tube

A new cathode-ray tube for low-voltage operation has been announced by National Union. This tube, which will be known as the Type 2002, has a two-inch flat screen coated with highly-sensitive fine-grain fluorescent material. The overall length is 6¾ inches, and the tube has a small octal base. Deflection plates are of non-magnetic material.

Following are typical operating conditions for the 2002:

- Anode No. 2 voltage: 400, 500, 600
- Anode No. 1 voltage: 80, 100, 120
- Grid voltage: never positive
- Deflection sensitivity: 0.24, 0.18, 0.16 mm. per volt
- Heater voltage: 6.3 volts
- Heater current: 0.6 amp.

From W1JEP comes another story of amateur radio jumping into the breach. A large instrument manufacturer needed several amperes of 14-Mc. juice for testing some f.c. ammeters. None being available in the plant, a member of the organization, W1JEA, was contacted and agreed to lend his rig for the test, which was a rush job. A new kind of service!

Vermont and New Hampshire come near to being desert isles for the many VK's who these days are shooting for WAS. Any ham in those states who wants to QSO Aussies can do a rushing business on 20 in the mornings, simply by sending out a few CQ's and signing "VT" or "NH" after the call.
SELL or trade large oil-filled Westinghouse condensers, $12, QSL'S-2

2000 v., 750 watt plate supply. List for stamp. Sell everything
too large for house trailer. W5EFV, Alva, Okla.

WANTED: complete amateur Ione transmitter 100 watt output.
SEND for circular. Hilet Engineering Co., W. Orange, N. J.

CALLBOOKS—new DX calls, new prefixes, thousands of new W
and VE calls, in the Fall, 1937 Radio Amateur Call Book.
COMPLETE training for all amateur and professional radio
operators, in every service. Send 10c in stamps for free brochure.

Radio station WRBI, 100 Shipman St., Newark, N. J,

FOR Sale-100-250 watt broadcast transmitter-high fidelity,
Comet M150 cost $15; 6-15 volts 500 watts Aircraft, $10.

200 watts 000 cycles, $15; 6-15 volts 500 watts Aircraft, $10.

On twelve volts deliver 375. Westinghouse 27 1/2/350, $10;
McLarty, 1235 Trenton, Seattle.

CRYSTALS: Unconditionally guaranteed. Supplied within 5 kilo­
cycles of frequency you specify in 160, 80, or 40 meter band.

These are X-cut carefully ground to deliver maximum output
and to resist fracture. Exact frequency of crystal written on box.

SEND cards at lower cost—Send 10c in stamps for elaborate
QSL'S. Entirely new printing process makes more beautiful
pictures today. WlBEF, 16 Stockbridge Ave., Lowell, Mass.

WANTED: complete amateur fone transmitter 100 watt output.
Write full details and lowest cash price. VE4AL, Mossbuck Drive, LA.

SAVING 50% on any type transmitting tubes or rebuilt, trade-in accepted.
New 203-A, $12.50. General Electronics, Dobbs Ferry, N. Y.

SELL All-Star 400 watt fone transmitter with 20 and 80 meter
cells, new tubes, crystal valve, relay rack, $800. Lincoln 20
super, 8 to 200 meters with Jenser 12" dynamic, $50. Barry five
meter transmitter $10, with new tubes. W8SKG, 404 Highland,
Huntington Creek, P. O. Box 575, New York City.

SEE the gang on 5. Bulletin describing efficient, stable, and
unusual SSB equipment is yours. Write Paradio Sales
Co., 124 Garrison Ave., Jersey City, N. Y.

SELL—books on commercial radio operating, cheap. VE4AB,
LaRiviere, Man.

NEW BOOKS on QSL'S, SWL'S, 100 3 color $75¢. Lapco, 344 W. 39, Indianapolis,
Ind.

QSL'S, W8DEN QSL's, Glasy white stock. Samples? (stamps)
W8DEN, Holland, Mich.

