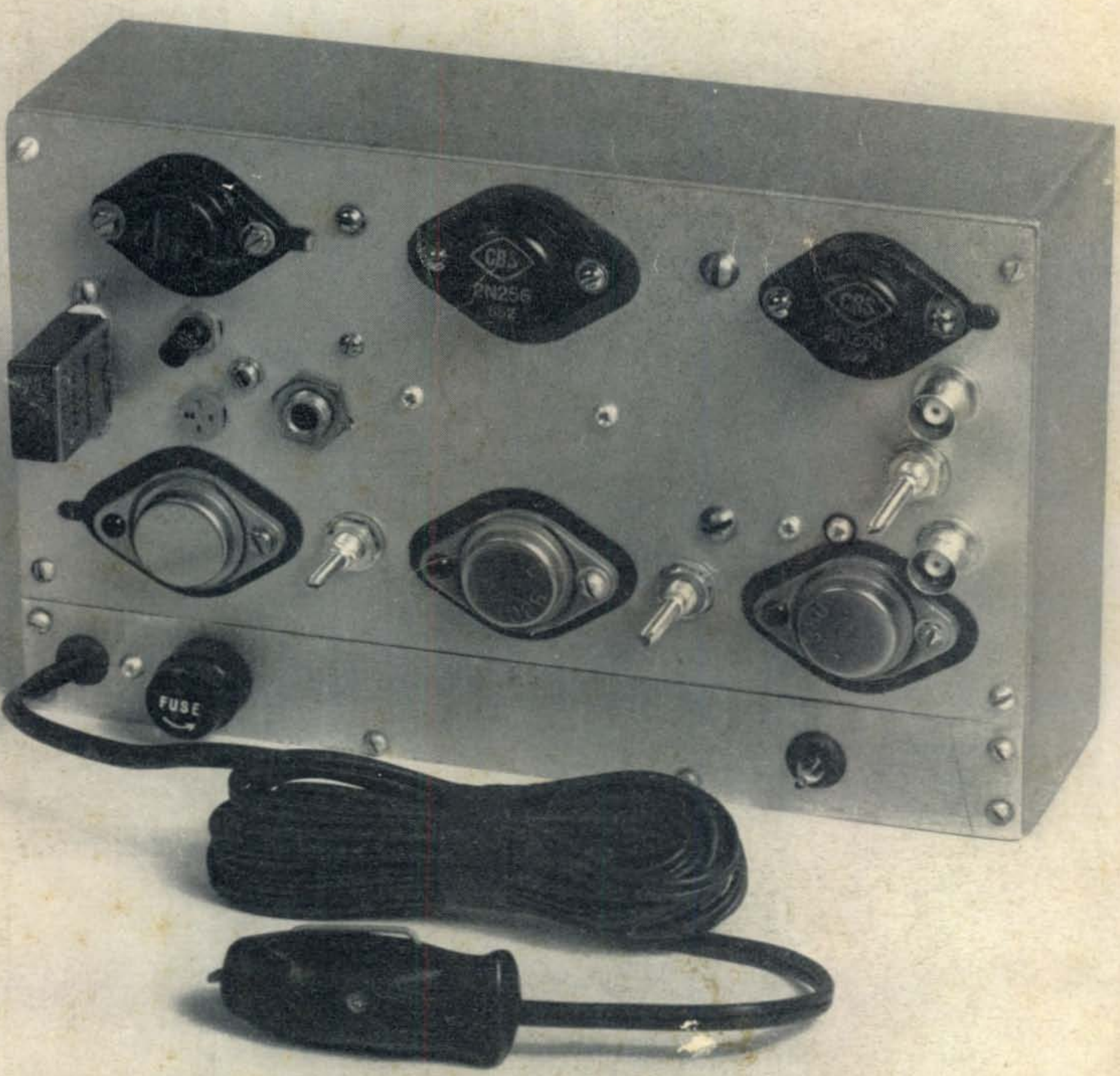
CQ

August 1961

50¢



The Radio Amateur's Journal

INTRODUCING COLLINS 75S-3

NEW RECEIVING VERSATILITY FOR CW, SSB AND RTTY

Name your mode – CW, SSB or RTTY – the new Collins 75S-3 will give you the best in reception. The 75S-3 has Collins' famous frequency stability, plus: Q multiplier, choice of variable or crystal BFO, 200 cycle crystal filter, 2.1 kc Mechanical Filter, and control of AVC. A new spinner knob provides ease of tuning, and AF-RF gain controls are conveniently located on concentric knobs. See your Collins distributor for a demonstration. He'll be showing the 75S-3 for the first time this month.

COLLINS

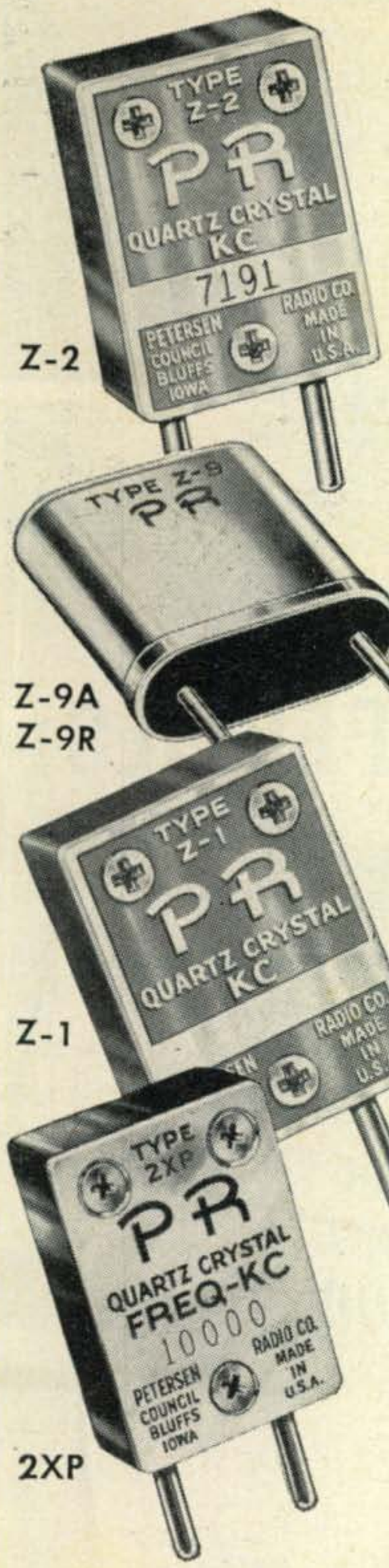
COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA

See you at the Western SSB Convention September 29th in Santa Maria

For further information, check number 1, on page 126

It pays to insist on PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934



Z-2

Z-9A
Z-9R

Z-1

2XP

AMATEUR TYPES

Fundamental, PR Type Z-2

Frequency Ranges in Kcs.: 3,500 to 4,000 (80M); 7,000 to 7,425 (40M); 8,000 to 8,222 (2M); 8,334 to 9,000 (6M).

Rugged. Low drift, fundamental oscillators. High activity and power output. Stands up under maximum crystal currents. Stable, long-lasting; ±500 cycles..... **$2.95** Net

(All Z-2 Crystals calibrated with a load of 32 mmfd.)

Third Overtone, PR Type Z-9A

Hermetically sealed; calibrated 24,000 to 24,666 and 25,000 to 27,000 Kc., ±3 Kc.; .050" pins..... **$3.95** Net

6 Meters, PR Type Z-9A

Fifth overtone; for operating directly in 6-meter band; hermetically sealed; calibrated 50 to 54 Mc., ±15 Kc.; .050" pins. **$4.95** Net

CITIZENS BAND CLASS "D"

Type Z-9R, Transmitter

FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225, 27.255, calibrated to .005%. (Be sure to specify manufacturer and model number of equipment) $2.95 Net

CITIZENS BAND CLASS "D"

Type Z-9R, Receiver

Specify I.F. frequency, also whether receiver oscillator is above or below transmitter frequency. Calibrated to .005%. (Be sure to specify manufacturer and model number of equipment.)..... $2.95 Net

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FCC assigned frequencies in megacycles: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255; calibrated to .005%. (Be sure to specify manufacturer and model number of equipment.)..... $2.95 Net

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Suitable for converters, experimental, etc. Same holder dimensions as Type Z-2.

1600 to 12000 Kc., (Fund.) ±5 Kc..... **$3.45** Net

12001 to 25000 Kc. (3rd Overtone) ±10 Kc..... **$4.45** Net

ALL PR CRYSTALS ARE UNCONDITIONALLY GUARANTEED. ORDER FROM YOUR JOBBER.

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Commercial Crystals available from 100 Kc. to 70 Mc. Prices on request.

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Official assigned frequencies in the range. Calibrated to .005%.

1600 to 10000 Kc..... **$3.45** Net

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Channels 2 thru 13.... **$6.45** Net

4.5 Mc. Intercarrier, .01%..... **$2.95** Net

5.0 Mc. Signal Generator, .01%..... **$2.95** Net

10.7 Mc. FM, IF, .01%..... **$2.95** Net

Type Z-6A, Frequency Standard

To determine band edge. To keep the VFO and receiver properly calibrated.

100 Kc. .. **$6.95** Net

Z-6A

PETERSEN RADIO CO., *Inc.* 2800 W. Broadway

COUNCIL BLUFFS, IOWA

EXPORT SALES: Royal National Corporation, 250 W. 57th Street, New York 19, N. Y., U. S. A.

For further information, check number 3, on page 126

HAMMARLUND SUMMER SPECIALS!

A **COOL** deal for the **HOT** days of July and August only. A once-in-a-year opportunity to save real money on the finest amateur radio equipment on the market. Your Hammarlund Distributor is offering the greatest Hammarlund bargain in history.

Think of it! You save almost $145.00 on the purchase of an HX-500 transmitter, HQ-180 general coverage receiver, and a matching S-200 speaker.

Remember—this offer is strictly limited to July and August only—prices go back to usual levels on September 1st.

If you're thinking of upgrading your present equipment—**THE TIME IS NOW.** Act now—see your Hammarlund Distributor and get in on the hottest "Cool Deal" in amateur radio history.

See the latest Hammarlund SSB Equipment at the 1961 Western Single Side Band Convention, Sept. 29-Oct. 1st, 1961 at the Vandenberg Hotel, Santa Maria, Calif. Write W6ZHH, Box 568, San Pedro, Calif. for registration."

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HX-500 SSB Transmitter .....reg. $695.00
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$1143.95 Value ONLY $999.50
SAVE $144.45

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an affiliate of Telechrome
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For further information, check number 4, on page 126

CQ The Radio Amateur's Journal

VOL. 17, No. 8 *AUGUST 1961*

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300 West 43rd Street
New York 36, N. Y.
Telephone, JUDSON 2-4460

CQ—(Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second class postage paid at New York, N. Y. and at Garden City, New York. Subscription Rates: U.S.A. and Possessions, APO, FPO, Canada and Mexico: one year $5.00; two years $9.00; three years $13.00. Pan-American and foreign, one year $6.00; two years $11.00; three years $16.00. Printed in the U.S.A.

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TABLE OF CONTENTS

DEPARTMENTS

MAGNIFYCENT!

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AMPLIFIE

$395.00

Built to Hallicrafters' highest quality standards . . . beautifully engineered to match the famous HT-37 and SX-111 . . . gives you maximum legal input* for the big signal you want, with conservatively rated components.

- **Low or high-power drive adjustment (20-100 Watts).**
- **Complete coverage, 80-10 meters.**
- **Adjustable Pi-network output.**
- **All important circuits metered.**
- **Built-in R.F. output meter to simplify tune-up.**
- **Standby bias supply for complete cutoff during receive.**
- **High-efficiency grounded grid circuit.**
- **New 7094 Beam Power pentodes.**
- **Highest performance on CW and AM, too!**

**FCC Rules and Regulations; Part 12, Para. 12.131.*

ew, low-cost linear amplifier
he SSB economy station of the year!

Today . . . you can be on the air with single sideband! This is the combination whose price makes it possible—whose performance makes it a great new experience.

HT-37 Transmitter $450.00 A precision-engineered CW/AM/SSB transmitter with the same power, rugged construction, and long-term frequency and carrier suppression stability as the famous HT-32. Sideband suppression 40 db. at 1000 CPS. Power rating: 70-100 watts P.E.P. output CW or SSB. 17-25 watts carrier on AM phone. 3rd and 5th order distortion products down 30 db. Instant CW CAL signal from any transmission mode. Ideal CW keying; full voice control system. 52-ohm pi network output for harmonic suppression.

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hallicrafters

Chicago 24, Illinois

For further information, check number 5, on page 126

NEW for Mobile...

autowhip TM-5

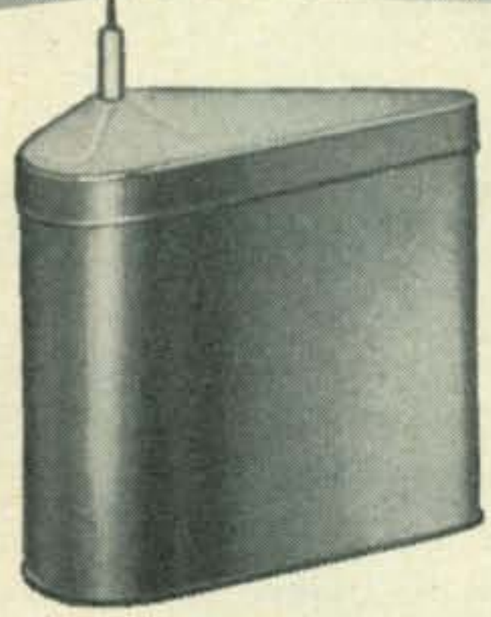
for 10·15·20·40·80

A five band mobile antenna with excellent radiating efficiency that changes bands without switches . . . that's the new Autowhip TM-5 by Mosley! Fully automatic electronic switching by means of simple series and parallel resonant trap circuits. These precision made, series-tuned traps improve SWR on the 10-15-20 and 40 meter bands and a parallel network achieves near unity SWR on 80 meters.

All exterior fittings are of stainless steel, brass and weatherproof plastic. The aluminum framed housing has a tough Plastisol cover that is practically unbreakable and will retain its shape through a temperature range of -30° F. to +200° F.

This cover is a neutral ivory color which will blend harmoniously with all vehicles. The Autowhip TM-5 is aerodynamically designed for a minimum of wind resistance.

The Autowhip TM-5 is designed for use with all popular commercial amateur mobile transmitters and transceivers and may be mounted on bumper or standard spring-type base mount, 3/8-24 stud.



This antenna offers finest component quality and imaginative engineering at a popular price. Thoroughly field tested, this beautifully designed, band-switching unit is fully guaranteed against defects in material and workmanship for a period of one year.

Amateur Net $69.95

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15 Moore Street
New York 4, New York

For further information, check number 6, on page 126

ZERO BIAS

WHEN the WPX program was announced in January, 1957, one of the major factors which enhanced its workability was that it offered no argument as to country status. Since prefixes were a "set" commodity, no problem was anticipated that could complicate the structure of the award and thus it looked as though WPX would become one of the main fixtures in DX circles.

Many new prefixes, however, have recently come into use since the granting of independence to a large number of African Republics. We have therefore reevaluated the WPX program and would like at this time to introduce a few rule changes aimed to streamline and stimulate further participation.

Complete information will be published in the September issue of *CQ* and rule changes become effective October 1, 1961.

Here briefly are the four major changes and why they are being made.

(*a*) Because 300 qualifying QSL cards makes a mighty big package, and offers considerable risk in shipping, *QSL Cards Will No Longer Be Required* to be verified by the WPX Committee. Although we know of only one batch of cards to go astray, we feel that should there be a one-in-a-thousand chance of it happening again, we would like to prevent it. The WPX committee, of course, still reserves the privilege of viewing any or all cards for checking purposes. New application blanks will be available under this rule change.

(*b*) Those of you who have been chasing prefixes since the awards inception are aware that the program was designed to start everyone on an equal basis. This actually is a fine idea, but with upwards of 1000 amateurs joining our ranks each month we can see that not everyone can stay on an equal level. With this point in mind, we are taking the liberty of pushing back the qualifying date to November 15, 1945, in order to give the newcomer a chance to place high on the WPX honor roll, and to eliminate those who are there only by virtue of time alone.

(*c*) The WPX Committee is now initiating a program whereby prefixes which are obsolete, or superseded by newer prefixes, or prefixes which have been officially changed, will be eliminated from the official WPX list. The intention here is to keep as current as possible, prefixes which are available to be worked by everyone. Naturally, this may not always be possible; it will, however, provide a clean competitive system in most cases.

(*d*) The final change is more of an addition than anything else. Since WPX certificates are endorsed for single modes of operation only the WPX Honor Roll has appeared similarly. We feel that the true picture of competition has been missing and starting with the October issue we will begin a "General", or "WPX" Honor Roll, listing those who have worked prefixes using *all* modes.

The above changes are by no means all that have been made. Small changes have been made too. All of them will, we feel add to the enjoyment of the award and considerably reduce its complexity. Full details will appear in the September issue.

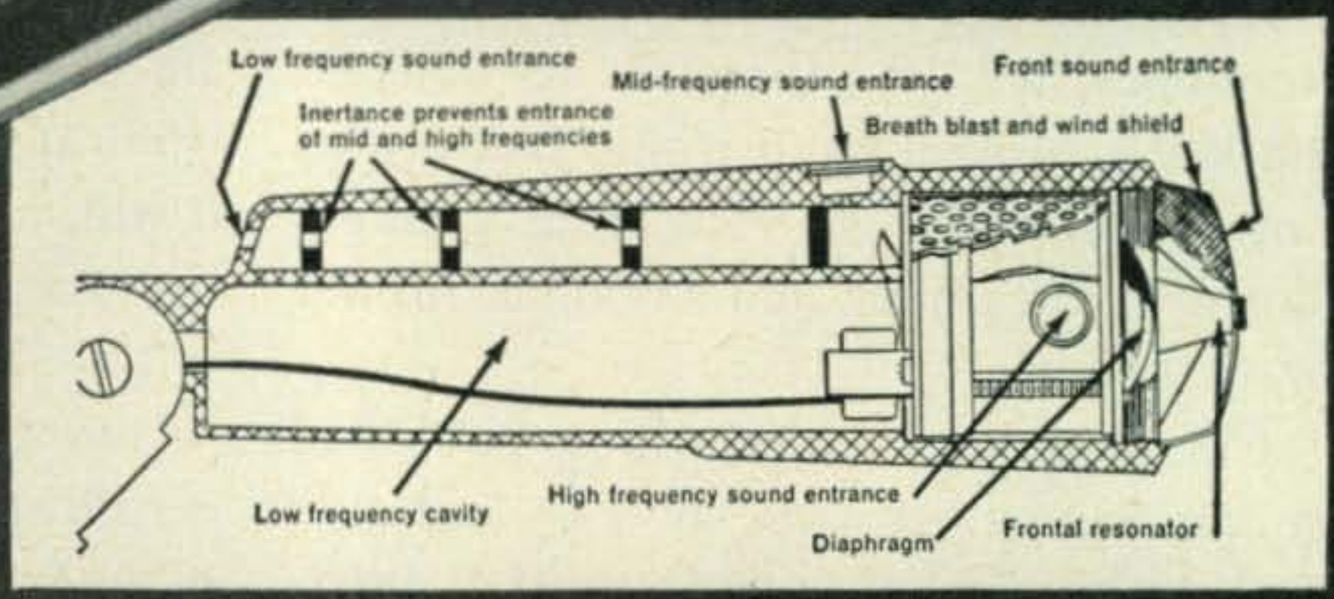
OUR COVER

Yep, it's transistorized, and that funny looking line cord plugs into the cigar lighter. Tune in next month for more details!

The Least Expensive Way to Increase

Flat response penetrates QRM more effectively because it permits an actual increase in RF power output! More effective cardioid pattern, essential for SSB, cuts accidental tripping of VOX circuit!

MODEL 664



HERE'S HOW IT WORKS

Exclusive E-V Variable-D* (Variable Distance) provides three sound-cancelling entrances at different fixed distances in back of the diaphragm. These entrances, utilizing the proper acoustical impedances, combine to form an effective front-to-back spacing which varies in distance from the diaphragm inversely with frequency. The resulting phase and amplitude conditions provide a uniformly true cardioid pattern at all frequencies.

**Pat. Pending*

Here's What the Top Radio Amateur Operators in the World Say About These E-V Microphones:

CX2CO "My new 664 resulted in better and more consistent QSO's."

W8KML "The 664 surpasses its claims in difficult operational environments."

ZL1HY "During QSO's . . . everyone preferred the 951."

W3JNN "I am really sold on the 664."

W8BF "I have had many unsolicited compliments since using the 729."

VQ4ERR "The performance of the 664 matches its thoroughbred appearance."

PY2CK "My 664 microphone vastly improved my SSB transmission."

Average Peak-Power and Intelligibility!

CHOOSE AN Electro-Voice® MICROPHONE

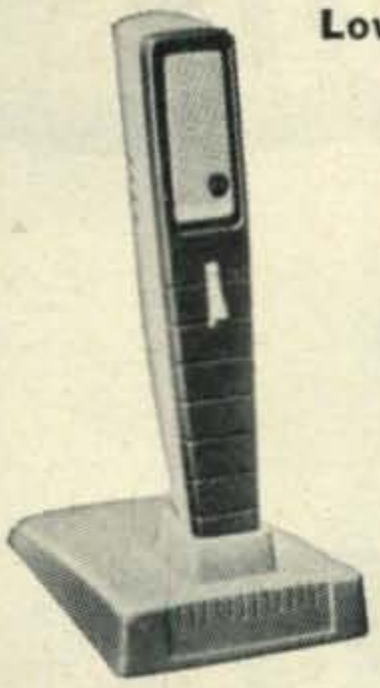
Model 664 for Highest Front-to-Back Discrimination Manufactured, Plus Peak-Free Wide-Range Response!

The effective strength of all sounds arriving at the sides of the 664 are reduced by as much as 50%, and arriving directly at the back of the microphone by as much as 90%. This uniquely effective design permits you to work at twice the distance from the microphone . . . a perfect invitation for "arm chair" QSO's—with no VOX tripping problems.

Smooth, peak-free response guarantees maximum P.E.P. Remember, a peak in response in or *out* of the voice range will limit maximum modulation and result in reduction of P.E.P. You do not have to talk with your lips on the mike. For best results, sit back and talk naturally.

Virtually indestructible Acoustalloy® diaphragm withstands high humidity, temperature extremes, corrosive effects of salt air and severe mechanical shock. Extra ruggedness means extra service, year after year.

MORE 664 FEATURES: Output—55 db. On-off switch (can be wired for relay control). 150 ohms or Hi-Z output selected at cable connector. Satin chromium finish. High-pressure die-cast case. Pop-proof filter plus magnetic shield. 90° swivel mounting. 18 ft. cable. 7 3/16 in. long (less stand coupler) by 1⅞ in. diameter. Net Weight 1 lb., 10 oz. Amateur Net, $51.00. Matching desk stand with DPDT switch. Model 419S, $9.00. Less switch. Model 419, $6.00.



MODEL 729SR

Lowest-Cost Ceramic Cardioid Available ...Includes Every Feature Essential For SSB Operation. Flat, Smooth Response From 300 To 3,000 CPS!

Rugged enough for mobile operation, the slim, small Model 729 fits easily in your hand or slips into the desk stand or floor stand adapter provided, without any hardware adjustments. Hi-Z output -60 db. Two-tone grey, pressure die-cast and plastic construction. Shielded, 8½ ft. cable. 7¾ in. long by 1½ in. wide. Net weight 1 lb. Ceramic element unaffected by high heat, humidity. Model 729. Amateur net, $14.70. Model 729SR with relay-control switch. Amateur net, $15.90.

MODEL 951

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Finest crystal microphone available for SSB. Variable-D design of Model 951 cuts room noise, interference from receiver speaker to a minimum. Allows greater working distance to microphone. Peak-free rising response for high intelligibility. Hi-Z output -60 db. High-pressure, die-cast finished in Metalustre grey. On-off switch. Shielded, 18 ft. cable. 5⅜ in. long (less stand coupler) by 1¾ in. diameter. Net weight 1¼ lbs. Model 951 Amateur net, $32.70. Matching desk stand with DPDT switch. Model 418S, $9.00. Less switch. Model 418, $6.00.

The World's Finest Mobile Microphone. Model 600D Dynamic Widely Known As Military Types T-50 And M-105/U!

Designed for high articulation under rugged mobile conditions, the Model 600D provides all the advantages of a dynamic element with peak-free, flat response for maximum P.E.P.

High-impact case soaks up physical abuse, feels comfortable at any temperature, fits hand naturally. Extremely high output of -55 db. is ideal for mobile equipment with severe audio requirements. Available in 50, 250 ohms or Hi-Z. DPDT switch. 6 ft. coiled cord. Panel mounting bracket included. Model 600D Amateur net, $28.50.

MODEL 600D

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Electro-Voice®

For further information, check number 7, on page 126

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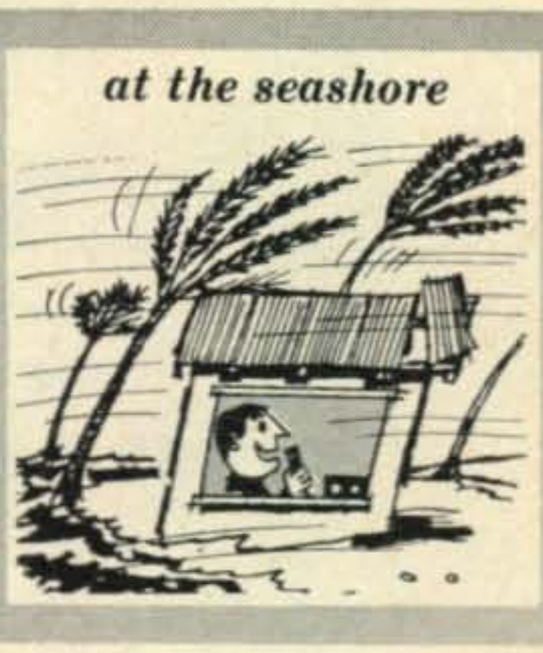
GONSET G-76 all-band 100 watt AM transceiver

performs like the champion it is –

in your car

in your boat

in the mountains



at the seashore

Only Gonset offers a single package 100 watt AM transceiver. This is the most versatile unit built today. Whether you vacation summer or winter, on land or sea, it's a great companion. Check these features:

* G-76 is a fixed, mobile, or portable station . . . all in one package.
* G-76 gives an honest 100 watts input AM, 120 CW.
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Amateur Net $399.50

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Division of Young Spring & Wire Corporation

801 S. Main Street, Burbank, California

For further information, check number 8, on page 126

Letters..... to the Editor

L-Networks

Editor, *CQ:*

The article of R. H. Griffith, W2ZUC, in the June issue of *CQ* presents some useful information on the use of *L*-networks to adapt the driving power available for a linear amplifier to the driving-voltage requirements of the amplifier.

Unfortunately, the author made the common mistake of using peak r.f. grid voltage with an r.m.s. voltage formula in making his power calculations. In terms of peak voltage of a sinusoidal wave, power is given by:

$$P = \frac{E^2}{2R}$$

The driving power values given in Table 1 and at the top of the right column of page 35 should, therefore, be divided by two.

Some mention should also be made of the fact that operating the exciter at too low a power level may not always be desirable, since the relative levels of noise, hum, and carrier (s.s.b. service) tend to rise under these conditions. Best practice would seem to be to select a load resistance for the networks which allows the exciter to operate at one-half to three-fourths of its maximum rated output. Under these conditions, networks other than the one shown may be required in some cases, to allow the use of physically realizable reactive elements.

R. L. Norton, W6CEM
Penta Laboratories Inc.
312 North Nopal St.
Santa Barbara, Calif.

Calling Frequencies

Editor, *CQ:*

ZERO BIAS, *CQ* April 61, has my 100% backing. I feel though there should be two National Calling Frequencies on each band . . . and possibly three. As we know, the American radio amateur has mentally allocated certain frequencies within a band to a.m., and a certain portion to s.s.b. C.w. operation on the phone portion of a band is frowned upon—Phone operation on the c.w. portion is illegal; a.m. operation on the s.s.b. portion of the band is discourteous; etc., etc. Therefore, we have, in essence, three segments, three modes, three portions to each amateur radio band . . .

A partial solution to this "new" idea is to set up a c.w., s.s.b., and a.m. National Calling Frequency for each band. I don't have all the answers for a compatible arrangement, but such a plan is certainly open to compromise among the amateur population. . . .

Norm G. Gignac, K1QIM
1 W. Emanuel Dr.
Brunswick, Maine

Editor, *CQ:*

Your praiseworthy crusade for the establishment of national calling and emergency frequencies comes just a few years too late—like your former editor's suggestion that some sort of distinctive symbol should be devised to represent amateur radio throughout the world. (Something like an antenna inside of a diamond, perhaps??)

It would be a great disservice to amateur radio to propose any frequencies other than those which have already been designated as national calling and emergency frequencies and which have been in successful use now for several years. For as long as I can remember, these frequencies have been printed every month and I find it hard to believe that you should be so poorly informed on a subject which is common knowledge to many hams. . . .

Eugene L. McMurtry, W9ICF
Box 251, RFD 1
Waterloo, Illinois

← For further information, check number 9, on page 126

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Kit **$79.95** Wired **$119.95**
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"Top quality"—ELECTRONIC KITS GUIDE
Ideal for veteran or novice. "Clean" 90W CW, 65W AM-phone with EXT plate modulation. 80 through 10 meters.

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Kit **$49.95** Wired **$79.95**
"Compact; well-planned layout. Clean-sounding, absolutely hum-free carrier; stable." — ELECTRONICS WORLD.
Perfect for novice or advanced ham needing low-power standby rig. "Clean" 60W CW, 50W AM-phone with EXT plate modulation. 80 through 10 meters.

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VARIABLE FREQUENCY OSCILLATOR (SELF-POWERED) #722
Approaches crystal stability. 80 through 10 meters.
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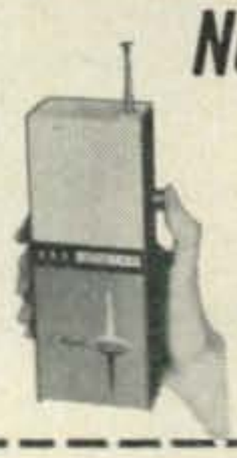
Wired **$59.95**

New!



CITIZENS BAND WALKIE-TALKIE #740
Complete with rechargeable battery and charger. 9 transistors, 1 diode. Full superhet. U.S. made.
Kit **$54.95**
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CITIZENS BAND TRANSCEIVERS
Superhet; prealigned xmitter osc; match different antennas by variable "pi" network. Single & multi-channel models.
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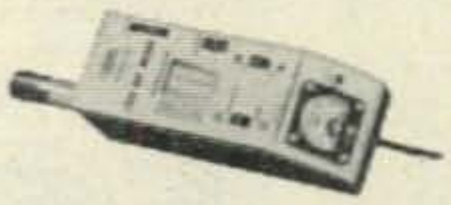
HIGH-LEVEL UNIVERSAL MODULATOR-DRIVER #730
Kit **$49.95** Wired **$79.95**
Delivers 50W undistorted audio for phone operation. Can plate-modulate transmitters having RF inputs up to 100W. Unique over-modulation indicator. Cover E-5 $4.50.



GRID DIP METER #710
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Includes complete set of coils for full band coverage. Continuous coverage 400 kc to 250 mc. 500 ua meter.

PEAK-TO-PEAK VTVM #232
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For further information, check number 10, on page 126

Zero Bandwidth

Editor, *CQ:*

I have been using sweep modulation for three years, and the results are really surprising! Five by nine reports from all corners of the world on 160 meters! My only complaint about the article is that Dr. Gitchagoome did not mention the latest method of attaining zero-bandwidth modulation—the Necio DeAbril Gogometer developed in the electronics labs of the University of Madrid. This inexpensive instrument takes advantage of the negative blanking characteristics of the Zener Diode and modulates the antenna by increasing the voltage input of a 5000 r.p.m. motor while blanking the 5000 cycle tone thus produced with a diode-fed Fitch-Gorsner Filter.

Kenneth Hirsch, K9TMD
2018 Linden Ave.
Highland Park, Ill.

Editor, *CQ:*

Congratulations on your spoof of "Zero Bandwidth Modulation". This was very nicely done and quite elaborately executed. It was such a work of prose that even the author's "name" sounds like it was taken from out of something written by Longfellow.

In the section called "Brush up on Theory", the heuristic approach taken towards sidebands and the independence of the carrier is quite amusing. If anyone were to take it seriously, it could completely destroy all of the progress made by the reader toward understanding amplitude modulation.

The obvious answer to the question posed is to use more conventional techniques to modulate or "vary" the signals applied to the antennas. Perhaps it should be emphasized that "sweep" modulation produces the same number of sidebands; two, and occupies the same bandwidth, twice the maximum modulating frequency, as any other scheme for amplitude modulation. It should be noted that sweep modulation or conical scanning has been used in radar-tracking control systems. The received signal is a normal carrier plus both sidebands signal even though the carrier was not modulated, per se, since the field strength was modulated and the result is equivalent.

The whole joke can be most easily seen by looking at the basic mathematics of amplitude modulation (but then they weren't presented). Please be sure to let everyone know that "Zero Bandwidth Modulation" is not accomplished by sweep modulation . . .

Robert B. Kelley, WA6KQA
2930 Colorado Ave.
Santa Monica, Calif.

Pennsylvania

The Sixth Annual Hamfest of the four York County Amateur Radio Clubs will be held on August 27th at the Dover, Pa. Fire Hall. Registration starts at 10:00 A.M. Plenty of free parking, auctions, soft drinks, games and door prizes for the entire family. Clowns and movies for the jr. ops. Talk-in frequencies, 50.62, 28.65 and 145.59 mc. Tickets $1.00 in advance or $1.25 at the gate; includes family or guest. For tickets, write John Zett, W3FLD, 2740 Grandview Ave., York, Pa.

East Coast V.h.f. Society

The East Coast V.h.f. Society, Inc. will hold its 3rd Annual old style picnic and hamfest starting at 10 A.M. on Sunday, August 13th at Saddle Brook Park, Saddle Brook, N. J. (rain date Sunday, August 20th). Free registration for all. Prize contests, drawings, games, displays of equipment, and other interesting events for all ages have been planned to make attendance at this hamfest both memorable and profitable. Food and soft drinks will be available at a nominal charge for those not bringing their own. The Society already well-known in amateur radio circles for its hospitality, once again extends a warm invitation to young and old alike.

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Manitoba

The Manitoba Hamfest sponsored by the Brandon A.R.C. will take place September 2nd and 3rd at Brandon, Manitoba. Saturday evening will be a social get-acquainted party and Sunday will be the hamfest activities, ending with a banquet. Prizes will be distributed. Advance registration required for the banquet; $5.00 per couple or $3.00 single. VE4KN will fill in on incidentals; her QTH is 715 7th St., Brandon, Manitoba, Canada.

Optometrists

K5RAB is making a last call for all those who may be eligible to join the long list of O.D.'s being compiled for distribution. K5RAB is Dr. Dan Monaghan, O.D., 112 S. Ninth St., P.O. Box 609, Garland, Texas.

North Penn A.R.C.

The North Penn A.R.C. of Harleysville, Pa. (club call W3BTN) informs us that K3HNW has been recently elected as president and W3NCW secretary.

Land of Lincoln

August 26 and 27th will mark the first time Springfield, Illinois will host an A.R.R.L. convention. Named the "Land of Lincoln" Convention, headquarters will be contained in the St. Nicholas Hotel located in Springfield. Neighboring clubs from Peoria, Mason City and Decatur are expected to help the local gang make this convention a real success. Information and registration may be obtained by calling or writing the Land of Lincoln A.R.R.L. Convention Office, 104 N Sixth St., Springfield, Illinois.

Illinois

The Egyptian Radio Club will hold its annual hamboree on September 24. There will be games for young and old and prizes galore. Take Route 66-40 to the Chain-of-Rocks Navigational Canal near Granite City, Illinois and follow the signs to the Club grounds. Come out and make a day of it; there will be plenty of food and drinks for all.

Florida Contest

The Flamingo Net of Miami Florida invites all amateurs both Stateside and DX to contact its members during the weekend of October 14th and 15th. This contest will be held on 10 meter phone only. It starts at 0500 GMT, Oct. 14 and ends 0500 GMT Oct. 16, 1961. The object of the contest is to work 10 or more Flamingos. For all amateurs working 10 or more active members, a Certificate will be awarded. No QSL cards will be required; only a list of contacts giving their station call, date, time contacted and their handles, plus, your complete address. All applications should be mailed to Moe Stabin, K4DJW, 1136 SW 74th Court, Miami, Florida. Persons wanting a complete list of active Flamingos may send K4DJW 10 cents in stamps for a copy.

A Net?

K1CBB is anxious to know if there's enough interest in organizing a net consisting only of amateurs in the printing or publishing business. He's at 20 Bradley Park Drive, Hingham, Mass.

Santa Cruz Certificate

The Santa Cruz Amateur Radio Club is now making available a new certificate. Any station outside the 50 United States requires 8 contacts with club members; U.S. stations are required to work 12 members. Application is made by sending a list of stations worked to Bob Campioni, WA6LCK, 1320 Bay St., Santa Cruz, California. Among the most active club members are; *WA6*BWP, CAM, FFV, GWM, HNW, KKL, KUL, LCK, OOY; *K6*LHG, LZK, OSX, UUG, UXV; *W6*FSD and NOE.

Virginia

The Shenandoah Valley A.R.C. will hold their annual Banquet and Hamfest on August 19 and 20. A steak banquet will be held on August 19 at the Lee-Jackson Dining Room in Winchester, Virginia, starting at 6:30 P.M. The Hamfest will be held at the National Guard Armory starting at 10 A.M. Registration for the hamfest is free and $2.50 per person will be charged for the banquet. Write for tickets to the S.V.A.R.C. at P.O. Box 139, Winchester, Virginia.

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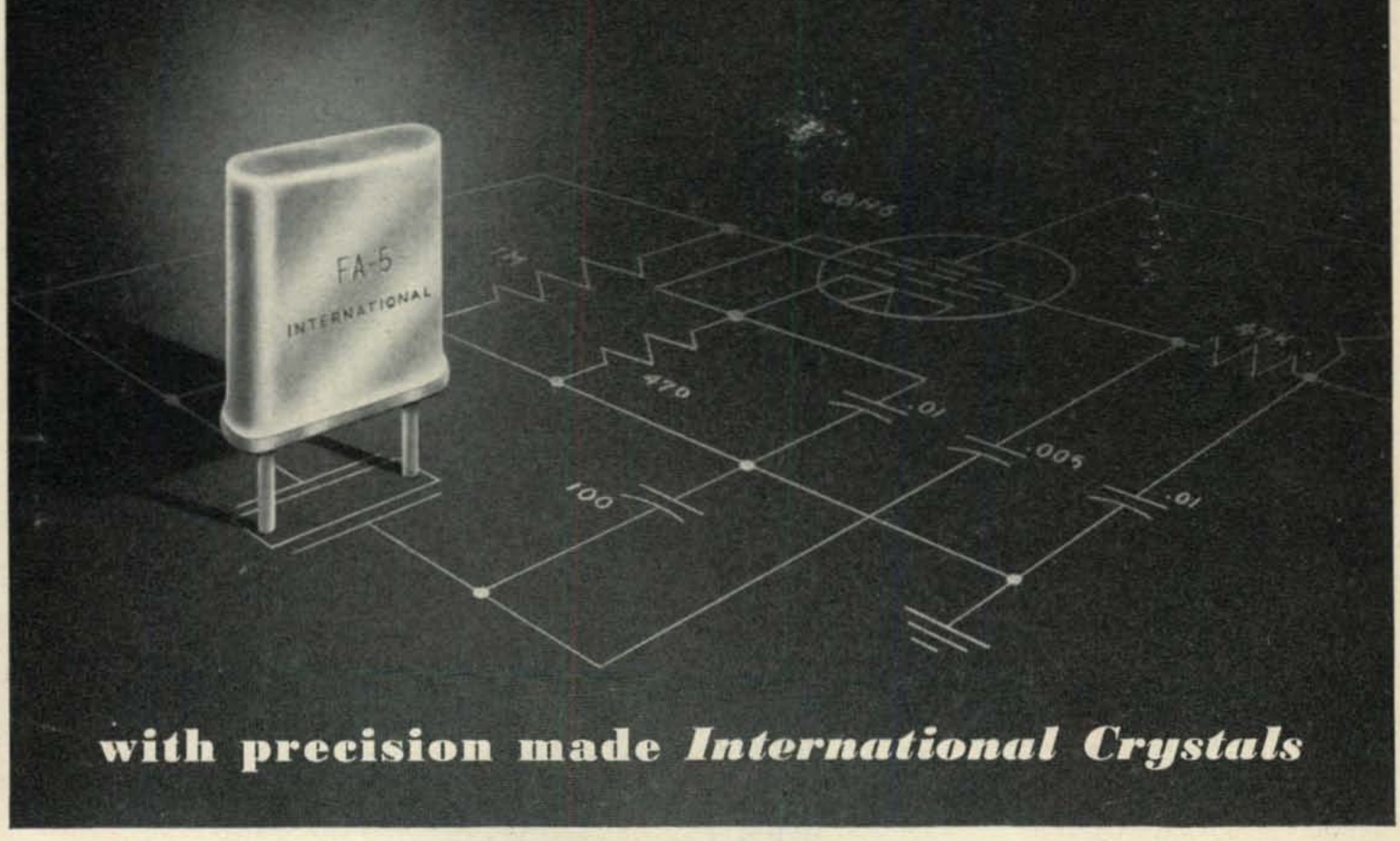

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For further information, check number 13, on page 126

South Jersey

The South Jersey Radio Association will sponsor its annual gala hamfest September 10, 1961, at Molia Farms, Malaga, New Jersey. Rain date will be the following weekend, September 17, 1961. Advance registration for non-club members is $1.50 with September 4, 1961 the deadline. General admission at the gate, $2.00. Day's activities will include 2 and 6 meter transmitter hunt, swap shop, OM, XYL and Harmonics door prizes. For Mobiles, there will be talk in by K2AA on 2, 6, 10 and 75 meters. All are invited to bring their lunch, swapping gear and enjoy a day of fun and excitement. Registrations are being handled by Earle Bond, K2QHM, 1173 Concord Drive, Haddonfield, New Jersey.

Indiana

The Second Annual 6 Meter FM Picnic sponsored by the Tri-State College Amateur Radio Club will be held on Sunday, August 6, three miles northwest of Angola, Ind. at the 4-H Park on the east side of Crooked Lake starting at 10 A.M. There will be Mobile check-ins on 52.525 and 52.640 mc using wide band f.m. Food and cold drinks will be available at the refreshment counter for a nominal charge, or you can bring your own. Some of the activities included will be Technical Talks, Swap and Shop, Ham Gear Auction, Frequency Measurements and Prize Drawings. There is a free public beach available for the XYL's and Children. Bring the family. For advance registration or additional information write to Tri-State College Amateur Radio Club, Angola, Indiana.

Oklahoma

The McCurtain County A.R.C. will sponsor their annual Hamfest on Saturday and Sunday, August 19th and 20th at the Beaver Bend State Park. All correspondence relating to the hamfest should be addressed to Elmer Poteet, K5PMR, P.O. Box 671, Idabel, Oklahoma.

Ohio

The Findlay Radio Club, W8FT, will hold its annual hamfest, Sunday, Sept. 10, at Riverside Park in Northeast Findlay, Ohio. Excellent playground facilities for the family. Two Elmac AF-68's will be door prizes. Special Ladies Bazaar. Talk-in on 3812 kc. Advance registration and information from C. E. Foltz, W8UN, 122 West Hobart, Findlay, Ohio.

Nebraska Counties Award

Don Morgan, KØTAJ informs us that the McCook A.R.C. of McCook, Nebraska is announcing a Worked All Counties Nebraska award. The first certificate will be awarded for submitting proof of working 50 of the 93 possible Nebraska counties, with endorsements for each additional 10 counties. There is no charge for the certificate but it is asked that sufficient postage be enclosed for return of QSL cards. Cards should be submitted to the McCook Amateur Radio Club, in care of KØTAJ, Box 491, McCook, Nebraska.

Hamfesters A.R.C.

The Hamfesters Radio Club of Chicago will hold its 27th Annual Hamfest at Santa Fe Park on August 13th. This year's event is expected to be bigger and better than ever. The Hamfest Chairman is Bill Frcka, W9ALS and he will handle all correspondence from 3526 West 59th Place, Chicago 29, Illinois.

Old Old Timers

The "Super Elite" are anxious to know if you qualify as an Old Old Timer. Requirements: You must have held a valid amateur license for 40 years. They are also anxious to contact as many amateurs whose call was listed in the first Government *Call Book* back in 1913. The Club Secretary is Earl Williams, W2EG, 507 Wayside Road, Neptune, N. J.

Stolen

On or about May 22nd an Eldico, 100M s.s.b. transmitter and homebrew receiver, similar in style to the 100M was stolen from K2CBO. The receiver is easily identifiable in that the chassis is painted gold. Please write Murray Gellman at 1268 E. 12th Street, Brooklyn 30, N. Y., or phone DEwey 8-3040 or OWens 8-4800.

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Complete Rules Appear on Page 95 of The July Issue.

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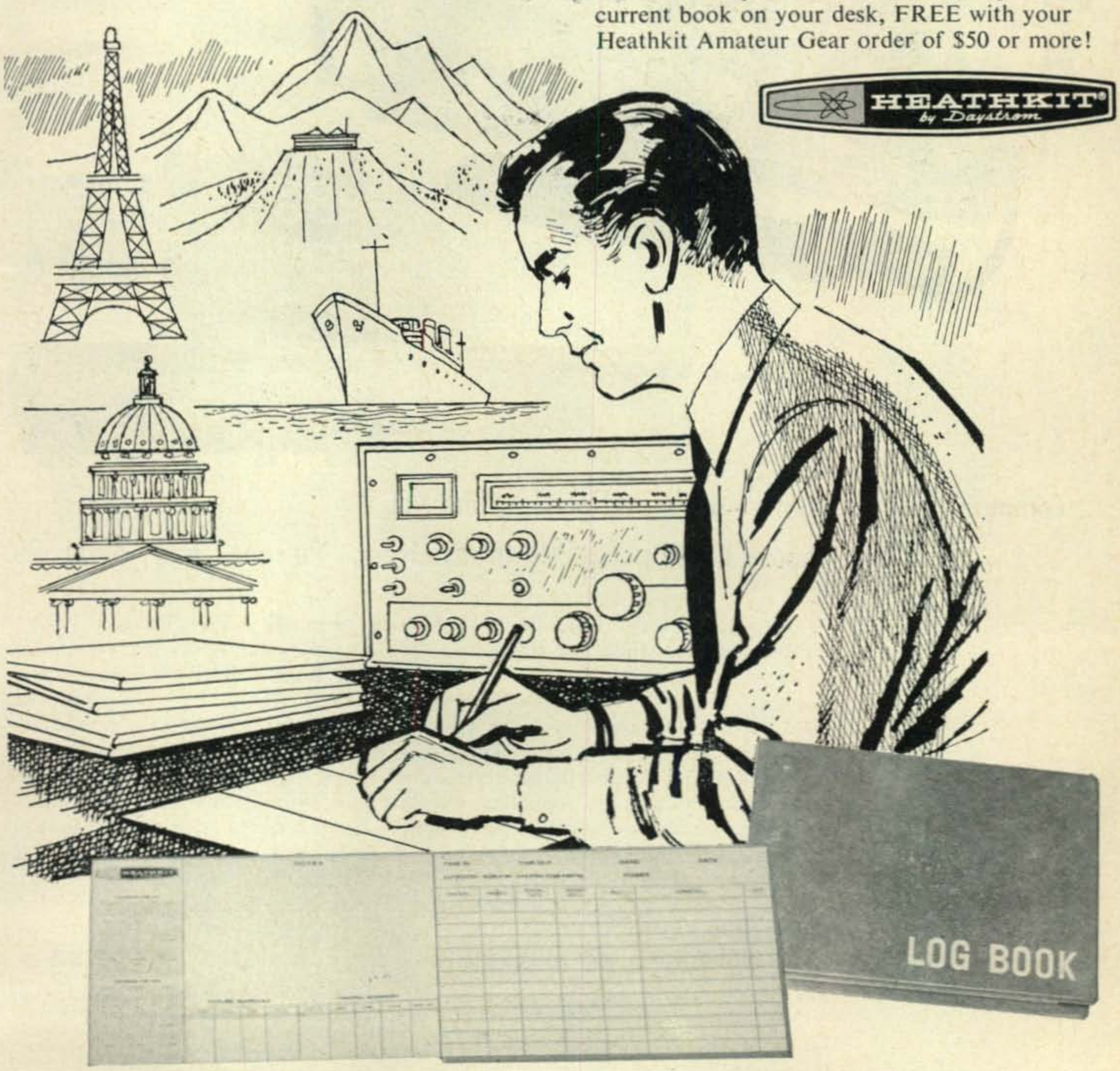

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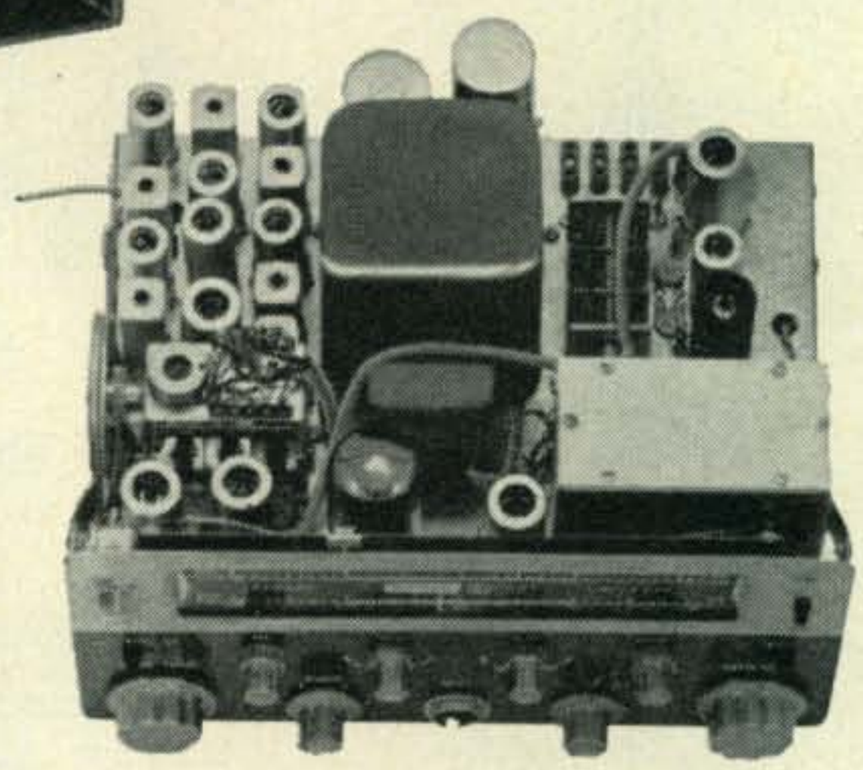

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KIT HW-10 (6 meter), **KIT HW-20** (2 meter)...$20 dn., $17 mo.....**$199.95** ea.

