QST

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amateur radio

in this issue—

New Portable Equipment

Full-Range Selectivity

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Collins Radio Company is first to present a series of high frequency transmitters of correlated design in powers from 300 watts to 2000 watts. One of the outstanding achievements in these “200 Series” Transmitters is the provision for efficient operation on any desired group of frequencies.

The Type 202BA-10 Transmitter is an example of the application of the Collins Autotune* System to the 200 Series design. The Autotune device automatically tunes the transmitter to any of ten desired frequencies within an interval of five seconds.

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Don't fail to send in the coupon for complete description of this marvelous new and modern receiver! It's striking in conception, designed and built by Hallicrafters for today's crowded amateur bands, with a thousand degrees of band spread!

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- 5 to 550 Meters Coverage
- 1000° Electrical Band Spread
- 13 Watt Undistorted Output
- "S" Meter
- Air-Trimmed R.F. Circuit
- Improved Expanding I.F. Transformers
- Better than One Microvolt Average Sensitivity on all bands
- Improved Crystal Filter Control

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Please mail me complete information on the New 1938 Super Sky Rider.
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SUPER SKY RIDER

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FROM 5 METERS to 550 METERS

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$99.00 LESS SPEAKER
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It's the most modern communications receiver you've ever seen and operated, designed and built for today's amateur requirements. Full coverage, from the 5 meter band to the top of the broadcast band. 1000° of Electrical Band Spread permits you to truly separate stations. A new double size "S" meter, and better than 1 Microvolt average sensitivity on all bands. It's right up to the minute in performance and appearance. And it's in a price range that every amateur can afford.

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RME Owners Take 1937 W/VE International

Montauk Highway, Quogue, Long Island, New York

With an attested score of 123,216 Ralph E. Thomas is announced by QST as the highest scoring W/VE in the 1937 annual International DX telegraph contest with his RME-69—and C. W. Rogers, with a score of 105,223 takes FOURTH (also with an RME-69).

“Performance Speaks Much Louder Than Words”—

RME - 69
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All appointments in the League's field organization are made by the proper S.C.M., elected by members in each Section listed. Mail your S.C.M. (on the 16th of each month) a postal covering your radio activities for the previous 30 days. Tell him your DX, plans for experimenting, results in phone and traffic. He is interested, whether you are an A.R.R.L. member or get your QST at the newstands; he wants a report from every active ham. If interested and qualified for O.R.S., O.P.S., or other appointments he can tell you about them, too.

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Address all general correspondence to the administrative headquarters at West Hartford, Connecticut.
A CONSIDERABLE contribution to amateur progress and operating pleasure would result if more honesty were employed in signal reporting. We hail the man who is completely candid in his reports. Some of us are scrupulous in this respect but most of us are pretty easy-going about it and some of us are downright dishonest.

The c.w. signal report, done in the RST manner, occupies but a moment of the QSO, yet it is an important moment. Most of us log the reports given us. To many an experimenter they constitute valuable information on the results produced by changes in the apparatus. To all of us they can be a warning when things are going awry. 'Phone stations are interested not only in the goodness of contact but also in the quality of modulation. We think there is more candor amongst 'phone men, by and large, than in the brass-pounding branch; we've heard some good intelligent criticisms of the other fellow's signal, coupled with willingness to spot the difficulty and help correct it. However, 'phone gets no clean bill of health on this subject from us, for we've heard plenty of inaccurate reports there also.

As to the RST system, it is admittedly difficult to apply it intelligently without having the scales constantly before oneself for reference. They are printed in the A.R.R.L. log and of course in the Handbook, and our C.D. has them on a useful sheet of data and abbreviations. It is helpful to have this dope handy at the front of the log or posted on the desk for ready reference.

The looseness prevailing to-day comes, we suppose, either from flattery or carelessness. An experimenter can't tell anything of the progress of his tests if his reports are inflated by carelessness or a mistaken attempt to flatter him. And wouldn't you think that if the quality or the note or the keying goes sour during transmission, any ham is entitled to know it from his correspondent and not be told "599" regardless?

The chief ingredient that wants to be taken out of signal reporting is flattery. Voices that rattle and splatter certainly aren't "fine business," and neither are telegraph signals that go "Chowpy-chowpy, chow chow cha chow." During the recent DX contest we listened to two amateurs in a shack we were visiting. A European signal was coming in. It was, in all truth, a miserable splutter, about like you'd get by rattling two tube bases in a cigar box. "What'll I tell him, George, T2?" asked the operator. "Gee, no," said George; "he's T2 all right but don't ever tell anybody he's worse than T5. It might make him sore and he'd not give you back a good report."

Now, for the luvva Microfarad, we ask you! Is that to be our answer to this problem? If that's the price of good reports, we don't want some. If our note goes T2 during a transmission (of course we always monitor our transmissions—hi!) we want to know it. Besides, telling us T5 or even T7 wouldn't make us feel any better.

Surely we all feel the same way about this. We want honest, candid reports. Out with flattery! Don't soft-soap us. We want to know what our signal's like. And if it's T4 or S2 or some scale-value that doesn't stay automatically in mind, we want to be able to look it up in the table and know that that is exactly what our correspondent meant. So out with carelessness too! Keep 'em honest, OM.

WE WANT to speak a word about logs too. Aside from the fact that federal regulations require the logging of certain data, a log is an invaluable record and a most interesting document to scan in later years. We've just been pawing through ours. Despite the fact that we never seem to have sufficient time for enough operating, we're on Book No. 14 now. A nice juicy record they make. How we wish we'd always kept a log and had a record of those precious days before the war! How pleasing a possession would be our own written record of our personal participation in the changing pageant of amateur radio from spark-coil days through rotaries and high power and the Transcons and the beginnings of tube transmission and the dawn of DX!

We recently got an A.R.R.L. map mounted on wallboard and started shoving in colored pins in the countries worked. Hadn't we worked Petruvia? Or had we? No Petruvian QSL card greeted us from the pile. So through the logs we went, all fourteen volumes, compiling a list. And there it was, back in 1927, dear old Petruvia! Proudly we shoved in one more pin. And a couple of others we'd forgotten.

Those logs were a revelation. We never knew we could be so stupid as some of those entries show. And many a smile comes as we examine marginal sketches and circuits and notes on the gear used in by-gone years. Yes, we think anybody
The power of the transmitter used is approximately 20 kilowatts. The emissions on 5000 kc. are useful for most of the rest of the United States and in other western parts of the world. Those on 10,000 kc. are particularly useful at distances within a few hundred miles from Washington, those on 20,000 kc. are useful for most of the rest of the United States, and those on 20,000 kc. are useful in the western part of the United States and in other parts of the world.

Our recent experience with the colored teas has led us to start a little side record of DX. With space provided for each country, we list all the DX worked; calls, date, frequency band, and city (the latter because calls get transferred in.

The service will be given successively on three radio carrier frequencies, as follows:

1. Noon to 1:30 P.M. EST, 10,000 kc.
2. 2:00 to 3:30 P.M. EST, 20,000 kc.
3. During the first four and the last four minutes of the 90-minute emission on each carrier frequency, announcements will be given; they will be made by telegraph keying and by voice, and will include the station call letters (WWV) and a statement of the frequency and the accuracy. The accuracy of the frequencies is at all times better than a part in five million.

From any single frequency, using harmonic methods, any frequency may be checked.

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The accuracy of the frequencies is at all times better than a part in five million.
A Complete Dry-Battery Portable Station with Crystal-Controlled Transmitter

By E. S. Van Deusen,* W3ECP

Almost every radio operator has had a desire or an actual need, at some time or other, for some kind of transmitting and receiving equipment which can be put into operation in a hurry, to meet unexpected conditions, when the normal power supply fails or when portable field operation away from power lines would be necessary. The recent flood emergency along the Ohio and Mississippi Rivers has emphasized the usefulness of such apparatus. A little preparation is recognized as the best possible insurance against an inability to perform when called upon, so it was decided to follow the advice of George Washington, who said, “In time of peace, prepare for war.” This led to the development of a complete station, using dry-battery power and arranged to be contained in a small, easily-portable case. This particular equipment is built into the salvaged case from a defunct portable phonograph, contains everything necessary for establishing a station for c.w. telegraph independent of any external source of power, and when packed for carrying weighs only about 82 pounds. The assembly includes a surprisingly good simple receiver with a 19 tube as a regenerative detector and a stage of audio amplification, the crystal-controlled transmitter which will be briefly described below, a midget monitor, headphones, key, antenna and insulators, a ground rod, a spare tube, the coils not in use in the set, a few essential tools, and the dry batteries which supply the necessary power.

The original model of this station was described in a previous issue of QST. That set used a transmitter consisting of a 19 tube working in a modified Hartley circuit, with an average power input of about one watt. Despite this very low power input, the set was used successfully on various occasions for consistent communication over moderate distances. For a period of several

Original model, except for the very limited power capabilities, was a lack of perfect frequency stability, arising from the type of circuit and the effects of swinging antennas. This led to the conversion of the set to the present improved design, during the fall of 1936, after rather extensive experiments to determine the constants and best arrangement of the various circuit components. The same type of tube, a 19 is used, but the transmitter functions as a crystal-controlled m.o.p.a., and the changes have resulted in a very noticeable improvement in both the frequency stability and the signal strength. The power input to the amplifier section averages about 2 watts. Of course, the little rig cannot compete with the QRM usually present on the amateur bands.

* Major, Quartermaster Corps, U. S. Army, Baltimore, Maryland.
during the evening traffic hours, but for emergency or auxiliary purposes it has a really respectable “sock” and the signal is read very easily through normal interference, due largely to the perfectly clean note resulting from the use of battery power. Consistent communication on the 80-meter band has been accomplished during the past winter with stations in all W districts east of the Mississippi River, and with all states in those districts except Wisconsin, Mississippi, Alabama and Florida, both from the home station location in Baltimore, Md., and from various field operating positions. On 40 meters, contact has been established with stations in mid-west W9 and in W5 districts.

The home station antenna is a 45-foot wire, loaded to operate as a Marconi radiator, while the field antenna usually is a 66-foot piece of bell wire drawn up on any convenient tree limb or pole. An alternate antenna which has been used successfully is a split Hertz arrangement with two 33-foot sections, center-fed, but the best results obtained to date have been with the Marconi type of antenna. Although fitted for operation on any of the amateur bands down to and including 20 meters, the experiments have been limited in general to work on the 80- and 40-meter bands. Local tests carried out on the 160- and 20-meter bands, however, indicate great possibilities, especially on 20 meters.

The circuit of the complete station is shown in Fig. 1, and is straightforward, without any trick connections. The receiver is basically the same as that used in the original model, but is changed slightly in the manner of connecting the audio section and also in the filament connections. The latter change provides some bias, and the changes have resulted in materially better volume and some increased selectivity over that of the original set. Change-over between the receiver and the transmitter is accomplished by a four-pole, double-throw jack type switch. The midget monitor is conventional except for its compact dimensions, and is used ordinarily only in getting the station on the air properly and for occasional checking purposes.

The transmitter circuit will be recognized as a normal triode crystal oscillator, capacity coupled to a neutralized triode amplifier or regenerative doubler. The neutralizing condenser is a midget padding condenser of 3 to 30 µfd., modified by having a portion of the movable plate removed, but may be a short section of twisted pair adjusted by trial to secure the desired results. The adjustable condenser has been used in this set primarily because of the ease with which values could be changed during the process of determining coil constants. A switch is provided to cut off the amplifier plate supply when neutralizing adjustment is to be made. There is still some doubt in the writer’s mind as to whether the operation is truly as a neutralized amplifier or as a locked oscillator, when the output is on the crystal frequency, but it works, and is remarkably stable, so this technical detail has been eliminated as non-essential. When the amplifier is operated as a doubler, an unexpectedly strong signal output is secured, and the circuit acts in an entirely normal manner. When doubling, it has been found desirable under certain conditions to use somewhat higher values of grid leaks in both oscillator and amplifier positions, and these biasing resistors are mounted on clips for ease in making changes.

The only details which require care in the construction, adjustment, and operation of the transmitter are the arrangement of components to limit any undesirable interactions or feedback, the choice of the crystal used, and the neutralization of the amplifier section of the tube. If space is available, shielding of the final tank coil, as well as the oscillator and receiver coils, can be provided and is recommended, because it will remedy some trouble experienced with excessive feedback during the development of this assembly. Space limitations dictated the omission of shielding for the final tank coil in the set described. The new National Type PB-10 plug-in bases and shields are excellent for this purpose and would have been used in this set except for the fact that the available space fell short of that
necessary for their use by only a fraction of an inch. The values of coupling to the antenna are a little critical under some conditions, especially with hastily placed field antennas, and the performance might be improved by provision of adjustable antenna coupling, but here also, space and a desire for simplicity indicated the use of a compromise arrangement and fixed coupling. The tip of one plate of the antenna tuning condenser is bent so as to short the condenser when set at maximum capacity. This permits link coupled output and the use of the set as an emergency exciter unit if necessary. On one or two occasions, when the regular home station exciter went wrong in the middle of a QSO, this little exciter proved its ability to drive a pair of 46's sufficiently to enable continuance of contact at least well enough to explain about the trouble. Due to the low plate voltage used, 135 volts, care must be exercised in the selection of the crystal to be used in this transmitter. An active crystal, and one which keys readily, is required. Keying is accomplished in the common plate supply to both sections of the 19.

The photographs are self-explanatory. On the panel, the receiver controls are at the left, and those of the transmitter on the right. The top row of knobs, from left to right, are: receiver regeneration condenser, antenna tuning condenser, transmitter amplifier tank condenser, and the oscillator tank condenser. Below the latter are the jacks for the crystal holder, with the filament rheostat to their left. The change-over switch is in the center of the panel, and to the left of the receiver tuning condenser dial are the pilot light and the headphone jack. The meter switches, directly under the change-over switch, are arranged to provide readings of either the filament voltage, or the plate current drawn by the oscillator or by the amplifier section of the transmitter, as will. The key jack is at the lower right corner of the panel. Filaments are controlled by insertion of the 'phone plug into its jack.

The general arrangement of the case and its contents is unchanged from that of the original model. Panel units are interchangeable, and a 5-meter transceiver, also designed to be inter-

(Continued on page 88)
A Battery-Operated Emergency Rig of Proved Performance

Description of an Outfit That Saw Service During the Floods

By William H. Jacobs,* W4CVQ

SINCE there has been so much said and written about the work amateurs did during the recent flood of the Ohio river, it seems that it would be a good plan for every amateur to take stock to see what he has that could be put to use if a flood or hurricane came down his alley and put the light company, telegraph and telephone systems out of business.

Most of us can dig enough out of the junk box to put something together on short notice; but things put together on short notice usually have bad habits. On the other hand, if one designs a portable rig around a few parts, then dumps the junk box on the floor, gathers together all the needed odds and ends available and, after very carefully planning the layout for efficiency, starts building, the results will not only be more certain but also well worth the time spent.

About four months of planning and ten dollars in cash went into the portable described in this article. It was first built up using a 59 e.e. oscillator and 46 r.f. amplifier, 53 speech amplifier and a 53 Class-B modulator. Coils were wound for 80-, 40- and 20- and the rig tested on all three bands. When put on the air on 20-meter c.w., to our surprise a W7 answered the first CQ. All districts of the U.S. and Canada were worked over one week-end on this band with about 15 watts input.

The big laugh came one Sunday morning while working W1SZ with it on 20-meter 'phone. He said QRM was so bad on Sunday that one could not possibly get through with less than three- or four-hundred watts. Yet he reported our signal solid S8. I believe Rod still thinks I was kidding him.

Then it was decided that a portable receiver should be built. So the whole works were dismantled and put in the junk box and a new start taken.

This time it was decided to use 6-volt tubes so it could be run from a storage battery. A close study of the tubes available was made and the lineup shown in the diagram decided on. The filaments consume three amps at 6 volts so it is not so hard on a storage battery.

The combined plate, screen, suppressor and bleeder drain of the r.f. section is 48 ma. at 225 volts when loaded, 18 ma. being drawn by the 89 and 30 ma. by the 6F6. The speech amplifier-
The transmitter circuits from 2700 to 4600 kc. and operates equally well (on both 'phone and c.w.) on a 22½-volt power supply. This doesn't sound reasonable but it is true.

The entire rig is bolted to the ½-inch aluminum front panel. It stands 10¾ inches high, 10 inches wide and 4½ inches deep and weighs 11 pounds without power supply. Starting from scratch the entire cost would be less than thirty dollars, including a power supply.

The “station” was completed in January and put on the air in the 80-meter c.w. band for two evenings. In all there were 16 contacts, all reports being 55 or better with 12 T9X’s and 4 T9’s.

It was operated on the 75-meter ‘phone band one Sunday morning and four contacts were made, all reports being 56 or better and the quality reports all that could be desired. These contacts were all over 100 miles.

The writer was sent to the flood area the 27th of January with a communication detail and was in control of a radio net in the Memphis district.

After a few days operation, one of the commercial transmitters furnishing communication at Wilson, Arkansas, went haywire. A radio store in Memphis was visited and about $12 of Uncle Sam's money spent for a pock full of gadgets which were assembled into the same circuit as the one shown in this article (r.f. only). This rig was placed on the air in Wilson at 4:20 P.M. February 8th and reported to the net control station at twenty minutes each hour for the next ten days, during which the filaments were never turned off!
And Now We Have Full-Range Superhet Selectivity

Electro-Mechanical I.F. Circuits for Continuously Variable Band-Width from Below 100 Cycles to Over 10 Kc.

By James J. Lamb*

The full range of receiver selectivity ideally desirable in amateur communication would embrace, as we have pointed out previously, band-widths from the minimum required for c.w. telegraph signals to the maximum required for high-fidelity 'phone. In practice, this interference conditions encountered with the different types of signals, the selectivity should be continuously variable throughout this 200-to-1 range and should also include the additional feature of ability to reject a particular interfering signal even within the band-width range for which the receiver may be adjusted, especially in c.w. telegraph reception.

Unquestionably this is a large order and might appear practically beyond attainment to one who had not followed the recent evolution of selectivity in the development of our amateur superheterodyne receivers. Actually, full-range variable selectivity meeting these ideal specifications is now within our reach.

In this article we shall attempt to show one method of approach by practical circuit arrangements and graphical performance data. There is nothing especially revolutionary involved, unless it be the results obtained, since the essential circuits are of types already familiar to us and are based on previous developments which have been described in QST and the A.R.R.L. Handbook.

The full range encompassed may be covered by the same i.f. amplifier in three steps, each capable
of giving continuously variable band-width between its minimum and maximum limits. These are from 100 cycles or less to approximately 3.5 kc., from 3.5 to approximately 9 kc., and from 9 kc. to over 20 kc. These are total band-width figures at 10 per cent maximum response; or, to put it differently, total band-width at ten times resonance input. For the highest selectivity range, the familiar variable-selectivity quartz crystal filter is used; for the medium range, a Transfilter unit 2 in the same variable-selectivity circuit carries on in place of the quartz crystal; and for the broadest range, variable-selectivity interstage transformer coupling fulfills the job with the filter circuit switched out. Since the band-width requirements of c.w. telegraph and 'phone reception have been found to be satisfied by the two higher-order ranges of selectivity, using the crystal filter and Transfilter respectively, only these two ranges will be treated in detail in the present article, the "straight" transformer-coupled i.f. selectivity being shown in each case simply for comparison.

THE EXPERIMENTAL SET-UP

The i.f. amplifier used in the experimental investigation included two stages of intermediate-frequency amplification with two 465-kc. air-tuned air-core transformers in addition to the filter unit, a diode second detector, and a "flat" two-stage audio amplifier with 6L6 output. The two i.f. transformers of this unit were adjusted for a relatively broad frequency characteristic to provide a fair amount of tolerance near resonance to accommodate minor deviations in frequency of the several quartz crystals and Transfilters used. A Rawson Type 501 milliammeter was connected in the second-detector circuit to indicate the rectified d.c. and a General Radio Type 583A power output meter was connected to the 6L6 stage for audio output measurements. The first i.f. stage was preceded by the filter circuit and this, in turn, was preceded by a 6L7 first detector. For i.f. selectivity, sensitivity and noise-ratio measurements, the grid circuit of the first detector was connected to the output of a G.R. Type 605A standard signal generator. An auxiliary i.f. amplifier, second detector and audio unit was used for aural monitoring throughout the tests, its i.f. input being taken off in parallel with the input to the grid of the first i.f. amplifier following the filter unit. Use of this auxiliary unit for monitoring avoided disturbance of the output measuring circuit of the test setup which would occur if 'phones or speaker were connected in the measuring circuit.

In making the selectivity tests, the second detector of the main unit was used as a vacuum-tube voltmeter to indicate i.f. amplifier output. This is an advisable procedure in running characteristics on high-selectivity circuits where it is not feasible to use a modulated signal and where it is inconvenient to adjust for the same beat-note output frequency on each measurement. This method of output indication also prevents the frequency characteristic of the audio amplifier from affecting the measured selectivity.

The standard procedure for making selectivity tests was followed in all other respects, throughout the hundreds of readings which were taken in obtaining the data presented here and in checking and rechecking those of a critical nature.

The input signal throughout the measurements was in the intermediate-frequency range, of course, the first detector serving simply as the input coupling amplifier. The results obtained fully represent actual superhet receiver performance, however, as was checked thoroughly by using the first tube as the mixer in a converter circuit both with signal generator input and in the reception of communication and broadcast signals.

Since many of the measurements were made at extremely high filter selectivity, careful adjustment of the signal-generator tuning and measurement of the frequency deviation from resonance were necessary. In these measurements, the frequency reading from the magnified tuning scale of the signal generator was checked by

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June, 1937
measurement of frequency increment in audio
beat-note output of the auxiliary monitoring
receiver unit. The stability of the 605A signal
generator, which is of the oscillator-amplifier
type, is exceptionally good. Repeated tests showed
that it had no appreciable frequency drift during
a run and that the re-set accuracy was entirely
adequate, even from day to day.

The general procedure in making selectivity
measurements for each of the various i.f. circuit
combinations was as follows:

![Diagram of selectivity curves]

**FIG. 3—TOTAL BAND-WIDTH CURVES, CORRE-
SPONDING TO THE SELECTIVITY CURVES OF
FIG. 2, TO SHOW MORE CLEARLY THE FULL-
RANGE COVERAGE OF THE CRYSTAL AND
TRANSFILTER CIRCUITS OF FIG. 1.**

The i.f. gain and signal input level were ad-
justed to give second-detector current correspond-
ing to that obtained with what would be consid-
ered a "normal" signal delivering output well
above the background noise level. This reference
current was 40 microamperes through the diode
load resistor of 100,000 ohms, the signal input on
i.f. resonance ranging between 10 and 40 micro-
vols. For most of the curves the signal generator's
attenuator was then set for 2, 10, 100 and 1000
times this resonance input, and the signal-
generator tuning adjusted to give the same refer-
cence output for each input level, first on one side
of resonance and then on the other side. In certain
special cases where there were irregularities in the
selectivity curve, additional readings were taken
for the particular frequencies at which these oc-
curred. Before starting each run a preliminary
test was made to insure that overloading would
not occur at any stage in the lineup for the maxi-
num input level which would be used in the run.
Furthermore, each run was made at least twice to
check for possible erroneous readings in fre-
quency settings or input microvolts.

The tuning of the i.f. coupling transformers was
also checked for each filter combination to make
sure that the "straight" selectivity characteristic
was not off resonance for the particular circuit in
use.

**FILTER CIRCUITS**

Previous experience with variable-selectivity
filter circuits using quartz crystals gave prefer-
ence to the arrangement of Fig. 1A which pro-
vides both variable band-width control and vari-
able rejection. The operation of this circuit has
been treated previously3 and need not be re-
peated in detail here. Band-width is varied by
adjustment of the parallel-tuned impedance as
indicated in the diagram, maximum band-width
(minimum selectivity) occurring with this circuit
tuned to crystal resonance and decreasing band-
width (increasing selectivity) occurring as the
parallel-tuned circuit becomes reactive (either
side of resonance). With the impedance matching
which this circuit provides, the over-all "w.g. gain
of the receiver is practically the same with the
input circuit adjusted for "optimum" (medium-
high) selectivity as it is with the crystal shorted
out and the input circuit adjusted for maximum
"straight" superhet gain. Either side of this
point the over-all gain decreases slightly, both
toward maximum band-width and toward ex-
treme minimum band-width.

Preliminary tests with Transfilter circuits
showed that the simple choke-condenser input
and resistance output coupling given in April
QST was considerably less satisfactory than a
coupling circuit giving more favorable impedance
matching. The Transfilter unit is of fairly low
impedance and accordingly cuts the gain of the
input amplifier or first detector when fed directly
from its plate. The same circuit used for the
crystal filter was found to overcome these ad-
vantages and to give nearly the same over-all
gain with the Transfilter as with the crystal, even
though the Transfilter unit has a ground connec-
tion which might be expected to impair the opera-
tion of the balanced circuit. A preferred Trans-
filter arrangement is shown in Fig. 1B. In practice,
the Transfilter unit has been found satisfactory to use the Trans-
filter interchangeably with a crystal of the same
frequency (465 Kc.) in this circuit.

With the Transfilter, selectivity is varied by
the same method as with the crystal filter; that is,
by variation of the parallel-tuned impedance
which constitutes the input to the divided circuit.
Although the selectivity-control condenser set-
ings are not exactly the same as for a quartz

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3 J. J. Lamb, "Developments in Crystal Filters," QST, Nov., 1933; "Interference and Noise Reduction in Com-
1936; U. S. Patent No. 2,054,757; The Radio Amateur's
crystal of corresponding frequency, minimum selectivity occurs with the input circuit resonant to the Transfilter frequency and increasing selectivity occurs as the input circuit is tuned either side of resonance. The resonance setting (maximum band-width) comes at lower tuning capacitance with the Transfilter than with the crystal because the Transfilter capacitance to ground is apparently greater by 10 µfd. or so. The adjustment is still well within the range of the condenser, however.

**Measured Performance**

The range of selectivity obtainable with these two circuits is shown in Fig. 2. Curve A is for the crystal filter at maximum selectivity, Curve B for the crystal adjusted for minimum selectivity, Curve C for the Transfilter circuit with the maximum selectivity adjustment and Curve D is for the Transfilter with the minimum selectivity adjustment. Curve E is the transformer-coupled selectivity characteristic of the i.f. amplifier without either filter ("straight" superhet). It is especially interesting to note that the selectivity range with the Trans-filter practically continues on from where the crystal range reaches its broadest. This is illustrated even more clearly by the total band-width curves of Fig. 3 which are plotted from the same data. The principal difference between the selectivity of the crystal filter at its broadest and of the Transfilter at its sharpest is that the Transfilter selectivity characteristic is somewhat broader near resonance, giving a slightly greater effective bandwidth.

Actual reception tests demonstrate that this continuous range of selectivity, from the crystal filter at its sharpest to the Transfilter at its broadest, embraces every degree needed for c.w. telegraph and 'phone communication. The crystal filter provides selectivity from the highest that may be used for c.w. telegraph signals with slow-speed keying to a band-width sufficient for reception of 'phone signals under adverse interference conditions. Throughout this range the crystal filter also provides adjustable rejection or control of symmetry of the response characteristic for elimination of a particular interfering carrier even within the normal band-width range. The Transfilter selectivity range carries on from this point to a band-width sufficiently great for speech reception with entirely adequate fidelity. In fact, the Transfilter selectivity at its broadest is generally useful for broadcast program reception, providing fidelity fully as good as that customary with the average broadcast receiver.

This range is especially adapted to short-wave broadcast reception where it is desirable to constrict the frequency band of the receiver anyway because of the noise and adjacent-channel interference which is aggravated by the fading so characteristic of these frequencies. True high-fidelity reception is practically never feasible on the high-frequency bands, and considerable high-frequency attenuation is inevitably necessary. This is accomplished by the i.f. band-width control with the Transfilter in much more satisfactory fashion than it can be obtained by an audio-frequency tone control with ordinary i.f. selectivity. The i.f. bandwidth control accomplishes the same effect of reducing the noise but does so without introducing the amplitude distortion which may occur with audio-frequency tone control. Furthermore, it does the job prior to the second detector and removes noise and adjacent-channel sideband components before they have a chance to intermodulate with the desired signal in the second detector to produce.
low-frequency audio components which cannot be removed by audio-frequency filtering subsequent to detection.

In running the selectivity characteristics of selectivity characteristic can be steepened on either side, of course, by other adjustments of the rejection control.³

In obtaining the Transfilter curves, the 50-µfd. bandwidth condenser C₁ was set at approximately 1/2 capacitance for minimum selectivity and at approximately 1/2 capacitance for maximum selectivity; that is, the input circuit was capacitively reactive at maximum selectivity. The phasing control C₂ was set near minimum capacitance. The phasing control has but slight effect on the symmetry of the resonance curve with the Transfilter, the rejection action being noticeable only at frequencies far removed from resonance in contrast to effective rejection action up to within a few hundred cycles of resonance with the crystal filter. The phasing condenser is effective in neutralizing stray capacitance coupling across the Transfilter, however, and improves the steepness of the skirts of the resonance characteristic.

OVER-ALL GAIN AND NOISE RATIO

A matter of some importance in judging the relative merits of selective i.f. circuits, in addition

![Selectivity Curves for Resistance Variation](image)

FIG. 5—SELECTIVITY CURVES FOR RESISTANCE VARIATION OF BAND-WIDTH OBTAINED WITH THE CIRCUIT OF FIG. 4A, C₁ SET FOR MAXIMUM SELECTIVITY WITH ZERO RESISTANCE

Zero- and 2500-ohm resistance curves practically coincide with the 1000-ohm curve and are not shown. Note the sharper "nose" and wider broadening in the skirts as compared with the impedance variation curves of Fig. 2.

Figs. 2 and 3 with the crystal filter, the bandwidth control C₁ of Fig. 1 was set at slightly less than half capacitance for maximum selectivity and at approximately 1/2 capacitance for minimum selectivity. The minimum selectivity setting is, of course, that at which the balanced input circuit is resonant to the crystal frequency, while the maximum selectivity setting is that at which the input circuit is inductively reactive for the crystal frequency. The rejection or phasing control C₂ was set to make the selectivity characteristic approximately symmetrical at 100 times resonance input; that is, so that the frequency deviations above resonance and below resonance were approximately equal for constant output with 100 times resonance input. The crystal-filter

![Total Band-Width Curves for Resistance Variation](image)

FIG. 6—TOTAL BANDWIDTH CURVES FOR RESISTANCE VARIATION

<table>
<thead>
<tr>
<th>I.F. Circuit</th>
<th>I.F. Input</th>
<th>Relative Voltage Gain</th>
<th>I.F. Noise</th>
<th>Relative Effective Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For Const.</td>
<td>%</td>
<td>Equiv.</td>
<td></td>
</tr>
<tr>
<td>Straight Super</td>
<td>17 µV.</td>
<td>100</td>
<td>2.0 µV.</td>
<td>0 db</td>
</tr>
<tr>
<td>Transfilter Broad</td>
<td>22 µV.</td>
<td>87</td>
<td>1.32 µV.</td>
<td>+3.5 db</td>
</tr>
<tr>
<td>Transfilter Sharp</td>
<td>25 µV.</td>
<td>70</td>
<td>0.80 µV.</td>
<td>+8.0 db</td>
</tr>
<tr>
<td>Quartz Xtal Filter Broad</td>
<td>35 µV.</td>
<td>50</td>
<td>0.60 µV.</td>
<td>+10.5 db</td>
</tr>
<tr>
<td>Quartz Xtal Filter Opt.</td>
<td>20 µV.</td>
<td>85</td>
<td>0.35 µV.</td>
<td>+15.0 db</td>
</tr>
<tr>
<td>Quartz Xtal Filter Sharp</td>
<td>23 µV.</td>
<td>74</td>
<td>0.30 µV.</td>
<td>+16.5 db</td>
</tr>
</tbody>
</table>

TABLE I—RELATIVE C.W. GAIN AND SENSITIVITY
to their contribution of selectivity, is their effect on the over-all gain and effective sensitivity. In connection with crystal filters, for instance, there is considerable divergence of opinion as to whether this or that particular arrangement is the better in point of how little it reduces the gain of the receiver. In our experience, the impedance-matching crystal filter circuit of Fig. 1A has practically negligible effect on the c.w. gain of the receiver as compared to the gain with the crystal shorted out and the circuit tuned to i.f. resonance for "straight" superhet operation. This refers particularly to the c.w. gain with the crystal filter circuit adjusted for optimum selectivity, at which adjustment the second-detector input (and the c.w. beat-note output) is maximum. The gain is actually reduced at minimum selectivity (maximum bandwidth) although the listener might get the opposite impression because the interference and background noise increase when the selectivity is reduced so that the gross sound output becomes greater. However, the net c.w. signal output is less, as is also the effective sensitivity of the receiver.

In the circuit arrangement of Fig. 1B, using the Transfilter, the gain is also negligibly affected as compared to the straight superhet gain. In practice, differences of a few decibels in over-all gain are readily compensated by adjustment of the receiver's gain control—provided, of course, the receiver has a proper margin of surplus amplification to start with. This should be true with any good receiver having a two-stage intermediate amplifier.

Of more importance than gain is the effective sensitivity of the receiver. This effective sensitivity is by no means a simple matter of how much amplification the receiver has. It is, rather, a matter of signal-noise ratio. It is best expressed in terms of the receiver's noise equivalent. As shown in the A.R.R.L. Handbook,\(^4\) the noise equivalent is the signal input required to give signal power output equal to the noise power output. The noise concerned is the receiver "hiss" noise, which would be the lowest possible noise background under ideal receiving conditions. The noise equivalent will be determined primarily by the signal-noise ratio at the input of the receiver but will be affected by the subsequent selectivity because the noise power output is generally reduced in proportion to the reduction in effective bandwidth of the receiver.

Table I gives typical quantitative comparisons of the over-all gain and effective sensitivity of the i.f. amplifier for the various orders of selectivity obtained with the circuit of Figs. 1A and 1B. In making these measurements, the receiver gain control was left fixed. The unmodulated c.w. signal input was adjusted to give 500-milliwatt beat-note output with each circuit combination in making the gain measurements, the input frequency being tuned to i.f. resonance. The noise-equivalent measurements were made in a similar manner, the c.w. beat oscillator being "on" for both the signal output and noise output measurements. It should be emphasized that receiver noise output should always be measured (or judged) with a carrier present in the second detector. The noise output with no carrier has little significance, since the

A Three-Stage Transmitter Unit for 1.75- to 30-Mc. Output

By Earl I. Anderson,* W8UD

By far the greatest problem in the design of an all-band amateur transmitter is that of maintaining suitable L-C ratios in the final stage. Insufficient capacity results in high harmonic content and poor linearity if modulated. Too much capacity results in poor efficiency. Because most transmitting condensers have a capacity ratio of about 4-to-1, a maximum of 3 adjacent bands may be covered with proper ratios. Operation on any other bands will leave a great deal to be desired. The transmitter to be described approaches the ideal condition over the full range from 1.75 to 30 Mc. Actually, the L-C ratio on 30 Mc. is slightly lower than the optimum value but the performance should be entirely satisfactory. On 1.75 Mc. the L-C ratio is slightly higher than is desirable for 'phone operation but is adequate for reasonable harmonic suppression.

Only 3 stages are used, a 6L6G or 42, a T-20 and a T-55. Using a 20- or 40-meter crystal more than enough excitation to the final may be obtained on 30 Mc. and on the lower frequencies the T-20 loaf along delivering only about 1/4 of full output when exciting the T-55.

In order to obtain the necessary high capacity ratio, grid neutralization, permitting an unbalanced output circuit, is used in the final stage. The plate tuning condenser is a Cardwell MT-100-GD selected because of its high maximum to minimum capacity ratio (100 µfd. maximum, 13 µfd. minimum per section). By using only one section or both sections in parallel, the ratio is 15.4 to 1. The final stage voltage and current were then selected to fit the L-C ratios available and the condenser spacing. The T-55 should be operated at 1000 volts and at 150 volts ma. or less. Operation over such a wide range cannot be achieved without some compromises. One section of the condenser is used on 28 and 14 Mc. and both in parallel on 7, 3.5 and 1.75 megacycles.

In one respect grid neutralization is rather a bad actor at the higher frequencies. The grid of the tube puts a resistive load across half of the input coil which results in the opposite end of the coil being other than 180° out of phase, the condition necessary for neutralization, if the coupling is less than unity. Unity coupling is never realized in actual practice but satisfactory results are obtained if the coil is made as short as possible with the minimum spacing between turns. The best cure, that of putting a resistor across the neutralizing half of the coil equal to the grid of the tube, wastes too much driver power on 10...
meters but could be used on the lower frequencies if desired. The 10- and 20-meter grid coils should be wound as shown with the turns as close together as possible. If this is done no difficulty will be experienced. The neutralization will hold from 6L6G for either fundamental or second harmonic output. When working straight through with a 20- or 40-meter crystal the crystal current may be too high for safety with this tube, and the 6L6G should be replaced with a 42.

20 to 160 meters and only a slight readjustment need be made for 10 meters. The neutralization seems to be better with the center of the coil grounded as shown than with the condenser rotor grounded.

The oscillator circuit is of the grid-plate crystal type using a 6L6G for either fundamental or second harmonic output. When working straight through with a 20- or 40-meter crystal the crystal current may be too high for safety with this tube, and the 6L6G should be replaced with a 42.

(Continued on page 88)

1 J. J. Lamb, "A Practical Survey of Crystal Oscillator", QST, April, 1937, circuit shown in Fig. 5, page 34.—Eroror.

COIL DATA

<table>
<thead>
<tr>
<th>Band</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.75 Mc</td>
<td>45 t. No. 18</td>
<td>21&quot; dia.</td>
<td>15&quot; dia.</td>
<td>15&quot; dia.</td>
</tr>
<tr>
<td>3.5 Mc</td>
<td>26 t. No. 18</td>
<td>15&quot; dia.</td>
<td>15&quot; dia.</td>
<td>15&quot; dia.</td>
</tr>
<tr>
<td>7 Mc</td>
<td>13 t. No. 15</td>
<td>22 t. No. 15</td>
<td>15&quot; dia.</td>
<td>15&quot; dia.</td>
</tr>
<tr>
<td>14 Mc</td>
<td>8 t. No. 16</td>
<td>15&quot; dia.</td>
<td>23/4&quot; long</td>
<td>15&quot; dia.</td>
</tr>
<tr>
<td>28 Mc</td>
<td>8 t. No. 10</td>
<td>15&quot; dia.</td>
<td>short as possible</td>
<td>23/4&quot; long</td>
</tr>
</tbody>
</table>

COMPLETE SET OF COILS USED IN THE ALL-BAND TRANSMITTER
The 100-Foot Lattice Tower at W9DNP

By Mel Williams,* W9DNP

One thing that always catches the eye of any radio amateur is a high, well-designed, sturdy sky hook. In some circles of society they make the statement that "clothes make the man." In amateur radio the same idea could be expressed in the statement, "a good antenna is the secret of success." That is my true sentiment after years of "wasted kilowatts," as a result of inefficient radiators, myriads of guy wires and any one of a dozen other things that might be brought up for discussion—or, should we say, cussing.

The sky-hook about to be described is not new or original in any sense of the word; but from the standpoint of performance, beauty, simplicity and low cost of construction, I have not been able to find any type that I like better. Of course there will always be some objection to most any type of tower whether it be expense of construction, the use of guy wires, the amount of space required to erect it, or any one of many others. The general objection to this one would probably be the fact that it has four guy wires. However, these four guy wires are placed at a point less than half way to the top of the mast, which still leaves 52 feet of un-guyed tower.

This tower was designed by W8KAZ, an engineer for the American Bridge Company, and much credit is due to him for his untiring efforts in the construction. The actual construction work was done under the most adverse weather conditions, in January, 1935. Regardless of these conditions the tower was built, oiled and raised in one week. The tower stood at its original location in Colorado Springs, Colorado, until March 1936, at which time it was taken down, placed on a pair of wheels and hauled to Denver, 75 miles.

* Box 677, Durango, Colo.

From the Springs. The tower is now in use by W9DNP-W9FY and its primary purpose is to snag DX. It seems to fill that purpose perfectly; for example, all continents were worked the night of April 5, 1936, in just one hour and twenty-eight minutes, with less than 300 watts in the antenna.

The total height of this mast is 100 feet and is strong enough to allow a man to climb to the top of it with safety. The greatest width is 26 inches at a point 48 feet above the ground. From this widest point it tapers to a width of 4 inches at the top and 6 inches at the base. The tower originally rested on a smooth block of stone two feet square and six inches thick. Later on, a recess 1 inch deep and 6 inches square was chiseled in the center of the block for the base. The total weight is about 400 pounds.