STATION surplus meters: Westinghouse portable a.c. volt­
meters, 20-150, 300, 600, 1200 volts $5; Weston Model 301
500 volt, 60 cycles, ten milliamperes; and five milliamperes.

Model 476 10 volt a.c.: 250 volt a.c.: all single range $2. each;
Model 476 10 volt d.c.; 100 milliampere; ten milliampere; and five milliampere,

10 volt: all single range $2. each; tubes, type 852 $8.; 203A, 211. 845. 872A $5. each; 217 $3;
665-2 Analyzer, Riders Manuals, Clough-Brengle OC oscillator.

COTTON, 1235 Trenton, Seattle.


CLIPPING—direct importers from Brazil of best quality pure
quartz suitable for making photo-electric crystals. Diamond Drive,
Flemington, N. J.

RADIO engineering, broadcasting, aviation and police radio,
servicing, marine and Morse telegraphy taught thoroughly.
All expenses low. Catalog free. Dodge's Institute, Byrd St.,
Valparaiso, Ind.

W8CSN, selling out.

QSL'S, highest quality. Lowest prices. Radio Headquarters,
17224 Hollywood Ave., N. Y.

QSL'S—entirely new printing process makes more beautiful
cards at lower cost—Send 10c in stamps for elaborate
QSL'S-Entirely new printing process makes more beautiful
pictures today. WlBEF, 16 Stockbridge Ave., Lowell, Mass.

RADIO materials, Bankrupt jobber stock. Everything service­
ables, hands use, Quality Radio, Richmond, Ind.

QSL'S—2 color—$1 hundred. Samples. Stamp. W8NOS.

GET an R9 crystal in our new air gap holder near your frequency
in the 80 and 160 meter bands. $1.25, R Crystals, 335 Murray Ave, Arnold, Pa.

SELL or trade large oil-filled Westinghouse condensers, $12,
weight 50 lbs., handles 3000 volts. O.K. One sufficient for trans­
formers In quantity for profit, even if by an Individual, Is
advertising shall pertain to radio and shall be of
interest to radio amateurs or experimenters in
their pursuit of the art.

Having made no investigation of the adver­
sed products in the Fall, 1937 Radio Amateur Call Book.
COMPLETE training for all amateur and professional radio
operators, in every service. Send 10c in stamps for free brochure.

Radio Station WRBI, 100 Shipman St., Newark, N. J.

FORE Sale—100-250 watt broadcast transmitter—high fidelity,
modulatable to approximately 0-40-80-160 cycles, $20.

WRITE for circular. Hilet Engineering Co., W. Orange, N. J.

A special rate of 5¢ per word will apply to advertising
which, in our judgment, is obviously non-commercial In
nature of Interest to radio amateurs or experimenters in
their pursuit of the art.

having made no investigation of the advertisers
in the classified columns, the publish­
ers of QST are unable to vouch for their
integrity or for the grade or character of the
products advertised.
C. R. MALMGREN, W91XR, WEYERHAEUSER, WIS.

Douglas Radio Products

The Complete Line of Telegraph Keys

Model No. 510

HI-SPEED

Semi-Automatic Key

- adjustable to give plenty of pen and life. Black wrinkle base and casting. All machine parts nickel plated.

LES LOGAN COMPANY

646 Jessie Street
San Francisco

UNIVERSAL TRANSFORMERS—Now Improved

PR CRYSTALS

Unconditionally Guaranteed

Powerful Reliable

X cut 7000 KC ± 5 KC... $1.85
Low Drift ± 5KC 40-80-160...... 2.20

PETESEKE RADIO CO. Ex

W9JR COUNCIL BLUFFS, IOWA
W7HE Formerly Omega Crystal Labs.

BRAZILIAN QUARTZ CRYSTAL

Largest and most varied stock of Brazilian quartz crystals in the P. United States. Finest, Quality suitable for manufacturing photo-electric crystals, lenses, and prisms. Shipments received regularly from our Brazilian Branch. Also in stock tourmalines for making crystals to control the higher frequencies and quartz for fusing purposes.