SPECIFICATIONS—Frequency coverage: (HW-20) 143.8 to 148.2 mc; (HW-10) 49.8 to 54.0 mc. **Noise figure:** (HW-20) 8.5 db or less; (HW-10) 6 db or less. **Sensitivity:** for 10 db S/N ratio, 0.5 uv or less. **Squelch sensitivity:** less than 1 uv. **Selectivity:** 15 kc at 6 db down. **Image rejection:** better than 70 db. **IF rejection:** 50 db. **Output impedance:** 50 to 72 ohms, unbalanced. **Transmit & receive power requirements:** At 6.3 vdc: 14.5 & 8.5 amps; at 12.6 vdc: 7.5 & 4.5 amps; at 117 vac: 120 & 60 watts.

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SPECIFICATIONS—Maximum power input: SSB-1000 watts P.E.P., CW-1000 watts, AM-400 watts (500 watts using controlled carrier modulation), RTTY-650 watts. **Output circuit:** Variable pi-network (50 to 75 ohms). **Driving power required:** 50 to 75 watts—depending on frequency. **Input circuit:** Broad banded—requires no tuning. **Input impedance:** 50 to 75 ohms. **Band coverage:** 80, 40, 20, 15, 10 meters. **Panel metering:** Switch-selected, grid current, plate current, high voltage and relative power output for ease of loading. **Tube complement:** 4-811A, 2-866A. **Size:** 19½" W. x 11⅝" H. x 16" D.

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"Full-fidelity voice reproduction—picks up the lows for that 'natural' sound for the first time!"
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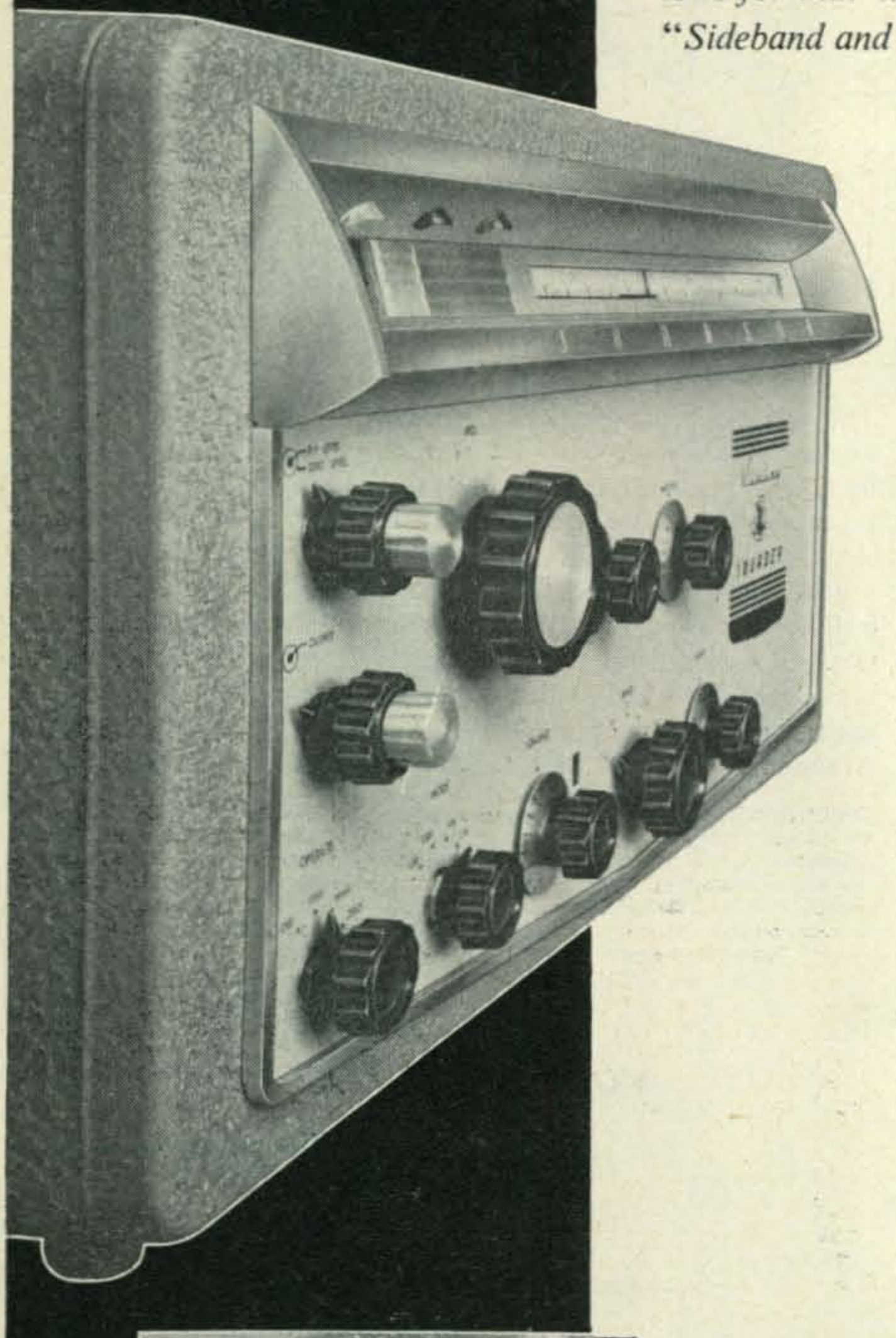
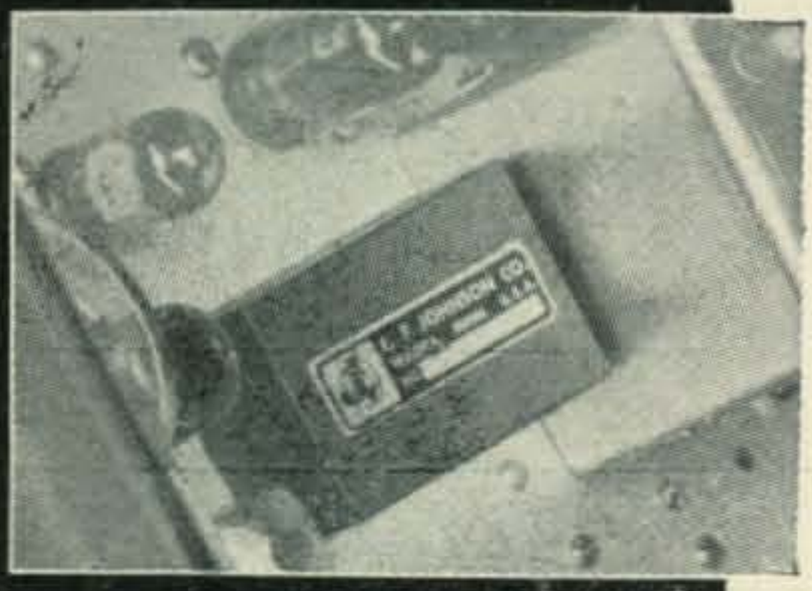


Here's the transmitter with the sharp, penetrating signal you've been waiting for—plus *more* exclusive operating and convenience features than any other SSB Transmitter on the market today! A classic of modern communication equipment design, the "Invader" offers instant bandswitching coverage 80 through 10 meters—no extra crystals to buy—no retuning necessary—delivers a solid 200 watts CW input; 200 watts SSB input; 90 watts input on AM! Unwanted sideband suppression is 60 db or better! Built-in VFO is differentially compensated. Exclusive RF controlled audio AGC and ALC (limiter type) provide greater average speech power—high gain push-to-talk audio system has plenty of reserve gain for either crystal or dynamic microphones. VOX and anti-trip circuits are extremely smooth in operation—built-in anti-trip matching transformer—adjustable VOX time delay circuit. Mixer-type shaped keying is crisp, sharp—click and chirp free. Single knob wide range pi-network output circuit—fully TVI suppressed. Blocking and operating bias for noise-free T-R switch operation.

Cat. No. 240-302-2—Wired and tested with tubes, crystals and crystal filter. **Amateur Net ....** **$619.50**



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EXCLUSIVE—Now, for the first time, not only **better** audio fidelity—but balanced audio response in a filter-type transmitter. The only equipment on the market using a specially developed high frequency, symmetrical, multi-section band-pass crystal filter for more than 60 db sideband suppression—more than 55 db carrier suppression! Select either upper or lower sideband instantly with a front panel "mode" switch.

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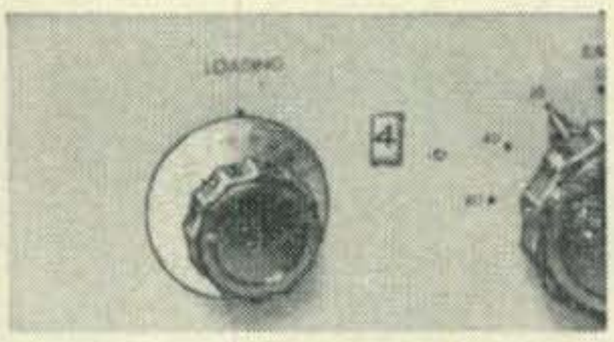
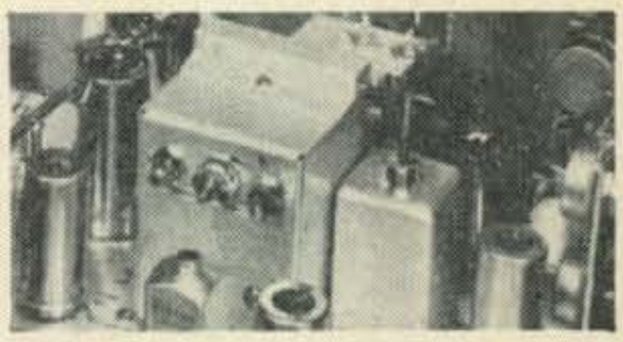
EXCLUSIVE—When converted to the Invader-2000—the only maximum legal power table-top unit available! (Remote power supply can be placed in any convenient location.)

EXCLUSIVE—The only transmitter with both limiter ALC and audio AGC for an **extra** sharp signal! Reduces overdriving and flat-topping—increases average audio level for greater penetration and the **best** signal anywhere!



EXCLUSIVE—Single-knob wide range output circuit makes it possible to load into just about any conceivable type of antenna!



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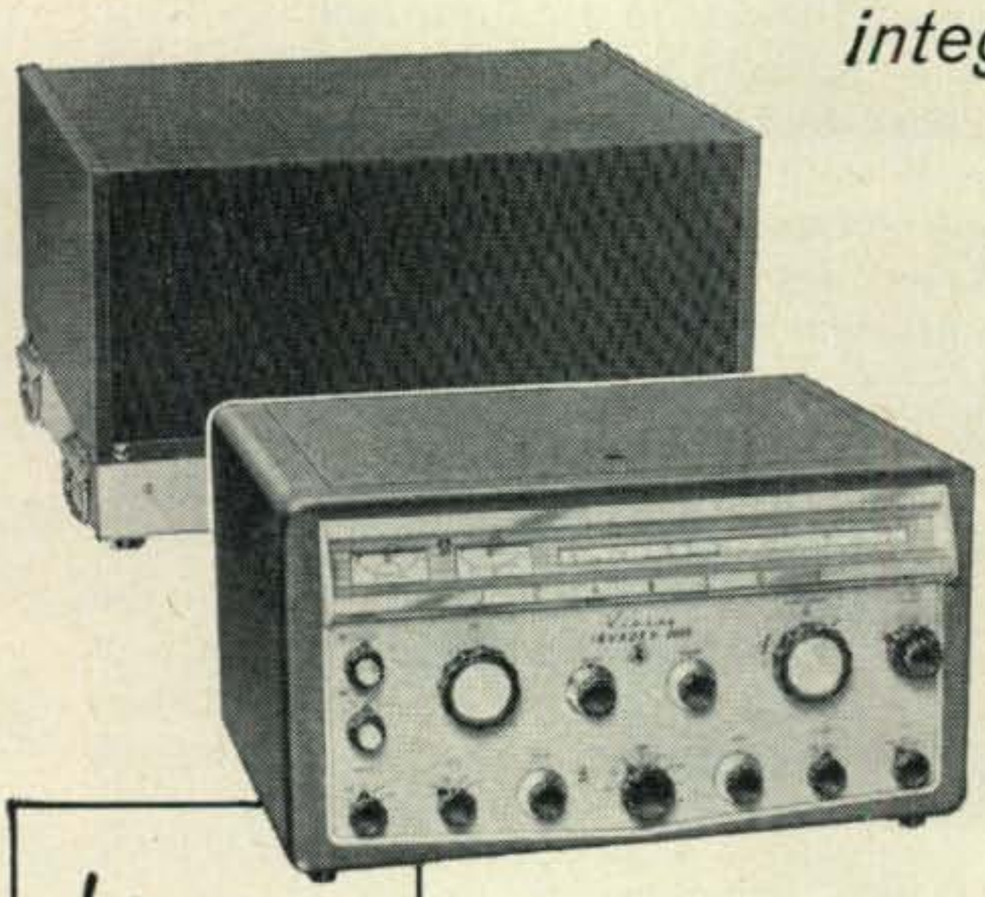

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For further information, check number 17, on page 126

The KW-2 Linear Amplifier

William I. Orr, W6SAI
Eitel-McCullough, Inc.
San Carlos, California

The KW-2 linear amplifier is designed for 2 kw p.e.p. sideband (1 kw c.w.) operation on all amateur bands between 10 and 80 meters. Employing a grounded grid circuit, the amplifier may be driven by any of the popular s.s.b. exciters having 70 to 100 watts output.

For the cost-conscious amateur, the grounded grid amplifier offers definite advantages. Of paramount importance is the elimination of costly bias and screen voltage supplies. Additional economy may be achieved through the use of a passive (untuned) input circuit. Simplicity of construction and the inherent stability of the grounded grid circuit eliminates the need of neutralizing components and complicated shielding. Dollar-for-dollar, a properly designed grounded grid amplifier is hard to equal with more conventional and complex circuits.

The KW-2 grounded grid linear amplifier is designed to operate at the maximum legal power level for c.w. and sideband service. Designed around a pair of 4-400A tubes, the unit may be run at reduced input with 4-250A, or 4-125A tubes. No circuit alterations are necessary when tube types are changed. A pi-network output circuit is used to permit matching to low impedance coaxial lines. Air tuning capacitors are used in the input and output sections of the plate pi-network in the interest of economy and with no sacrifice in performance. The complete amplifier is housed in a TVI-suppressed metal cabinet measuring 17¼" × 12" × 12½"—small enough to be placed on the operating table next to your receiver and exciter.

The Amplifier Circuit

A simplified schematic of the amplifier is shown in fig. 1. Two tetrode tubes are used in parallel, cathode driven, with grid and screen elements grounded for r.f. and d.c. Neither bias nor screen voltage are needed for this mode of operation. The exciting signal is applied to the filament circuit of the tubes, which is isolated from ground by an r.f. choke. No neutralization of the stage is required because of the excellent circuit isolation afforded by the grounded elements of the tubes. Control grid and plate current are monitored to establish the correct value of loading. A complete schematic of the amplifier is shown in fig. 2, including the metering circuits and TVI suppression devices.

The Input Circuit

The driving signal is fed, in a balanced manner, to the filament circuit of the two tubes. A disc ceramic capacitor is placed between the filament pins of each tube socket and excitation is applied to each tube through two 1250 volt, mica capacitors. Mica units are employed in place of ceramic capacitors because of the relatively high level of r.f. current flowing in this circuit which may cause capacitor heating if ceramic units are employed at this point. The filament circuit is wired with #10 wire to minimize voltage drop. RFC_1 is a Barker & Williamson 30 ampere choke having four separate windings. One set of windings is used for each tube. Liberal use of bypass capacitors at the "cold" ends of the choke windings ensures that no r.f. finds its way back into the filament transformer.

The "Grid" Circuit

The "grid" circuit comprises connections to the grid and screen terminals of the socket. Each screen terminal is grounded directly to the chassis of the amplifier. The best and easiest way to accomplish this is to bend the terminal lead of the socket down so that it touches the chassis.

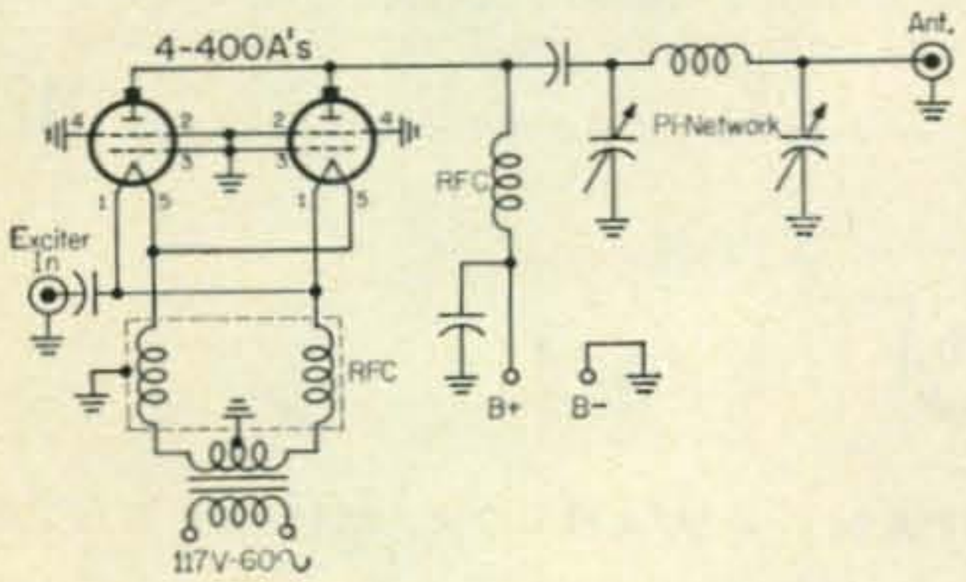


Fig. 1—Certain tetrode tubes (such as the 4-250A family) may be employed in grounded grid service, with screen and control grid grounded and driving power applied to the filament circuit. Bias and screen voltage are not required, and in many instances the amplifier does not require neutralization. Elimination of screen and bias supplies affords considerable savings for the cost-conscious amateur.

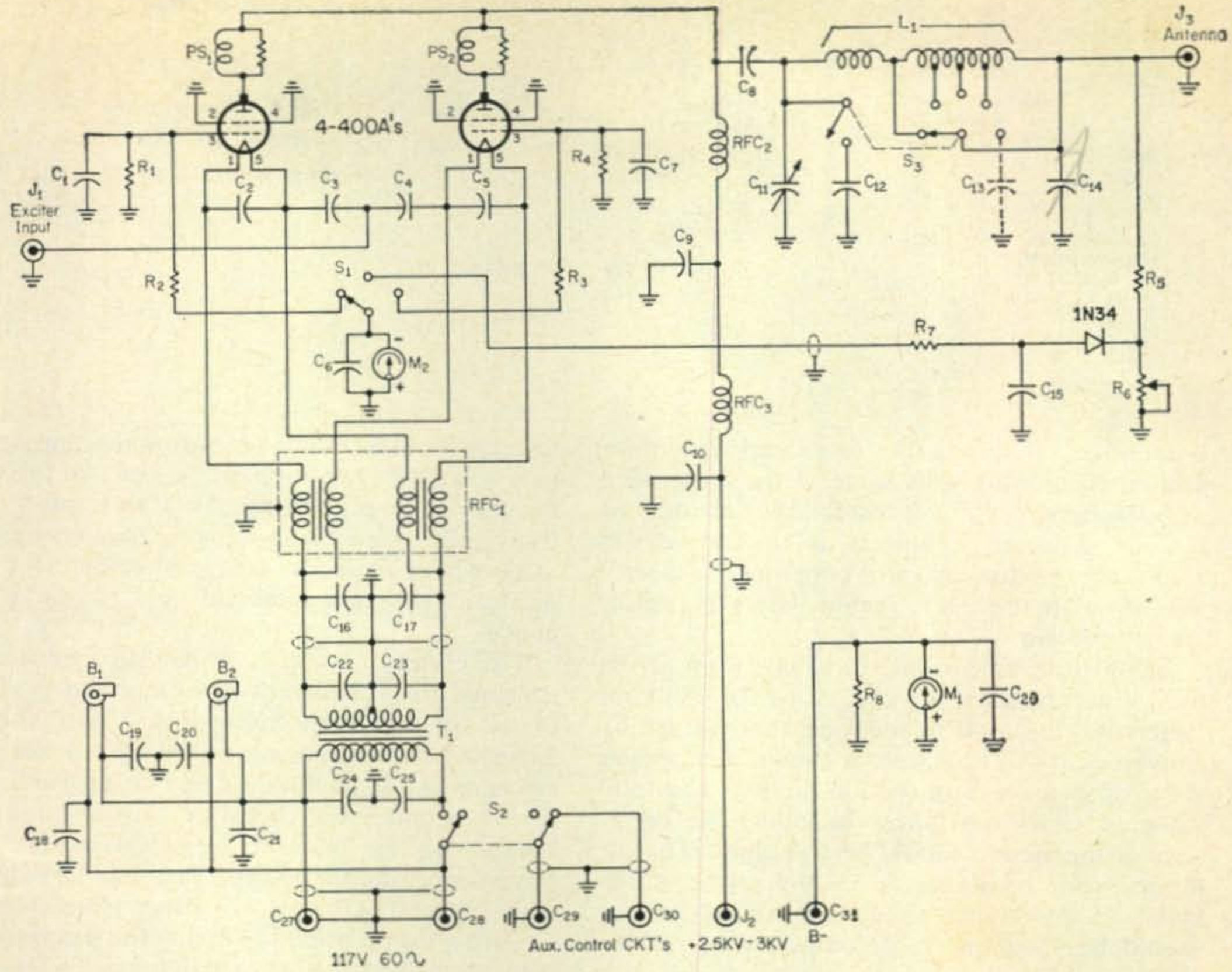


Fig. 2—Schematic of KW-2 Linear Amplifier, including parts list.

B_1, B_2 — Blower motor and fan. Barber-Coleman DYAB

C_1, C_2—.01 mf, 600 volt disc ceramic

C_3, C_4—.01 mf, 600 volt mica

C_5, C_6, C_7—.01 mf, 600 volt disc ceramic

C_8—.002 mf, 5 KV (2 Centralab 858-3, two .001's)

C_9, C_{10}—500 mmf, 10 KV (Mallory HV—20035B)

C_{11}—150 mmf 4500 volt, Johnson 150D45

C_{12}—50 mmf vacuum capacitor from Command Set

C_{13}—1000 mmf, 1250 v mica. See text.

C_{14}—1500 mmf Cardwell 8012 or Miller 2113 3 gang broadcast variable with sections parallel.

C_{15} to C_{26}—.01 mf 600 volt disc ceramics

C_{27} to C_{31} — .1 mfd 600 volt coaxial capacitor. Sprague Hypass 80P3

J_1, J_3—SO-239

J_2—H.v. Connector Millen 37001

L_1 — KW pi network coil, Air-Dux 195-25 (silver plated). Modify as follows: Strap coil; 3 turns 1¾" diam.; Wire coil, Remove turns from free end leaving 11½ t counting from the junction with tubing coil.

Tap placements:

10 m—1¾ t from junction of tubing and strap coil

15m—3¼ t as above

20 m—1½ t of wire coil counting from junction with tubing coil

40 m—5¼ t as above

80 m—complete coil

M_1—0-1000 ma, Triplett

M_2—0-1 ma, Triplett

PS_1, PS_2—3½ t #12E, ⅞" diam, 2" long. Wound around three 220 ohm 2 watt composition resistors connected in parallel.

R_1, R_4—1 ohm composition

R_2, R_3—See Text

R_5—220K 2 w

R_6—1K, 2 w pot.

R_7—2K, 1 w

R_8—10 ohms, 10 watts w.w.

RFC_1—30 amp filament choke, B&W FC-30

RFC_2—KW r.f. choke, Raypar or B&W 800

RFC_3—VHF choke, Ohmite Z-50

S_1—S.p. 3 position rotary

S_2—D.p.d.t. toggle

S_3—Communication Products Co., Marlboro, N. J., type #88. Single pole 7 position (5 used). Ceramic switch from "TU" type tuning units may be substituted.

T_1—5 v @ 30a. Stancor P-6468

Chassis and lead are then drilled simultaneously for a 4-40 machine screw. This configuration provides the shortest possible ground connection. This is important for the high order of stability required in grounded grid service.

Grid current is monitored by grounding the control grid of each tube through a 1-ohm composition resistor, bypassed by a .01 mf disc ceramic capacitor. The voltage drop across this resistor is measured by a simple voltmeter calibrated to read full scale when 100 milliamperes of grid current is flowing through the resistor. A single pole, double throw switch permits monitoring grid current of either tube. When loading

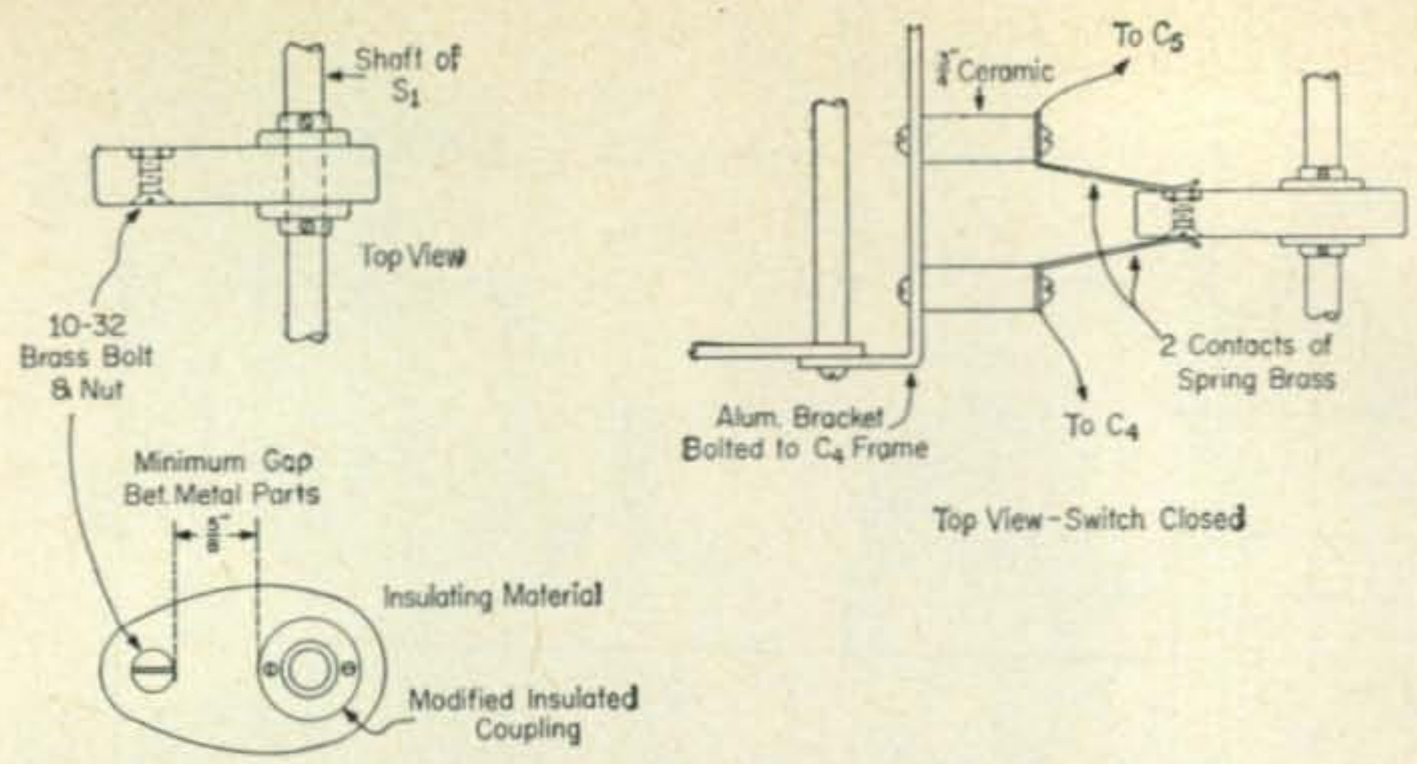


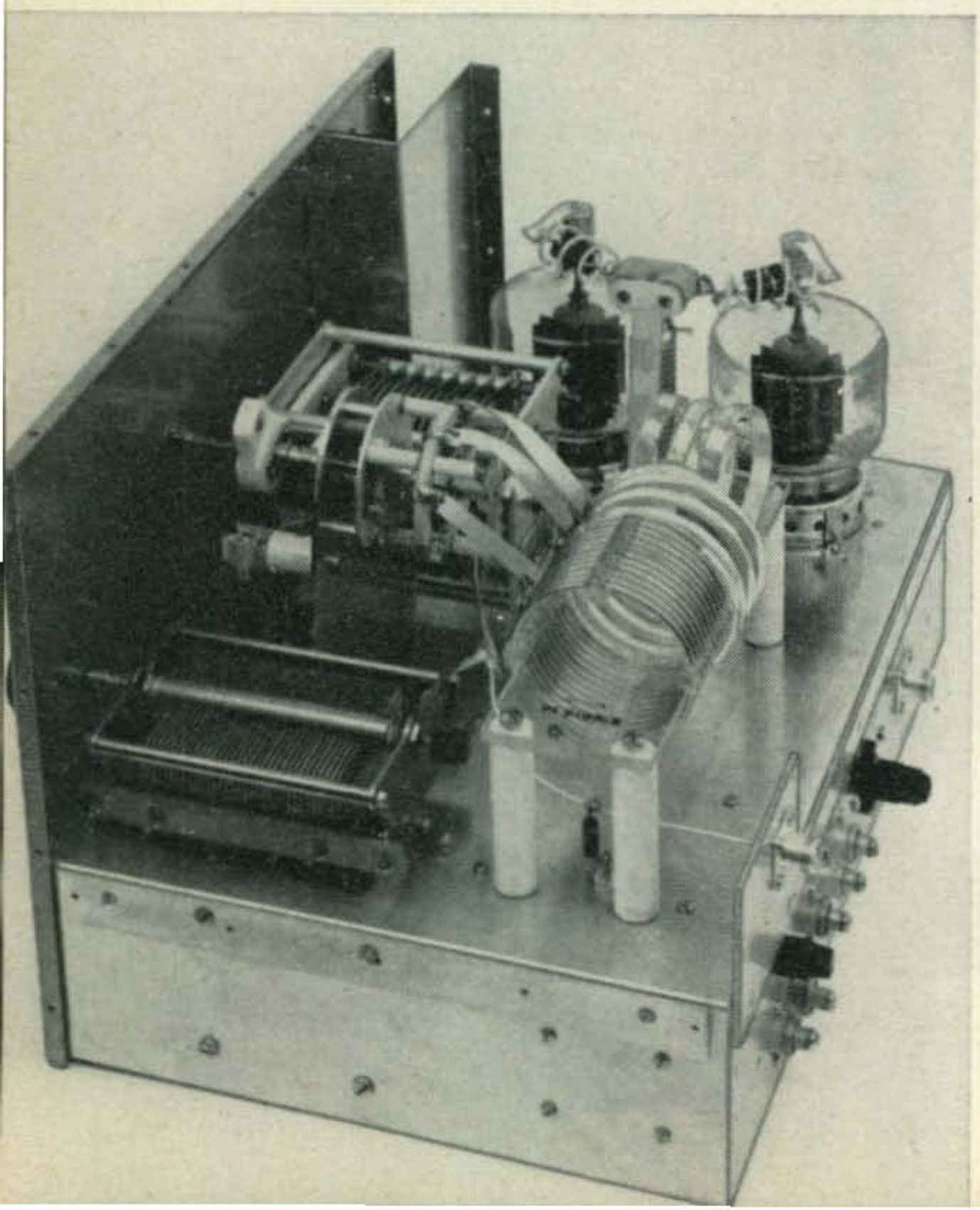
Fig. 3 — Construction of auxiliary 80 meter padding switch, part of S_1.

is incorrect, it is possible to exceed maximum grid current rating with some of the larger size s.s.b. exciters. No circuit instabil.ty is introduced by this metering technique as the impedance across the resistor-capacitor combination is very low, even in the v.h.f. region where parasitics are a problem.

At 100 ma grid current, the voltage drop across the 1 ohm resistor is 0.1 volt. A 0-1 d.c. milliammeter may be used to measure this voltage by converting it to a voltmeter as shown. The proper value of series resistor will do the job. The total value of series resistance (including the resistance of the meter) should be 100 ohms. That is, if the meter resistance is 55 ohms (the actual value of the meter used) the series resistor should be 45 ohms. A 47 ohm, 1-watt resistor can be used.

The Plate Circuit

Power is applied to the plate circuit via a heavy duty r.f. choke bypassed at the "cold" end by a 500 mmf, 10KV TV-type ceramic capacitor. In addition, a v.h.f. choke and capacitor are used to suppress high frequency harmonics that might pass down the plate lead and be radiated through the power supply wiring. Two .001 mf, 5 KV transmitting-type ceramic capacitors in parallel are used for the high voltage plate blocking capacitor. These are mounted atop the large r.f. choke.

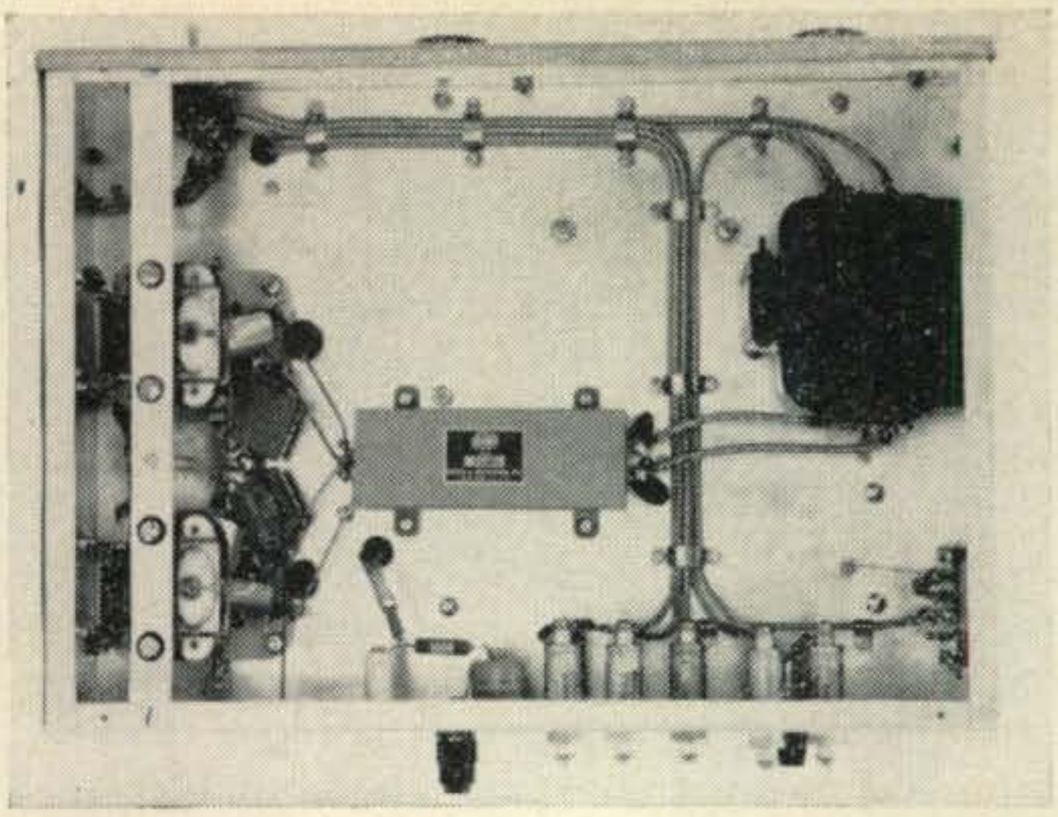


Bandswitch is mounted on aluminum plate, with vacuum padding capacitor affixed to fuse clips on opposite side of plate. Home-made high voltage switch section can be seen on shaft of bandswitch. Pi-net work loading capacitor is at edge of chassis. An inexpensive, four gang "broadcast-type" capacitor with paralleled sections may be substituted for this unit.

The pi-network coil is an Air-Dux inductance designed for 1 kilowatt operation, and is silver plated for minimum circuit loss. Use of the inexpensive version having tinned wire is not recommended for continuous service at maximum power. Connections between the coil and the bandswitch are made of ⅜ inch wide strap cut from copper flashing, available at any large hardware store. The straps are silver plated.

Care must be taken in affixing the straps to the turns of the coil, as the least amount of r.f. resistance at this point will cause dangerous temperatures to be built up in the coil windings. Only a slight amount of heat is required to melt the insulation of the coil. A good, low resistance mechanical connection is required between the strap and the coil. It is recommended that the strap be wrapped about the proper coil turn, and then bolted firmly in position by a 4-40 nut and bolt. After a good mechanical joint is made, it should be quickly soldered with the aid of a large soldering iron. Once a smooth, well soldered joint is made, the complete coil should be dunked in water to remove the residual heat left in the coil. Carefully clean the slight coat of silver oxide from the area of the coil where the connection is to be made and make sure you have a solid mechancial joint before you start your soldering operation and all will be well.

The straps are finally cut to length and bolted to the switch terminals with 4-40 hardware, and



Tube sockets are mounted at one end, with blowers affixed to aluminum strap beneath them. At the center is the multiple winding filament choke, with the filament transformer mounted to the wall of the chassis at the opposite end. Low voltage leads are run in shielded loom, bonded to the chassis by small clamps made of soft aluminum. "Hy-pass" feed-through capacitors are bolted to rear wall of chassis. The chassis is bolted to the front panel leaving 1/16" gap between bottom of chassis and panel to permit edge of cabinet to slip in.

the joint is then soldered as described previously.

A circuit *Q* of 10 was chosen to permit a reasonable value of capacitance to resonate the circuit at 80 meters. In this case, a 150 mmf variable capacitor is employed for operation *above* 80 meters, and an additional 50 mmf parallel capacitance is switched into the circuit for 80 meter operation. The padding capacitance is a small vacuum capacitor found in the surplus "Command" set antenna relay boxes. These capacitors seem to be plentiful and inexpensive. A satisfactory substitute would be a 50 mmf, 7KV mica capacitor, also available on the surplus market. Two 100 mmf, 5KV mica capacitors connected in series may also be used.

The pi-network output capacitor is a 1500 mmf unit. It is sufficiently large to permit 80 meter operation into reasonable load values. For operation with very low impedance antenna systems that are common on this band, the variable capacitor should be paralleled with a second capacitor. A 1000 mmf, 1250 volt mica unit is satisfactory. This capacitor may be connected to the vacant "80 meter" tap of the bandswitch, or it may be placed across the coaxial output connector of the amplifier.

Meters are shielded from r.f. field by a simple L-shaped aluminum plate which is bolted to chassis and panel and fastened to screened enclosure by sheet metal screws. Base rings of tubes are grounded to chassis by means of spring metal clips. Under-chassis air passes through ventilation holes in base rings.

Typical Operating Characteristics

4-125A

D.C. Plate Voltage	2000	2500	3000	volts
No-Signal D.C. Plate Current	10	15	20	ma
Single-Tone D.C. Plate Current	105	110	115	ma
Single-Tone D.C. Screen Current	30	30	30	ma
Single-Tone D.C. Grid Current	55	55	55	ma
Single-Tone Driving Power	16	16	16	watts
Driving Impedance	340	340	340	ohms
Load Impedance	10,500	13,500	15,700	ohms
Plate Input Power	210	275	345	watts
Plate Output Power	145	190	240	watts

4-400A

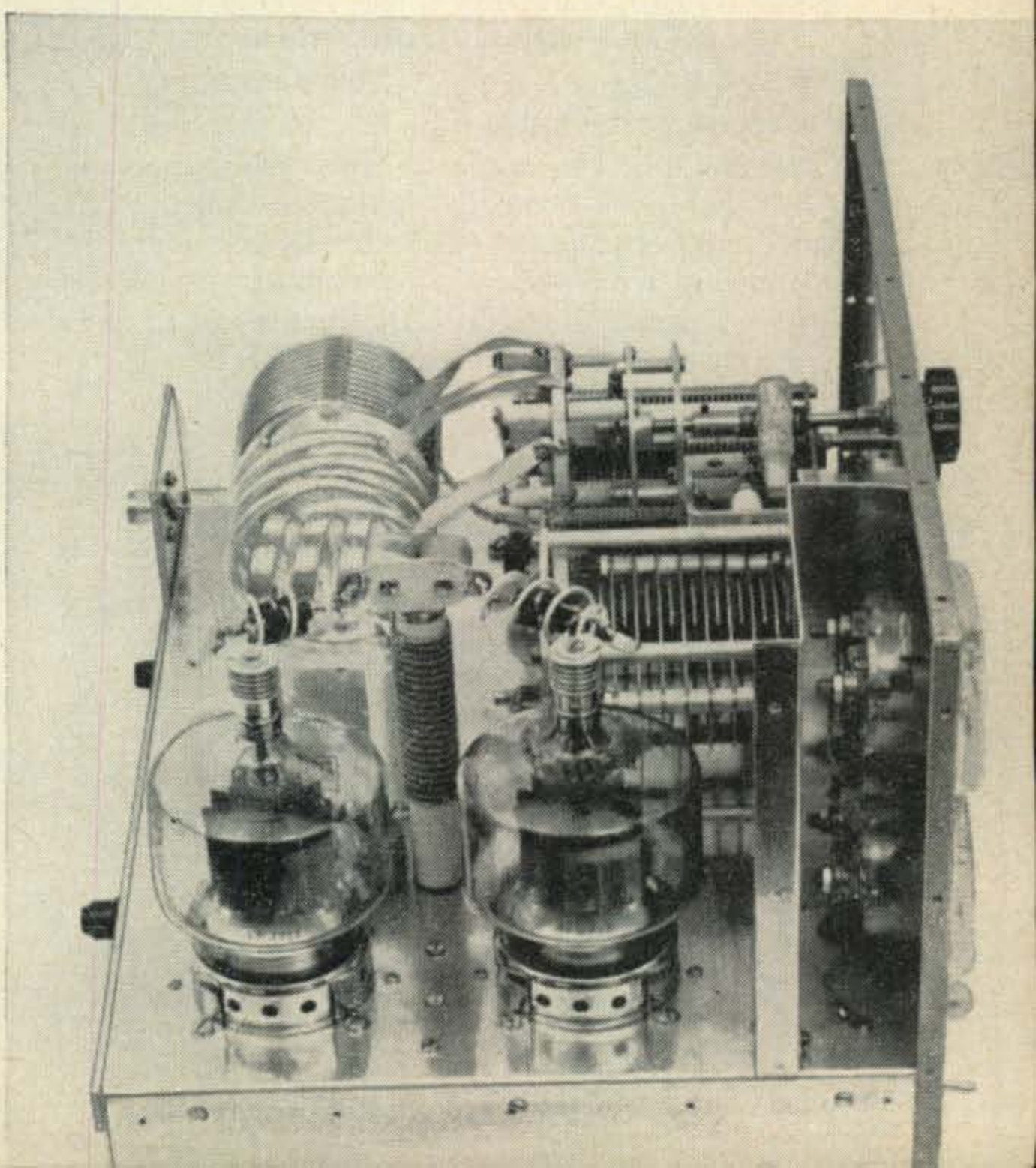
(ratings also apply to 4-250A, within plate dissipation rating of 4-250A)

D.C. Plate Voltage	2000	2500	3000	volts
Zero-Signal Plate Current	60	65	70	ma
Single-Tone Plate Current	265	270	310	ma
D.C. Screen Voltage	0	0	0	volts
Single-Tone Screen Current	55	55	55	ma
D.C. Grid Voltage	0	0	0	volts
Single-Tone Grid Current	100	100	100	ma
Single-Tone Driving Power	38	39	40	watts
Driving Impedance	160	150	140	ohms
Load Impedance	3950	5000	5700	ohms
Single-Tone Input Power	530	675	930	watts
Single-Tone Output Power	325	435	555	watts

4-1000A

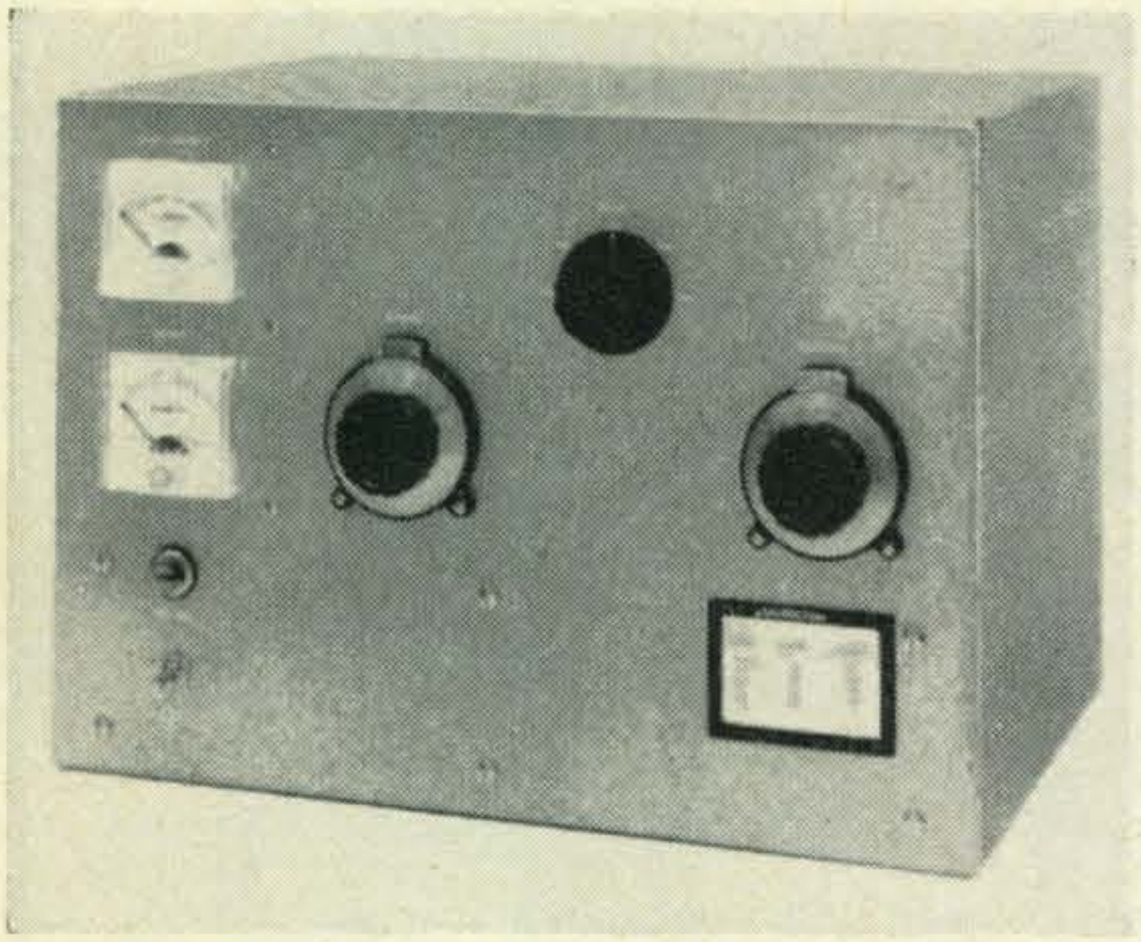
D.C. Plate Voltage	3000	4000	5000	volts
Zero-Signal Plate Current	100	120	150	ma
Single-Tone Plate Current	700	675	540	ma
D.C. Screen Voltage	0	0	0	volts
Single-Tone Screen Current	105	80	55	ma
D.C. Grid Voltage	0	0	0	volts
Single-Tone Grid Current	170	150	115	ma
Single-Tone Driving Power	130	105	70	watts
Driving Impedance	104	106	110	ohms
Load Impedance	2450	3450	5550	ohms
Single-Tone Input Power	2100	2700	2700	watts
Single-Tone Output Power	1475	1870	1900	watts

Characteristics shown are for tetrodes in grounded grid configuration (intermittent voice service). Meter readings for plate, grid and screen currents under voice conditions will be approximately one-half the single tone values.