This weight could probably have been reduced considerably by using cedar lath instead of pine, but the tougher qualities of the pine made it preferable in our case. The best lath obtainable was used and each individual one was inspected carefully for flaws. If any flaws were found the lath was discarded to be returned for credit. Most lumber companies will give full credit for all such lath returned, as they are still OK for their regular purpose.

The four upright corner pieces are made of 1-by-2 stock, each individual piece being 16 feet long before being cut for joining. Spruce was selected for the corner pieces

![Diagram](image-url)
because of its toughness and because of its ability to stand many nails without splitting. This last item is a big one, as there are around 5000 small cement-coated nails in the structure. These pieces are then cut and nailed together so that they form a single 2-by-2, 100 feet long. Four of these 100-foot pieces are required. In making these corner pieces, the individual sections were cut and nailed together in such a way that no joint in any of the four corner members was at the same distance from the base. To accomplish this, four pieces of 1-by-2, 16 feet long, were laid side by side on the ground and marked "A," "B," "C," "D." The four pieces were then cut to the following lengths: "A," 7 feet; "B," 10 feet; "C," 13 feet; and "D" remained the full 16 feet. Another piece of 1-by-2 was then cut to a length of 4 feet. This piece was nailed on to the piece marked "A," making the start of the 2-by-2 corner piece. A full-length piece was then nailed on to the remaining 3 feet of the piece marked "A," thus making it a 2-by-2 and leaving a piece 13 feet long to be covered by another full length piece; and so on, until the full-length 100-foot 2-by-2 is completed. The pieces to be nailed to "B," "C," and "D" are 8½ feet, 11½ feet and 14 feet, respectively. These figures are not critical, however, and most any combination will work out OK. The idea is to "stagger" the joints to prevent weakness which could be caused by joints at the same distance from the base of the mast. The nails used on the corner pieces were long enough to go completely through the two 1-by-2's with a little left to clinch. They were placed every 6 inches for the whole length.

For the base and top we obtained two pieces of fir timbering 8 by 8 by 30 inches long. These pieces were then dressed down so that there was an even taper on all sides from about 7 inches to 5 inches. These dimensions are not too critical. A 2-by-2 inch slot was then cut in each corner the entire length of the piece for the corner pieces to fit into. The corner pieces were then cut to exactly the same length and bolted into place by ¼-inch bolts, 8 inches long. It is advisable to figure out the best way to arrange the bolts for maximum strength when you are ready to use them, as the grain of the wood or the arrangement of the corner pieces may necessitate some variations.

**ASSEMBLY BEGINS**

Now the fun really begins. After the top and bottom pieces have been firmly bolted to the corner members, get the thing straightened out on as level a piece of ground as you can find. You may have to block it up in places with pieces of scrap 2-by-2, or what-have-you. Above all don't get discouraged; it will probably look like a hump-backed snake and act like a piece of heavy rope. Now drive a small nail into the exact center of each end; then take a chalkline or heavy cord and stretch it tight from end to end. This is the center line and all measurements are made from it. The shaping of the tower is next in order. Two sides are formed at the same time, which simplifies things considerably. At the 50-foot mark, the middle of the tower, the corner members are spread apart until the outside of each one is exactly 13 inches from the chalkline. A cross piece is then nailed on temporarily to keep them in place. The correct taper is then determined and pieces of sharpened 2-by-2 are driven into the ground about every 15 feet for the entire length. The corner members are then pulled into position and temporarily nailed to the 2-by-2's driven in the ground. The lath, nails, saws, hammers and what-nots are then brought into action along with the glue pail. Every joint in the tower should be brushed with a coating of water-proof aeroplane
glue before being nailed together. A strong center cross piece is then put into permanent position. There are four of these pieces all together, two of them being 26 inches long by 3 inches wide by 1 inch thick, and the other two are of the same stock but 28 inches long. The shorter cross pieces are used first, one on the front and one on the back (or top and bottom, if you want to refer to it that way). These cross pieces are all nailed, bolts not being necessary.

The next thing in order is to measure and mark the position of each of the horizontal cross pieces. These cross pieces are placed on centers 20 inches apart and should all be marked before any of them are nailed into permanent position. A steel tape should be used to mark these centers to prevent the slight errors which might add up to a considerable amount by the time 25 measurements have been made. It might be well, after the positions for these cross pieces have been marked, to nail several of them into permanent position along the entire length of the structure. In our case these pieces were placed 80 inches apart. Needless to say, we worked from the center toward each end so that the shape would be symmetrical. Careful measurements cannot be stressed too highly; the success of the whole project largely depends on accurate measurements. It might be well at this time to mention that for about 25 feet from the center toward each end, all lath used in the horizontal and diagonal cross pieces are doubled.

With these several cross pieces in permanent position, the rest of the cross pieces can be nailed and glued down tight. Four small cement-covered nails are used in each joint. The nails used to hold a single-thickness lath to the corner pieces are nearly two inches long and have thick shanks and large heads, while 2½-inch box nails are used on the double-thickness lath. Careful selection of the kind and style of all nails used is very important. It would probably be wise to get a flock of samples and try them out before making the final choice. It must be remembered that there are four nails at the end of each cross piece in a space 2 inches square. In the thousands of small nails driven into our tower, not a single split was caused by a nail. This speaks well for the pine lath which was very brittle, due to the dry Colorado climate.

The diagonal cross pieces are next nailed into place to form an “X” in each of the spaces between the horizontal cross pieces. The hard work is now finished, and the structure is turned completely over and the cross pieces are nailed into place on that side. After this side is completed it will be necessary to stand the two completed sides on edge and spread them apart in the middle. The two remaining 28-inch center cross pieces are then nailed into permanent position. These two pieces are made 25 inches long so they will cover the ends of the other two cross pieces which are only 26 inches long. A lot of temporary cross pieces are then nailed in place to start forming the tower. Measurements conforming with the already completed sides are then transferred to the side being worked on and the same procedure fol-

FIG. 3—ILLUSTRATING THE LATH PLACEMENT AND NAILING OF THE SIDES

FIG. 4—INTERNAL BRACING OF THE MID-SECTION AND ATTACHMENT OF GUYS

QST for
The tower is now ready for the finishing touches. A bridle arrangement is built on the inside of the structure, 48 feet from the base, to connect the heavy guy wires. This bridle is constructed of 1½-by 3/16-inch strap iron and fastened to the corner pieces with ¼-inch bolts 3 inches long. It is arranged so that the pull exerted by the guys is distributed by the bridle. This relieves strain on the tower which might be caused by high winds, or heavy snow or sleet.

The guy wires in use at present are No. 6 gauge galvanized iron, each wire being broken in two places by heavy strain insulators of the interlocking “egg” type. All splices and connections of the heavy wire are made by using small cable clamps. The use of these clamps removes the danger of crystallization of the wire which could be caused by bending or improper serving. Two clamps were found to be more than sufficient to hold any splice securely. For guy posts we used four 12-foot street car rails set in 4 feet of concrete. The holes for these rails were dug with a 6-inch posthole digger and less than one sack of cement was required to fill all four holes. The wires were fastened to the rails about 7 feet above the ground. The holes were already drilled in the rails so that simplified matters. These rails were placed at an angle of 90 degrees to, and 40 feet from the tower foundation. The height of the posts not only prevents broken necks but increases the effective

length of the guy wires themselves, thus assuring a great safety factor. The wires themselves are arranged in a criss-cross manner, as shown in a sketch, so that there would be less twisting or shaking of the tower by wind. A small block and tackle was used to pull them tight. If you cannot obtain a clamp designed for this purpose, a pair of cable clamps and a piece of scrap guy wire can be made to serve the purpose. In the original erection of the tower the guy wires were not placed on the structure until after it had been raised, heavy ropes being used temporarily in place of them. Two sets of weather-proofed halliards were first installed but were removed when we found that the mast was strong enough to climb. To weather-proof the tower it was “sonked” with six gallons of boiled linseed oil.

UP SHE GOES

The stone block for the foundation was made solid and the tower was ready to raise. All the rope we could get hold of was on hand, along with a block and tackle carrying ¾-inch rope. Four ½-inch ropes were tied on at the half-way point. These ropes were used to guide the tower on its way up and then to hold it in place until the permanent guys were in place. In tying the rope on to the mast care must be exercised in the way it is placed around the structure or crushing and breaking of the lath may result. It is a good plan to tie the rope around the tower at a point where there is an internal support. The stay rope for the block set should be tied around the mast at a point about sixty feet from the base. The other end of the tackle should be made fast to a pole or some other solid object about seventy feet away from the

(Continued on page 59)
Frank Talk About This Business of Transmitting Tube Ratings

Some of the Why's and Some of the Wherefore's

By E. C. Hughes, Jr.,* W3EHJ

We all know there are so many transmitting tubes that we can't remember their numbers. What a lot of us would like to know is why two tubes that look to be about the same size carry widely different ratings—and, incidentally, how far above the manufacturer's "conservative" rating it's safe to go. Here's one tube builder's answer to these questions.—EDITOR.

This article is a discussion of the problems involved in rating transmitting tubes. Therefore, let's be frank in beginning by saying that it may sound to some like an advertisement of one company's method or its engineering staff. However, it is the writer's intention not to preach or advertise, but only to present the facts as he knows them. It is also, at the start, desirable that the author identify himself so that the reader may know his background. Furthermore, he believes that the tube manufacturer, as the one who shares the grief when things go wrong, should speak frankly and at some length regarding the problems of transmitting tube ratings.

MEDIUM-POWER TUBES, SUCH AS THE 803 IN THE YOUNG LADY'S HAND, ARE TESTED IN THIS RACK AT THE RCA TRANSMITTING TUBE PLANT

When yours truly gave up his spark coil in 1921 he had no connection with a tube manufacturer nor did he even suspect that some day he might. As a result he bought four of the then "fast-gasp" 202's, tied them in parallel, poured on the coal in the form of raw a.c. and cursed the manufacturer who couldn't build tubes that would stand four times the voltage he said they would. 5AFS, in those days, could often work several stations between tube failures. Since that time a lot of water has gone under the bridge, and I find myself in the position of making tubes rather than ruining them.

Some years back, it looked as though Johnny Q. Amateur was on the way to giving the manufacturer the benefit of the doubt and, out of courtesy to his imbecilic ravings, taking tube ratings seriously. Recently, however, there has been another epidemic of tube-icide. You see, some optimists have been telling us how we could slip a kilowatt into a '99 and still look like sissies to those who really knew how to operate tubes. All of which has inspired me to attempt this piece, thus sticking my neck out for the rest of the fraternity to take cracks at it. Well, here goes:

HEAT

Heat is probably the greatest limiting factor in transmitting tube ratings. Heat is the result of losses in the tube. First, we have a hot filament or cathode giving off heat which can only be dissipated by the exterior surface of the tube. Then we have heat developed by other power losses in the tube. We all know that we can put so much power into a given tube and take so much out, but that we never can take as much power out as we put in. What we can't take out is lost power and this lost power shows up in the form of heat.

If you could refrigerate to a low temperature every part of a given tube except the electron emitter, it is safe to say that this tube's ratings could be doubled, trebled, or even quadrupled, just so long as there is enough electron emission to furnish the extra power you are pulling out. Unfortunately, it isn't practical to refrigerate a tube. As a result, the power is increased the added losses which show up in heat mean higher temperatures, and these mean all sorts of difficulties. Let's look at a few.

While one doesn't usually think of the struc-
tural materials used in tubes as possible emitters of electrons, every metal, as well as the glass, in a tube is a potential source of electrons should the material be raised to a sufficiently high temperature. Accordingly, excess heat is dangerous in that it raises the temperature of such parts as grids, supporting structure, and plates to very high temperatures, which may result in primary emission. Emission from anything but the cathode is usually bad business, since tubes have a habit of resenting the assumption by certain parts of functions which rightly belong to others.

Materials inside the tube also have the annoying habit of releasing gas should the temperatures become excessive. No amount of pumping, bombarding, or getter will prevent gas evolution under overload conditions. Gas can be evolved from the bulb, plate, insulating spacers or other structural parts inside the tube.

Another cute trick occurs when positive ions are released by overload conditions from some tube part. These are attracted to the filament like flies to molasses. Unfortunately, the ions arrive at higher speeds than any fly ever achieved and under certain conditions literally dislodge hunks of the emitting surface from the filament or cathode. This treatment isn’t conducive to long tube life.

Now don’t get the idea that all tubes are alike. Some tubes use materials and have design features which permit them to run at very high temperatures without damage. Other tube types will not stand such temperatures, but that doesn’t necessarily mean that the latter tubes are not as useful for their jobs as the others are for their particular applications. Design features, cost, operating characteristics, and the like, are what determine a tube’s real worth. But, in general, remember to be a bit shy of operating conditions which cause your tubes to develop quite a fever. Be especially shy of high temperatures when you are trying to prove that the manufacturer doesn’t know what his tubes will do. He may have discovered something about that type which you haven’t, but shortly will—unless you were born under a lucky star.

VOLTAGE

I should call plate voltage the next limiting factor in transmitting tube ratings. Excessive plate voltages bring a triple curse.

In the first place, excessive plate voltages usually mean excessive power input, therefore more losses (even though the efficiency may be considerably higher), more heat, and more trouble.

In the second place, excessive plate voltages are likely to break down the insulation between the plate and other electrodes. The results are well known and we need not dwell thereon.

In the third place, excessive voltages may cause excessive electronic bombardment of the bulb, resulting in gas evolution or, as often happens, bulb “suck-ins.” This latter effect is particularly prevalent when high-frequency dielectric loss is also present.

PERIODIC CHECKS OF SAMPLES OF ALL TUBE TYPES ARE MADE IN THESE LIFE-TEST RACKS

CURRENT

Plate current, or more properly, total cathode current, is probably the next limiting factor. Like excessive voltage, excessive plate current usually means excessive inputs and excessive losses which, as we have already seen, are detrimental to a tube’s disposition. These excessive losses may result in loss of emission from the cathode. Reactivation may or may not restore the lost emission.

OTHER LIMITING FACTORS

While heat, voltage, and current are not the only factors which limit the ratings for a tube, they are for the purposes of this story the most important. Other factors, such as the frequency at which the tube is to be operated, may influence the rating but the troubles they engender usually show up in the form of our regular nemesis—heat.

WHAT RATINGS ARE SUPPOSED TO MEAN

When a reputable manufacturer puts a rating on a tube it means that he has gone to considerable expense in determining that rating in order that you may know how to operate that particular tube at high power and still obtain long, reliable and economical operation. Ratings established with that intent are a protection both to you and to the manufacturer. Ratings which

(Continued on page 104)
How Would You Do It?

Solutions to the Problem of Protection Against Injury from Transmitter High-Voltage Supplies—Announcing the Sixth Contest

Judging from the splendid response to Problem No. 4, a good number of the amateur fraternity is alive to the grave dangers lurking behind the innocent-looking transmitter panel. It is admitted that none of the measures suggested will protect the ham who insists on working on the transmitter with the high voltage turned on. Any protective circuit of which we know may be short-circuited or propped open if one is foolish enough to do so. There should be no necessity for working on a transmitter with high voltage applied and, since no one in his right mind would do so, forgetfulness or absentmindedness is responsible for most accidents. It is for this reason that we believe we are justified in eliminating those systems designed for protection which depend solely upon warning signal lights. Signal lights may serve as a reminder for a few days or several weeks but eventually they become a part of the general atmosphere about the transmitter and become practically worthless as a protective device. Several of us have learned this from sad personal experience.

Solutions fell into four or five distinct groups. Some of the contestants may notice that principles presented are identical with their own. In these cases, it should be explained, selection was made of the most complete and best written manuscript. It is interesting to note that the system suggested by the first prize winner is not only the most foolproof but also the simplest. The whole idea is based on the use of push-button type switches which prevent the high voltage from coming on unless the operator not only pushes the button but keeps pushing.

First Prize Solution

By Jennings Chestnut W9LYW

Here is my solution to problem No. 4. I find that with the use of two switches, I can avoid the danger of being electrocuted when making adjustments on a transmitter.

Fig. 1 shows a transmitter mounted in a relay rack with tuning controls in front. A push-button type of switch is mounted on the front of the transmitter. This switch is connected in series with the primary of the plate transformer. Therefore to tune the transmitter, the push-button must be held closed all the time. But the instant the hand is removed from the button, the plate voltage is cut off. When an adjustment is made behind the panel, the operator knows that the plate voltage is off. After the adjustment is completed, he can walk around to the front of the transmitter, and read the meters which are in full view.

Fig. 2 shows the operating table on which the key is mounted. The section marked A is hinged as shown in Fig. 3 in the cut away view. A second push-button switch is mounted under section A. This switch is connected in series with the primary of the plate transformer, and in parallel with the switch on the front of the transmitter. When the operator is ready to transmit, the weight of the arm closes the switch and connects the plate transformer.

Of course, if 'phone a push-to-talk switch on the microphone or a foot-operated switch can be connected instead of the desk switch, and serve the same purpose.

This also makes break-in operation easy, which is very desirable.

Bernstadt, Kentucky.
Second Prize Solution

By Clement Van Velsor, W2HNX

Our hero need no longer fear that the high voltage may be on, for with the “step-on-it” switch, he cannot get juice even with the main switch closed, so long as he stands near his rig to adjust it.

The sketches of Figs. 4 and 5 show the idea which incorporates small platforms placed close enough to the transmitter, so that the operator must stand upon one of them to get near enough to work. The upper board is about 12 inches wide and of a length equal to that of the side of the transmitter, or the width across the back if that is exposed too. It is \( \frac{3}{4} \) inch thick to adequately support the weight of our hero. The lower board is \( \frac{1}{2} \) inch thick, of the same length as the first one, and about an inch narrower.

A brass strip \( \frac{3}{4} \) inch wide and \( \frac{1}{4} \) inch thick, the length of the boards, is mounted along one edge of the lower board on a number of bushings about \( \frac{1}{4} \)-inch high. The edges of the bushings come about \( \frac{3}{8} \) inch from the edge of the lower board. The brass strip extends over the edge of the board. Soldering lugs are fastened under the bushings, the number and location depending upon where wire connections are made. One is enough if only one switch is used, but if more, then two lugs are necessary.

Heavy compression type springs about \( \frac{3}{4} \) inch long and about the same in diameter are used to keep the switch closed. Two or three per board is enough, depending upon length. Shallow cups like those shown are made in the upper and lower boards so the springs will not slip.

Now two or three strap hinges depending on length of the board are obtained, each about six inches total length. The two boards are fastened together with them as indicated. Holes for fastening the switch to the floor are drilled through both boards when closed, and the upper board holes made larger for the screwdriver to get through.

The springs are placed in position and the boards held closed while the bent brass contact strip (\( \frac{3}{6} \) inch thick, and about six inches long) is fastened to the edge of the upper board as shown, so that when the boards are released, the springs will cause the contact strips to make contact with the bottoms of the brass strips. One or two lugs for soldering are fastened under the brass piece depending on where the wires are run to.

It is advisable to make connections before the switch is fastened to the floor to allow more room to work in. Then, with the whole assembly placed about six inches from the transmitter and parallel to it, it is screwed to the floor, putting the screwdriver through the upper board holes. The two boards cannot be spread apart when the brass pieces are assembled.

If more than one board is used, then all connections are in series, so that stepping on any one will break the contact.

By placing the boards six inches from the transmitter, our hero can stand just about near enough to adjust the rig. Standing within six inches is mighty uncomfortable. Switches are only necessary in front of exposed sides. As the front panel should be "dead," no switch is needed.

The springs should be heavy enough to make good contact in the switch, but not so heavy our hero's weight will not readily press the board down and break the circuit. So as long as he is on the switch, voltage cannot be applied to the transmitters since the switch is in series with the main switch or line.

![Diagram](image-url)
The main advantage of the switch is that it is out of the way, and not cluttering up useful space. It is easily moved and positive in action.

Another simple system is suggested by H. E. Rice, Jr., W9YZH. The essentials are shown in Fig. 6. A rope barrier surrounds the transmitter. Any pressure applied against the rope automatically opens the primary circuit of the high voltage transformers. The pulleys are mounted on posts set in the floor on either side of the transmitter.

FIG. 6—THE ROPE OR LAMP CORD BARRIER

Panel. In his application of this system, Mr. Rice uses a permanent brass rail for the front portion of the barrier. Two flexible electric cords in the line to the plate transformers form the two side sections. Plugs and receptacles are fitted to each end of each of these sections of cord so that the plugs are pulled out by a pressure against the cords.

Problem No. 6

Now that the transmitter is almost finished, our hero is planning a new antenna system. He will require, amongst other things, a new 50-foot mast in the back yard. The mast simply must be a clean and neat-looking affair with an absolute minimum of guy wires, but it must also be capable of taking a beating from the occasional violent winds. Our friend cannot help thinking that, with all the thousands of masts that have been put up by hams during the last twenty years, someone, somewhere, must have come pretty close to the ideal design and be willing to offer the details. The mast must be reasonably inexpensive to build and it must be so arranged that a whole army is not required to erect it. It is not essential that the design submitted has actually been erected but, naturally, special consideration will be given to descriptions of existing masts which have shown their ability to stay put.

Complete drawings with constructional details and dimensions are required.

Several contestants submitted various forms of the “door interlock” protective system in which the transmitter is entirely enclosed in a cabinet. Access to the inside of the transmitter is gained only through doors in the side or rear of the cabinet. Each door is equipped with a switch which opens the plate transformer primary circuit or a relay circuit whenever one of the doors is opened. An example of the correct method of installing such a system is described by Hammond Mathews, W0JRM. The circuit is shown in Fig. 7.

The opening of any door of the enclosure will automatically open not only the primary circuit of the high voltage transformer but also the circuit including the holding coil of the magnetic switch so that it will not be possible to close the primary circuit again until all doors have been closed and the operator has returned to the operating position and pushed the starting switch.

We should like to mention in addition the very complete papers by J. B. Carter on a capacitative relay system, by G. P. Stout, W3FVF on a photoelectric relay system and by Mr. L. C. Waller on methods of protection by high voltage isolation and insulation. While these systems are most interesting and novel, we believe them to be somewhat too complicated for general amateur acceptance at the present time. We hope to be able to include these papers in a future presentation.

We should also like to thank the following for their interest in submitting various ideas, many of which were excellent:

(Continued on page 78)
The Board Meets

The Federal Communications Commission was requested to change the 'phone portion of the 10-meter band to read 28,500-30,000 kc.; no changes were asked in 4-Mc. and 14-Mc. 'phone. A non-political group to study allocations within the amateur structure on an engineering basis, and a better planned use of bands, was created. A detailed plan for the recognition and coordination of amateur communication in times of emergency was forwarded to the F.C.C. Warner and Segal were ordered to the Cairo conference, with instructions to pursue as aggressive a position as possible without endangering present frequencies. They are also to attend the regional conference at Habana in November, with some interesting matters at issue. The headquarters office was continued at West Hartford; erection of the new memorial station, W1AW, will now proceed apace. Important new regulations tightening the requirements for eligibility to the Board and to the office of S.C.M. were adopted. Membership referenda were voted down. A national convention for 1938 was authorized.

These were the highlights in the fifteen-hour 1937 annual meeting of the A.R.R.L. Board of Directors at Hartford in early May. Every division of the League was represented. Keeping its nose strictly at its work, the Board waded through five busy sessions in two days, recessing only to have its meals in an adjoining room. By the time it had finished, every problem of the League that any director could think of was taken up and dissected, new orders issued.

Under the able chairmanship of Dr. Woodruff, the fourteen divisional directors, the Canadian General Manager and the Vice-President assembled, together with the other officers of the League, the General Counsel, Assistant Secretary, and an expert technical adviser. The Board received reports from its officers and committees, examined the work of the Executive Committee and its own informal actions in the past year, then heard detailed reports from every director, and thus spread before itself a foundation of detailed information on which to base its subsequent examination of a large number of League matters.

OPERATING MATTERS

The recurrent question of 'phone allocations was again before the Board but it was decided to leave these allocations in the 4-Mc. and 14-Mc. bands in their present status. However, everyone has known that something ought to be done about the 28-Mc. band, and by a unanimous vote the Board requested the F.C.C. to enlarge and to shift that 'phone allocation to the upper three-quarters of the band, retaining 28-28.5 Mc. exclusively for c.w.

The Board suggested to the Commission the desirability of rearranging its licensing structure to provide that 'phone may not be operated on frequencies below 56 Mc. until after a year of c.w. experience. That is what the Board would like to see but it is a complex subject, involving fundamentals of Commission policy and either a rather thoroughgoing rearrangement of all of its classes of amateur licenses or the addition of a fourth class and a new examination for it. Rather than a firm recommendation for a specified change in regulations, then, the matter goes to the Commission as a general suggestion. It is felt that such an expression of fundamental policy on the Board's part can aid the Commission in formulating its basic attitudes and possibly lead to simplifying the distinctions between classes of licenses.

We all are aware of the need to do something to consolidate our position as the chief handlers of emergency communications. Recent emergencies have shown the need for better coordination. A plan drafted by the Communications Manager was endorsed in its entirety by the Board and transmitted to the Commission with a request for enactment. Briefly, it calls for the selection of amateur coordinators, for the cooperation of F.C.C. in confining restricting orders to major emergencies and then only to the areas necessary, as determined in consultation with the League; for the creation of emergency calling and listening sub-bands of 25 kc. on the edges of certain low-frequency bands, with five minutes of each hour specified for mandatory listening for weak isolated stations. A complete structure for amateur emergency work is included, which it is believed fits in with the Commission's general plans for coordinating emergency communication, and which will be presented in detail in QST as soon as possible.

In recognition of the great possibilities that lie in planning the use of our bands and arranging our sub-allocations on an engineering basis, the Communications Manager was directed to centralize a study on this subject and report to the Board next year, having as his collaborators skilled amateurs drawn from different parts of...
the country and representative of different types of amateur work, chosen with the advice of the division directors—and with the results digested with the aid of QST's technical editors. Great hopes are held for the possibilities of such a study conducted in an engineering atmosphere.

INTERNATIONAL MATTERS

The Secretary and General Counsel were selected to represent the League at the Cairo conference to review the radio regulations. Their instructions are to pursue as aggressive an attitude on amateur frequencies as is possible without endangering our present assignment. The Board of course opposes all of the proposals to restrict us, notably wishing the power of amateur stations to be set by each administration as at present. While the League is concerned primarily with W/VE amateurs, its representatives will lend every possible aid to the interests of European amateurs whose low-frequency assignments are in a special table for the European region.

Considerable tightening of the requirements.

The Board is to lend every possible aid to the interests of European amateurs whose low-frequency assignments are in a special table for the European region. Warner and Segal may be absent from the country five months on this mission.

The same two men are to represent us at Habana in November where a Pan-American regional conference is to be held. The general question of all the amateur frequencies in the Americas is at issue there. There is also a proposal by the Latin-American countries to permit amateur 'phone between 7 and 7.1 Mc. Our Board is opposed to any 'phone in this band but feels that, if the countries to the south of us insist upon some such 'phone, it is much better to concentrate it in a limited portion of the band than to permit it to be spread at will through the band as is now unfortunately the practice. The Board also hopes that agreement may be had at Habana to permit amateurs of all the countries in the Americas to interchange third-party messages of the type that would not normally go by a paid service, and the government of the United States has been requested to propose this.

ADMINISTRATIVE MATTERS

Candidates for S.C.M. hereafter will have to have been licensed amateurs at least two years and League members at least one year before nomination. Candidates for director will have had to be both licensed amateurs and League members for at least four years before nomination. Moreover, by an amendment to by-laws, the Board specified in much greater detail than heretofore the requirements for eligibility, making plain its intention to exclude from eligibility to the Board any candidate whose business connections are of such nature that he could gain financially through improper actions or through the exploitation of his office. This is no change in principle but it will have the practical effect of a considerable tightening of the requirements.

Names on ballots for S.C.M. and director hereafter will be listed alphabetically, rather than in order of the number of nominating petitions received, and some of the folderol is eliminated. When a director is being elected to fill a vacancy, if the remaining term is less than a year in length, the election will be both for that remainder and for the next regular term of two years.

The Board accepted the recommendation of its committee on the location of headquarters, ordering that the headquarters remain at West Hartford. Many plans that have been held in abeyance for this decision will now go forward. Work will start at once on the Maxim Memorial station, W1AW, which is to have 1 kw. transmitters on three bands. The Board instructed that, to the extent feasible, the new station be equipped with directive antennas, to lay down the maximum signal to the west. The Secretary was authorized to conclude a lease on the present headquarters building which will give the League a great increase in space, occupying the entire building. New facilities for the editorial department will shortly be provided, notably providing greatly increased space for workshop and laboratory. Some interesting shop and experimental programs have had to be held up for lack of room but will now shortly be under way.

The Board authorized a national convention for 1938, its regular 1938 meeting to be held at the same time and place. A proposal for membership refers to problems before the Board was voted down. Cordial thanks were expressed to the Standard Frequency Stations and to the QSL Managers for their labor. The QSL Managers are to be supplied with cards to send to amateurs for whom QSL's are on hand, presumably non-members, in extension of this A.R.R.L. service to amateurs. Hereafter when members pay their dues they may obtain a membership certificate instead of a membership certificate, if they so prefer and specify. (Not both, however, and not for those who already have certificates—not until their dues are again payable. Announcement will be made when the cards are available.)

The Board decided that every licensed amateur ought to be a member of the League, and the directors themselves propose to sponsor this increase in membership. To this end, a committee of their own number is being appointed to study ways and means to make membership more attractive, to point out its advantages, and to increase fraternalism. Several ideas were referred to this committee for study. It is an important step.

South Carolina was transferred from the Southeastern to the Roanoke Division and is made a separate section, with an election for S.C.M. now announced. This will bring the number of S.C.M.'s to seventy.

Considerable study was given the subject of b.c.i. interference. Recognizing inadequate receiver design as the chief cause of complaints, the
Board endorsed a resolution originally drafted at a division convention, bringing this matter to the attention of the Radio Manufacturers Association and asking their cooperation. A QST article was asked, showing amateurs how a shift in frequency will frequently escape the interference caused by these inadequate receivers by overcoming the bum geometry of their i.f. stages. QST articles were also asked in analysis of the present amateur bands and how they came to be; and on an idea for the international subdivision amongst amateurs of the 7-Mc. band, now under study in the I.A.R.U. QST departments for A.A.R.S. and N.C.R. news were offered.

The Board appropriated money for its own meeting and for the division administrative expenses of directors the next year and a half, likewise for the international conferences that have to be attended and for several minor purposes. Total appropriations aggregated over $18,000. In two years the Board has appropriated $35,000 for numerous special projects, an index to the scope and variety of the work which A.R.R.L. is carrying on for its members.

We have had only a brief time to prepare this account, while the presses wait to carry it to you in June QST. Obviously we have hit only the high places. QST in months to come will uncover many of the details. Meanwhile here are the minutes themselves, well worth your careful reading.

Minutes of 1937 Annual Meeting of Board of Directors, American Radio Relay League

May 7-8, 1937

In compliance with the Constitution and responsive to due notice, the Board of Directors of the American Radio Relay League, Inc., convened in regular annual meeting at the Hartford Club, Hartford, Conn., on May 7, 1937. The meeting was called to order by Dr. Eugene C. Woodruff, president, at 10:05 a.m., d. I. The roll was called, showing the following directors present:

- Eugene C. Woodruff, President
- George W. Bailey, Vice-President
- Alex Reid, Canadian General Manager
- Bennett R. Adams, Jr., Southeastern Division
- E. Ray Arledge, Delta Division
- Charles E. Blalack, Southwest Division
- Hugh L. Caveness, Roanoke Division
- J. L. McCargar, alternate for S. G. Culver, Pacific Division
- Ralph J. Gibbons, Northwest Division
- Wayland M. Groves, West Gulf Division
- Kenneth T. Hill, Hudson Division
- Carl L. Jabs, Dakota Division
- W. Bradley Martin, Atlantic Division
- R. H. G. Mathews, Central Division
- Percy C. Noble, New England Division
- Floyd E. Norwine, Midwest Division
- Edward C. Stockman, Rocky Mountain Division

Thus all divisions were represented. There were also present Secretary K. B. Warner, Treasurer A. A. Hebert, Communications Manager F. E. Handy, General Counsel Paul M. Segal, Assistant Secretary A. L. Budlong, and, as technical adviser to the Board, George Grammer, Assistant Technical Editor of QST.

On motion of Mr. Gibbons, after discussion, the minutes of the 1936 annual meeting of the Board of Directors were approved in the form in which they were issued by the Secretary.

On motion of Mr. Hill, unanimously VOTED that the annual reports of the officers to the Board of Directors are adopted and the same placed on file.

On motion of Mr. Arledge, unanimously VOTED that all acts performed and all things done by the Executive Committee since the last meeting of the Board, and by it reported to the Board, are ratified and confirmed by the Board as the acts of the Board. Mr. Martin requested, as objecting to the manner in which the Executive Committee picked the A.R.R.L. nominees for the Paley Award.

On motion of Mr. Blalack, unanimously VOTED that the Board, having considered its mail vote in which it rejected the supplementary report of its Cairo Committee dated July 7, 1936, in favor of filing a minority report in the United States preparatory committee preparing for the Cairo conference, pressing the endeavor to secure more frequently, and having examined the same, now ratifies the vote taken and decides to take this action as of August 6, 1936. And on the further motion of Mr. Blalack, unanimously VOTED that the Board, having considered its mail vote on the question of withdrawing 1936 request to the Federal Communications Commission for an expansion of the 4-Mc. 'phone allocation to read 3850-4000 kc. and refraining from appearing at the hearing thereon ordered for October 20, 1936, and having examined the same, now ratifies the vote taken and decides to take this action as of August 7, 1936.

Mr. Reid presented his report as Canadian General Manager. In turn, every division director rendered a report on conditions in his division, Mr. McCargar presenting the report of Mr. Culver.

On motion of Mr. Bailey, unanimously VOTED that the sum of three thousand dollars ($3,000.00) is hereby appropriated from the surplus of the League, as of this date, for the purpose of defraying the expenses of holding this meeting of the Board of Directors, any unexpended remainder of this sum to be restored to surplus.

On motion of Mr. Blalack, unanimously VOTED that the sum of one hundred eleven dollars and sixty-eight cents ($111.68) is hereby appropriated from the surplus of the League, as of this date, for the defraying of the expenses of the Cairo Committee of the A.R.R.L. Board in excess of the amount heretofore appropriated.

On the question of deficiency appropriations for directors who had contracted expenses in excess of their appropriations for administrative expenses, after discussion, moved, by Mr. Norwine, that the Mid-Wilix Division Director be required to refund the amount expended in excess of his appropriation. But there was no second, so the motion was lost. After further discussion, on motion of Mr. Mathews, unanimously VOTED that there is hereby appropriated from the surplus of the League, as of this date, the sum of twenty-three dollars and forty-three cents ($23.43) on account of the director of the Midwest Division, and the sum of seventeen dollars and thirty-nine cents ($17.39) on account of the director of the Southwest Division, and the sum of nine dollars and fifty-one cents ($9.51) on account of the director of the Rocky Mountain Division, for the defraying of division administrative expenses in the preceding year in excess of the amounts hereinbefore appropriated for their respective uses. At the suggestion of Mr. Blalack, without dissent, it was decided to make future appropriations for the administrative expenses of directors on the basis of the calendar year.

On the question of matters concerning the American regional conference to be held at Havana in November, 1937: On motion of Mr. Jabs, unanimously VOTED that the Secretary is instructed to be present at the said conference, in representation of the interests of amateurs, and that there is hereby appropriated from the surplus of the League, as of this date, the sum of five hundred dollars ($500.00) for the purpose of defraying his expenses, any unexpended remainder of the same to be restored to surplus.
question of policy towards the Cuban proposal on the agenda of this conference that the frequencies 7000-7100 kc. be opened to 'phone operation in the Latin-American countries, moved, by Mr. Norwine, that the Board opposes this proposal. But, after discussion, with unanimous consent, Mr. Norwine withdrew the motion. After further discussion, on motion of Mr. Norwine, unanimously RESOLVED that, while the Board is opposed to any telephone operation in the range 7-7.3 Mc., it recognizes the right of Latin-American countries to permit their amateur licensees to use telephone frequencies, and therefore suggests that if such telephone operation must be permitted in the Latin-American countries, it be confined to a range of 100 kilocycles. Disregarding a discussion of the desirability of a better appreciation by amateurs of the reasons behind their frequency assignments, on motion of Mr. Mathews, after discussion, unanimously VOTED that the Editor of QST is instructed to prepare an article to be included in a future issue of QST, giving the history of amateur frequency allotments and the reasons behind them, together with details on the coming Cairo conference and our connection with it, the attitude of foreign countries toward amateur frequencies, the importance of their votes, etc., for the purpose of creating a better understanding and better feeling of confidence among both members and non-members of the League; draft of said article to be submitted to the Board of Directors for approval before publication. On motion of Mr. McCargar, unanimously VOTED that the League requests the Department of State to propose the addition to the Havana agenda of the question of a uniform special arrangement in the Americas permitting the international handling of third-party traffic by amateurs. On motion of Mr. Bailey, VOTED that the question of selecting and instructing representatives to the Cairo conference is made a special order for the first item of business the following day; that the proposal of a continuing advisory technical council for allocation studies and a planned use of bands is to be examined before questions of 'phone allocation are considered by the Board; that the proposal to carry the good will item on the book of the League at a nominal $1, and that the Board then recess for luncheon.

On motion of Mr. Blalack, unanimously VOTED that the Board make no request of the Federal Communications Commission for increasing the 3800-4000 kc. 'phone assignment. In the course of an extended and spirited discussion, moved, by Mr. Arledge, that the motion be amended to add the words "as a temporary policy, until the advisory technical council studies and reports on the question." But, after further discussion, the said motion for amendment was rejected. The question being on the adoption of the original motion, the yeas and nays again being ordered at the request of Mr. Gibbons, the said question was decided in the affirmative: whole number of votes cast, 15; necessary for adoption, 8; yeas, 11, nays, 4. Those who voted in the affirmative are Meares, Adams, Arledge, Blalack, Caveness, McCargar, Martin, Gibbons, Hill, Jabs, Stockman and Bailey. Those who voted opposed are Messrs. Gibbons, Groves, Hill and Jabs; abstentions, Mr. Reid. So it was decided to make no request of the Commission concerning this band.

Moved, by Mr. Martin, that the Board make no request of the Federal Communications Commission at this time concerning expanding the 14-Mc. 'phone allocation. After discussion, the yeas and nays again being ordered at the request of Mr. Groves, the said question was decided in the affirmative: whole number of votes cast, 15; necessary for adoption, 8; yeas, 13; nays, 2. Those who voted in the affirmative are Meares, Adams, Arledge, Blalack, Caveness, McCargar, Hill, Jabs, Martin, Mathews, Noble, Norwine, Stockman and Bailey; those who voted opposed are Messrs. Gibbons, Groves and Jabs; abstentions, Mr. Reid. So it was decided to make no request of the F.C.C. concerning this band.

On the question of the desirability of providing for membership referenda, moved, by Mr. Mathews, that By-Law 43 be amended by adding thereto the following wording: "If, and only if, after the taking of a regular vote by the Board of Directors, it is found that eight or more of the members have voted as a minority, then those eight by their unanimous vote may have the right of causing the subject of such original vote to be submitted as a general membership referendum. The result of such a referendum shall be segregated by Divisions and if the majority of the votes in any Division are contrary to the original vote of the director on the submitted subject, then his vote shall be changed, and a new vote of the directors on such subject recorded accordingly." After extended discussion, the yeas and nays being ordered, the said subject was decided in the negative: whole number of votes cast, 16; necessary for adoption, 8; yeas, 8; nays, 8. Those who voted in the affirmative are Meares, Adams, Arledge, McCargar, Jabs, Mathews, Noble and Stockman; those who voted opposed are Messrs. Blalack, Caveness, Gibbons, Groves, Hill, Martin, Norwine, Reid and Bailey. So the motion was rejected.

On motion of Mr. Arledge, unanimously VOTED that the report of the committee on the location of the headquarters is accepted and placed on file. Proceeding to a consideration thereof, moved, by Mr. Bailey, that the headquarters remain at West Hartford, Conn. After extended discussion, the yeas and nays being ordered at the request of Mr. Blalack, the said question was decided in the affirmative: whole number of votes cast, 16; necessary for adoption, 9; yeas, 15;
nays. 3. Those who voted in the affirmative are Messrs. Adams, Arledge, Caveness, Gibbons, Groves, Hill, Martin, Mathews, Noble, Norwine, Reid, Stockman, Bailey; those who voted opposed are Messrs. Blalack, McGargar and Jabs. So the motion was adopted. On motion of Mr. Martin, unanimously VOTED that the Board expresses its thanks and appreciation to the members of the Committee for their work.