BRAZILIAN TRADING CO., INC.

377 Fourth Ave., New York City
Murray Hill 4-2971

Say You Saw It in QST — It Identifies You and Helps QST
Your Nearest Dealer Is Your Best Friend

Your nearest dealer is entitled to your patronage. You can trust him. He is equipped with a knowledge and understanding of amateur radio. He is your logical and safe source of advice and counsel on what equipment you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

Patronize the dealer nearest you—You can have confidence in him

<table>
<thead>
<tr>
<th>ATLANTA, GEORGIA</th>
<th>Wholesale Radio Service Company, Inc.</th>
<th>430 West Peachtree Street, N.W.</th>
<th>“Investigate Our Easy Payment Plan”</th>
</tr>
</thead>
<tbody>
<tr>
<td>BALTIMORE, MARYLAND</td>
<td>Radio Electric Service Co.</td>
<td>3 N. Howard St.</td>
<td>Everything for the amateur</td>
</tr>
<tr>
<td>BOSTON, MASS.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>110 Federal Street</td>
<td>“Investigate Our Easy Time Payment Plan”</td>
</tr>
<tr>
<td>BRONX, NEW YORK</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>549 East Fordham Road</td>
<td>“Investigate Our Easy Payment Plan”</td>
</tr>
<tr>
<td>BUFFALO, NEW YORK</td>
<td>Radio Equipment Corp.</td>
<td>326 Elm Street</td>
<td>W80BK — Ham, service and sound equipment — W80LB</td>
</tr>
<tr>
<td>BUFFALO, NEW YORK</td>
<td>Dymac Radio</td>
<td>216 E. Genesee Street</td>
<td>Complete Line Ham and BCL Equipment Cl. 2080</td>
</tr>
<tr>
<td>JAMAICA, L. I.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>90-08 166th Street (Merrick Road)</td>
<td>“Investigate Our Easy Payment Plan”</td>
</tr>
<tr>
<td>MONTREAL, CANADA</td>
<td>Canadian Elec. Supply Co., Ltd.</td>
<td>285 Craig St., W.</td>
<td>Quality parts and equipment for discriminating buyers</td>
</tr>
<tr>
<td>NEWARK, N. J.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>219 Central Avenue</td>
<td>“Investigate Our Easy Payment Plan”</td>
</tr>
<tr>
<td>NEW YORK, N. Y.</td>
<td>Gross Radio, Inc.</td>
<td>51 Vesey Street</td>
<td>Fair dealings plus fair prices. Anything in radio</td>
</tr>
<tr>
<td>NEW YORK, N. Y.</td>
<td>Wholesale Radio Service Company, Inc.</td>
<td>100 Sixth Avenue</td>
<td>“Investigate Our Easy Payment Plan”</td>
</tr>
<tr>
<td>NEW YORK, N. Y.</td>
<td>Harrison Radio Company</td>
<td>12 West Broadway</td>
<td>“The Friendly Ham Supply House”</td>
</tr>
<tr>
<td>PHILADELPHIA, PENNSYLVANIA</td>
<td>Eugene G. Wile</td>
<td>10 S. Tenth Street</td>
<td>Complete Stock of Quality Merchandise</td>
</tr>
<tr>
<td>PROVIDENCE, RHODE ISLAND</td>
<td>W. H. Edwards Co.</td>
<td>32 Broadway</td>
<td>National, Taylor Tubes, Hallicrafters. Complete amateur supply house</td>
</tr>
<tr>
<td>PROVIDENCE, RHODE ISLAND</td>
<td>Kraus &amp; Company</td>
<td>89 Broadway</td>
<td>Everything for the amateur and serviceman</td>
</tr>
<tr>
<td>RICHMOND, VIRGINIA</td>
<td>The Arnold Company</td>
<td>527 W. Broad Street</td>
<td>W3EHL—“The Virginia Ham Headquarters”—W3FBL</td>
</tr>
<tr>
<td>ROCHESTER, NEW YORK</td>
<td>Radio Parts &amp; Equipment Co.</td>
<td>244 Clinton Avenue, North</td>
<td>Complete stock amateur-BCL parts. Standard discounts</td>
</tr>
<tr>
<td>SPRINGFIELD, MASS.</td>
<td>S. S. Kresge Company</td>
<td>1540 Main Street</td>
<td>Standard discounts, standard lines. Advisory service: W1JQ, W1FOF</td>
</tr>
</tbody>
</table>
You Are Protected When You Buy From QST Advertisers