The Output Metering Circuit

It is almost mandatory to have an output voltmeter on any linear amplifier. A simple r.f. voltmeter can be made up of an inexpensive germanium diode and a 0-1 d.c. milliammeter. The scale range is arbitrary, and may be set to any convenient value by adjusting the potentiometer in shunt with the meter. This control is placed on the rear apron of the amplifier. Once adjusted to provide a convenient reading at maximum output level of the amplifier, the control may be left alone. Under proper operating conditions, maximum meter reading will concur with resonant plate current dip, as read on the plate current meter.



At the left are the plate current and multi-purpose meter, with the pilot light and filament switch below the meters. At center is the plate circuit tuning capacitor, with the pi-network bandswitch to the right. At the right of the panel is the output loading capacitor of the network, with a calibrating chart directly below it. Since the photograph was taken, the pilot lamp has been removed and switch S_3 substituted in its place.

The Plate Current Meter

It is dangerous practice to place the plate current meter in the hot B plus lead of the amplifier unless the meter is insulated from ground, and is placed behind a protective panel so that the operator cannot touch it. This entails considerable mechanical work to make a neat installation. A simpler scheme is to place the meter in the negative power lead to the amplifier. If the meter is placed in the cathode return, as is commonly done, the meter will read the cathode current; which is a combination of plate, screen, and grid current. This is poor practice, as the reading is confusing and does not indicate the true plate current of the stage. A better idea is to place the meter in the B minus lead between the amplifier chassis (ground) and the power supply. The negative of the power supply thus has to be "ungrounded" or the meter will not read (see schematic). A protective resistor is placed across the meter to ensure that the negative side of the power supply remains close to ground potential. *Make sure* that the negative lead between the power supply and the amplifier is connected at all times, and that the chassis of the power supply and amplifier are bounded together. One sure way to kill yourself (with *any* high power equipment) is to neglect a common grounding lead between two units!

Cooling the Tubes

It is necessary to provide a modest current of cooling air about the base seals and the plate seal of the tubes, regardless of the tube type chosen for use. If small blowers are mounted beneath each tube socket it is possible to dispense with the special air sockets and chimneys, and use the more inexpensive "garden variety" of socket. A Barber-Coleman type DYAB fan and impeller are mounted in a vertical position centered on each socket, and about an inch below it. Cooling air is forced up through the socket holes and around the base seals and envelope of the tube. The perforated metal enclosure provides maximum ventilation, yet effectively "bottles up" the strong r.f. field about the amplifier. In order to permit air to be drawn into the bottom of the amplifier chassis, small rubber "feet" are placed at each corner of the amplifier enclosure, raising it about ½ inch above the surface upon which it sits.

Amplifier Construction

The amplifier is built upon an aluminum chassis measuring 13" × 17" × 3". Input circuit components, power circuits, and the blower motor are mounted below the chassis, and the plate circuit components are mounted above the deck. Placement of parts is not critical, except that the leads between the bandswitch

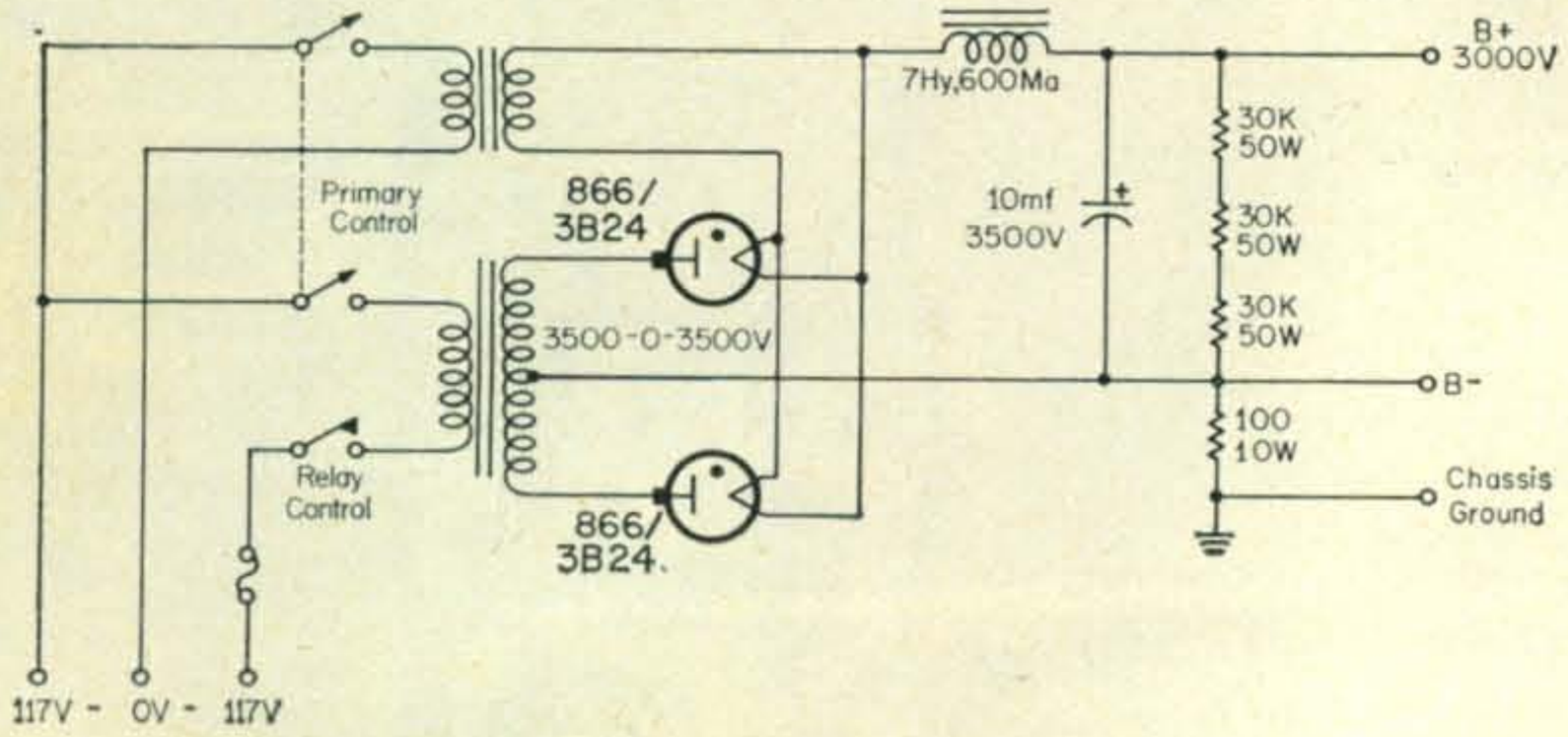


Fig. 5 — Typical power supply for KW-2 amplifier. The energizing coil of the control relay may be actuated by the VOX circuit of the exciter. Plate current metering takes place across the 100 ohm, 10 watt resistor in the negative return of the power supply.

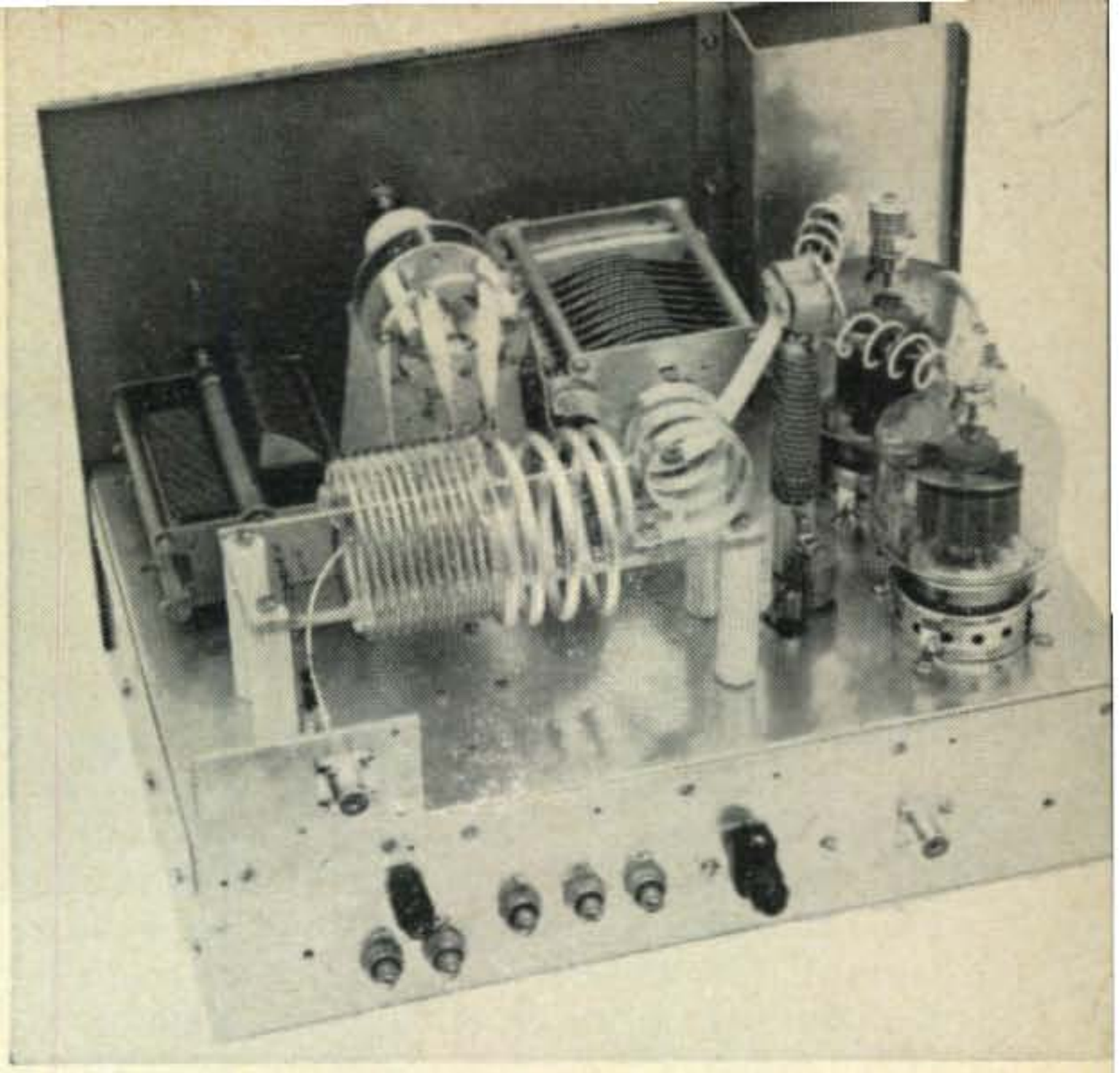


Plate circuit components are mounted above chassis. Across rear "apron" of chassis are various coaxial feed-through capacitors for power leads, line fuse, and coaxial input receptacle. Output receptacle is mounted above chassis in a small metal bracket. Pi-network coil is mounted on four ceramic pillars, and the bandswitch is mounted on a sturdy aluminum bracket. The bandswitch is commercial product, but an equivalent item may be found in surplus "TU-type" tuning units. Meter shield may be seen at right, rear.

and the plate coil must be short, heavy, and direct. Three-eights inch, silver plated copper strap is used. The straps are bolted to the bandswitch terminals with 4-40 nuts and bolts. Low resistance joints are imperative at this point of the circuit. A poorly soldered coil or switch tap will heat up when the amplifier is in use and will waste large amounts of precious output power! Take your time, and do a good soldering job. To play safe, you can submerge the coil in a can of water, with just the top of the turns showing above the surface. This will prevent the body of the coil from overheating during the soldering process. It is also helpful to depress the turn on each side of the tap in order to provide sufficient clearance for the soldering iron. The turns may be depressed by placing the blade of a heavy screwdriver on the wire and hitting it with a smart tap.

The coil assembly is supported on four ceramic pillars, placed immediately behind the band change switch which is mounted behind the panel on a sturdy aluminum bracket. The coil is positioned so that the taps come off on the side nearest the switch.

A set of auxiliary bandswitch contacts are required to switch an extra padding capacitor into the circuit when the switch is thrown to the 80 meter position. A simple switch may be made up from the metal portions of an insulated coupling and a block of insulating material such as teflon, lucite; or micarta. The insulated disc of the coupling is removed, and an oval disc of insulating material is substituted. This assembly is placed on the shaft of the bandswitch. A set of spring contacts are mounted on small standoff insulators attached to the side of the plate tuning capacitor and positioned so that the disc rotates between the contacts as the bandswitch is turned. A hole is drilled in the disc and a flathead 8-32 brass machine screw is passed through the disc. A nut is run on the screw, and the screw end and nut head are filed flat. When the bandswitch is placed in the 80 meter position, contact is made between the two spring arms through the brass screw which closes the space between the switch contacts as shown in figure 3.

Amplifier Layout

Looking at the amplifier chassis from the back, the tube sockets are placed at the right end of the chassis with the plate r.f. choke between the tubes. The two coupling capacitors are affixed to the top terminal of the choke by means of a brass strap. The 500 mmf, 10 KV TV-type bypass capacitor is placed at the foot of the choke.

The two panel meters are mounted one above the other on the left portion of the front panel (see photograph). An aluminum shield plate is placed around the rear of the meters to protect them from the strong r.f. field of the tubes. Meter terminals are bypassed, and the meter leads are run in shielded braid.

Beneath the chassis, the filament transformer is mounted to the side apron, and the dual winding filament choke is placed between the transformer and the tube sockets. The two blower motors are attached to an aluminum strip that holds them in position under the tube sockets. The strip, in turn, is bolted to the lower chassis flange by flathead bolts. The bolts holding the blowers pass through rubber grommets mounted on the strip. This deadens blower noise to a large degree.

Amplifier Adjustment

Typical operating conditions for various tubes in grounded grid service are tabulated in the chart. For initial tune-up, four or five hundred volts plate potential is applied to the amplifier and sufficient grid drive is supplied (five watts or so) to provide an indication on the plate meter. The loading capacitor is set at maximum capacitance and the plate tuning capacitor is adjusted for resonance, which is indicated by the customary dip in the plate current reading. When resonance is established, excitation is removed and full plate voltage applied to the amplifier and resting plate current compared with that value shown in the table. If all is well, a steady excitation signal (carrier) is applied to the amplifier for adjustment purposes. The signal may be generated by carrier injection, or by tone modulation of an s.s.b. exciter.

Caution! Do not apply full excitation to any grounded grid amplifier without plate voltage on the stage, or with the stage improperly loaded. Under improper tuning and loading conditions, driving power normally fed to the output circuit becomes available to heat the control grid of the tube to destructive temperatures. Adjustable control of the excitation level is *mandatory*.

Experience has shown that the proper ratio between excitation and loading is achieved when the amplifier is loaded for *maximum output* at any given value of excitation. Maximum grid current for two 4-400A tubes, for example is 200 ma. At 3000 volts plate potential, the amplifier should be loaded to an input level where the grid current approaches the above value, at the point where the output (as measured on the plate circuit voltmeter) ceases to rise. Under c.w. conditions (steady carrier) this will be a plate input of 3000 volts at 330 ma. Driving power will be approximately 30 watts per tube. Sideband power input will be 1000 watts p.e.p. For conditions of maximum linearity, antenna coupling should be *increased* beyond this point so that the r.f. output (as read on the voltmeter) *decreases* by about two percent. For so-called "2 k-w, p.e.p." conditions it is necessary to have a special test signal that will permit a d.c. input of one kilowatt to be run, or the legal power input will be exceeded during the tuning process. A two tone test signal will permit loading the amplifier to a p.e.p. input level of about 1.6 kilowatts with a "meter reading" of one kilowatt. However, since neither this amplifier (nor most power supplies) are designed for continuous service at 2 kilowatts, some means must be devised to tune and adjust a "legal 2 kilowatt p.e.p." linear amplifier without exceeding the limitations of the equipment and the F.C.C. A proper test signal will permit you to do this. Some form of signal having a high peak to average power ratio will do the

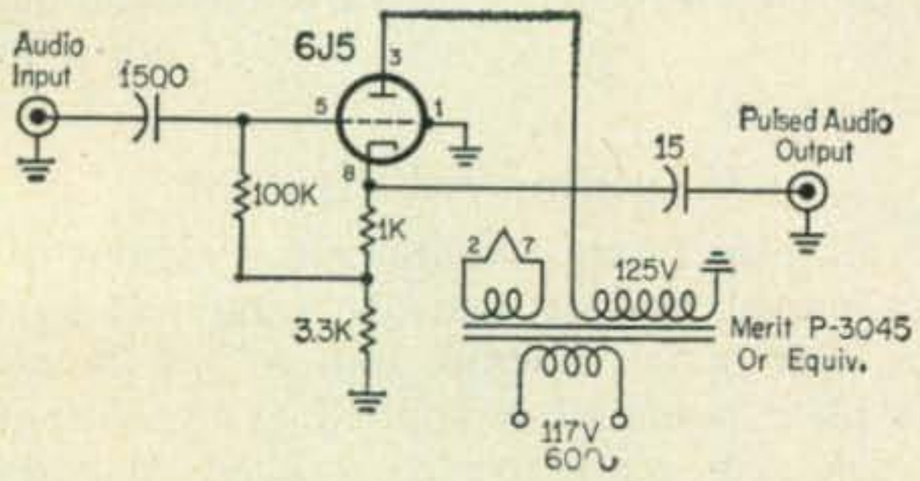


Fig. 6—A simple audio pulser may be used to lower the average power input to the amplifier for "2 kilowatt, p.e.p." tune-up conditions. Using two tone input to the pulser, a d.c. indicated input of less than 900 watts provides maximum p.e.p. conditions suitable for proper amplifier loading.

job, permitting the amplifier to run at less than a kilowatt d.c. input while allowing the two kilowatt peak power level to be reached. This type of signal can be developed by an audio pulser.

A satisfactory pulsing unit is described in the A.R.R.L. Handbook *Single Sideband for the Radio Amateur* and also in *QST* magazine, August, 1957. The circuit is shown in fig. 6. The duty cycle of this simple pulser is about 0.44. This means that at the point the amplifier is tuned up for a d.c. power level of 880 watts, when using two tone injection, the peak envelope power will just reach the 2 kw level. Loading and drive adjustments for optimum linearity consistent with maximum power output may be conducted by this method.

If you have a husky power supply and a good, heavy duty dummy antenna, you can load the amplifier to two kilowatts d.c. input with a steady exciting tone and you will achieve the same results.

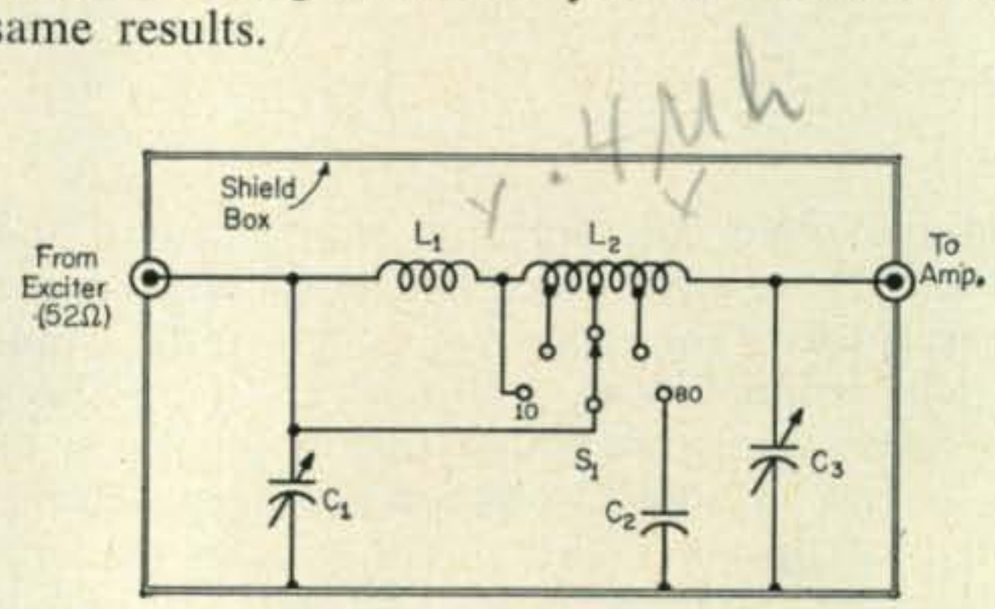


Fig. 7—Cathode matching network for coupling to 52 ohm "flat" lines. The unit is housed in a 4 × 5 × 6 inch box (Bud CU-3007).

C_1—1260 mmf (3 section broadcast type variable capacitor with the sections in parallel)
C_2—500 mmf mica capacitor
C_3—365 mmf, J. W. Miller, #2111
L_1—5 t #12, 1" diam., 1" long
L_2—17 t #16, 1¼" diam., 2⅛" long (B & W 3018)
21 mc—tapped 2 t from L_1
14 mc—tapped 4 t from L_1
7 mc—tapped 10 t from L_1

Coupling to Amplifier

As the input impedance of the amplifier is some value in excess of 50 ohms, a moderate value of s.w.r. will exist on the coaxial line coupling the amplifier to the exciter. With certain lengths of line, it may be found difficult to properly load the amplifier to maximum input. That is to say the mismatch between the amplifier and the exciter is sufficient so that proper loading is not achieved, and the amplifier does not receive the full value of excitation. A slight change in length of line will help to alleviate this trouble. Unfortunately, some sideband exciters are handicapped by having a non-adjustable pi-network output circuit with fixed loading designed for 50 ohms. This is a sticky situation indeed, and it may require a network to be placed between the exciter and the amplifier to achieve a proper match. A suitable network of this type is shown in fig. 7. Use of such a network is not a bad idea in any case, as it greatly simplifies the loading problem and eliminates any cable trimming that otherwise may be necessary.

Addenda

The cathode network should be placed directly at the filament circuit terminals of the amplifier, keeping the lead between capacitor C_3 and C_4 (fig. 2) very short. The amplifier plate circuit return to the cathode now passes through capacitor C_3 of the network instead of returning via the coaxial line and exciter tank circuit. In any grounded grid amplifier, the condition of maximum linearity may only be achieved by the use of such a network.

The network may be adjusted by placing an s.w.r. bridge in the coaxial line to the exciter. When properly tuned, maximum grid current to the amplifier will coincide with minimum s.w.r. on the line.

The question has been asked by various amateurs who have examined this amplifier if it would be modified to accommodate the new 3-400Z zero bias triode tubes[1]. The answer is a qualified "yes", with the qualification being that this particular unit was designed with one idea in mind; to provide the best possible grounded grid amplifier for 4-400A tubes at a modest price. Certain problems, therefore, arise when a specific design is asked to do something other than the task for which it was conceived.

[1]Orr, W. I. "The 3-400Z and 3-1000Z for Amateur Service", *CQ*, June, 1961, p. 56.

To modify the design for the 3-400Z tubes, the following problems must be taken into account:

1. Screen terminals 2 and 4 of each socket must be ungrounded and strapped to terminal 3, as the 3-400Z has three grid leads. Each grid terminal should be bypassed to ground.
2. The grid meter range must be extended to 300 ma, as the grid current of the zero bias triode is considerably higher than that of the tetrode.
3. Because of the compact size of the 3-400Z, additional cooling air is required. The blowers shown for the 4-400A's are inadequate for the smaller tube, and must be replaced by a suitable unit providing 15 cubic feet per minute for each tube. Suitable air sockets should also be used.
4. The resonant load impedance of the 3-400Z's is of the order of 1750 ohms for two tubes, compared to 2850 ohms for the 4-400A's. This requires that the capacitors of the pi-network be increased in value by 50 per cent and the plate coil modified accordingly. The tank circuit would, therefore, have to be redesigned to accommodate the extra capacity in the same space.

A slightly different design philosophy, therefore, would have to be used for the 3-400Z tubes, and it is hoped that an article covering an amplifier using these new tubes will be ready shortly. ■

When Capacitors Are Not

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For many years circuits have appeared in publications and commercial equipment for the amateur in which .001 and .005 mf disc ceramic capacitors have been used as bypass and coupling capacitors. However, one fact that most engineers have overlooked is that with one quarter inch lead lengths, a .001 mf disc capacitor is self resonant at about 60 mc, and a .005 mf disc capacitor is self resonant at about 20 mc. This means that a .005 mf disc capacitor, when used as a bypass at 50 mc, is really a nice large inductor. Its reactance *may* be small enough to allow some bypassing action, however, try removing one of these .005 capactiors from a v.h.f. circuit and see how much gain is lost. It won't be much. (These same self resonant capacitors are responsible for many of the unsuspected parasitic oscillations which turn up in amateur equipment.)

For high frequency use, a bypass capacitor should be self resonant slightly above the highest frequency to be used in that circuit. Exactly at the self resonant frequency of a capacitor, the impedance will be zero. To get the best bypass or coupling action, the capacitor should be chosen so that the zero impedance point falls near the particular frequency being used.

To find the self resonant frequency of a capacitor, solder the tips of the leads together and check it with a grid dip meter. Following is a table of resonant frequencies of various capacitors. These values will vary slightly with different manufacturers and voltage ratings, and they will vary consderably with lead lengths. The resonant frequency of a capacitor is an exponential function of the lead lengths. So, at high frequencies and very high frequencies, keep them short! ■

Resonant Frequencies of Typical Bypass Capacitors

½" × ¼" Micas		Disc Ceramics	
mmf	Resonant Frequency	mf	Resonant Frequency
47	206 mc	0.001	60 mc
100	154 mc	0.002	40 mc
270	90 mc	0.005	23 mc
390	70 mc	0.01	15 mc
470	60 mc	0.02	9 mc
560	50 mc	0.1	4.2 mc

BASIC SPECTRUM ANALYSIS

Part I Modulated Signal Analysis

Simon Rand, W2QZJ* and Chatland Whitmore, K2BAJ†

The first of a three part series on spectrum analysis is presented this month. This is a review of the fundamentals of signal distribution along the frequency spectrum and how the various sidebands in a modulated signal recombine to form the audio output. The authors introduce some unique illustrations and analogies to simplify the topic. The subsequent parts will deal with spectrum analyzer display analysis and the construction of a spectrum analyzer, the "Spectroscan."

THERE are many hams who desire a better understanding of how the various components of modulated signals are distributed along the frequency spectrum, how and why vectors are used in analyzing these signals, and also how sound or other information is conveyed and reproduced by them.

This article will attempt to explain these things, using a somewhat new approach. Great care has been taken to first: keep it simple; second: maintain continuity of thought; and third: explain in full, without frequent references to other sources. The final plum will be to familiarize the reader with spectrum analyzer displays. The spectrum analyzer opens up a new dimension in visual observation of the r.f. spectrum. So at this point let's begin.

Most hams are familiar with the modulated r.f. pattern as seen on a conventional oscilloscope. I can assure you that although this pattern is a useful one it does not give any hint as to the true nature of modulation sidebands and their relation to the carrier.

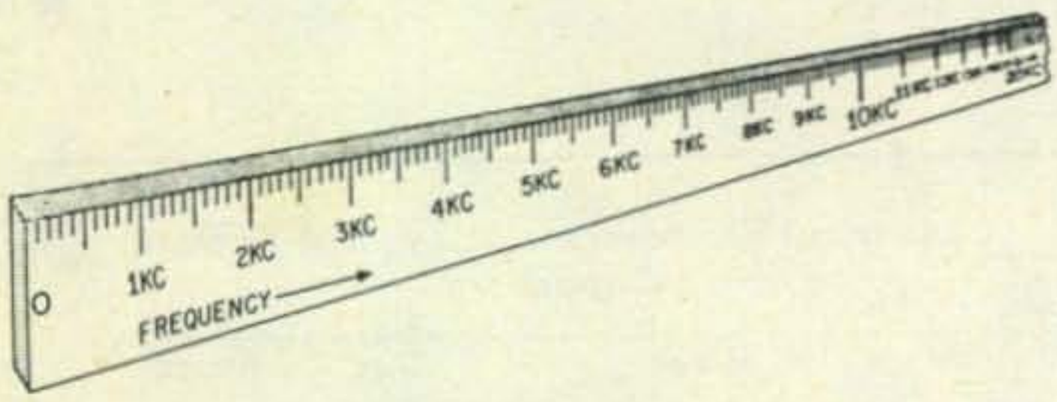

Fig. 1—A pictorial analogy of the r.f. spectrum. The left edge of the ruler represents zero cycles and the first inch represents 1 kc and each inch thereafter represents an additional 1 kc.

Such a display is merely the instantaneous sum of the amplitudes of all modulation and carrier frequencies. Now let's try to establish a true picture of these modulation components as they exist in the r.f. spectrum.

In order to avoid confusion when thinking of these different frequencies let's use an analogy from our own environment. Imagine a long ruler whose left edge, zero inches, is directly in front of us. Our ruler is infinitely long, so of course we cannot see the right edge. (fig. 1) We'll let zero inches represent zero cycles or d.c.; the first inch is one thousand cycles; the second is two kc; the third is three kc and so on. One hundred kc would be at the 100 inch mark, and one megacycle falls precisely on the 1000 inch mark. We can see that each frequency has its own place on our ruler and no other frequency can claim this position. This has established a dimension; the horizontal or X axis which will be referred to simply as the frequency axis from now on.

R.f. signals have another quality, that is strength or amplitude. We can represent this by a vertical line whose height is proportional to the relative strength of the signal. Now we have a second dimension; the vertical or Y axis. This will be referred to as the amplitude axis. (fig. 2)

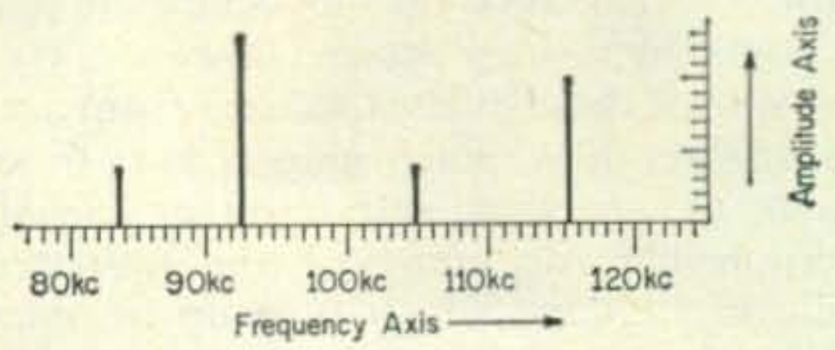

Fig. 2—Signals of various frequencies and amplitudes displayed along the frequency axis.

These two quantities are entirely independent. Any given frequency exists at only one point on the frequency axis whether its amplitude is one microvolt or one megavolt. Let me be more specific. Let's assume a signal is transmitted at 1 mc, and it is unmodulated; in other words, a pure r.f. carrier, and its stability is absolute. We

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will find that it exists only on one megacycle on the rule, not one cycle more or one cycle less, regardless of power.

Now let's see how the components of an a.m. modulated signal are distributed along the spectrum. For simplicity we will choose 100 kc as the carrier frequency. The modulation is a 1000 cycle tone. We now find two new frequencies in addition to the original carrier. One is at 99 kc (the lower sideband) and the other is at 101 kc (the upper sideband) as shown in fig. 3.

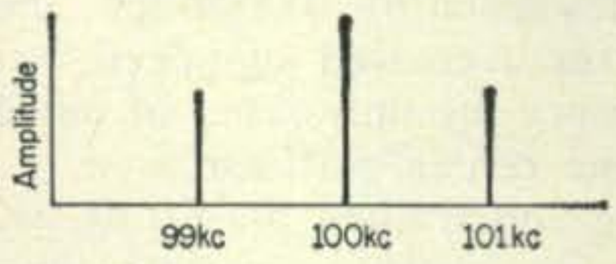


Fig. 3—Components of an amplitude modulated signal where the carrier is 100 kc and the modulating signal 1000 cycles.

To make our picture complete we will now add a third dimension; time. Figure 4 illustrates this time axis. Notice that fig. 4 is similar to fig. 3 in that it shows an a.m. signal; that is, a carrier with lower and upper sidebands.

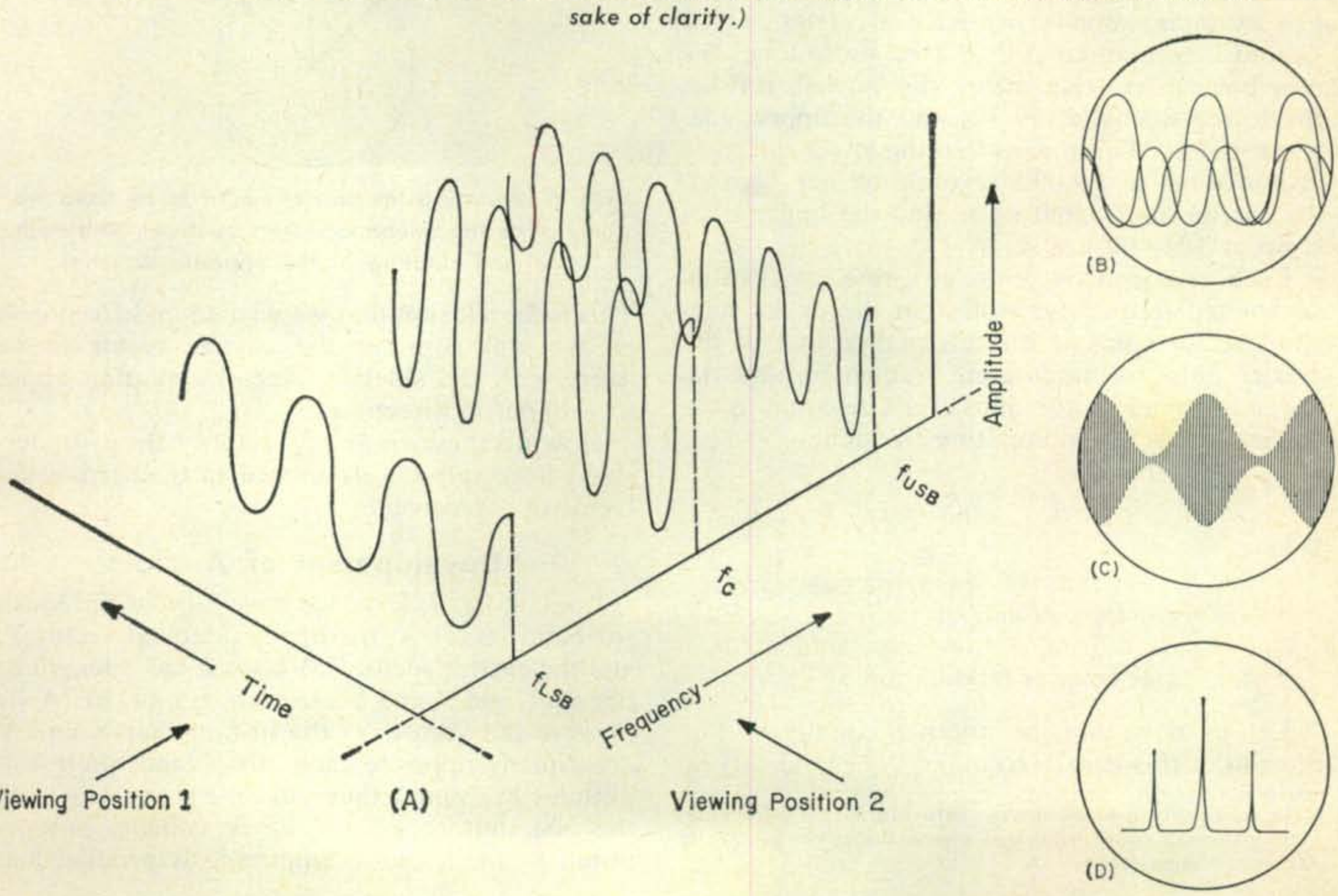
The difference in frequencies of these components has been greatly exaggerated for clarity. Two viewing positions are indicated in the figure. If you imagine yourself to be observing this three-dimensional illustration from position one, you will see the frequencies of each signal component displayed along the time axis. They appear as sine waves, each having a different number of cycles in a given length of time. The lower sideband is the lowest frequency and therefore has the least number of cycles per unit length along the time axis. The carrier is slightly higher in frequency and has more cycles in the same amount of time. The upper sideband has even more. If these three frequencies were each applied to the separate input channels of a three-beam 'scope, each channel being selective enough to accept only the one frequency desired, the display shown in fig. 4B would be observed. However if these three were applied simultaneously to the vertical plates of a regular 'scope, the display shown in fig. 4C would result. This is the familiar wave envelope pattern seen on a simple modulation monitor 'scope.

Now move to position two. From this location we are viewing these same frequencies, but they are seen on the frequency axis rather than the time axis. The result is illustrated in fig. 4D. This is similar to fig. 3, and both are typical of the presentation given by a high-resolution spectrum analyzer. We'll go into spectrum analysis in more detail later on, but first let's find out how vectors can help us understand modulation sidebands.

Vector Analysis

Referring again to fig. 4, we could consider that each wave has a corresponding vector, which

Fig. 4—(A) Presentation of the amplitude modulated signal components in three dimensions, time, frequency and amplitude. When viewed from position 1, the time axis, the individual waveforms, superimposed on each other, may be seen as in (B). This would be as shown on a three beam scope. The presentation of this combined signal, as seen on an ordinary scope, is shown in (C). When viewed from position 2, the signal will appear as shown in (D) which is a typical presentation of a high resolution spectrum analyzer. *(Liberties have been taken in the positioning of the zero reference lines for the sake of clarity.)*



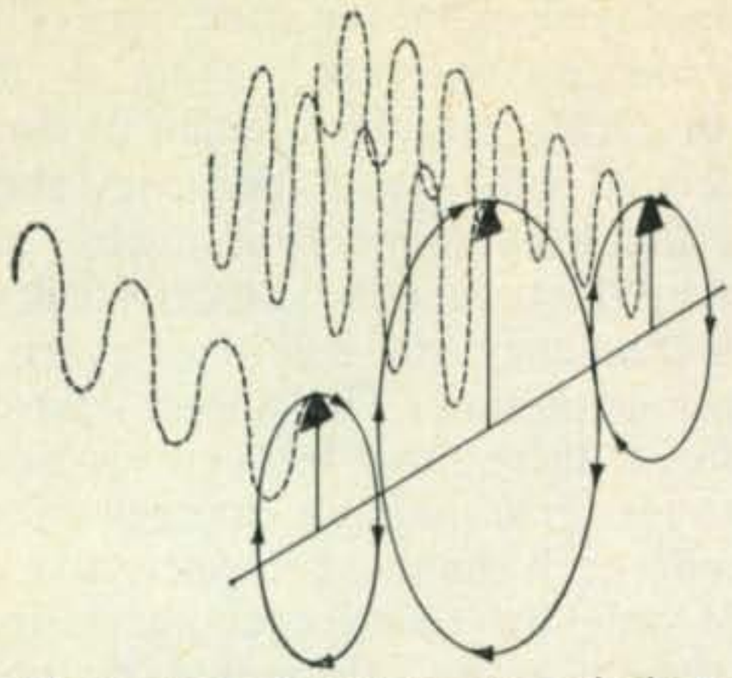


Fig. 5—The vectors are rotating in a clockwise direction about the frequency axis and each spins at a rate determined by its designated frequency as explained in the text.

is shown as an arrow rotating on the frequency axis. See fig. 5. This arrow rotates once for each cycle of the wave because one cycle is equal to 360 degrees. For two cycles the arrow will rotate twice, etc. The speed of the arrow's rotation is governed by the frequency. Figure 5 also shows that the carrier is represented by a vector of unit length, and the lower and upper sidebands are each represented by vectors of ½ unit length if the modulation is 100%.

Now that we have put the carrier and sidebands into vector form, we must call upon our imagination to create another important illusion.

Imagine each vector to be spinning about the frequency axis in a clockwise direction.[1] The speed of rotation is governed by the frequency of each component. The lower sideband is lowest in frequency and therefore it spins the slowest. The upper sideband is highest in frequency and it spins the fastest. The carrier being in between the two sidebands spins faster than the lower sideband, but slower than the upper sideband. For example, suppose we have a carrier at 100 kc and it is modulated by a 1 kc audio tone. We now have three frequencies; the carrier, 100 kc; the lower sideband, 99 kc; and the upper sideband, 101 kc. This means that the lower sideband vector spins at 99,000 revolutions per second; the carrier at 100,000 r.p.s.; and the upper sideband at 101,000 r.p.s.

Each vector arrow spins at a rate equal to its designated frequency. Note that the upper sideband vector spins at a rate equal to that of the carrier plus the modulating frequency, and the lower sideband vector spins at a rate equal to the carrier minus the modulating frequency.

That is:

$$f_{usb} = f_c + f_m, \text{ and } f_{lsb} = f_c - f_m.$$

Where:

f_{usb} = freq. of upper sideband
f_c = freq. of carrier
f_{lsb} = freq. of lower sideband
f_m = freq. of modulation

Let us now imagine another condition. The illusion in this case is to make the carrier arrow stand still and to use it as a reference.

To give an analogous example, assume you are standing on a platform in the void of space and this platform is travelling at 100,000 mph. Again assume that there are two more platforms, one in front of you and one trailing behind. All three platforms are traveling the same speed. You feel no wind in space, you see nothing but the three platforms, and so you sense no speed. As far as you are concerned all these platforms are standing still. Now what if the leading platform increased it's speed by 1000 m.p.h. and the trailing platform decreased its speed by the same amount? Since the only sense of movement you have on the center platform is a relative one, the leading and trailing platforms will seem to be speeding away from you with equal speed in opposite directions.

Now let's apply this thinking to the spinning vectors. Remember that all three arrows are spinning on the same axis and in a clockwise direction, but that the lower sideband vector is moving slightly slower and the upper slightly faster than the carrier. Now if you were to step upon the hub of the carrier arrow, facing toward it's point, you would be turning with the vector. Assume that you don't become dizzy and fall off, and, not feeling the rotating motion, you can imagine yourself to be standing still. The upper sideband vector, which was turning faster than the carrier, now appears to be rotating around you in a clockwise direction. The lower sideband vector was going slower than the carrier, so it now seems to rotate counterclockwise. See fig. 6.

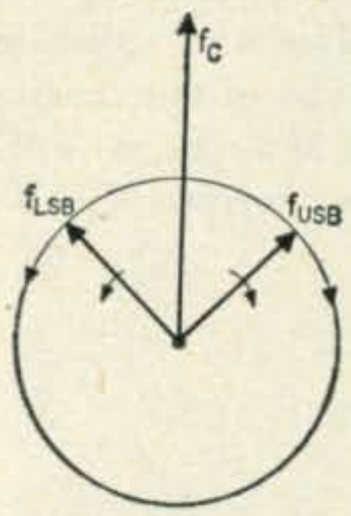


Fig. 6—Assuming the carrier vector to be fixed we may place the sideband vectors as shown with each sideband rotating in the opposite direction.

This is the illusion that we wanted and from now on we will consider the carrier vector to be fixed, with the sideband vectors rotating about it in opposite directions.

How do these spinning vectors help us understand how audio is developed in the second detector of a receiver?

Development of Audio

Look at fig. 7. Here we have labeled the lower sideband vector X, the upper sideband vector Y, and the carrier vector Z. Vector Z has a length of one unit, and X and Y are each ½ unit. In 7A we observe the vectors at the instant that X and Y are directly opposite each other. Since their amplitudes are equal they cancel out leaving only the one unit of carrier, Z. A voltage, proportional to the vector's amplitude is produced at

[1] The assumption of clockwise rotation is made for clarity, although counterclockwise rotation is the generally accepted convention.

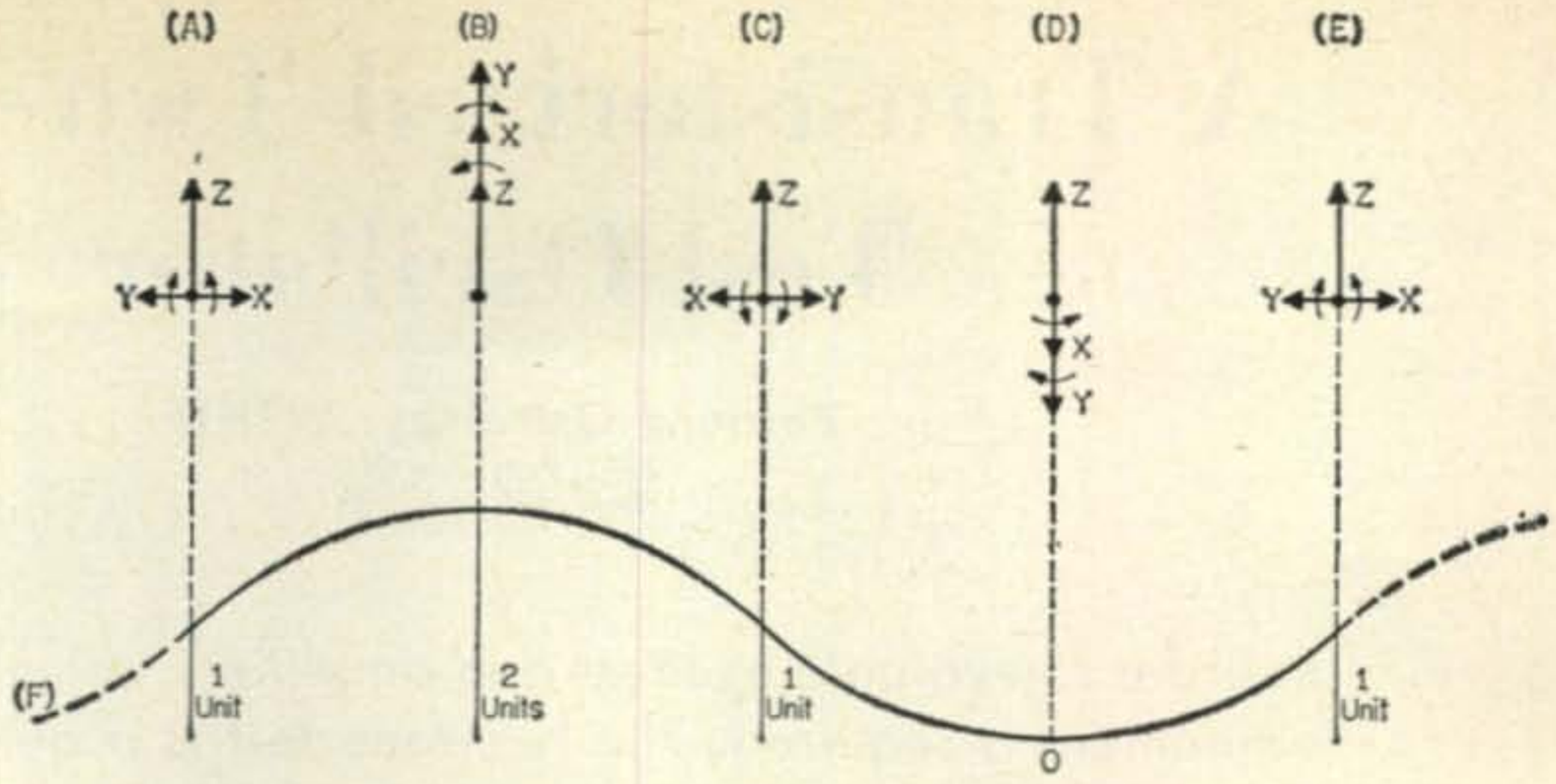


Fig. 7 — When the sideband vectors are 180 degrees out of phase as in (A) and cancel, one unit is left, the carrier, as shown in (F). In step (B), the two sidebands add to the carrier and produce the maxima in (F). Carried out step by step, the resultant signal (F), the audio, is developed.

the output of the detector. In 7B, X and Y have each rotated 90 degrees in their respective directions, and they add with Z to produce 2 units of voltage. In 7C, X and Y again cancel, leaving one unit. In 7D, X and Y have rotated to a position opposite that of Z, and their sum is equal to the amplitude of Z. This results in complete cancellation, leaving zero voltage output. In 7E the vectors have rotated back to the ori ginal position of 7A. Figure 7F shows how the vector sums, at each instant, trace out a sine wave. This is a close duplicate of the original modulating frequency, and thus produces an equivalent audio tone at the detector output.