4. On the desirability of amending the by-laws governing the filling of vacancies on the Board of Directors, moved, by Mr. Groves, that By-Laws 21 and 31 be amended by the addition to each of the following sentences:

"The unexpired remainder of the term to be filled is one year or more, the election shall be for the remainder of the term. But if the unexpired remainder of the term to be filled is less than one year, then the election shall be for such remainder plus the next regular term of two years."

The yeas and nays being ordered, the said question was decided in the affirmative; whole number of votes cast, 16; necessary for adoption, 11; yeas, 16; nays, 0. Every director voted in the affirmative. So the by-laws were amended as proposed.

On motion of Mr. Gibbons, the Board, by unanimous vote, extended a cordial expression of its thanks and appreciation to the members of the Committee for their splendid services to amateur radio.

Pursuant to special order, the Board addressed itself to matters concerning the Cairo conference. Moved, by Mr. Caveness, that Secretary Warner and General Counsel Segal be the League's representatives to the Cairo conference. After discussion, on motion of Mr. Bailey, further discussion of the matter was postponed until 11:00 o'clock.

Mr. Reid, on behalf of the committee appointed the preceding day, made the following report:

"Your committee, after consideration, decides to recommend against the formation at this time of a continuing advisory technical committee, but recommends that, as an initial test of the potentialities of the idea, the Communications Manager be requested to co-ordinate a study of this general nature and to incorporate the results of the same in his next annual report to the Board. To this end we recommend that the Board request the Communications Manager to endeavor to find a heating expert for the maintenance of the heating system, and that there is hereby appropriated from the surplus of the League, as of December 31, 1937, $4,200, heat included; the Board accepts and adopts the foregoing report."}

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<tr>
<th>Year</th>
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<tr>
<td>1987</td>
<td>$2,150.00</td>
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<td>1988</td>
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and that there is hereby appropriated from the surplus of the League, as of this date, the sum of two thousand one hundred fifty dollars ($2,150.00) for the purpose of defraying these expenses during the remainder of the calendar year 1937, any unexpended remainder of these funds at the end of the year 1937 to be restored to surplus; and that there is hereby appropriated from the surplus of the League, as of January 1, 1938, the sum of three thousand three hundred seventy-five dollars ($3,375.00) for the purpose of defraying the disbursements authorized for the calendar year 1938, any unexpended remainder of these funds at the end of the year 1938 to be restored to surplus.

The Board recessed for dinner at 6:38 p.m., reconvening at 8:56 p.m., and adjourned at 11:22 p.m. on the morrow. The Board reassembled at the same place on May 8, 1937, and was called to order by Chairman Woodruff at 10:10 a.m. with all directors and other persons hereinbefore mentioned in attendance.

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"Your committee, after consideration, decides to recommend against the formation at this time of a continuing advisory technical committee, but recommends that, as an initial test of the potentialities of the idea, the Communications Manager be requested to co-ordinate a study of this general nature and to incorporate the results of the same in his next annual report to the Board. To this end we recommend that the Board request the Communications Manager to endeavor to find a heating expert for the maintenance of the heating system, and that there is hereby appropriated from the surplus of the League, as of December 31, 1937, $4,200, heat included; the Board accepts and adopts the foregoing report."

On motion of Mr. Gibbons, the Board adjourned at 8:58 p.m., and adjourned at 11:22 p.m. on the morrow. The Board reassembled at the same place on May 8, 1937, and was called to order by Chairman Woodruff at 10:10 a.m. with all directors and other persons hereinbefore mentioned in attendance.

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and Bailey; Mr. McCargar voted opposed. So Secretary Warner, as one of the representatives.

After further discussion of other representatives, moved, by Mr. Caveness, that the choice of the second representative be left to the Executive Committee. But there was no second, so the motion was lost. Moved, by Mr. Reid, that Vice-President George W. Bailey be named as the second representative. But Mr. Bailey regretted his unavailability, there was no second, and the motion was lost. Moved, by Mr. Blalack, that the Executive Committee be requested to select a list of candidates for the second member of the League's representation, submitting their qualifications to the directors for a choice by mail. But the said motion was rejected. After further discussion, on motion of Mr. Gibbons, VOTED that General Counsel Segal is selected as a member of the A.R.R.L., delegation to the Cairo conference. Messrs. Jabs, Mathews and Noble requested to be recorded as voting opposed to this motion. Moved, by Mr. Gibbons, that the League delegation to the Cairo conference consist of three members. But the said motion was rejected, 6 votes in favor to 8 opposed. So the League representation to the Cairo conference consists of Secretary Warner and General Counsel Segal.

The Board being advised that General Counsel Segal intended to attend the Habana conference in November at his own initiative, on motion of Mr. Mathews, VOTED that General Counsel Segal is appointed one of the representatives of the League to this conference, to assist Secretary Warner, at no expense to the League. On motion of Mr. Caveness, unanimously VOTED that General Counsel Segal is appointed one of the representatives. But the said motion was rejected, 6 votes in favor to 11 against. So the new by-law was adopted. Moved, by Mr. Gibbons, VOTED that the League representation to the Cairo conference consist of three members. But the said motion was rejected, 6 votes in favor to 8 opposed. So the League representation to the Cairo conference consists of Secretary Warner and General Counsel Segal.

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On motion of Mr. Mathews, unanimously VOTED that the sum of nine thousand dollars ($9,000.00) is hereby appropriated from the surplus of the League, as of this date, for the purpose of defraying the expenses of the representation of the League at the conference in Cairo in 1926, any unexpended remainder of this sum to be restored to surplus.

On motion of Mr. Martin, VOTED that the Board instructs its representatives to the Cairo conference to assume as aggressive an attitude for the acquiring of additional frequencies as possible under circumstances without endangering the present frequencies and regulations. Mr. Gibbons requested to be recorded as voting opposed. It was further agreed to be the policy of the Board to uphold the right of each administration to fix the power limitations of its amateur stations, to seek the continued admittance of the I.A.R.U. in the meetings of the C.C.I.R., and to give at Cairo such assistance as is possible in the matter of the lower-frequency assignments of European amateurs who operate under a special arrangement for the European region.

On the question of the desirability of making certain recommendations to the Federal Communications Commission concerning emergency work by amateurs, the Board entered upon an extensive discussion. Mr. Martin read and filed a letter on the subject from the Washington Radio Club. The Board reconvened for luncheon at 12:54 p.m., reconvening at 2:02 p.m. with all directors in attendance and all other persons hereinafter mentioned except General Counsel Segal. After further discussion, on motion of Mr. Mathews, unanimously VOTED that the Board concurs in the recommendations made in Communications Manager Handy's annual report to the Board and that the appropriate officers of the League are instructed to transmit to and pursue these matters before the Federal Communications Commission.

As to amending the Constitution & By-Laws concerning the eligibility of candidates for Director and Section Communications Managers, moved, by Mr. Martin, that a new by-law be adopted, to follow By-Law 9 and to be known temporarily as By-Law 9a, as follows:

"9a. Any candidate for the office of Section Communications Manager shall have been both a member of the League for a continuous term of at least one year and a licensed radio amateur operator for at least two years preceding receipt of his petition of nomination."

The yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 16; necessary number of votes, 17; yeas, 15; nays, 1. Those who voted in the affirmative were: Adams, Arledge, Blalack, Caveness, McCargar, Gibbons, Groves, Hill, Martin, Mathews, Noble, Norwince, Reid, Stockman and Bailey; Mr. Jabs voted opposed. So the new by-law was adopted. Mr. Segal here joined the meeting at 2:30 p.m.

Moved, by Mr. Hill, that Section 2 of Article IV of the Constitution be amended to read as follows:

"2. No person who is commercially engaged in the manufacture, sale or rental of radio apparatus reasonably capable of being used in amateur radio communication or experimentation shall be eligible to membership on the Board of Directors; nor shall any person who is commercially engaged in the publication of radio literature intended, in whole or in part, for consumption by licensed radio amateurs. The Board of Directors shall from time to time stipulate in the by-laws annexed to this constitution such regulations as they deem desirable for determining the eligibility or ineligibility of candidates for director. Directors shall serve without compensation from the League for services in any capacity."

On motion of Mr. Norwince, unanimously VOTED to amend the proposed text by striking out the word "amateur" where it appears as the twenty-second word thereof. The question then being on the adoption of the amended motion, the yeas and nays were ordered, and the said question was decided in the affirmative: whole number of votes cast, 16; necessary number of votes, 17; yeas, 15; nays, 1. Those who voted in the affirmative were: Adams, Arledge, Blalack, Caveness, McCargar, Gibbons, Groves, Hill, Martin, Mathews, Noble, Norwince, Reid, Stockman and Bailey; Mr. Jabs voted opposed. So the new by-law was adopted. Mr. Segal here joined the meeting at 2:30 p.m.

Moved, by Mr. Hill, that a new by-law be adopted, to be inserted immediately under the sub-head "Directors" and to be known temporarily as By-Law 10a, reading as follows:

"10a. Any candidate for the office of director shall have been both a member of the League and a licensed radio amateur for a continuous term of at least four years preceding the receipt by the Secretary of his petition of nomination, as hereinafter provided. It is further declared to be the policy of the League to exclude from eligibility to the Board of Directors any candidate whose business connections are of such nature that he could gain financially through the shaping of the affairs of the League by the Board of Directors or by the improper exploitation of his office for the furtherance of his own aims. The primary test of a candidate's eligibility shall be his freedom from commercial connections of such nature that his selfish influence in the affairs of the League could result in his pecuniary benefit. The following types of candidates are hereby declared, amongst others, to be ineligible:

(a) Any person commercially engaged in the manufacture, sale or rental of radio apparatus reasonably capable of being used in amateur radio communication or experimentation or television or facsimile operation, whether such person is engaged as owner, principal or employee.

(b) Any person commercially engaged, whether as owner, principal or employee, in the publication of radio literature, whether periodicals or text books, entered into for profit and intended, either wholly or in part, for consumption by radio amateurs.

(c) Any commercial user of QST advertising space.

(d) Any person commercially engaged, whether as owner, principal or employee, in the manufacturing or selling to radio amateurs of station supplies such as log books, QST cards, message blanks, maps and reproductions of calls.

(e) Any person commercially engaged as an owner or a principal of a broadcasting station or a group of such stations, or associated as an owner or principal with an enterprise controlling a broadcasting station.

(f) Any person employed in radio work in any capacity wherein he participates in shaping the radio affairs of his enterprises, by a public service communications company or by any other agency making use of radio frequencies which is, or is reasonably capable of becoming, a competitor with amateur radio for the allocation or use of radio frequencies.

38 QST for
The following types of persons are, amongst others, declared to be eligible:

(a') Operators and engineers of broadcasting stations who have no stock interest therein.

(b') Radio operators and other employees of commercial public-service communications enterprises and of other radio operating agencies whose business connection with such activities is of such nature that they have no participation in shaping the radio policies thereof.

(c') Persons owning not over five per cent of the capital stock of an enterprise commercially engaged in the manufacture or sale of radio apparatus, or commercially engaged in public-service communication by radio, or commercially engaged in radio broadcasting; provided that such person has no other connection with the management of such enterprises than his possession of minority stock interest therein.

No person serving on the Board of Directors is to be deemed in violation of these by-laws if, subsequent to his election, he engages in the publication of a divisional A.R.R.L. paper or magazine not organized for profit and no portion of the net income of which inures to his benefit.

At this point Messrs. Gibbons and Segal retired from the meeting. The yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 14; necessary for adoption, 10; yeas, 14; nays, 0. Those who voted in the affirmative are Messrs. Arledge, Black, Caveness, McCargar, Groves, Hill, Jabs, Martin, Mathews, Noble, Norwine, Reid, Stockman and Bailey; abstentions, Mr. Adams; absent. Mr. Gibbons. So the new by-law was adopted.

Moved, by Mr. Hill, that the second sentence of By-Law 18 be amended to read:

"The remaining names shall be listed on a ballot, in alphabetical order."

The yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 15; necessary for adoption, 10; yeas, 15; nays, 0. Every director present voted in the affirmative. So By-Law 18 was amended.

Moved, by Mr. Hill, that the sixth sentence of By-Law 9 be amended to read as follows:

"The candidates' names shall appear on the ballots in alphabetical order."

The yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 15; necessary for adoption, 12; yeas, 15; nays, 0. Every director present voted in the affirmative. So By-Law 9 was amended.

Moved, by Mr. Adams, that By-Law 5 (a) be amended to delete the words "South Carolina" under the tabulation of territory in the Southeastern Division and to add the words "South Carolina" under the tabulation of territory constituting the Roanoke Division. The yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 15; necessary for adoption, 12; yeas, 15; nays, 0. Every director present voted in the affirmative. So By-Law 5 (a) was amended.

On motion of Mr. Mathews, unanimously VOTED that the group being formed by Communications Manager Handy for studies of allocation and a planned use of bands is requested to examine the desirability of requesting the Federal Communications Commission to amend its amateur regulations to require that amateur 'phone transmitters shall not have an emission band in excess of four kilocycles width.

On motion of Mr. Mathews, after extended discussion, VOTED without dissent that the Board makes the suggestion to the Federal Communications Commission that a change be made in the requirements for new licenses for amateur operation, requiring that prior to approval of 'phone license applications on frequencies below 16 Mc., the applicant be required to have held for at least one year a license for the operation of a c.w. transmitter. Messrs. Adams and Reid requested to be recorded as not voting on the foregoing.

On motion of Mr. Mathews, VOTED that a national convention of the American Radio Relay League shall be held at a suitably designated spot during 1938.

On motion of Mr. Martin, after discussion, unanimously VOTED that, in view of the fact that many directors have expressed a feeling that it would be highly desirable to increase the membership of the League, such endeavor shall be sponsored by the Board of Directors.

On motion of Mr. McCargar, after discussion, unanimously VOTED that the Board endorses as its viewpoint the following resolution adopted at the 1936 annual Pacific Division convention and transmits the same to the Radio Manufacturers Association:

"TO THE RADIO MANUFACTURERS ASSOCIATION:

"WHEREAS the amateur fraternity is receiving the brunt of the adverse criticism in connection with broadcast interference complaints to the Federal Communications Commission, and
"WHEREAS most of the complaints received are from broadcast listeners using small grid super-
heterodyne receivers which have flooded the market in the past few years, and
"WHEREAS the present state of the radio art is such that present design practice being employed by
manufacturers of small sets is wholly indefensible,
"THEREFORE be it resolved that we, the members
of the American Radio Relay League, here in convention
assembled, petition the Radio Manufacturers Association
to establish a higher standard of requirements in the
design of midget broadcast receivers which will pre-
clude the pick-up of radio interference from other
services which are operating in compliance with good
engineering practices."

Moved, by Mr. McCargar, that all headquarters' ex-
penses and salaries be submitted to the Board of Directors
in budget form for approval at the annual meeting. But,
after discussion, the said motion was rejected.

Moved, by Mr. McCargar, that the annual reports of the
officials to the directors be made available to the Section
Communications Managers and to the members before the
Board meeting in order to allow members to make known
to their director before the meeting their ideas and wishes
regarding these reports. But, after discussion, the said
motion was rejected.

Moved, by Mr. McCargar, that Secretary Warner's
salary be reduced to $7,500 per annum and that the sum of
$4,500 be applied to further representation at Washington.
But the said motion was rejected.

Moved, by Mr. McCargar, that Secretary Warner's
duties be limited to that of Editor of QST and that someone
else take over all duties that have to deal with representa-
tion, the work of secretary, and League general manager-
ship. But the said motion was rejected.

Moved, by Mr. McCargar, that a periodical in draft form
be sent to directors, S.C.M.'s and affiliated club secretaries
containing information about the League doings and that
on request of two hundred League members any subject
must be presented for discussion therein. But the said
motion was rejected.

Moved, by Mr. McCargar, that the American Radio Relay
League adopt as fundamental that the operation of
transmitters by private citizens, under reasonable regula-
tion, is a constitutional right; and further that the General
Counsel be requested to draw up a resolution embodying
this idea for action by this Board,

Moved, by Mr. McCarlgar, that the Board request the Fed-
eral Communications Commission to extend into the range
56-50.3 Mc. the regulatory restrictions as to stability and
quality of signal now provided for in the range 28-30 Mc.
After discussion, and in view of the recommendation of the
technical adviser, unanimous consent being given, Mr.
McCargar withdrew the motion.

On motion of Mr. Norwine, unanimously VOTED that the
Editor of QST is requested to present in QST an article on broadcast receiver design, explaining the processes of recep-
tion and calling the attention of amateurs to the manner in
which b.c.l. interference with local broadcast stations arises,
and means for eliminating it.

On motion of Mr. Blaack, VOTED that the 1938 annual
meeting of the Board of Directors shall be held at the same
time and place as the national convention.

On motion of Mr. Noble, after extended discussion, VOTED that the Editor of QST is directed to make avail-
able at least one page of each issue of QST for Army-Ama-
teur Radio System activities and that one page be made
available for the Naval Communications Reserve, details to
be arranged by headquarters.

On motion of Mr. Arledge, after discussion, unanimously
VOTED that the sum of one hundred dollars ($100.00) is
hereby appropriated from the surplus of the League, as of
this date, to provide printed postal cards for the use of the
QSL Managers in notifying amateurs of cards held on hand
for them.

In response to inquiries, the President stated that work
on the new headquarters station would now go forward at
once.

On motion of Mr. Arledge, after discussion, VOTED that
the committee to be appointed by the President to consider
ways and means of making League membership more desir-
able, is requested to examine the desirability of the League
paying the expenses for an annual meeting of Section Com-
munications Managers in their respective divisions at any
point they may select, preferably at the division conven-
tions.

On motion of Mr. Jabs, unanimously VOTED that the
Board requests the installation, to the extent feasible, of
directional antennas at the headquarters station, in order
to provide better coverage to the western portion of the
country.

On motion of Mr. Caveness, the Board adjourned, sine
die, at 6:52 p.m.

In the course of its deliberations the Board also discussed,
without formal action, classifications of amateur licenses,
television, beginners' literature, the design of broadcast
receivers from the interference standpoint, American Morse
code, Army and Navy liaisons. Total time in session, 14
hours, 36 minutes. Total appropriations, $18,287.01.

On motion of Mr. Warner, Secretary, QST for

Butte Radio Club Butte, Montana
N.T.A.C. Radio Club Arlington, Texas
Fall River Amateur Radio Club Fall River, Mass.
San Isabel Radio Club Pueblo, Colorado
Montachusett Radio Research Communications Ass'n
Fitchburg, Mass.
A 500-Watt 14- and 28-Mc. Amplifier

Novel Constructional Methods for Accessibility and Performance

By James Millen,* WIHRX

IN MOST descriptions of r.f. amplifiers that have appeared in the past, it has generally been customary to stress primarily the circuit details and then, possibly to some extent, trick layouts making possible short leads. Mechanical and structural design both of the piece of gear as a whole, as well as of such minor details as brackets, coil and condenser montings, etc., have largely been ignored. Feeling that it really takes no more time to do a good mechanical job in the first place than the more usual rag-time one, it is the particular intent herewith to illustrate and comment upon the mechanical rather than the electrical design features of a moderate-power r.f. final amplifier recently designed for use with a companion exciter unit to form a complete one-half kilowatt 'phone transmitter. Consequently, we will use more than the customary number of photographic illustrations and devote less space to circuit comments and description. Particularly interesting should be the views taken prior to wiring and panel mounting.

In Fig. 1 is shown the front view of the complete transmitter. The entire r.f. section is contained in the two upper panels, the lower of which is the exciter unit already described. The top panel is the combination buffer-final stage unit to be the subject of this paper. The other units in sequence are: the 838 Class-B modulator stage; the Collins "7-C" speech amplifier; the 1000-volt power supply using two 866 rectifiers, for the Class-B modulator, and, finally, the 3000-volt power supply, using four 866's in a bridge circuit, for the final r.f. stage. Inasmuch as these units are, with the exception of the Class-B modulator and the 3000-volt power supply, standard commercial units re-mounted on rack panels, and as the Class-B modulator and the high-voltage power supply are quite conventional in both mechanical and electrical design, they will not be further commented upon.

THE CIRCUIT

The output from the exciter is ample to drive a high-µ triode of the 35T, 808, or RK-37 variety, consequently one of these triodes (RK-37) is used for the buffer stage. In addition to the small size of the tube itself, it has the added advantage of requiring a relatively low value of neutralizing capacity (3.5 µfd.), making possible the use of the compact NC-800 type condenser, shown in the illustrations. The buffer stage in turn drives the final amplifier, employing a pair of RK-38 high-µ triodes in push-pull.

Coupling between the exciter unit and this amplifier unit is by means of a low-impedance link circuit with a pre-tuned plug-in tank circuit, mounted adjacent to the buffer tube on the amplifier chassis.

BAND SHIFTING

In shifting from one band to another, it is merely necessary to plug in the proper pre-tuned input tank circuit unit for the particular band desired (assuming, of course, that the exciter output has been shifted to the proper band, as previously described) and the input and output plug-in coils of the final stage. The coils shown in the transmitter in the illustrations are for the 28-

* Middleton, Mass.
* James Millen, "A Universal Exciter with Variable Frequency Crystal Control," May, 1937, QST.
Mc. 'phone band, upon which band this particular transmitter has been primarily operated this past winter.

DESIGN AND CONSTRUCTION NOTES

The three main points kept in mind in arriving at the mechanical design were:

1. Efficient electrical layout (short leads, symmetrical arrangement of push-pull circuit components, etc.).
2. Compactness.
3. Economical use of component parts.
4. Freedom from likelihood of mechanical or electrical failure.

Structurally, the transmitter is built around the central steel chassis or U-frame, under which is mounted the filament transformer and the RK-38 sockets, and to the sides of which are attached the aluminum brackets carrying the relatively lightweight r.f. components, such as the two variable condensers, the neutralizing condensers, input tank circuit, and the buffer tube socket. This chassis unit is illustrated in Figs. 2 and 3, without wiring and without mounting of the front panel, in order to illustrate the simplicity and neatness of this type of construction.

Perhaps at this time it may be well to point out some of the constructional details that contribute much to the neat final appearance of the complete unit. Most prominent in this connection are, of course, the aluminum brackets carrying the variable condensers; actually, it takes very little, if any, more labor on the part of the constructor to form-up the type of brackets shown from sheet aluminum in an ordinary vise, than does to bend up strip stock in the more normal manner. The round holes cut in the two rear brackets add much to the appearance and little to the labor, as holes of this size are very easily cut in aluminum with an ordinary trepanning tool or fly-cutter. Just to illustrate another type of bracket construction that is quite easily made and equally neat in appearance, we used for the front condenser mounting a slightly different form of bracket, made from sheet aluminum and shown very clearly in Fig. 2.

In order to bring the control shafts of the two condensers in line with symmetrical panel arrangement of the dials and without having the bracket extend above the main chassis level, four GS-1 standoff insulators were used minus their regular bases, for mounting the inter-stage tuning condenser. This also permitted the frame of that particular condenser to be operated above ground electrically, which is considered quite safe practice in this instance inasmuch as the plate voltage used on the RK-37 is only 1000, and not the 3000 of the final, and especially inasmuch as the metal shell of the type "O" National dial, used for tuning this condenser, is unusually well insulated from the shaft by means of a large bakelite bushing molded as an integral part of the knob. The only precaution necessary is to have ample clearance in the hole provided in the front panel for passage of the condenser shaft.

By mounting the filament transformer in the manner shown, not only is its relatively heavy
weight supported by the strongest part of the chassis, but extremely short leads also result. The a.c. input to this transformer is through the special receptacle recessed in the side of the chassis. Such an arrangement makes it possible to remove the entire amplifier from the relay rack at any time merely by pulling a few plugs, inasmuch as the r.f. input circuit is also fed through the G.R. plug-type terminals.

In addition to the symmetry of layout of the push-pull stage, which is so desirable for easy neutralization, the neutralizing condensers have also been mounted with a view to ease of access of adjustment for facilitating the original tuning of the transmitter. As can be seen from the photographs, the adjusting screws on all neutralizing condensers are readily accessible from the side of the transmitter. They are also placed so as to eliminate the necessity for mounting brackets.

Fig. 3 also shows an interesting and highly practical use of standard stand-off insulators as high frequency bushings by mounting them behind rather than on front of metal panels. The two at the back of the chassis are for the high voltage power-supply connections to the two stages, while the ones on the side are for the high voltage leads to the tank coils.

The two RK-38 sockets on the main chassis are mounted underneath, with just part of their shells protruding, so as to eliminate the necessity for bushings and holes through the chassis in order to make connections to the socket terminals.

The final r.f. tank coil is mounted by means of standard, commercially available, brackets designed especially for the purpose, upon the frame of the final tank tuning condenser. Such an arrangement, again is neat in appearance, requires no special effort on the part of the constructor, provides a symmetrical push-pull circuit arrangement, and results in short leads.

The terminal strip, located alongside the a.c.

FIG. 4—A VIEW FROM THE OTHER SIDE, SHOWING COIL FORMS IN PLACE

Note the mounting for the driver tube.

COIL DATA

L1—28 Mc., 2 turns; 14 Mc., 3 turns; both No. 24 d.c. wire.
L2—28 Mc., 5 turns; 14 Mc., 10 turns; No. 20 enameled, spaced 20 turns per inch.
L4—28 Mc., 6 turns; No. 16, 2½ turns per inch, c.t.
14 Mc., 16 turns No. 14 enameled, 6 turns per inch, c.t.
L5—28 Mc., 5 turns No. 16, interwound with L4.
14 Mc., 13 turns No. 14, 5 turns per inch.
L6—28 Mc., 4 turns No. 10 enameled, 4 turns per inch.
14 Mc., 12 turns No. 10 enameled, 7 turns per inch.

Note: L3 and L5 wound on 1-inch diameter forms (in FXTB unit).
L4 wound on 1¼-inch diameter isolantite forms (National UR-13 unit).
L6 wound on ceramic form 2½ inches in diameter (National UR-10A unit).

The filaments transformer input socket, is for easy connection to the relay or switches used for controlling the transmitter. When building any piece of equipment necessitating the use of switches, we have found it extremely convenient to incorporate, in the original design, terminals of this type across all panel switches, or in series with the primaries of all power transformers. If not required, they need not be used; when it is desired,
however, to control any piece of equipment from other than the panel switch, it is of inestimable convenience to be able to run a pair of leads are amply long for easy insertion in jacks mounted some distance behind the panel in this manner. The chassis unit just described is mounted

directly to such a terminal, rather than to dis- mantle half the transmitter in order to get at the leads of a switch or the primary connections on a "buried" filament or power transformer.

For reasons of economy, only two meters are employed: one is a grid milliammeter and the other is a plate milliammeter. By means of jacks and plugs, they may be used in either stage. Jacks are mounted on a bakelite sub-panel set well behind the main front panel so as to eliminate danger of anyone's coming accidentally in contact with the mounting bushings which, of course, in the case of the plate jacks, are at high voltage. The usual type round-shell 'phone plugs directly to the aluminum front panel. Aluminum, rather than Masonite or other such composition, is used for the front panel because of the strength required for carrying a relatively heavy unsupported chassis without warpage, as well as for its electro-static shielding value.

The panels of all the units of this particular transmitter have been finished in the new light-gray lacquer now being so much used for commercial communication equipment. This new finish has a decided advantage over the older black finishes in that it reflects considerable light and makes much easier the wiring and working in what might otherwise be rather dark corners. The standard black relay rack sets off the gray panels in very attractive fashion.

More support for that cartoon on page 84 of January, 1936, QST: W11XB sends in a clipping from a Boston paper reporting a two-way contact between 7.5-meter police stations in Hull, Mass., and Beverly Hills, Cal. This is probably the first instance of an actual DX QSO between two police stations on such a short wave length.
Some Practical Receiver Kinks for the Man Who Builds His Own

By Yardley Beers* W3AWH

Despite the wide-spread use of manufactured receivers, there are still a great many amateurs who like to do their own constructing. For this reason, the following modifications, made to two of the most popular of home-built receiver designs, should be of interest.

Combined Autodyne Receiver and Pre-selector

In the past QST has carried a number of articles dealing with converting an autodyne receiver into a pre-selector for a superheterodyne. Unfortunately, to convert back to a receiver requires the complete reverse process, which involves considerable work with a soldering iron in the vital parts of the apparatus. This state of affairs does not permit one to live the apparatus for a portable or emergency work or as an auxiliary receiver at such times as N.C.R. drills, when it is convenient to have two receivers to guard two frequencies simultaneously—except by submission to the above-mentioned inconvenience.

In Fig. 1 is shown a circuit which will enable one to change from one use to the other with about as little trouble as is ordinarily undergone in changing coils. This circuit is an adaptation of the popular QST two-tube receiver described on page 119 of the Handbook (1937 edition), but the same method can be applied to any receiver employing a screen-grid or r.f. pentode detector.

In addition to the originally specified components, there are needed two more fixed capacitors \((C_9\) and \(C_{10}\)), a 300-ohm resistor \((R_7)\), a second r.f. choke (National Type 100), and a second six-prong tube socket. \(R_7\) and \(C_{10}\) serve as a fixed bias circuit for the pre-selector. Parallel feed is to be preferred for the plate of the pre-selector, for there is a possibility of shorting the "B" supply in making improper connections to the binding posts of the output circuit, if series feed is used. All other symbols and components are the same as given in the Handbook.

For use as an autodyne receiver, a 57, 58, 6C6 or 6D6 tube is placed in the \(V_1\) socket, and the circuit behaves in normal fashion. For use as a pre-selector, the tube is removed from the \(V_1\) socket and placed in the \(V_2\) socket. The grid leak \(R_1\) should then be short-circuited, which can be done in a number of ways. Probably the most convenient is to mount a midget knife switch directly on the condenser and grid leak. However, the reader is warned that there is apt to be leakage across the insulation usually furnished with these switches. If the grid leak is of the type which slips into clips mounted on the condenser, an odd pigtail resistor can be obtained from the junk box and, with the pigtails soldered together, can be slipped into the clips in place of the grid leak. Of course the job also can be done with a piece of bare wire.

While the apparatus is being used as a pre-selector, the audio tube is obviously not in use and can be removed from its socket. From experience, I have found that the 58 or 6D6 is much superior to the 57 or 6C6 as a pre-selector tube, while the 57 or 6C6 is somewhat to be preferred as detector. (Note—there are never tubes in both the \(V_1\) and \(V_2\) sockets at the same time.)

The pre-selector shown in the diagram is regenerative, which gives a considerable improvement in amplification and selectivity over a non-regenerative one. However, if a non-regenerative pre-selector is desired, it can be had by

* 900 West State St., Trenton, N. J.
connecting the $V_2$ cathode terminal to ground through $R_7$ and $C_{10}$, and by supplying the screen-grid voltage through a suitable fixed tap on a separate voltage divider.

It should be remarked in passing that the author has also made two slight alterations in the a.f. stage from the original QST circuit. First, an a.f. volume control $R_{6}$, which has proved to be a great convenience, has been installed. Secondly, it has been the general policy at this station to equip all a.f. output circuits with parallel feed, not only to prevent shock to the operator and damage to the headphones by the large d.c. currents, but also, since one side of the 'phones is grounded, to simplify the switching from one receiver to another. The output coupling circuit in this case consists of the choke $L_8$ and condenser $C_{11}$.

In spite of the number of extra parts, it was

$$\text{RFC}.$$ 

selectivity, it remains popular among those who build their own because of its simplicity and economy. During the last couple of years I have used such a receiver and obtained results which compare favorably with those obtained by other local amateurs using commercially-built crystal-filter receivers.

Unfortunately, however, at first I met with considerable difficulty with instability in the regenerative i.f. stage. Changing weather conditions demanded a readjustment of the tickler with most inconvenient frequency. Furthermore, the control was far from smooth with the method originally suggested in QST (tickler shunted by variable resistor). The problem was then to find a method of regeneration control which would have a larger range—though not as large as with an autodyne detector—and which would be smooth in action.

The obvious solution seemed to be the well-known method of varying the screen-grid voltage. This voltage is supplied through the divider, $R_{20}, R_{21}, R_{22}$ with a variable tap shown in the diagram, Fig. 2. Under requirements of the range of control mentioned above, the resistance of the potentiometer is smaller in proportion to the fixed section of the divider than with regenerative autodyne detectors, which permits greater ease of adjustment.

This obvious modification proved to be an adequate solution to the problem. I find now that it is necessary to make a slight readjustment of the tickler only once in six months, usually in the spring or fall with the change from cold weather to hot or the reverse. Now the regeneration in the i.f. is a most effective weapon against QRMs.

The receiver, a portion of whose circuit is shown in the diagram, is a modification of the original QST circuit (Lamb, April, 1933, QST, page 8), and unless otherwise noted the symbols are the same.

**REGENERATIVE MIXER**

Regeneration in the mixer is an effective way of reducing image interference without the use of a pre-selector. Many claim, however, that it is undesirable in a receiver that already has a regenerative i.f. stage because of the danger of interlocking of the gain control and the two regeneration controls. Nevertheless I was tempted to try regeneration in the mixer of my receiver, and I was delighted with the result. This modification is also included in the circuit shown in Fig. 2. The modification consists of first supplying the screen voltage from a variable tap on the voltage divider ($R_{18}, R_{19}$) and secondly removing the condenser which bypasses the cathode to ground, and instead connecting the cathode.
The VK-ZL 1936 DX Contest Results

G. B. Ragless,* VK5GR

As was the case with the two previous contests, the last event during October again proved an outstanding success. The contest was organized by the South Australian Division of the Wireless Institute of Australia in conjunction with the New Zealand Association of Radio Transmitters and under the patronage of W.I.A. Federal Headquarters. Many were the expressions of appreciation made by entrants and general satisfaction was shown with the new scoring methods. It will be remembered that a sliding scale of points was arranged for the first 12 contacts with a particular zone or country and that only one contact on the same band with the same station during the whole contest (except 28 Mc.) could be counted. The last rule had the desired affect of making listening important and encouraged the low-power station where weaker signals were eagerly sought after. The 28-Mc. band again proved very good particularly for VK2, 3, 4 who made many contacts with DX stations.

The Committee desires to thank all the overseas societies for giving the contest so much publicity and the competitors for their keenness during the contest. The outstanding performance during the contest was the wonderful work of VK3EQ who easily won the Australian section. He worked 70 countries for his score of 235,970 points, and his log reads more like a list of the countries of the world. The New Zealand top scorer was ZL1DV for 95,964 points and 44 countries. Other high scores were VK2AE, 55 countries; VK4BB, 54 countries; VK2HE-VK4YL, 47 countries; VK3MB, 45 countries; VK3KK, 41 countries and ZL1FT, 40 countries. With 28 Mc. band proving so good between VK-ZL and North America it was not unexpected that U.S.A. stations would lead the overseas contingent. The first station was W5EHM, 8850; followed by W6HXM, 8460; W7TB, 8390; W6FZL, 8300; W9AEH, 7550; W3BES, 7290; and W6CJ, 6970.

The VK Handicap section proved a close contest between VK2HV and VK3HK who worked 27 and 26 countries respectively. Considering the opposition from higher-powered stations the performance of these stations were really outstanding. In VK-ZL the receiving section was almost unsupported, but excellent scores were registered by VK3ERS and ZL1FT. The receiving section was well supported overseas particularly by German and British listeners, who registered some very good scores. The top score was made by G2CAR 7780; followed by BRS 1535, 7710; BRS 1173, 7470; BERS 311, 7270; DE2415H, 7230; DE1729U, 7180.

Competitors Comments

D4BUF sent a complete report showing the German participation. G2ZQ who was on during part of the contest but was too busy to send in a report, made a score of over 6000. G2TH, G6LJ and G5VQ had only 10 watts and G6ZO 11 watts. Z5U was very active on 7 Mc. and found conditions good. The only 28-Mc. contacts of OE1ER were VK4BB; EI5F-VK6AA; SM6W-M-V2KLZ and OK2RM-VK4EI. K5AY and XE1AY were very solid on 28-Mc. band, the latter making 51 contacts on that band. VE3AU after waiting 6 months for his first VK7 worked two within ten minutes during the contest. K5AC called VK4UR 5 times without luck. ZS1H made all his contacts on 28 Mc., and ZT6Y had four. G6CJ sent a very complete description of all his gear and of observations made during the contest on all bands. LA2Q sent his log in time to make sure we would have it. VU2LJ had no intention of entering and did not trouble until the last two week-ends, when VK-ZL was calling him hotly. G2LB, G6RB, HB9AT and many others expressed their appreciation of the contest.

OK2OP used 28 Mc. and heard many VK-ZL stations there. G6YG was operated by G6ZX and, in sending in a very complete report, said he worked 67% of stations called! WSCXR was on for four hours and called 30 stations for 7 contacts. W9VVR says 5 week-ends gave a chance of one good one. W1JPE found VK6-7, ZL4 very scarce. He used several antenna systems for various times. W8BXC says VK2HE loudest but VK3MR and VK6FI very good, while W8FGA found VK2NY, VK6FO and VK7JB best. Many stations found ZL-VK stations coming the long way and East Coast U.S.A. had many good contacts. W1SZ was only on during the last two week-ends! W3BES worked 47 and W9AEEH 41 VK-ZL's during first A.M. W6GVM says he is going to win the contest next year. The best score outside VK-ZL W5EHM. He used 1 kw. with Johnson Q antenna on 7 Mc.; 1 kw. with V beam on 14 Mc. and 800 watts with V beam on 28 Mc. He and W6FZL made nearly 70 contacts on the 28-Mc. band. W6BX used 1 kw. and made 51 28-Mc. contacts.

Late Returns

The following stations sent in reports which arrived too late: VE1EA, VE5HR, W3DBD, W3GHB, W3BWA, W4OG, W4AJY, W4DCZ, W6KJK, W8DAE, W8BYM, W91J and W9RCQ.

* Contest Manager, St. Marys, South Australia.

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A 28-Mc. Mobile Installation
By Willard S. Wilson, W3DQ

IT IS quite surprising that numerous amateurs seem to be unaware of the fact that the 28-Mc. band is available for mobile operation, both on c.w. and 'phone in accordance with F.C.C. Rules 376, 381 and 382. Greater activity with portable-mobile apparatus has been shown during the past few years on the 56-Mc. band, but there is no reason to pass up the opportunity of 28-Mc. mobile work, as surprising results await those who "get in" on the fun. This band offers not only local but also real DX contacts. The author's mobile installation has worked many local stations ranging in distances from 2 to 20 miles by ground wave coverage, and also 1000- to 2000-mile QSO's on the skip.

The transmitter (Harvey UHX-10) contains but four tubes, two of which are in the r.f. section and two in the audio side. The Trivet oscillator is crystal controlled, using a 7-Mc. crystal in the grid circuit and quadrupling to 28-Mc. in the plate to excite the second 6L6 Class-C r.f. amplifier. Excitation is adjusted by varying the plate voltage to the oscillator through the 6000-ohm resistor $R_6$ to 5 ma. grid current being sufficient for the Class-C stage. The oscillator grid-cathode tuning condenser and oscillator plate condenser also govern grid current, and these should be varied until maximum grid current is obtained. The Class-C plate condenser $C_4$ is adjusted to resonance, and loaded to approximately 75 ma. with antenna connected. The antenna coil $L_4$ is series tuned by condenser $C_5$ mounted on the front panel. The series connection is necessary when working into a low impedance coaxial cable, twisted pair feed line, or a single-wire quarter-wave antenna against ground.

For 'phone operation the emission switch is turned to $P\Phi$ and the plate meter toggle switch to $M$. As the 6N7 audio tubes heat, the meter reading will rise to about 50 ma., which is the combined modulator and driver plate current. With a single button microphone plugged into the mike jack, and the gain control $R_s$ advanced, normal speech causes a rise in modulator plate current of about 25 to 30 ma., or meter readings to about 75 to 80 ma. peaks. For modulated c.w. and straight c.w. operation, the emission switch is turned to position desired, and key plugged into key jack.

A quarter-wave vertical antenna was found to give the best results. As shown in the photograph, it is mounted on the side of the car at the rear side window, close to the transmitter. The window is opened to the "no draft" position, which allows the Masonite strips to be inserted which hold the base of the fish pole telescoping antenna. This is raised to a height of approximately 7 feet, with about a 1-foot lead-in to the antenna post of the transmitter. In this position the top of the antenna is below trolley wires, etc., but care should be taken when driving through garage doors, underpasses and under trees with low-hanging branches. With the antenna in this position its radiating field is more above the auto than with the antenna fastened to the rear bumper. The antenna current is about $1\frac{1}{2}$ amperes at the binding post connection.