“Advertising for QST is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League.”

Quoted from QST's advertising rate card.

Every conceivable need of a radio amateur can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff.
Winning DX contests

with

RME Equipment

has now become "standard practice"

Winners must have apparatus that they can depend upon ... it must be able to perform under all conditions ... it must be good for 24-hour service ... and it must have all of the features built in that make possible contact under the most severe operating conditions.

We could think of no better testimony than the fact that these recent winners have used RME-69 receivers in showing the world what can be done ...

INTERNATIONAL TELEPHONE
Contest Winners
K6MVV Kenneth C. Bryan
First Place International "Leader in QSOs"
W9ARA Robert Henry
First Place W/VE

INTERNATIONAL TELEGRAPH
Contest Winners
W2UK Ralph E. Thomas
First Place W/VE
W2AIW C. W. Rogers
Fourth Place W/VE

The RME-69 does the job — whether for phone or CW contacts. Full information will be sent on request

RADIO MFG. ENGINEERS, INC., PEORIA, ILLINOIS

RME - 69
UTC BEAM POWER AMPLIFIERS

The UTC PAK kits are now acknowledged by the PA field as ideal Universal amplifiers. PAK power amplifier kits are available with outputs of 8, 15, 35, 70, 110 and 250 watts. Stabilized feedback can be used in the PAK-1, PAK-2, PAK-3 and the PA output transformers have special feedback windings for this purpose. There is provision for mixing of two high impedance inputs. An etched panel providing a dual gain, two position mixer with gain links for high or low gain on each position and a VARITONE equalizer control are now standard equipment on these kits.

PAK-1XM Self bias 35 watt output. Audio and power on separate chassis for rack or cabinet mounting. High impedance input 110 to 120 dB gain. Provision for immediate switch-over to 95 dB gain with connections either for triode plate or 500-2000 ohm input line. VARIMATCH modulation output transformer. Impedances available are 320, 408, 1180, 2350, 4400, 3000, 4000, 4670, 5560, 7000, 9150, 9470 ohms. Includes all components and accessories such as resistors, condensers, sockets, calibration plates, etched mixer panel, controls and accessories for a dual gain, two position high impedance mixer, chassis, dust covers with handles, hardware — except tubes — all fully mounted. List Price $80.00, Your Cost........ $48.00

PAK-2XM Same chassis layout as PAK-1XM but has output of 55 watts in fixed bias. VARIMATCH modulation output transformer. Impedances on 3800 ohm plate to plate 380, 550, 2050, 3740, 4100, 7000, 7500, 8200, 12,000, 15,000, 16,400, 91500, 90,800. On 4000 ohm plate to plate 937, 1300, 1750, 2200, 2370, 3200. List Price $85.00, Your Cost........ $51.00

Tubes required for PAK-1M and PAK-2M kits are 6J7, 6C5, 2L6, 1-6J7, 3-6CS's.

VARITRAN★ VOLTAGE CONTROL UNITS

APPLICATIONS
• Line voltage control
• Rectifier control
• Motor control
• Heat control
• Light control
★ Heat control
★ Smooth control
★ High efficiency
★ Excellent regulation
★ Low cost

The UTC VARITRAN makes possible continuously variable output voltage, using a sliding contact riding over the turns of an auto-transformer. Standard units are designed for 115 volts Input, 0-130 continuously variable output.