Now let's use some of this vector information to help understand frequency and phase distortion and their effect on different modulation systems.

In a single tone modulated a.m. signal the frequency of the carrier falls halfway between the frequencies of the upper and lower sidebands. Mathematically expressed, the frequency of the carrier in relation to its sidebands is:

$$f_c = \frac{f_{usb} - f_{lsb}}{2} + f_{lsb}$$

or

$$f_c = \frac{f_{usb} - f_{lsb}}{2} - f_{usb}$$

That is to say that the carrier frequency is equal to half the difference of the sideband frequencies plus the lower sideband frequency or minus the upper sideband frequency.

Now suppose we suppress the carrier at the transmitter and send out only the two sidebands. We must now reinject the carrier at the receiver with the b.f.o. If frequency of the reinjected carrier does not satisfy the equations given above we encounter frequency distortion. If the carrier is modulated by a 1000 cycle tone, the lower sideband vector is rotating counterclockwise at 1000 r.p.s., and the upper sideband vector rotates clockwise at the same speed. But if the injected carrier were 100 cycles too high in frequency it would now produce different beat frequencies with the upper and lower sidebands; 900 and 1100 c.p.s. respectively. You can readily see that for every tone of modulation used, two tones of audio would be reproduced unless the frequency of the reinserted carrier was exactly correct.

In single sideband transmission this is not as severe a problem. Since only one sideband is transmitted, only one audio tone is produced at the receiver for each one that is sent. If the carrier is injected off frequency the pitch of each tone is incorrect. A small error is tolerable and at times cannot even be noticed.

Another important point is that the angular position of the carrier vector is equal to half the phase difference of the upper and lower sideband vectors. Going back to our example of a d.s.b. signal modulated with a 1000 cycle tone, remember that we encountered frequency distortion if the injected carrier was not exactly correct in frequency. Now consider the effect if it were of correct frequency, but not correct in phase.

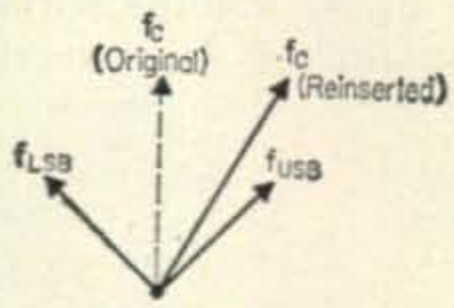


Fig. 8—If the phase of the carrier is shifted slightly in d.s.b. operation, distortion could result when the two out-of-phase-tones add.

See fig. 8. Now the two sidebands each produce a 1000 cycle tone at the detector, but these two tones are not in phase. They may now cancel to some extent instead of reinforcing as they normally would. This results in undesirable amplitude distortion. This problem does not exist in s.s.b. transmission. Since there is only one sideband the only defect is a shift in phase of the tone; there is no cancellation or reinforcement to worry about. The human ear is generally insensitive to such phase shifts and so no distortion is noted.

I believe that at this time sufficient background has been established for understanding spectrum analysis. In the next article of the series there will be a discussion of spectrum analysis accompanied by a presentation of various spectrum analyzer displays. ■

[*To be Continued*]

A Transistorized Two-Tone Test Oscillator

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In order to evaluate exciters and amplifiers, some form of test equipment is required. The two-tone test is a quick, reliable, means of checking the sideband signal for linearity and to optimize system performance. The power output of an s.s.b. system can also be determined from this test as explained.

THE transistorized two-tone oscillator described here, in conjunction with an oscilloscope, will permit the operator to check the sideband linearity and determine the power output of the s.s.b. system.

The basic circuit is a tuned collector audio oscillator.[1], [2] There is a high impedance in series with the transistor base to help linearize the oscillator and improve the wave form and frequency stability.[3] The use of a high base source impedance makes for limiting in the collector circuit and excellent waveform is obtained because the collector is tuned. Stability is such that the oscillator frequency changes about three cycles with a supply voltage variation of 15 to 30 volts. Approximately 1.2 volts output is available with the transistors used. Figure 1 shows the individual and mixed wave forms obtained.

The circuit diagram of the test oscillator is shown in fig. 2. It consists of a 1000 c.p.s. and a 2000 c.p.s. oscillator with provisions for setting the outputs to obtain equal amplitudes and to adjust the total mixed output. Two switches are provided to permit each unit to be turned on individually. A common battery supply is used. The entire unit is built into a 4¼ × 2¼ × 1½ inch minibox. The transistor sockets are mounted on a small bracket fastened by the screws that hold the two toroids. The other components are symmetrically placed allowing space for the battery at one end.

Operation

To use the oscillator, connect the output to the microphone input of the exciter and an oscilloscope to the exciter output connected to a dummy load. The exciter-amplifier combination is checked through by connecting the exciter to the amplifier in the normal manner and

[1] "A Handbook of Selected Semiconductor Circuits", Navships 93484, U. S. Government Printing Office, Washington, D. C.
[2] Oakes, J. B., "Analysis of Junction Transistor Audio Oscillator Circuits", *Proc. of the I.R.E.*, August, 1954.
[3] Melchy, M. A., and Reed, M. B., "Junction Transistor Oscillators", *Proc. National Electronics Conf.*, Vol. XIII, Oct., 1957.

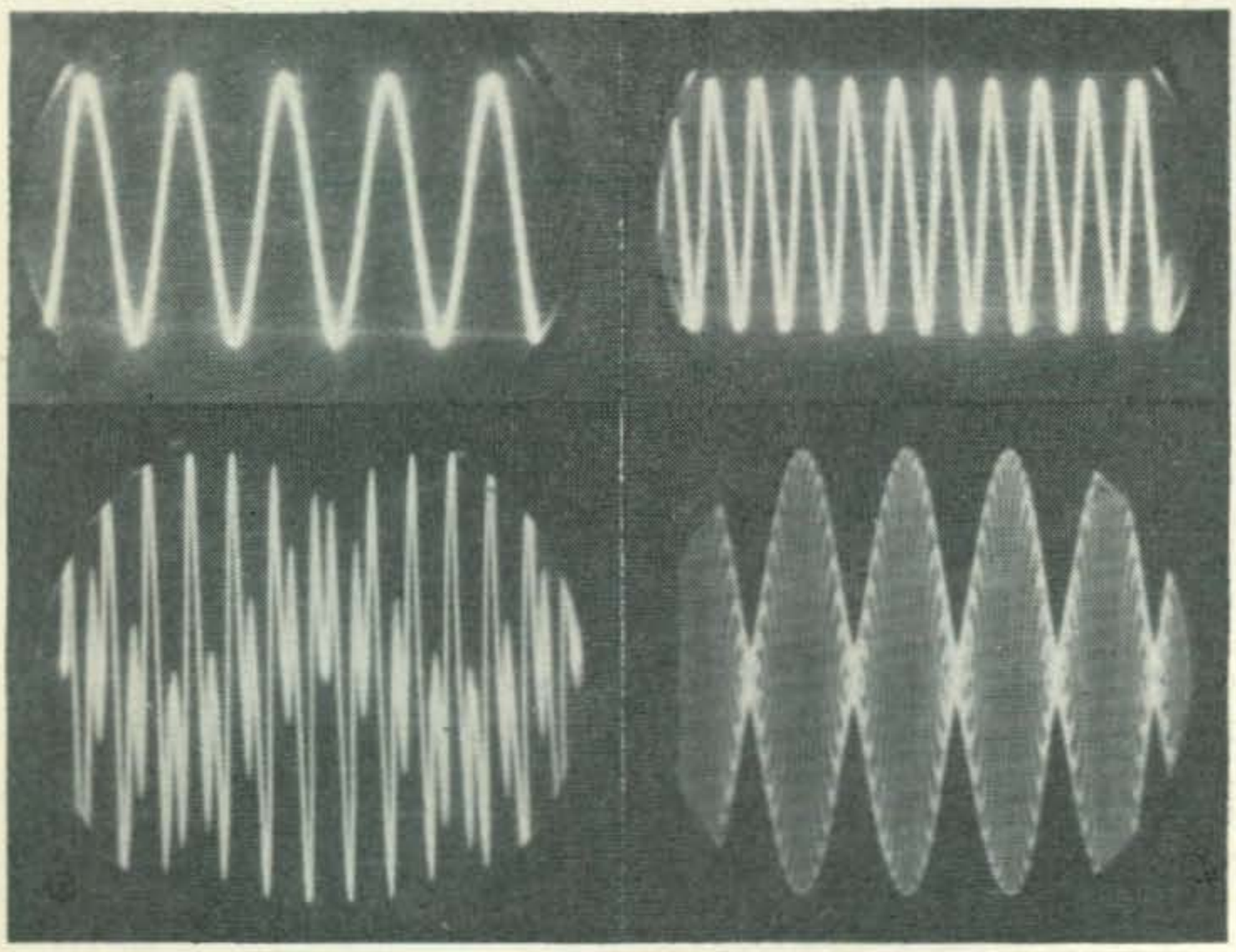


Fig. 1—Two-tone test oscillator waveforms with equal oscillator amplitude. Upper left — 1000 c.p.s.; Upper right—2000 c.p.s. Lower left—1000 + 2000 c.p.s., sweep rate 1.2 milleseconds/cm. Lower right—1000 + 2000 c.p.s., sweep rate 0.12 milleseconds/cm.

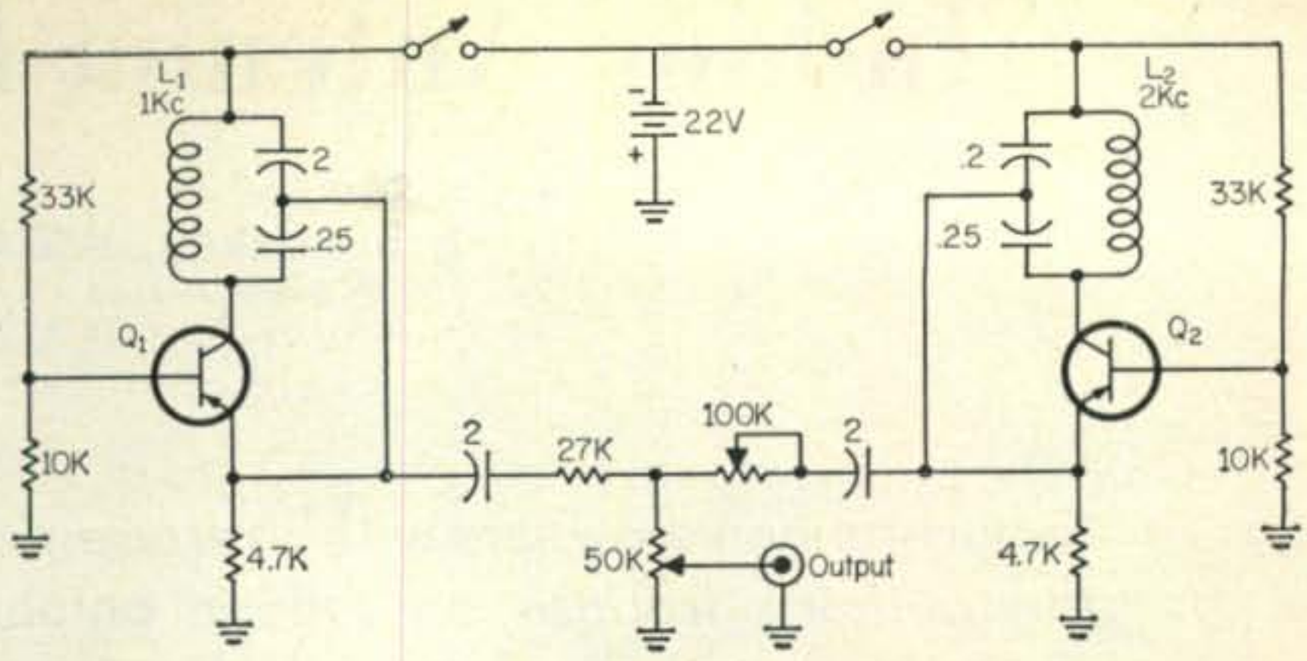


Fig. 2—Circuit diagram of the two-tone oscillator. The 100K pot is used to balance the output levels of the two oscillators and the 50K pot is the output level control. All resistors are ½ watt and all capacitors rated at 50v. d.c.

L_1—50 mhy, Chicago Standard Toroid TM50A

L_2—100 mhy, Chicago Standard Toroid TM100A

Q_1, Q_2—2N256

the dummy load and oscilloscope to the amplifier output. Be certain that the output of each oscillator is the same amplitude. The wave forms obtained and their significance have been described previously and reference should be made to these articles.[4], [5] A simple way to connect the oscilloscope to the antenna is shown in fig. 3.

[4] *Fundamentals of Single Sideband*, Collins Radio Co., second edition, 1959.

[5] *The Radio Amateurs Handbook*, A.R.R.L. 1960.

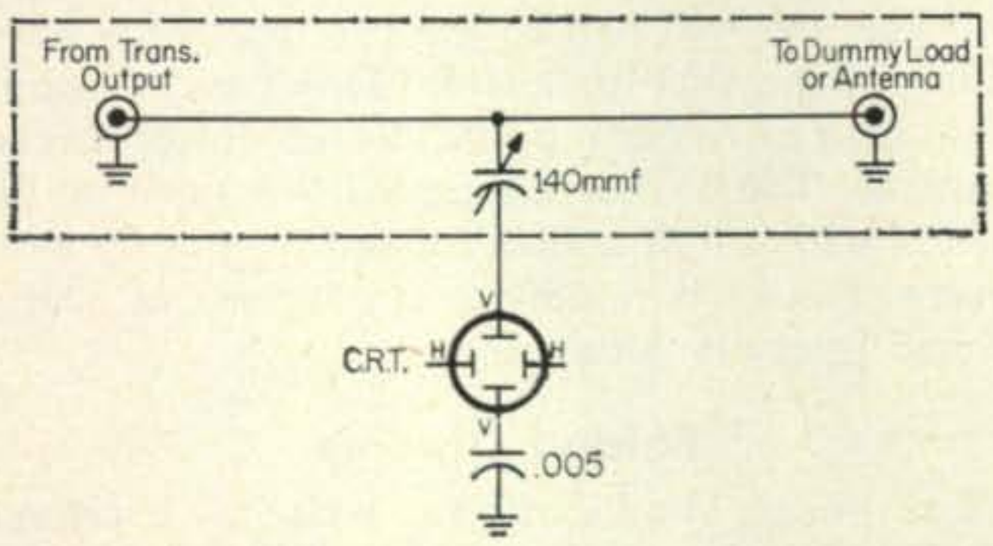


Fig. 3—A simple method of connecting the transmitter output to the oscilloscope. A low voltage spacing for the 140 mmf variable is adequate.

Power Calculation

The peak power can readily be determined from the two-tone test. After adjusting the drive and loading to obtain maximum output with linear operation, the idling (no-signal) and d.c. plate meter reading with two-tone test signal and plate voltage are noted. Substituting these values in Equation 1 will give the peak input power in watts.

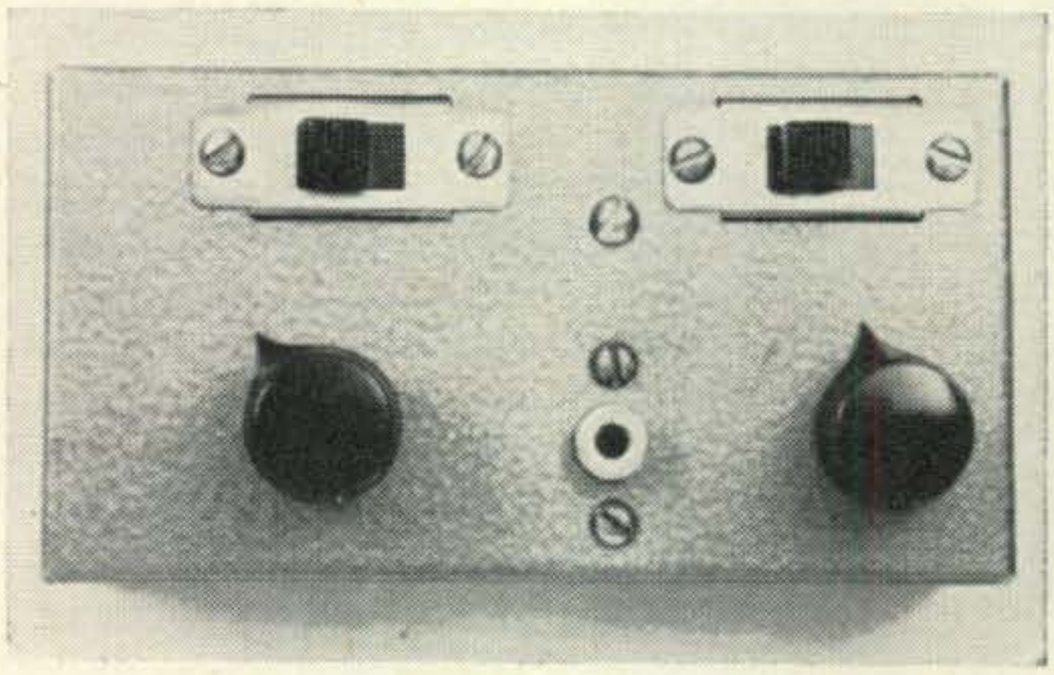
$$P_{pep} = V_p I_{d.c.} \left[1.57 - 0.57 \frac{I_o}{I_{d.c.}} \right] \qquad (1)$$

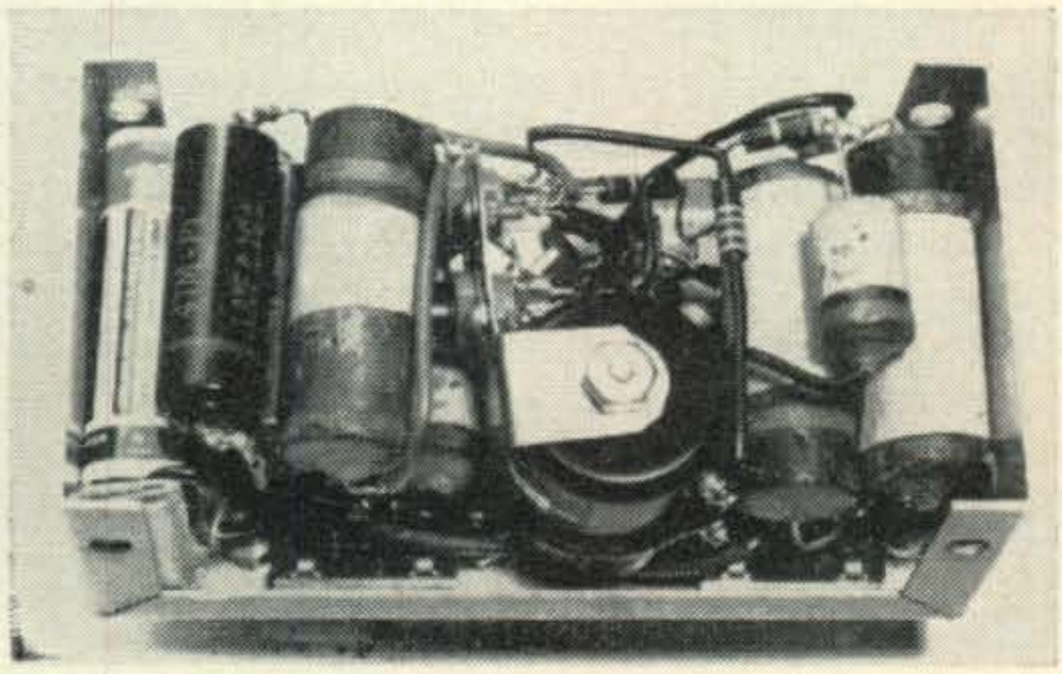
V_p = D.C. Plate Voltage (volts)
I_o = Idling (no signal) plate current (Amps.)
I_{dc} = D.C. Plate current with two-tone test signal (Amps.)
P_{pep} = Peak envelope power input (watts)

The average power is:

$$P_{ave} = 0.5 P_{pep}$$

This is the actual power dissipated in the load. ■





Front and inside views of the test oscillator. The front controls are the balance and output level knobs and the two oscillator on-off switches with the output jack located between the knobs. The battery may be seen on the left of the inside view with the toroids mounted in the center. The two transistors are mounted on the toroid hold down bracket.

Indoor Antenna Farming

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Suburban home owners with average size real estate will find the author's treatise on indoor antenna installations well rewarding.

If you, Mister Reader, own a bank account in six or more figures, separate kilowatt finals for each band, and several acres of salt marsh for a backyard, proceed right to the next article. This one is for people with antenna problems, and the only obvious problems you have are those involving tax collectors, fund raisers, and mosquitos.

But if the old homestead is perched on a city lot about the size of a ping-pong court, if the thing you jokingly refer to as a backyard is forested with 60 foot trees and a generous thatching of utility lines, if you are about to trade the family ham gear for a hi-fi set and a postage stamp album, then read on. As long as you are still breathing and the filaments still light, all is not yet lost.

It is sometimes amazing what a little imagination and a little improvisation can do to make a seemingly impossible situation quite livable. The author, although residing in a location which would cause any sensible radio engineer to cover his eyes in horror, has used nothing but indoor or partially indoor antennas on the low frequency bands for the past eleven years. The results have not been unimpressive. The score thus far is approximately 70 countries on 80 meter c.w. (including a solid S-7 contact with England when running only 10 watts), close to the 100 mark on 40 meter c.w., and numerous odds and ends on the higher bands. Sound interesting? Then keep on reading.

Feed Problems

Because of space limitations and the physical layout of his house, the indoor antenna horticulturist must frequently approach his task in a seemingly illogical fashion. The man with the fifty acre lot, for example, strings up the antenna of his choice and then feeds it with whatever type of line and matching devices are most suitable electrically. The problem is considerably tougher when the feeder must be run down stair wells, around 90 degree corners, and under closely fitted doors and windows. The feedline itself, therefore, will often dictate the type of antenna system to be used.

Most readily adapted to these circumstances, as well as the least conspicuous, is ordinary 300 ohm flat twinlead. It follows that a logical antenna choice is the folded dipole or some type of simple beam which can, without undue complications, be matched to 300 ohm line within the confines of an ordinary attic. Have no fear as to the power handling capabilities of the twinlead—matched anywhere within reason, receiving type line will handle the best part of a kilowatt with no sigh of heating. Don't try to use it as a tuned transmission line at high power levels, however. The author attempted this once on 20 meters with a half gallon rig and wound up with several feet of bare copper conductors at neatly spaced intervals along the line.

Folded Dipoles

For sheer simplicity, as well as excellent bandwidth characteristics, the twinlead folded dipole is hard to beat in an indoor installation. The author keeps a set of these available for all bands from 28 mc to 7 mc, those not in use being coiled up in a corner of the attic. Small hooks and eyes, the former attached to the antennas with string and the latter screwed into the peak beam of the attic at strategic points, provide a simple and flexible means of suspension (see fig. 1). The dipoles can be changed in less than five minutes, feedline connections being made with spring clips.

Space does not pose too much of a problem on the higher bands, since the normal attic will just about accommodate a 20 meter dipole. Hanging a full length dipole for 40 meters indoors is something else again, and fig. 2 shows

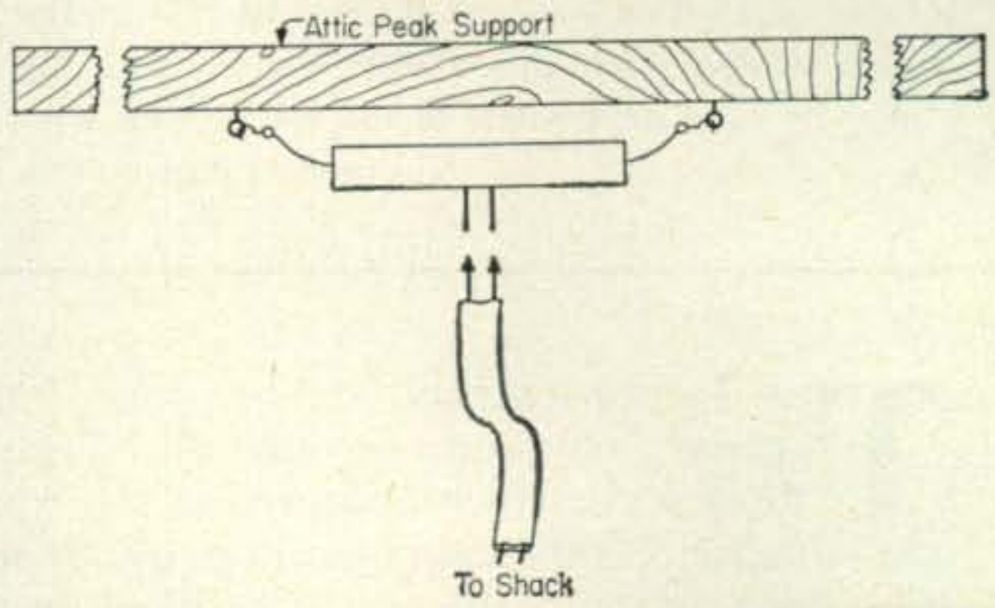

Fig. 1—The half wave dipole is suspended by hooks and eyes and connected to the feedline by spring clips.

the method used at W2LCB. The center half, the part which does most of the radiating, incidentally, runs in a straight line along the peak of the roof. The ends, in turn, run down the sloping roof beams at the extremities of the attic and fold in toward the center again at floor level. More about the radiation pattern from this beast a little later.

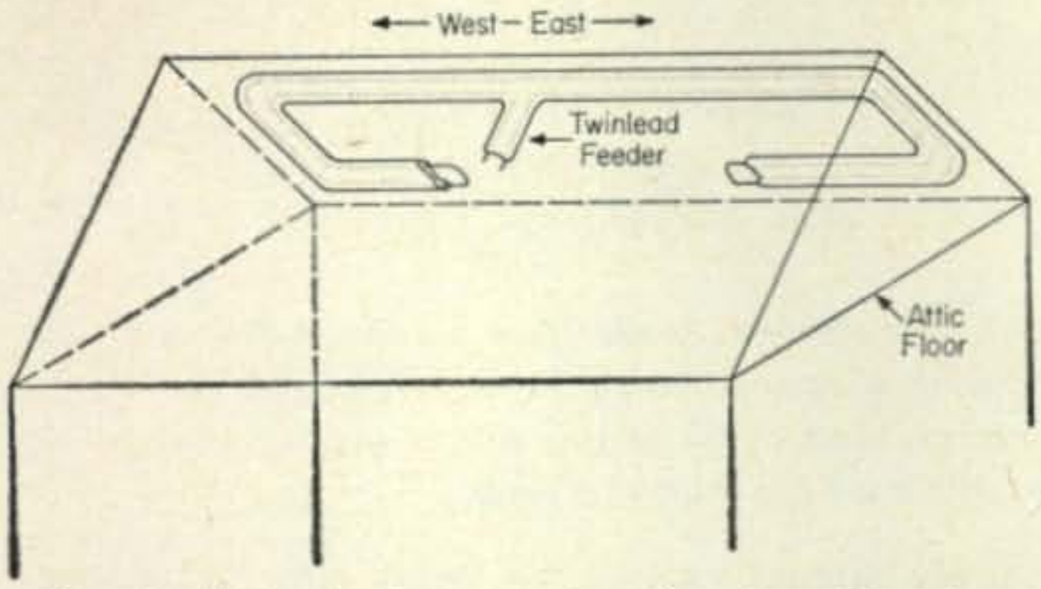

Fig. 2—Method of suspension for the 40 meter dipole. The hooks and eyes (not shown) are located at the ends and bends.

Firing up on 80 meters in cramped quarters is even more difficult, but it is by no means an insurmountable obstacle. Figure 3 illustrates the author's approach to this problem. The antenna, a full length twinlead dipole, starts at ground level at the back of the lot, runs upward at an angle through the attic window, continues on through the house at approximately the same slope, and then drops out of a front window to the base of a small tree near ground level. When not in use, it is untied from the tree and the front half is coiled up at the rear of the attic.

Other Antenna Types

Convenient though it may be, the folded dipole is by no means the only answer to the city dweller's problem. Another antenna which lends itself quite well to indoor use on bands from 14 mc to 28 mc is the old single section 8JK, a bidirectional end-fire array with a pair of driven elements.

Probably the most serious drawback to this antenna is the extremely low impedance at the feed point when wire elements are used. Fortunately, this disadvantage is easily overcome. Reference to the *ARRL Antenna Handbook* will show that if folded dipole elements with one-quarter wavelength spacing are used, and if these are fed with quarter-wave matching sections made of 300 ohm twinlead, the feedpoint impedance will also be 300 ohms (see fig. 4).

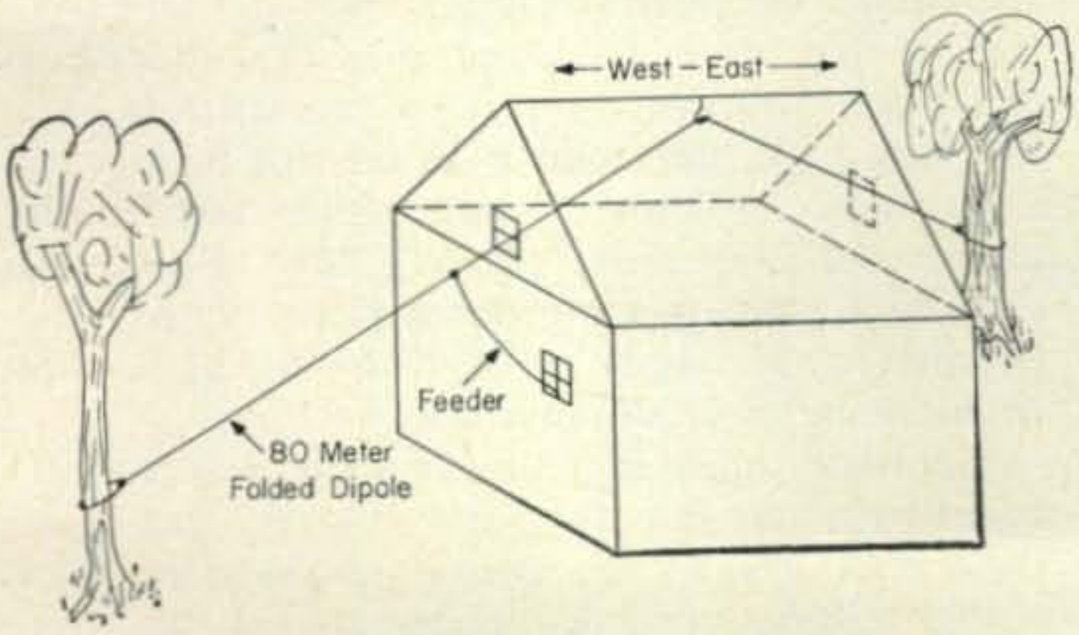

Fig. 3—A method of hanging an 80 meter folded dipole. The antenna enters the back attic window, runs to the peak and drops out the front attic window to the ground. The antenna is supported by hook and eye at the peak and the feedline is taken off just before the antenna enters the rear attic window.

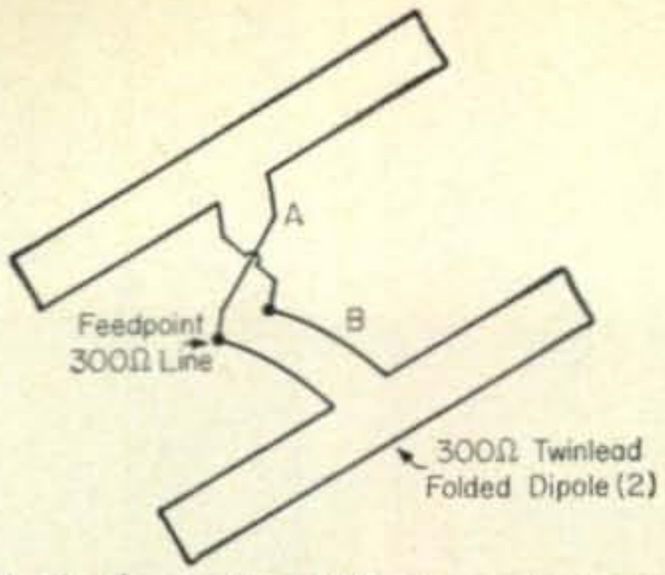

Fig. 4—A single section 8JK (two element endfire) array designed for 300 ohm feedpoint impedance. The dipoles are spaced ¼ wavelength and suspended from beams with hooks and eyes. A and B are ¼ wavelength matching sections made of 300 ohm twinlead and cut according to transmission line formula. Either one may be transposed to give the necessary 180 degree phase shift.

This is just what we need to match our permanently installed twinlead feedline.

In practice, of course, things are not quite that simple. The impedance figures given in the *Antenna Handbook* are for an antenna suspended in the clear and will vary considerably for an array located in close proximity to other objects. By varying the spacing and element lengths a bit, however, it is possible to achieve a very satisfactory match for 300 ohm feedline. The author, in fact, has had quite satisfactory results with arrays of this type simply cut to *Handbook* dimensions and installed without additional matching adjustments.

Three other types of antennas have been tried indoors at W2LCB with varying degrees of success: the two element driven beam commonly known as the "ZL Special"; parasitic arrays of up to three elements; and both full size and top-loaded groundplanes.

The "ZL Special" is very similar in configuration to the 8JK array and, if multiple wire elements or a suitable matching section is employed, can be fed with 300 ohm twinlead. By utilizing the hook and eye suspension system described earlier, the beam can easily be turned around 180 degrees to provide service in either of two directions. Although performance will not compare with that of an outdoor installation, the array will still show some gain and an excellent front-to-back ratio.

Parasitic arrays of the Yagi type can be constructed either from aluminum tubing or from aluminum foil. One fixed Yagi tried by the author on 28 mc consisted of three strips of foil tacked

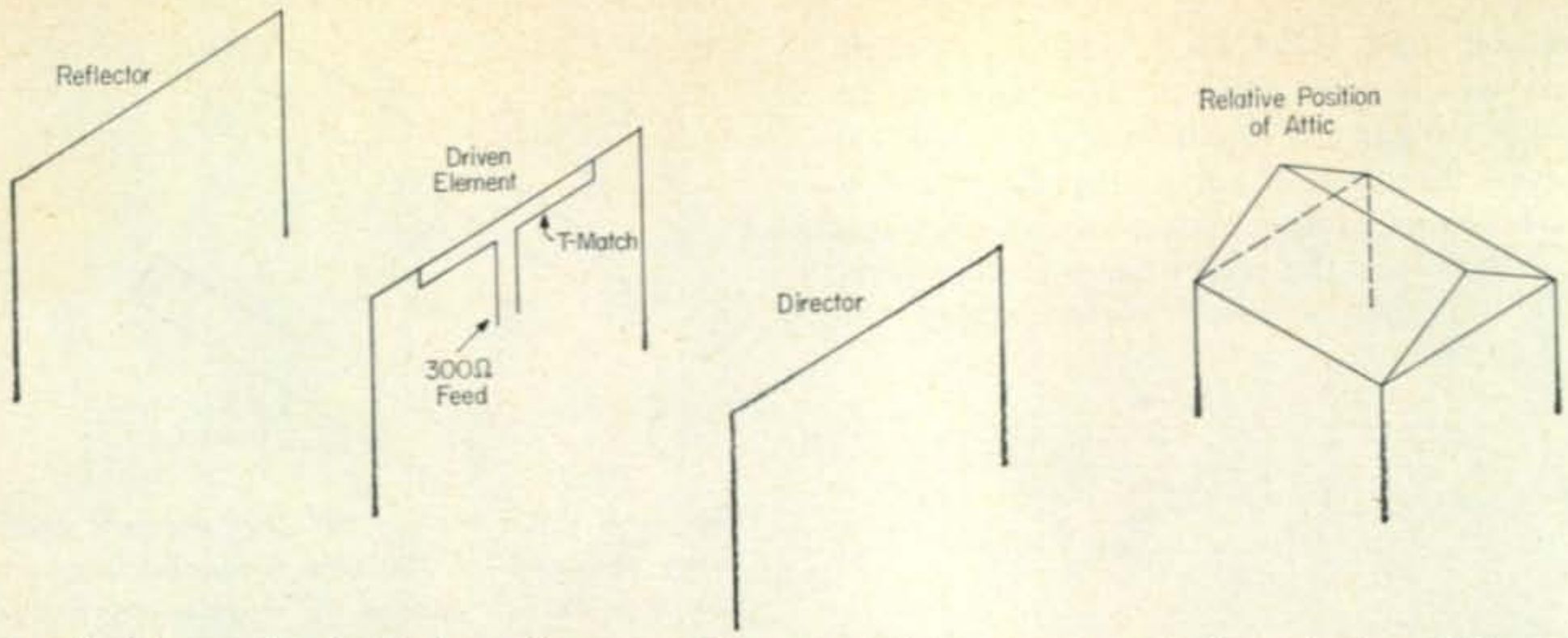

Fig. 5—Construction details for a 3 element 28 mc yagi with elements made from aluminum foil and fastened to the beam with thumb tacks. The element spacing is approximately 0.15 wavelength. The T match is made from two short pieces of aluminum tubing insulated at the center with a wooden dowel and supported from the driven element with a pair of short clip leads.

to the beams with thumbtacks (see fig. 5). The elements of this particular antenna ran across the attic rather than lengthwise, which necessitated dropping the ends of all three straight down for several feet. It still produced a fair signal in the part of the world at which it was aimed.

An attic 8 feet high from floor to roof peak, and of any normal length, will take a full size ground plane on 28 mc. Radials are simply strung out along the floor and the vertical radiator suspended from the peak. Again the primary problem is low feed point impedance, and if 300 ohm transmission line is to be used, some form of matching device will be required. The *ARRL Antenna Handbook* suggests several methods of feeding these antennas.

If the attic is 30 feet or so long and at least 8 feet high, a less effective but still workable groundplane can be constructed for 20 meter use (see fig. 6). Radials are again strung along the floor, but the vertical section, instead of running straight up, has its top portion folded back and forth along the center beam of the roof. Although this proved to be a generally poor performer, the low radiation angle characteristic of the groundplane was definitely noticeable on both transmitting and receiving.

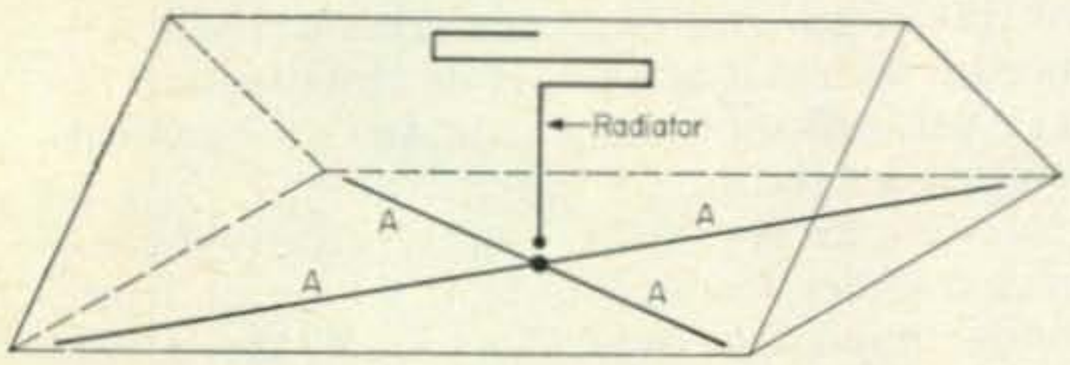

Fig. 6—A shortened groundplane for 20 meters with top half (approximately) of the radiator folded back and forth along the peak of the roof. This method is not recommended unless the distance from floor to peak is at least 8 feet. Radials (A) are made of aluminum foil or heavy wire laid along the attic floor. The feedpoint impedance is low so a matching device for 300 ohm line is needed.

Dimensions

The antenna systems described in this article have all been tried at W2LCB and have produced many satisfactory contacts. Since they are merely suggestions as to what can be accomplished under adverse conditions, and since optimum lengths and element spacing will vary from one situation to another, no actual dimensions have been shown. It is suggested that the individual experimenter simply start with *Handbook* dimensions and then resort to cut and try tactics until element resonance and optimum feedline match are obtained. An s.w.r. bridge and antennascope will facilitate the operation considerably.

Shortcomings

The old proverb that nobody ever gets anything for nothing in this world certainly holds true in the case of these lashups. They will get the crowded city dweller on the air all right and will give him some excellent contacts, but they have inherent shortcomings which must be accepted as part of the package.

Radiation Patterns

One of the major problems is that of predicting radiation patterns, since these can assume very peculiar configurations indeed when antennas are bent or suspended in close proximity to other objects. The 40 meter dipole described in this article is an excellent example of the case at point.

The center half of this antenna runs almost due east and west (the direction of the author's house), and it would appear logical to assume that maximum radiation would take place on a north-south axis. This is exactly what it does *not* do. The antenna does its best job by far in Australia, northern Europe, and southern Africa, in that order. It also produces excellent late afternoon (our time) reports in Australia via the long path, no mean trick on this band with any dipole radiator. Furthermore, just to increase the confusion, shifting the folded end sections to the opposite down slope of the attic beams changes signal strength by a full S-point or more in some directions.

Generally speaking, life is a bit less complicated with antennas for bands above 7 mc, since these can usually be strung up indoors in a straight line. As a result, maximum radiation

does tend to occur at right angles to the axis of the antenna, and the pattern is fairly predictable. Even the 80 meter dipole illustrated in fig. 3 is reasonably faithful to the laws of nature, giving maximum signal in the direction of the long downslope and an angle of radiation considerably lower than that of a simple horizontal dipole. In support of the latter observation, it has consistently dumped an excellent signal into New Zealand on this band while producing only mediocre results in Western North America.

Directly related to the problem of predicting indoor patterns is the problem of controlling them. The answer is: you don't control them; you take what you get and make the best of it. If your 15 meter attic dipole follows a straight east-west axis, you had better develop a liking for north-south contacts (unless, that is, you are able to rotate the house). But so what? This doesn't mean that you can't have some fine contacts in these two directions, nor does it mean that you won't get good reports. Even the unpredictable, in fact, may work to your ultimate advantage, as it has in the case of the above-mentioned 40 meter dipole.

Coupling to Nearby Objects

Coupling to nearby objects is another hazard of indoor antenna farming, and it is one which may prove either a curse or a blessing. An excellent example of the former may be seen in the relatively poor performance associated with 10 and 20 meter operation at this QTH. Reports from all directions on these bands, even the favored directions, indicate that the signal is simply being absorbed before it leaves the vicinity of the antenna. The villains are not too hard to pinpoint: a metal ridgepole along the peak of the house, and metal gutter pipes along the eaves on each side. All three of these are approximately 32 feet long, a nice convenient half-wave on 20 meters. Need we say more?

Coupling to house wiring can produce some truly spectacular effects, and they are not necessarily detrimental. The wiring at W2LCB, for example, is definitely part of the overall radiating system on 40 meters, although exactly what role any particular portion of it plays would be almost impossible to ascertain.

One of the outward manifestations of the phenomenon is that amplifier plate current and s.w.r. readings both change noticeably when certain combinations of lights are switched on in the house. Fortunately, the change is not great enough to require any retuning, not does it appear to have any appreciable effect upon the received signal at the other end of the line.

A bit more awe inspiring to the layman is the lighting of house lights which can take place under these circumstances, particularly when fairly high power is involved. A pair of three-bulb living room clusters at this QTH flared so brilliantly before corrective action was taken that keying the transmitter at night created an illusion from the street that the house was afire. To save potential wear and tear on the local fire department, offending lamps or lamp clusters were bypassed with 0.1 mf, 600 volt capacitors. These solved the visible part of the problem very nicely (at least in this house).

TVI and BCI

Although the prospects of TV and b.c. interference might be viewed with some alarm, especially under the circumstances described above, these problems may well prove to be insignificant. In eleven years of operation with the various antenna systems described here, the author has experienced only two cases of TVI with his 600 watt low frequency rig. One of these occurred in a certain 1950 model TV receiver which, from the standpoint of susceptibility to interference, is generally conceded to have been the worst offender ever produced in this country. The station was operating at the time on 40 meter c.w. The other was also a clear-cut fundamental overload situation resulting from operation on 11 meter phone. Both were cleared up completely by installing the cheapest and simplest type of unshielded high-pass filters at the receiver antenna terminals.

The best single precaution to take against TVI is to make certain that harmonic energy reaching the antenna is kept to an absolute minimum. A tiny trace of harmonic in a TV channel, which might cause no trouble at all when using a transmitting antenna well up in the clear, might prove devastating when radiated practically at ground level from an indoor antenna or from nearby house wiring. Good transmitter design and thorough output filtering with low-pass filter and/or antenna coupler are the secrets to success. A bit of discretion in the choice of operating hours and mode of operation will also go a long way toward maintaining peace in the home neighborhood. C.w. and s.s.b., needless to say, are likely to cause far less uproar than a.m.

Give it a Try

If this article were composed in the best science fiction style, we would conclude by describing an all-band, super-power-booster, preshrunk miniature beam which could be concealed in a clothes closet and still outperform a five element Yagi on a 100 foot tower. Unfortunately, there is no such ready cure-all for the city dweller's problems. The goal instead has been to stimulate thinking and to demonstrate that with a little ingenuity the crowded city ham can still enjoy his hobby. The examples shown here are by no means the only possibilities—any radiating device which will fit into the confines of the attic or the operating shack itself is worth a try (and this includes the bedsprings).

If your curiosity has been aroused, pick up a copy of any antenna handbook, take a closer look at your supposedly impossible QTH, and let your imagination run wild. *You can get on the air!* Furthermore, once you have cultivated your indoor antenna farm, you will get some much-needed exercise galloping up and down the attic stairs as you flit from band to band. ■

Inexpensive 150 Watt Power Supply

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Surplus TV power transformers are currently available at rather low costs. It is possible to design a power supply using these economical units, for service in the 150-175 watt class. The author describes here some basic circuits and design thoughts that may be useful for low power transmitters and receivers.

I WAS led into an investigation of the possibilities of cheap power supplies by the need for a supply that would deliver dual voltages of about 300 to 350 volts and 600 to 700 volts for the final amplifier. This transmitter was a controlled carrier version using a 6146 final designed for minimum cost so I was seeking a power supply of economical design.

After looking around for suitable transformers, it appeared that all transformers with a secondary in the neighborhood of 700 volts each side of center tap with a current capacity of 150 to 300 mils (to take care of future expansion) were too expensive for our purpose. Familiar sources such as a radio and television transformers of many types were examined. It appeared that television receiver transformers has the required power capability. These transformers could deliver the power on a I.C.A.S. basis and provisions would have to be made to use a bridge rectifier for the 600 to 700 volt requirement.

Heater Windings

Television transformers also have heater windings that can deliver ample current to supply the normal transmitter requirements. Most television transformers have a 5 volt winding to supply one or two rectifiers of the 5U4 type. On the other hand this winding may be absent due to the fact that selenium rectifiers were used. If a 5 volt winding for the 5U4 is non-existent, we still have a 5 volt or 6.3 volt winding which will handle one rectifier. This winding was used for the damper tube in the television receiver. The damper tube winding current is usually sufficient for only one rectifier tube and I would suggest that this be used for the dual diode rectifier such as a 5U4. If it is a 6.3 volt winding, a small series resistor can be inserted that will reduce the voltage to 5 volts.

Bridge Rectifier

But what do we do about a bridge rectifier? We have a supply for a dual rectifier tube but we still need heater supply for two single diode rectifiers. The television receiver transformer usually has an ample heater supply, since it supplied power for probably twenty tubes.

The problem of what to do about the other two half wave rectifier units is solved by examining rectifier ratings. We need a tube that we can operate from the 6.3 volt windings as a first requirement. A second is that the heater to cathode breakdown voltage rating must be well in excess of any voltage that the tube would be subjected to in its application. The 6AU4 meets these requirements since it has a 6.3 volt filament and a heater to cathode breakdown rating of 4300 volts. The schematic of fig. 1. shows a basic full wave schematic in which the 6AU4 delivers up to 750 volts at currents as high as 250 ma.

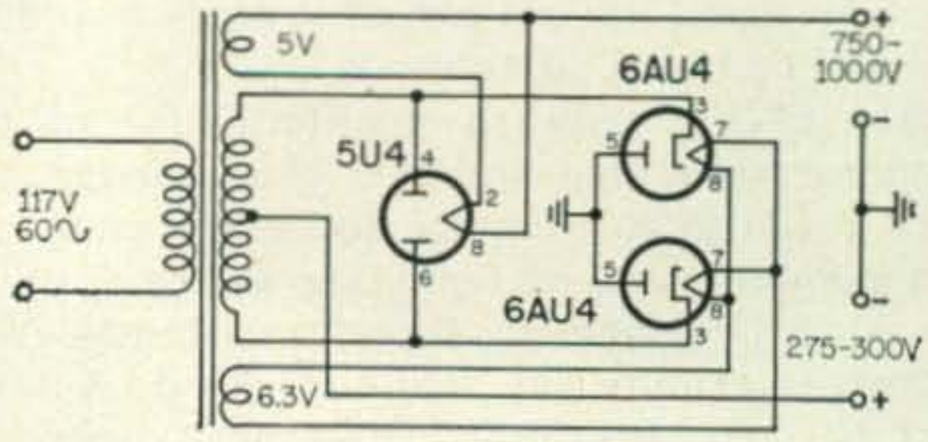


Fig. 1—Basic bridge rectifier circuit using a 5U4 and two 6AU4s (designed for TV damper service). Two output voltages are available.