Control relays are operated from the driver's position by toggle switches mounted on a small

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*405 Delaware Ave., Wilmington, Del.
FIG. 1—COMPLETE TRANSMITTER DIAGRAM OF UHX-10

L1—Cathode coil, 8 t. No. 20 wire on 1/4" diam. isolamite coil form.
L2—28-Mc. 4½ t. No. 18 on 1/2" form, 1½-inch spacing. Tap 1 1/2 t. from lower end.
L3—28-Mc. plate coil, 3½ t. No. 18, 1/4" spacing.
L4—Antenna coil, 3 t. No. 18, 1/4" from plate winding.
C1—2 µfd. Hammarlund "Mex" trimmer.
C2—Cardwell ZU-140-AS.
C3, C4—Cardwell ZR-50-AS.
C5—Cardwell ZR-10-AS, using one stator plate.
C6—50-µfd., 600-volt mica.
C7—0.1-µfd., 600-volt tubular.
C8—10-µfd., 25-volt.
C9—50,000-ohm 1-watt carbon.
C10—500-ohm potentiometer.
R1—500,000-ohm potentiometer.
R2—75,000-ohm 20-watt.
R3—100-ohm 1-watt, carbon.
R4—25,000-ohm 1-watt, carbon.
R5—250-ohm 1/2-watt, carbon.
Rs—5000-ohm 1/2-watt, carbon.
R7—25,000-ohm 25-watt bleeder.
R8—75-ohm 20-watt.
R9—200-ohm 1/2-watt, carbon.
T1—Kenyon plate to P.P. grids.
CH—National R-100 choke.
SW1—4-pole, 3-throw rotary switch.
SW2—D.p.d.t. toggle.
SW3—S.p.s.t. toggle.

A good receiver is necessary, and the HRO Jr. was selected in this respect, as it operated exceedingly well from the vibrator B supply, and the six-volt heater type tubes in the set. The antenna for the receiver is also a quarter wave vertical mounted on the rear bumper of the auto. A large 23-plate 6-volt storage battery in the car furnishes filament current to receiver and transmitter, and also to the receiver B supply and high voltage dynamotor for the transmitter. This dynamotor has an output rating of 300 volts at 150 ma. Filter unit is incorporated in base of dynamotor. The power output of the transmitter is rated at 10 watts.

Upon completion of the installation, the first contacts were local. With the car ignition system

(Continued on page 80)
A Simple and Inexpensive Rotary Beam Antenna for 28 Megacycles

WE NEED not enlarge upon the well-known advantages of directional antennas. It is sometimes not realized, however, that even the simpler types are worthwhile, because even though the power gain cannot be compared to that obtainable from large arrays using several hundred feet of wire, still a small gain is of considerable help, especially when signals are weak. And the advantages of directivity in reducing noise and QRM from unwanted directions are of decided benefit in receiving.

The drawings of Figs. 1 and 2 show the essential details of a rotatable antenna system which has been used very successfully by William Fritz, W5BZR, of Minden, La., for 28-Mc. work. It is not hard to build, mechanically, and is simple electrically, consisting of a half-wave antenna, center-fed through "Q" bars, with a parasitic reflector spaced a quarter-wave from the antenna. The antenna and reflector are strung on a light wooden framework which is fastened to a short length of pipe acting as a support and fitted at its lower end into an ordinary pipe coupling which serves as a bearing.

The following excerpts from a letter to W5BZR explain how to build it: "Get a good hard piece of 2" by 2" wood, 17 feet long (two hams can go in together and buy a 2" by 4" piece and have it split down the middle to reduce cost), and bore a hole approximately 11/16th inches in diameter in the exact center. This hole wants to be just right to pass a ½-inch pipe. Go to a blacksmith's shop and get a piece of ½" by 2" iron, 14 inches long, and have drilled in the exact center a similar hole to pass ¼-inch pipe. Also have a 5/16th-inch hole drilled in each end of the iron piece about an inch in from each end. These holes are to pass ¼-inch bolts which hold the iron strip to the wooden crosspiece, thus strengthening the crosspiece at the center. Now get a 27-inch length of ¾-inch pipe and fit it into the center hole in the iron piece so that three inches of the threaded end projects through, then have it brazed or welded to the iron. A jam nut can be obtained by sawing off one end of an old ¾-inch valve, running a tap through to enlarge the threads. While you are still in the blacksmith's shop, have a ½" by 2" by 5¼" iron piece bent square ¼ inches from one end, then have a 1-inch pipe coupling welded on the short side. Two 5/16th-inch holes should be drilled in the other side so the piece can be bolted to the pole. This piece supports the antenna assembly. The ¾-inch pipe slips down in the 1-inch pipe coupling and turns very easily in it. A galvanized-iron strap, 2 inches wide, shaped to fit closely around the pipe and the top of

(Continued on page 98)

FIG. 1—"SCHEMATIC" OF THE 28-MC. ROTARY ANTENNA-REFLECTOR AT W5BZR

A wooden framework supports the two wires. The cross braces are 1 by 3 wood.

FIG. 2-MOUNTING DETAILS

Two special pieces, A and B, are required. These should be obtainable at little cost from a blacksmith, being made up from ordinary ¼-inch iron and pipe fittings.
Notes on High-Power Electron-Coupled Oscillators

A Practical Colpitts Arrangement With Parallel-Coil Band Changing

By Christoph Schmelzer,* D4BlU

A transmitting circuit which has attained considerable popularity with German amateurs is the Colpitts version of the electron-coupled circuit oscillator which may use a fairly high-power tube such as the Valvo-Philips QB2/75, which is the equivalent of the 860. Before describing this circuit in some detail, however, it would be well first to point out some features of the electron-coupled oscillators which are not generally appreciated.

In the first place, it is not correct to consider that the E.C.O. is only an oscillator and buffer in one tube, for the following reasons:

(1) Strictly speaking, a buffer amplifier is one which works without requiring any driving power (that is, without grid current rectification), so that any change in the plate circuit does not affect its grid circuit and hence has no influence on the driver.

(2) There is actually reactive coupling between the plate load circuit and the generating portion of the E.C.O. in the cathode-ground element which is common to both the input and output circuit.

(3) The electron-coupled oscillator's special feature of constancy of frequency with voltage fluctuation is not available in the ordinary oscillator-buffer combination using separate tubes unless the oscillator tube is a tetrode. This self-correcting feature is characteristic of any oscillator circuit employing a tetrode, incidentally, and is not especially peculiar to the electron-coupled oscillator as such.

Accordingly, we may more appropriately describe the electron-coupled oscillator as the combination of a triode oscillator and a tetrode amplifier having a common control-grid element, with electrostatic screening between the control and output elements, and possessing the general tetrode ability to compensate the influence of voltage fluctuation on the frequency generated by the oscillator—provided the ratio of plate to screen voltage is correct.

In the case of the Hartley arrangement of the E.C.O., there is one other consideration which has not been frequently emphasized. In this circuit, the cathode is tapped to the tank inductance to form an inductive r.f. voltage divider to give excitation of the proper phase and amplitude.

However, the inevitable capacitance of the cathode to ground across one portion of this divider affects the phase. This capacitance may be relatively small with tubes having indirectly heated cathodes (such as the RK23, S02 etc.) but becomes appreciable with filament-type tubes when a separate filament transformer is used as shown in Fig. 1. The primary of the transformer is, of course, at ground potential and there exists an appreciable capacitance between

![Diagram](image)

**FIG. 1**—SIMPLIFIED HARTLEY AND COLPITTS ARRANGEMENTS SHOWING THE FILAMENT-GROUND CAPACITANCE SHUNTING A PORTION OF THE TANK CIRCUIT

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*Present address, 57 Waterman St., Providence, R. I.

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cially undesirable for frequencies of five megacycles and higher in actual practice.

To avoid this trouble, we should use a circuit employing a capacitive instead of an inductive voltage divider to obtain the feedback, in which case the transformer capacitance \( C_T \) is simply in parallel with another capacitance element in the tank circuit and hence does not contribute any undesirable phase shifting. This means that a Colpitts rather than a Hartley oscillator arrangement should be used. As indicated in Fig. 1B, \( C_T \) is in parallel with the cathode-ground capacitance element of the familiar Colpitts tank circuit.

I have used this type of oscillator for some time and it works very well. There is nothing especially original as compared to the circuit described by J. B. Dow \(^4\) except that he used chokes in the filament circuit. Unless these chokes have a capacitive reactance for the generated frequency, which would require rather large windings, the phase would be affected somewhat as in the Hartley circuit. A practical example of the application of these principles is shown in Fig. 2. This particular arrangement is one which I used for the last month I was on the air before coming to this ham paradise (the U. S. A.), and which brought me all T8X and T9X reports on 3.5 and 7 Mc.

Attention is called especially to the heavy-duty grid leak, which assists a lot in avoiding "creeping" of frequency. Another feature is the band-switching arrangement employing two coils in parallel for second-harmonic (7-Mc.) output. This system has been used at D4AAAR-D4BIU for several years in crystal-controlled oscillators and gives no noticeable loss in efficiency. A particular advantage is that the taps for the output link need not be shifted from one coil to the other. In the layout at D4BIU these coils were side-by-side but can be arranged at other angles, although different arrangement will affect the mutual coupling and the value of inductance for the respective coils.

For the 860 type tube the value of \( C_1 \) is approximately 150 \( \mu \text{fd.} \). This capacitance should be adjusted experimentally for best constancy of frequency as well as best power output. An outstanding feature of this oscillator is its excellent over-all frequency stability with changes in supply voltage. It is keyed in the cathode lead and gives a clean "crystal" note, even without any bleeder across the high-voltage power supply.

It is especially notable that tuning of the plate circuit does not influence the frequency of oscillation in such a critical way as in the case of the Hartley version. Tuning of the plate tank around resonance varies the frequency only about 300 cycles per second when doubling and about 2000 cycles per second when amplifying straight through on the fundamental. This is without additional shielding between the input and output circuit. The plate tuning is not especially critical and the input circuit may be adjusted for a QSY of 10 kc. on 3.5 Mc. without appreciably affecting the power output or quality of the signal (with a fixed setting of the plate tank).

With 2000 volts on the plate, the no-load plate current is approximately 20 ma. with the output circuit tuned to the fundamental and approximately 40 ma. tuning to the second harmonic (doubling). With a resistive load coupled, 120-ma. plate input can be drawn without appreciable change of frequency or quality of the signal, and loading up to the maximum recommended value of the 150 ma. is possible.

Naturally this oscillator is more sensitive to reaction from a subsequent amplifier stage, as compared to a crystal-controlled oscillator, but this should not be blamed on the oscillator since it is evidence of some fault in the other stages which was not taken care of by the designer. This suggests one unfortunate aspect of crystal control. Frequently the ham thinks his transmitter is perfect when he hears the crystal oscillator's TXS signal in his monitor (if he uses a monitor); but he wonders why he has such bad key clicks when the transmitter is on the air. Then he tries all the key-click filter systems he can find in the A.R.R.L. Handbook and his file of QST's without (Continued on page 94)

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*Fig. 2—THE CIRCUIT USED AT D4BIU*

L<sub>1</sub>—12 turns, 1½-inch diameter, extra heavy mounted.
L<sub>2</sub>—25 turns, 2-inch diameter.
L<sub>3</sub>—10 turns, 2-inch diameter.
C<sub>1</sub>—500-\( \mu \text{fd.} \), receiving condenser.
C<sub>2</sub>—500-\( \mu \text{fd.} \), fixed.
C<sub>3</sub>—100-\( \mu \text{fd.} \), variable.
C<sub>5</sub>—250-\( \mu \text{fd.} \), variable.
C<sub>6</sub>—75-\( \mu \text{fd.} \), variable.
C<sub>7</sub>—0.002-\( \mu \text{fd.} \), fixed.
C<sub>8</sub>—2000-\( \mu \text{fd.} \), fixed.
C<sub>9</sub>—50-\( \mu \text{fd.} \), fixed.
R<sub>1</sub>—100,000-ohm 100-watt.
R<sub>2</sub>—10,000-ohm 100-watt.
RFC—2-mh. 200-ohm r.f. choke.
T<sub>1</sub>—Separate filament transformer, preferably core type.

Heavy-line connections have to be made vibration-proof, preferably from copper tubing. No additional shielding required if L<sub>1</sub> is at right angle to L<sub>3</sub> and L<sub>5</sub>, which may be side-by-side.
The tube is an 860 type (Valvo-Philips Q82/75).
HINTS and KINKS
for the Experimenter

A Midget Transceiver
By E. Harbidge, W6LSJ

While many commercial types of transceivers now on the market boast of compactness, ruggedness, and—most important—light weight, I have found that even the best of these is too heavy to carry on a twenty-mile hike, especially at high altitudes. So it was with this important fact in mind that a new and lighter transceiver was designed in the shack.

Instead of using the usual two tubes, the circuit is designed for one, a Type 19. One of the triodes is used as a detector and oscillator, while the other is used as an audio amplifier and speech modulator. As a further convenience, the circuit has no tricky dual-primary transformer; instead uses a simple mike transformer and a choke. The transformer is used to couple the mike to the grid of the modulator while the circuit is transmitting, and as a grid coupling impedance while receiving. Heising modulation is used while transmitting, and the modulation reactor begins a plate impedance on the receiving side. The headphones are condenser-coupled and grounded through a double-throw switch.

The antenna is coupled by means of a postage stamp condenser of 100-µfd. capacity. The antenna may be a quarter-wave vertical rod, running directly from the antenna jack on the cabinet. For short distances an eighth-wave rod may be used, but for more efficient operation, the quarter-wave rod is recommended.

In actual operation this rig has worked over ten miles airline (this test was made from Berkeley to San Francisco) with an S9 signal.

As actually built, the transceiver is very compact, being mounted in a 3½- by 3- by 4-inch cabinet almost pocket size. The container is made of No. 20 gauge iron, held together by self-tapping screws. The usual precautions as to short leads in the r.f. circuit, as well as keeping the r.f. coils clear of other parts, should be observed.

The batteries may be carried in a specially designed knapsack or box. The filament rheostat is connected directly on one of the battery terminals. The variable resistance should be ten ohms.

Beam Crystal Oscillator with Transformerless Power Supply

The circuit of Fig. 2, used by William R. Percival, W2GCV, is suitable not only as a crystal driver for a regular transmitter, but also as a compact and light-weight portable rig, since it works directly from the 110-volt line without a

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power transformer. W2GCV writes: "Having spent many hours in experimental work with the type 6L6G tube as a crystal oscillator, doubler and buffer amplifier, I have come to the conclusion that although this tube is an excellent oscillator, it appears to have greater power output than is necessary for many amateur applications. I have therefore been experimenting with the layout of Fig. 2. A Type 25L6G tube is used as a crystal oscillator, this tube being of the beam power type, but with lower ratings than the 6L6G, and intended for use in a.c.d.c. receivers. As a rectifier I use a Type 25Z5 in a voltage-doubling circuit; the power supply delivers approximately 150 volts at 70 milliamperes. The output is more than enough to drive one or two 6L6G's as doublers or buffers.

The layout has the advantage of being well adapted to a small space, since I had room to spare when the entire set-up was mounted on a 12- by 4-inch base-board.

"The only disadvantage from the standpoint of overall efficiency is the fact that some 21 watts are lost in the filament dropping resistor, R4. However, if other 0.3-amp heater tubes are used in the transmitter, their filaments may be placed in series with those now in the circuit, thus putting the loss to work."

Three-Band "Automatic" Antenna

Fig. 3 is a sketch of a novel antenna system which has been working out satisfactorily for Frederick Weyerhaeuser, W9YPQ. As most amateurs know, a center-fed antenna with twisted feeders is good for operation only in the band for which the antenna is cut. W9YPQ gets around this situation by using three antennas, one for each band, but all fed through a common low-impedance feeder. Only the desired antenna will take power because the others are the wrong length for resonance. The shorter antennas are suspended from the longer by means of glass-rod spreaders so that the spacing between wires is 4½ inches.

W9YPQ writes: "The fact that different center spacings are required for proper impedance matching of a twisted pair to a 40-, 20- or 10-meter antenna suggested combining all three of them to a single feeder. Local field-strength measurements and DX results are comparable to separate half-waves of the same type. The feeders at present are No. 18 stranded rubber-covered wire, and it is hoped that even better results will be had with more efficient feeders. The theoretical value for center spacing was used only on 40 meters.

"The tuning characteristics on each band are identical with those of separate antennas, and a neon bulb indicates the presence of r.f. in the desired section only."

One point about such an antenna system is that it does not possess the ordinary twisted-pair feeder's harmonic-discrimination. Therefore harmonics must be eliminated before they get to the feeder.

A Cheap and Easily Constructed Unguyed Mast for Vertical Antennas

Fig. 4 shows the mast whose essential details are outlined in Fig. 4 has been giving Charles W. Clemens, W3DZR, good service for nearly a year. It has been used to support a 5-meter vertical antenna, but there is no reason why it could not do the same for a 10- or 20-meter vertical. For the height specified it requires no guys, weighs only about 25 pounds, and was constructed by two men in about two hours—at a cost of only $1.50!
The bottom section consists of four sides with corner pieces of 1 by 2 spruce, each 20 feet long, formed into a square pyramid about 5½ feet wide at the bottom, tapering at the top to fit around the 2 by 4 top section. The lattice work is made with plaster lath nailed to the 1 by 2's. The bottom of the pyramid is fastened to two pieces of 2 by 4 about eight or ten feet long, which act as runners to prevent rocking. Four pieces, one to a side, could be used to prevent rocking in both directions. The 2" by 4" top section is set about two feet down in the top of the pyramid. The purpose of the collar around the lattice section is to hold rope guys in case they are used, although no guys have been found necessary on the 38-foot height. Taller masts would require some guying.

The mast is kept upright by means of ballast on the runners. The ballast may consist of any collection of "junk" having enough weight to keep the mast from "walking." Despite the fact that the mast can be lifted by one man, W3DZR has climbed up the lattice section to give it a coat of paint. It has stood up under all kinds of wind, and only once fell over—in a 60-mile gale. The damage in that case was one broken lath, and the mast was put right up again.

Flood Notes

J. R. EAKIN, Superintendent of the Great Smoky Mountains National Park of the National Park Service at Gatlinburg, Tenn., writes informing us that the "U. S. Forest Service portables" used on boats on the Mississippi during the January-February flood emergency were installed by technicians attached to the park. Operating personnel was provided by both the N.C.R. and the Park Service.

J. B. Wathen, III, W9BAZ, writes correcting the reference in the flood account to the Kentucky Net as an outgrowth of the A.A.R.S. The net was organized in 1931 under the auspices of the A.R.R.L., S.C.M. and R.M. of that time (W9OX and W9BAZ, respectively), with a spot frequency chosen at 3810 kc. A year or two later the A.A.R.S. adopted the same frequency for their drills, presumably because they were all members of the KYN as well.

C. L. Wilkins, W9KSH, wired on April 23rd from Cairo as follows: "This to inform you I came here. A pair of 46's is not much but satisfactorily effective for me as A. T. & T. kept me busy during flood with receiver at office to check river stages so feel I participated. Correction is indicated.

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**Dixie Jones' Owljuice**

**ALL** of you all who have long noted and marveled at the sweet signal and beautiful splatterbugging emanating from W4IR will be shocked to learn that this here transmitter is now possessed of a devil. It does it on two freeks at once and more louder on the wrong one. Everything looks the same. All the nertz is screwed up and the darn little wires all disappear around the same corner they always did, and the meter needles wham over as of yore, but sumpin's funny. I git more RSTs and QSA5s and R9s off of where I don’t think I’m at than where I do think I’m at. That bean’ so it follows in logical sequence that the proper caper would be to haul off and tune the basic signal out entirely and then key the harmonic. What I wanto no is how to do that.

—W4IR of the "Dixie Squinch Owl"

Atlantic Division Convention
June 25th and 26th at Erie, Pa.

A **Cordial** invitation is extended to all amateurs to attend the 1937 Atlantic Division Convention by the Erie Amateur Radio Club, to be held at the Hotel Lawrence, Erie, Pa., June 25th and 26th.

The committee in charge has prepared a program replete with interesting events, and so arranged as to please everybody. Talks, trips, stunts, etc. We are assured of prominent speakers and A.R.R.L. has promised to send C. C. Rodney, WISZ, as the official representative.

For further information write to J. V. Brother-son, chairman, 1722 West 11th St., Erie, Pa.

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W4PL, Shepherd, Tenn.

OPERATING convenience is one of the features of W4PL, owned by Benton White, of Shepherd, Tenn. The three tables arranged in a square “U” give plenty of operating surface, all within easy reach of the man at the key.

Starting at the near end, the frame-mounted transmitter at the left is a four-band job working W4PL from 10 to 80 meters, changing crystals for the higher bands. A 47 crystal oscillator works into a 46, then to a 10 and finally a pair of 50T’s. Three power supplies used with this rig also are built into the frame. Primary keying is used with this transmitter. Input runs from 200 watts, with operation usually on 80 meters during the cool weather and on 20 and 10 during the summer.

On the relay rack next in line are two transmitters. That at the top, on bakelite panels, is an early Collins transmitter using a 47 crystal oscillator, 46 buffer and 10 final. Two supplies furnish power for this rig, which operates with an input of about 50 watts. It is usually on 80 meters, although it can also be used on 40 and 20.

At the bottom of the rack is a straight-through transmitter (no doublers) using a 53 crystal oscillator, 10 amplifier, and push-pull 50T’s in the final. By changing crystals and coils it can work on several bands, but usually is kept on 40 meters. Three power supplies are used with this set, which also has primary keying. The input to the final is about 200 watts. Pi-section antenna couplers are used with all three transmitters.

On the operating table itself, at the extreme left, is a Peak preselector (not in use at present) and on top of this unit is the plate meter for the final stage of the first transmitter, placed here so it can be seen conveniently. Next is an NC100X receiver, and above it an old all-wave super converted for amateur-band use but now used only as a monitor.

Beneath the desk lamp is the station control box, containing the jacks and switches necessary to control the three transmitters, two receivers and three receiving antennas. To the right of the control box is an NC101X receiver, used for all ham work except for handling traffic on a net in which stations are on different frequencies, when the smaller band-spread of the NC100X permits jumping from one frequency to another more rapidly.

VE4LQ, Edmonton, Alta.

VE4LQ, on the air since December, 1935, was built in its entirety by the owner-operator, W. W. Butchart, became an ORS in November 1936, and is the Edmonton outlet for the Alberta Net.

The station layout is shown in the photograph. To the left on the desk is the message file, freqmeter-monitor, receiver, keying oscillator, Vibroplex and straight key and, to the right, the transmitter.

(Continued on page 80)
Fifth Annual A.R.R.L. June Field Day Contest

Combine Portable/Emergency Set Tests and Outing, June 19th–20th

To be prepared for emergencies requires that equipment be at hand, and the operator know what to do when power goes off, how to work without commercial power, how to send a message (proper order of parts) and show receipt for same, how to tune up workable antennas in "new" locations, how to make the most of low power, and many other things. The Annual Field Day is open to all W/VE amateurs and dedicated to the testing in actual operation of sending and receiving equipment that will function self-powered for the occasion.

The F.D. combines an outing with the opening of the season for outdoor radio activities. Operating time for the F.D. shown in logs must be between Saturday, June 19th (4 P.M. local time) and Sunday, June 20th (7 P.M. local time), for all points that count.

Only portable stations actually operated away from the "home" address are eligible to submit field-day scores. Any or all amateur frequency bands may be used, voice or c.w. telegraph likewise. Advance entry is not required. The general call: (c.w.) CQ FD or (phone) CQ FIELD DAY. The object is for each field-portable to work as many other amateur stations as possible in the time allotted.

Scoring: Each different station worked counts one point toward the score (but one contact per station allowed). Working other stations in the field, portable-to-portable at both ends of a QSO will count two points instead of one only. "Manufactured" contacts between stations of the same field group in the contest are out, however. All stations used by a single group must operate under the same call signal and portable designation and in the same "F.C.C.-notified" locality. An extra credit of 10 points (before multiplier) may be claimed for originating not more than one message addressed to A.R.R.L. Hq., reporting the number of operators, the location, conditions and power (informative data on situations always needed at Hq. in actual emergency, too!). These extra points will count only if the message copy is submitted showing complete handling data, and word count (CK) must be correct as well as preamble complete in the right order.

The multiplier: Scores may be multiplied by 2 if either the receiver or transmitter is independent of mains or commercial power source, by 3 if both transmit and receive are supplied from an independent local source. The following additional score multiplier is determined by the power input to the final stage (plate voltage times plate current—E X I).

(a) Up to and including 20 watts—multiply score by 3.
(b) Over 20, and up to 60 watts—multiply score by 2.
(c) Over 60 watts—multiply score by 1.

The log of operation, claimed score, and data on power, frequency band and time of each contact should be listed, with the claimed total, and sent in promptly at the end of the tests. Be sure to note the source(s) of plate and filament power, along with the "watts input."

Clubs are all invited to encourage their members to build portables, and to arrange special Field Day activities. Club contests for emergency set-building of members should be instituted, as well as planning for higher power centrally located amateur-emergency stations where possible. Every amateur is invited to take part, whether or not able to participate in club plans. Your portable transmitter can be a source of great pleasure for the whole summer season. Get it working now. Take a couple of hams with you. Test it in the Field Day. One field contact—and you win over the ham not taking part! All amateurs are requested to ask for application forms for registering their equipment and availability in A.R.R.L.'s Emergency Corps, if not already on record as a member of this organization.

Keep an operate portable at hand all the year. Use "six-volt" tubes in exciters (and receivers, too) so they can be easily converted in emergency. Better yet plan gas-driven units for ample power, but don't deny yourself the ability and pleasure to set up in any location when supplementary links to important agencies may be required. Surprisingly efficient and useful equipment may be operated from vibrator-type, generator and battery power supplies. Use them at the mountains and seashore this summer. See some of the set descriptions elsewhere in this issue and plan to get in on this interesting, constructive side of amateur radio fun. We'll be looking for your report on the F.D.

—F. E. H.

1To comply with F.C.C. regulations for portable station operation, licenses in the U.S.A. have only to observe the instructions of par. 387-384 as respects advance notification of the location in which the portable will be operated, to the Inspector-in-Charge of the district, and as regards proper station identification (HF-P type, etc.), only on the 28 Mc., 56 Mc. and higher frequency amateur bands is portable work permitted without such notification. In Canada, except for the inclusion of authorization to portable in the regulations for these u.h.f. bands, it is necessary to ask special permission of the Department of the Marine for the work a VE-amateur has in mind for frequencies below 28 Mc.
Conducted by Byron Goodman

Contests:

Apparently the “Contest Calendar,” suggested by the D.A.S.D. and reported in the December, 1936, I.A.R.U. Calendar and the February, 1937, edition of this column, has been overlooked by several of the member-societies. Three DX contests were scheduled for May by member-societies, and no doubt there will be several more conflicts during the year. While such conflicts work no great hardship on DX-minded amateurs in the outside countries, it is not quite fair to the country holding the contest to have to share its time with several other countries conducting similar affairs. The December I.A.R.U. Calendar carried a list of the contemplated contests for 1937 and an invitation for other member-societies to make known their contest dates and thus establish priority for that period. We heartily recommend that all societies planning tests during the next twelve or fifteen months advise I.A.R.U. headquarters as soon as possible, to avoid future conflict.

Although it is probably none of our business, we would like to suggest that smaller countries conducting DX contests plan to reduce the length of the tests. For example, a country with less than 25 active amateurs should be able to conduct a satisfactory contest over a period of a week, which includes the two weekends and their peak activity, instead of the four weekends some of them now ask. In this way, we believe foreign contestants will not have time to lose interest and a much better contest will result.

Power:

Because this column treats with the doings of our member-societies, and because we felt that many of our United States readers would be interested in it, we are going to list the requirements for a “high-power” permit in Great Britain.

The freedom and limit (1 kilowatt) in the United States is often the envy of amateurs in other countries, and the following, taken from the R.S.G.B.’s “T & R Bulletin,” will show why:

“In submitting applications for an increase in power in excess of 25 watts, members are required to note the following information:

1. The application must be based on sound technical grounds.
2. Details should be given of past and projected experiments, with an explanation as to the reason why the present power is insufficient for the experiments.
3. Applicants must give an assurance that crystal control or some other recognized form of frequency stabilising will be used for high-power tests.
4. Applications must be addressed to the Secretary, R.S.G.B., and forwarded via a member’s D.R., who is required to comment upon the application.”
“5. Members, after being recommended by the Council, must hold themselves in readiness for a G.P.O. inspection of their station.

“The inspecting officer will, in particular, require to examine the station log and crystal certificate, and will seek evidence of past experiments and enquire for particulars of projected work. A log containing only a record of transmissions made, is not evidence of their experimental value.

“6. The requisitioned higher power may not be used until a definite authorisation in writing has been received from the G.P.O.


“Members are reminded that their applications, or a copy thereof, are submitted by the Council to the G.P.O., therefore they should be written in official style and submitted as a separate communication to any other correspondence forwarded to their D.R.”

Is that all?

General:

The R.S.G.B., through their secretary Mr. Clarricoats, would like to advise all amateurs that the R.S.G.B.’s National Field Day will take place from 1800 GT, Saturday, June 5th, to 1800 GT, Sunday, June 6th. During that time their portable stations will use the suffix “P” after their calls, as for example, “G6CLP.” Last year their stations lost valuable minutes explaining that the letter P indicated that the stations were portable . . . . Most liberal of the larger nations from the standpoint of licensing foreigners is Germany, which offers to license the nationals of any other nation which in turn grants amateur licenses to German citizens . . . . . W2GMN advises us that William P. Schweitzer, W2JKQ, rifle enthusiast and well-known 14-Mc. ’phone man, travels to England the last week in June with the American rifle team to take part in the International matches. He will be stationed first at Bisney, near London, and later at the Hotel Rafael in Paris. During the latter part of July he will be at Helsingfors, Finland. He is anxious to make contacts, or a copy thereof, are submitted by the Council to the G.P.O., therefore they should be written in official style and submitted as a separate communication to any other correspondence forwarded to their D.R.”

The 100-Foot Lattice Tower at W9DNP

(Continued from page 87)

The second part of Ross Hull’s article on ultra-high-frequency propagation is scheduled for the July issue.

U.H.F.
ADVANCE INDICATIONS POINT to greater interest in the annual A.R.R.L. Field Day (scheduled for June 19th-20th) than ever before. This is as it should be for the F.D. combines the idea of an outing with the testing of portables and emergency equipment. It brings out the best in operators, and next to traffic work, calls for the highest degree of cooperation and work with a group of one's fellow amateurs to plan the station, food and transportation arrangements and to put over a real communication performance, usually with a modest-powered rig.

The Field Days mean even more to us than opportunities to test self-powered equipment, however. Whether groups of three or four individuals work together, or clubs promote plans, the F.D. develops the highest in human fellowship and relationships. The F.D. is dedicated to preparedness, with the aim to promote building and testing equipment, and operator training; it exposes our construction and operating theories to the cold light of practice afield; it brings out weak points in equipment and operating to permit improvements. Also our album of amateur radio events is filled with snaps that fill us with happy recollections of the set-ups and experiences of several previous A.R.R.L. Field Days shared with others. New places and a changing assortment of equipment, and good times combined with the radio station as the central attraction and reason for the plans, give the F.D. a world of meaning to all its followers.

Certain clarifications and amendments to the F.D. rules have been made in this year's announcement which appears elsewhere in this issue, but the fundamentals of Field Day operating are the same as in our previous successful affairs. Any member's file of QST's will disclose numerous suggestions for Field Day equipment by the way of articles and the suggestions made with previous announcements. This issue alone contains information enough from which to build a suitable set for this year's tests. Excellent low-power manufactured transmitters are also available.

We recently completed a new transmitter-exciter using all six-volt tubes, especially for portable work, but suitable for use in our fixed amateur station too. Work in the latter keeps it in trim, ready for any outside work, but giving us regular returns from its use. A convenient plug-in receptacle in the trunk of the car and another in the station permits operation at home from station power mains (a.c.) or at any point the car takes it from storage batteries (d.c.) using vibrator-type or generator h.v. sources, easily transportable. Plug-in coils give excellent all-band capability, with e.c.o. for flexibility within the bands, as well as ability to break-in on some continuously monitored government frequency to which the emergency set has been previously calibrated in the event of a justifying great need. Teats of such new low-power stations give a thrill of pride in satisfactory accomplishment that is something above and beyond the usual records so easily possible with plenty of power and all modern station aids. If you don't agree with the writer, we ask you at least to stick a simple job together and try it afield on June 19th before you tell us so!

Since more rigs will work as frequency multipliers and double or quadruple—and there will be more e.c.o.'s in the field this year—we may well outline a few precautions for all and sundry. Design of course may permit either crystal control or electron-coupled oscillator control of frequency or both in the same transmitter. While the crystal is well worth having as frequency insurance, the emergency significance of the construction will in the future make change-over to a "rubber crystal" (by which we mean the electron-coupled oscillator) an important feature in these intermediate power sets. Of course the e.c.o. must be lightly loaded and operated below its rated plate voltage rather than otherwise, and provided with an amply large dial (for accurate resettings) and should be used and calibrated only over the high-C end of the tuning condenser scale (to permit keying comparable to crystal-keyed characteristics).

Other precautions are very important when operating e.c.o. or crystal multiplying, else off-frequency operation and consequent F.C.C. citations are likely! (1) Be sure the correct coils are plugged in for the particular bands and calibration anticipated. Unless you check, it is easy to get the wrong coil combination installed if there are several coils. This may make the set inoperative, but is more likely to invite an off-frequency adjustment or direct radiation of a harmonic or
parasitic. (2) Provide a small, simple, rugged, absorption type frequency meter or wavemeter (just a coil-condenser and indicator) of known characteristics to positively identify frequency and distinguish harmonics from fundamentals. Check with both this and the receiver. It is well to use our sets at the home QTH as a preliminary with more than one frequency or other faults. It is well to mention the possibility of finding crystals and make sure they are “right” before we set and distinguish harmonics from fundamentals. If and whenever working “c.e.o.” keep away from the band edges. Allow liberal factors of safety . . . always. It pays dividends. Even with crystals, the exact value of plate tank tuning, oscillator circuit and holder capacities and temperature may vary our frequency control considerably, not to mention the possibility of finding crystals with more than one frequency or other faults.

The choice of bands and exact type of equipment is left to participants. The gasoline-driven high-powered rig has our admiration and is most useful for clubs to develop as community-center dependable stations for possible emergency. Its ability to communicate makes it subject to a just handicap in an operating competition of this type. Most of us cannot afford such elaborate and extensive preparation, but intermediate power stations have proved highly useful and successful, where well built and operated by skilled operators. Our “little” station fills us with enthusiasm for its performance. The Field Day appropriately encourages the more widespread availability of the excellent lower-powered station which is not only good for the establishment of secondary stations if and wherever needed in communication emergencies of the general type, but is equally a pleasure to take to the mountains or the seashore during the summer season. Here’s success to all in the Field Day this June. See you there.

— F. E. H. ——

New South Carolina Section Created

Following action by the Board of Directors transferring South Carolina, on petition of members, from the Southeastern to the Roanoke Division, Director Cavensness, W4DW, and your Communications Manager have taken the necessary joint action to make South Carolina a new independent A.R.R.L. Section, the League’s 70th field organization Section, as of the date of election of South Carolina S.C.M. by South Carolina League members.

The election notice appearing elsewhere in these pages specifies the closing date for receipt of nominations for South Carolina Section Communications Manager as June 15, 1937, in soliciting nominations for the office.

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South Dakota Emergency

A severe election storm visited South Dakota on the night of March 23rd, turning into a blinding blizzard. When it receded on the evening of the 24th it had left behind from 13 to 20 inches of wet snow. Practically the entire section of the state was without wire communication service of any kind for a period of three or four days. Highways were blocked for nearly two days. Amateur radio quickly sprang into service, handling important dispatches for telephone and power companies, railroads, W.U., news associations, and others. Several operators manned their stations continuously for 48 hours.

A letter from Mr. E. K. Albert, Electrical Superintendent, Northwestern Public Service Company, impressively tells of the great service rendered by amateur radio in emergencies of this type. Mr. Albert writes: “Due to the whole-hearted cooperation of radio amateurs in our territory we were able to establish communication between our strategic points. This was a great help to us in recovery work and the towns in the area affected by the storm. Many of our towns had service restored hours sooner than would have been possible without the help of these amateur stations. In the affected area we operate about 800 miles of high and low voltage lines serving about 90 towns. Highways were blocked with snow. You can readily appreciate the problem of restoring service under such conditions without communication facilities. Our men who were engaged in this work are most enthusiastic and the help of the amateur stations. The following is a list of the stations that worked with us: W9FJP, W0K, W9FLO, W9WFL, W01DU, W0JBT, W0DAZ.

Rapid City: W9RY, W9YQR, W9TOP and W9YOB handled train orders for the C. & N. W. railroad through W9FJR, Fort Pierre, using W9YOB in the daytime and W9TOP at night. This set-up also handled W.U. traffic. W9YQR handled repair service in Pierre. Phillip, Chamberlain and Wall via W9YOB/W9TOP to W9FJR and W9YQR. W9SWY handled traffic into Nebraska on 1.75-Mc. phone, W9UAV and other members of the Black Hills Amateur Radio Club at Rapid City assisted in laying transmission lines and in phoning local traffic. W9AT and W9JNA on the outskirts of Rapid City, had a circuit working into Rapid City for a grain company in Sioux Falls through W90XC, Pierre; W9DIY handled the Sioux Falls end; this was on 3.9-Mc. cw.

Mitchell: W9DZA of this city remained on the air continuously for 48 hours, with W9UXC and W9RMD assisting, handling traffic on the power company, telephone company, W.U., railroads and schools, as well as from W9DIY, Sioux Falls.

Wall: W9VQI, after erecting a temporary antenna (the storm had brought down his regular skywire), handled trafic with W9TOP, Rapid City. W9YOB and W9UAV handled traffic into Nebraska on 1.75-Mc. phone, W9AZR, A.A.R.S. State Control Station, handled traffic with W9BNT, Omaha, Nebraska, W9BNT standing guard on 817-ke. continuously until the emergency was over. W9AZR handled urgent death message from W9FED, Miller.

Huron: The public utilities, W.U., etc., were served here by W9K1 and W9QVP, Brookings: W9ORY and W9PPE played important parts in Brookings, handling emergency traffic. Watertown: W9BY, 3.9-Mc. phone, was the important link here. Rapid City: W9RSE did a fine job, although his antenna was down in the snow.

Aberdeen: About 100 messages were handled by Aberdeen stations for the N.W. Bell Telephone Company, the N.W. Public Service Company, the railroad, the A.P. and local Aberdeen American-News, the local broadcasting station KABR, and the State and County Highway Departments. Assistance was also rendered in locating one missing person.

W9FJR, W9UAV, W9YQR, W9DIY and W9VQI were important stations at this point. Aberdeen hams received a letter of appreciation from Mr. L. S. Siekmeyer, Chief Engineer of the Dakota Central Telephone Company, which is here quoted in part: "The management of the Dakota Central Telephone Company wishes to express its thanks and appreciation for the services rendered it with your amateur short wave stations during the period immediately following the severe storm of March 28 and 29, 1937. . . All long distance circuits were out of service at Aberdeen, Huron, Mitchell, Watertown and Pierre, resulting in the complete isolation of the points insofar as telephone communication was concerned. . . The fine cooperation of . . . radio operators expedited the supply of quick information regarding the extent of the storm, and the dispatching of crews and material from other sections. As it was, you helped us handle our work more efficiently and restore our lines at an earlier date." W9FQW at Fargo, North Da-
The first time I was up to his shack he showed me a lot of stuff in his log and a few DX cards on the wall. There were a few minor discrepancies in the cards such as: they were all written in the same handwriting, same color ink, same width pen, and they had all arrived in envelopes that had since been destroyed. I was dubious. In fact I didn't believe any of it.

After that, whenever I met him he had some new tale to tell. "I got 87 from J2— I got 88 from SU1— I got 90 from XE1—" he would say as we were shaking hands.

After a time this became rather boring and then downright disastrous. He never had a chance to bear up our own DX. When we come out with working a new country that was our pride and joy he would retaliate with, "Oh, I worked that country with five watts input to an "01A on eighty the week after I got my ticket." Only a very just respect of the law saved him more than once.

Something had to be done, so yours truly had a brainstorm. I knew that W9CQ had a blank K6 card that he had received in a personal QSO and was not filled in. I talked him into giving it to me and filled it out very nicely. Inserting it in an envelope, I addressed it to the "Great DX'er" as he had come to be called. First, however, I had taken the precaution of writing an eight-letter code group on the inside of the envelope. Then I put this in another envelope which I addressed to the postmaster at Hawaii and requested him to remail for philatelic purposes. Then I sat down and adopted what is known as a period of watchful waiting.