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 medium rating, 7.5 amps., uncased, with terminal board and provisions for mounting, net ......... $14.00
Model V-4. 1250 watts — 11 amps. maximum rating, uncased, net .................................................. $20.00
Model V-5. 2000 watts maximum rating, 17.5 amps., uncased, net .................................................. $39.00

UTC CATHODE RAY OSCILLOSCOPE

The UTC OSCILLOSCOPE incorporating the new 2" cathode ray tube has every feature required for application in the radio field. It includes linear sweep, audio amplification, brilliance, focus, beam centering and amplitude controls. Grouping of the controls on the simple control panel is such that rapid and simple adjustment is possible. The entire unit is housed in a black crystal finished carrying case with etched plate control panel. The size of this unit is extremely small, considering the 2" cathode ray tube and multiplicity of applications. Net price, complete, less tubes ................................................. $30.00

TYPICAL FEATURES ARE

Large Tube ............................................. 2" screen
Linear sweep ....................................... 15 to 15,000,000 cycles
Amplifier response .................................. 30 to 50,000 cycles
High sensitivity ...................................... 0.5 volts per inch (amplified)
All controls including beam centering on main panel
Small size ........................................... 6½ x 10 x 9½ inches overall
A.C. Power Supply .................................. 90 volts — 60 cycles
Tubes used ........................................... 885, 80, 6J7, 6K7, 2L6-3H
Low hum pickup .................................... choice filtered plate supply

UNITED TRANSFORMER CORP.
72 SPRING STREET • NEW YORK, N. Y.
EXPORT DIVISION 100 VARICK STREET • NEW YORK, N. Y.
CABLES: "ARMAL"
IT would have been nice if such an outstanding new development as the wide-range crystal filter had been introduced on a high-priced "Super-De Luxe-Ultra" Receiver. But it was too good to keep just for that, because for the first time it has made it possible to build a really fine receiver at a low price.

THE crystal circuit provides selectivity continuously variable from 400 cycles to 5 kilocycles, and has wide range phasing control. By its use, interference and noise are so reduced that a favorable signal-to-noise ratio can be obtained without the signal gain of a preselector. The high IF frequency (1560 KC.) makes it possible to reject image-frequencies without the extra selectivity of a preselector.

THIS is the basic idea back of the NC-81X. To it have been added other new developments, such as the new beam tubes, that take AC-DC sets out of the "midget" class. And to it, also, have been added older time-proven developments such as the "Movable Coil Tuning Unit" of the NC-100, and the Amateur-Band-Spread of the HRO.

THE new NC-81X is in many ways the most extraordinary receiver National has ever built. Do not judge it by its very low price. Test it — where the going is toughest.

NC-81X
RCA offers in this new design many worthwhile features that will appeal to the advanced amateur radio operator. Look these outstanding features over and carefully consider all the engineering features RCA Engineers have put into this—the most efficient—most economical 150-watt transmitter ever offered by anyone.

- 150 watts output C.W. and Phone from 10 to 160 meters
- Special Speech Amplifier with Inverse Feedback for high quality voice reproduction
- R.F. feedback practically impossible
- Modulation indicator
- Coils and crystal easily accessible
- Conservative ratings on all parts
- Transformers given special impregnation
- Circuits fully metered
- Attractive cabinets and panel layout
- “Tune-up” protection
- Low tube and accessory cost.

R-F—RCA-807 crystal oscillator, RCA-802 buffer/doubler, 2 RCA-807 drivers, 2 RCA-808 final amplifiers. Audio—RCA-6J7 input, RCA-6C5 amplifier, 2 RCA-2A3 drivers, 2 RCA-808 modulators. Power Supply—RCA-80 for speech amplifier, RCA-83 for exciter, RCA-5Z3 for bias and driver plate, 2 RCA-866 for high voltage.

AMATEUR’S NET PRICE
f.o.b. factory with speech amplifier and one set of coils but less tubes, microphone, crystal and other minor accessories. See your supplier or write for descriptive literature

$625.00