This tube seems to be an excellent choice for this type of service and I have used supplies of this type to operate one transmitter using a pair of 6146's on the low bands running as high as 150 watts and another on a controlled carrier 6 meter transmitter using a single 6146. In my

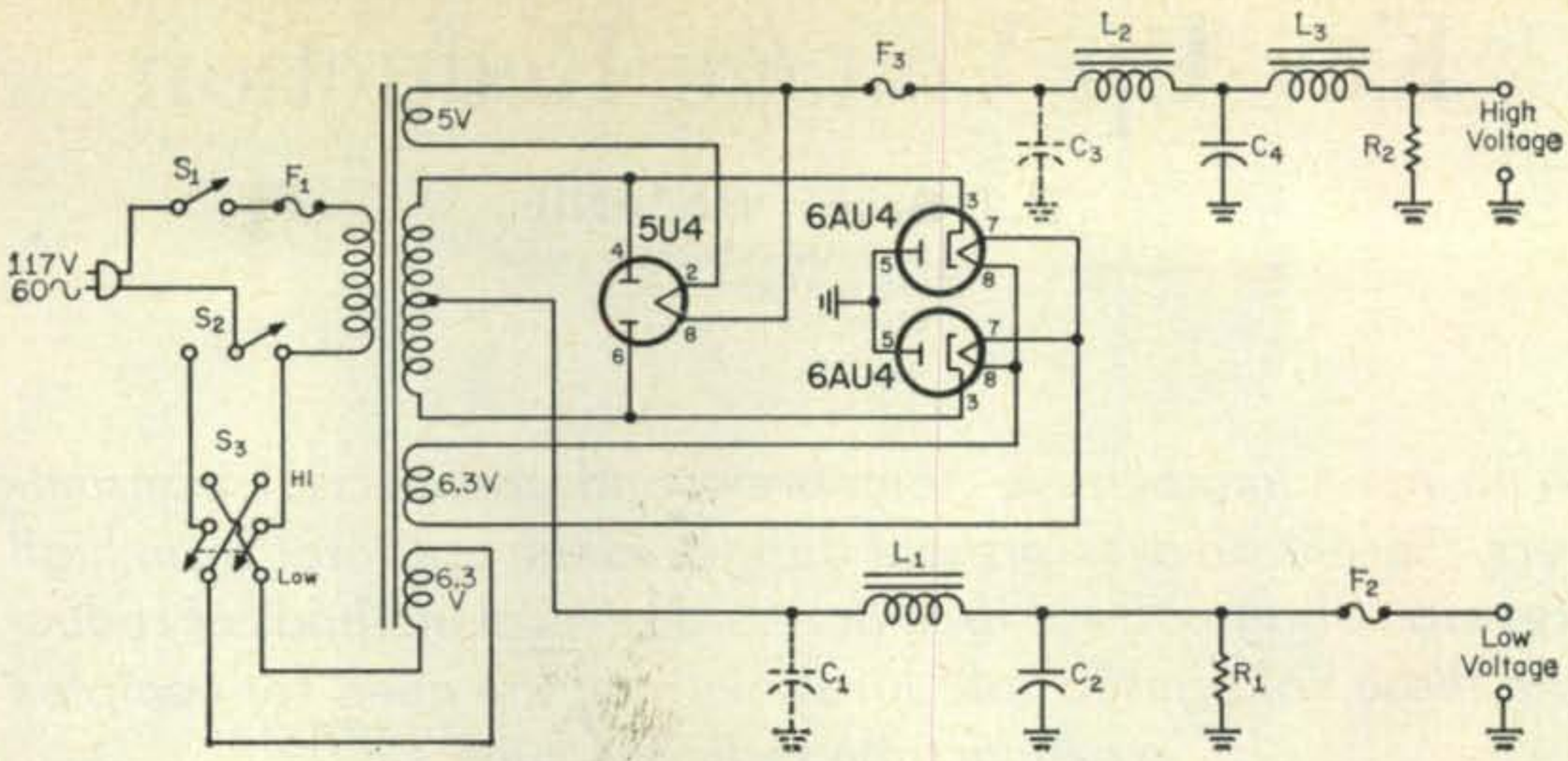


Fig. 2—Operating circuit of the bridge type power supply with high adn low output voltages. Switches S_1 and S_2 provide a variable output voltage as explained in the text. Further voltage output control can be had by inserting or omitting the input capacitors in each filter.

use of the 6AU4 in these applications I have had no trouble whatsoever and have been using these tubes in this manner for well over a year without replacement.

The current rating of the 6AU4-GTA is listed as 190 ma d.c. A 5U4GB is rated as 137.5 ma at 450 volt r.m.s. per plate with capacitor input filter, so we get an insight here into the relative capacity of the two tubes.

Variable Output

Figure 2 illustrates a little trick which will allow you to design a power supply to give a selection of three output voltages. Looking at the input circuit of the power transformer you will see that we have three selections of primary windings. The switch S_1 in the right hand position determines that the primary will be used in the usual way and the output voltages of the transformer will be the original ratings of the transformer as designed by the manufacturer. You will see that S_2 is wired in such a way that when S_1 is thrown to the left contact, the 6.3 volt winding is now connected in series either adding or subtracting to the primary winding. If the added 6.3 volt winding is phased to add, then the secondary voltages are lower. If the 6.3 volt winding subtracts, the secondary voltages will be higher by a voltage equal to the ratio of the primary to secondary turns ratios.

The use of a 6.3 volt winding to adjust the secondary voltages can be accomplished only when three heater windings are available.

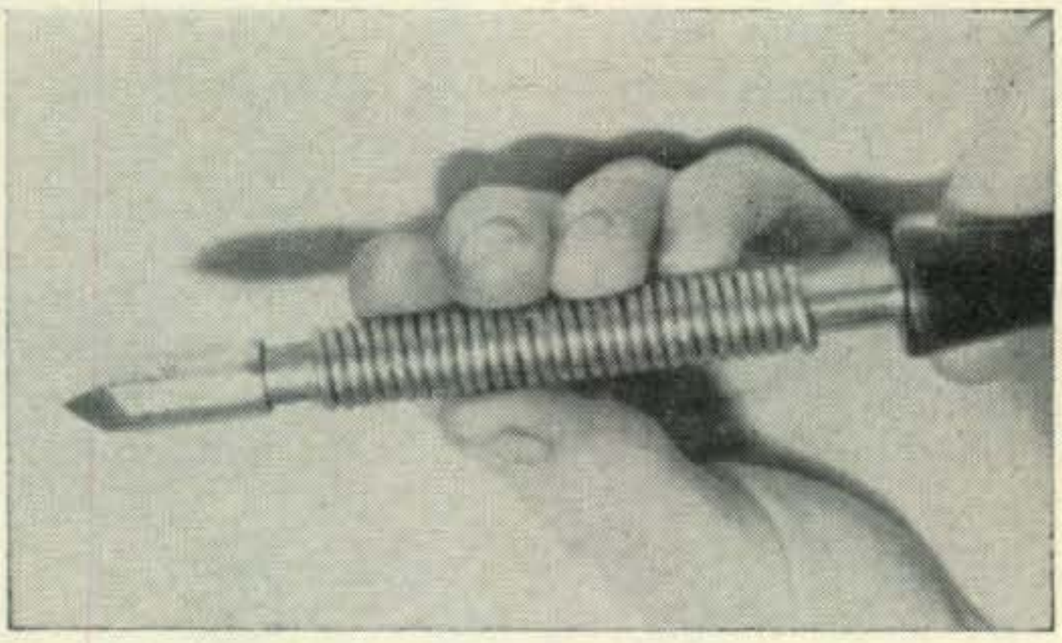
The circuit in fig. 2 is a typical configuration using the ideas discussed here. The ideas of the bridge circuit and the two output voltages are not new and neither is the method of adjusting voltages. Further changes in the output voltages can be made by the insertion or omission of the input filter capacitors as indicated in the circuit. The methods for computing the output voltages for both capacitor and choke inputs are given in the amateur handbooks and it is not necessary that I go into this here.

Another idea which might be explored is, that if the supply can deliver sufficient heater current, we might be able to use it to supply the transmitter on transmit and then use the low voltage output to supply the receiver on receive. This would milk the last bit of economy out of the supply and should work quite well.

The television receiver power transformers can be obtained from discarded television receivers and should be quite inexpensive. Supplies designed along these lines will pleasantly surprise you for transmitter power running up to 150 to 175 watts. Remember that these transformers will deliver far more than their ratings during transmit periods and still average well within intended ratings.

It is hoped that by tapping this source of inexpensive transformers that many amateurs may be able to economically increase transmitter power in their future design. ■

Ham Hints



Preventative For Iron Handle Char

Although inexpensive soldering irons having wooden handles are useful for occasional soldering jobs, their wooden handles tend to char when they are left plugged in for long durations of time. Kit builders, hams, and others who find it necesary to leave their irons plugged in for long periods of time, should wrap the iron barrel with heavy-gauge solid copper wire as shown. The wire helps dissipate excess heat that would otherwise char the handle and cause it to come loose.

Key-Up Voltage Reduction

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With most inexpensive homebrew and commercial transmitters, there is an ever-present danger to the operator from high key-up voltages. Described here are several methods of reducing these voltages to safe levels without the need for complex vacuum tube keying circuits.

MANY kit transmitters and simple home brew rigs perform keying by breaking oscillator and amplifier cathode leads. This can be risky to both the operator and to the heater-cathode insulation of the tubes. Here are a few ways that this voltage can be reduced to a less dangerous level.

A typical circuit is shown in fig. 1. While a crystal oscillator is shown for simplicity, the oscillator could just as easily be a v.f.o. In such circuitry, the voltage across the open key is close to that at point A, the lack of cathode current through the oscillator tube tending to hold it at this value. Of course, any heater-cathode leakage to ground will lower the voltage at A.

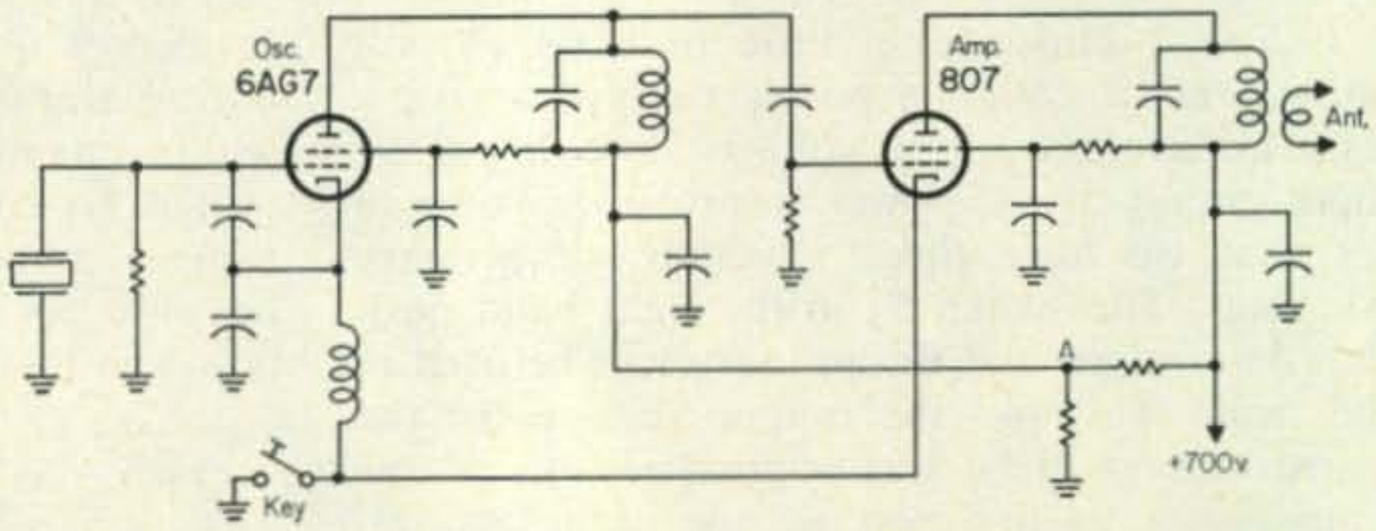

Fig. 1 — Typical transmitter circuit with cathode keying. High voltage can appear across the open key.

Voltage Reduction

The purpose of the key is to turn a radio signal on and off, not to endanger either tube insulation or the operator. (A possible secondary purpose is to minimize amplifier dissipation during standby.) However, these goals can be reached by *not* open-circuiting the cathode when the key is up.

Oscillators that have a grid-leak connected to ground (fig. 1) will usually stop oscillating when a large d.c. bias is inserted in the grid-to-cathode circuit. The techniques to be described apply just this bias when the key is up.

The simplest (and probably least expensive) method is shown in fig. 2. Resistor values are suitable for most circuits using the 807 or 1625 at voltages up to about 700 volts, but the circuit may be adapted to other tubes merely by juggling the resistance up or down to give a safe amplifier dissipation in key-up condition. With the values shown, about 35 volts of grid bias is placed on the oscillator and amplifier control grids.

A somewhat more expensive method is shown in fig. 3. Here bias voltage is obtained from a second source, which the diode effectively disconnects when the key is down. The reduced key-up amplifier current flows as charging cur-

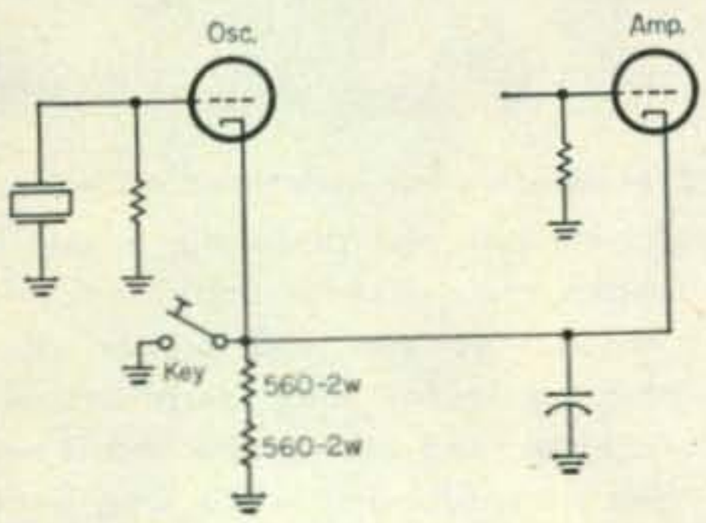

Fig. 2—Amplifier idling cathode current in key-up position biases the oscillator off and limits the amplifier plate tc a safe dissipation level (see text).

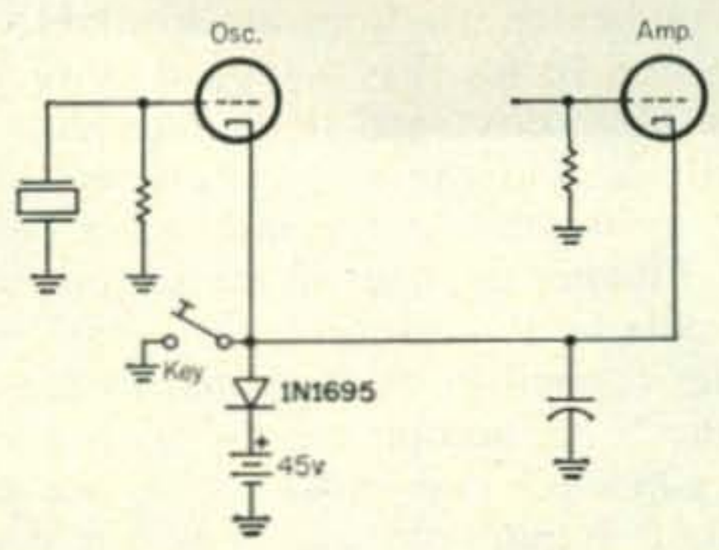

Fig. 3—Diode prevents key-up voltage from rising above 45 volts. Charging current flows through battery, so dry cell life may be short.

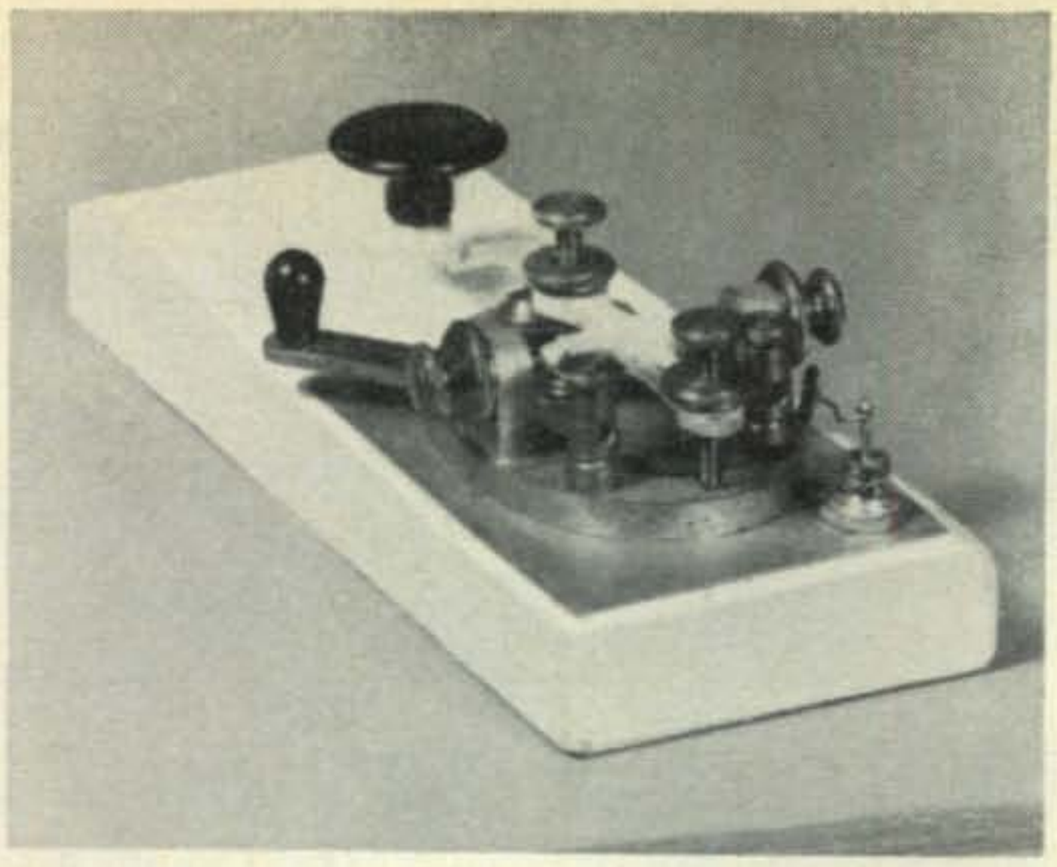

Photo showing the mounting of a zener diode on the key base with a sheet copper heat sink. The zener diode is merely connected in parallel with the key terminals to reduce the key-up voltage across the key contacts.

rent through the bias supply. This, however, shortens the life of the dry-cell battery considerably.

A Zener diode is used in fig. 4 as the bias supply. The diode shown costs about six dollars,

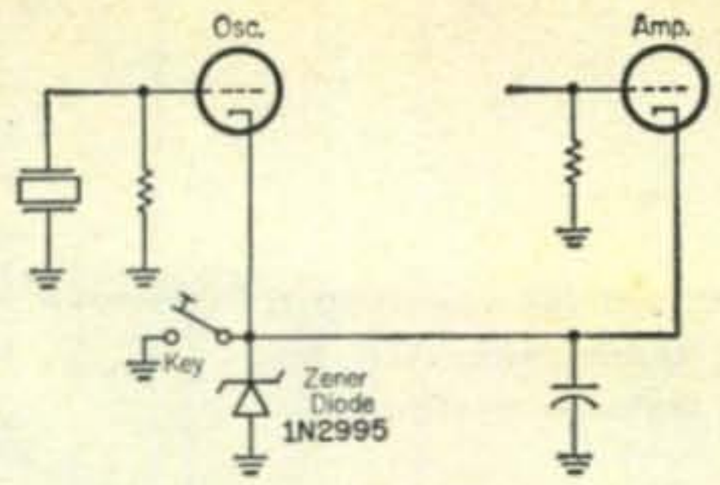

Fig. 4—Amplifier current through the zener diode develops about 45 volts bias (see text).

but is perhaps the most elegant approach for those with extra cash. The 1N2995 develops between 37 and 57 volts fairly independently of current and can dissipate 10 watts when tightened down to a large and fairly thick flat piece of copper or aluminum. Such an installation is shown in the photograph and when mounted as shown a safe dissipation of four or five watts is more realistic. Zener diodes are currently available in many different tolerances, voltages, powers, and costs providing the amateur with an easy and flexible method of key-up voltage reduction, applicable to most any small transmitter. ■

Current Transformer Component Control

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It is frequently necessary for a secondary circuit or mechanical device to be controlled by a primary electronic device. At times this can become complex. Here is a simple circuit employing standard parts that may simplify the problems involved.

CIRCUITRY for controlling an auxiliary device, such as an electromagnetic clutch, from a multi-function primary device, such as a bi-directional tuning motor, tend to be very complex if only standard components are used. This is particularly true when the total power involved is low, or when the clutch operates on d.c., while the primary device is a.c. operated.

Where power consumption of the primary device is fairly high, the operating current is sufficient to operate a low-voltage series relay, which in turn controls the adjunct device. This is an excellent procedure when the currents involved are measured in amperes, but becomes less practicable when currents are only milliamperes, unless the relay current approximates the minimum load current, and line voltage is elevated to compensate for relay drop. Even under these conditions, the problems of relay contact bounce, contact trouble, and system voltage regulation remain with us, and are particularly severe with motor loads.

Although a number of control voltage tap-offs, including "stealer" windings on the motor coils, can be used successfully, the simplest and most dependable device for this purpose seems to be a small current transformer, which operates a control tube, in whose main circuit the adjunct device (or a power relay, if desired) is placed.

For light and medium loads, roughly from 2 to 50 watts (at 117 volts a.c.), a small "push pull plates to voice coil" transformer makes an excellent current transformer, producing a negligible voltage drop in the load circuit, and a rather high *peak* voltage in the secondary.

Practical Circuit

Complete circuit of a working device for controling a magnetic clutch from a tuning motor, using

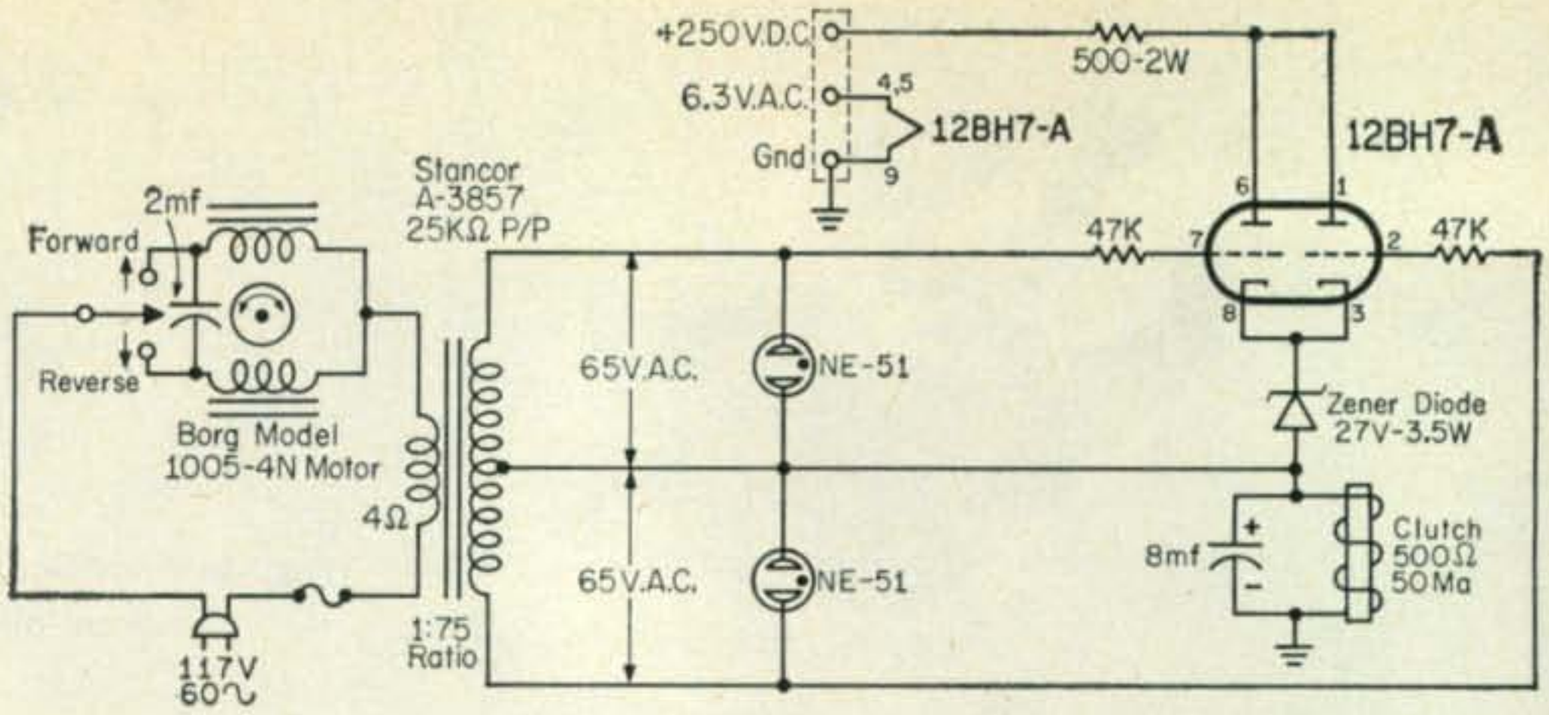


Fig. 1 — Circuit for operating a magnetic clutch whenever the tuning motor is energized.

a current transformer, is shown with constants in fig. 1. Here, whenever the motor operates, current through the transformer primary in the supply return induces a secondary voltage, which is applied to the control tube grids. This causes the control tube to draw plate current, and this current operates the clutch in its cathode return circuit.

Peak Voltages

Voltages induced in the secondary of the current transformer seem at first glance to be inordinately high, as the measured average drop across the primary is only 0.5 volts, and the turns ratio is approximately 75 to 1. Furthermore, if the secondary voltage, with the motor operating, is measured with and ordinary a.c. voltmeter, it will be found to be approximately 38 (r.m.s.).

Despite this turns ratio limitation, the unloaded secondary, when the motor is running, will light seven NE-51 bulbs connected across it, indicating peak voltages of the order of 450! This might suggest that the conventional turns ratio formulae have failed, or that we are getting something for nothing. Actually, power available from the secondary of this transformer is always less than power in the primary. Oscilloscopic studies of voltages and waveforms in the windings show that while average voltage drop in the primary is 0.5 volts, instantaneous drop, for a fraction of a cycle, is very much greater, and waveforms are certainly not sinusoidal. Shape of the input waveforms can be altered markedly by changing the mechanical load on the motor.

Secondary waveforms reflect primary waveforms, and are also complicated by ringing in the transformer secondary and flybacks, so long as the secondary is very lightly loaded. Waveforms present in the secondary of fig. 1, with no loading (except the scope input) are shown in fig. 2A. Much fine detail in the curve has been omitted in this figure. The result of connecting NE-51 lamps across the secondary is shown in fig. 2B. This expedient "dumps" the high voltage spikes on the curve, giving a useful flat-topped pulse of adequate magnitude.

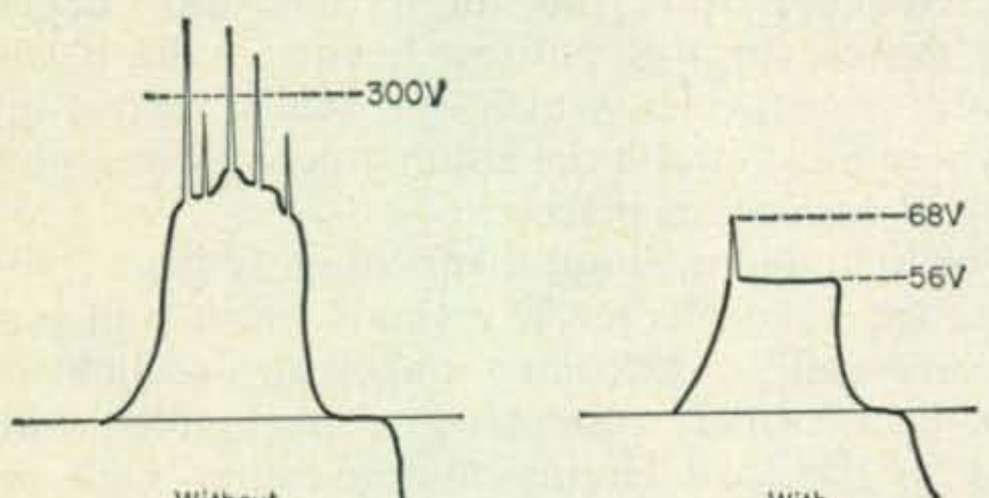


Fig. 2A—Waveform across transformer secondary with no loading. B—Waveform across secondary with neon loading.

Other methods of eliminating the very high voltage spikes in the secondary circuit consist of shunting the secondary with small resistors or capacitors, as in fig. 3. Where a surplus of power is available, a diode shunted across each half of the secondary can be used. This kills the negative half wave and loads the secondary so that the voltage output is substantially that called for by turns-ratio computations. Similar effects can be obtained by shunting the primary of the current transformer.

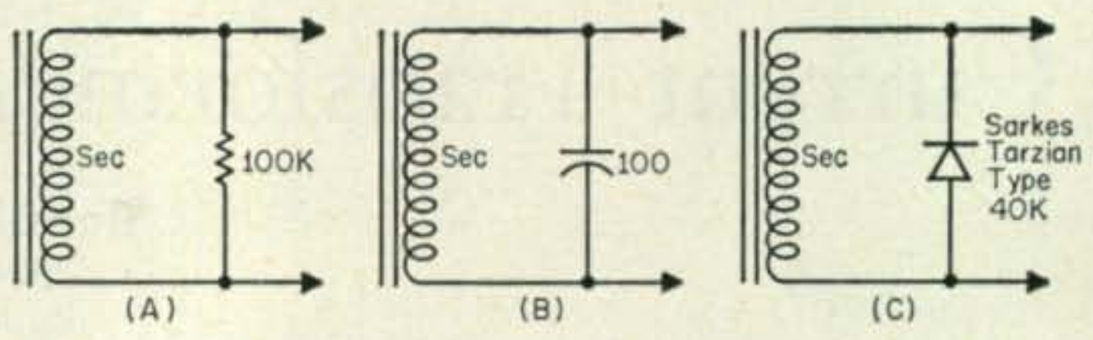


Fig. 3—Alternate methods of loading the secondary. The primary may also be loaded to reduce peaks.

Positive peaks in each half of the secondary of the current transformer are applied to the grids of a dual triode, which is biased to cutoff by a zener diode. These peaks override the bias of the tube, causing conduction, and the cathode current passes through a load, the magnetic clutch, operating it. As the control voltage is pulsating, a smoothing capacitor is required, and 8 mf was found adequate for this purpose.

Total operating lag of this system, between motor energized and clutch engaged, is almost undetectably small, being about 90 milliseconds, most of which is operating lag of the clutch. By increasing the plate voltage to 350 volts, increasing the plate resistor to 2500 ohms, and connecting 20 mf between plate and ground, the operating lag can be reduced to about 80 milliseconds. As the operating lag is already too slight to be detected under most conditions, the added circuitry needed for an 11 per cent acceleration seems unnecessary for most purposes.

Although this circuit was developed to solve a specific problem, the general principles involved here have possible wide applications in electronic control. One application already developed is a signal-operated tape drive clutch. The same general circuitry can be used in a variety of signal-operated devices. ■

Dr. Lee DeForest

1873-1961

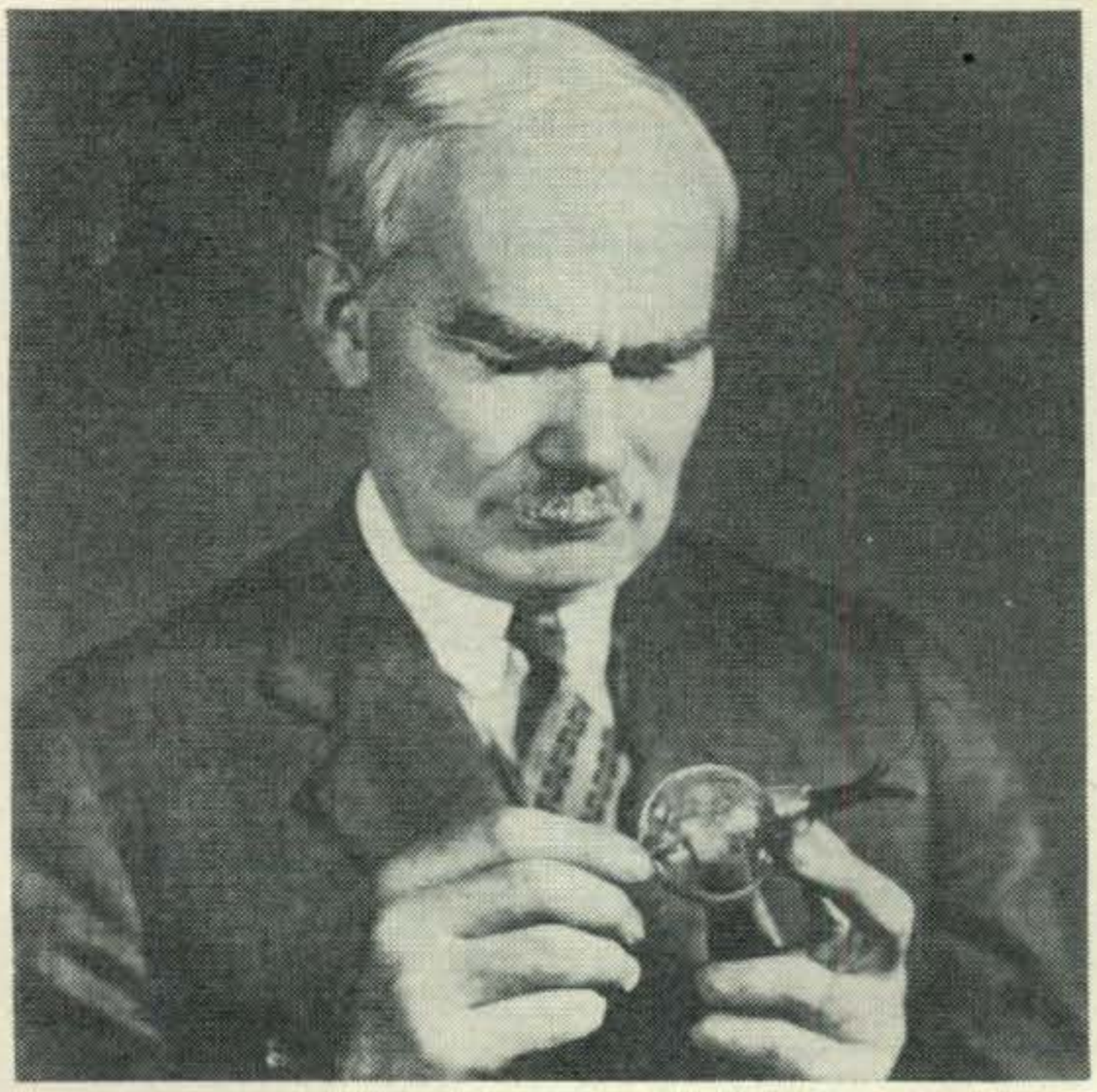
With the death on July 1 of Lee DeForest, radio lost one of its earliest and most outstanding pioneers.

Born on August 26, 1873 in Council Bluffs, Iowa, DeForest demonstrated scientific aptitudes very early in life. At the age of 20 he entered the Sheffield Scientific School at Yale, from which he received his doctorate in 1899. It was at Yale that he first became fascinated by the work of Hertz and his contemporaries in the generation of radio waves, which at that time was primarily a laboratory phenomenon.

Soon after graduation, DeForest began to conduct experiments in the then newly born field of wireless telegraphy. Noteworthy among his early achievements, which earned him the reputation as "America's rival of Marconi", were the development of the "Responder" metallic detector, an alternating current transmitter which was a considerable improvement over the less efficient d.c. powered spark coil and vibrator, a vacuum tube detector using diodes developed by Edison and Fleming, and the establishment of the first commercial wireless telegraphy station in the United States.

Dr. DeForest's greatest contribution in the field of radio and to science was made early in 1907, when he developed the "Audion", or triode vacuum tube. He found that by placing a metallic grid between the plate and the filament of an Edison-Fleming type two element tube, it was possible to control the flow of current in the tube, thereby producing signal implification. A short time later he demonstrated the phenomenon of feedback, or oscillation, using his newly developed triode tube.

The invention of the triode vacuum tube with its ability to amplify and oscillate, revolutionized the field of radio and telephone communications. It was this invention, often described as an invention as great as radio itself, that made possible the subsequent development of long-distance telephone communications, the present day complex of high power world-wide radio communications, and countless numbers of other electronic devices which depend in one way or another upon triode vacuum tubes.



Dr. Lee DeForest, 1873-1961

Patent No. 841,387, issued on January 15, 1907 to Dr. DeForest for the triode tube is considered to be the most valuable patent issued in the entire field of radio, and one of the most valuable ever issued by the United States Patent Office.

Using his newly developed triode, DeForest was the first to demonstrate radio telephony transmission. In 1908 he successfully broadcast an experimental voice transmission from a transmitter located in Paris' Eiffel Tower. A year later, he staged the first musical radio broadcast in history. This took place from New York's Metropolitan Opera House, with Enrico Caruso in the leading role.

When the United States became actively engaged in World War I, Dr. DeForest contributed much to the war effort by designing and supervising construction of several high power naval radio stations.

During the more mature years of his life, Dr. DeForest became a leader in such diverse fields as television, sound motion pictures and medical electronics. In 1930, he was licensed by the United States government to operate one of the first experimental television stations, W2XCD, located in Passaic, New Jersey. He was among the first to develop a practical method for photographing sound waves on motion picture film, making possible todays "talkies". He was also among the first to use diathermy for medical purposes.

During his life-span of 88 years, DeForest witnessed the growth of radio from a laboratory phenomenon to a mighty communications medium capable of traversing almost limitless distances into the outer reaches of space. During this time he obtained patents on more than 300 inventions, most of which have contributed much to the betterment of mankind.

Although never a licensed radio amateur, Lee DeForest always had a kind word and a warm spot in his heart for this hobby. In his early days, several years before amateur radio came into being as such, he played a leading role in the establishment of the Society Of Wireless Telegraph Engineers which many consider as a predecessor to present day radio amateur organizations. DeForest was president of the Society from 1909-1910. He was also one of the Charter Members of the Institute Of Radio Engineers.

DeForest often asked radio amateurs to work with him on some of his early radio broadcasting experiments. Such was the case during the dramatic presidential election of 1916, when he asked dozens of radio amateurs in the New York City area to tune into the special election bulletins that he transmitted from his experimental station 2XG located in the Bronx, New York. In this way, the latest election returns were spread throughout the city many hours before they appeared in the newspapers.

Science was not his only love. Everything human seemed to attract Lee DeForest, and his friends and colleagues could, and did, learn much from him. His contributions to science went considerably beyond his own research. Lee DeForest was an enthusiastic teacher, and many of his prodigies are present day leaders in the fields of electronics, radio and communications.

The world of science will miss Dr. Lee DeForest, but he leaves an indelible mark behind him. His influence will continue to be felt, both through his outstanding contributions and through the help and training he gave to so many others.

Results of the 2nd Annual *CQ* 160 Meter C.W. Contest.

Charles M. O'Brien, W2EQS/FP8AS
48 Prospect Avenue
Westwood, N. J.

WELL! Did you ever!! Did you ever what? Did you ever hear so many stations jammed into two little 25 kc segments as you did over the week-end of February 24/26 during the Second Annual *CQ* 160 Meter C.W. Contest? Well, fellers and gals, those of you who didn't participate or weren't aware of the Contest simply don't know what you missed.

Let's face it, gang. We have very few kilocycles within which to work but do you really realize how far a signal will travel on 160? Far too many hams look down and pooh-pooh 160. For exactly what reason I'll never exactly know. Under normal conditions (when no contest is on) you can work out much better and have more enjoyable ragchews than are possible on 40 and 80. Why? Simply because the terrific QRM isn't to be found on 160.

Last year we inaugurated this affair which will be held yearly from now on over the last week-end in February. Without too much fanfare and advance notice the 1960 Contest was a whopping success with 283 stations from 34 States, 4 Canadian Provinces, British Virgin Islands and England participating. 60 submitted logs. Now, one year later and with a good deal of advance promotion what happened? Well, I'll tell you what, gang. The results by far, far, far surpassed our fondest dreams, hopes or desires.

Every single State that is allowed the use of 160 was represented. This means 44 States (including Hawaii), 7 Canadian Provinces, England, Czechoslovakia, Cyprus and Germany.

For only the second year that this Contest has been in effect it simply didn't just mosey forward . . . it *Leapt!* My heavens! At this rate what will it be next year, and the year after, and the year after, ad infinitum?? Well, boys, your guess is as good as mine.

Let's make another comparison by districts, 1961 *vs* 1960 . . .

First	73 *vs* 23	VE 1-2-3-5-6-7-VO1	24 *vs* 8
Second	99 *vs* 45	G	17 *vs* 2
Third	49 *vs* 11	OK	3 *vs* 0
Fourth	41 *vs* 17	ZC4	1 *vs* 0
Fifth	9 *vs* 4	DL	2 *vs* 0
Sixth	87 *vs* 33	KH6	3 *vs* 0
Seventh	54 *vs* 18	*Total*	
Eighth	109 *vs* 59	1960	283 stations
Ninth	127 *vs* 43	1961	805 stations
Zero	107 *vs* 20		

Wow! That's a rather impressive list . . . no matter which way you look at it. The band was just *teaming* with c.w. Wonder where all the phone men went those two nights? Bet their YLs or XYLs wish there were more c.w. Contests—hi!

I mentioned earlier that every State that is allowed the use of the band was represented. The only States that are prohibited—and it's a shame something can't be done about it—are: Alabama, Florida, Georgia, Louisiana, Mississippi and Alaska.

And, such wonderful conditions over both nights. From here on the East Coast conditions to W6/W7/VE7/KH6 were terrific but nothing was coming in from Europe. Saturday night conditions westward weren't nearly as good but terrific signals were in there from G, OK, DL and even ZC4 was in the mess.

Last year the greatest number of QSOs from any one station was 116; the greatest multiplier was 31. This year it was 223 and 44 respectively. Quite a difference, eh?

One of the keen surprises was the influx of some of our nation's top DX men. Among them were W8JIN, W8FGX, W4KFC, WØNWX, W2DMJ, W3MFW, W3ECR, W1ME, W2QHH, W2UWD, W3VAN, VE7EH, VE3BWY and KH6IJ. Please pardon me, fellows, if I've left any of the gang out. There were lots of other big name calls in there but I can't know them all. It was most encouraging to hear them participating in this Top Band Contest.

As for weather conditions in various parts of the country . . . they were as varied as a woman's mind is, at times. We went from pleasant, warm weather in the south and far west, to sleet and ice storms in the midwest, to winds of practically tornado force from Indiana, Ohio, Michigan, Ontario and up into Quebec and where poles were down and electricity off for hours and, in some instances, days.

Power used ran from a measly 6 watts, to our full 200 watt limitation. Antennas were as different as the winds and ranged from just a hunk of wire thrown up only hours before the Contest to very complicated arrangements. By the time this is published, *CQ* will already have run a full article on KH6IJs vertical[1] and did Katashi ever put out a potent signal all the way here to the East Coast!!!

Comments

Comments, ah yes, comments—they're always interesting. So, here goes:

To start things off with, what Contest Com-

[1]Nose, K., "Gamma Matched 160 Meter Vertical," *CQ*, May 1961, page 52.

mittee can be so proud of and boast so highly of than to have had none other than K6ZH, Herbert Hoover, Jr., former Undersecretary of State, and son of one of our three living former Presidents amongst us. And, he's no new-comer to the band. He has been in there year in year out.

W-ONE

And, "Mr. 160" himself; none other than W1BB. Stew, our hats are off to you. You've done a tremendous job on this band. Says he: The Contest gave all hands a chance to test out antennas and equipment under real test conditions. Again, I would like to compliment *CQ* on the c.w. Contest which went off very nicely, indeed—and I really think it was a lot of fun for all. W1WY, with whom all readers of *CQ* are familiar. A very successful Contest. W1RWP, from that very elusive State of Vermont: Good fun. Expect to be on more hours next year.

W-TWO

W2UWD—an old 160 stalwart: A most fb Contest I've taken in for a long time. We are already planning for next year—most famous words of the big boys: "Wait till next year." W2SSC: Tnx for vy fb Contest. First time on 160 since 1940. Had lots of fun with low power. Hope to make this Contest a must in future. W2IU, who is none other than ex-W9NH: Wait till I get my quarter wave vertical up as well as my half wave horizontal (OK, Sam, we'll wait. We're in no hurry); W2HUG—The 44 foot vertical worked fine in spite of being only 0.08 wavelength; K2VUM—Had just got on 160 for first time and antenna was just my co-ax lead (outer conductor) out to the garage about 80 feet.

W-THREE

W3VAN: One of our top DX men . . . It was never my intention to enter the Contest officially. Had a swell time and sure hope to be a little better prepared for the next one. Wish you the best of luck in building up this event which I think is one of the most interesting Contests on the air. All right, gang. How many of you are familiar with this cry from W3MFW: I am sorry but before I had made 20 QSOs my XYL caught up with me. She gave me my choice of participating in this Contest and forgetting about the DX Test (ARRL DX Contest) coming up or *vice-versa*. (Gosh, what a position to be in). However, I intend to give the fb 160 Contest a real whirl . . . come heck, high water, or irate XYLs this coming season (more power to you, Russ). Actually I had never been on 160 before in 15 years on the air and heard about the Contest only about an hour before starting time (Russ, why not subscribe to *CQ?* We do a lot that you may not be aware of—hi!). W3KNQ: A very enjoyable party—first time on 160 since 1933; watta difference! W3GJS: Tnx for fb Contest. This should show some people that 160 meters is still a fine band.

So you'd like to check contest logs, eh? W2EQS.

W-FOUR

K4DK (K4JCP): This has been my first attempt at 160 and I find it very interesting. What can be done about the small band limits? W4IQU: Thanks for an interesting Contest and will be seeing you and, I hope more contacts, next year from a new QTH. W4NO: This is a good Contest. If I had had a better sig I'd have had more fun. Maybe next year I'll get me an antenna (how's about doing it this summer, OM—Ed). K4HQK: This year's Contest was certainly indicative of the fact that interest in 160 meters is anything but dead. I've never heard the band so lively—even during the late afternoon, which is quite unusual. Worthy of mention were the excellent operators participating in the test. (Yes, om, this is an annual event—Ed). W4OMW (of W4KVX's *DX Magazine*): The activity on top band sounded like the sweepstakes from beginning to end. Looking forward to next one. W4KFC: What a workout this underrated and neglected band got! Am sure, when the boys who missed this one get the word, activity will double again next year.

W-FIVE

W5KG: I apologize to fellows in upper sector for not answering calls due to my being new comer to the *new 160 band!* Actually unaware of the upper sector until I got a copy of *CQ* off newsstand February 26—too late. And, thanks to *CQ* for running frequency information under ZERO BIAS. W5SOT: A most enjoyable party. Thank you.

W-SIX

W6JEK: Very nice contest. K6TSQ: I had an excellent and enjoyable time. Sorry I couldn't devote more time. Conditions seemed very good although a little crowded (the mis-statement of the year—Ed). Looking forward to the next contest on 160. K6HXT: Wonderful contest. Keep up good work! Conditions really good Friday especially. K6ZH: Herbert Hoover, Jr.: No prizes claimed but a lot of fun.

Frank, K4JCP at the controls of K4DK, top entry from Tennessee. This was Frank's first contest.

K6SDR: Enjoyed 160 Contest very much. It sounded just like SS the first evening. Was very pleased to hear all the stations packed into 25 kc on both ends. Feel I could have done much better but on Saturday evening I burned up my r.f. choke in the final and was put out of Contest rather early. Wait till next year—200 watts! W6YC: I certainly enjoyed this Second Annual *CQ* 160 Meter C.W. Contest. Stations from back east were pouring in loud and clear first night; second night I made only a few eastern contacts.