After a month or so I met him again. "Got any new DX cards, old man?" I asked.

"Why yes," came the reply. "Just the day before yesterday I got a card from K6— That was sure a swell QSO, let me tell you. I hardly knew if I would take it for about an hour. Yep, me' n' Oliver are great pals. Made a sked with him and kept it every third night since then."

"Yeah," says I. "Yea," says he. "One thing I always do when I have a swell QSO QSO like that is write the guy a nice long letter and ship it with the card. Always get a neat reply. Come over and I'll let you read Oliver's letter."

My eyes opened and I thought maybe he had really received a card and letter and then I decided that he was only enlarging on the fact that somebody had made a mistake, or so he must have thought.

"Well, I'm kind of busy right now but I will someday soon. Incidentally, when you get home look inside the radio, just respect of the law saved him more than once.

"Well, I'm kind of busy right now but I will someday soon. Incidentally, when you get home look inside the radio, look on my face laughs, "Yeah, yeah, sure. Got to have your joke, Ha ha." We part and I forget about it. About eleven-thirty that night when I was having a swell rag-chew with CK2-.. ops, there I go. Well, anyway, the 'phone rings. It's the "Great DX'er.""

"Hello, Marty," he says. "I want to ask you something." "Shoot," I says. "What did you say that code group was?"

I repeat and then he says, "Marty, how many guys know about that?"

"All of them," I tell him. A moment of silence, then, "Well I'll tell you how it happened. That night that I was sitting up and I heard this K6 rolling in. He was calling CQ and when he signs I give him a call. He comes back, "QRZ W9???." I calls him again and he comes back, "r c sori ob but missed call pse reprt."

I gave him my call about five times, but every time he missed it, so finally he calls it a day and tells me that he'll look for me sometime when conditions were more favorable. I agree and sign, so that's how come I was thinking that he sent me that card."

"But Oh," I says. "If he didn't get your call how could he ship you a card?"

That got him but he says, "Oh, I sent him one first."

"Mind if I write to Oliver and ask him?"

"Well you won't take my word and want to go to all that trouble."

"And how about all the dope on how great friends you were, and the skeds and the letters?" I ask.

"Well, maybe I did stretch the point a little," lie admits.
"You needn't tell any more of the boys than you can help about that, though, will you?"

"Of course not, ol' pal, ol' pal," I tell him, and after he hangs up I can hear him talking on the phone telling his wife, and you.

Needless to say, the next time the select circle gathered it was "Oh, yes, that DX'ers' call. Anyone wishing further information kindly write to me enclosing a self-addressed postcard. I'll have a rubber stamp of his call made."

Re: DX Contest Disqualifications

W1HP was erroneously listed in the DX Contest "Disqualified List" printed in May QST. This was a typographical error; the call should have been W1HPV. W7DXZ will be happy to know that he was one of those cases in which "he notified ARRL first" on receiving a FCC citation.

Susquehanna Emergency Net

An AMATEUR radio emergency communication system - a has been organized along the Susquehanna River watershed, to provide the hydro-electric plants with information on river stages at various points. Stations were chosen that were known to be reliable and beyond the reach of flood waters. In some cases stations have installed or have available emergency powered transmitters. Three stations have been made arrangements to operate from State Institutions having private power supply systems.

To cope with the possibility that the river gauges would be inaccessible during floods, prominent buildings whose elevations could be determined were photographed and marked thereon in addition to the photographs. With this data, the hydrographic department will be able to determine the river stages at these points fairly accurately. With the information furnished by the observers from the various points along the river, the hydrographic department of the power company will be able to forecast the stage of the river accurately eight hours in advance, this information to be radioed back to the stations.

The 3500-kc. baud is used because it is the only one that will pass all messages in the time allowed. The 3890-kc. is used in addition to the photographs. With this as a basis, the stations will be able to cope with the traffic for relief, power boats, medical supplies and will reduce confusion of relief messages that usually occur during an emergency as a result of over ambitious stations picking up messages and starting them to a destination without authority. A supplementary net will be built up to take personal traffic from the emergency net at such times when the emergency traffic calls are reduced and traffic speeded up. During periods of the year that the Susquehanna River is subject to flood, prominent buildings whose elevations are inaccessible during floods, the Susquehanna Emergency Communications Net holds tests at intervals, eliminations and additions being made as necessary. Should an emergency arise along the Susquehanna River Watershed, the net will be called to order either by radio or telegraph and scheduled.

Another net operating a similar way. The Net Control Station will have fill any gaps existing in one net from the other net. The Susquehanna Emergency Net will give consistent service over the distances involved 24 hours of the day. C.W. men operate on 3890 kc. and the radioed back to the stations, only 20 kc. apart; in this way stations will then be cleared to its destination through another radio circuit, by wired wireless, private lines or land lines that are available to the Net Control Station. Messages to the Coast Guard Station at Philadelphia and Baltimore will be handled in a similar way. The Net Control Station will have sufficient help from the Alternate Station and other amateurs to cope with the traffic for relief, power boats, medical supplies and will reduce confusion of relief messages that usually occur during an emergency as a result of over ambitious stations picking up messages and starting them to a destination without authority. A supplementary net will be built up to take personal traffic from the emergency net at such times when the emergency traffic calls are reduced and traffic speeded up. These stations "make" the R.P.L. with one of 500 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count.

<table>
<thead>
<tr>
<th>Call</th>
<th>Extra Del.</th>
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<tbody>
<tr>
<td>W8CBG</td>
<td>15 63</td>
</tr>
<tr>
<td>W8F2G</td>
<td>22 43</td>
</tr>
<tr>
<td>W8IIW</td>
<td>22 23</td>
</tr>
<tr>
<td>W8JFK</td>
<td>66 46</td>
</tr>
<tr>
<td>W92GGE</td>
<td>15 63</td>
</tr>
<tr>
<td>W8L2G</td>
<td>24 43</td>
</tr>
<tr>
<td>W8MDC</td>
<td>17 45</td>
</tr>
<tr>
<td>W8S7H</td>
<td>90 49</td>
</tr>
<tr>
<td>W8UW</td>
<td>81 45</td>
</tr>
<tr>
<td>W8IOU</td>
<td>41 83</td>
</tr>
<tr>
<td>W8IPW</td>
<td>47 86</td>
</tr>
</tbody>
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More-Than-One-Operator Stations

<table>
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<tr>
<th>Call</th>
<th>Extra Del.</th>
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<tbody>
<tr>
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<td>20 22</td>
</tr>
<tr>
<td>W8WMO</td>
<td>10 21</td>
</tr>
<tr>
<td>W8J7A</td>
<td>24 15</td>
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</tbody>
</table>

These stations "make" the B.P.L. with one of 500 or over. One hundred deliveries + Ex. Del. Credits also rate B.P.L. standing. The following one-operator stations make the B.P.L. on deliveries. Deliveries count.

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<tr>
<td>W8T9E</td>
<td>103</td>
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<td>W8RAU</td>
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<td>W8YQF</td>
<td>10</td>
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<td>W8CPY</td>
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<td>W8QTB</td>
<td>187</td>
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<tr>
<td>W8AAJ</td>
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A total of 500 or more, or 100 deliveries Ex. Del. Cr. will put you in line for a place in the B.P.L.

*Feb.–Mar.*

BRASS POUNDERS' LEAGUE
(March 16th–April 15th)

| Call | Orq. Del. Rel. Extra Del. Total |
|------|-------------|-------------|-------------|
| W873T | 714 | 3 | 1188 | 1907 |
| W8G9D | 248 | 278 | 1156 | 2000 |
| W8D8T | 81 | 94 | 1442 | 1827 |
| W8FPT | 129 | 200 | 2065 | 2378 |
| W8B3X | 224 | 48 | 708 | 1006 |
| W8D7R | 81 | 83 | 866 | 959 |
| W8B9A | 51 | 69 | 769 | 796 |
| W8R1N | 116 | 147 | 649 | 1919 |
| W8MTP | 5 | 49 | 727 | 837 |
| W8B1H | 7 | 123 | 129 | 522 |
| W8J9P | 7 | 42 | 718 | 278 |
| W8H7T | 6 | 66 | 418 | 758 |
| W8BN | 191 | 146 | 443 | 730 |
| W8E9F | 73 | 11 | 606 | 696 |
| W8DRB | 5 | 5 | 616 | 631 |
| W8AKS | 105 | 127 | 336 | 563 |
| W8U1R | 86 | 67 | 488 | 624 |
| W8TGN | 148 | 38 | 426 | 612 |
| W8C6S | 71 | 102 | 468 | 605 |
| W8DRD | 6 | 75 | 518 | 594 |
| W8G0P | 129 | 204 | 320 | 549 |
| W8BMN | 5 | 30 | 21 | 583 |
| W8IOX | 61 | 130 | 224 | 380 |
| W8T6E | 10 | 29 | 522 | 531 |
| W8F4Y | 22 | 154 | 197 | 359 |
| W8LSF | 22 | 43 | 429 | 573 |
| W8I1W | 22 | 23 | 518 | 655 |
| W8GRN | 22 | 60 | 827 | 859 |
| W8GGE | 15 | 63 | 444 | 547 |
| W8JCU | 24 | 105 | 61 | 264 |
| W8H9P | 24 | 105 | 16 | 249 |
| W8U7A | 24 | 105 | 14 | 249 |
| W8G2E | 12 | 79 | 391 | 532 |
| W8MCN | 17 | 457 | 457 | 914 |
| W8H7G | 84 | 201 | 80 | 515 |
| W8U9J | 30 | 45 | 424 | 513 |
| W8L0T | 37 | 426 | 33 | 507 |
| W8IWT | 37 | 426 | 33 | 507 |

MORE-THAN-ONE-OPERATOR STATIONS

| Call | Orq. Del. Rel. Extra Del. Total |
|------|-------------|-------------|-------------|
| W817A | 724 | 727 | 727 | 727 |
| W8CGJ | 43 | 215 | 215 | 215 |

A.A.R.S.

| Call | Orq. Del. Rel. Extra Del. Total |
|------|-------------|-------------|-------------|
| WLYH (WEBMO) | 10 | 11 | 530 | 541 |
| W8AA (W8V8A) | 17 | 17 | 57 | 57 |
| W8LGK (W1EIG) | 502 | 502 | 502 |

MORE-THAN-ONE-OPERATOR STATIONS

| Call | Orq. Del. Rel. Extra Del. Total |
|------|-------------|-------------|-------------|
| W8LW (W8CXL) | 335 | 338 | 338 | 338 |

A total of 500 or more, or 100 deliveries Ex. Del. Cr. will put you in line for a place in the B.P.L.

June, 1937

W3UA
How's DX?

How:

No doubt it's a little unfair to inflict a gentle poke on this column's faithful readers, but there's no time like the present, since our subject is a timely one. But, with all due respect to the other branches of amateur radio, we have always sort of looked up to the DX contingent as the last gasp in amateur radio with respect to technical things. They seem to be the ones that pick up the latest developments first, utilizing every new gadget to improve their operating range. Usually they haven't failed us, what with new antennas, higher efficiency finals, better receivers, and the like. And along these lines, they should be the most careful observers of cosmic phenomena, because a knowledge of the vagaries of the ionosphere is helpful in determining operating times and frequencies. Some of the DX men do a swell job on this, as for example, the "DX Calendar" arrived at by W6CUH, and some of the very complete logs kept by a number of the foreign amateurs. But why leave it to just a few to struggle along when we have a legion of observers throughout the country, admirably situated to notice unusual conditions? On April 25th there were two or more complete "fade-outs," when the bands were almost completely devoid of signals for periods of 20 minutes or so. Being Sunday, there were a great number of stations on the air, each in this demonstration of cosmic whimsey, and all with a perfect chance to collect and forward data on it to us so we could send it to Dr. Dellinger, who really studies the thing. Oh, sure, we received reports on the fade-outs—about six! Six of our ranks interpreted the fade-out for what it was, and 4996 thought their receivers were dead or that no one was on the air. A fine example of something or other.

Where:

Among the more favorite pastimes during dull moments is looking through the Call Book for V55 stations above the Arctic Circle and VK4 stations in Papua. Passing swiftly past the V55 subject, we are pleased to report that at last a VK4 in Papua has been found—and not only found but worked! Yes, W6MCQ, west of California, who does plenty in a DX as well as a traffic way, worked VK4KC the other day for the Papua station's first W contact, and W8LEC also reports a QSO with him.

W6QEB is on the inactive side again. He received a QSL card from CR9AB in Macau, establishing the authenticity of the station previously suspected of being a phoney. Joe says that the note and first of the CR9 were probably responsible for a mix-up on the call, since he heard several W6's calling the station, each calling him something different.

There is an addition to the HS1PJ-HS1RJ combine; the call is HS1BJ . . . . . . CN1CR, reported a few months back, confines his work to 7 Mc, so far. He sent us a card to forward to B3IBN, but the call stops us. Any suggestions? . . . . According to W8LEC, FK7KW was not a phoney, but is an unlicensed station in Honduras. He used to sign HR1TG, also unlicensed . . . . . . Fan American Airways deserves a plug at this point. In pioneering trans-Pacific air travel they have set up a sweet combination, made WAC and WBE five times since last May, but the topper was during a QSO with W4DAY of Rome, Ga. Trimming several reductions of power, he got down to 2½ watts input (75 millimicroamp current) and was still S4. DAY told him to go ahead again, and this time the English station announced that his plate input and antenna current were both zero, but he was still S4-5! As far as he can determine, his final was perfectly neutralized, so there was no controlled-carrier or other effect. W9YGC was also listening to the test and will confirm it. The result is an all-time QRP record, a real "no power" achievement. You can tie it but you can't beat it!

(Edited, this column reports these things as they are told to us, so don't take issue with us. We're still receiving applications for our DX expeditions!)

V81AD (14,380 kc., T9) and V8BDY (14,340 kc., T8). The VU is in Burma, you know, which counts as a separate country from India, and a tip on V81AD is that he tunes from the high-frequency edge . . . . . . Iowa is well represented this month by W9LEZ, who peaked up above the tail corn long enough to let us know about U1AD (14,440 kc.),

JOHN BUTCHER, G5XG, HAS A LOW-POWER RECORD THAT SHOULD END ALL LOW-POWER RECORDS

The British station has been doing some remarkable work with a 20-watt final and "screened" grid. Recently, he made WAC and WBE five times since last May, but the topper was during a QSO with W4DAY of Rome, Ga. Trimming several reductions of power, he got down to 2½ watts input (75 millimicroamp current) and was still S4. DAY told him to go ahead again, and this time the English station announced that his plate input and antenna current were both zero, but he was still S4-5! As far as he can determine, his final was perfectly neutralized, so there was no controlled-carrier or other effect. W9YGC was also listening to the test and will confirm it. The result is an all-time QRP record, a real "no power" achievement. You can tie it but you can't beat it!
SP1GZ (14,050 kc.), 11LY (13,390 kc.), TG1AM (14,330 kc.), US4E (14,450 kc.), US6EP (14,450 kc.), PZ1AL (14,450 kc.), PZ1PA (14,500 kc.), US4AA (14,650 kc.), 5WGPB reports VP2Q (7100 kc., TS), good DX for the West Coast. The 14-Mc. Africans come through around 1600 GMT out there.

What:

With the feeling that there are a great number of technical hints that will help out in the working of bigger and better DX, and with the hope that our readers will see fit to contribute such material as they feel will be useful, a new section is ushered in this month. Under this heading we plan and most effective things to try is that of tuning the receiving antenna. We think you may have . . . One of the simplest seems to be in on things is G2PL. The first to make a frequency oscilator and mixer is the inductive method used in Jim Lamb's original version of the n.s. super. A 0J7 is the mixer tube.

Who:

We were afraid it would happen, and so weren't terribly surprised. But it would have been nice if the score had come in soon enough to include in last month's write-up of the DX Contest. Yep, the highest score turned in for the answering portion is that of W2UK, which claimed 128,210 points. In a word, awfully good. 272 contacts in 72 different countries did it . . . . An English station that always looks awfully, awfully good. 272 contacts in 72 different countries did it . . . . An English station that always looks awfully, awfully good.

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Briefs

A short Short Story: "Sell or trade for BC receiver: Aero automatic short wave tuner; 5 dial omnigraph mounted on baseboard with key and buzzer." (From QST, July 1931.)

The Columbus Amateur Radio Association announces its Field Day, incorporating a 56-Mc. Treasure Hunt andFamily Picnic, for Sunday, June 6th. The place: "The Trees," 8 miles north of Columbus, on Route 23 to Worthington, Ohio. Follow arrows to "The Trees." The Hunt starts at 10:00 A.M. from Worthington. P. H. G. Mathews, W9BN, Central Division Director, will be present. Bring the YL, YF and junior ops and your own lunch basket. Free coffee and lemonade. Registration 50¢ includes treasure hunt and chance at prizes. There will be games, swimming, golf, fun for all. Don't miss this Gala Event!

When the government radio station at Bayamo, Cuba, broke down April 7th, CMSGV handled official dispatches until repairs could be made.

Time Signals

W1NW, Narragansett, R. I., suggests that amateurs sign the name of their state after each CQ to indicate at once the location; thus: CQ CQ de W1NW R1. This would be helpful when we're searching for a particular state and would save wear and tear on call books.

Hams Afloat

W3GBB is operating aboard the S.S. Flow City, KIVG, a coastwise freighter plying between Galveston, Texas and Atlantic coast ports. The transmitter on KIVG uses a 50-watt. W2T2L is deck steward on the T.S.G. Skaveee, WOJG, running between New York and Miami. W5BJ pounds brass on the City Service Koolkod, WGAO. W9FTG is chief operator on the S.S. Pannon, WECY. W4CPV is still pushing 'em out on the S.S. Colorado. W5HBJ is an operator on the S.S. Santa Barbara, Chief operator on the S.S. Eschophora, WDBF, is W2BVJ; this ship runs from N. Y. to the Mediterranean and W2BVJ will be glad to listen for any hams; address him: C. A. Luckenbach, S.S. Eschophora, American Export Lines, New York.

W1WA4, Oroya, Peru (radiophone, 14,064 kc.), is expected to work with the American Museum of Natural History solar eclipse expedition to Peru in contemplated broadcasts to New York. W22C may handle the N. Y. end.

W1HWZ passes along the following information: Official radio time is available from Ottawa, Canada on 7335-ke. 24 hours per day, accuracy to .02 sec. Dots each second miss 90th to 51Jth sec. (5 mins.), and 40th to 50th sec. (5 mins.).

WILL Ham Forum

The "Ham Forum," 10:00 A.M. Saturday feature of WILL, the University of Illinois radio station, for several years, is now on the air on 580-ke. since the station's change of frequency April 19th. In charge of this weekly hamfest is Bill Livesey, W9MLH. The "Forum" presents news of mid-western amateur affairs and sponsors periodic code speed, interference and other contests. The program was started by Fred Wiley, W9ACZ. Last summer it was carried on by Dan Hazel, W0HUM, who is one of the three student operating engineers of WILL, who also have amateur stations. Others are Walter Sparf, W9SZP, and Frazer Leslie, W9RLV. A. James Ebel, the station's new chief engineer, is licensed as W9KJY. He replaced W. E. Phillips, W9CMZ, who now has other connections.

W1ZO (portable), set up at the Leisure Show, Mechanics Hall, Boston, worked Ohio, Georgia, Washington, Indi•n., Chual Zone and Hawaii on 3.9-Mc. 'phone during the Show. The same Collins rig used was taken to Siberia with the Harvard Expedition.
Briefs

W9RMN lives on Telegraph Road, Waukegan, Ill. He's a C.W. man, too!

1.75-Mc. "Phone Round Table

On Easter morning, 1937, fifty-two 'phone stations in thirty states, coast-to-coast, all operating on frequencies between 1935 and 1935 kc., took part in a "round table" QSO party, organized by Lloyd Miller, W8NYY, O.P.S., Akron, Ohio. The stations were selected in advance as consistent with W8NYY and were invited by card to participate. Starting at 2 a.m., EST, W8NYY called the roll in numerical and alphabetical order. Each station then called the Round Table for one minute while the rest listened, and after the round each station reported the other stations heard, with signal reports. The party lasted until 6:20 a.m., and a 'good time was had by all." Souvenir QSL's were sent to all participants.

Alberta Hamfest

The Northern Alberta Radio Club will stage the Alberta Hamfest In Edmonton, Alberta, Canada, July 10th and 11th, and a cordial invitation is extended to all hams. Address inquiries to A. Stoltery, Sec'y, N.A.R.C., 10608 73rd Avenue, Edmonton.

Hams who do some listening on the HCL channels will be interested to know that Eddie Green, comedian, who is heard on the NBC Blue Network at 9:00 P.M. (Eastern Time), Fridays, is one of the gang—W8ARKM.

W5FBQ, Dallas, Texas, claims that he has worked all states five times and has at least five QSL's from every state (including five from Nevada!). He works 7 and 14 Mc. with 11 watts input.

Columbus A.R.A. Field Day

May QST mentioned the work of W9WJL, Des Moines, Iowa, during a snow and ice storm in early April. Word has now been received of the amateurs who worked during this severe storm on the night of April 3d disabled all normal communications out of Mason City, Iowa. Amateur radio was used to bring news from Des Moines to this city of the company's general offices. The trucks were set ahead to the dates given here-with. In the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and is subject to the provisions of the Section's operating rules of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon of the day stated below.

Due to resignations in the Eastern Florida and Northern Sections, nominations made are hereby withdrawn and the office of Section Communications Manager in those sections are hereby vacated. The closing date for receipt of nominations at A.R.R.L. headquarters for the next quarter is hereby specified as noon, Tuesday, June 15, 1937.

ELECTION NOTICES

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

This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices for elections for Section Manager, the name of the present incumbent and the date of expiration of his term of office.

Please note that you are hereby notified that an election for an A.R.R.L. Section Communications Manager for the next two year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

In the event of failure of regular communication facilities, the elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The ballots mailed from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by A.R.R.L. members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominations at A.R.R.L. headquarters.

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

Communications Manager, A.R.R.L.
38 La Salle Road, West Hartford, Conn.

We, the undersigned members of the A.R.R.L. residing in the Section of the Division hereby nominate, as candidates for Section Communications Manager for this Section for the next two year term of office.

W1KJP, East Lyme, Conn., is interested in forming a traffic net for W1's under twenty years of age. Anyone interested should get in touch with W1KJP, giving opinions on the time such a net should meet, what days, frequencies, etc. Address Ralph W. Curtis, Box 51, East Lyme, Conn.

"The sentiment seems to be, 'Give a good report and the other fellow will give you one.' That isn't right. Let's have true reports and not a lot of applause." —WAAXP

Speaking of rag chewing, W0LEZ knows how it's done. On April 4th he worked the following stations, in the order given. The length of each QSO is indicated with the call. LE5 was on 14,002 kc: W9IQY 14 mins, W4CSB 48 mins, W6RKC 51 mins, W6WGQ 8 mins, W7FUR 35 mins, W7TJ 29 minutes, W8EKC 51 mins, W9IQY 36 mins, and W9WJL 53 mins. A total of 294 minutes of QSOing with 8 stations, each in a different district, for an average of 36.75 minutes per QSO.
such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the day given. In the case of some offices there is no limit to the number of petitions that may be filed, but no members shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the Section Manager's election. You can help by taking advantage of your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

P. B. Handy, Communications Manager

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager were received in all sections, as provided in the Constitution and By-Laws. The following officials, the term of office starting on the date given.

New Mexico
Hon. W. 0. Howard, W7XW
April 15, 1937

Rhode Island
Clayton C. Gordon, W1HRC
April 15, 1937

Virginia
Clifford J. Wortman, W4CVR
April 15, 1937

Indiana
Noble Burkhard, W9QGl
April 15, 1937

In the North Carolina Section of the Renneki Division Mr. B. Carter, W4OCG, Mr. Gordon S. Smith, W4XK, and Mr. W. J. Wortman, W4CYB, were nominated. Mr. Carter received 58 votes, Mr. Smith received 158 votes. Mr. Baunach's term of office begun April 22, 1937.

In the New York City and Long Island Section of the Hudson Division Mr. E. Baunach, W2AZV, and Mr. Robert L. Poceul received 158 votes, Mr. Baunach's term of office begun March 18, 1937. In the New York City and Long Island Section of the Hudson Division Mr. Edward L. Baunach, W2AZV, and Mr. Robert L. Poceul received 158 votes, Mr. Baunach's term of office begun March 18, 1937. In the New York City and Long Island Section of the Hudson Division Mr. Edward L. Baunach, W2AZV, and Mr. Robert L. Poceul received 158 votes, Mr. Baunach's term of office begun March 18, 1937.

STATION ACTIVITIES

ONTARIO—SCM, Fred H. B. Saxson, V6S8C—R.M.'s: ABW, DB, GT, MB, QK, TM, WK, WX, P.A.M.: NX. The VE/W contest was a great success. BO incorporates a fan in his half kw. rig and is looking forward to his return. AEJ is a member of the R.C.C. (Ottawa) has commercial ticket. TY finally hooked a VK. VE1A has one-watt carrier on 1.75-Mc. phone. ANA is the OM of JU. AGV sends nice report on AKL at Camp Borden. The "SCM's "Cu" is sponsored by the Lakehead Junior Chamber of Commerce and won last year by KM It is up for competition again this year and must be won three times by a station before it becomes the property of that station. How about it, fellows, are you going to let KM win it again this year? Your SCM made enquiries at A. & A. Radio and was told they are sold out of the NON CONDUCTIVE solder advertised on page 37 of their catalogue. TG has new rig with '03A's Class B and 100TW in final in 14 Mc. The Hamilton gang are quite proud of their 50-Mc. rig. ADG is holding up the end of the Toronto gang on this band. WW had the call 4XK before coming to this Section, and now has to use power from a gas engine plant. HP (Chatham) has made W.A.C. AGQ is qualifying for O.R.S. DII (St. Catharines) is new O.R.S. MB sent in his thirty-second consecutive report. ES is member of A.B.C. Supporting Division. The Beaumaris gang took in the Buffalo hamfest on April 10th and LHS has his skyhook cut down by B.C.L.'s. FF is getting into the work of the organization in your Section.

Traffic:

VE1EY 103 HJ 18 JK 16 EV 15.

MARITIME—SCM, A. M. Crowell, VE1DQ—VE tops the list this month. HJ is getting ready for the Field Days with air-cooled gas engine and generator to power his half kw. rig. He is interested in Class Band. CW was told he works 119s on 1.75-Mc. 'phone. AW is working 14-Mc. 'phone. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. CW is doing FB with 10 watts. BU is doing well on 14-Mc. 'phone rig. cw is now in addition to the Collins which is kept on 14-Mc. 'phone. VO1K has single 6L6 crystal on 3.7, 14 and 17 Mc and is working Europeans on 3.5 Mc. VO1M is quite active on 5-Mc. VO1S, VO1T, and VO1W, on 7-Mc. VO1V is quite active on 10-Mc. VO1O is going places with his 6L6 e.e. osc. and pair in final on 3.5 Mc. VO1P's two rigs on 3.5- and 14-Mc. 'phone and cw are working FB; 100 watts on 3.5 and 150 on 14, remote-controlled. VO1Q, an op. years ago is back again on 1.75 Mc. VO18 schedules VO1S on 3.5-Mc. phone every night. VO1U is using a 211 osc. with 700 volts on the plate. VO1W is active on 3.5- and 7-Mc. cw and has grid-mod. 'phone on 3.5. VOIX with 50 watts on 14-Mc. 'phone is going places. VOIX is active on 2.9-Mc. phone with 15 watts. VO1Z is heard on with single '10. VO2N is active Sunday mornings on 14 Mc. VO28 is active on 3.5 Mc. VO3's active: VO30, VO3P, VO3R, VO3Y, VO3X. VO4 is active on 3.5-Mc. 'phone as well as on 3.5 and 7 Mc. VO1K is heard working VO28. Also active are VO6L, VO6Q and VO6W. The VO1 Club is trying to get a room and then put together a transmitter.

Traffic: VE1EY 103 HJ 18 JK 16 EV 15.

ONTARIO DIVISION

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QUEBEC DIVISION

QUEBEC—SCM, Stan Connach, VE2EE—New QTHs: EX is now located in the Hams Paradise; FG we understand is in N.D.Q., with HF close by; DU is almost next door to IE; JX has moved a little closer to JY and LC is another quarter of a mile away. FO is building a home at Sonneville and has the angles marked out for his Diamond beam. KK lost an RK-20. BO is new member of the Bag Chewers Club. CV is a newcomer at Clowa. Cupid has moved to SW, WV20NX. We wish us for another summer at Belmont Park and this time Bill brings with him his YF. Congrats. EG is due for congrats also; he worked all continents on phone; this gives our district the only two W.A.C. phone tickets in Canada. DF of Quebec City is new W.A.C. AB has purchased an oscilloscope. 3DA of Ottawa was a visitor at HT. BU built a new exciter unit. JD is using a pair of T65's. IN has been playing around with a modulator. KM is still rebuilding. LC is pinch hitting as Tmnk Op. LU built a new power supply. EC is chasing DX Contest. LV is using a T20 final. DQ is going 'phone in a big way. EW blew two tubes in new final, CR wants to trade ten chickens for an Elma 16011. Hfaa off to AX, top VE in DX Contest, with a score of 32,000!! BK is a newcomer on 14-Mc. 'phone, DN, the station at the Club Les Amateurs Canadien Français, is soon to be put on 'phone; FS is building a new exciter for the equipment. JY is the proud owner of an RME69 with noise silencer. BH is rebuilding his battery-operated station. IP and EU are active on 7 Mc. HZ has completed his transmissor. AB and DW were visitors at the Functions Club. EV is active on all 'phone bands. KZ had to pack up 79 tubes to move. AH has been transferred to Toronto; another good man gone VE3. CA has deserted 14 Mc. for 28 Mc. Miss DA is very anxious to get on down on 14 Mc. ER has moved bag and baggage to Ottawa. HF has bought a Sky Buddy. FO brought a new Ultra Sky Chief across the line. KS is rebuilding to 'phone. BG is building special rig for 28 Mc. GA works 14 Mc. occasion-}

VANALTA DIVISION

ALBERTA—SCM, Alfred D. Kettlenbach, VE4LX—EA works good DX on 14-Mc. 'phone. PJ tried 'phone and went back to 28-Mc. LQ is working four bands regularly. HJ is new Edmonton call and is secretary of N.A.R.C. VY tried new vertical antenna on 14 Mc. ABN made 100 QSO's in month. ADM popped 7-Mc. crystal and is trying electron-coupled oscillator. ADH is using beam antennas on 28 Mc. BW is using new equipment. JY is the proud owner of an RME69 with noise silencer. BH is rebuilding his battery-operated station. IP and EU are active on 7 Mc. HZ has completed his transmissor. AB and DW were visitors at the Functions Club. EV is active on all 'phone bands. KZ had to pack up 79 tubes to move. AH has been transferred to Toronto; another good man gone VE3. CA has deserted 14 Mc. for 28 Mc. Miss DA is very anxious to get on down on 14 Mc. ER has moved bag and baggage to Ottawa. HF has bought a Sky Buddy. FO brought a new Ultra Sky Chief across the line. KS is rebuilding to 'phone. BG is building special rig for 28 Mc. GA works 14 Mc. occasion-}

PRAIRIE DIVISION

MANITOBA—SCM, A. J. R. Simpson, VE4BG—HJ has installed a pair of T65's. IN has been playing around with a modulator. KM is still rebuilding. LC is pinch hitting as Tmnk Op. LU built a new power supply. EC is chasing DX Contest. LV is using a T20 final. DQ is going 'phone in a big way. EW blew two tubes in new final, CR wants to trade ten chickens for an Elma 16011. Hfaa off to AX, top VE in DX Contest, with a score of 32,000!! BK is a newcomer on 14-Mc. 'phone, DN, the station at the Club Les Amateurs Canadien Français, is soon to be put on 'phone; FS is building a new exciter for the equipment. JY is the proud owner of an RME69 with noise silencer. BH is rebuilding his battery-operated station. IP and EU are active on 7 Mc. HZ has completed his transmissor. AB and DW were visitors at the Functions Club. EV is active on all 'phone bands. KZ had to pack up 79 tubes to move. AH has been transferred to Toronto; another good man gone VE3. CA has deserted 14 Mc. for 28 Mc. Miss DA is very anxious to get on down on 14 Mc. ER has moved bag and baggage to Ottawa. HF has bought a Sky Buddy. FO brought a new Ultra Sky Chief across the line. KS is rebuilding to 'phone. BG is building special rig for 28 Mc. GA works 14 Mc. occasion-}

SASKATEWHAN—SCM, Wilfred Skafe, VE1EL—The Regina Gang paid a visit to the Airways Beam station. XM gets going once more. BD is still not edging his beam up. BL did a little operating at XB's station. JB puts out plenty of sock on 3.9-Mc. 'phone. IQ is using 6A6 osc-doubler and 6A6 amp. on 14 Mc. QZ hooked TF3GM, Iceland, on 7 Mc. first night of 14-Mc. QSO contest. KF 22 EC 15 IN 6 DR 40 HH 27.
The Mis-Used DX Bands

Pinehurst Road, Eau Claire, Wisc.

Editor, QST:

...The condition of all bands here in the Midwest is such that international communication is becoming impossible. This condition can be remedied. A great majority of the newer hams are using the high-frequency bands for short haul communication, for no apparent reason, during hours that formerly were considered "DX" hours. It is possible to hear very good DX on 7000 kc. from 7 P.M. until 7 A.M., but it cannot be copied except for a few hours in the early morning. The interference at all other times is of the short-haul communication type. By investigation I have found that many hams do not know that foreign stations come in at other hours than three to five in the morning, and consequently they cannot be blamed too heavily, but there is no reason why they should not be educated to the facts that do exist. Whether they are newcomers or not they would be interested in DX if they knew they could hear it, and work it. They can, if they would sacrifice their nearly local S9 communication for a lot of S6 international communication. Why should any ham work stations from 12 A.M. until 8 A.M. that he can work all day and all evening?

I have been speaking principally of the 7000-kc. band. Conditions on 14,000 kc. are almost as bad. On 14,000 kc. DX can be heard at nearly any hour of the twenty-four, therefore why use that band at all for any United States communication except daytime coast to coast work? Witness the number of foreign and American stations working outside the 20-meter band. Witness the rapid increase of crystal-controlled foreign stations outside the band, and witness the percentage of stations working those foreign stations outside the band as compared to those inside the band. The greatest portion of 14,000 kc. DX that I work is that which is operating outside the band.

We have had many good campaigns within the last few years in ham radio. We have put crystal control on all bands to five meters. We have developed for ham use signal squitters with a handle on them, and sights on them too. Now, to be consistent, let's put on a campaign, an educational campaign for all, for real operating, and while we're at it let's help the rest of the world maintain peace by our friendly, easily-maintained international communication...--Cletus M. Dunn, W9DIT

Observations During a Strongly Marked Dellinger Effect

Schad-Str. 24, Ulm (Donau), Germany

Editor, QST:

The conditions of propagation on the ultra-high-frequencies had been quite unusual on November 6, 1936. On the morning of this day the sub-harmonics of some European short-wave stations appeared with great field-strength on the wavelengths between 8 and 10 metres. Skip-distances had been very small, an evidence of a strong ionisation in the Kennelly-Heaviside layer.

At 14:20 GT I received the Australian amateur station VK2GU on 28,120 kc. when 80 per cent of the Great Circle line connecting Europe with Australia was on the night-side of the globe. I was calling this station at that time with my station D4MDN and was heard there with a good strength until 14:25 GT when the propagation broke off. It is remarkable that my station had operated with not more than 5 watts output, but using a 5A directional antenna system for the east-west direction.

14:30 GT I received the sub-harmonic of the commercial station VVQE, Rocky Point, L. I., on 87,940 kc. with an unusually high field strength. On about 40,000 kc. I observed—but couldn't exactly identify—another station from the U.S.A. In the following time I observed the sub-harmonics from commercial stations between 40,000 and 27,000 kc.

16:12 to 16:15 GT I was calling "CQ TEN" on about 28,250 kc. with my station D4MDN over my east-west radiator and observed—when I began listening—that no more stations could be received on the amateur band. The sub-harmonics of the commercial station WQT on 27,770, WQP on 27,800, and WTY on 27,740 kc. had disappeared completely. On the wavelength of 14 meters the stations PPX, Rio de Janeiro, on 20,720 kc. and W2XE, New York, on 21,520 kc. had disappeared also. I observed these last two stations 16:10 GT at normal field strength. On 21,470 kc. I received, however, the British Broadcasting Station GSH, Daventry.

During the whole period of the fadeout I received
Modulation Limits

163 East Bettlwood Ave., Oaklyn, N. J.

Editor, QST:
The writer, having been inactive in amateur radio for a considerable period and observing the struggle from the sidelines, holds the following to be self-evident, viz:

1. A limited number of kilocycles is available to all.
2. Each amateur, ‘phone or c.w., is democratically entitled to an equal swath of the ether.

Good intelligibility of voice communication may be realized if a pass-band of 290 to 2500 cycles is considered. The land-wire telephones operate essentially within these limits without difficulty, enabling subscribers to understand lisps, without difficulty, enabling subscribers to understand lisps, and foreign accents.

The writer suggests that each ‘phone station operating within the valuable bands of 20, 80 and 160 meters be required by law to insert a simple band-pass filter of the above limits between the microphone and the transmitter input. Such a device could be defined electrically by the Federal Communications Commission in the matter of broadcast station modulation monitor or frequency deviation meters and would be sold generally at a reasonable price by manufacturers bearing the F.C.C. approval stamp or number.

By the compulsory use of such apparatus on frequencies below 14,250 kc., those hams desiring to project their voices into DX regions might do so with a minimum of heterodynes and low frequency growls while those more seriously interested in high fidelity performance and pseudo-broadcasting of phonograph records may confine their activities to the 5-meter regions where space is not at such a premium.

The writer believes the foregoing suggestion, while not original, to be worthy of consideration as a means for the greatest good for the greatest number.

—R. H. Attell, WIBBS

Edrow’s Note.—Once made the subject of a recommendation by the A.R.R.L. Board of Directors, later rescinded, the idea of limiting sideband width has been viewed unfavorably by the majority of amateurs in the past. Perhaps it is now time for renewed consideration.

Mr. B. Is Irate

Madison, Ohio

Editor, QST:
Well, the 1937 DX Tests are over, and for the second time in my life I am thoroughly “let up.” After the first night I started keeping count of stations doing one of three things during DX hours, namely, calling QO-DX, continuous testing or spending idle time rag-chewing. The last item I realized was anybody’s privilege if he holds a license, but it does indicate a lack of thoughtfulness. Anyhow and otherwise, the grand total for the eight days was 284 stations logged.

You, Mr. W6—, famous DX man,—Do you think that, because your call is known the world over, half the DX stations from parts “over there” will flock to answer your QRP call? Do you think that your “check list” is so big that a DXQRP at 20,000 watts will attract only the listeners with a special interest in DX? You Mr. W6—, spent a lot of time rag chewing about nothing, right smack on top of two of the scarcer countries. No doubt it is your right to chew as much as you like (I enjoy nothing better than a good chew) but you have fifty weeks of the year in which to chew. I wonder if it would cause you any unbearable grief if you had to let the rig collect dust for just nine days? Don’t think that your cooperation is not appreciated, because I know of several DX stations who were absolutely QRT during SB contests, believe it or not.

You, Mr. W9—,— ‘phone man,—did you know that you were over-modulating your 14-Mc. ‘phone so badly that you ruined several DX stations that were near you? I wonder how much of a squawk you would make if you were over-modulating your 14-Mc. ‘phone so badly that you invaded your ‘phone band and smeared some valuable DX for you?

And you, Johnny Twiddledial, spent the better part of two hours sliding between 13,250 and 14,200 kc. Possibly you were looking for a hole for your self-excited rig but the stations were ten deep all over the band. A little intelligent listening would have shown you the futility of it all.

Mr. W6—, Do you think it is your right to call the Second International Contest a “DX Jamboree”? It is the only DX signal plopping outside your state borders? Your action seems to indicate an unhealthy conceit.

You Mr. W9—,— ‘phone man,—you have hurt someone’s feelings or trodden someone under foot.

You Mr. W2—,— ‘phone man,—you have done a negative thing amounts to. One wonders, if their heads are as thick as they seem, how they managed to absorb enough theory to believe it or not.

After all that has been printed in radio magazines about making short calls and not calling QO-DX, a small minority still had to fish for SWL cards. This is about as general as it is possible to get. The thing amounts to. One wonders, if their heads are as thick as they seem, how they managed to absorb enough theory to get a ticket.

The point I am trying to bring out is that this is our hobby and it will be just what we make it. We should do things as a body. If the majority of hams enter a contest such as the SSB. or DX, then we should all abide by the majority. It may build character to be different and pursue your own course, but it pretty near ruins a wonderful hobby.

The lack of cooperation among our 40,000 amateurs is appalling. We form a “Drapers Club,” an “Old Buzzards Club,” a “Perfect Operators Club” and a host of other cliques and clans. One club disaiguers with another and the ‘phone and c.w. fellows still rattle skeletons.

This is a plea for more thoughtfulness and commonsense in our dealings with other amateurs. May I suggest a motto for each and every ham? It could and should be, “All for one and one for all.”

And remember, fellows, “No matter what the goal may be, it is the victory is not worth the winning if, on the way up, you have hurt someone’s feelings or trodden someone under foot.”

—W. D. Benjamin, W5BOU

(Continued on page 78)
DURING the past few months Dana Bacon, who heads our circuit development laboratory, and his staff have been working on the design of a receiver to fill the place once taken by the FB-7. Such a receiver must necessarily combine low price with performance of a high order, and like most National Receivers its design has required quite a bit of research. This research has resulted in one very interesting development: — the use of a rather high frequency for the IF. Results are quite surprising.

One result — the practically complete elimination of image frequencies — was to be expected. However, it was found that the use of the high IF also made it possible to design a crystal filter with continuously variable selectivity from 200 cycles or so, up to the other extreme of perhaps eight or ten kilocycles. In other words, the selectivity range is so wide that it covers every requirement of amateur work, and the crystal filter is left in circuit all of the time. We think this is pretty hot stuff.

The reasons why a high IF frequency helps in the design of the crystal filter are quite complex. The most obvious reason is that the available change of selectivity is shifted to a more useful range of values. In other words, suppose that a certain filter has a selectivity range of from 100 cycles to 1500 cycles when the IF is 475 KC. Then it would be expected to have three times the range (300 cycles to 4500 cycles) when the IF frequency is three times as high (1425 KC). This is a help because 100 cycles is much too sharp for any practical purpose even on CW, and selectivities sharper than about 300 cycles are almost never used. Consequently, the change in the IF can be said to make the useful selectivity range much wider.

Actually, however, the results are even more far reaching than that. In the HRO (with 456 KC IF) the minimum/maximum selectivity ratio is about fifteen when using the crystal. With the new filter, the ratio is thirty or more without sacrificing other desirable characteristics. This improvement is explained best by the vague statement that the high IF helps the designer in a number of small ways that are hard to explain theoretically. For example, crystals ground for 1550 KC are easier to wangle in a filter than those ground for the more usual IF frequencies.

In the paragraph above we used the phrase “without sacrificing other desirable characteristics” when giving figures for selectivity ratio. This is important. A modern crystal filter is expected to do a lot of things. It is expected to give high gain on a desired signal, and high attenuation on an interfering signal, and furthermore the frequency difference between the two signals as well as the selectivity must be adjustable. Unfortunately, these various effects are mutually incompatible, and in designing the filter it is necessary to make a compromise. For example, it is possible to increase the gain by 500% if certain changes in the design are made. However, selectivity will not be adjustable at all, and will be so high that even slow speed code is mushy, and clicks of static sound like a bell. In practice it is necessary to make a compromise on gain to achieve other equally important characteristics. Consequently, it means very little when anybody says that the selectivity ratio is so-and-so, unless they also give figures on a lot of other things too.

The major field for the new crystal circuit seems to be in low priced receivers. In our opinion, only a new development of this kind can make the cheap receiver suitable for use in the amateur bands. Of course, the new filter would improve any receiver, but in the HRO the filter is so good already that the possible improvement does not justify a new model.

James Millen
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**Editor, QST:**
Many prospective hams would like to get on the air with their own rigs as soon as possible. They learn enough of the fundamentals of radio and have a code speed of just thirteen words per minute. With this scant knowledge many fellows pass the examination and get their own transmitters on the air. If you listen in on the 160, 80, or 40-meter bands you will hear many beginners, and anyone familiar with these bands knows how, with the bands crowded and QRM heavy, a beginner adds to the confusion.

A proposed idea which I am trying to emphasize is to have another class of license. This license would be just for operation on the five-meter amateur band and would be issued for a limited time, not more than twelve months, not being renewable. This examination would be easier than the Class B exam. The code exam would not be more than eight or so words per minute, with simpler questions pertaining to radio principles, etc. While on this band the beginner would learn how to keep the transmitter adjusted and running, and get better acquainted with ham radio. After a required length of time on this band, he could apply for the Class B exam.

... This idea would eliminate the inexperienced ham and would make for better bands all around.

---Jim Miller

**Alaskan Reverie**

Ohogamute, Alaska

**Editor, QST:**
Just a chirp from the Top of the World, where radio and airplanes mean so much to isolated villages. Ohogamute is a little Eskimo village on the most southern bend of the Yukon River in Western Alaska. Here we depend upon planes for our winter mail service, which by the way, comes only once a month, and upon a river steamer, twice a month, and by road. I am waiting now upon slow mail service for my new transmitter parts for the ham bands, and until they arrive I must stay put on the commercial bands, which are filled with QRM twenty-four hours a day. With no roads, no cars and only the planes, boats and dog teams for transportation it means much to all Northerners to know that little rig may be the means of contacting a doctor or calling a plane when an emergency arises.

Almost all the small villages in Western Alaska, from Point Barrow to the last of the Aleutian islands, can boast of only one or two white families, but in all cases radio communication has become essential. It may be only a paperback book, but it means connections with at least the nearest Signal Corps station and a chance for a friendly visit with some neighboring ham when weather permits. With no roads, no cars and only the planes, boats and dog teams for transportation it means much to all Northerners to know that little rig may be the means of contacting a doctor or calling a plane when an emergency arises.

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3 AWQ, 3 CPT, 3 ETM, 4 BBX, 5 EOW, 6 BOY,
6 CDA, 6 LCD, 7 DXZ, 8 AZY, 80 KC, 8 PC,
8 PCU, 9 EWU, 9 GBT, 9 H QD, 9 IEJ, 9 BLP,
9 VQN, 9 V W W, 9 WPP, 1 8 5 A, 3 XU, 4 XM,
GM QRG, R. M. Arnold, T. J. Barnes, W. D.
Clague, Gordon Jacobs, Fewick Job, R. J.
Kircher, Joseph McGrath, James Roark, George
Statham, William Thompson, Chester Voorhees.

Before we pass on to the essential rules
and regulations we might ask whether you, dear
reader, have a hero in your home. Ours has turned
in some problems of general interest so far but
before we know it he will have his station com-
plete and be so engrossed in operating that his
only real problem will be keeping peace with the
family. What we mean is that we should appreci-
ate deeply any list of practical problems that any
of you fellows may have bumped against.

Now, the 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 \textit{QST} before March
20th.) They must be addressed to the Problem
Contest Editor, \textit{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, but must be neat and
legible.

3. All solutions submitted become the property
of \textit{QST}, available for publication in the magazine.

4. The editors of \textit{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 have the privilege, of
course, of stating the supplies preferred.

—D. H. M.

MANUFACTURER’S
REPRESENTATIVES

One of the oldest organizations in the radio field is
considering appointment of representatives to handle
distributor-contact on a small-volume but extremely
desirable line. Distribution is already established
through practically all radio parts dealers.

This advertisement is addressed only to the highest
caliber Manufacturer’s Representatives who are al-
ready handling one or more thoroughly established
lines.

Please address replies to Box W., c/o \textit{QST}, West
Hartford, Conn., giving if possible a Chicago address
during the June Show.
New all-time high scores set by the winners of the 1937 DX contest were made by users of RCA Transmitting Tubes. Subject to final checking of their logs by the A.R.R.L., some of the stations using RCA Transmitting Tubes placed as follows:

**CW CONTEST:**

<table>
<thead>
<tr>
<th>Place</th>
<th>Station</th>
<th>Score</th>
<th>Tubes in Final Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>W2UK</td>
<td>123,216</td>
<td>RCA 852's</td>
</tr>
<tr>
<td>2nd</td>
<td>W1SZ</td>
<td>116,665</td>
<td>RCA 805's</td>
</tr>
</tbody>
</table>

**PHONE CONTEST:**

<table>
<thead>
<tr>
<th>Place</th>
<th>Station</th>
<th>Score</th>
<th>Tubes in Final Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>W9ARA</td>
<td>45,367</td>
<td>RCA 806's</td>
</tr>
<tr>
<td>3rd</td>
<td>W2UK</td>
<td>39,000</td>
<td>RCA 852's</td>
</tr>
</tbody>
</table>

—and the station which was WORLD-HIGH:

<table>
<thead>
<tr>
<th>Station</th>
<th>Score</th>
<th>Tube in Final Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>K5AY</td>
<td>256,997</td>
<td>RCA-211</td>
</tr>
</tbody>
</table>

We congratulate these amateurs upon their fine operating performances and their choice of tubes.

Outstanding stations are made by a combination of outstandingly good operation and outstandingly good equipment. You usually find RCA tubes in such stations.

For further information on these and other RCA Products, see your distributor or write to

RCA MANUFACTURING COMPANY, INC. • CAMDEN, N. J.
RADIO SHACK carries the largest stock of UTC products in New England

These Items Use Solder

21467—Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 600-425-0-425-600 at 250 MA. (2) 5 V.3 Amps. (3) 5 V.C.T. 3 Amps. (4) 6.3 V.C.T 3 Amps. 2.95
20757—Primary 115 volts, 60/60 cycles AC. (1) Secondaries: 400-0-400 at 250 MA. (2) 5 V.3 Amps. (3) 7.5 tapped at 6.3 volts at 3 amps. (4) 2/5 volts at 10 amps. ...2.95

NEW UTC VARITRAN

Compact, simple, rugged, inexpensive. . . . An ideal voltage control unit of the type employing a sliding contact riding over the transformer turns.

V.1—570 watts maximum rating, 115 volts, 50/60 cycles input. Output 0 to 130 volts. Complete with cord plug and switch. net $10

A 28-Mc. Mobile Installation

(Continued from page 49)

properly shielded, very little interference was noticed. Passing autos are the worst offenders in this respect, but many local and DX signals had sufficient strength to over-ride the noise level. Excellent duplex operation has been obtained by working with locals on 75- and 160-meter phone.

Numerous contacts on ten-meter phone have been made with W9's and W9's, with an average report of 87 at 1000 miles. Coast to coast QSO's can be made when conditions are favorable.

Installations of this type will be very valuable in emergency work, and can be used in conjunction with police U.H.F. systems which are used in many cities and communities at the present time. Six-band operation may be obtained by using proper plug-in coils, with crystal control on all bands except 56-60 Mc., which is electron coupled. However, mobile operation is legal on the 5- and 10-meter bands only. With the ten-meter band continuing to hold up as it has in the past, we are assured of much success.

VE4LQ

(Continued from page 56)

The receiver is a home-made nine-tube superhet with built-in speaker and power supply, and uses a 57 first detector (regenerative), 57 h.f. oscillator, two stages of i.f. with 58's, 57 second detector, 287 a.v.c., 58 beat oscillator, 2A5 audio and a 80 rectifier. Complete band-spread on all bands is obtained by the tapped-coil method.

The rack-mounted transmitter operates on four bands: 14, 7, 3.5 and 1.75 Mc., and is equipped for 'phone on the latter band. The r.f. line-up is 47 crystal oscillator, 46 buffer-doubler and a pair of 45's in push-pull in the final amplifier, with an input of 45 to 50 watts on all bands. A single power supply using an 83 rectifier and choke-input filter delivers 425 volts to the final and 375 volts to the oscillator and buffer.

The speech equipment consists of a No. 10 Continental double-button microphone, a 6C6 high-gain amplifier into a triode-connected 6C6, into a pair of 6L6's in push-pull Class-AB as modulators. The power supply, with the exception of a 5Z3 replacing the 83, is identical to the r.f.

NEON TUNING WAND

Inductively Coupled with 2 T. LINK
FULLY GUARANTEED
Complete with mounting clips $1.50
Part paid in U.S.A.

Highly sensitive new type Tuning Wand. Great for adjusting the xmr. Indicates peak R.F. volts. Use one in each stage to indicate maximum individual performance. Practically no power used. Sensitive neon tube 8" long, of 1/8" diameter. Order No. 5146.

SUNDT ENGINEERING CO., 4236 Lincoln Ave., Chicago
THE NEW 1938
SUPER SKY RIDER

WITH WIDE RANGE VARIABLE SELECTIVITY

OUTSTANDING

FEATURES OF THE 1938 SUPER SKY RIDER

✓ 5 to 550 Meters Coverage
✓ 6 Bands
✓ 11 Tubes
✓ Wide Range Variable Selectivity
✓ Better than One Microvolt Average Sensitivity on all bands
✓ 1000° Electrical Band Spread
✓ "S" Meter
✓ 13 Watt Undistorted Output
✓ Air-Trimmed R.F. Circuit
✓ Improved Expanding I.F. Transformers
✓ Improved Crystal Filter Control

AT LAST, a truly modern receiver, with the up-to-the-minute developments in short wave radio. Wide Range Variable Selectivity that gives you knife edge sharpness to broad high fidelity. 1000 Degrees of Band Spread that really permits you to spread out the bands and separate the stations. A 5 meter band that's really "hot." Better than 1 microvolt average sensitivity on all bands. You can really pull them in! These are just a few of the many features on this amazing new receiver, that's built to suit modern conditions on the amateur bands. Come in, see it, operate it—only this way can you really appreciate the New 1938 Super Sky Rider. $99.00 LESS SPEAKER

COME IN TO SEE THE NEW SUPER SKY RIDER OR WRITE FOR FULL INFORMATION

THE RADIO SHACK
46 BRATTLE STREET
BOSTON, MASS.

the hallicrafters inc.
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Voltage</th>
<th>Current</th>
<th>Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2228H</td>
<td>Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 600-2500 at 100 MA, (3) 2.5 V, 3.5 Amps, (3) 6.3 V, 3.5 Amps, (4) 6.3 V, 5.5 Amps, also tapped for 2/3 V, 10 amps.</td>
<td>2500 Volts Insulation</td>
<td>300 MA. DC.</td>
<td>5.05</td>
</tr>
<tr>
<td>2242H</td>
<td>Smoothing Choke - 20 Hy., 300 MA, 95 ohms DC Resistance, 3000 Volts Insulation</td>
<td>2.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2242S</td>
<td>Smoothing Choke - 20 Hy., 300 MA, 95 ohms DC Resistance, 3000 Volts Insulation</td>
<td>2.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2242G</td>
<td>Smoothing Choke - 20 Hy., 550 MA, 55 ohms DC Resistance, 5000 Volts Insulation</td>
<td>4.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2242S</td>
<td>Swinging Choke - 20 Hy., 550 MA, 55 ohms DC Resistance, 5000 Volts Insulation</td>
<td>4.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2242F</td>
<td>Smoothing Choke - 20 Hy., 200 MA, 115 ohms DC Resistance, 2500 Volts Insulation</td>
<td>5.45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2242F</td>
<td>Smoothing Choke - 20 Hy., 500 MA, 50 ohms DC Resistance, 5000 Volts Insulation</td>
<td>5.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These Items Use Solder Terminal Connections

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Voltage</th>
<th>Current</th>
<th>Insulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>21467</td>
<td>Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 500-425-0-425 at 100 MA, (2) 5 V, 3.5 Amps, (3) 6.3 V, C.T. 3 Amps, (4) 6.3 V, C.T. 3 Amps.</td>
<td>2.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20757</td>
<td>Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 600-2500 at 100 MA, (3) 2.5 V, 3.5 Amps, (3) 6.3 V, 3.5 Amps, (4) 6.3 V, 5.5 Amps, also tapped for 2/3 V, 10 amps.</td>
<td>5.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We carry a complete stock of NATIONAL products

**Power Supply**

All chassis and panels are of sheet aluminum, burnished with a wire brush and clear lacquered. The fronts of the panels are painted with black crystaline lacquer.

The antenna used on all bands is a half-wave center-fed Hertz 44 feet above ground, fed through tuned feeders 45 feet in length. Collins matching networks are used to couple into the antenna on all bands.

With the exception of time spent on traffic handling on 3.5 Mc., the station operates on all bands approximately an equal amount of time, and the station activities cover DX, rag-chewing, traffic and experimenting. Phone will be used on 14 and 3.9 Mc., as soon as a first-class license is obtained at the end of this year.

**WWV Services Expanded**

(Continued from page 10)

second may occur in the audio modulation frequency as received. It is generally possible, however, to use the audio frequency with an accuracy better than a part in a million by employing that one of the three carrier frequencies which has the least fading. It is helpful to use automatic volume control and audio-frequency filters to reduce the effects of fluctuations in amplitude or phase of the received audio frequency.

Any desired frequency may be measured in terms of any one of the standard frequencies, either radio or audio. This may be done by the aid of harmonics and beats, or, in the case of the 1000-cycle standard, also by the operation of a simple motor-generator.

The standard 1000 cycles per second is especially useful in the accurate measurement of audio frequencies and time intervals, calibration of tuning-forks, etc.

3. Standard time intervals. The c.w. standard frequency emissions each Tuesday and Friday, described under 1 above, will be modulated (30 per cent) by a short pulse once each second (except during announcements). The pulse lasts about 0.005 second and consists of a 1000-cycle modulation on the carrier frequency; this type of pulse was chosen to facilitate its reception by ordinary radio receivers. The length of the inter-

**New Holder Design**

15 seconds to install crystal

For all bands
Greater stability
Plug in 6-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. bands 5.90

Write for new literature

HiPower "Low Drift" Broadcast and Commercial Crystals Are Approved by F.C.C.

HiPower Crystal Co., 2035 Charleston St., Chicago
The new 1938 Super Sky Rider marks an amazing forward-stride in communications receiver design. It gives you wide range, variable selectivity (single signal razor sharpness to broad high fidelity), and 1000° of Electrical Band Spread. Improved image and signal-to-noise ratio—"S" Meter that works with weak signals. It has everything you could possibly desire, at an amazingly low price. Stop in and see this marvelous new receiver or write TODAY and complete technical data will be rushed to you.

- 5 to 550 METERS

More than 1000° Band Spread
Complete Coverage 5 to 550 Meters
11 Tubes
Includes 5-Meter Band and Broadcast Band
Wide Range variable selectivity (single signal, razor sharpness, to broad high fidelity)
Better than one Microvolt Average Sensitivity
Electrical Band Spread
True High Fidelity in the broad position
Double size "S" meter
15 Watt Undistorted Output

$99.00 Less Speaker
Less Crystal

Chicago Radio Apparatus Co.
415 South Dearborn Street, Chicago, Illinois

the hallicrafters inc.
The NEW 1938
SUPER SKY RIDER

With 1000°
of ELECTRICAL
BAND SPREAD

Now you can really separate stations. More band spread than ever before. And Wide Range Variable Selectivity that gives you razor-sharpness to broad High Fidelity. New and greater sensitivity. Covers the entire spectrum from 5 to 550 Meters. It's something entirely new and modern in communications receivers, at an amazingly low price.

$99.00

FEATURES:

- 5 to 550 Meters Coverage in 6 Bands
- 11 Tubes
- Wide Range Variable Selectivity
- Better than 1 Microvolt average sensitivity
- 1000° Electrical Band Spread
- Double Size "S" Meter
- 13 Watts Undistorted Output
- Expanding I.F. Transformers
- Air Trimmed R.F. Circuit

DROP IN OR WRITE FOR COMPLETE INFORMATION

DELAWARE
RADIO SALES CO.
405 WILMINGTON AVENUE
WILMINGTON, DELAWARE

vals thus marked between each second and the next is accurate within 0.000,01 second, as sent out from the transmitter. Measurements to this accuracy have not been made of these signals as received, but measurements made at one receiving location showed no error within the limits of precision of the measurement, which was about 0.000,05 second. Vagaries occurring in the transmission medium may cause fluctuations materially greater than this at particular places or times where there is excessive fading.

These standard seconds signals constitute a standard frequency of one cycle per second, and are derived from the Bureau's primary standard of frequency which is in turn based upon the standard time service maintained by the U. S. Naval Observatory. They are of special value in physical measurements, in geodetic, seismological, and similar work, in rapid checking of pendulums and chronometer rates, and wherever short time intervals of great accuracy are needed. They are not capable of giving absolute time, as needed in navigation, for example, for which astronomical observations or the Navy's time signals are required.

4. Standard of musical pitch. The American standard of musical pitch, 440 cycles per second, for A above middle C, will be broadcast as a modulation frequency every night except Saturday and Sunday (and except nationally legal holidays). It will be a 440-cycle modulation on a radio carrier frequency of 5000 kc. The service will be given daily from 4:00 P.M. to 2:00 A.M. EST. The station call letters (WWV) will be given every ten minutes on the even ten minutes by telegraphic keying, so that musicians using the service may be sure they are listening to the right station. The letters WWV are dots and dashes as follows:

- - - - - - - - - - - - - -

The radiated power will be one kilowatt, with 100 per cent modulation. The accuracy of the 440-cycle standard pitch is approximately the same as that of the 1000-cycle tone as described under 2 above, i.e., far beyond any musical requirements.

5. Ionosphere bulletins. Data on the ionosphere and a summary of high-frequency radio transmission conditions will be broadcast each Wednesday afternoon, the same day on which the 1000-
Here are but a few of the infinite variations possible with Centralab Switches. Whatever your requirements there is a positive, bull-dog contact switch which can be designed and produced to meet your particular circuit requirements. They are engineered to meet Centralab’s exacting standards of quality.

**CENTRALAB Division of Globe-Union Inc.**
**MILWAUKEE, WISCONSIN**

- TONE SWITCHES
- WAVE BAND SWITCHES
- LOCAL DISTANCE SWITCHES
- HIGH FIDELITY SWITCHES
- INPUT OUTPUT
- REVERSAL SWITCHES
- SHORT WAVE LOW LOSS
- ISOLANTITE SWITCHES
These Items Use Solder Terminal Connections

20462A—1000-750-0-750-1000 AC at 300 MA, DC. __________ $5.20
20462B—1500-1250-0-1000-1250-1500 AC at 300 MA, DC. __________ $6.75
20462C—2500-2000-1500-0-1500-2000-2500 AC at 300 MA, DC. __________ $10.95
20462D—1500-1250-0-1000-1250-1500 AC at 500 MA, DC. __________ $10.95
20462E—575-525-0-525-575 AC at 500 MA, DC. __________ $5.20

20462F—Smoothing Choke—20 Hy.-200 MA, 1/5 ohms DC Resistance. 2500 Volts Insulation. __________ $1.45
20462FS—Swinging Choke—5-25 Hy.-20MA, 1/5 ohms DC Resistance. 2500 Volts Insulation. __________ $1.45
20462G—Smoothing Choke—20 Hy.-300 MA, 95 ohms DC Resistance. 5000 Volts Insulation. __________ $2.05
20462GS—Swinging Choke—5-25 Hy.-400 MA, 95 ohms DC Resistance. 5000 Volts Insulation. __________ $2.05
20462H—Smoothing Choke—20 Hy.-400 MA, 85 ohms DC Resistance. 5000 Volts Insulation. __________ $2.05
20462HS—Swinging Choke—5-25 Hy.-400 MA, 85 ohms DC Resistance. 5000 Volts Insulation. __________ $2.05
20462I—Smoothing Choke—20 Hy.-500 MA, 55 ohms DC Resistance. 5000 Volts Insulation. __________ $2.95
20462IS—Swinging Choke—5-25 Hy.-500 MA, 55 ohms DC Resistance. 5000 Volts Insulation. __________ $2.95

A Complete Dry-Battery Portable Station

with Crystal-Controlled Transmitter

(Continued from page 18)

changeable in the case, may be used to provide for operation on that band. Connection to the power batteries is made automatically by banana plugs and jacks when the panel unit is slipped into its position in the case. These plugs are located at the left lower rear corner of the panel unit, with the jacks mounted correspondingly in the case. Looking at the rear of the set, the oscillator coil and its shield are at the left, followed in order by the transmitter tube, the amplifier coil, the receiver tube, and the receiver coil and its shield. Resistors, r.f. chokes, and other components are mounted under the shelf, which is supported on 2-inch brackets.

For convenience in the use of an existing b.c.l. antenna, a trio of antenna loading coils is carried in the case. The first of these is wound on a 1 3/4-inch tube, with 70 turns of No. 22 d.c.c. wire, tapped at 30, 50 and 60 turns. A selection of loading inductance can usually be made which will enable the tuning of almost any antenna. This coil is supplemented by two smaller coils, on 1-inch tubing each of 30 turns, which are slipped inside the larger coil when packed for travel. The use of a split Hertz antenna of small dimensions is made possible with these coils, and they are often handy to provide additional loading for makeshift field antenna arrangements.

From the interest expressed by operators who
AN EXAMPLE OF THE INTELLIGENT APPLICATION OF THE NEWER PRINCIPLES OF TRANSMITTER DESIGN.

THE STATION OF CHARLES M. SREBROFF W2BHY

CHIEF ENGINEER OF RADIO ENGINEERING LABORATORIES, INC., LONG ISLAND CITY, N.Y.

QUOTING FROM A LETTER FROM W2BHY

"It might interest you to know that I have placed a transmitter on the air using a pair of 100TH tubes in the final, and these are modulated with another pair of 100THs in class "B" audio. The transmitter operates beautifully on 5, 10, and 20 meters. For 5 meter operation the final plate tank circuit comprises a pair of long lines. For 10 and 20 meters operation the final plate tank circuit uses the coil and condenser arrangement.

"The transmitter so far has been operated chiefly in the 10 meter phone band. It is arranged for high quality voice transmission, using audio parts which have a flat response from 70-7000 cycles. Every station worked comments on the terrificsock and beautiful quality. Eimac tubes are receiving wonderful comment.

"Incidentally the final is driven by a pair of 35T6 which operate as a straight amplifier for 10 and 20 meter operation and are operated as triplers for 5 meter operation.

"On 10 meters the 100THs in the final operate with an exact 1 KW input and under these conditions the tubes perform perfectly.

"Many of the stations worked marvel at the amount of power possible from a pair of 100THs."

EITEL-MCCULLOUGH, INC.
San Bruno, California, U. S. A.
have heard and worked this little "peanut whistle" on the air, it is believed that there is a real field for the application of similar equipment. For local operation and the reduction of neighborhood QRM, the results obtained are most satisfactory. On at least one occasion during preliminary tests with this set, the power input was reduced to less than one-quarter of a watt to the amplifier section of the 18, yet maintaining solid readability of signals on the 80-meter band at a distance of about 250 miles. This particular QSO took place during the early evening, when the band was fairly well covered with the usual QRM.

For emergency use, this type of equipment is invaluable. Battery life has been quite satisfactory, especially that of the plate batteries, which require renewal only when the signal becomes chirpy. With intermittent use, even the filament batteries will last for months, and replacement is both easy and cheap. Modification for complete operation from an automobile battery is perfectly feasible, and, with proper choice of tubes, such a set will result in much better signal strength. One outstanding advantage of the dry battery power, however, is the distinctive, clean, absolutely pure d.c. note, which pierces through an unbelievable amount of interference. After all, power alone does not mean operating satisfaction; there is a much greater thrill in having some fellow ham call you a liar when you tell him your input is only a watt or two, than there is in the disappointment you feel when a VK or ZL reports your "California Kilowatt" only RST 479!

The 100-Foot Lattice Tower at W9DNP

(Continued from page 60)

power leeches, I have only to say that the signals radiated from this tower were checked and re-checked with a commercial-built field intensity meter and no difference was noticed when the ropes were replaced with the permanent guy wires. These checks were made on three amateur bands for a radius of seven miles from the transmitter location. Additional tests were made with stations in nearly every part of the world with the same results being reported. These tests were made with a vertical radiator fed with a 600-ohm, untuned transmission line, the power used ranging from 50 to 1000 watts input to a pair of 150T's.

A Three-Stage Transmitter Unit for 1.75- to 30-Mc. Output

(Continued from page 88)
in which case only the 6L6G need be used. The 42 will not give any appreciable second harmonic output. With the 6L6G in this oscillator the crystal current is extremely low when working 1000-2000 AC at 500 MA. DC. 

UNITED TRANSFORMER CORP.
A real BUY on
RELAY RACK PANELS
AND CHASSIS BASES
at Newark's Special Prices

Another Steal! We made a special quantity purchase at a spectacular price concession. Now we offer you an opportunity to SAVE 30% to 40% . . . . If you BUY now while this limited quantity lasts.

BASSETT CONCENTRIC FEEDER
SEE AD IN THIS ISSUE
The BCF-50 is a complete concentric feed system with end seal. New leak brought out through the seal for soldering to the center of a doublet half-wave antenna.
BCF — 50 ft. — $2.75
BCF — 100 ft. — $6.75

VERY SPECIAL
Oil Filled and Oil Impregnated FILTER CONDENSERS
Lucky Purchase of 10,000 all well known makes enables us to offer astonishingly low prices. All Guaranteed at rated voltages. Already down to limited supply and going fast.

VARIMATCH MODULATION TRANSFORMERS
VM-1. Will handle any power tubes to modulate a 20 to 60 watt Class C stage. Maximum audio output 30 watts—$7.35
VM-2. Will handle any power tubes to modulate a 40 to 120 watt Class C stage. Maximum audio output 60 watts—$11.76
VM-4. Will handle any power tubes to modulate a 200 to 600 watt Class C stage. Maximum audio output 300 watts—$19.11

THORDARSON TRANSFORMERS with plug-in jack terminals. Completely compound filled.
T-11M74 — Will handle any power tubes to modulate up to 20 to 80 Watt Class C Stage. Maximum audio output 40 Watts, $4.78
T-11M57 — Will handle any power tubes to modulate up to 100 to 200 Watt Class C Stage. Maximum audio output 75 Watts, $9.44
T-11M57 — Will handle any power tubes to modulate up to 100 to 200 Watt Class C Stage. Maximum audio output 75 Watts, $9.44
T-11M77 — Will handle any power tubes to modulate up to 300 Watts, $16.84
T-11M77 — Will handle any power tubes to modulate up to 350 Watts, $19.20

Order Direct From This Ad—Now
Full details of any item, with complete NEW CATALOG FREE upon request. Buy now at today's prices. Prices have already advanced about 20% during the past month, and are sure to go much higher! Prices guaranteed for this month only!
Amateurs are always welcome at SERLIN’S. Why not drop in to see W8AWJ? Melvin Duffy usually has some new gadgets to show you...

20462—1000-750-0-750-1000 AC at 300 MA, DC. 6.75
20462B—1500-1250-1000-0-1250-1500 AC at 300 MA, DC. 7.50
20462C—11250-2000-1500-0-2000-11250 AC at 300 MA, DC. 10.95
20462D—1500-1250-1000-0-1250-1500 AC at 300 MA, DC. 10.95
20462E—575-525-0-525-575 AC at 500 MA, DC. 5.20
20462F—Swinging Choke—20 Hy.—200 MA. 115 ohms DC. Resistance. 2500 Volts Insulation. 3.45
20462G—Swinging Choke—5-25 Hy.—200 MA. 115 ohms DC. Resistance. 2500 Volts Insulation. 3.45
20462HS—Swinging Choke—20 Hy.—300 MA. 95 ohms DC Resistance. 6000 Volts Insulation. 4.95
20462J—Swinging Choke—5-25 Hy.—550 MA. 55 ohms DC Resistance. 6000 Volts Insulation. 2.95

These Items Use Solder
21467—Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 500-425-0-425-500. at 250 MA, (2) 5 V-3 Amps., (3) 6.3 V.C.T. 3 Amps., (4) 6.3 V.C.T. 3 Amps. 2.95
2075—Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 600-600-200 MA, (2) 5 V-3 Amps., (3) 7.5 tapped at 6.3 volts at 3 amps, (4) 2½ volts at 10 amps. 2.95

Terminal Connections
2283—Primary 115 volts, 50/60 cycles AC. Secondary 2½ V.C.T. at 10 amps, 5000 Volts Insulation for 2.95
22160—Primary 115 volts, 50/60 cycles AC. (1) Secondaries: 600-600-200 MA, (2) 5 V-3 amps., (3) 7.5 tapped at 6.3 volts at 3 amps, (4) 6.3 V-5.5, also tapped for ¾ V. at 10 amps. 5.50


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A disaster—a great historical event—an Easter parade—attract the eyes and ears of the modern civilized world.

The miracle of radio makes possible an accurate first-hand word picture of these events. It is published instantaneously in the minds of countless listeners many thousands of miles away.

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A FLEXIBLE INSULATED COUPLING

TYPE "A"—Fits all 1/4 inch shafts. Diameter of isolantite ring 1 inch. Thickness 1/8 inch. Extra-ordinary flexibility due to improved type phosphor bronze springs. Reversed hubs minimize space required. Rugged construction with swaged hubs and eyeletted springs insure permanent strength. Case hardened steel cup set screws provide permanent "non-slip" hold on shafts. Net price $0.35

MT-70-GD Capacity 70-70 mmds. Airgap 0.70 inches, isolantite insulated. 2500 volts. For 5 meter transmitters of medium power. Net price $2.16


Midway Feather weight line. Trim-Air singles and complete new line of Dual Trim-Air offer most satisfying line up for the summer portable gear.

Don't miss Cardwell display — Booth 29 Radio Trade Show, Chicago, June 16th to 19th. See complete line Dual Midgets and many new and improved types of all kinds.

ET-36-AD—New Dual Midget. Capacity 30-30 mmds. Airgap 0.70 inches, isolantite insulated. 2500 volts. For 5 meter transmitters of medium power. Net price $2.16

ZU-140-AS—Capacity 140 mmds. Double bearing Trim-Air midget, 500 volts working, for tube oscillators, S.W. receivers. Net price $1.85

W3EXI advises east coast hams who are looking for Nevada for W.A.S. to watch out for WEHZ, who is on 14294-kc from 8:00 to 9:00 P.M., EST. HZ promises a QSL to all contacts requesting same for W.A.S.

An example of real amateur accomplishment in spite of physical handicap is the case of Perley Swasey, W1GOJ, Maine Route Manager and operator on A.R.R.L. Trunk Line "C". A victim of infantile paralysis, Perley cannot walk by himself and has to be helped in nearly everything he does. He cannot even hold a pencil. He contains himself in his wheelchair, maintaining enough control over his hand to wiggle a bug. His dad does all the band-changing on the transmitter, turns the rig on and off, checks the tuning, etc. His mother acts as secretary and does all the message copying, with GOJ telling her what to write down. When she says, "OK", Perley sends out his "R K". W1GOJ does a remarkable job in operating fields. He organized the Pine Tree Net and has kept it functioning in excellent style. Amateur radio means a lot to Perley as it does to so many others in similar circumstances, and the fraternity should respect these fellows for their perseverance and results against odds which to the ordinary individual seem insurmountable.

S.A.R.O. Field Day

On Sunday, April 16th, there was held an emergency powered transmitter field day by the Society of Amateur Radio Operators for the purpose of testing and checking the various portable rigs and emergency powered a.c. systems in use by the members. Climaxing several weeks of preparation the gang started out bright and early to assemble at predetermined locations and hold the drill. Loading transmitters, gas engines, portable antennas and a good supply of lunch in the cars the trek was started. Those members who live in the East Bay had a beautiful early morning view
Driver transformers require correct turns ratio for maximum audio power and minimum distortion. Now six types cover all driver requirements properly—not a compromise. Instantly correct step-down ratios for any given class B arrangement. Unique design gives efficient coupling at any listed ratio.

FURNISHED IN SIX TYPES AS FOLLOWS

**T-15D76—Capacity 15 Watts**
- Push-Pull 2A3's or 45's
- Ratios—Pri. to ½ Sec. 1:1, 1.2:1, 1.4:1, 1.6:1

**T-15D77—Capacity 15 Watts**
- Push-Pull 2A3's or 45's
- Ratios—Pri. to ½ Sec. 2:1, 2.2:1, 2.4:1, 2.6:1

**T-15D78—Capacity 15 Watts**
- Push-Pull 2A3's or 45's
- Ratios—Pri. to ½ Sec. 3:1, 3.2:1, 3.4:1, 3.6:1

**T-15D79—Capacity 15 Watts**
- Push-Pull 2A3's or 45's
- Ratios—Pri. to ½ Sec. 4:1, 4.5:1, 5:1, 5.5:1, 6:1

**T-15D80—Capacity 30 Watts**
- Push-Pull Parallel A3's
- Ratios—Pri. to ½ Sec. 1:1, 1.25:1, 1.5:1, 1.75:1, 2:1

**T-15D81—Capacity 30 Watts**
- Push-Pull Parallel A3's
- Ratios—Pri. to ½ Sec. 2.25:1, 2.5:1, 2.75:1, 3.25:1

**LOOK—INCOMPARABLE FEATURES—LOOK**
1. Plug-in Jack Terminals for changing output.
2. Recessed base lugs permit single hole sub-panel wiring.
3. New Modernistic Case Design.
4. Completely Compound Filled.
7. High Efficiency.
8. Moderate Price.

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Special "EVEREADY" battery aids radio weather research...

No matter what kind of battery-power research requires—"Eveready" can make it. This tiny battery is a 45-volt "Eveready" "Layerbilt" "B" Battery—specially made for the Bureau of Standards.

This Bureau of Commerce equipment consists of a balloon and a tiny radio transmitter which is powered with the remarkable "Eveready" "Layerbilt" 45-volt batteries, smaller than flashlight cells.

Here is a close-up of the apparatus the U.S. Weather Bureau hopes will aid in predicting our weather weeks in advance. This tiny radio set transmits signals back to earth as it soars miles up into the stratosphere. The set is powered by two "Eveready" flashlight batteries and the two special "Eveready" "Layerbilt" batteries.

NATIONAL CARBON COMPANY, INC.
General Offices: New York City Branches: San Francisco, Chicago

Unit of Union Carbide

The words "Eveready" and "Layerbilt" are trade-marks of National Carbon Co., Inc.

A ham, who was loved by relations,
Had worked only four or five stations.
He was lighting his pipe
Near some stick dynamite
And was picked up in fifty-two nations!

No wonder some BCL sets fold up when the transmitter goes on. W3EZF, installing a wave-trap to prevent blanketing in his BC receiver, hooked a flashlight bulb in series with the trap and, after losing it, found there was even enough juice to blow out a 14-volt Xmas-tree bulb!

Circulation Statement

PUBLISHER'S STATEMENT OF CIRCULATION AS GIVEN TO STANDARD RATE AND DATA SERVICE

This is to certify that the average circulation per issue of QST for the six months' period July 1 to and including December 31, 1936, was as follows:

Copies sold ........................................ 41,594
Copies distributed free .......................... 376

Total ............................................. 41,970

K. B. Werner, Business Manager
D. H. Houghton, Circulation Manager

Subscribed to and sworn before me on this 8th day of March, 1937
Alice V. Scoular, Notary Public

Notes on High-Power Electron-Coupled Oscillators

(Continued from page 82)
WHAT—
NO TESTIMONIALS?

BY THOUSANDS—through the mail, on the air, over jobber counters, on Q.S.L. cards and wherever radio men gather—Taylor Tubes receive universal acclaim. "MORE WATTS PER DOLLAR" requires advanced engineering and production standards, to meet the exhaustive test of amateur application—at value plus prices. Join the thousands who use Taylor Tubes and become a booster yourself. There are 6,000 Taylor T-55's, 7,000 Taylor T-20's, and over 20,000 Taylor 866's in amateur rigs today. What No Testimonials? This is the best testimonial Taylor Tubes or any one can offer you.

'The More Watts Per Dollar'  
Taylor HEAVY CUSTOM BUILT DUTY Tubes  
TAYLOR TUBES, INC., 2341 WABANSIA AVE., CHICAGO, ILLINOIS
keyed wave rather than to clean up spurious "bricks" in the transmitter's output.

It is preferable to operate the E.C.O. rather lightly loaded so as to produce a good clean signal, although I have found that the oscillator can be operated at full load and provide a good signal if the screen voltage is carefully adjusted. To accomplish this, RS in the circuit of Fig. 2, should be varied for the best obtainable note while the oscillator is working into a load equal to that which will be applied in service.

That's all there is to it.

Simple Rotary Beam Antenna

(Continued from page 60)

The pole, is placed as shown in Fig. 2 to hold the pipe close to the pole at the top.

"The ropes that cross over the piece of wood on top of the crosspiece support the weight of the antenna assembly. Good rope should be used here; it is best not to use wire because of its tendency to get mixed up in the operation of the antenna.