W-SEVEN

K7HDB: Sure glad that the *CQ* 160 C.W. Contest has become an annual fixture. I'm not much for Contests but wouldn't miss this one for the world. There is just the right balance between operating periods since the band virtually closes down all day allowing a chance to rest up a little. Last year it was terrific . . . this year even better. Heard W2EQS and W1BB on sunrise skip. Very rare this far north (Boy, could I have used Oregon for a multiplier—Ed.). W7ZZW: I worked for only 7 hours Friday night using 10 watts to a dipole running all around the house. Had lots of fun and heard plenty of stations with quite a few of the East boys coming through. The band was in good condition and at times seemed to be as crowded as 20 meters on a good day. I guarantee next year I'll have a little more power and a good vertical antenna. I hear lots of East Coast low band stations but they never seem to tune up to the top section. Please inform them that they are missing some 160 meter DX by not tuning there. Let's have more 160 meter activity or more Contests. I think the fellows are missing out on a lot of fun on a good band. I didn't realize just how good it was until I cut an antenna for it and tried the band. I'd rather work it, now, than any of the other low bands . . . if someone else would get on. W7ABO: First time I've worked 160 in more than 25 years. Couldn't figure out how to work cross-band for Easterners. Had fun anyway. W7ZOC: This log represents several very interesting hours of effort. I am most grateful to *CQ* for making it possible. It wasn't until Friday evening, 17 February, that I happened to see the announcement in the CONTEST CALENDAR section and, realizing a chance for some fun, started pawing through my junk box to see what I could do about it. Goody, goody, gumdrop! There was enough junk in the box to provide parts for a 5763 Colpitts v.f.o. and an HY-69 final. I could see a place to string up 114 feet of sky-wire. I had a power supply to feed the rig and time enough to throw it together if I didn't run into too many snags. Finishing it on Thursday night around 11:45 I hurriedly tuned up and called a WØ in Colorado (was it you, Bind?—Ed) and got a report of 579C. Went to bed, then, with a mental note to improve things next evening. Then, Friday the 24th, I let the antenna down, added another 20 feet after the insulator, tapped an odd coil across the insulator, and hauled it back up. 35 feet high at the far end and 6 feet above ground where it left the shack window, working against a darn poor Arizona ground—that's all the antenna I had, but it worked. After correcting the voltage regulation to the oscillator by changing the v.r. tubes and thereby eliminating the chirp, I got into the Contest. Considering my 65 watts, poor antenna, poor location just 5 miles from the Arizona/Mexico border, I don't think I did too badly. Incidentally, this is the first time I've been on 160 meters since I was W6AIS back in 1935 and reading the old *R-9 Magazine*. Oh yes, the receiver I used for the contest is one I built in 1931. It uses a C-224 (Cunningham tubes—remember?) untuned r.f., a C-227 regenerative detector, a C-227 audio stage, and the coil is wound on an old UX-280 tube base. When first plugged in, the old wet electrolytic capacitors sputtered for a few minuties before settling down and there was a noticeable glow of light purple in the 280 but it is surprising how well the old blooper still brings them in. So, thanks again for holding the Contest. It was great fun and, God willing, I'll be with you again next year . . . but with the full legal power (Ed note: the entire contents of W7ZOCs remarks have been listed because they bring back such nostalgic memories. And, I'm sure there are many, many of us who *do* recall the old Cunningham tubes, etc.).

W-EIGHT

W8QWI: Had a very fine time, except for Saturday evening when one of the worst storms hit the Lorain area. Had winds up to approximately 60 m.p.h.; rain, sleet, snow, lightning and thunder. QRN terrific. K8HWW: Enjoyed Contest very much although couldn't operate much. Ran 6 watts input to 40 meter folded dipole. K8BDZ: Had a wonderful time but southern Ohio experienced a hurricane on Saturday with winds up to 110 m.p.h. Obviously it took every bit of antenna I had up. When the winds were down to about 40-50 m.p.h I was back up in the trees frantically working to get the skyhook back up. K8RYU: Thank you for a very nice Contest. Would have been much better if the whole country had been allowed to use the same frequencies. W8CXS: I sure enjoyed the contest although score wasn't high. Very surprised at all the activity on 160 and the good

signals. BCNU next year. W8GDQ: I was looking for that Asian contact (Willie refers to ZC4AK who was on and calling several Ws but with no luck at QSO. Subsequently Willie worked him giving him the second 160 WAC—congrats; a mighty fine accomplishment). W8-JIN: I only put in one hour and 45 minutes during the 160 meter Contest. My working sked at local TV station only gives me one week-end off per month and this wasn't one of them. (Jim, arrange to have the last week-end of Feb. in 1962 all yours). W8FGX: Sure hope you accept this 160 meter log. Sort of got caught with 2 beams down between 1st and 2nd portions of ARRL DX Test. (You betcha we accept your fine log, Jake. Join us again next year, please.) W8GIY: Had a ball and missed a lot of sleep. Never heard so many sigs packed into 25 kc in my life! My antenna was all iced up Saturday nite. Here's to more and bigger 160 meter Contests. W8ROV: It sure seemed swell to hear the good old "Top Band" loaded with c.w. signals from all over the U.S. Any possibility of running it for two week-ends (what's that again, man?—Ed.)

W-NINE

W9UKV: Along with many other amateurs I feel this band should never have been taken from us; that it should still be appreciated and used much more than it is and that every effort should be made by uniting all interested hams to make their wants known to the proper people concerning the restoration of more frequencies to the amateur service. W9PNE: I enjoyed it very much. The storm that week-end triggered a very bad power leak that hurt my score. I worked all but 4 of the stations I heard. Couldn't hear the weak ones. W9MAK: Very enjoyable Contest. I was pleasantly surprised by my first encounter with 160. W9HLY: I am very happy with my results considering the fact that 26 hours before the Contest started my XYL presented me with my #3 harmonic (congrats and best wishes to both of you—Ed). W9CLH: This was my first fling at 160. Put up the dipole about 2 weeks prior to this event and had a great time. WØVXO/9: In a few years this 160 Contest will make the ARRL SS look like a kiddies contest. I'm already planning for next year. K8HBR/9: Sure was a fb Contest. Conditions were excellent and the band really jumping. W9WJB: Was surprised to hear East Coast rolling in 2 hours after daylight. K9ALP: This Contest not only demonstrates the capabilities of 160 but the merits of using low power. W9DPL: Conditions here were miserable; a blizzard was raging and I missed much of the Contest period when we were without electricity for over 11 hours.

W-ZERO

WØSDN: I went into this Contest without any preparation but will not be caught in that condition next year. WØGDH: I enjoyed this Contest as much as any I have ever taken part in. KØP-AU: This Contest was something new for me. It

K8HBR/9, Al Breulich, Shipkeeper aboard lake freighter tied up at Superior, Wisconsin for the winter. Valiant at 190 watts; dipole antenna 100 feet in air; 75A-4. Nice, neat lil layout, eh?

is the first one I have really entered and it was on a good band. KØMRH: While I do not care much for contests (too nerve racking for me) I did want to get in on this 160 affair to help show that the band is still in use. I am one of the strongest advocates for 160. WØCBV: My first time in any contest. Had only about 3 hours to get in but I had lots of fun. Hope we can do it again next year. I have been working 160 for about 10 years. Have 160 WAS and the best on DX is KH6IJ and ZL3RB. WØCDP: A lot of fun! Certainly a great increase of participants over last year . . . this can grow into a junior SS at this rate!

CANADA

VE3ACB: Licensed since 1936; this is the first time ever on 160. VE2AIL: Enjoyed the Contest very much. In seven years of activities on the air it was my first QSO on Top Band. Wait till next year. VE3BZB: An excellent Contest. Used 30 watts to 80 meter half-wave against ground. I'll be there next year. VE2IL: I was unable to continue in the Contest on Saturday and Sunday due to an ice storm accompanied by high winds up to 70 m.p.h. which not only took down antennas but cut us off from power for 5 days. The whole Montreal area was without power for periods from 2 to 8 days as thousands of poles and countless thousands of wires were down. The last time I operated this band was in 1933. Thank you for a fine Contest. VE7AFW: I am ashamed to say that I completely forgot about the 160 c.w. Contest until you reminded me. I enjoyed it very much and am still active on 160 when I have the time. (Borge, note on your calendar for next year the last week-end in February. That is the week-end we have selected to hold this affair annually). VE6WW: I let my *CQ* subscription expire last winter and didn't get the details on the Contest so was not prepared for it. It was pretty difficult for me to copy the East Coast stations through the signals from the boys in the Mid-west. I believe I could have made a few more contacts but I spent too much time listening to see just what I could hear. If my present plans materialize I will have a better antenna up for 160 next winter. I am a farmer so space is not an obstacle. VO1DX: I didn't

VO1DX, Horace W. McNeill of St. Anthony, Newfoundland—a real rare Province on 160. Homemade xmtr pr. 807s at 100 watts; long wire antenna; NC-98 rcvr.

enter the Contest seriously but merely tuned up to give the boys a "lift." Guess I really should have taken the Contest seriously and stayed up. Friday night I heard many Ws coming through and called my head off but no takes. But on Saturday the band seemed better and I had no trouble working stations. Next year I will definitely be in there pitching.

HAWAII

KH6DVD: What with a megawatt Loran station just 2 miles away I could not hear much but was advised that plenty were calling me. Maybe better QTH or noise reducing system next year. (Check KH6IJs noise reducing system —Ed). KH6VF: I had to work all week-end so had no time to really devote to the Contest. Many West Coast stations were heard but all were calling CQ East. It would help a lot if the West Coast boys would call a CQ KH6 occasionally and listen on their own frequency. (George, the West Coast boys sure were in there listening on their own 1975-2000 kc segment a-plenty. Sure, they called CQ East, too, to get QSOs and multipliers. Hope you have more time to be with us next year—Ed).

DX

This Contest had been set up as a United States/Canadian affair but with extra points given should any foreign stations be worked. The Committee has received several requests from foreign stations to make this Contest world-wide next year and we are giving this most serious consideration. Here are some quotes from foreign stations across the Atlantic: ZC4AK: Conditions during the Contest seemed excellent but for me they were marred by an extremely high local static level. I heard W1BB and W2FYT as early as 0050 GMT and at 0410 W2FYT, W3VAN and W4KFC were peaking 579 here in Cyprus over a distance of 5000 miles. I couldn't raise them due to a tremendous amount of stateside QRM. (Boy, oh boy, couldn't you guys really kick yourselves in the pants now?—Ed). I had planned to erect a 300 foot vertical balloon. Held aerial especially for the Test but the balloons broke loose as I put them up. I hope this report from so far away is of interest to you. (Sure is, Steve, and we are very seriously considering your suggestions—Ed). G5JU: Conditions were pretty good and I did better than for a long time. Heard 13 stations over your side and worked seven of them. I am glad to learn the Contest is to be an annual affair and I hope to be able to take part on future occasions. G3PU: Actually I heard more DX stations on the morning of Feb. 26 than I heard on any other occasion this season. *But,* I only worked 3 stations because most of you chaps over there didn't seem very interested in DX that morning! Stations heard were: W1BB, K1KSH, W1ME, W1PPN, W1RWP, W1WY, W2DEN, K2DGT, W2EQS, W2FYT, W2GGL, W2IU, W3MSR, W3VAN, K4DK, W4KFC, W8ANO, W8APN, K8DDZ, W9PNE, WØGJT, WØSDN, WØVXO/9, VE1ZZ, VE3BWY, VE3DFD. (Need anything further be said, oms? —Ed).

Here's an interesting maritime mobile report from Jack Lally, W2BXS, aboard the USS *Constitution* off the Northwest Coast of Sicily covering what he heard the night of the 25th. W1BB, PPN, WY; W2FYT, K2BWR; W3MSR; W4KFC; W8FGX; WØTUT. Jack writes, "All these stations were calling CQ West but were being very frantically answered by any number of Europeans. Of this gang W2FYT and W4KFC were by far the best signals and most consistent.

And now comes a very, very sore point; one that we despise bringing up. But, it must be. If you can't go into a Contest and be honest then it is time that you quit the game and spend your hours doing something else. Why must there always be a certain few who can't play the game according to the rules? What pleasure is there to be derived from cheating? How can one feel proud if that certificate he has obtained has been "won" under false pretenses? What is to be gained? The results of this Contest have been checked very carefully and your Committee regrets that they found it necessary to disquality certain stations. We can't all be winners but we all can have a helluva lot of fun. When next year's affair comes to pass it is your Committee's fervent wish that there will be no repetition of the unsavory taste that a certain few have left in our mouths.

And so it goes. From all these remarks it is very apparent that it was a most successful and thoroughly enjoyed affair. What will it be like next year? Well, my friends, your guess is as good as mine.

Many did not know whether to count District of Columbia as a multiplier or not. Fellows, it counts the same as Maryland. Also, many counted QSOs with KH6 as 2 points. Hawaii is a State as well as a "foreign" country and counts for 5 points. For our KH6 friends, the only 2 pointers you get are for QSOs with other KH6s; all other QSOs are at 5 points per.

In conclusion, 5 stations are extremely lucky that their scores are even listed. On St. Paddy's

Day, Friday, March 17, after picking up these logs at *CQ* I stopped off at my favorite little French Restaurant for lunch with a friend. We had just finished and were sitting there relaxing when the terrifying yell of "FIRE" reverberated throughout the place. Were you ever in a similar circumstance? This was my first such "experience" and the thought of it still gives me goose pimples. The only thought was to get out of the place . . . no hat; no coat; just save yourself. I was slightly injured with the result I didn't get back to work in New York City til the Wednesday following. During that period of time those 5 logs were constantly on my mind. I thought about them; I worried about them; I even had a dream about them Well, Wednesday I stopped in and weren't they still intact in the big brown manila envelope. Whose were they? VE2IL W8YPT WØNWX W9YT W6GWQ. Yes sir, that Contest was so hot even these logs carried the heat of it and were probably the cause of this restaurant fire. Hope you boys never go through this type of experience and I pray that such a frightening, terrifying occasion never crosses my path again. Attractive certificates have already been sent to the highest scoring station in each State, Province and foreign country. See you all again next year. This is definitely an annual fixture. To prove it: *CQ* has 500 certificates on hand for this affair alone.

In the tabulation, the first column is the number of contacts, second is the multiplier and the last column is the final score. P. S. One fellow became so excited about the Contest his log showed everything but his call. We had to check back through the numbering system to determine who he was.

Top Ten—East

W4KFC	19,932	W9WJB	13,680
W2FYT	18,480	K8HBR/9	12,833
WØNWX	17,960	W3VAN	12,738
WØVXO/9	15,695	K9MBR	12,236
W2EQS	14,364	W9PNE	11,914

Top Ten—West

WØCDP	13,846	WØSDN	5,678
W6KIP	10,412	W6LN	5,049
W5DWB	7,446	VE7EH	4,806
K6HXT	7,440	KH6IJ	4,580
WØTUT	6,831	WA6CDR	4,300

Connecticut

W1WY	106	30	6510
W1TX	77	22	3388

Maine

W1AQW	31	14	868

Massachusettes

W1BB	156	37	11,877
W1ME	48	20	1920
K1AII	23	10	460

Rhode Island

W1PPN	144	30	9180

Vermont

W1RWP	50	21	2100

New Jersey

W2FYT	211	42	18,480
W2EQS	195	36	14,364
W2IU	129	36	9468
K2BWR	126	30	7560
W2HUG	127	26	6604
WA2AXX	96	28	5376
W2QDY	90	20	3600
W2CVW	66	18	2376
W2DMJ	57	19	2166
W2ZI	57	17	1938
W2DEN	48	19	1824
K2VUM	14	10	280

New York

W2SSC	106	24	5088
W2UWD	84	29	4959
K2PFC	80	22	3520
WA2OJD	65	22	2860
K2TMG	49	19	1862
W2QHH	20	14	560

Maryland

W3VAN	193	33	12,738
W3MSR	150	34	10,200
W6LWN/3	60	20	2400
W3BKE	40	17	1360
K3HPG	45	14	1260

Pennsylvania

W3JXS	100	25	5000
W3GJS	99	25	4950
W3IDO	53	25	2650
W3KNQ	27	17	918
W3UMY	29	9	522
W3MFW	20	10	400

Kentucky

W4OMW	107	25	5350

North Carolina

K4IEX	63	21	2646

South Carolina

K4HQK	78	29	4524

Tennessee

K4DK (K4JCP)	104	26	5408
W4IQU	50	22	2200
W4HYY	33	15	990
K4AMC	23	13	598
W4JGS	22	13	572

Virginia

W4KFC	222	44	19,932
W4NO	40	19	1520

New Mexico

W5DWB	108	34	7446
W5SOT	62	30	3810

Oklahoma

W5KG	23	15	690

Texas

W5TLY	50	21	2100

California

W6KIP	134	38	10,412
K6HXT	117	31	7440
W6LN	92	27	5049
WA6CDR	86	25	4300
K6SDR	84	20	3420
W6YC	65	17	2261
K6ZH	52	21	2247
K6RIF	51	18	1890
W6GWQ	50	16	1600
W6ISQ	46	15	1425
W6JEK	38	14	1106
W6FHW	30	13	819
K6TSQ	41	8	656
W6OST	31	9	558
W6EIG	23	6	276

Arizona

W7ZOC	65	25	3250
W7ZZW	36	12	864
W7ENA	23	7	322

Idaho

K7BWV	34	12	852

Nevada

K7ICW	44	18	1584

Oregon

K7HDB	64	16	2048
W7LNG	46	14	1330
W7JLU	33	17	1173
W7HHD	42	11	957
K7IJH/7	20	7	280

Washington

W7ZVY/7	85	23	4048
K7EKD	54	25	2700

Wyoming

W7ABO	15	7	210

Michigan

W8APN	155	33	10,230
W8GIY	111	30	6750
W8HUT	108	27	5832
K8QDZ	84	23	3864
K8HWW	47	15	1410
W8CXS	22	15	660
W8ROV	4	4	32

Ohio

W8FGX	140	37	10,360
K8BDZ	130	30	7800
W8QWI	134	26	6968
W8TSD	98	27	5292
K8RYU	72	21	3024
K8CAG	60	22	2640
W8YPT	55	20	2200
W8JIN	55	19	2090
W8VDF	35	16	1128
W8ANO	16	8	256
W8GDQ	2	2	8

West Virginia

K8MMZ	42	17	1428

Illinois

WØVXO/9	181	43	15,695
W9WJB	171	40	13,680
K9MBR	161	38	12,236
W9PNE	161	37	11,914
W9CLH	103	28	5768
W9MAK	42	16	1344
K9ALP	20	12	480

Indiana

W9HLY	102	25	5100
W9UKV	27	16	864
W9DPL	25	14	700

Wisconsin

K8HBR/9	155	41	12,833
W9YT	120	33	7920
K9OVZ	14	9	234

Colorado

WØCDP	161	43	13,846
WØTUT	102	33	6831
WØJGF	35	17	1190

Iowa

WØNWX	223	40	17,960
WØGJT	104	31	6448

Kansas

WØGDH	143	38	10,982
WØIFH	112	33	7491

Minnesota

KØPAU	80	28	4480
WØRHI	38	18	1368

Missouri

WØCBV	39	20	1560

Nebraska

WØBBS	40	20	1600
KØMRH	15	7	210

North Dakota

WØSDN	82	34	5678

Nova Scotia

VE1ZZ	38	16	1696

Quebec

VE2IL	25	15	750
VE2AIL	5	5	50

Ontario

VE3BWY	146	34	9928
WØAIH/VE3	89	30	5340
VE3DU	61	25	3050
VE3RIT (VE-3BFA)	38	18	1368
VE3BZB	25	10	500
VE3ACB	18	13	468

Saskatchewan

VE5DT	2	2	8

Alberta

VE6WW	34	20	1420
VE6IZ	14	8	224

British Columbia

VE7EH	86	27	4806
VE7AKI	53	21	2289
VE7AFW	5	4	40

Newfoundland

VO1DX	17	9	414

Hawaii

KH6IJ	47	20	4580
KH6DVD	10	4	161
KH6VF	2	1	4

Cyprus

ZC4AK	9	3	135

England

G5JU	7	6	210
G3PU	3	3	45

A Modulator-Powered Hybrid Transmitter

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Richland, Washington

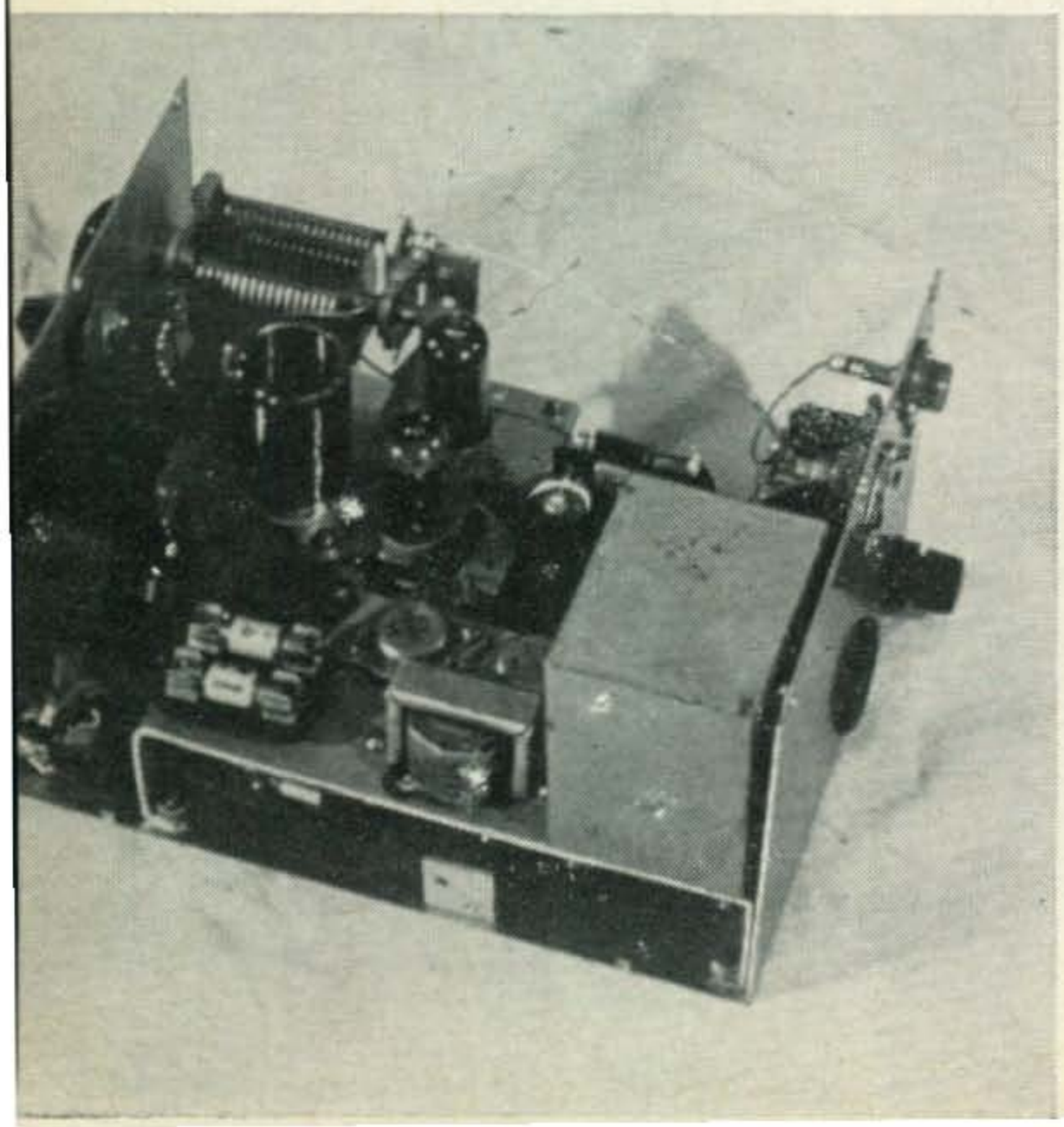
A small hybrid transmitter, 5 watts input, for the 40 and 80 meter bands that is powered by the modulator output. The high voltage is there as long as you keep talking.

Described here is a small a.m. or c.w. portable transmitter for the 80 and 40 meter bands running about 5 watts input. The rig has no d.c. power supply as such. High voltage is obtained from the modulator by a diode clamping circuit.

Circuit Description

The r.f. section is composed of a Pierce oscillator followed by an amplifier stage. Operation is on the crystal fundamental; an 80 meter crystal must be used for the 80 meter band. The 12K5 oscillator tube is a "hybrid" tube that normally operates with 12 volts on the plate and screen (space charge grid). The 12AQ5 requires high voltage on the plate and screen, and is driven by the modulator clamp circuit.

The modulator section is a standard transistor type modulator, capable of delivering 15 watts of audio output. Transformer T_2 is a 15 watt (or more) audio output transformer wired in backwards. The 4 ohm tap is grounded, and the collectors are connected to the common and 16 ohm taps. Between 125 and 200 volts r.m.s. is obtained from the 5000 ohm secondary for powering and modulating the final. Capacitor C_{12} and the M-500 rectifiers are used in a standard diode clamp circuit where the diodes do not allow the a.c. voltage to swing negative. The result is 100 percent modulated high voltage. Components C_6, L_2, and C_5 are arranged in a pi network to pass only frequencies below 3500 cycles per second. This filter prevents splatter and keeps the output signal bandwidth narrow. Inductor L_2 is a junk box filter choke from a small a.c.-d.c. radio with the coil pruned down to ½ henry inductance.



Side view showing the modulator sub-chassis. On the left end are the two 500 ma diodes, CR_1 and CR_2. On the right end is T_2, the output transformer, and in the center is T_1. Directly behind T_1 and the diodes are the transistors.

Operation

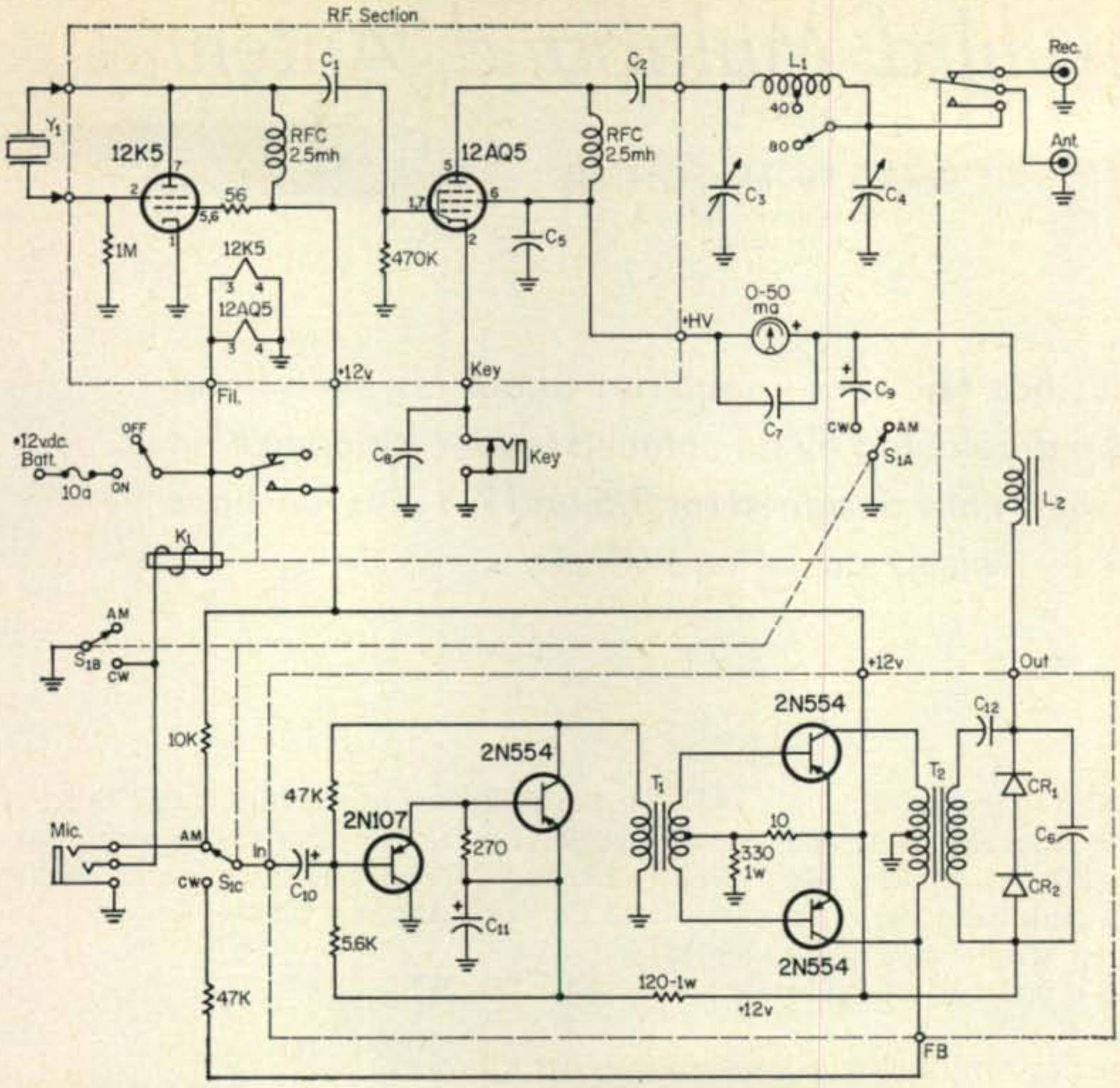
The transmitter can be tuned up by switching to the c.w. position on switch S_1. Section S_{1c} completes a feedback loop in the modulator so that it oscillates; S_{1b} energizes the relay and S_{1a} switches in a filter that bypasses all audio voltage to ground so that high voltage d.c. only is supplied to the final amplifier. The rig is now tuned normally by dipping C_3 and loading with C_4. When used on c.w., the key opens the cathode of the final, and S_1 is used as a transmit-receive switch with A.M. being used as the receive position, and C.W. as the transmit position. Operation on a.m. is simply "push to talk" and keep talking or the output disappears.

General Comments

1. Higher oscillator output would improve the efficiency of the output stage, so the addition of a tuned circuit in place of the r.f. choke and Conversion of the oscillator a T.G.T.P. or a Colpitts type would boost the output somewhat. It was left out of this rig to keep the tuning simple and quick.

2. If your car has a negative hot system, it will be necessary to modify the modulator so that all + 12 lines are grounded and all minus lines are "hot."

3. Other bands can be used by changing L_1 and using a suitable crystal, but be sure a crystal whose fundamental is in the band you will use is available, or modify the oscillator for harmonic operation on higher bands. The rig as described will be best used on 160, 80, 40 and maybe 20 meters.



T_1—100 ohms to 100 ohms center tapped. Thordarson TR-64

T_2—5000 ohms to 4 and 16 ohms such as Stancor A 3304

C_1—.001 mfd ceramic

C_2—.001 mfd ceramic 600 volt

C_3—100 mmfd max variable—plate tuning

C_4—450 mmfd max variable—loading

C_5—.01 mfd 600 volt

C_6—.01 mfd 600 volt

C_7—.005 mfd

C_8—.01 mfd

C_9—20 mfd 250 volt (or higher) electrolytic

C_{10}—2 mfd 15 volt tantalum

C_{11}—100 mfd 25 volt electrolytic

C_{12}—1 mfd 400 volt paper or oil filled

L_1—See Text.

L_2—0.5 H, 50 ma. See text

K_1—12v, D.P.D.T.

Fig. 1—Circuit of a 5 watt c.w. or a.m. transmitter in which the final is powered by the modulator output.

4. The 10 amp fuse should not be left out. There are a large number of 12 volt leads and connections with 12 volts on them, and it is very easy to accidentaly wire in a direct short. (Don't laugh—I had three grounds on my first try). The transmitter draws about 1 ampere on standby, and about 3 amps when transmitting and may peak at 5 amperes.

5. The plate power input may be increased by using a larger output transformer (T_2). Power in this rig is limited by the maximum available modulator output.

6. Do not leave out the filter capacitor C_9 if you want to use c.w. operation. Remember that m.c.w. operation is not legal for hams. Also be sure that C_9 is on the amplifier side of L_2. If it is on the modulator side, it presents a low impedance to the modulator and you will have very little high voltage.

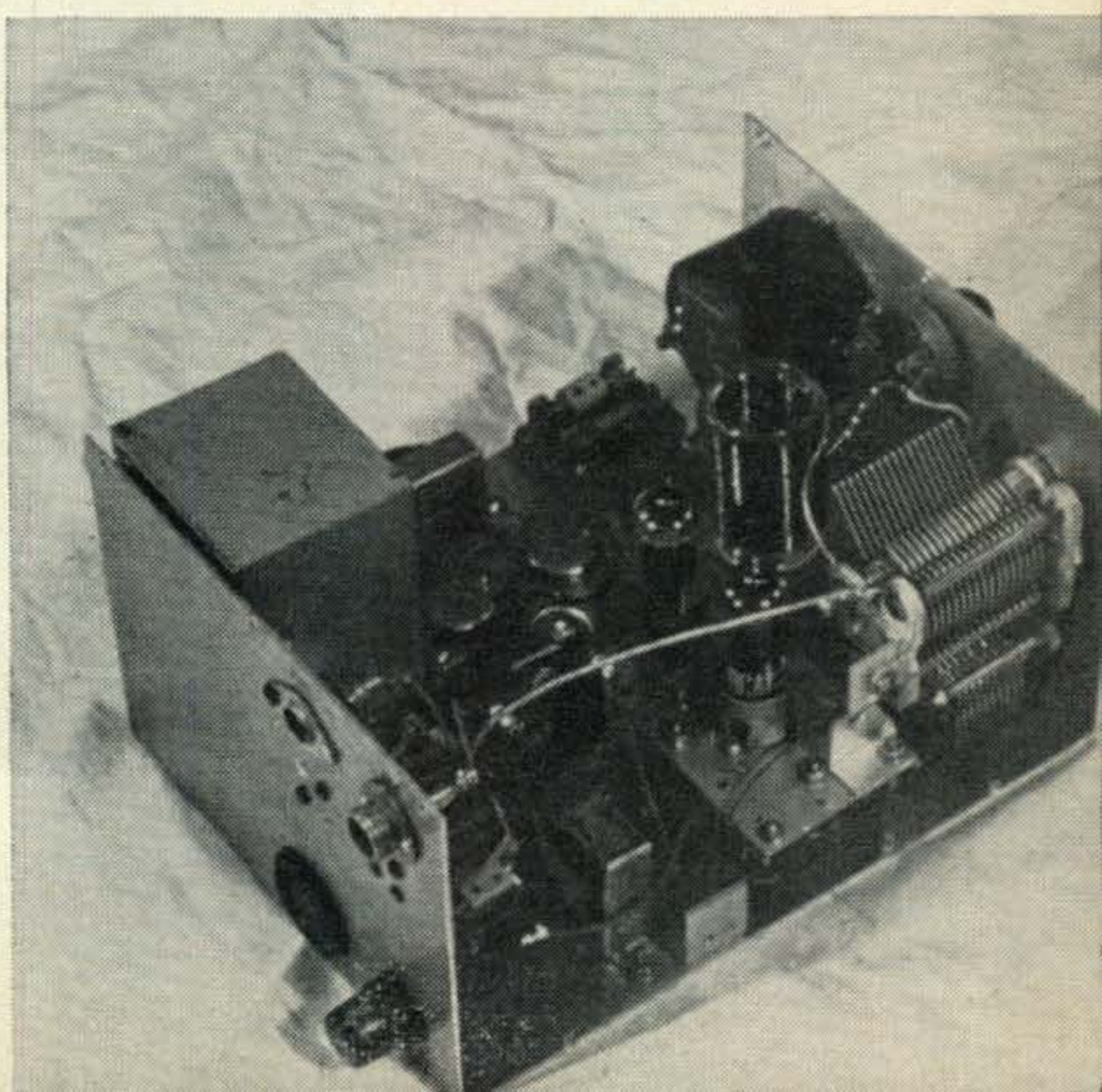
7. To simplify construction and make the wiring easier, the r.f. section and the modulator section were built on separate small chassis and were tested prior to the final assembly. A 5000 ohm 10 watt resistor was used to load the modulator output, and a small power supply was used to check out the r.f. section. The final assembly and wiring was completed with room to spare, and an accessory plug was added at the last minute for a possible future control box.

8. Inductor L_3 was made by cutting and trying with a grid dip meter. Approximate values for a 72 ohm output are:

80 meter-24 microhenries
40 meter-13 microhenries

These inductances can be connected to a 50 or 100 mf capacitor and checked for resonance

[*Continued on page 114*]



Side view showing the r.f. assembly. The antenna tuning capacitor may be seen on the front panel with the P.A. tuning capacitor directly beneath it. To the left of the variables is L_1, part of the pi network. Filter choke L_2 is just to the rear of the r.f. chassis. The rear panel contains the fuse holder and the power input plug to the left of the holder. The antenna and receiver plugs are in the top right. The changeover relay is mounted on the inside of the rear panel below the antenna connectors.

The One-Third Multiband Antenna

Pekka Pyykko, OH1NE
Markonkuja, Turku 9
Finland

Pete, OH1NE, has had many inquiries about his multi-band antenna. It is a dipole, fed by an untuned feeder for operation on 3.5 and 7 mc. While designed for 3.5 and 7 it also functions nicely on 14 and 21 mc.

A GREAT deal of my short ham career has been spent among the pines in raising and lowering various multiband dipoles. My purpose has been to find a multiband wire, fed with untuned feeders, which would give good results on 3.5 and 7 mc, and if possible, on other bands. My main interest is c.w.

After having tried most known multiband dipoles, I sat down—and came up with an idea.

Theory

A 3.5 mc halfwave dipole, as you know, resonates on all of our h.f. bands. However, the impedance on 3.5 is low; 20-100 ohms, depending upon the height. On other bands it is high; in the neighborhood of 1000 ohms. The problem is thus: how to feed it? I solved the problem this way:

If we take this doublet and connect a 3.5 mc quarterwave open stub at the feedpoint and then draw the current distribution curves of the antenna and the stub (fig. 1.) we find that the

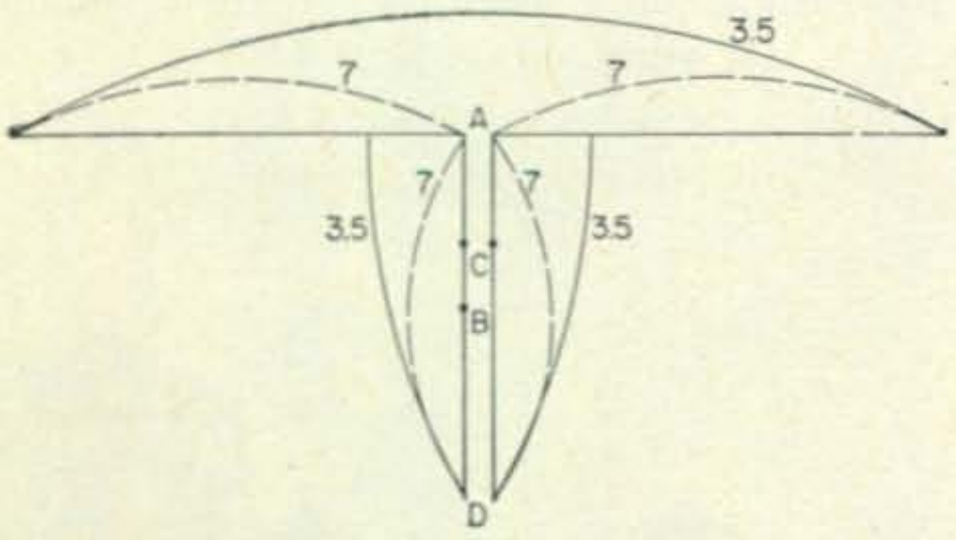


Fig. 1—Current distribution on the antenna and stub for 3.5 and 7 mc. Point C, ⅓ of A to D, will have approximately the same impedance for both bands.

impedance at point A is low at 3.5 mc and high at 7 mc. At point B it is medium high at 3.5 mc and low at 7mc. Somewhere between A and B the impedance at 3.5 and 7 mc must be equal. If we connect the feeder at point C (AC = AD/3), the feedpoint in the stub is one third of a quarter-wave away from current maximum on 3.5, 7, 14, and 28 mc. The impedances should be about the same on these bands (fig. 2).

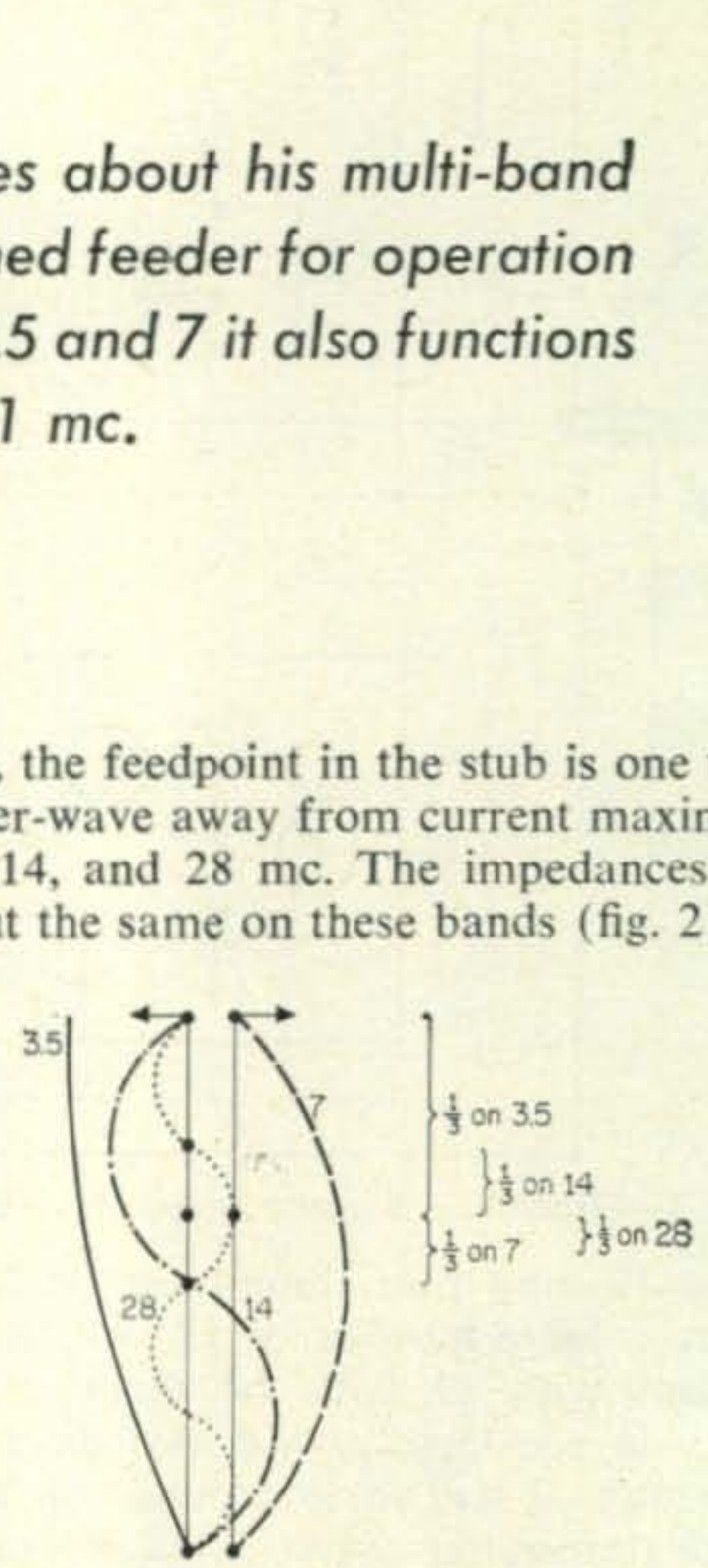


Fig. 2—Distribution of current on the stub for 3.5, 7 and 28 mc.

Also, if we make both the feeder and the stub of 300 ohm twin lead (or other 300 ohm line if you prefer) and than use the formula of a stub such as this we see that on 3.5 mc this stub raises the impedance about 4 times, ($4 \times 70 = 280$). On other bands it lowers the impedance about 4 times, ($1000/4 = 250$). Thus, we get a very good impedance match to a 300 ohm feeder on the 3.5, 7, 14, and 28 mc bands.

This "one-third-idea" has appeared previously but the theory describing it was unorthodox.

On 21 mc the stub doesn't change the impedance and we thus feed a 1000 ohm antenna with 300 ohm feeder. The s.w.r. is rather high, but this antenna is usable on 21 mc.

Measurements

I have measured the s.w.r. of this antenna to be as shown in fig. 3. The measurements were made using a bridge arrangement. It can be seen that the losses in the feeder are very small on the 3.5 and 7 mc c.w. bands and not too high on other bands. On 21 mc the curve is a bit better than it should be. I don't know why. The end effect moves the resonance point to the 'phone segment on higher bands.

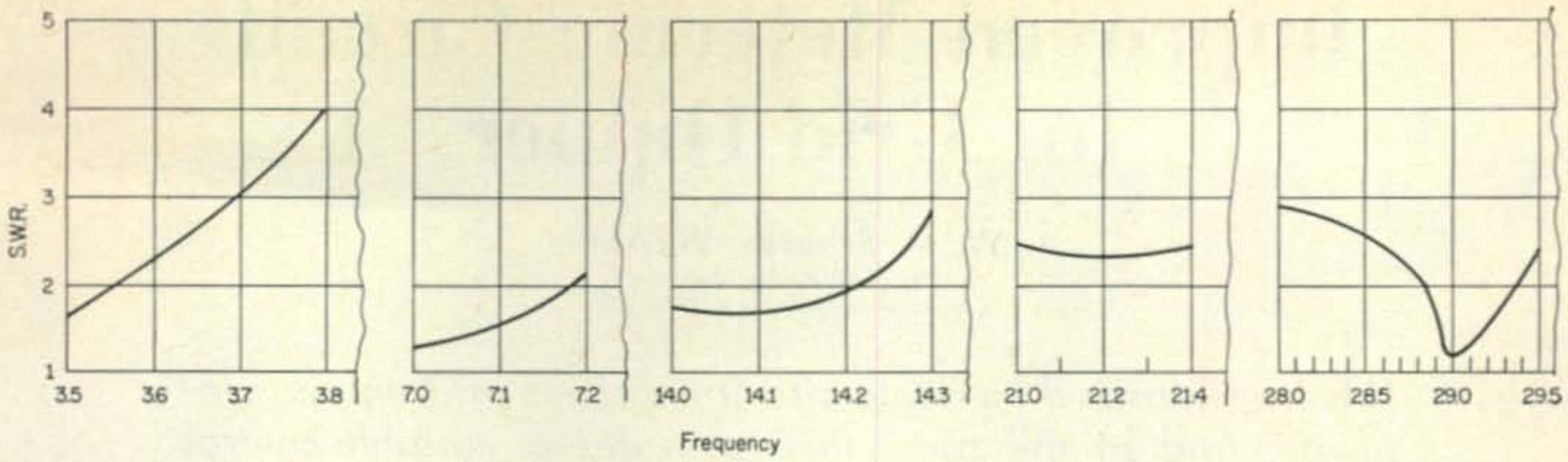


Fig. 3—S.w.r. versus frequency for each band.

On-The-Air Results

This antenna has been in use for some time now and I'm rather satisfied with the reports I have received. According to the reports, this antenna is as good on 3.5 mc as a normal halfwave dipole. On 7 mc this new antenna is the best wire antenna I have had; especially on long hauls. This is probably due to the directional characterisitics of this antenna; two halfwaves in phase. On 14 mc the same can be said as on 3.5. On 21 mc the s.w.r. is rather high, but I have received some nice S9 reports for my 20 watts on this band also. Ten has been dead every time I have tried.

Well, the theory appears to work out, the measurements are good, and the reports I've obtained are good. I hope I don't need to do any more climbing for a while.

Construction

The length of the dipole is 134 feet. The stub and the feeder in my antenna are made of 300 ohm flat twinlead. The length of the stub is 58 feet.

If you wish, you may build a more durable antenna using 300 ohm open wire line or 300 ohm steelconductor twinlead. Use your grid dipper for measuring the quarter wave stub in this case.

The "tail" of the stub (fig. 4) can be left hanging down as in (A), tied under the feeder as in (B), or folded together at the feedpoint, (C). Don't fold it too tightly.

In some cases it may happen that the stub alone will be long enough to reach the rig, and I think that this system is reasonable then as an automatic matching system. You don't need an antenna tuner; a saving in money and a saving in time.

Other Versions

If you are short of space and want to work 80 and 40 you can bend about 20 feet down on each side with little effect on the signal strength. If you don't want the directional characteristics you can set the antenna legs at right angles to each other. If you omit 80 you can make your copy in ½ scale. It will be good on 7, 14, and 28 mc and I know it will also work on 21 as I have tried. In this case you can bend it 10 feet at both ends, if necessary.

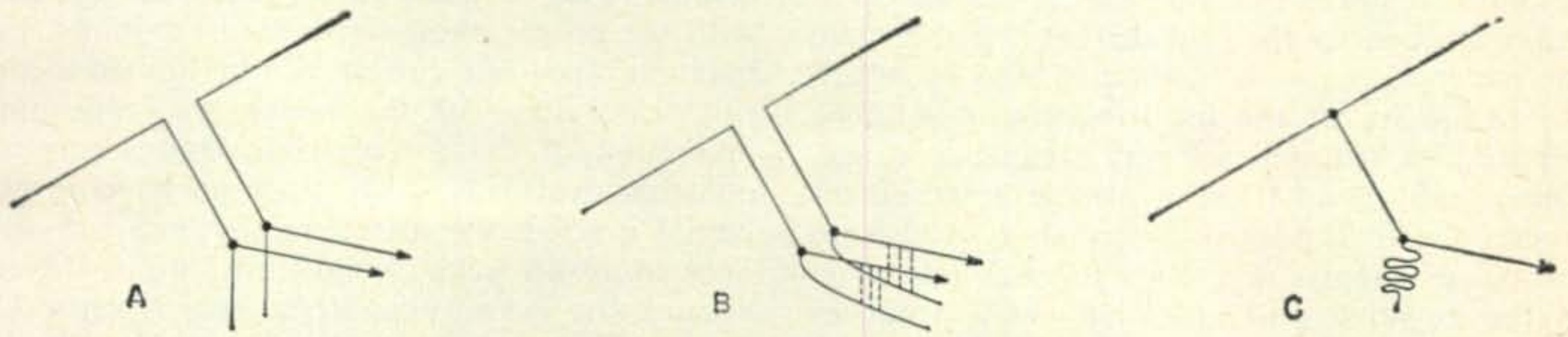


Fig. 4—Three methods of handling the open stub.

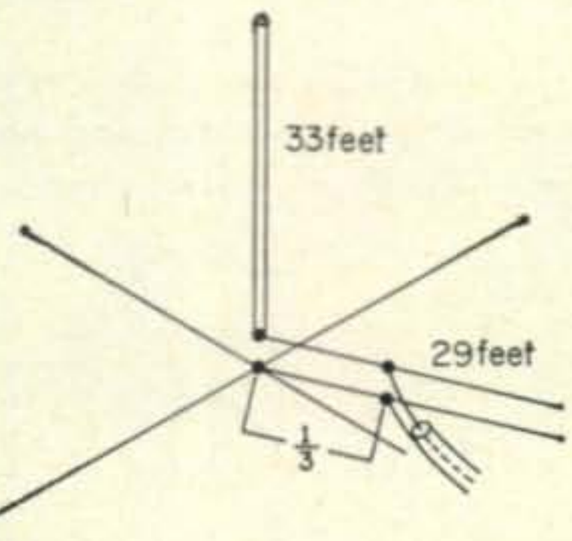


Fig. 5—Application of the stub to a multiband vertical for a good match to 120 ohm coax.

One can probably use this type of matching also in multiband verticals. For example, a 33 foot vertical with a 29 foot stub should be well matched to 120 ohm coax on 7, 14, and 28 mc and should work on 21 mc (fig. 5). Also, I guess you could use a dipole of this type as the radiating element in a multiband beam. This is conjecture as I have not tried this yet. ■

Improved Metering Circuit for Grid Dipper

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Englewood, New Jersey

This transistorized metering circuit improves grid-dipper sensitivity, and at the same time provides a variable-control arrangement which does not risk damaging the meter by off-scale overloads as is experienced with other systems.

In early types of grid dippers a 0-1 ma indicating meter was used, but because an inherent characteristic of most oscillators is the falling off of grid current when the higher frequencies are used, meter readings at frequencies above 100 mc are less than 0.5 ma, sometimes dropping to as low as 0.1 ma. This, in effect, reduces the overall sensitivity of the instrument.

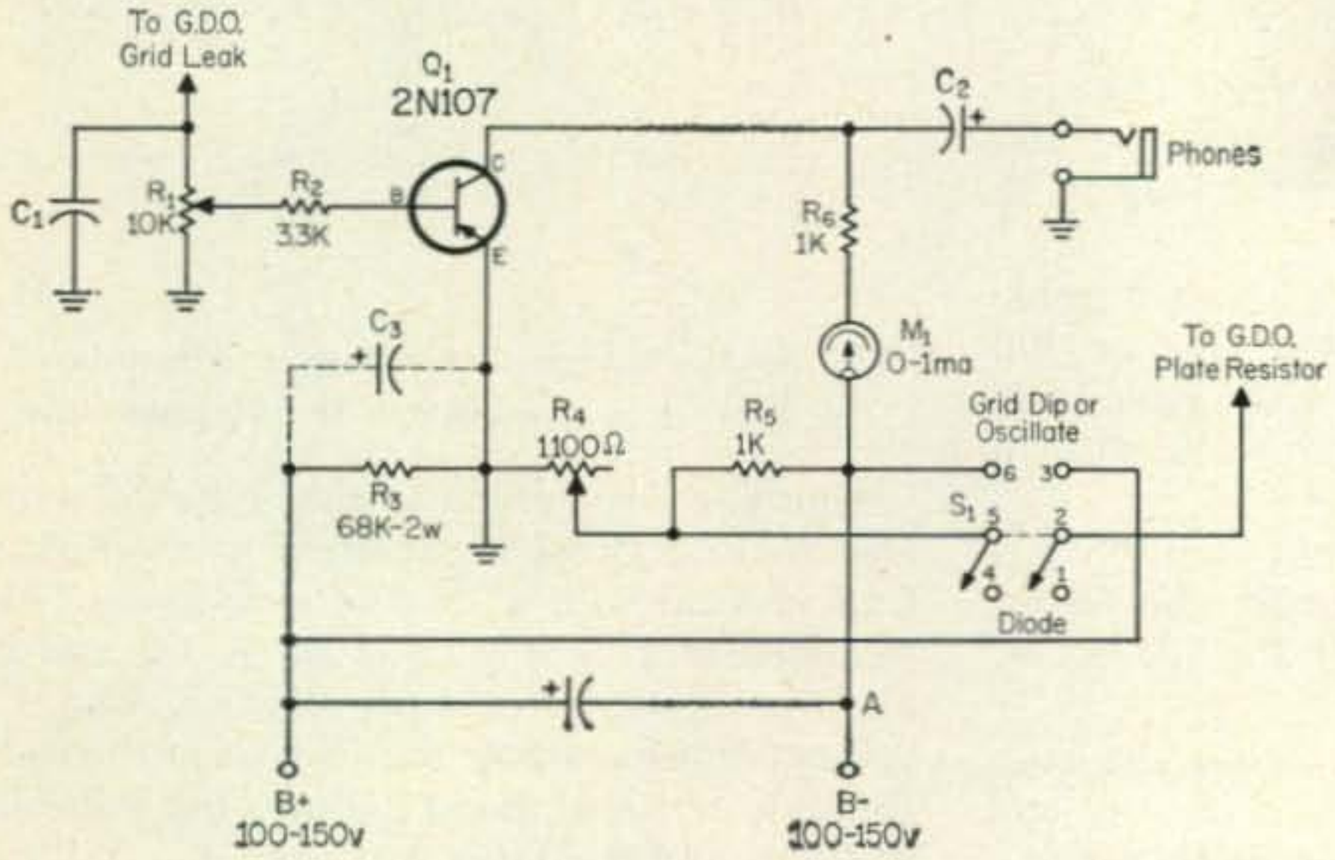
In order to obtain higher meter readings and a better grid-dip indication, later instruments employ a 0-500 microampere meter; however, at lower frequencies the grid current is higher than the meter range, so a method is used by which the sensitivity of the metering circuit may be adjusted as required for any frequency range. This usually consists of a variable arrangement whereby a small positive potential, derived from the power supply, is applied to buck out some of the negative grid potential which produces the current flow through the meter.

While this method readily produces the desired control of the meter sensitivity, it also leads to possible damage of the meter movement. (We have seen several meters ruined thereby.) This is due to the fact that when a coil is removed from the instrument, or if the actual grid current drops too low, the meter pointer slaps *backwards* off scale, because the positive bucking potential is now quite a bit greater than the negative grid potential. In addition to this, when the sensitivity control is set near maximum, the meter will slam *upwards* off scale if a coil, which produces high grid current beyond the meter range, is plugged into the grid dipper.

Solution

The use of a transistor d.c. amplifier in the grid metering circuit will increase the meter sensitivity by a factor of from five to ten, and with the proper choice of circuit constants, the maximum possible current can be limited to the full scale range of the meter, thus affording protection of the meter from serious *upward* off scale overloads. Also, since no bucking potential is used, the meter pointer will not slap *backwards* off scale when coils are removed, because the lowest possible current is zero. Although the grid-dip indication still will be limited, percentage-wise, by the range of the meter itself, assurance of near full-scale readings will be found advantageous, while with the diode function of the instrument the meter readings will be considerably higher than otherwise obtainable. In addition to this, the transistor also serves as an audio amplifier, increasing the audio level in the headphones for diode use.

Fig. 1—Circuit diagram of an improved grid-dipper metering arrangement. Point A in the circuit is where the original B-minus and filter capacitor leads were lifted off ground and connected to the junction of R_5, M_1 and S_1 as shown.



R_1—10K pot. with ganged s.p.s.t. switch
R_2—3.3K ½w
R_3—68K 2 w
R_4—1100 ohm rheostat, screwdriver adjust, Wirt WC807A
R_5—1K ½w
R_6—1K ½w
C_1—500 mmf disc ceramic
C_2—1 mf 5 volts
C_3—20 mf 250 volts. See text
M_1—0-1 ma or 0-500 μa. See text.

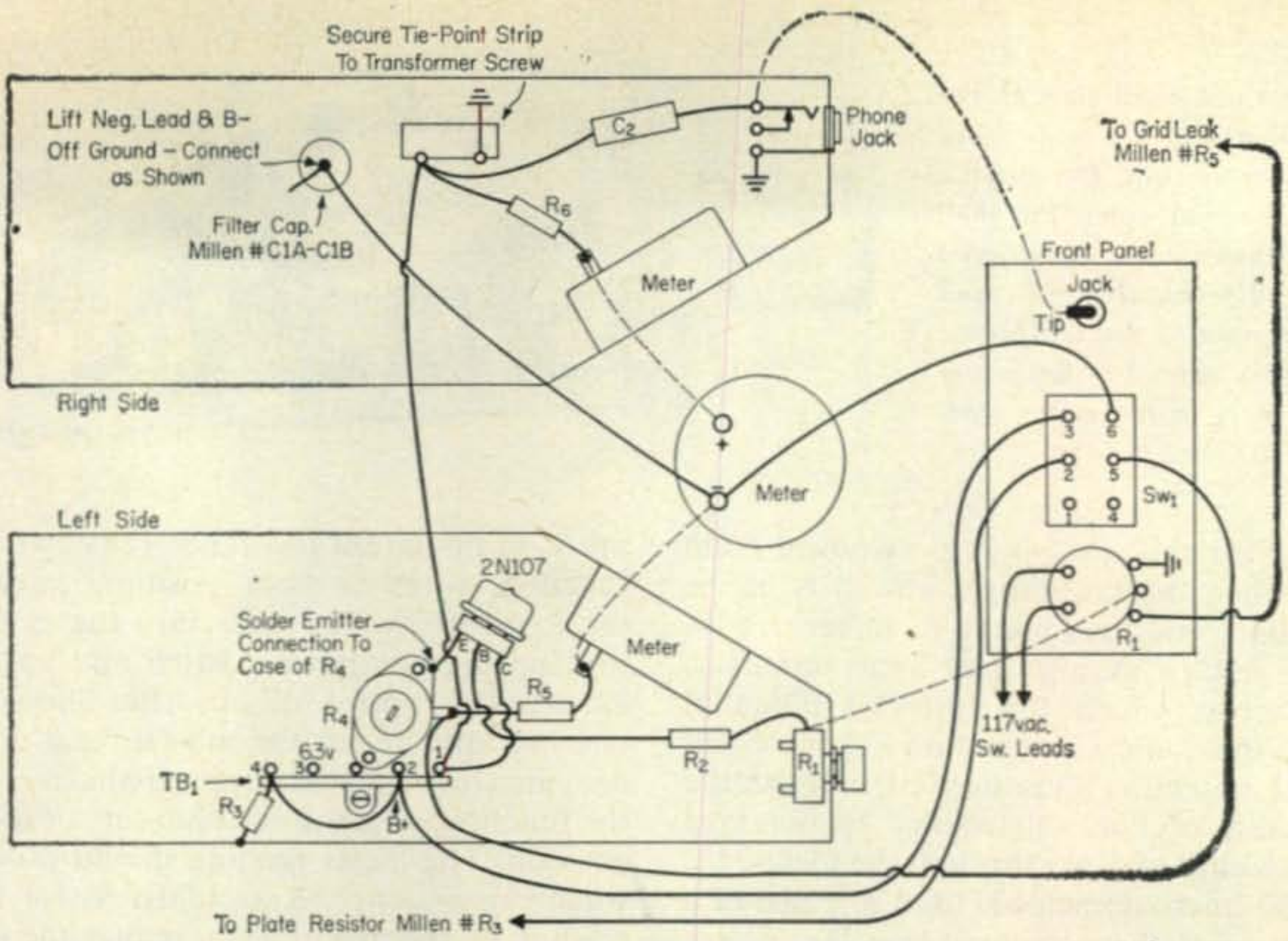


Fig. 2—Pictorial wiring diagram of the modification made on the Millen Grid-Dipper. Before proceeding with the above wiring, do the following on the external power tie strip TB1.

1. Disconnect the red B+ switch from lug 2 and remove it together with the original plate on-off switch.

2. Remove red B+ lead from lug 1 and connect it to lug 2.

3. Remove the 6.3 a.c. lead from lug 4 and connect it to lug 3 where the other 6.3 volt lead is already connected.

4. Wire TB_1 as shown above. Solder bottom end of R_3 to frame below lug 4.

Circuit Operation

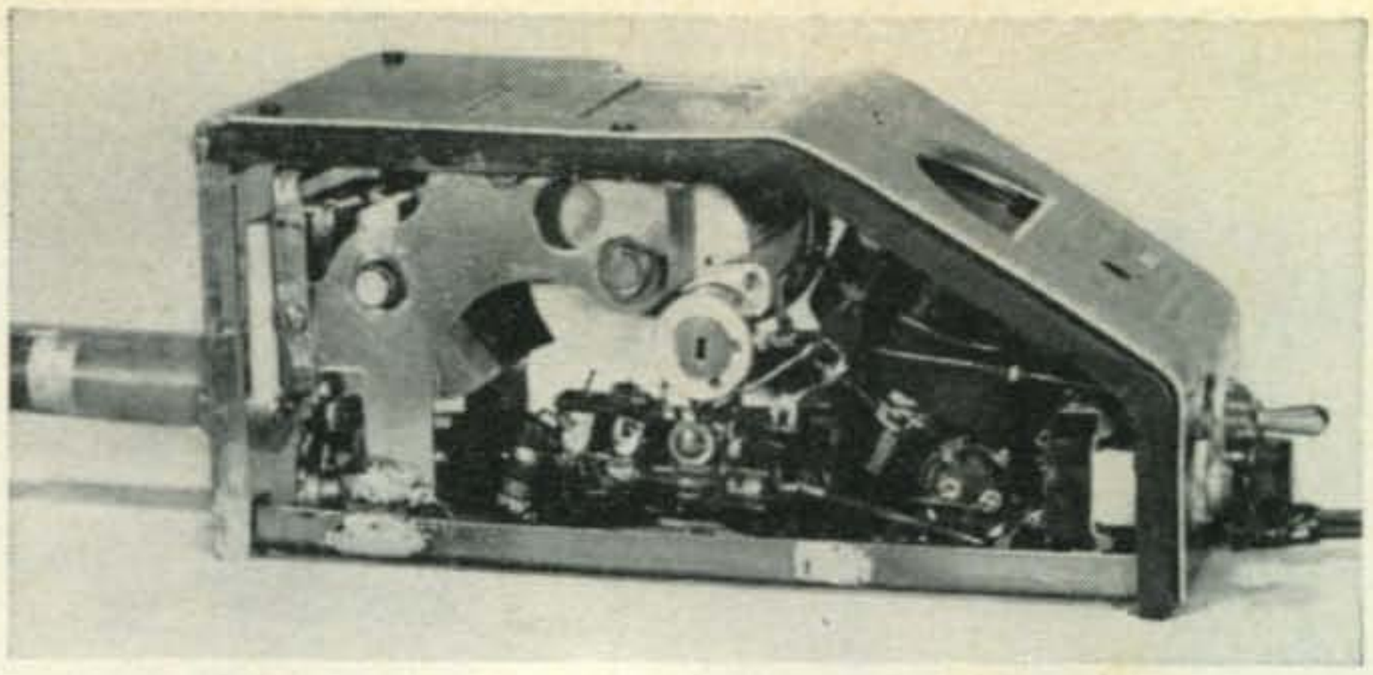
The improved meter circuitry for the grid dipper is shown in fig. 1. Resistor R_1 is the sensitivity control which is connected in series with the grid-dipper grid leak. Although this will decrease the normal flow of grid current, it is more than made up by the current amplification in the transistor. The required amount of grid current is taken from the arm of R_1, and is applied to the base of a P-N-P type transistor through R_2.

A 2N107 P-N-P transistor was used in the original model, but any similar one may be used as long as it is a P-N-P type. N-P-N types will not work in this arrangement. In order to eliminate a battery for powering the transistor, a negative collector potential is obtained directly from the a.c. power supply of the grid dipper. This is accomplished by lifting the normal B minus off of ground, and connecting it to one end of a potential divider network composed of R_3, R_4 and R_5. The junction of R_3 and R_4 is then grounded, resulting in a negative potential at the transistor's collector (with respect to its emitter) through R_6, while the transistor's base obtains a negative controlling forward bias (with respect to its emitter) from the negative potential developed by the dipper oscillator's grid current through R_1. At the same time, the oscillator's plate remains positive with respect to its cathode and ground.

When the grid-dipper's function switch is in OSCILLATE, *or* GRID-DIP, position, R_5 is shorted out by the switch, leaving only R_3 and R_4 across the power source. Resistor R_3 and R_4 are proportioned so that the drop across R_4 is approximately one volt. This is the supply potential for the collector circuit of the transistor.

Resistor R_6 limits the collector current to a maximum of 1 ma due to the following: When the current reaches 1 ma, the IR drop through R_6 will be one volt (.001 a. $\times$ 1000 ohms = 1 v.) Since this is equal to the supply potential, any further increase in current will be impossible, because the supply potential (also one volt) is not high enough to provide the necessary current flow through the limiting resistor R_6. (Actually, with all else being equal, the current cannot quite reach 1 ma; however, the figure is near enough for the purpose of explanation.) Another way to look at the situation is that no potential would be available at the collector, because the IR drop, with higher current, would exceed the supply potential. Resistor R_4 is made adjustable so that it may be precisely set to provide the exact supply potential for the desired limiting action through R_6.

When the grid dipper is used as a diode detector, the plate current of its tube drops to zero. This reduces the current flow through the potential divider network, resulting in a lower drop in poential across R_4, which in turn decrease the collector supply potential to approximately 0.5 volts. This then limits the maximum meter reading to about half scale, because only one half of the original supply potential is now available to overcome the drop through R_6. To



View of the right hand side of the modified Millen grid dip meter. The external power tie strip, TB_1, may be seen below the dial drum. The shell of the Wirt rheostat, R_4, is soldered to the ground terminal of TB_1, and is positioned next to the dial drum. Transistor Q_1 is located at the upper right of R_4, next to the meter case.

compensate for this, the short is removed from across R_5 when the grid-dipper switch is in the DIODE position, and thus places R_5 in series with R_4, which results in a larger total resistance (R_4+R_5) across which the collector potential (at almost the same current flow) is now obtained. The potential, thus derived, is near the required value of one volt needed to obtain a current flow limit of 1 ma through the meter.

If a 0-500 microammeter is used in place of a 0-1 milliammeter, the maximum possible current flow will have to be reduced to 500 microamperes. This may be done by doubling the size of R_6, or by adjusting R_4 (lower resistance) to a point where the *IR* drop across it is 0.5 volts.

Installation

The improved metering arrangement was installed in a Millen grid dipper as shown in the photographs, but it may be used with other models as well. In this unit, the plate ON-OFF toggle switch was removed, and in its place was installed the sensitivity control, R_1, with an attached s.p.s.t. switched used for the a.c. power switch. The physical size of the potentiometer with the switch must be small enough to fit into the restricted space. (An IRC Q-Control, or smaller, is recommended.)

The normal a.c. power toggle switch was also removed, and in its place was substituted a d.p.d.t. toggle switch of the same physical size. (The space, here, is restricted by the case of the meter.) This switch is S_1 which is used to select the desired function of the instrument (*left* position is DIODE DETECTOR, right position is OSCILLATE OR GRID-DIP).

Resistor R_4 is a wirewound, screwdriver adjust Continental-Wirt rehostat #WC807A, since this component is very small and fits neatly into the limited space. It is mounted vertically along the right side of the dial drum just above the external-power tie-point strip (TB_1) where it is secured by soldering to the ground lug of the tie strip. Some of the normal leads were moved around on the tie strip to facilitate installation of the new components. See fig. 2 where the wiring and general physical arrangement are shown. A socket was used for the transistor, but the latter may be wired directly into the circuit instead.

Adjustment

Resistor R_4 must be properly adjusted before the instrument is placed in operation. To do this, set R_4 at minimum resistance (clockwise), place function switch at DIODE position, insert one of the lower frequency coils into the grid dipper, turn on the a.c. power switch and advance the SENSITIVITY control full on. After allowing about one half minute for the tube to heat up, as will be indicated by a reading on the meter, place the function switch in the GRID-DIP, or OSCILLATE, position. The meter reading should drop to zero when this is done. Next, adjust R_4 for full scale reading on the meter. Then reduce the setting of the SENSITIVITY control to a point where the meter reads about one third scale. *Without* readjusting the *sensitivity* control, find the coil and frequency at which the highest meter reading can be obtained. Under this condition advance the SENSITIVITY control to full on and adjust R_4 for full-scale meter reading.

Now, slowly reduce the setting of the SENSITIVITY control, and carefully observe the meter pointer as this is done. At first, the pointer will move down scale very slowly until a place is reached at which the pointer suddenly moves at an accelerated rate. This place should be around 0.8 ma (or 400 microamps if a 0-500 microammeter is used). If necessary, R_4 may be readjusted for this condition, even if the maximum meter reading goes slightly above full scale when the SENSITIVITY control is advanced full on.

Operation

The adjustments outlined in the preceding paragraph are required because the collector current of the transistor flattens off as saturation is approached near full-scale current, producing a non-linear response which slows down the meter movement. In operation, then, it is necessary to adjust the SENSITIVITY control for a maximum meter reading of 0.8 ma if maximum meter protection is desired. This will not impair the grid-dip indication sensitivity; however, meter readings in the non-linear area (above 0.8 ma) will decrease such sensitivity. Control R_4 can be adjusted for linear operation above 0.8 ma, but the maximum meter current will be quite a bit higher than the full scale range of the meter, thus minimizing the desired protection of the meter.

When the function switch is operated from the DIODE to the GRID-DIP position, the initial surge of current through the potential-divider network will cause the meter to go off scale at

[*Continued on page 120*]

NOTES TO NOVICES

A. David Middelton, W5CA
Tijeras, New Mexico

ALTHOUGH the Novice license has been available but a few short years, the quantity and quality of the achievements of the Novice operator has been of high value to Amateur Radio.

The columns of the ham magazines are filled with the splendid record of Novice operators of all ages and both sexes. There is no set pattern for the successful Novice who may be in any age, economic or social bracket or endeavor. By this action the Novice is following the true Amateur Radio tradition which holds that it is the *operational* performance of the *individual* amateur that counts. It matters not his lineup of gear, his status in his community, his job classification or his age or sex.

Any amateur should be judged only by his operation on the air, his technical skills, and his ability and willingness to "pay his way" in ham radio through public service plus his enhancement of his chosen hobby through unselfish assistance to others. This reads out as two words, Ham Spirit—upon which our wonderful hobby was founded, fostered and cherished.

Your Amateur Radio call sign is the most individual nomenclature in the world. Regardless of the complexity or strangeness of your name, there are others who share it. But your ham call is issued to you and you alone in all the world.

What matters the other fellow's "handle"? A term, by the way, which brings shudders to any genuine old timer. It is the call that matters. If you can't recall the name of your last contact, you can and should recall the call letters of the stations you work and retain those letters in your memory for a long time. It is the call that counts

Entirely too much emphasis has been and is currently being placed on the acquisition and possession of commercial-built factory-assembled gear. The photographs in station descriptions appear to over-emphasize this feature of store-bought gear. One hears down-right bragging over the air about station equipment which is almost stereotyped today!

Ham radio was born, nurtured and grew to tremendous stature and stupendous worth to the world long before we had store-bought gear, the "budget plan", or even kits! Only a few short years ago hams saved their pennies, dimes and dollars until they could buy outright all those components that they could not scrounge, borrow or swap from some luckier brother ham.

These same hams improvised, modified, rebuilt and otherwise exercised their brains, their hands and their enormous amount of savvy to build gear that performed in outstanding fashion even by today's standards! You cannot realize the thrill of genuine ham activity unless you have gone through some of these trials and failures to eventual success! What distinction is possible if *anyone* with the proper amount of down payment, a good credit rating and an instruction manual can put on the air the legal amateur limit without any proper knowledge of *how* and *why* the gear works. Couple this with a lack of ability to fix it, should equipment break down, plus the thought of not modifying the equipment or even repairing it for danger of violating the guarantee or reducing its resale value. The result is not conducive to furthering the state of the art! Radio amateurs worth holding their calls can *build, repair* and *operate* gear with consummate skill gained only through sincere interest in all these fields.

The Novice has only one year of life. After that he loses his license unless he has qualified for a General or Conditional class. It is up to the Novice to make the choice. Are you going to be a full-fledged ham, or not? The latest figures on Novice-to-General-class advancement are not available but it is conceded that it is low, too low in fact.

Although we have had many Novices who really earned the plaudits of their fellows, there have been many who did nothing in their Novice year. This is a shame but is to be expected when the technical requirements and operational skill are so drastically reduced, as they are in the current Novice license, which would naturally attract a large number of people who are *not* serious about this, or any other, hobby or pastime. But those who drop out are *not* the subject of this piece so let's forget them.

What does an active radio amateur with 40 years continuous ham activity recommend to a Novice? Here are my suggestions:

1. **Perfect your ability to read and transmit CW.**

Keep everlastingly at CW operation to put yourself into the class of an operator who can "read anything" and who can send clearly and precisely at normal ham speeds of 15 to 25. Remember that a properly adjusted and correctly handled *straight* key can move more Ham communications than any "jitterbug." Learn to be a *good* operator.

[*Continued on page 108*]

D.C. to D.C. Converter

Tony Gitt, W3BRQ
428 Burns Drive
Springfield, Pa.

This article might be entitled, "How To Get Around Those Expensive Toroidal Bifilar Wound Transformers For Transistor Power Supplies". The power supply, built by W3BRQ, is strictly experimental and little output data is available. However, there is nothing to prevent you from putting this together and running a set of curves to see what it will do.

THE biggest drawback of transistorized power supplies, to the amateur of limited means, (especially college students working their way through electrical engineering), is the high cost of the transformers used in such circuits. Such transformers must be able to handle the high currents associated with transistors used in power switching circuits, and are usually bifilar wound on torroidal cores, which necessitates high cost. Such transformers have decided advantages for use in d.c. to d.c. converter circuits, the main of these advantages being the extreme efficiency of torroidal transformers.

Efficiency being what it is however, what difference does a few mils of current make, if the overall cost of the unit is considerably reduced? This brings us to the circuit of fig. 1, which presents an effective compromise between efficiency and cost.

Circuit

No originality what-so-ever is claimed for this circuit. I merely wish to point out that transformer T_1 is a 6.3 volt centertapped filament transformer, straight out of the junk box. (Current rating about 1a.)

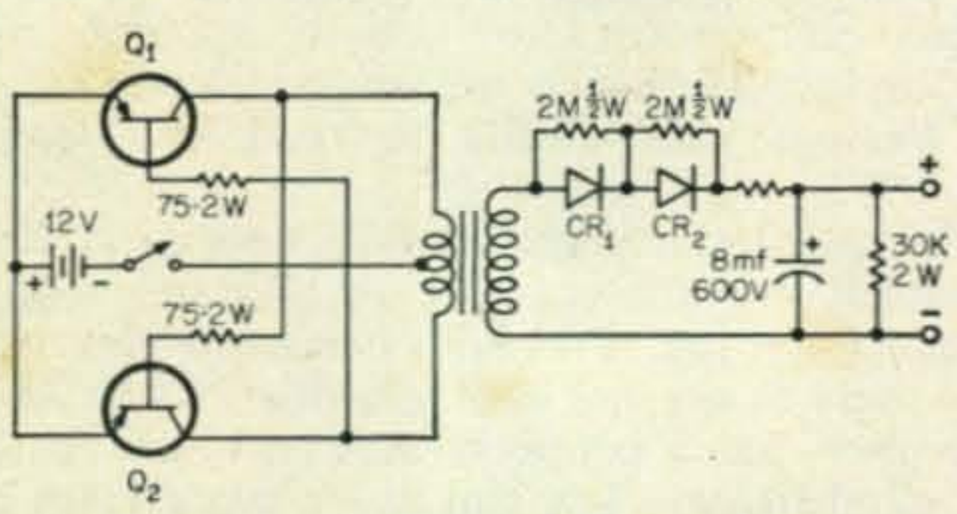
The most interesting thing about the circuit is its simplicity. Nothing is critical, in fact; it works great as soon as it is bread boarded or haywired up. The circuit itself provides enough "unbalance" to start the transistors switching.

The circuitry is straightforward. Transistors Q_1 and Q_2 are the switching transistors. Resistors R_1 and R_2 are the current limiting resistors, and T_1 is the 6.3 volt filament transformer. The secondary of T_1 is connected to the input side of the circuit. The 110 volt winding thus becomes the secondary. The rectifier circuit used in the secondary or output is straightforward. Naturally, if desired a bridge or full wave rectification circuit may be used instead of the half wave circuit shown in fig. 1.

Initially, two Clevite DEPO1 transistors were used for Q_1 and Q_2. These are military versions of the RCA 2N301-A, and will handle 60 volts at 3 to 5 amps. Any similar transistors with d.c. amplication factors of 20 or so will work fine in this circuit. Just be sure not to exceed the peak current and voltage ratings.

With an input voltage of 12 volts at about 0.7 amps, the a.c. output voltage measured across T_1 is 500 volts at very nearly 60 cycles per second. The output waveform at this point is a fairly clean square wave considering it comes from a filament transformer.

This little power supply should find many uses with the mobile set. I intend to use it to charge a capacitor for my electronic flashgun. It beats having to carry around 450 volt batteries or long a.c. extension cords. ■



Q_1, Q_2—DEPO1 (Clevite) or 2N301 (RCA)
CR_1, CR_2—IN603
T_1—6.3 volt center tapped filament transformer

Fig. 1—Circuit of the d.c. to d.c. converter. The resistors across the diode rectifiers equalize the distribution of the inverse voltage. The transformer T_1, may have a fairly low current rating (about 1 amp) but exact value for the desired load must be determined experimentally.

The Switzerland Of The Caribbean Calls CQ!

Carole F. Hoover K9AMD
401 East Wood Street
Hillsboro, Illinois

K9AMD introduces some of the members of the Radio Club d'Haiti.

A little over a year ago the Radio Club of Haiti voted to award a certificate to any amateur contacting twenty HH stations, and since then hams by the hundreds have turned their antennas toward the picturesque island republic known to many as the "Switzerland of the Caribbean."

Although the "HH 20" is a relatively new award, the Radio Club of Haiti itself dates back to 1948. All but a few of the RCH's growing membership, numbering close to 100, live or work in Port-au-Prince, Haiti's busy seaport capital, spread at the foot of a beautiful range of mountains. Here, in a clubhouse on Harry Truman Boulevard, regular meetings are held every two months, but members get together almost daily to talk radio and operate HH2RC, (Radio Club). The 300 watt home-brew rig, Hammerlund HQ 150 receiver, and G4ZU beam keep QSL cards coming from the states and all over the world.

Each Monday, Lou Decatrel, HH2LD, club president, calls a board meeting to thrash out business with his vice-president, HH2RW; Secretary General, HH2V; Treasurer, HH2KW, and Advisors, all elected for two year terms. Well known as Haiti's "Ham Ambassador," Lou is president of the Chamber of Commerce, former Consul in New York and Haitian Ambassador to Costa Rica and Panama where he operated as HO1EH and later HP1EH.

"The club helps its members in many ways," he commented. "There are code practice sessions and lessons on electronic theory for beginners. In addition, our members repair equipment for novices in their spare time."

A QSL bureau is also available to members, and HH2CX, Pierre Decatrel, one of Lou's three hamming sons, works hard at that project.

Unlike U.S. ham groups, the Radio Club of Haiti is directly responsible to the government for the action of its members as well as the big job of amateur licensing. Anyone who learns the ABC's of transmitter operation as well as regulations and Morse code at 6 words per minute must take his Class C (Novice) examination from a club member appointed as District Manager. The novice can then operate phone or c.w. on 160, 80, or 40 meters and only code on 15 meters. Maximum input to his transmitter must not exceed 100 watts.

To qualify for a General license or Class B, the novice must again see his District Manager to prove his ability to copy code at 12 words per minute and his advanced knowledge of theory. He is then free to operate on all bands with a limit of 350 watts input to his transmitter.

An Extra Class (A) license is awarded any amateur who improves his code speed to 15

[*Continued on page 108*]

The Radio Club d'Haiti headquarters on Harry Truman Boulevard in Port-au-Prince with the mountains of Haiti in the background.

Pierre Decatrel, HH2CX, one of HH2LD, Lou Decatrel's three hamming sons, at his own station. He also handles the QSL Bureau of the Radio Club of Haiti.

A Ham Dirge

John Lewallen
Box 515, Whitman College
Walla Walla, Washington

One evening last year as I lay sleepless, a condition directly resulting from the nocturnal hamming activities of my brother Roy (KL7CIB, Douglas, Alaska), my code-sated mind conceived an unbelievably repugnant crime.—The Author

I USED to love my brother Roy. We shared for many years a keen interest in outdoor sports. Many a carefree hour we hunted deer together in the deep forest. Often the wily trout fell prey to our brightly flashing spoons. In the evenings we would relax in our comfortable bedroom and plan future trips together.

Then one day Roy became a ham. At first the change was hardly perceptible; he would spend his evenings at an antenna-shrouded house a couple of blocks up the street. The tenure of these visits grew progressively longer, until he began dragging in during the wee hours of the morning.

The first radio was a small one; it fit snugly on a shelf in our room. Soon another, larger one joined it, to which a key was attached. An antenna was strung from the window, and Roy began using this machine.

I could feel a barrier growing between us. No longer did we talk of hunting and fishing. The few times that I saw Roy he would excitedly explain how many volts he was running, whom he had "worked," and always, "I'll really be in business when I get ahold of a. . . ."

This acquisitive drive grew by leaps and bounds. The first small set was soon replaced by a huge, black, knob-studded object. Tube-sprouting machines soon filled the shelves in the corner of our 8 × 12 ft. bedroom (now become a "shack"), and spare parts covered the desk. A mound consisting of tubes, metal cases, cylinders, wires, etc., germinated in the center of the floor and spread like a malignant cancer. Something hard and black and twisted then formed in my brain, growing in proportion.

I lived with this patiently until last night, when the culmination of my brother's hated change occurred.

I had taken a leisurely bath, and, as it was 11:30, decided to retire for the evening. I slipped on my bathrobe, walked down the hall to my bedroom, and opened the door.

Instantly my ears were assailed by a now-familiar scream, above which a jumble of sporadic sounds loudly asserted themselves. Roy, barely discernible over the gray mass of parts, was scribbling frantically on a scrap of paper. I covered my ears and stepped in.

My shin struck the sharp corner of a metal box. I cried out in pain (the sound was drowned out) and stepped heavily onto a pile of crystals and transistors. Silently cursing, I stepped over a box of tubes to the side of my bed.

On the pillow lay a tangle of wire, two screwdrivers, and one Boy Scout knife, blade open. The remainder of the bed was covered with a film of nuts, bolts, wires, tubes, etc. I grasped a corner of the spread and gave it a sharp tug.

The ensuing crash attracted Roy's attention for the first time. "Hey, takit easy," he muttered. "That stuff costs money."

"He worries about this *junk*!" I thought. Above the whine I asked loudly, "You goin' to bed?"

"Justaminnit. I'm workin' a guy in Scranton."

He flipped a switch and started pounding his key as I crawled into bed. I lay for awhile staring at the gray mattress of the bunk above. The bare bulb beat brightly on my eyeballs. My temples throbbed in unison with the screams of the morse key.

I turned over and covered my head with the pillow. The noise knifed through the feathers into my burning brain. Oh, how I hated that sound, that infernal screech!

Pushing the pillow against my pounding ears, I twisted onto my side. There against the wall, dusty and unused, our battered 30-06 rifle caught

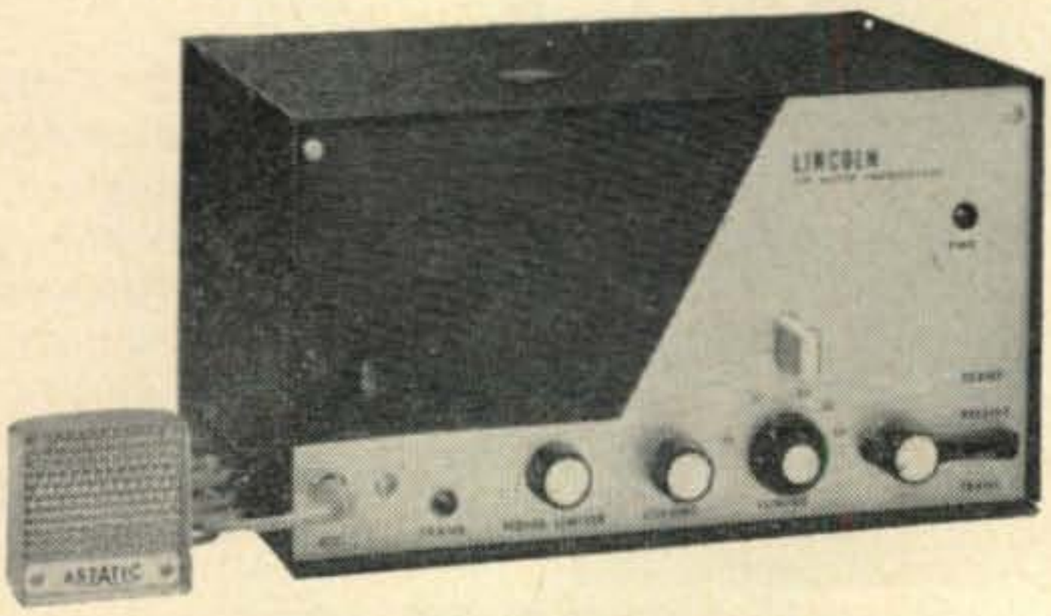
[*Continued on page 120*]

CQ Reviews:

ALLIED *Lincoln* 6 Meter Transceiver

Bob Brown, K2ZSQ
V.H.F. Editor

MORE and more commercial manufacturers are coming out with v.h.f. gear these days, and by now it's no secret that Allied Radio Corporation of Chicago has joined the march toward better and more inexpensive units. Their latest contribution is the Lincoln 6 meter transceiver, running 7 watts input with a *superhet* receiver. The ads run on this unit really startled me when, along with its many other features, I spotted that price; $57.50!



Technical Data

The Allied Lincoln, as mentioned earlier, utilizes a sensitive superheterodyne circuit with a.v.c. and incorporates a controlled noise limiter. An r.f. stage precedes the detector for added sensitivity and selectivity and to keep r.f. radiation to a minimum. The receiver, of course, tunes the entire 50 to 54 mc 6 meter band. A vernier dial results in slow tuning without passing over the weaker signals.

The tube line-up is a 6U8A/6EA8 acting as both r.f. amplifier and mixer, 6U8A/6EA8 oscillator and first i.f. amplifier, 6AL5 as detector and noise limiter, 6CX8 crystal oscillator and r.f. power output, 12AX7 a.f. amplifier and microphone amplifier, and finally the efficient 6V6GT modulator and audio output. As you undoubtedly noticed, each tube has a dual purpose, the first listed, naturally, is its use in the Receive position, and the second in Transmit. The transmitter uses third overtone type crystals directly at the 6 meter frequency. Provided with the unit is a 50.2 mc crystal, but others have been used with little retuning.

An r.f. indicator lamp, an NE-2, is located right on the front panel for tuneup and checking on modulation and speech amplifier.

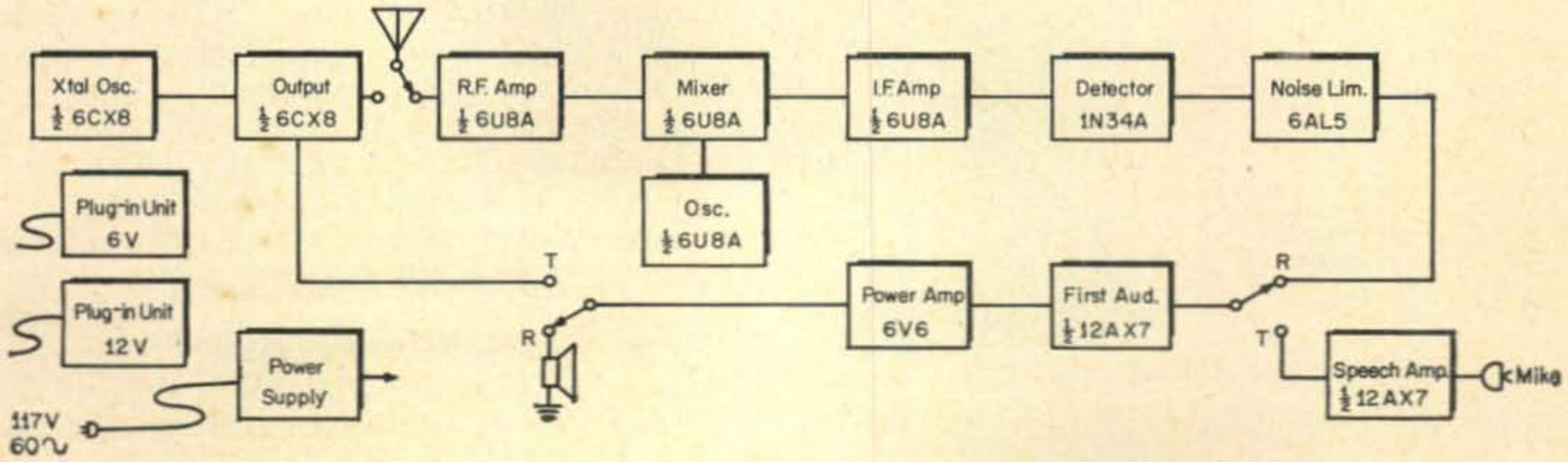
Power Supplies

Allied sells mobile supplies for the Lincoln, although it is equipped with a 110 v.a.c. 50-60 cycle input cord with an 11 pin socket for plug-in to the unit. Six volt or 12 volt d.c. source supplies (Model PL-6 and PL-12) are available as external power supplies for the transceiver when mobile operation is desired.

Conclusion

Although the Lincoln hasn't been in production for too long, their first run on the production line sold out within weeks! If this isn't evidence of top sales, I don't know what is! The transceiver has caught on like wildfire and for good reason. It has broken the price barrier for good 6 meter transceivers, as well as excellent versatility for portable or mobile use. If you would like more information on the Lincoln, you can get it from Allied Radio Corporation, 100 N. Western Avenue, Chicago 80, Illinois. ■

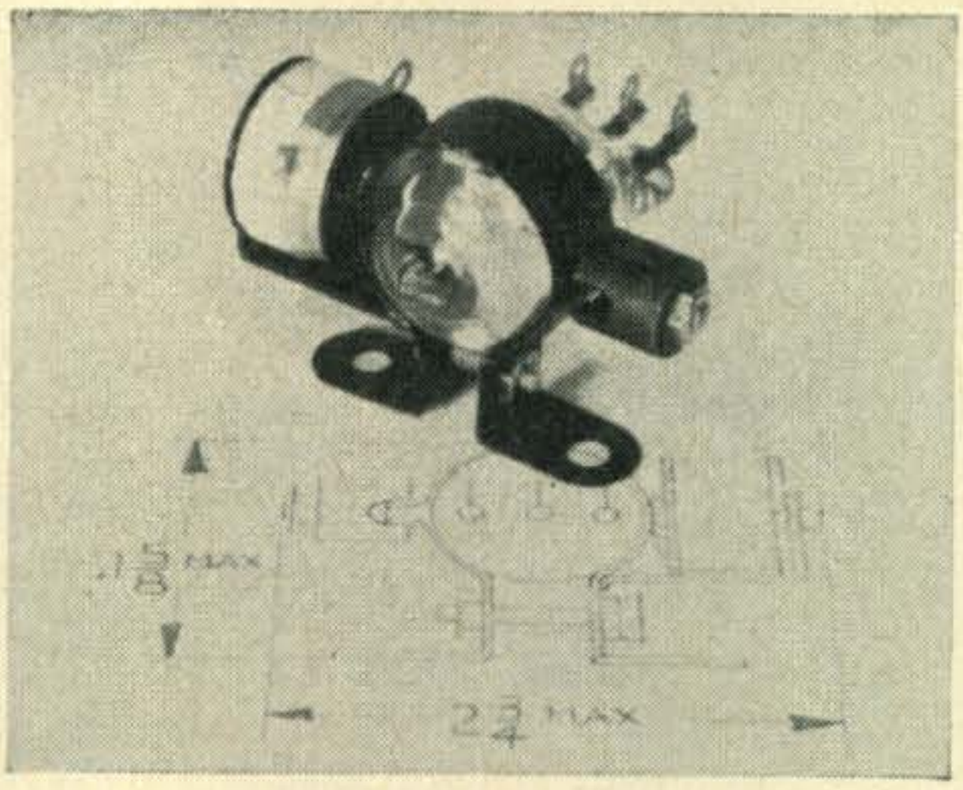
Fig. 1—Block diagram of the Allied Lincoln 6 meter transceiver.



New Amateur Products

Vacuum Antenna Relay

A NEW vacuum antenna relay, specifically designed for amateur kilowatt service, has been announced by the Jennings Radio Manufacturing Corporation. Designated Model #RP1, this unit utilizes an inexpensive, externally mounted magnet and 28 v.d.c. coil to provide the actuating force necessary for movement of the enclosed contacts. The RP1 has r.f. ratings of 1 kv and 4 amps rms. Net price to amateurs is $32.07 f.o.b. San Jose, California. Delivery is 30 to 45 days from receipt of order. For further information check A on page 128.