"An antenna of this type takes very little space and therefore can be used in crowded locations. It can be mounted on top of the house on a short length of 2" by 4", but a good light pole is better for longer lengths since it is not so flexible as 2" by 4". The antenna can be turned quite easily; I use two strong fish-lines off each end leading down to the ground and to turn it all one has to do is pull on the lines until the antenna is in the desired position. The lines can then be anchored to anything conveniently available.

"A 600-ohm transmission line is used to feed the 'Q' section. The line terminates on insulators on the pole, with a pair of No. 8 house wires running to the ends of the 'Q' bars, an arrangement which permits full rotation of the antenna.

W5BZR uses the beam for receiving as well as transmitting, the feeders being switched from one to the other by means of a d.p.d.t. switch. Compared with a vertical beam of similar electrical construction the horizontal arrangement has been found to give more complete cut-off of signals in the back direction, and in the forward direction shows a definite gain over a half-wave doublet. The antenna has given excellent results for W5BZR, with strong 'phone signals being received from Europe, Oceana and Africa, and has proved equally effective for transmitting.

VK-ZL Contest Results

(Continued from page 47)

Australian Open Section

VK3EG 235,970; 2AE 138,940; 4BB 127,818; 4YL 105,750; 3MR 104,670; 2HI 93,060; 3KK 83,353; 5HF 71,410; 2DA 50,470; 3GQ 44,736; 6FM 44,400; 2XT 40,703; 2AI 40,524; 7J 39,092; 3GF 35,915; 5LW 32,400; 2TF 32,172; 7AB 29,302; 5WJ 25,208; 6MW 24,732; 9EG 22,132; 2QF 21,525; 1HR 21,120; 6FL 20,372;
International DX CHAMPION .......

XE2N, Juan Lobo y Lobo of Monterey, N. L., Mexico, who won the 1938 contest with 189,081 points, and this year finished second with 201,520 points, using only 150 watts input. Nearly 2,000 QSO's on 5 bands in only 18 days ...

JAoN Loobo y Loobo

MONTERREY, N. L., MEXICO

Amperex Electronic Products Inc.
79 Washington Street
Brooklyn, New York

Gentlemen:

It took me only two hours to build up on a bread-board a final with the HF-100 and a few minutes later, I was ready to use it from 10 to 160 meters with the same power supply used for my old 210's (1,000 volts). Even capacitative coupling was tried for more simplicity, neutralizing was so easy on all bands and Oh Boy!!! What an output from only 150 watts input that was all I could get from my power supply!!!

Next day the "CW" International DX Contest started and I don't need to say anything of my signal as there are many thousands of stations all around the world that heard me during those days.

Five bands were used: 10:20:40:80 and 160 meters and near 2,000 QSO's were made during the eighteen days of the contest. Several WAC's both on "PHONE" and "CW" were also made even it was supposed that I must work W & VE's only.

To close this letter, permit me to congratulate you for the excellent performances of the HF-100 and at the same time, recommend it to all those amateurs interested in "REAL DX."

Yours very truly.

JAN Lobo y Lobo

Thank you, XE2N, amateurs everywhere agree with you that the AMPEREX HF100 is the easiest tube to drive.

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Come in and see the new 1938 Super Sky Rider, or write NOW and we will rush complete information to you.

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AMAZING... the reception given the Gross CP-55 and CB-55 — we were prepared to have Gross Transmitters purchased throughout the world by discriminating users who know line equipment and price values — but these units made for us more satisfied customers than anything we ever sold.

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- 3 stages, 42 Osc, 6L6 buffer, 2-T20's in final

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Less tubes, meters, crystal — One set coils included in price

The "CP-55" uses the marvelous new T-20's in the output stage. These real transmitting tubes will give outputs and performance not possible with ordinary existing tubes — their price is very low.

The ideal unit for the beginner or the "Old Timer" desiring an additional Transmitter for operation on 10 meters, or any other band. In the CP-55 you have available an Xmitter having real power at a marvelously low price.

Compare the construction of the "CP-55" with units selling at many times its price. Only finest components are used such as Cardwell Condensers, Beallite Sockets, IRC Resistors, Cornell Dubilier and Aerovox Condensers, etc.

The CP-55 is converted into a fine RADIOPHONE TRANSMITTER by merely adding an available modulator unit. Descriptive Bulletin on Request

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The Radiophone version of the "CP-55" — Also sensational low priced

ALL BANDS INCLUDING 10 METERS
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Austria
OE3FL 3780; 7JH 2090; 1ER 1712

Hungary
HAF4H 3360; SC 1280; 1G 889; 8D 756

Norway
LA2Q 1687; 4K 355; 5Y 108; 2U 48

Sweden
SM6WL 1901; 7UC 360

France
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Italy
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Estonia
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Argentina
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Peru
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1000° Electrical Band Spread

We strongly urge inspection of the New 1938 Super Sky Rider, a modern receiver in every respect. It has the things you have wanted, complete coverage from the 5 meter band clear through to the top of the broadcast band — a new high order of sensitivity — Wide Range Variable Selectivity that offers any degree of selectivity from knife-like sharpness to broad high fidelity. Better image suppression and better than 1 microvolt average sensitivity on all bands was obtained by improving the Q of all the RF coils. A new “S” meter that operates on weak signals is just another of the many new features you’ll find on this up-to-the-minute Super Sky Rider. Be sure to see it at our store, or drop us a line and we’ll send you complete details.

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- 5 to 550 Meters Coverage
- 6 Tubes
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- Improved Crystal Filter Control
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Idles at one kilowatt

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SU1WM 3510

Rhodesia
ZE1JV 1740

New Zealand
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Mexico
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OVERSEAS RECEIVING STATIONS

Germany
DE2415h 7230; 1729u 7180; 2881o 6410; 2750c 6290; 2981e 6120; 1609e 6090; 3550n 5511; 3166n 5490; 2219p 5450; 2297m 5320; 2409f 5310; 3987n 5280; 3197r 5190; 3250m 5110; 2328e 5090; 2467k 5030; 2685g 4880; 3319e 4850; 1480i 4830; 3324f 4710; 3042k 4680; 3648n 4270; 1971o 4130; 1977b 3960; 3055r 3100; 3225m 2520; 3229u 2439; 3388o 2385; 2574i 2349; 2518f 2223; 3368u 2160; 3204p 1784; 3647m 1719; 3264e 1519; 3603i 1440; 3642r 1250; 2371i 1280; 2338u 1200; 2581i 1200; 3214h 1092; 3394c 944; 2555i 810; 3745i 768; 3492c 756; 3641f 744; 2783e 610; 3600i 500; 1082h 498; 2403u 410; 3443i 350; 2102g 261; 2877t 190; 2224k 171; 2082e 171; 3168b 110; 3395e 108; 3345u 92; 3384h 48

Great Britain
2CAR 7780; BRS1535 7710; 1173 7470; 1885 6720; 2AZX 6540; 2AWX 6530; 2AOU 6390; 2ADC 5760; 2AOZ 5520; 2AZT 5620; 2ASH 5250; 2ADY 4570; 2BFTU 4300; 720 3590; 1948 4010; 1371 3420; 2BDT 3360

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Hong Kong
BERS 3265; 3040

India
BERS 811; 7270

Holland
L208 108

Frank Talk about Ratings

(Continued from page 89)

promise you the moon usually give you results which are about as useful as the moon would be if you really did have it sitting right there in the shack.

Ratings form the basis of the manufacturer's guarantee; in order to protect yourself within that guarantee, ratings should be observed.

It probably isn't tactful to make this point, but here goes, anyhow. Some amateurs return tubes to the manufacturer for adjustment with a letter pointing out in all sweet innocence that these particular tubes were run well under their ratings at all times and the owner simply can't understand why the tubes failed. Now, no engineer worth his salt can fail to detect in many of these returns the evidences of excessive plate dissipation, excessive voltage, filament burn-outs due to high voltage, and many other like symptoms. As a word of advice, I would suggest that you give the manufacturer the whole story when you return tubes, since it won't materially lessen your chances for an adjustment, and it will help the manufacturer produce better tubes in the future so that all may benefit.

HOW RATINGS ARE DETERMINED

It is very difficult to lay out in one, two, three, four fashion the steps taken in determining the ratings for a transmitting tube. Every manufacturer probably has his own theories and procedure, so we will have to be personal and tell you how we do it at RCA and why we think it is a good method.

When the tube is in the design stage, tentative ratings, which the tube is to meet, are set up. Materials, dimensions, and arrangement of parts are selected on the basis of known properties of materials, the laws of science, our research work and the experience, both in the laboratory and in the field, of our engineers with other similar types. Sample tubes of the new design are then checked for compliance with the desired ratings.
UHF

The complete constructional dope on UHF is in two large chapters in the RADIO AMATEURS HANDBOOK $1 POSTPAID IN CONTINENTAL USA $1.25 Postpaid Elsewhere

AMERICAN RADIO RELAY LEAGUE, INC.
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4 OSCILLATORS
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Here's a natural for the medium power amateur. 4 Oscillators... 2 Buffer Doubler... and 4 Ampliers... 55 to 120 watts input - ALL FROM A SINGLE KIT.
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Supplies rectified D.C. for operating relays, solenoids and remote controls. Voltage ranges from 6 to 24 volts, rated at 2 to 15 amps. Operates on 110 volt A.C.

ADAPTROPak
Operates A.C. radios in D.C. districts and 110 volt A.C. radios in autos and trailers.

ELECTRICAL PRODUCTS CO. 6539 RUSSELL ST. DETROIT, MICH.

and characteristics. In addition, destructive overload tests are made to determine if there is a reasonable margin of safety in the tube's design.

Most important of all, however, are life tests in the determination of final ratings. The procedure is simple but expensive. A number of tubes is placed on the life-test racks and operated under maximum rated conditions. At intervals they are removed for electrical check tests and the life tests are continued until the tubes fail. Final ratings are released when life tests indicate that the tubes will give satisfactory performance under these conditions.

Now, if we examine the results of life tests on a large quantity of tubes, we find some interesting facts. A few tubes will fail very early in life and then after a prolonged period the rate of failure will increase rather rapidly for a while. Finally, we will have a few tubes which will hang on for exceedingly long life. This sort of thing is typical of many mortality propositions, and is particularly comparable to the human mortality curves from which life-insurance companies figure their rates.

UNIVERSAL TEST SET FOR CHECKING CHARACTERISTICS AND PERFORMANCE OF HIGH-POWER TRANSMITTING TUBES

It is obvious, therefore, that the life of a single tube, even under rigidly specified operating conditions, cannot be accurately predicted. The average life of a group of tubes, however, can be predicted for the conditions under which the tubes are operated. The point to get fixed in our minds is this: if operation of tubes is confined within well-established ratings, satisfactory service and life will be obtained.

THE BASIS FOR RATINGS

When a tube is built we have little idea into what class of radio service it will find its way. Accordingly, the ratings must be established so that the tube will give long, reliable service in all services requiring it. Now long life is capable of a number of interpretations, depending on the point of view of the user.

The broadcasting station, for instance, operates tubes on an average of 18 hours a day. Tube
The New 1938 SUPER SKY RIDER
5 TO 550 METERS

The things the amateur has always desired in a receiver

Many features you’re accustomed to seeing only on the highest priced receivers are embodied in the new 1938 Super Sky Rider, plus 1000° Electrical Band Spread, new sensitivity and Wide Range Variable selectivity (razor sharpness to broad high fidelity).

1000° Electrical Band Spread
Complete Coverage 5 to 550 Metres
11 Tubes
Includes 5 Meter Band and Broadcast Band
13 Watt Output

Wide Range Variable Selectivity
In the Broad Position
True High Fidelity

If you can’t come in to see it — write for full information
E. J. Tydings Co.
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Pittsburgh, Penna.

Speer Graphite Anode
A special patented process makes the radiating area of Speer Graphite Anodes double the projected area. Will dissipate more than four times as much heat as metals. Cannot melt, warp or twist. Many other advantages add to tube life and usefulness. Regularly used by well-known tube manufacturers. List and booklet on request.

Speer Carbon Company
St. Marys, Pa.

It's here, Fellers
Standard RMA Mica Capacitor
COLOR CHART
Ask for yours TODAY

A real honest to goodness COLOR CHART
For simple and quick identification of mica condenser capacities. Fits conveniently into your vest pocket.

No ham . . . serviceman . . . or engineer can afford to be without one. Eliminates expensive guesswork and irritating delays.

These color code charts are obtainable only from authorized C-D Distributors
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LO-LOSS INDUCTORS
WITH VARIABLE LINK

- ROTATABLE link provides optimum coupling for each stage.
- ROTATABLE link with each inductor, obviates necessity of re-adjusting coupling when changing bands.
- ROTATABLE internal link protected from mechanical injury when band-changing.

RADIO PRODUCTS
PROVIDENCE
R. I., U. S. A.
EXPORT ADDRESS - 100 VARICK ST., N. Y. C., N. Y.

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 0.01% are priced as follows: 1750 and 3500 kc. bands — $3.50 each. 7000 kc. band $4.00 each. Holder $1.00.

(X) cut PRECISION Crystals carefully ground for maximum power supplied within 0.2% of your specified frequency and calibrated to within 0.01% are priced as follows: 1750, 3500 and 7000 kc. bands — $3.00 each. Add $1.00 if holder is desired.

(AT) cut crystals for commercial use quoted on 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.

failures are expensive both in themselves and in advertising revenue lost because of interrupted programs. Consequently the broadcaster insists that his tubes operate for over a thousand hours without failures.

On the other hand, let’s look at the requirements of the aviation companies. They operate the tubes with plate loads for perhaps only 15 minutes per day altogether. It takes a good many days of operation at 15 minutes per day to run up even 1000 hours of tube life. However, with lives at stake it is imperative that the tubes be ready for operation when necessary, since failures may mean damage to an expensive airplane or loss of human life. Picture yourself as a pilot sitting “upstairs” on top of the “ceiling.” You have to come in for landing soon. You want to find out exactly where you are by bearings. If the tubes in the transmitter have failed and you can’t raise the ground, you are in that sort of a mess which requires unpublishable adjectives to describe it.

The amateur, however, usually does not demand the utter reliability that some other services require nor, relatively speaking, does he require the extreme long life of still other services. As nearly as we can estimate from surveys, the average amateur transmitter is on the air about 300 hours or less per year. Of course some stations far exceed this figure and others fall far below it. On the whole, however, it takes Johnny Q. Amateur about 3½ years to run up a thousand hours of operation on his transmitting tubes. All of which means that many amateurs figure they can overload their tubes a certain amount and shorten the life to one year and still come out about right on the cost of their tubes. But the point remains, inescapably, that the manufacturer doesn’t know and cannot find out, because of the varied applications, conditions, etc., how much overloading the average tube will stand and still give a desired fraction of its probable normal-rating life. This problem may look simple, but take it from one who knows, it isn’t.

The maximum operating conditions, or ratings, which are established for any tube type must of necessity be conservative enough to insure that the vast majority of tubes of a given type will give the long, reliable service required in certain applications. Again, ratings must be conservative enough to take care of all classes of service.

You are probably thinking in the back of your mind that the foregoing sounds like a backhanded invitation to amateurs to overload their transmitting tubes in order to obtain greater output per dollar of tube cost. From the sales standpoint, every manufacturer is anxious to rate his tubes as high as possible. That’s a fact, even though I know numerous amateurs believe we rate tubes “conservatively” out of pure cussedness. A reputable manufacturer establishes conservative ratings for your protection as well as his own. He wants to sell tubes, and they are easier to sell when he can establish higher ratings. Conservative ratings, therefore, would seem to work against him and his product. But we want, just as every other reliable manufacturer wants, every customer to obtain long, trouble-free operation. Ac-
UHX-10 TRANSMITTER
1,500 - 60,000 KILOCYCLES

FIXED • PORTABLE • MOBILE
• AC OR BATTERY POWERED
• PHONE — MCW-CW OPERATION
• LOCAL OR REMOTE CONTROL
• MODELS
• NOMINAL RATING 10 WATTS OUTPUT
• COMPACT • LIGHT • RUGGED
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SPECIAL LOW DOWN PAYMENTS AND TERMS ON ALL HARVEY TRANSMITTERS
UHX-10 DOWN PAYMENT ONLY $7.00

DELAWARE RADIO SALES CO., WILMINGTON, DELAWARE
WILLARD S. WILSON — W3DQ

Improves Your 'Fist'
Cuts Effort in Half
Simply press lever — machine does the rest
JUNIOR ONLY $12.50
Small and more compact. Large contact points. Black japanned base. A low priced key with world famous Vibroplex Quality. Other models, $17 and $19.

VIBROPLEX SEMI-AUTOMATIC KEY
Faster than the fastest hand sender — less than half the effort. Easy to learn. Easy to use. Easy to own. Order today! Insist on the Genuine Martin Vibroplex key. Accept no substitute. Liberal allowance on old Vibroplex. Money order or registered mail. Write for FREE illustrated catalog just off the press.

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READ CODE LIKE AN EXPERT!
Learn Quickly at Home; Get Real Speed
It's easy, fascinating, to become a good op with the NEW ALL ELECTRIC MASTER TELEPLEX Code Teacher to help you. Only instrument ever produced which records your sending in visible dots and dashes on specially prepared paper tape — then sends back to you at any speed you desire. Also sends practice work, recorded by an expert. That is why so many schools teaching code prefer Master Teleplex. That is why thousands agree this method is surest and quickest. We furnish Complete Course, lend you the All Electric Master Teleplex, give you personal instruction with a MONEY-BACK GUARANTEE. Low cost. Send today for booklet Q-6; no obligation.

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TELEPLEX — "The Choice of those who know"

Say You Saw It in QST — It Identifies You and Helps QST
NEW LOW PRICES
on UTC amateur "specials"
TRANSMITTING PLATE TRANSFORMERS AND REACTORS

20462A-1000-750-0-750-1000 AC at 300 MA. DC. $5.20
20462B-1500-1250-1000-0-1000-1250-1500 AC at 300 MA. DC. 6.75
20462C-2500-2000-1500-9-1500-2000-2500 AC at 300 MA. DC. 10.95
20462D-1500-1250-1000-0-1000-1250-1500 AC at 500 MA. DC. 10.95
20462E-575-525-0-525-575 AC at 300 MA. DC. 2.85
20462F-Smoothing Choke — 20 Hy.-200 MA. 15 ohms DC Resistance, 2000 Volts Insulation, $1.45
20462FS-Swinging Choke — 5-25 Hy.-200MA, 15 ohms DC Resistance, 2500 Volts Insulation — 2.45
20462G-Smoothing Choke — 20 Hy.-300 MA. 95 ohms DC Resistance, 3500 Volts Insulation — 2.85
20462GS-Swinging Choke — 5-25 Hy.-300 MA, 95 ohms DC Resistance, 3500 Volts Insulation — 2.85
20462H-Smoothing Choke — 20 Hy.-450 MA. 85 ohms DC Resistance, 5000 Volts Insulation — 3.45
20462HS-Swinging Choke — 5-25 Hy.-450 MA, 85 ohms DC Resistance, 5000 Volts Insulation — 3.45
20462I-Smoothing Choke — 20 Hy.-550 MA, 85 ohms DC Resistance, 6000 Volts Insulation — 4.95
20462IS-Swinging Choke — 5-25 Hy.-550 MA, 55 ohms DC Resistance, 6000 Volts Insulation — 4.95

20462J-Swinging Choke — 20 Hy.-600 MA. 55 ohms DC Resistance, 6000 Volts Insulation — 4.95
20462JS-Smoothing Choke — 5-25 Hy.-600 MA, 55 ohms DC Resistance, 6000 Volts Insulation — 4.95

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UNITED TRANSFORMER CORP.

VITROHM LINE VOLTAGE REDUCER
Protects the Set From Over Voltage
The way line voltage is being stepped up it is no wonder that you are getting kicks because resistors, condensers and tubes are burning up. You can not only answer embarrassing questions but can turn them into profit by offering the kicker this inexpensive unit that brings too high voltage down to safe limits. Write today for folder No. 1480 and prices.

See us at Booth 107, Radio Parts Show, Chicago

WARD LEONARD ELECTRIC COMPANY
41 South Street, Mount Vernon, N. Y.
Please send me Folder No. 1480.

Name: .................................................. 
Street: .................................................. 
City and State: ........................................ 
Call Signal: ...........................................

TYPICAL TUBE-LIFE CURVE: PERCENTAGE OF TUBES VS PERCENTAGE OF AVERAGE LIFE

The average life (100%) has no particular significance in hours, but is simply the total number of hours of life divided by the total number of tubes. A small percentage of tubes will fail relatively early; the rate of failure then increases over a long period, followed by a decrease in rate toward the end. In normal service the average life will be many times the 100-hour figure.

Therefore, ratings must be set to take care of those tubes which for some undetected reason will not have the overload capabilities of certain other tubes. The unfortunate part about it all is that you don’t know whether your tube has exceptional overload capabilities until you have tried it. If it hasn’t, you are minus one tube. The conscientious manufacturer, therefore, protects you by establishing ratings which he states his tubes will meet. He tries to build additional capabilities into all of his tubes so that you will get better value, but he can’t guarantee these capabilities in every case.

From the practical standpoint, the amateur overloaded transmitting tubes to obtain slightly better output in the transmitting tubes is, therefore, “washing his feet with his socks on,” to use the vernacular. And here’s why. It takes four times as much power output from the transmitter to double the voltage strength of the received signal. Now a 100% increase in signal strength represents an increase of
SPECIFICATIONS
The Isolantite Coil Form is 1¾" diameter x 3½" 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.
NEW JOHNSON COMPONENTS

Waseca, Minn.—The 1937-38 Johnson line will contain many important new items in addition to the widely-known and accepted radio transmitting equipment parts manufactured by the E. F. Johnson Company throughout the past decade.

★ New Variable Condensers. The long-sought smaller types with many new features and the same high standard construction as in the popular types C and D.

★ New Tube Sockets. New wafer types for all tubes, using Alsimag 196 ceramic insulation, and the same careful design and construction which have built the Johnson reputation for quality.

★ New Coil Forms and Complete Inductors—all for short-wave requirements from crystal to high power final.

★ New Ceramic Insulators. Not only with Johnson superior porcelain, but also new pieces of Alsimag 196, the finest Steatite type ceramic.

You are invited to inspect these and other new Johnson products at Booth 55, National Radio Parts Show, Hotel Stevens, Chicago, June 10-12. Or ask your Jobber for complete information.

E. F. JOHNSON COMPANY
Makers of Radio Transmitting Equipment

NEW LOW PRICES on UTC amateur "specials" TRANSMITTING PLATE TRANSFORMERS AND REACTORS

20462A-1000-750-0-750-1000 AC at 300 MA. DC. ..... $5.20
20462B-1500-1250-0-1250-1500 AC at 300 MA. DC. ..... 10.95
20462C-2500-2000-1500-0-1500-2000 AC at 300 MA. DC. ..... 4.75
20462D-3500-2500-1750-0-1750-2500 AC at 300 MA. DC. ..... 20.75
20462E-575-525-0-525-575 AC at 500 MA. DC. ..... 5.20

RADIO ELECTRIC SERVICE CO.
N. W. Cor. 7th & Arch Sts., PHILADELPHIA, PA.

UNITED TRANSFORMER CORP.

Say You Saw It in QST — It Identifies You and Helps QST
GAMMATRON!
SCORES AGAIN.
3 NEW TUBES
354-D Amplification Factor 22
354-E Amplification Factor 35
354-F Amplification Factor 50

Choose the amplification factor best suited for your rig.
All styles 150 watts rated plate dissipation. Furnished
with grid connection on side of blank; on base by
special order.

AT YOUR DEALER

VISASIG Full Automatic Siphon Tape Recorder
Records code signals from receiver up to and
over 100 wpm. VISASIG with electrically driven
tape puller, constant level ink feed and 1500 ft.
tape capacity complete in one unit.....$69.00
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RCA Institutes offer an intensive course of high standard
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Also specialized courses and Home Study Courses under
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113
NOW

A Crystal Microphone

HANDSET!

Model R-9

Here is a "Natural" for that transceiver job. Now you can have perfect quality with no lock or influence, extra high output and high efficiency at voice frequencies. One-piece moulded construction. Five-foot microphone cable and phone cord. Sensitive magnetic receiver. Complete technical data given in bulletin No. 27. Ask your jobber for it or write:

THE TURNER CO.

Cedar Rapids, Iowa

Licensed under patents of the Brush Development Company

ARE SPECIFIED BY LEADERS

When leading designers lay out their new rigs they naturally specify parts that can "stand the gaff" yet are priced right. It's no wonder, therefore, that most designers specify Birbach because Birco products give you the highest possible quality at the lowest possible price.

Improved Cone Standoff Insulators

Made of STEATITE, the better ceramic. Complete ranges of heights, condenser, collar, tube sockets, etc., can be mounted with minimum labor. White glaze. heights List

430 ½" 10c
431 1" 15c
431 ¼" 20c
432 1 ½" 25c
433 2" 25c
433 ¼" 30c

NEW TRANSMITTING SOCKETS

- Side Wiping Contacts
- Brass, Nickel Plated Shell
- Highly Vitrified, Low Absorption Rate
- All Brass Hardware - Low Prices

SPECIAL LOW PRICES in Large Quantities

BIRNBACK INSULATORS

STANDARD FREQUENCY SCHEDULES

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<tr>
<th>Schedule</th>
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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 W9XAN 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 complete new WWV schedules effective June 1st see the article, "WWV Services Again Expanded," elsewhere in this issue.

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., 5000 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. On each Tuesday and Friday the emissions are continuous unmodulated waves (c.w.); and on each Wednesday they are modulated by an audio frequency. The audio frequency is 1000 cycles per second.
Equipped with my new "dot stabilizer" which is the most remarkable feature ever offered operators on a speed key. (The "dot stabilizer" may be purchased separate for any speed key at 90c.)

Main spring selected as you all know with great care (these main springs likewise may be purchased by unfortunate operators having those "speed keys" that won't work right without the right spring at 25c complete with rivets). May be purchased by unfortunate operators having those "speed keys" that won't work right without the right spring at 25c complete with rivets). Fine silver contacts mounted on 1/4" fine threaded dot and dash contact screws (may be purchased separately at 25c each). Adjustment screws by 32 screws. All screw heads knurled and bushings bakelite. Dash button, dot paddle bakelite. Bearing pins and screws oversized case hardened steel. Note also pigtails for electrical connections instead of depending on bearings. All parts above have beautifully chromium plated. Same gigantic solid one-piece cast base but now breathtakingly finished like a piece of polished black marble with light veins running through it.

T. R. McELROY
175 Congress Street
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THE SUPER SKY RIDER
$99.00

THE NEW 1938
SUPER SKY RIDER

62 MC TO 540 KC COVERAGE

- 1000° Electrical Band Speed
- 5 to 550 Meters
- 11 Tubes
- Wide Range Variable Selectivity
- Double Size "G" Meter
- Better Than 1 Microvolt Average Sensitivity

The Newest and Most Complete of Communications Receivers. All the Amateur Bands including the 5 Meter Band. New sensitivity and Wide Range Variable Selectivity that provides razor sharpness to broad high fidelity. Answers the needs of the amateur in a communications receiver. Come in to see it today or write for full details.

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DON'T "SIT DOWN" ON THE JOB. GET BUSY AND PREPARE YOURSELF FOR THE BIGGER JOBS IN STORE FOR TECHNICALLY TRAINED MEN. A POSTAL BRINGS YOU OUR 48-PAGE BOOK OF INTERESTING FACTS ABOUT YOUR FUTURE IN RADIO. DEPT. Q-6, 14TH & PARK ROAD, WASHINGTON, D. C.

CAPITOL RADIO ENGINEERING INSTITUTE
Station Activities

(Continued from page 88)

NEW ENGLAND DIVISION

CONNECTICUT—SCM, Frederick Ellis, Jr., W1CTC, has over one million total kinks this month. JANX and two nets in the net. JXP is doing fine work in two nets. AH, ITX and 5783 this time. FB, gang. HSX takes honors again this month. RR much traffic as last month. AW missed B.P.L.

GKM arranged details for Nutmeg get-together May 2nd. GME acted as Alternate for N.C.S. when UE was unattended. KFN. APZ gets his traffic on the A.A.R.S. in the contest.

Many thanks for the Field Day. BFS changed frequency to 3830 kc. BHM's at Darien Police Headquarters if someone will get them for W.A.S. TD built a new power supply. EH is working DX and worked England on 1.75 Mc. c.w. JJL is on 14 Mc. with luck, Rog. EAO blew a look of fuses and filter condensers 200 watts to HP on the air soon on 1.75 and 28 Mc. George is a shut-in, he is paralyzed in waist and hips and just enough in hand in.


WESTERN MASSACHUSETTS—SCM, William J. Barrett, W1JAH—IQR may say B.P.L. with plenty to spare. IOT also gets in the charmed circle. The news from Worcester: DIF returned from cruise.—IDG applied for O.R.S. and is moving to Delaware.—JNA has gone to Europe.—JOT has joined very well.—WMA has organized 56-Mc. net to handle Merrimack Valley amateurs. The following went to the Manchester, New Hampshire, W.A.C. and worked

DQK and YF, BDX (of 1927 Flood Fame) and YL, FSV, W5JRV, WRU and YF, BDX (of 1927 Flood Fame) and YL, FSV, and is still keeping daily schedule with WCFT, now in Saratoga, JNA is getting gray trying to stir up some life in this Section.—How about a little cooperation among New England amateurs? WBQO got into R.C.C. ISN keeps schedules on 7 Mc. IPK is newcomer to our Section, QTH Chichester Falls. Welcome. AJ is still using temporary antenna at new location. JOP is doing most of his operating at club station WBQA. DIF built ex 50-Mc. phone. JJB is building a real rig. Applications for Official Relay or Phone Stations are very welcome.


NEW HAMPSHIRE—SCM, Carl E. Evans, W1BFB—On April 17th, the Fourth Annual N. H. State hamfest was held at the Hotel Carpenter in Manchester, George Bailey, KB1, Vise President. XFZXX holds district manager. JFZ had trouble with one, and buffer stages. GKM arranged details for the annual traffic contest. JXP got new traffic at last month's contest. "OCT " 65 missed B.P.L. This is the last month of the show and JXP has high hopes for the future. "OCT " 65 missed B.P.L. This is the last month of the show and JXP has high hopes for the future.


RHODE ISLAND—SCM, Clayton C. Gordon, W1HRC—A.A.R.S. 1st car is named after "The Car of the Century." The name is "The Car of the Century." The name is still keeping daily schedule with WCFT, now in Saratoga, JNA is getting gray trying to stir up some life in this Section.—How about a little cooperation among New England amateurs? WBQO got into R.C.C. ISN keeps schedules on 7 Mc. IPK is newcomer to our Section, QTH Chichester Falls. Welcome. AJ is still using temporary antenna at new location. JOP is doing most of his operating at club station WBQA. DIF built ex 50-Mc. phone. JJB is building a real rig. Applications for Official Relay or Phone Stations are very welcome.


VERMONT—SCM, Alvin H. Battison, W1GNF—JJP is doing most of his operating at club station WBQA. DIF has succeeded B.JU as new V.T. "The Vermontian" is still keeping daily schedule with WCFT, now in Saratoga, JNA is getting gray trying to stir up some life in this Section.—How about a little cooperation among New England amateurs? WBQO got into R.C.C. ISN keeps schedules on 7 Mc. IPK is newcomer to our Section, QTH Chichester Falls. Welcome. AJ is still using temporary antenna at new location. JOP is doing most of his operating at club station WBQA. DIF built ex 50-Mc. phone. JJB is building a real rig. Applications for Official Relay or Phone Stations are very welcome.


I0V—The final results of the April 19th, the 21st Annual Traffic Contest are now in.

Traffic: W1TGN 612 INU 515 IEG 160 (W1G09) IAV-HRC 2.

Traffic: W1TGN 612 INU 515 IEG 160 (W1G09) IAV-HRC 2.
EASTERN NEW YORK, S.CM., Robert E. Haight, W2LU—We welcome Jim's FB traffic totals again. GZG is spending a lot of time on 1500 kc. for N.C.R. drills and traffic. HCC has new Sky Challenger and worked K7PQ, V02W and K5AV on 3.5 Mc. ISQ gets out FB with 47-401, 30 watts. JW visited HDq. and received meeting the boys. COG sent his QSL to trucking his Class A ticket and playing with 14 Mc. ATM was transferred to S.S. Santa Mara and sends his 73 to the 3.5-Mc. boys. CWY, only hostradier in E.N.Y. Section, attended meeting in Middletown, Conn. HLA has rig on 50 Mc. TKY removed his rig and put it up in the air again. KFP, HON, CMG and CWY are active on 50 Mc. JAX is heard consistently in Albany by CWY. ITK reports for HUM. ITK is using RX-20 in final. HTH is putting in 5000 watts transmitter to buck local QRM from DOC, CBO, DBB, CYZ and GFL. 5AB lives in Scotts now. KSR is on 22 Mc. KVR is on 47 crystal. KV2Q has 807 doubler, HFT100 final. HCM tried 28-Mc. phone. HNI holds Class A ticket. DDW is back on the air again. BZZ paid him a visit. E.N.Y. misses BZZ and would like to see him return.

W2EFG 530 GZF 308 LU 137 HYC 85 ISQ 74 JFT 45 W3 JSL 4.

NEW YORK CITY AND LONG ISLAND, S.CM., Ed. L. Busch—W2GAA wants to thank his supporters for their whole-hearted cooperation in the election and appreciates the large number of congratulatory letters and messages received. JND is out for O.F.S. INF is again out for O.K. DOC has been doing extensive band tuning and searching. HWL did some FRZ in the DX contest. IAM works consistently through local QRM with five watts to a 245. HBQ is getting ready for QSO's on 28 Mc. EVA still has plenty move cards. Send him a station card if you expect any. JDQ is putting in 354; he is W.A.S. now. OXO is using a '45 as a keying tube. PMA now has 24 countries. PSR is on W. Va. Net regularly. JJK worked YI5NN on 7 Mc. for W.A.C. GAP, FQP, and EMM are planning new vertical rotating beam antennas. FGJ is putting in a pair of T-200's. CHE has a pair of FB-35's now. EMM got an S8 from LU on 28-Mc. 'phone. HWS is getting ready for summer contests. HQL 120 CJX 4.

ROANOKE DIVISION

VIRGINIA—SCM, Charles M. Waff, Jr., W2UVA—P.M.:3AIJ.R.M. s:3AKN,3BJX,3BYA.FQO worked PAQGZ with a ten-foot untuned indoor antenna on 14 Mc.; he is now W.A.C. NTV won a set of tubes in M.A.R.A. Membership Contest. JKN got an S8 from LU on 28-Mc. 'phone. HFT has spent the winter at Bound Brook, N. J. ILF worked 19 countries on 7 Mc. with self-excited p.p. 250's. The N.C.R. Club went full blast at Foods and Progress Show. ALP is rebuilding with 100 watts to a T55. JGC has been after DX on 14 Mc. and experienced the trials and tribulations of the beginning ham. BD reports "Chubby" is doing nicely; so are the boys. BOW has Commercial Radiotelephone First. KIU is using bi-push osc.-exciter. HD is running a ten-foot untuned indoor antenna on 14 Mc.; he is now W.A.S. and needs Asia for W.A.C. LCN worked FYSC. E.N.Y. welcomes him. CJS is rebuilding for '47 crystal, and ODY are rebuilding.

ROANOKE FLOATING RADIO CLUB meets next in Danville on Sunday, July 18th. This will be a joint meeting with the North Carolina Floating Club, so you may expect a large attendance. Write BBW or JF2IF for information. CA and DDY are rebuilding.

Traffic: W2GTS 236 (WLQE 83) GKB 64.

WEST VIRGINIA—SCM, Dr. Wm. H. Riedel, sophomore Ph.D.—I'm not on 7040 kc. for the moment. Nevertheless, BOW has Commercial Radiotelephone First. KIU is using a 100-to-TH for the V.P.I. Radio Club. EXG works on 14-Mc. 'phone occasionally. AYR is giving traffic schedules aBIG, 8ZX and 8KVE daily. AYR is giving phone DX Contest. JJK tried to rebuild his SW-3 but thinks now that National can build 'em better than he can. HH1 and AII is using a '10 final. GRO is putting in 500 watts into a 100-TH for the V.P.I. Radio Club. EXG works on 14-Mc. 'phone occasionally. AII schedules 35IC final. GW1QF reports for HUM. ITK is using RK-20 in final. Proceeds of the dance given by the N.N.J. QSP Club helped defray cost of crystals for net operation. HTX will have his '03A back on the air when he comes home from college.

ROANOKE RADIO CLUB has been purchased. PQQ got a 1936 rifle and has just started building a new box. He is not QRA and does not seem to be able to build a preamplifier to take care of his new velocity. HSP is through with the exams and back on the air again. Welcome, George. IGQ has just built a new straight key, one for each foot. FIJ has a pair of HB-354's and a pair of HC-10A, T'Y8A, and T'Y8B, and the U9's brought his total to 68 countries. BSB has worked several U9's lately. GAP worked YI5NN and is putting in 1000 watts to a T200 for the V.P.I. Club. WINN is building a new 500-watt transmitter to buck local QRM. HBS keeps HBS busy in his extra time. BOW is running a ten-foot untuned indoor antenna on 14 Mc.; he is now W.A.S. and needs Asia for W.A.C. LCN worked FYSC. E.N.Y. welcomes him. CJS is rebuilding for '47 crystal, and ODY are rebuilding.
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<th>Model</th>
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<tr>
<td>RME-69</td>
<td>$151.20</td>
</tr>
<tr>
<td>New 1937 Breitling 14s</td>
<td>$100.00</td>
</tr>
<tr>
<td>New RCA ACR-155</td>
<td>$74.50</td>
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<tr>
<td>RCA ACR-175S</td>
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<tr>
<td>New 1937 Super Pro</td>
<td>$238.14</td>
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<td>$89.00</td>
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<td>Hallcrafters Ultra Skyriders S-10</td>
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W2—H. W. Yahncl, W2SN, Lake Ave., HelmeRIA, 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. Jason Mast, W6KHIV, 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.

W9—George Dammann, W9JO, 319 Sherman Ave., Evanston, Ill.

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

VE2—C. W. Skarstedt, 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, Santurce, Puerto Rico.

K6—John J. Carr, K5AV, 75th Pursuit Squadron, Albrook Field, Canal Zone.

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

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

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

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A red light (110-volt variety) conspicuously mounted near or inside a transmitter and connected directly across the primary of a “lethal” transformer, may call any ham’s attention to the fact that the soup is on and that he had better keep his mitts out of it.

—W1BGY

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Atlantic Division

Eastern Pennsylvania—Scm, James M. Bruning, 3EM, 3AB, 3AO, 3AN, 3AQ, 3AR, 3AU, 3AV, 3DA, 3EE, 3GJ, new NCOlX receiver, 3EOP is installing some Kenyon Broadcast Transformers in his phone rig. 3ECC replaced his 10 with a 20. 3GJ is busy sending out Legislative press release on Morse lines. 3FCL increased his rig work with a new 3CX. 3FAA worked his first on the late Dx Contest. 3G2S enjoyed some recent Dx contacts. 3MV made W.A.C. in Dx party. 3CHF took active part in the W/VE tests. 3IU is getting ready to move to the "Han's Paradise" in Boston. 3GDG took time out from schedules to make two chase eligible for R.C.C. 3KA worked Baltimore Hamfest. 3EFG is building a final amplifier on 100111. 3CQ is a new R.C.C. member. 3FLX has a new Radiotelephone First ticket. 3EUP is now working for Hamilton Watch Co., and met 3BRZ and several other hams there. 3NQ moved to a new location. 3EWW is now D.N.C.S. 3FXZ reports her 6nxD schedule still going fine. 3AXC has a new Sky-Rider. 3BRZ (O.P.S.) sends another report. 3CQ worked a dozen VlQ phones along with SU1CH and a nice assortment of Dx phones and e.w. catches. 3NF sent his report via Western Union to your loyal support. and urge that you give your new S.C.M. your full cooperation.


Western New York—Scm, Charles Smith, W3DSS—R.M.'s; 3JTT, 8BJO, 8AQE, L.O.: 3CSE, P.A.M.: 3CGU, The Buffalo Hamfest drew the remarkable crowd of 194 Western New York amateurs, a goodly number of VE hams, and was a big success all around. Congrats, fellows. Another record was broken this month when four of our traffic pushers made the B.P.L. Old reliable JTT led this select group. He had some fine events to report on, including the Section now and W.N.Y. is losing one of its most consistent high traffic men. Best of luck and success to you in your new job. Roger. CSE sent in the next best total with MQX and JKE making the B.P.L. with over 105 deliveries. 8JO, who has taken over Trunk Line "G," only lacked a few of going over the top also, PLA, a comparatively new O.R.S., is doing very fine work; he will be on with a portable at Conesus Lake during the summer. GWT and NWZ are very regular in traffic, and are keeping everyone happy on their score in O.R.S. party. EFA has been reporting fine. He is working some nice DX on 14-Mc. phone. KVR, your V.O.R.S., spent two weeks in Washington, D.C. QIX is working good DX. EBR is now W.A.S. HTT is working for G.E. in Erie, Penn. Another new ham was an election of Emergency President of the Club and will discuss future emergency operations at the Atlantic Division Convention. PFM successfully passed the O.P.S. examination. Mr. and Mrs. SDG of Cleveland Heights, Ohio, were recently overnight guests at the home of Mr. and Mrs. SDG, and SDSG DQV attended the Convention. A comparison of traffic activities with the other Sections of the Atlantic Division. Our W.N.Y. Section is well up near the top. This fine showing is nearly all due to the managers and members of our two Section nets, W.N.Y.-1 and W.N.Y.-2. The S.C.M. congratulates all of you on the excellent work during the last traffic season. 73, gang, and on to Erie.

Traffic: W3VTP 1007 C53 293 (WM3N 84) MQX 745 3JEA 275 448 100 AVE 320 3K YA 128 (WLM 2735) SN 720 BWT 502 CIZ 430 3EWW 105 NF 99 (WLM 262) GJY 51 EDC 46 DGC 44 ETM 40 (WQLF 48) GJY 31 GMK 19 PW 10 BGD 9 EZGDI 8 CHH 6 ETA 3 AGK-AQN-EUP 2. WSFLA 225 and members of our two Section nets, W.N.Y.-1 and W.N.Y.-2. The S.C.M. congratulates all of you on the excellent work during the last traffic season. 73, gang, and on to Erie.

Traffic: W3WJP 1007 C53 293 (WM3N 84) MQX 745 3JEA 275 448 100 AVE 320 3K YA 128 (WLM 2735) SN 720 BWT 502 CIZ 430 3EWW 105 NF 99 (WLM 262) GJY 51 EDC 46 DGC 44 ETM 40 (WQLF 48) GJY 31 GMK 19 PW 10 BGD 9 EZGDI 8 CHH 6 ETA 3 AGK-AQN-EUP 2. WSFLA 225 and members of our two Section nets, W.N.Y.-1 and W.N.Y.-2. The S.C.M. congratulates all of you on the excellent work during the last traffic season. 73, gang, and on to Erie.

Traffic: W3WJP 1007 C53 293 (WM3N 84) MQX 745 3JEA 275 448 100 AVE 320 3K YA 128 (WLM 2735) SN 720 BWT 502 CIZ 430 3EWW 105 NF 99 (WLM 262) GJY 51 EDC 46 DGC 44 ETM 40 (WQLF 48) GJY 31 GMK 19 PW 10 BGD 9 EZGDI 8 CHH 6 ETA 3 AGK-AQN-EUP 2. WSFLA 225 and members of our two Section nets, W.N.Y.-1 and W.N.Y.-2. The S.C.M. congratulates all of you on the excellent work during the last traffic season. 73, gang, and on to Erie.
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The transfilter fills the selectivity gap between the electrically tuned circuit and the quartz filter. A transfilter can be employed in any superheterodyne whose intermediate frequency amplifier can be tuned to 465 kilocycles.

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And speaking of 40 meters, to the casual observer activity on that band seems to be divided about as follows:

CQ’s (long and longer)—75%
Sending “V”, “test” or just holding down key—24%
Communication—1%.

Full Range Selectivity
(Continued from page 91)

second detector always has r.f. signal voltage present in actual reception. The c.w. noise equivalent in microvolts is calculated by substitution in the following simple equation:

\[ NE = E_s \sqrt{\frac{P_n}{P_s}} \]

where

\( NE \) = noise equivalent in microvolts.
\( E_s \) = signal input microvolts.
\( P_n \) = noise power output with no signal input.
\( P_s \) = signal beat-note power output.

The signal input was sufficiently great so that the noise output was negligible with the signal present, and the beat oscillator voltage was always large enough so that the signal output power varied as the square of the signal voltage in the range of the measurements.

The relative sensitivity figures are especially interesting in that they show the large signal-to-noise ratio improvement with increasing selectivity. In the case of c.w. reception with the crystal filter at maximum selectivity, for instance, the sensitivity is about 700 percent of the straight superhet sensitivity, while the phone sensitivity with Transfilter-sharp or crystal-broad selectivity is raised over 300 percent.

In the range of adjustment of the selectivity or bandwidth control with these circuits, the resonance frequency of the crystal filter varies but a few cycles. This variation is so small that if the signal is first tuned in with the crystal set at maximum selectivity, the resonance frequency shift is not noticeable when the control is adjusted to the minimum selectivity point. With the Transfilter, the resonance frequency variation is a few hundred cycles at the most, although here again the variation is so small as to be hardly noticeable if the signal is first tuned in on resonance with the filter adjusted for maximum selectivity.

RESISTANCE CONTROL OF TRANSFILTER SELECTIVITY

In a previous article, suggestion of varying the selectivity by adjustable resistance in the common ground connection of the Transfilter was made. Impedance-matching circuits incorporating resistance control of selectivity are shown in Fig. 4. The circuit of Fig. 4A is the same as Fig. 1B with zero resistance in the ground lead from the Transfilter and the input circuit adjusted for
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maximum selectivity (C1 adjusted for slightly higher capacitance than the resonance setting). Fig. 4B is of the type in which impedance step-down at the input is obtained by a transformer with a low-impedance secondary instead of the divided-capacitance step-down used in the other circuit. When used as a crystal filter, the circuit of B is of the fixed-selectivity type.3

The selectivity curve of Fig. 5 shows the decrease in selectivity which occurs as the resistance in the ground lead from the Transfilter is increased. The curves for zero resistance and for 2500-ohm resistance are not shown since they practically coincide with the 1000-ohm curve. The most interesting feature of these selectivity curves is the "notch" which appears with a 20,000-ohm resistance. This double-hump effect indicates the equivalent of over-coupling with a transformer. As compared to the selectivity curves of Fig. 2, it is apparent that increased resistance tends to broaden the nose of the selectivity characteristic less effectively, while the skirts of the curves spread out more rapidly. They also show that the selectivity characteristic is generally less symmetrical with resistance variation than with variable impedance control. The curves of Fig. 6 show the total bandwidths for the various values of resistance.

The gain of the circuit falls off somewhat more rapidly with increasing bandwidth as compared to the gain variation with impedance control of selectivity, although the loss is not especially noticeable in practice. On the whole, adjustable impedance control of selectivity appears to be preferable to resistance control with the Transfilter, just as it has been found to be preferable with the quartz crystal filter.

BAND-PASS TRANSFILTER CHARACTERISTICS

An interesting band-pass type of selectivity characteristic was obtained with two similar Transfilter units connected in parallel in the circuit of Fig. 7. Except for the additional unit, the circuit is identical with that of Fig. 1B. The two units had the same rated frequency of 465 kc. and actually differed only 200 cycles in resonance frequency. The band-pass curve of A of Fig. 7 was obtained with the bandwidth control condenser C1 critically adjusted so that the same output was obtained on both "humps" with constant signal input. The mid-frequency of this selectivity curve is approximately 1.2 kc. lower than the maximum-selectivity curve obtained with the input condenser C1 adjusted for slightly greater capacitance than the broad-band adjustment. The greater broadening of the selectivity curve near resonance is especially desirable in broadcast program reception, although the overall c.w. gain with this circuit is practically the same as with a single unit.

PRACTICAL APPLICATIONS

Detailed suggestions for incorporating these full-range selectivity methods in existing receivers are hardly necessary. For instance, many sets with two-stage 465-5 kc. amplifiers and crystal
Now the UHF 6

At last that 5 and 10 meter superhet with low background and high sensitivity — 6 tubes, special IF's, will bring in modulated oscillators but selectivity favors MOPA, punched chassis, and instructions and layout with each kit.

Complete Kit less tubes and cabinet $26.50
Tubes, $5.43 Cabinet, $2.25
Wired and Tested, $5.00

R-S SPECIALS

There are kits and kits, but the UTC PAK kits for 6L6's give more undistorted output, cost less and are easier to build than any we know of — ideal for PA or modulators.

Chassis-Special
Cadmium Plated
9 x 7 x 2 $ .51
17 x 7 x 3 .90
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17 x 10 x 3 .96
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A TIMELY TIP

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THOSE HARD-TO-GET NECESSITIES

Dunco relay, R1 series AC and DC $2.00; CDBX1 DPDT $6.60; sensitive and time delay in stock — Peak Pre-Selector $19.80, covers 10, 20, 40, 80, 160—Biley BC3, LD2, HF, VF1 at $3.90, $4.80, $6.50, $8.50 — International chokes 12H—200 ma $2.50, 12H 300 ma $3.75, 12H 500 ma $6.50 — swinging chokes 5/25 H 200 ma $2.50, 5/25 H 300 ma $3.75, 5/25 H 500 ma $6.50 — Brush crystal devices from $3.50 phones to $81.00 mikes — Brabbach EO1 cable $ .06 per foot — Aladdin IF transformers — International standard drilling 6 foot racks $13.50 — Fish pole and door hinge broadcast and UHF antennas — millivolt, microamp and db meters in addition to regular AC volt and millamp measuring gear — and Clough Brengle oscilloscopes.

All Prices Subject to Change Without Notice
Mail Orders Filled — Send Money Order or Check

Say You Saw It in QST — It Identifies You and Helps QST
SHURE MODEL 703S
COMMUNICATIONS-TYPE
CRYSTAL MICROPHONE

Now, Shure Engineers bring you a NEW Communications-Type Microphone...smaller...lighter...with a new convenient swivel head. Has the same "high-efficiency" Double-Power characteristic that made the 70S world famous.

Model 703S as illustrated.
List Price...$27.50

Model 705W. A newer, better 70S with 5 db higher output level! List Price, complete with desk mount...$25

Write for complete information today!
Licensed under patents of the Brush Development Company
Shure patents pending.

SHURE
MICROPHONES & ACOUSTIC DEVICES

NOW SHURE ENGINEERS BRING YOU NEW COMMUNICATIONS-TYPE MICROPHONE...

- SMALLER...
- LIGHTER...
- WITH A NEW
- CONVENIENT SWIVEL HEAD.

HAS THE SAME "HIGH-EFFICIENCY" DOUBLE-POWER CHARACTERISTIC THAT MADE THE 70S WORLD FAMOUS.

MODEL 703S AS ILLUSTRATED.
LIST PRICE...$27.50

MODEL 705W. A NEWER, BETTER 70S WITH 5 DB HIGHER OUTPUT LEVEL!
LIST PRICE, COMPLETE WITH DESK MOUNT...$25

WRITE FOR COMPLETE INFORMATION TODAY!
LICENSED UNDER PATENTS OF THE BRUSH DEVELOPMENT COMPANY
SHURE PATENTS PENDING.

NEW SHURE MODEL 703S
COMMUNICATIONS-TYPE
CRYSTAL MICROPHONE

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Model 703S as illustrated.
List Price...$27.50

Model 705W. A newer, better 70S with 5 db higher output level! List Price, complete with desk mount...$25

Write for complete information today!
Licensed under patents of the Brush Development Company
Shure patents pending.

SHURE
MICROPHONES & ACOUSTIC DEVICES

FILTERS ARE ALSO ADAPTABLE TO THE TRANSFILTER BY SIMPLE PLUGGING-IN OF THIS UNIT IN PLACE OF THE CRYSTAL AND SLIGHT ADJUSTMENT OF THE FILTER CIRCUIT. RECEIVERS OF DIFFERENT I.F. FREQUENCIES WOULD REQUIRE RETURNING OF THE I.F. CIRCUITS THROUGHOUT, IN WHICH CASE IT WOULD BE ADVISABLE ALSO TO RE-ALIGN THE SIGNAL INPUT CIRCUITS AND TO REPLACE THE ORIGINAL CRYSTAL WITH ONE OF 465-KC. FREQUENCY. AT THE PRESENT TIME THIS IS THE ONLY FREQUENCY FOR WHICH THE TRANSFILTER UNITS ARE AVAILABLE. FOR GREATEST CONVENIENCE IN OPERATION, OF COURSE, AN ADDITIONAL SWITCH TO CHANGE FROM CRYSTAL TO TRANSFILTER WOULD BE INCLUDED. AS SHOWN IN THE CIRCUIT OF FIG. 15, THE GROUND LEAD OF THE TRANSFILTER SHOULD BE OPENED WHEN SWITCHING TO CRYSTAL OR "STRAIGHT SUPER". OTHERWISE, THE TRANSFILTER CAPACITANCE TO GROUND THROWS THE INPUT CIRCUIT OUT OF BALANCE FOR CRYSTAL AND STRAIGHT SUPERHET OPERATION.


FURTHER INTERESTING AND USEFUL SELECTIVITY CHARACTERISTICS ARE OBTAINED WITH TWO VARIABLE-SELECTIVITY CRYSTAL FILTER CIRCUITS SIMILARLY IN CASCADE. WITH ONE FILTER ADJUSTED FOR MINIMUM SELECTIVITY AND THE OTHER FOR optimum SELECTIVITY, FOR instance, INDEPENDENT REJECTION CONTROL IN C.W. RECEPTION MAKES IT POSSIBLE TO ELIMINATE TWO INTERFERING HETERODYNES OF DIFFERENT FREQUENCIES, WHETHER BOTH ARE ON THE SAME SIDE OF RESONANCE OR ON OPPOSITE SIDES OF RESONANCE. THE CRYSTALS MAY DIFFER 100 CYCLES OR SO IN FREQUENCY WITHOUT APPRECIABLY IMPAIRING OPERATION, IT HAS BEEN FOUND. IN FACT, SUCH A DIFFERENCE ACTUALLY MAY PROVE ADVANTAGEOUS, SINCE IT GIVES A BAND-PASS CHARACTERISTIC IN THE REGION NEAR RESONANCE.

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

$48.00

"TYPE TR-6A6"
- NON-RADIATING REC'VR
- 7 TUBES - JENSEN DYNAMIC SPEAKER
- 6E6 UNITY COUPLED OSCILLATOR
- 10 WATT CENTER
- 100% MODULATION
- DUPLEX OPERATION - PHONE\(\bullet\) MCW TRANSMITTER-RECEIVER

$39.75

RADIO TRANSCEIVER LABORATORIES
8627-115 STREET, RICHMOND HILL, NEW YORK

126 Say You Saw It in QST — It Identifies You and Helps QST
Radio Operator's Course
Complete in Telegraphy—Telephony

AVIATION RADIO
A new complete training embracing advanced work for amateurs, or operators—twelve months' study required for the average amateur to graduate—excellent opportunity for men interested in commercial airlines. Applicant for enrollment must be high school graduate, or college student. We confer degree—Science of Radio—to graduates of this course. If interested, write for aviation radio details.

P. A. C. is an endowed, educational institution—not privately owned, not operated for profit, college rank maintained. Course consists of maximum knowledge necessary to secure Commercial Telegraph Second-class, and Radio-telephone First-class government licenses. Course includes Wireless Code, Radiophone, Announcing, Microphone-Studio Technique, Service, Television, Police, and Aeronautical Radio. We are authorized to teach RCA texts. At the completion of course you receive practical studio technique experiences in our commercial broadcast studios located in the administration building, and experience as an operator on P. A. C. (500-Watt Commercial transmitter located on the campus, owned and operated by the college), and inter-departmental marine communication experience.

If interested, write for Bulletin R

PORT ARTHUR COLLEGE

YOU ARE INVITED TO INVESTIGATE THE MANY ADVANTAGES OFFERED BY EASTERN RADIO INSTITUTE
899 BOYLSTON STREET, BOSTON, MASS.

"Put Your Signal Where You Want It When You Want It There"

MIMS SIGNAL SQUIRTER ROTARY BEAM ANTENNAS
20 and 14 Meters Only


MIMS RADIO COMPANY
M. P. MIMS—W3BB, P. O. Box 504, Texarkana, Ark.

THE F. W. SICKLES CO. presents "SILVERCAP"
Permeability Trimmed Intermediate Frequency Transformers

OUTSTANDING FEATURES: 1. High stability under varying conditions of temperature and humidity. 2. Good selectivity and "Q", 3. Small size: 15/6" x 17/6" x 9/6" shield. 4. LOW COST. 5. Fixed converters have "Q" and stability comparable with air dielectric types. 6. Movable iron cores for tuning. 7. High merit moisture proof coils.

SINGLE STAGE KIT List Prices
No. 6504, Interstage... ea. $2.00
No. 6521, Diode........... ea. $2.00

TWO STAGE KIT
No. 6562, Interstage... (Two used) ea. $2.00
No. 6563, Diode........... ea. $2.00

BEAT FREQ. OSCILLATOR
No. 6577................. ea. $2.00

CRYSTAL FILTER COILS
No. 6740, Input......... ea. $2.00
No. 6741, Output......... ea. $2.00

NOISE SILENCER COIL
No. 6743, Single tuned, Center-tapped........... ea. $2.00
All units designed for 400 Kc.

THE F. W. SICKLES COMPANY
300 Main St., Springfield, Mass.
A directory of suppliers who carry in stock the products of these dependable manufacturers.

ALBANY, N. Y. Uncle Dave's Radio Shack 356 Broadway
Baltimore, Md. Radio Electric Service Company
BOSTON, MASS. Radio Shack 46 Brattle Street
HARTFORD, CONN. Radio Inspection Service Co.
NEWARK, N. J. Wholesale Radio Service Co., Inc.
NEW YORK, N. Y. Gross Radio, Inc. 51 Vesey St.
NEW YORK, N. Y. Harrison Radio Co. 12 West Broadway
NEW YORK, N. Y. Wholesale Radio Service Co., Inc. 100 Sixth Ave.
NEW YORK, N. Y. Terminal Radio Corp. 80 Cortlandt Street
POTTSVILLE, PENN. E. Norwegian & George Stu. Sylvester Radio & Supply Co., Inc.
READING, PENN. George D. Barley Company 404 Walnut St.
SPRINGFIELD, MASS. T. F. Cushing 349 Worthington St.

BOSTON, MASS. Radio Shack 46 Brattle Street
BURLINGTON, VERMONT Vermont Hardware Co., Inc.
CAMDEN, NEW JERSEY Radio Electric Service Company
GREENWICH, CONN. Mead Stationery Company
HARTFORD, CONN. Radio Inspection Service Co.
MONTREAL, CANADA Canadian Electrical Supply Co., Ltd.
NEWARK, N. J. Wholesale Radio Service Co.
NEW YORK, N. Y. Bruna-New York, Inc. 460 W. 34th St.
NEW YORK, N. Y. Sanford Samuel Corp. 136 Liberty St.
NEW YORK, N. Y. Wholesale Radio Service Co. 100 Sixth Avenue
NEW YORK, N. Y. Harrison Radio Company 12 West Broadway
NEW YORK, N. Y. Grand Central Radio, Inc. 124 E. 44th St.
PHILADELPHIA, PENN. Eugene G. Wilse 10 S. 10th Street
PHILADELPHIA, PENN. Raymond Rosen & Company 117 North 7th St.
PHILADELPHIA, PENN. M & H Sporting Goods Company
PHILADELPHIA, PENN. Radio Electric Service Company
PHILADELPHIA, PENN. N.E. Corner 7th & Arch Street Radio Electric Service Company
PITTSBURGH, PENN. Cenradio Company 563 Liberty Ave.
POTTSVILLE, PENN. E. Norwegian & George Stu. Sylvester Radio & Supply Co., Inc.
READING, PENN. Bright & Company 8th & Elm 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.
A directory of suppliers who carry in stock the products of these dependable manufacturers.

SPRINGFIELD, MASS.  1540 Main Street
S. S. Kresge Radio Department

WASHINGTON, D. C.  938 F Street, N. W.
Sun Radio & Service Supply Co.

RME
RECEIVERS -- PRE SELECTORS
AMATEUR RADIO EQUIPMENT
RADIO MFG. ENGINEERS, Inc.
PEORIA, ILLINOIS

ALBANY, NEW YORK  356 Broadway
Uncle Dave's Radio Shack

BINGHAMTON, NEW YORK  25-27 Sturges Street
Radio Testing Station

BUFFALO, NEW YORK  216 E. Genesee Street
Dyneac Radio

HARTFORD, CONNECTICUT  210 Chapel Street
Stern Wholesale Parts Company

NEW YORK, N. Y.  12 West Broadway
Harrison Radio Company

NEW YORK, N. Y.  80 Cortlandt Street
Terminal Radio Corp.

PITTSBURGH, PENN.  963 Liberty Ave.
Cameradio Company

ROCHESTER, NEW YORK  944 Clinton Ave., N.
Radio Service Shop

WASHINGTON, D. C.  1837 Vernon St., N.W.
Upshur Radio Company

BOSTON, MASS.  46 Brattle Street
The Radio Shack

BOSTON, MASS.  28 Brattle Street
Selden Radio Company

BUFFALO, NEW YORK  396 Elm St.
Radio Equipment Corp.

CONCORD, NEW HAMPSHIRE  80 N. State Street
Carl B. Evans

NEWARK, NEW JERSEY  219 Central Street
Wholesale Radio Service Co.

NEW YORK, N. Y.  100 Sixth Avenue
Wholesale Radio Service Co.

NEW YORK, N. Y.  100 Sixth Avenue
Harrison Radio Company

TRIPLITT
INSTRUMENTS

ALBANY, N. Y.  356 Broadway
Uncle Dave's Radio Shack

BOSTON, MASS.  46 Brattle Street
Radio Shack

BOSTON, MASS.  28 Brattle St.
Selden Radio Company

MONTREAL, CANADA  295 Craig Street, West
Canadian Electrical Supply Co., Ltd.

NEWARK, N. J.  919 Central Ave.
Wholesale Radio Service Company

NEW YORK, N. Y.  100 Sixth Avenue
Wholesale Radio Service Company

PITTSBURGH, PENN.  963 Liberty Ave.
Cameradio Company

POTTsville, PENN.  404 Walnut Street
E. Norwegian & George Sls.
Sylvester Radio & Supply Co., Inc.

LISTINGS ON THIS PAGE DO NOT NECESSARILY IMPLY ENDORSEMENT BY QST OF THE DEALERS OR OF OTHER EQUIPMENT SOLD BY THEM.
Some Practical Receiver Kinks

(Continued from page 89)

through condenser C₁₂ to a tap on the grid coil L₂. The location of the tap is not critical, and is about the same as the cathode tap on the h.f. oscillator coil L₄. A more precise job of ganging the mixer tuning to the h.f. oscillator tuning must be done because of the increased selectivity.

The increase in gain and selectivity was as good as was previously obtained by adding a regenerative pre-selector, and the image suppression nearly as good. It is true that there is a certain amount of the interlocking of the controls, especially between the gain control and the first detector regeneration, but in practice this does not introduce any difficulty in tuning the receiver. In fact, once the regeneration control is set on any band it is rarely touched. In general, the regenerative mixer is preferred at this station to the use of a pre-selector because of its economy and, even more important since much changing of bands is done, because there are only two coils to change instead of three.

There is also included in this circuit a slight modification of the method of coupling the h.f. oscillator to the suppressor of the mixer. A condenser C₁₃ and a second National Type 100 choke permit operating the suppressor at ground d.c. potential, which seems to result in a slight increase in selectivity.

RADIO ENGINEERING, broadcasting, aviation and 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

110 VOLTS AC

KATOLIGHT PLANTS

250 watt 110 v. 60-cycle All Plant $ 95.00
Karlstahl's Complete Mains 6.4 Amps., 40.00
Other All 3.5 Watts Up to 10,000 Watts Available

Silent Keys

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

Clarence A. Carlson, W9VYQ, Maywood, Ill.


Harry J. Johnson, W9IJD, Minneapolis, Minn.

T. M. Jones, Jr., W4BEI, Decatur, Ala.

Paul D. Maxwell, W9M2B, Fort Wayne, Ind.


Dale N. McDonald, W6LAA, Santa Barbara, Calif.

J. Rady Miller, W3AYI, Ardmore, Pa.

J. C. Moore, VE5H, Victoria, B. C.

Walter L. Morris, W9RQW, Galesburg, Ill.

David B. O'Donnell, W9AV, Fort Worth, Texas

Gorman C. Palmer, W5FBP, Tyler, Tex.

Capt. A. Patterson, SU1AP, Cairo, Egypt

H. V. Routzong, W8ICP, Gettysburg, Ohio

A. R. Swisher, W6LID, Vexor, Calif.

William J. Tracey, W6AKU, Daly City, Calif.

Lee A. Tucker, W5TL, Fort Worth, Texas

130 Say You Saw It in QST — It Identifies You and Helps QST
HAM-ADS

(1) Advertising shall pertain to radio and shall be of such nature as to be of interest to radio amateurs or experimenters in their pursuit of the art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part embossing, be accepted.

(3) The Ad rate is $1.00 per word, except as noted in paragraphs below.

(4) Remittance in full must accompany copy. No cash or credit will be allowed.

(5) Closing date for HAM-Ads is the 25th of the second month preceding publication date.

(6) A special rate of 72 per word will apply to advertising which is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League.

(7) All information and prices will be disinterested.

(8) Advices and offers of exchange or advertising inquiries for specialized equipment, if by a member of the American Radio Relay League, takes the 72 rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and takes the 12 rate. Provisions of paragraphs (1), (2), (3) and (4) apply to all advertising in this column regardless of which rate may apply.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products advertised.

QUARTZ—direct importers from Brazil of best quality pure quartz suitable for making picosecond-electric crystals. Diamond Walt Co., 151 Quincy St., Brooklyn, N. Y.

RADIO engineering, broadcasting, television and police radio servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Byrd St., Valparaiso, Ind.

NATIONAL—Hammarlund, RCA-RME used sets, 60% off list. W3DQ, 405 Delaware Ave., Wilmington, Del.

QSL's—W2SN, Helmetta, N. J.

CLASS B transformers—Universal for two or four 46's, 6L6's, 210's, 800's, etc., 37.75 pair postpaid. 70 watts audio from 46's, 100 watts from 80's. Write for details. WUSD, Douglas, Mich.

QSL's—Distinctive—Individual—Colorful—Striking—Vivid—Astonishingly inexpensive—Write for free kit. QSL Company, Box 481, Hartford, Conn.

CALLBOOKS—new DX books, new prefixes, thousands of new W and VE calls in the Summer. 1937 Radio Amateur Call Book. Send postpaid $1.25 A.M. (four copies for $4.) (In foreign countries $1.35 and 4.35.) Your call and QRA printed in large type $1 per year. Radio Amateur Call Book, 610 S Dearborn, Chicago.

TELEGRAPH speed keys in kit form, only $2.89. A postcard list. W3DQ, 405 Delaware Ave., Wilmington, Del.

AMATEUR radio, commercial radiotelephone and radiotelegraph licenses, complete training. Resident and correspondence courses. Every graduate a licensed operator. N. Y. Wireless School, 1123 Broadway, N. Y.


SPECIAL—Reconditioned Emerson generators, Input 6 volts L85, Output 6 volts 20 m., 5 L85. Walter Askas, Radio Co., St. Louis, Mo.

WANTED: Antique radio sets, parts, tubes, catalogs, magazines, cutters, for museum. All letters answered. W6LM.

QSL's—Better designs; better stock; better workmanship. Free samples to hams only, W2FJE, 143 DeKalb Ave., Brooklyn, N. Y.


QSL's—New production process—Really when you read this—Write for free kit. QSL Company, Box 481, Hartford, Conn.

SELL: 60—RX-2000e, CW rig, four power supplies, 60 watt mod. unit, six meters—fine built. Sacrifice for cash. Photos. W6YER.


VE Hams: write for price on new ACR-175 or used FBT. Both complete and priced right. VE8SY.

$25—complete transmitter 47—60. Includes unused modulators and new tubes. Armin M. Meyer, City Hall University, Columbus, Ohio.

QSL's—2 color—$1, hundreds. Stamp, W8NOS.


QSL's, Samples, Stamp, Printers, Lowell, Iowa.

FOR SALE: F2E14's, four band superhets, $30, W6UK.

QSL's, QSL's, World's finest, Samples? (stamps) W8OED, Holland, Mich.

CRYSTALS, Free circular. W8BDED.

SELL or trade. Melissander noises silenced. New, complete. Will trade for receiver. Ask price. W8AED.

CRYSTALS—80 X-cut 1" square, $1.50. Y-cut, $1.25, within 10 k. guaranteed. W9KDE, 538 Wyandotte St., Laurium, Mich.

QSL's, SWL's, 3 color, 75¢ a 100. Lapeco, 344 W. 39 St., Indianapolis.

WANTED: good receiver, Cash. W2IWO.

WANTED: used nationally advertised Ham receivers; can use any quality; quote lowest prices. Hancock Export Co., Renata, N. Y.

QSL's—New sensational idea—Write for free kit. QSL Company, Box 481, Hartford, Conn.

RECEIVER, Ham superbhet wanted. Will exchange transmitting tubes or cash. W9FW.

QSL cards, neat, attractive, reasonably priced, samples free. Miller, Printer, Ambler, Penn.

BARGAINS: pair 500's, $20, RK20, new, $10. WE-242A, $8. National TML-BODD 1900 volt, $12. Triplet A.O. milliammeter to 25A. Collins modulation transformer XR-202 T67-73, $2. Colo-Coil for 160 meters, $1.75. RCA 902, $2.50. Every article guaranteed OK. W8BDA.

SWAP SW5 complete for printing press complete or make offer. Bill Morgan, Chalmette, La.

SALE: Gardner-Levering automatic sender, $7.50. T. Porcher, Chestnut Hill, Penn.

QSL's, all colors, cartoons, snappy service. Write for free samples today. W1BEF, 16 Stockbridge Ave., Lowell, Mass.

COMPLETE kit for one tube 3 meter amateur receiver, $1.59 postpaid. Munson Radio, 151 Quincy St., Brooklyn.

QST's before 1928 wanted. Issues 1923-1925 for sale or trade. W8EWH.

QSL's—SWL's—prices slashed. June, July, Fritz, 203 Mason, Joliet, III.

TRANSFORMERS—1300 watt 1200-2900-3000 each side, $20. Frank Greben, W9CDS, 2012 S. Feorina St., Chicago, III.

QSL's: buy yours from a Ham. $1.50 for 200 colors. Buy through W2EI.


QSL's, finest cards. Lowest prices. Free samples. Maleco, 1512 Eastern Parkway, Brooklyn, N. Y.


QSL's, 300 one-color cards, $1. Samples, 2143 Indians Ave., Columbus, Ohio.

COMPLETE outfits described in How To Become a Radio Amateur, brand-new, $2 net price of parts. Card brings full information. Albert Stuart, 1220 N St., N.W., Washington, D. C.

TRANSMITTER—complete—Fone, CW, all band, 250 watts—goes to highest bidder. W8OIZ, Clarcroft, Penn.

QSL's—Special introductory offer extended. Radio Headquarters, Ft. Wayne, Ind.

WESTERN Electric amplifiers and equipment: 8A, $25; 8B, $35; 8C, $35; 8D, $40; 8E, $35. General indicator, $20; 10A, $35; rectifier panels 1B, $95; 600A, $75; 514A meter panels, $17.50; 74AF condensers 2 mfd., $94; 96D 1 mfd., 75c. Assorted transformers, chokes, resistances, condensers, and Weston meters. List available. Hass Radio, 427 Fulton St., Brooklyn, N. Y.

QSL's—Different from anything you ever saw before—Write for free kit. QSL Company, Box 481, Hartford, Conn.

SELL trade 6 inch telescope, 4 eyepieces, excellent condition for candid camera. Contax preferred. Joseph Dolgo, Norwich, N. Y.


RECEIVER headquarters—new and used. W8ANT.

RME-69's and DB20's in stock. W8ANT.

UTC transformers. W8ANT.

COTO-coils in stock. W8ANT.

BIMAC tubes. W8ANT.

VALPEY crystals, $3. W8ANT.

CRYSTAL mikes. W8ANT.

CARDWELL condensers. W8ANT.

NEW Sargent Model 11—special—$60. W8ANT.

PYRANOL condensers. W8ANT.

NEW transmitters. W8ANT.

QSL—Autogenous—Write for free kit. QSL Company, Box 481, Hartford, Conn.


WANTED: 500 watt phone rack mounted and complete. Will pay cash for rig now on air—should be in 1st or 2nd district. Please submit photograph and all particulars. Reedell, Deepwell Park, Stamford, Conn.

SELL National PW4 unit, PP T20 transmitter complete. W9FDU.

CRYSTALS: see May QST advertised for prices and dope on crystals. William Threm, W8FN, 4021 Davis Ave., Cheviot, Ohio.

CANADIAN hams in the Maritime Provinces: VE1CR Sydney has Taylor tubes at current Canadian ham prices. Ask us about them.

TRANSFORMERS: 425 volt, 150 mill, 110 volt Pri, $1.25. Dope sheet on 78 other bargains on request. J. D. Larkin, 3rd, Larkin Co., Inc., Radio Dept., Buffalo, N. Y.

WANT speech amplifier—modulator with power supply. Xtal mike input—250 watts output. W9ULJ, Emerson, Iowa.

NEW stock of ham parts. W3FBL.

PLENTY used 242A's. W3FBL.

COMPLETE stock of ham parts. W3FBL.


SELLING out: 40 modulator complete, $22; complete 6L6 modulator, $28; 203A modulator with power; 200 watts transmitter. Plenty good buys. 115 S. Main, Blackwell, Okla.

TRANSMITTERS constructed to order, Suitcase portable, three bands, 80 watts, $48 with accessories. Write. Howard Radio, 5514 Lake St., Chicago.

METERS—stamped envelope brings price list. Henry Munz, 312 W. 100th St., N. Y. C.

KENYON High Fidelity 2243 amplifier, practically new; hum-less power supply, tube, $18. A real buy. W2EXR.

SELL or trade—Alnozworth button balance, Voight pulp balance, 204A, 10–505 dynamotor. Want power saw, drill press, thread cutting lathe, 0–1 millimeter, ham super, W6WH.

QSL’s—Don’t order any until you’ve seen this new idea—Write for free kit. QSL Company, Box 481, Hartford, Conn.

TELEPLEXES, instructographs, omnigraphs, vibroplexes bought, sold, traded. Ryan Radio Co., Monroe City, Mo.

QSL's free with 100 color-2 cards, $1. W8JDW, Lima, Ohio.

5500 JOBS FOR CW MEN
WHO PREPARE THEMSELVES

■ AVAILABLE SOON ■

No license required. Eight hours per day, Year around. 65 to 80 cents per hour. If you can copy 15 words per minute, write

CODE-CRAFT
Q 6703 Dunham Ave.,
CLEVELAND, OHIO

RADIO COURSES

RADIO OPERATING: Prepare for Gov't License Exam. RADIO COURSES: Basic and Advanced courses. Send for free catalog. W8MEM.

Day and Evening classes—Booklet upon request

NEW YORK YMCA SCHOOLS
4 West 63rd Street, New York City

At Last!
A Perfected AUTOMATIC SENDER

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

Say You Saw It in QST

USED receivers, all kinds. W3FBL.

COMPLETE stock of ham parts. W3FBL.


SELLING out: 40 modulator complete, $22; complete 6L6 modulator, $28; 203A modulator with power; 200 watts transmitter. Plenty good buys. 115 S. Main, Blackwell, Okla.

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TELEPLEXES, instructographs, omnigraphs, vibroplexes bought, sold, traded. Ryan Radio Co., Monroe City, Mo.

QSL's free with 100 color-2 cards, $1. W8JDW, Lima, Ohio.

5500 JOBS FOR CW MEN
WHO PREPARE THEMSELVES

■ AVAILABLE SOON ■

No license required. Eight hours per day, Year around. 65 to 80 cents per hour. If you can copy 15 words per minute, write

CODE-CRAFT
Q 6703 Dunham Ave.,
CLEVELAND, OHIO

RADIO COURSES

RADIO OPERATING: Prepare for Gov't License Exam. RADIO COURSES: Basic and Advanced courses. Send for free catalog. W8MEM.

Day and Evening classes—Booklet upon request

NEW YORK YMCA SCHOOLS
4 West 63rd Street, New York City

At Last!
A Perfected AUTOMATIC SENDER

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

USED receivers, all kinds. W3FBL.

COMPLETE stock of ham parts. W3FBL.


SELLING out: 40 modulator complete, $22; complete 6L6 modulator, $28; 203A modulator with power; 200 watts transmitter. Plenty good buys. 115 S. Main, Blackwell, Okla.

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regarding the

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Your 1938 communication receiver will have one (or more) radio frequency stages, a first detector, a radio frequency oscillator, two stages of IF, a second detector, an audio frequency oscillator, and audio amplification. It must have a fine crystal filter circuit, a phasing device and a variable audio beat control. It must have coil switching. It cannot be without a good indicating device. It must be excellent in design, workmanship, and overall efficiency.

This, in substance, will be your "NEW MODEL."

Of course, special features are many times desirable, but not always necessary. For instance — a noise suppressor may or may not be needed, depending on locality or operating frequency or both. High audio output power may be asked for by some users. Combination AC and battery operation has its advantages in some radio stations. RME has consistently cooperated in meeting these requirements and making fine radio operating possible.

Fundamentally a receiver layout for communication purposes calls for the adaptation of basic principles to operating conditions as they are, not as we might visualize them. In the RME-69 and the several special models now available, all of the above requirements have been met.

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QST for June, 1937, EASTERN Edition
This pleasing HRO combination comes in two choices of finishes: a rich grey (as shown) or black leatherette, with matching speaker cabinets. It features a high-quality receiver, relay rack type, and includes a control panel containing 10,000 components and one dial panel connected to matching pegboard. The cabinet is designed to accommodate a complete rack of equipment, and the table-model relay rack type MRR is priced at $13.50.
It isn't what you put in that counts—

It's what you get Out

Use RCA Tubes to be sure of better performance at high frequencies

It seems to us that much emphasis has been placed on tube input ratings with little regard to tube and circuit efficiencies and the resulting output. After all, the other fellow only hears what you put into the antenna—not what you put into the final stage. Why gamble, therefore, with the operation of your transmitter? Give it a good start by designing it around RCA tubes. There are many types to choose from which will give you long, reliable service at high efficiencies.

High plate efficiencies in many tubes are obtainable only at very high plate voltages. This means costly power-supply equipment. RCA offers you a line of tubes designed to give high efficiencies at reasonable plate voltages, thus permitting you to save money on your power supply equipment. The money saved can be used to improve other portions of your transmitter.

Efficiency at ultra-high frequencies is an important matter. Naturally, overall circuit efficiency is lower. Don't let the tubes be the weak link in the system—use RCA ultra-high-frequency types which have been carefully designed and rigidly tested to assure good ultra-high-frequency performance.

For full information on any RCA type, see your supplier, or write to

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RCA 803  RCA 805
RCA 807  RCA 808
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RCA for Amateur Radio

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Announcing

The 1938 SUPER SKYRIDER
A WORD ABOUT OUR NEW RECEIVER

Since the inception of our organization, Hallicrafters receivers have won a rapidly growing acceptance in the amateur radio fraternity. We are grateful for this approval, but consider it an obligation to continue our efforts toward constant improvement.

We had visualized a receiver tuning from 5 meters to the top of the broadcast band, with wide range, variable selectivity (single signal, razor sharpness to broad high fidelity); with an electrical band spread equaling the standards set by the A.R.R.L. HANDBOOK; with improved image and signal-to-noise ratio, with an "S" meter that would work on weak signals.

"A large order", said our engineers. "With all these features, what else could we want?" our amateur friends asked us. So we went to work.

We've realized our objective. It has taken many hours of painstaking design, research and study. We had to "invent" an ingenious new method that gives us 1000 OF BAND SPREAD with 5KC PER DIVISION ON THE 20 METER BAND and proportional spread on other bands. We sweated over the 5 meter band but it's there — and it's "hot". We improved the Q of all the RF coils — and got substantially better image suppression and better than 1 microvolt sensitivity average on all bands.

We've made improvements all through the receiver — redesigned the I. F. coils to provide wide range selectivity and improved signal-to-noise ratio — improved the crystal filter circuit, the beat oscillator, the audio — and now the job is finished — surpassing our most hopeful expectations.

Our hats are off to Mr. Karl Miles and his competent staff — including Mr. J. L. A. McLaughlin, co-designer with Mr. James J. Lamb of the famous "dual diversity" receiver.

So here's the New 1938 Super Sky Rider. Even to us it's amazing — and its price, in the Hallicrafter tradition, is exceptionally attractive. Be sure to see it at your dealers.

W. J. Halligan
PRES.

the hallicrafters inc.
2611 Indiana Ave., Chicago, Ill.
Cable Address: "Hallicraft" Chicago