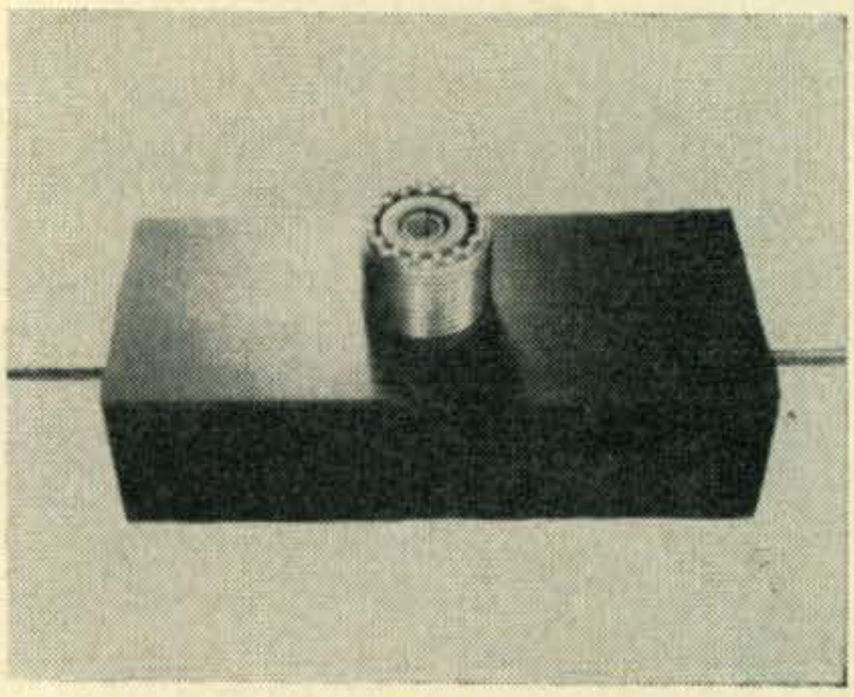


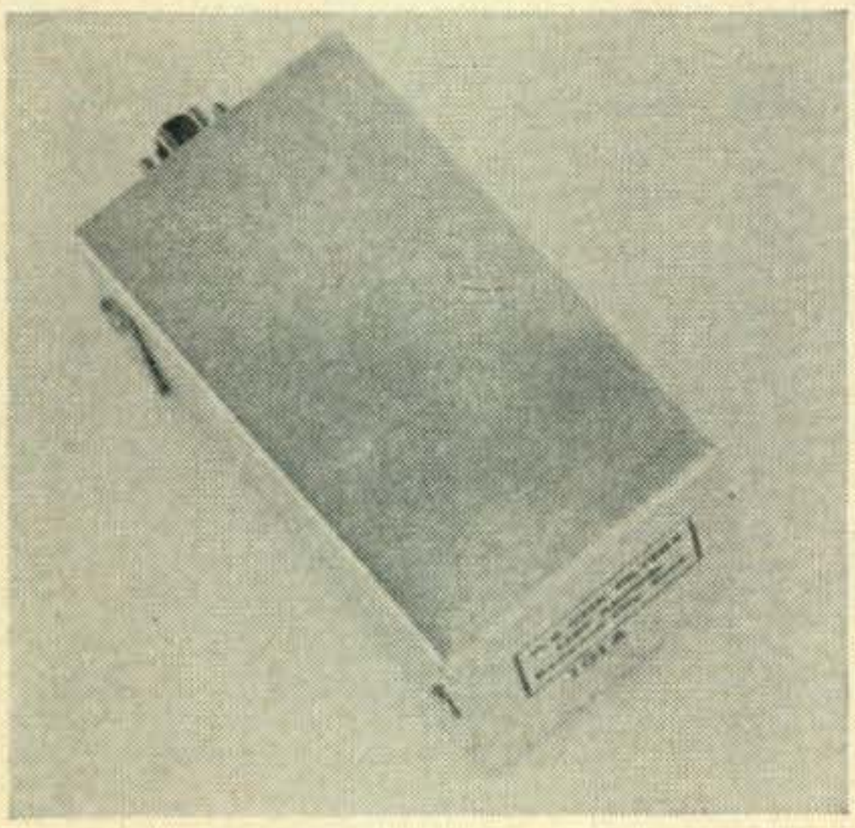
Call Letter Signs

HERE'S a new line of call letter signs for both amateur and CB operators that are glass-bead reflectorized for day and night visibility. Call letters are permanently embossed in sheet aluminum, and finished in slick black baked enamel. Ham signs sell for $1.00, with CB signs slightly higher. They are manufactured by Redicraft Products Company. For further information check B on page 128.

"Matchbuddy"

BEAM Radio Enterprises is marketing a handy center insulator for dipole antennas designed to provide a non-reactive connection, maintaining a ¼ inch spacing of the radiator. This unit is completely encased in a high-impact epoxy resin. The coaxial connector makes possible quick and easy installation and removal of coaxial feedlines, maintaining a match at the antenna feedpoint. The need to expose inner and outer coax conductors to weather conditions is also eliminated. The 12 guage copperweld wire leads provide easy connection to the dipole by soldering. Special connectors replacing wire leads or the coax connector are available on special order. For further information check D on page 128.





RTTY Filters

A COMPLETE line of filters for radio-teleprinter a.f.s.k. terminal units has been announced by W6CQK Filters, 1307 Alameda, Redwood City, California. Each unit is enclosed in a 2¼" × 2¼" × 4" aluminum box, and plugs into an octal socket for easy installation.

Two types of input band-pass filters for 850 cycle shift are presently available: 600 ohms input and output, and 4 ohms (receiver output) to grid (TU limiter input).

Two types of discriminator filters are presently available for 850 cycle shift: sharp-tuned to mark and space frequencies, and 200 cycle pass bands centered about the mark and space frequencies. The latter type makes receiver tuning less critical with respect to frequency drift of receiver or transmitter. For further information, circle C on page 128.

DX DX DX DX DX DX DX DX

URBAN LE JEUNE, JR., W2DEC
BOX 35, HAZLET, NEW JERSEY

The following certificates were issued between the period May 12th, 1961 and June 12th, 1961:

CW WAZ

1541	W2BRR	Thomas J. Buzalski
1542	W7CMO	Norman S. Moberg
1543	K7CHT	Gerald F. Newton
1544	G3AIZ	C. C. Olley
1545	K6OPI	William F. Haddon, Jr.
1546	KØRAL	Fredric L. Abrams
1547	W6HVN	Douglas W. Murray
1548	I1CHJ	Renzo Amadei
1549	VE6TP	G. Krehbiel
1550	W2VCZ	Robert W. Stankus
1551	K6GLC	Jim McCook
1552	ZS6EU	A. D. Coetzee
1553	DL3SZ	Adolf Vogel
1554	EA4CR	Santos Yebenes
1555	W4YWX	Paul H. Newberry, Jr.
1556	W3MCW	James C. Berger
1557	UA4KHA	Radio Club of Kuibyshev
1558	GI3NPP	R. Gibson
1559	ZS6ATA	Norm Kropman
1560	VE1WL	R. W. Wilson

SSB WAZ

2	OD5CT	L. M. Rundlett
3	UB5KAB	Radio Club of Stalino
4	G3FKM	E. J. Allaway

PHONE WAZ

74	W5AFX	A. R. LaMarche
75	PAØWWP	Bill P. Ingenegeren
76	K6LAS	Charles R. O'Hara
77	OZ7FG	F. Gotschalk
78	W8ZET	H. James Hire
79	W2OKM	Robert N. Boulle
80	LA5HE	Ragnar Otterstad
81	SM3BIZ	Curt Westling

CW WPX

180	DL9PF	Walter Vedder
181	SM5BBC	Ulf Swalen
182	SP9RF	Andrzej Semekowicz
183	W4LRN	J. P. C. Martineau
184	W5ARJ	R. I. Vaughan
185	OK2QR	Rudolf Staigl

PHONE WPX

29	LA5HE	Ragnar Otterstad

SSB WPX

61	W4WDI	David A. Rawley, Jr.
62	W2VCZ	Robert W. Stankus
63	ZS6ATA	Norm Kropman
64	W2HMJ	Aug Nickel
65	VP6WD	G. Mac Lean Wilford
66	XE1CV	Carlos de Leon, Jr.

Soap Box

In the past, I have always tried to report matters of DX interest as impartially as I could possibly make them. I felt this was necessary if this column was to serve its true purpose. I have always tried to avoid taking sides on any controversial issue. Previously, the only exception to this rule has been my stand on reciprocal licensing. However, I feel that the time has again come to speak up against a practice which is very rapidly deteriorating DXing as we now know it. What I am referring to is the Master of Ceremonies type of operation.

Repeated below is an editorial from the *NEDXA Bulletin* which concerns this type of operation.

"The MC type of DXing has caused alot of bad feelings on the bands. We who have spent many days on top of our towers both in below zero temperatures and cloud bursts just to get our signals in tip top condx, and who have spent many long hours perking up receivers and building KW finals, are not anxious to sit in line while a station with low power fed to a window screen wastes much of the DX station's time just because he happens to be a friend of the MC or has a good skip into the MC's QTH. Those who prefer to operate with QRP and a poor antenna should not expect to come out on top in a pileup. This is DX with an incentive; to the biggest signal, and/or best operators belongs the spoils. It has become so bad on s.s.b., that every time a new one shows up, five minutes later someone thinks he needs help and begins to act as MC. Either you get your signal relayed thru the MC (and as often as not—your report as well) or you don't work him. Try to work him over the head of the MC and you receive a torrent of snide remarks from the boys who are on the list and don't want a good thing broken up. Try to get on the list and more often than not the MC is some W1 or W2 who can't hear you because of the skip. As a matter of fact, in all but a few of the cases, the DX station is far louder than the MC! It has gotten so bad that a few even try to get up a list *before* the DX station has even fired up! I'm sure the DXer who has spent many weary hours building up his station potential to the point where he can jump into any pileup and have good hopes of a QSO does not wish to have his contract by proxy. It has gotten to the point on s.s.b. where half the MC type of QSO aren't even two-way. Once you're on the list—you have it made. Don't worry whether or not you can copy the DX station; just give him a report when your turn comes and some kind soul will let you know when the DX station turns it over to you. Surely we have a new breed of DXer

We already have his card, you poor boy! W8ZY, W8WZ, W2AGW, W3CRA.

I hope these pictures affect you the same way! W9YFV, W4KVX.

on the bands; the big brother who is going to give you a helping hand, whether you want it or not. Have we reached a point where we expect our DX to be served up on a silver platter? As long as the DX is controlled by an MC, we must join the crowd if we want a contact—but is it a QSO, and what's more important—is it DXing?"

I wholeheartedly concur with the above ideas. One very unfortunate aspect of the MC type of operation is that an alarming number of contacts are not really legitimate contacts at all and its very surprising to me the number of people who will indulge in such an operation.

During the recent UA3FE/Ø, Zone 23 operation, the MC was giving the call of the station to UA3FE and relaying the reports in both directions. There was absolutely no exchange of intelligence . One evening UA3FE was completely inaudible at this QTH. I realize that I may not have the best receiving location in the world, but I have a 3 element 20 meter beam on a 24 foot boom 65 feet in the air on a spot that is within 35 feet of the highest in the County and many stations were "working" the UA3, that normally receive reports that are one to two S units less than I usually receive.

It seems that DX has been generally made very easy to work and no one wants to put any great amount of effort into working a new country. Many stations running low power with poor antennas do not ask for many operation privileges but what they lack in equipment they make up with determination and skill. To get into a pileup and come away wtih the prize, running low power, requires a great deal of operating skill and unless you get in and fight for this station, it is impossible to learn the little tricks which I am certain everyone has noticed and admired when they have been used by the knowing operator. The amount of effort put in at this point will determine whether or not one will become a true DX operator or just another DX chaser.

Letters

EP Iran: Hal, K4ORQ/EP1AD, was kind enough to send the following information on EP land.

"Frank, EQ2AT, EP5X, etc., is leaving for Korea June 10. Don't know what his new address will be but QSL via W2AYN will reach him eventually. I am departing stateside on June 3 and will hit Bangkok, Hong Kong, and then the West Coast for a month's visit with the families. We will be at our home QTH about the middle of July. QSL cards to me should be sent via K4ORQ, 5412 Williamsburg Boulevard, Arlington, Va. I will continue to answer all QSL cards as received. Upon my departure, EP2BB will take over here as President of the Amateur Radio Society of Iran. EP2AF will become the EP QSL Manager.

"So, this winds up a very interesting tour here. I am most grateful that I was able to help in putting EP land legally on the map. We have a fine bunch of hams here and I will miss seeing them and will miss our local QSOs. You should hear the screams of anguish when a couple or more of the locals here start to rag chew and condx are fairly good—in short, our only successful rag chews are when condx are so bad no one else hears us. Speaking of condx, they have been terrible here. Several of us here are statesiders and we seldom are able to work into the states.

"I would suggest that any inquiries re EP land be sent to EP2BB after my departure. So back to K4 land on the other end of the pile-ups. CUL"

Hal's fine fist will sure be missed.

JY Jordan: The following letter was received by W6YY from ZC4AK and should clear up much confusion:

"I have never made plans for a DXpedition to Jordan, and it is rather unlikely that I or anyone else will be allowed to operate from there in the near future. Earlier this year I suggested to Colin Thomas, ZC4CT, that it might be worthwhile finding out whether nor not operation from Jordan might be possible and Colin wrote a letter of inquiry to the Jordanian authorities. Unfortunately, he also wrote to several magazines telling of a JY DXpedition with ZC4AK!!! In due course, a letter came back from Jordan saying that they wanted no operation by amateurs in their country.

No wonder I missed him! My beam was on 210 degrees and I should have had it on 215. W8DUY, W8KIA, W8HGW and W9YVF.

This was the day to work DX! Standing; W2PUN, W2QMJ, W2SAW, W2JT and W8KPL. Seated; K2GMO, W2AGW, W2GUM, W2DOD, W8DUY, W8CQ and W9YVF.

"Whenever I go on the air I get asked about my trip to Jordan, so I am now getting rather "fed up"! I must apologize to any of the boys whose hopes of working JY have now disappeared but the source of the rumors was not ZC4AK. I have even had two offers from U.S. stations to be my QSL Manager."

It's a shame something couldn't be worked out as it has been a long time between JYs.

KC6 Eastern Carolines: Carl, who operated KC6PE was killed in a plane accident last fall. Steve, W9SFR, has his logs from October 28, 1959 to August 4, 1960. (Tnx WGDXC)

VP4 Tobago: The following is from ex VP4WD via W3LE.

"Don't suppose I'll get another chance to operate from Tobago, and it doesn't look as though VP4TAQ is ever going to get on the air. Actually, I have still 105 cards to come in from the States—all districts. Guess the best thing would be to QSP my QTH to them—so they can QSL direct or via RSGB to my home QTH. As you can imagine conditions in Tobago were pretty hectic when the paths to the States were open and a 4 valve super wasn't the ideal RX to cope with modern conditions of QRM. Hi!

Jack's QTH is:

Jack Lambert, G3TA ex VP4WD
327 The Parkway
Iver Heath
Iver, Bucks
England

VQ8 St. Brandon: VQ8AP will return to this spot again in August, signing VQ8APB. VQ8AD now has all VQ8BBB logs. Try him at Box 467, port Luis Mauritius, if you need a card! (Tnx *DXer*)

VS9 Maldives: The following letter is from David, the chief op at VS9MB:

"Over the past two years this station has had many contacts with stateside stations embracing c.w., a.m. and s.s.b. on reception only. And, we have found, almost without exception, that the standard of operating has been extremely high and efficient, especially on c.w.

Our only axe to grind is that some people try to get their friends a contact with us in the middle of a pile up, which is time consuming and rather frustrating for the other stations who have been patiently waiting; sometimes for hours. Apart from that, we have only praise for the boys and XYLs stateside.

Very shortly we do hope to start s.s.b. operation on 10, 15 and 20 meters, at the moment we are working s.s.b. one way only, but it is rather awkward without break in and all the relevant equipment.

At the moment, the station is operating with a Heathkit DX-100U, a standby DX-35, AR88 receiver, a standby HRO, and a G4ZU 3 element tribander 22 feet above sea level and one 14 mc half wave dipole 15 feet above sea level.

The main point in writing is that just lately we have been landed with a VS9MB pirate who signs himself as Mac. He is known to operate on 20/40 meters c.w. The amount of QSL cards being received here for this phoney contact is so great that we can no longer inform each station that he has been duped. And, in the future all cards received for 'Mac' will have to be destroyed unless postage accompanies the card and then it will be returned to the sender."

TU2 Ivory Coast: TU2AE, ex FF4AB, is heard on 21 and 14 mc fone almost daily.

UA Frans Josef Land: UA1KED is very active. He is on almost daily from 1000-1400 GMT on 14.060-.075 kc and also 14.110 kc fone. (Tnx *DXer*)

UAØ Tana Tuva: Both UAØKYA and UAØYE are active on 14 mc c.w. between 05-07 GMT for those still needing Zone 23.

UAØ ZONE 18: From a letter by UB5DW in the ISWL *Monitor*:

"I have just paid a visit to Novosibirsk in Zone 18, taking with me a sideband adaptor. I did not hear of any sideband activity from there before as I missed the last two Soviet roundtables. Just after I had jumped off the jetliner, I said to the boys at UA9KOG, the club station: "I've come here to open Zone 18 on sideband." They replied: "You are too late OM!" UA9OI had worked 40 countries so far. I feel I had the thought to leave my luggage in the cloakroom and spend my free hours on skis. But as the boys at UA9KOG said they would like to take part in the s.s.b. contest. I arrived that Friday

UB5WF, Vlad Goncharsky, Lvov, Ukraine made 160 meter history this last season when he worked W1ME, W1BB, W2EQS and VE1ZZ using 150 watts to a long wire. Many congratulations and thanks to Vlad for making this possible. We hope to hear him again next year. (Tnx W1BB)

evening with my portable station. Saturday was spent trying to excite the UA9KOG transmitter as my rig has only 50 w. p.e.p. In Moscow, I have been told about the UA3FE trips to Kyzyl (Tana Tuva Zone 23), so from time to time we have been on the look out for him and QSOs have been made, using my sideband adaptor and local ground plane antenna. We have been very glad to meet on the air so far from Moscow and Kiev, as 3FE is my personal friend for many years. Then UA9OI called the club. Stan, the chief op at 9KOG asked him to listen to KOG on s.s.b. "Don't think I'm an idiot," said 9OI, "I visited the club two days ago and saw nothing similar to s.s.b. there." But in 5 minutes he called again and said the quality was OK and he "allowed" us to take part in the contest. Moreover, as 9OI's ground plane antenna had been ruined when the roof was cleaned of snow, he asked if he could take part in the contest at 9KOG. Then I told him about my trip in one hour 9OI appeared with his AR-88 at the station.

"All seemed ok; 400w. p.e.p. to ground plane, but no replies though we heard a lot of sideband stations. "Morning is better than evening," they tell me, so we got in bed.

"The Sunday morning was really fine, the temperature approximately 15 degrees Centigrade, everything covered by starred snow, sky is blue and sun is shining and bringing life to the amateur bands—we know that and wait for the East. JAs over here are similar to DLs in Europe, but we can hear UAØLA calling CQ . . . no reply, again his CQ, still no reply. We go across the band and hear nothing else. UAØLA does not hear us either.

"Stan found the trouble in the coax. We readjusted our linear and the first contact was made —UAØLA. Then UA3FE/Ø, MP4BBW, ZS5UG, VU2NR . . . suddenly many Russians from UA3, 4, and UB5 appear, then Western Europe, sometimes North America and PY2CK from South Ameriea; plenty of ZL/VKs coming through.

"We made 76 QSOs but the conditions were very poor and UA3FE/Ø worked 76 stations also, though he had a very good double conversion receiver with mechanical filter and product detector. We only worked two or three JA stations from there. It was the usual trouble, broad pass-band at the receivers, QRM from commercials and jamming stations. The next two days we added some DLs to the sideband score of 9KOG. PY2CK has given us the opportunity to complete the s.s.b. WAC.

"UA3FE has now returned to Moscow. The portable station he used on his trip to Zone 23 was constructed by UA3CR and UA3FE especially for those Soviet prefixes having no s.s.b. stations on the air. The portable rig will be travelling during 1961 so I think that during 1961 we can hear all prefixes from the USSR on 14 mc Sideband. Best 73 for now, Toly, UB5DW"

Pirates

The following from W4LVV is self explanatory.—"Some joker is using the calls VP7NE and KC3EE and apparently quoting W4LVV as being his 'QSL Manager' . . . so solly, but he's a phoney."

W. B. H. Award

1. The Directory of LABRE of Minas Gerais, establishes the W.B.H. award to be conferred to those radio amateur stations which work the city of Belo Horizonte in the following proportions:

10 QSO's for stations in Brazil.
5 QSO's for the stations in the Western Hemisphere, Europe and Africa.
3 QSO's for the stations in Asia and in the Pacific areas.

2. In order to obtain the Award it will be sufficient to present a log containing the calls worked, band, date and report—not less than

Operating position of W1BB, showing K6CJ, Dud, noted 160 meter DXer pointing to W1BB's miniature "160 DX key", that is supposed to have that certain magic necessary to snag the rare ones. Dud is particularly noted for his exploit in working three ZL stations on 160 by calculating meticulously and taking advantage of the "shadow edge" transmission path. (Tnx W1BB)

This neat station is UA3KND in Moscow. It looks like we are not the only ones that believe in pin up calendars. (Tnx K2UKQ)

RST 338 for c.w. and RS 33 for phone.

3. The Certificate will be ussued only after the radio-amateurs of Belo Horizonte have received the QSL's confirming the QSO's performed either in phone or c.w.

4. All bands can be used for the Award, provided the QSO's are after December 31, 1958.

5. Five (5) IRC's are requested for postage for the Certificate, which will be issued by PY4AA, P.O. Box 314, Belo Horizonte, Minas Gerais, Brazil. (Tnx W2LNB)

DUF

The following rule changes for DUF via F9IL.

"The DUF rules have been changed as follows: FB8XX or FB8ZZ or even FB8YY could replaee contacts with Asia for contacts after Sept. 20, 1960, but Laos is still ok for other than W/K and VE before Sept. 20, 1960 and after Jan. 15, 1961. Of course, 8XX and 8ZZ don't take a part of Africa and 8YY of Oceania. If 8XX serves to replace Asia the other is ok for Africa and vice-versa; the same for Adelie Land. Moreover, 3V8 is all right until January 1, 1959 and CN (Morocco) until April 22, 1961, according to the latest modified rules. Also ex-FQ8 and FF8 now TL8, TN8, FF4 (TU2), TR8, FF7, FU7, 6W8 and TT8 are still available for DUF."

John Knight, W6YY (left) and Luis Desmaras, CE-3AG at John's QTH during Luis' recent visit to Los Angeles during his round-the-world trip. John is describing to Luis the "big one that got away". John's 40 meter vertical is in the background. (Tnx W6HJT)

BV Award

BV Award Number One has been issued. VK5FY did some fine brass pounding last January to come up with BV1US and BV1USA and thereby crack the glass cage holding Award number One. His certificate with c.w. endorsement was issued on May 9. VK5FY is a member of the Elizabeth Radio Club of South Australia.

As of this date we still have not received an application for a.m. or s.s.b. awards.

(Note: See last month's column for details on this very attractive certificate)

This is Arild, SM3AGD, and the wallpaper speaks for itself. (Tnx K2UKQ)

QTH's

CN8IK Post Office Box 2475, APO 30, N.Y., N.Y.

DL5HI Peter H. Grillo 180th USASA Co. APO 108, N. Y., N. Y.

DU1SA S. Aison, 1549 Espana, Sampaloc, Manila, Philippine Islands

EA9AP Adolfo Perez Real, Post Office Box 213, Mililla, Spanish Morocco

EI (Eire) QSL Bureau (new address) Irish Radio Transmitters Society 24 Wicklow St. Dublin 2, Ireland

FA8VN .....via REF

FB8CS Roger Grabot, Box 730, Tananarive, Madagascar

GI3OQR QSL via ISWL or RSGB—Direct address: Dick Gibson, Bush House, Dungannon Co. Tyrone, N. Ireland

GW3DUR .....via K2LTI

GW8BL Box 971, Dakar, Senegal Republic

HI8DGH Ave. Bolivar 78, Cuidad, Trujilli, Dominican Republic

HK7YB Juan, Post Office Box 222, Bucaramanga, Colombia

HS1X .....via K8RFW

HP1AP Box 639, Panama City, Panama

JZOPH Joop Hesp, 1953 Hortensiaweg, Biak, Netherlands, New Guinea

KB6BC (CB) Kazumi Takeuchi, c/o Civil Aeronautics Adm. Canton Is. Phoenix Group, South Pacific

KC4USR USS Arneb, AKA 56, FPO, New York, N. Y.

KG1FD Ken, APO 121, New York, N. Y.

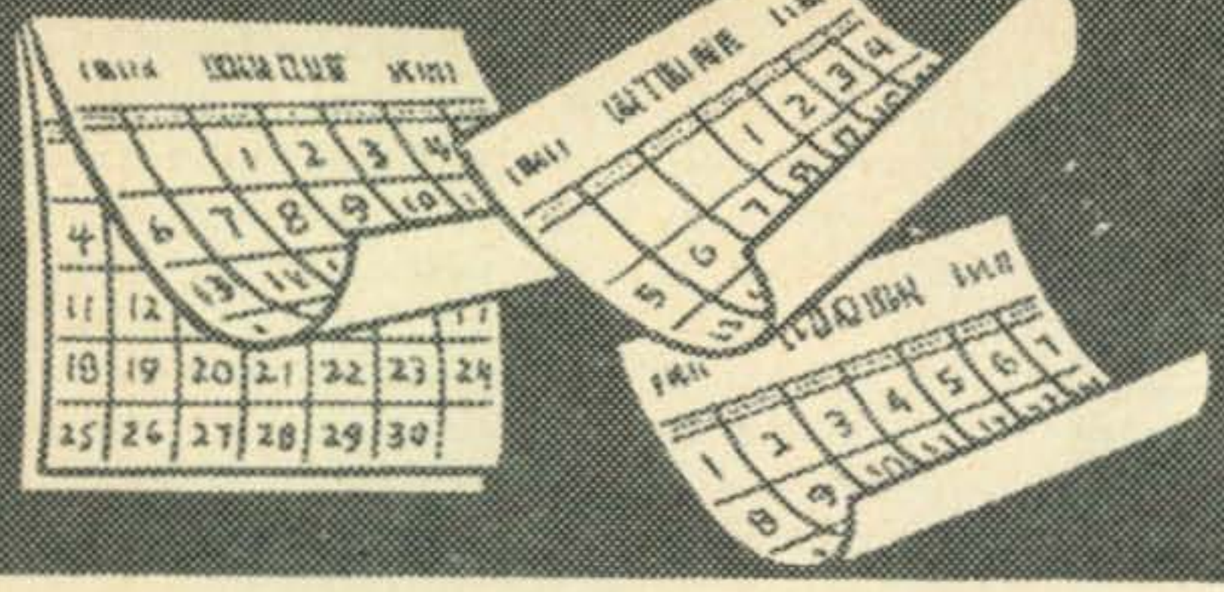
KH6ACU Dan E. Earhart, 2159 St. Louis Dr., Honolulu 16, Hawaii

LX3AH QSL via DL7AH, Harry Lilienthal, Airport Munich 64, Germany

MP4TAC Cpl. A. Dicker 22515258, Trucial Oman Scouts, Sharjah, BFPO 64, via London, England

OA4DS Box 1141, Lima, Peru

[*Continued on page 110*]



CONTEST CALENDAR

by Frank Anzalone, W1WY
14 Sherwood Road, Stamford, Conn.

CALENDAR OF EVENTS

August	26—27	JARL DX C.W.
*September	2— 3	LABRE C.W.
*September	9—10	LABRE Phone
September	9—10	SSBARA WAS
September	9—10	PERUANO C.W.
September	16—17	PERUANO Phone
September	16—17	SAC C.W.
September	23—24	SAC Phone
*September	23—24	MARC VE/W
Sept. 30 —	Oct. 1	VK/ZL Phone
October	7— 8	VK/ZL C.W.
October	14—15	ARRL CD C.W.
October	21—22	ARRL CD Phone
October	28—30	*CQ* WW DX Phone
*November	4— 5	(Open Date)
November	11—13	ARRL SS
November	18—20	ARRL SS
November	25—27	*CQ* WW DX C.W.
December	2— 3	RSGB 21/28 Phone
*December	2— 3	OK DX C.W.

*Denotes events from which we have not officially heard. The dates as noted are based on last year's activities and it is assumed that they will be held on the same week-ends this year. Next month will be too late for the LABRE but there is still time for the MARC to make up their mind.

JARL DX

Starts: 1000 GMT Saturday, August 26th.
Ends: 1600 GMT Sunday, August 27th.

This is the 2nd All Asian DX Contest held by the JARL, which was organized to increase Asian activity. Activity in the original contest last year proved it a success.

Amateurs in other continents will try to work as many Asian stations as possible during the 30 hour contest period. Use c.w. only, all bands 3.5 thru 28 mc. Awards will be made for single band and multi-band operation, however only single operator entries will be accepted. Better check last month's CALENDAR for more details.

Get your log in the mail no later than September 30th and send it to: The J.A.R.L. Contest Committee, P.O. Box 377, Tokyo Central, Japan.

Peruano

C.W.

Starts: 1200 EST Saturday, September 9th.
Ends: 2400 EST Sunday, September 10th.

Phone

Starts: 1200 EST Saturday, September 16th.
Ends: 2400 EST Sunday, September 17th.

This is a Panamerican contest sponsored by the Radio Club of Peru and therefore is confined to the American continents only.

For multiplier purposes the Canal Zone and Panama will be counted as one country. And Alaska is considered as a separate country.

Serial Nrs.—Five and six figures, consisting of the RS or RST report, plus three self-assigned numbers for the first contact. However, for each subsequent contact the three numbers will be those received on the previous QSO. Compli-

W1WY (with the knees) offers proof that he spent some time in Nassau. Pictured is Lowell Albury, VP7NY who promises more contest activity down that way, especially on 160. Mrs. CONTEST CALENDAR looks as though she's enjoying herself too.

cated? Nope, just study the following example log:

Date	EST	Station Wkd	Sent	Rec'd	Band
Sept. 9	1201	OA4AV	59314	59415	20
Sept. 9	1206	PY1ADA	59415	57211	20
Sept. 9	1211	CX2CO	58211	56789	20
Sept. 9	1213	W1WY	57789	58345	20

Scoring—1—One point per contact.

2—A multiplier of one for each country worked on each band.

3—An additional multiplier for each additional band used and confirmed by at least one contact.

4—The final score will be the total number of contacts multiplied by the sum of the two multipliers.

5—Your log must contain at least one OA contact. And your country can be worked once per-band for multiplier purposes only.

Awards—A medal and certificate to the highest scoring station in each country and each W/K and VE district. Second place stations will receive a certificate too.

The Radio Club Peruano Trophy goes to the highest scoring Phone station. These are two separate contests but phone activity seems to predominate.

Include a summary sheet with your log, showing your score, bands worked and etc. Make sure you include your name and address in block letters. Sign the usual declaration and mail your log within 20 days of the conclusion of the contest to: Radio Club Peruano, Presidente de Comisión Concursos, Casilla Postal 538, Lima, Peru.

S A C

C.W.

Starts: 1500 GMT Saturday, September 16th.
Ends: 1800 GMT Sunday, September 17th.

Phone

Starts: 1500 GMT Saturday, September 23rd.
Ends: 1800 GMT Sunday, September 24th.

This is the third Scandinavian Activity Contest and this year it is sponsored by Norwegian Radio Relay League.

It's the world working the Scandinavians in this one. For contest purposes the following prefixes will be considered: LA, LA/p, OH, OHØ, OX, OY, OZ and SM/SL; eight in all.

1—Two classifications, single and multi-operator. Club stations will be considered as multi-operator even tho only operated by one man.

2—Use all bands 3.5 thru 28 mc.

3—The usual five and six digit serial number, signal report plus a three figure progressive contact number starting with 001.

4—One point per contact.

5—A multiplier of one for each prefix worked on each band. A maximum of eight per band.

6—Final score will be the total QSO points multiplied by the sum of the multipliers.

Certificates to the two highest scoring stations in both classes in each country and each W/K call area. The Contest Committee may issue more awards depending on the returns.

Keep a separate log sheet for each band and a summary sheet with the scoring and other essential information plus the usual signed declaration. Remembering of course that the c.w. and phone sections are two separate contests.

The mailing deadline is October 20, 1961 and this year your logs go to: The N.R.R.L. Traffic Department, Box 898, Oslo, Norway.

VK/ZL

Phone

Starts: 1000 GMT Saturday, September 30th.
Ends: 1000 GMT Sunday, October 1st.

C.W.

Starts: 1000 GMT Saturday, October 7th.
Ends: 1000 GMT Sunday, October 8th.

This year's contest is sponsored by the Wireless Institute of Australia. Rules therefore will be different from last year, but are quite simple. Usual five and six figure serial number with each contact counting one point. The multiplier is determined by the number of VK and ZL-districts worked on all bands. Complete details next month.

SSB WAS

Starts: 1500 GMT Saturday, September 9th.
Ends: 2100 GMT Sunday, September 10th.

The Side Banders are sponsoring this popular Worked-All-States contest. It's principally an all USA affair but overseas stations are invited to take this opportunity to work some of the more difficult states for their WAS certificate. Anyway Dorothy and Irv explain it all in their SIDEBAND Column this month.

CQ WW DX

Phone

Starts: 0200 GMT Saturday, October 28th.
Ends: 0200 GMT Monday, October 30th.

C.W.

Starts: 0200 GMT Saturday, November 25th.
Ends: 0200 GMT Monday, November 27th.

See page 76 for complete rundown on rules.

Ed. Note

Just before leaving on my trip to Nassau, John Knight, W6YY stopped in for a chat. His anticipated European trip is being postponed until later this year. It was good to see Johnny after all these years. And just recently we spent a pleasant hour with Don Miller, W9WNV the mid-west contest "hot-shot".

Always glad to meet any of the fellows, do stop in to say Hello whenever you're in New York.

73 for now, Frank, W1WY

Rules: 1961 *CQ* World Wide DX Contest

I. CONTEST PERIOD:

Phone Section: 0200 GMT October 28 to 0200 GMT October 30.

C.W. Section: 0200 GMT November 26 to 0200 GMT November 28.

II. BANDS:

The contest activity will be in the 1.8, 3.5, 7., 14., 21., and 28. mc amateur bands.

III. TYPE OF COMPETITION:

1. Phone Section. (a) Single Operator. (b) Multi-operator, single transmitter. (c) Multi-operator, multi-transmitter. 2. C.W. Section (a) Single Operator. (b) Multi-operator, single transmitter. (c) Multi-operator, multi-transmitter. 3. Inter-Club. (DX Clubs affiliated to a National body.)

IV. EQUIPMENT:

There is no limit to the number of transmitters and receivers allowed and competitors may use the maximum power permitted under the terms of their license.

V. SERIAL NUMBERS:

1. Phone stations will exchange serial numbers consisting of 4 numerals, the first 2 being the RS report and the last 2 their own Zone number.

2. C.W. stations will exchange serial numbers consisting of 5 numerals, the first 3 being the RST report and the last 2 their own Zone number.

3. Stations in Zones 1 thru 9 will prefix their Zone number with Zero. (01 and etc.)

VI. POINTS:

1. Contacts between stations on different continents will count 3 points.

2. Contacts between stations on the same continent, but not in the same country, will count 1 point.

3. Contacts between stations in the same country will be permitted for the purpose of obtaining a Zone and/or Country multiplier but no QSO points are credited.

4. Only one contact with the same station is permitted per band.

VII. MULTIPLIER:

Two types of multipliers will be used.

1. A multiplier of 1 for each Zone contacted on each band.

2. A multiplier of 1 for each Country worked on each band.

VIII. SCORING:

1. The score of each Single Band is the sum of the Zone and Country multiplier for that band, multiplied by the total contact points on that band.

2. The total All Band score is the sum of the Zone and Country multipliers of all bands, multiplied by the sum of the contact points on all bands.

3. Those sending in logs for a Single Band are eligible for a Single Band award only. If a log is sent in for more than one band, indicate which band is to be judged, otherwise it will be judged as an All Band entry.

4. A station is not eligible for more than one award.

5. Single operator contestants must show a minimum of 12 hours of operating time to be eligible for an award. If a contestant operates more than one band and wishes to be judged for a specific single band, he must show a minimum of 12 hours on that band.

6. Multi-operator stations must show a minimum of 24 hours of operating time to be eligible for an award.

7. Multi-operator stations will only be judged on the basis of an All Band score.

IX. ZONES and COUNTRIES:

The *CQ* Zone map and the ARRL and WAE country lists will be used as standards. The continental boundaries used for WAC will also be recognized. Should any question arise as to the positive location of a station, the official definition will be final.

X. AWARDS:

Certificates will be awarded in each section as follows:

1. To the highest scoring Single Operator station on each Single Band in the following areas:

a. Each call area of the United States, Canada and Australia.

b. All other countries.

2. To the station having the highest All Band score (more than one band) in the following areas:

a. Each call area of the United States, Canada and Australia.

b. All other countries.

3. Awards to multi-operator stations will only be made in the #2 ruling.

XI. SPECIAL AWARDS:

In addition the following special awards will be made:

1. A cup will be awarded to the highest scoring Single Operator, on a Single Band, Phone Station in the world. (*Donated by K2IEG*)

2. A cup will be awarded to the highest scoring Single Operator on a Single Band, CW Station in the world. (*Donated by W7KVU*)

3. A cup will be awarded to the highest scoring Single Operator, All Band, Phone Station in the world. (*Donated by W2SKE*)

4. A cup will be awarded to the highest scoring Single Operator, All Band, CW Station in the world. (*Donated by W9IOP*)

5. A cup will be awarded to the highest

scoring Multi-operator, Single transmitter Phone Station in the world. (*Donated by K2AAA*)

6. A cup will be awarded to the highest scoring Multi-operator, Single transmitter c.w. Station in the world. (*Donated by W3AOH*)

7. A cup will be awarded to the highest scoring Multi-operator, Multi-transmitter Phone Station in the world. (*Donated by W6AM*)

8. A cup will be awarded to the highest scoring Multi-operator, Multi-transmitter c.w. Station in the world. (*Donated by K2GL*)

9. A plaque will be awarded to the affiliated DX Club (not a national body) submitting the highest aggregate score of the scores submitted by its members. (*Donated by CQ*)

a. For a club to enter, an officer of the club must submit a list of its participating members and their scores.

b. This list may include scores of single operator and multi-operator stations; both phone and c.w.

c. Stations that are members of a competing club therefore must indicate this fact on their report forms.

8. At the request of the donors, previous winners are not eligible for the 1961 awards. In other words the trophy cannot be won more than once by the same station. This does not apply to the plaque.

9. Also such special or additional awards as the Committee shall choose to make. In countries or sections where the returns justify second and third place certificates will be awarded.

XII. DISQUALIFICATION:

Violation of the rules and regulations pertaining to amateur radio in the country of the contestant or the rules of this contest will be deemed sufficient cause for disqualification.

XIII. LOG INSTRUCTIONS:

1. In keeping a log, fill in Zone number and Country, **ONLY FIRST TIME** it is contacted.

2. Use a separate sheet for each band and a tally sheet or report form.

3. Keep all times in **GMT.**

4. All contestants are expected to compute their scores. Logs should be checked for contact duplications and proper point credit before they are submitted.

5. Make sure name and address is clearly noted on each log. **Print or type.**

6. Each contestant must sign a pledge that all rules and regulations have been observed and that the report is a true one. Note sample contest report form.

7. If official log forms are not available, use a duplicate form as indicated. The size is 8½" × 11" with 52 contacts to the page.

8. Copies of the Zone map, log sheets and report forms are available from *CQ*, address listed below. Send a self-addressed envelope, large size. Include sufficient postage, in the case of overseas stations IRC coupons are acceptable. Make sure to indicate how many sheets are needed.

XIV. RULE CHANGES:

1. Note Par. VIII #7 and Par. X #3. The Committee feels justified in making this change. It does not require the efforts of more than one operator to cover a Single Band during a contest period. Especially now that the active time of the higher frequency bands is becoming shorter. Therefore there will no longer be Single Band awards for multi-operator stations.

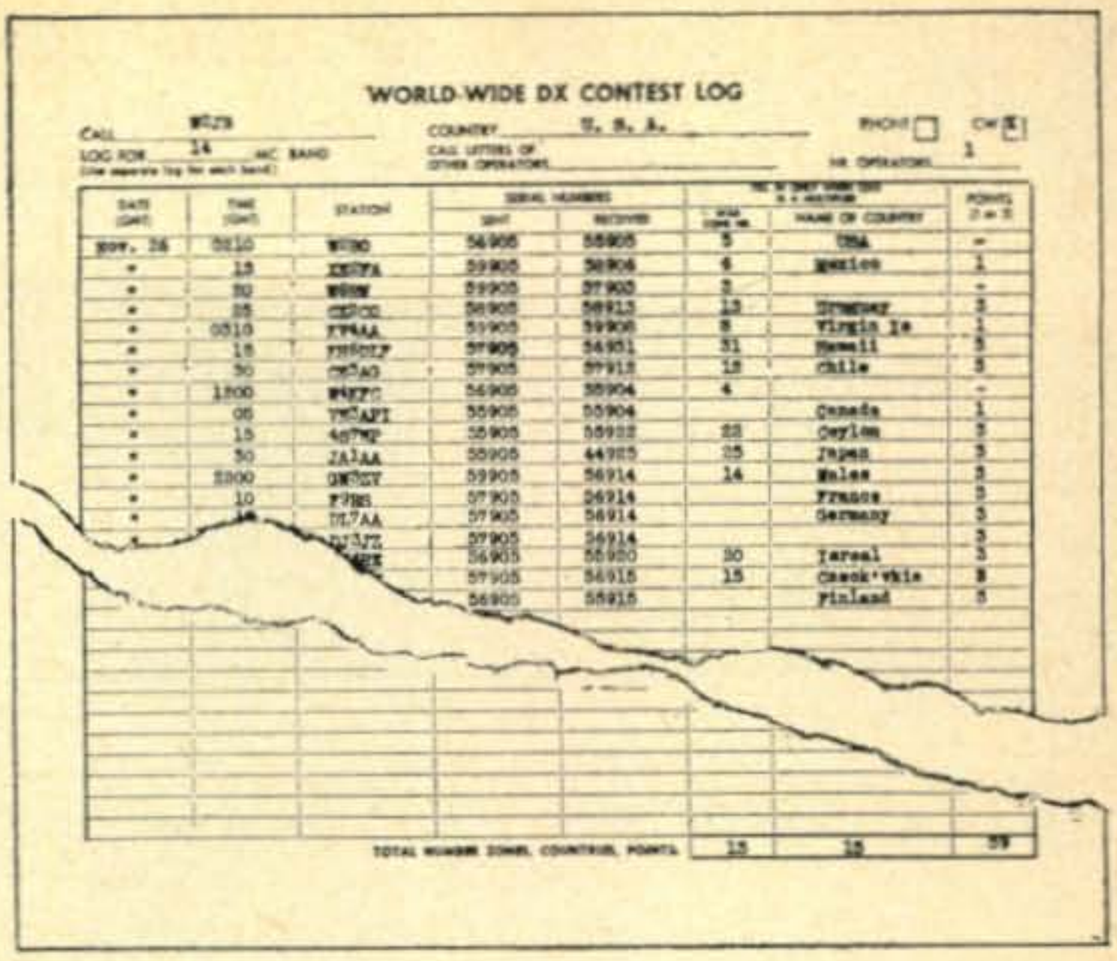
2. In the multi-operator division, (b) single transmitter and (c) multi-transmitter under Par. III. It is important that multi-operator stations indicate under what classification they are operating.

XV. DEADLINE:

All logs must be postmarked *no later* than December 1, 1961 for the Phone section and January 15, 1962 for the c.w. section. In rare isolated places the deadline will be made more flexible. Send logs directly to:

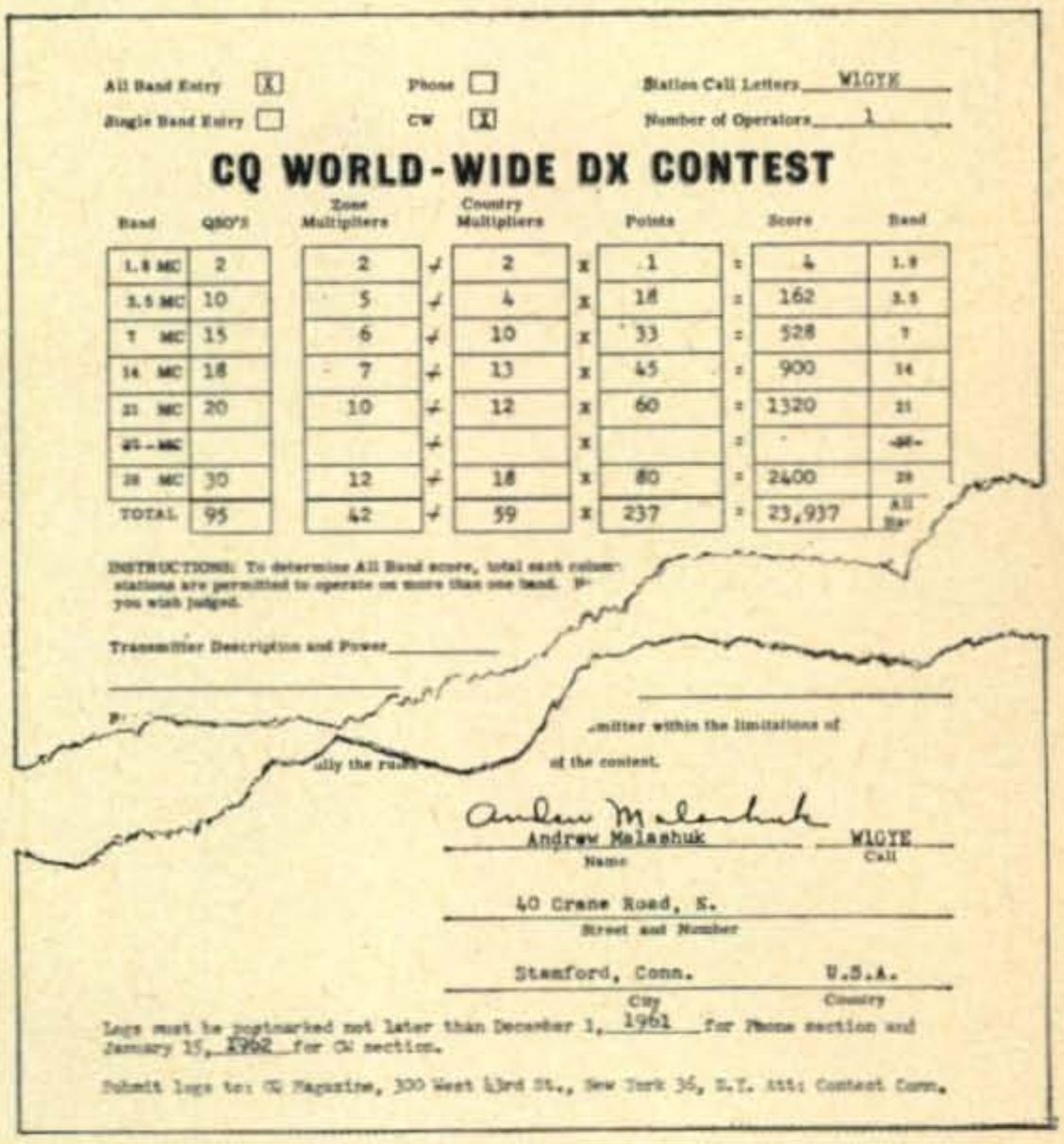
CQ, 300 West 43rd St.,
New York 36, N. Y.
Att: Contest Committee

(Please inform your local association of this contest)



WORLD-WIDE DX CONTEST LOG

DATE (GMT)	TIME (GMT)	STATION	SERIAL NUMBERS SENT	SERIAL NUMBERS RECEIVED	WAS ZONE NO.	NAME OF COUNTRY	POINTS 2 or 3
Nov. 26	0010	W1XX	56905	56905	5	USA	-
"	15	XE1FA	56905	56906	6	Mexico	1
"	30	W1XX	56905	57900	2		-
"	35	CE1CC	56905	56913	13	Chemnez	3
"	0010	KV4AA	56905	56906	8	Virgin Is	1
"	15	KH6CLF	56905	56951	31	Hawaii	3
"	30	CE3AO	56905	56913	13	Chile	3
"	1200	W4ZYC	56905	56904	4		-
"	05	VE3APZ	56905	56904		Canada	1
"	15	4S7MP	56905	56932	22	Ceylon	3
"	30	JA1AA	56905	44905	25	Japan	3
"	0300	ON4CY	56905	56914	14	Belgium	3
"	10	F3BS	56905	56914		France	3
"	15	DL7AA	56905	56914		Germany	3
"		OH2YZ	56905	56914			3
"		4X4	56905	56950	20	Israel	3
"			56905	56915	15	Czech'vkia	3
"			56905	56915		Finland	3
					TOTAL ZONES, COUNTRIES, POINTS	15	15	59



All Band Entry [X] Phone [ ] Station Call Letters W1GYK
Single Band Entry [ ] CW [X] Number of Operators 1

CQ WORLD-WIDE DX CONTEST

Band	QSO's		Zone Multipliers		Country Multipliers		Points		Score	Band
1.8 MC	2		2	✓	2	x	1	=	4	1.8
3.5 MC	10		5	✓	4	x	18	=	162	3.5
7 MC	15		6	✓	10	x	33	=	528	7
14 MC	18		7	✓	13	x	45	=	900	14
21 MC	20		10	✓	12	x	60	=	1320	21
45 MC				✓		x		=		45
28 MC	30		12	✓	18	x	80	=	2400	28
TOTAL	95		42	✓	59	x	237	=	23,937	ALL BAND

INSTRUCTIONS: To determine All Band score, total each column. Where stations are permitted to operate on more than one band, prorate as you wish judged.

Transmitter Description and Power

...mitter within the limitations of ...of the contest.

Andrew Malashuk — Name
W1GYK — Call
40 Crane Road, S. — Street and Number
Stamford, Conn. — City
U.S.A. — Country

Logs must be postmarked not later than December 1, 1961 for Phone section and January 15, 1962 for CW section.

Submit logs to: CQ Magazine, 300 West 43rd St., New York 36, N.Y. Attn: Contest Comm.

PROPAGATION

George Jacobs, W3ASK
11307 Clara St., Silver Spring, Md.

LAST MINUTE FORECAST

The forecast indices for the month of August, shown in the Propagation Charts following the predicted times of openings, are expected to be related to day-to-day propagation conditions in the following manner:

Forecast Indices	Above Normal Days Aug. 8-10	Normal Days Aug. 1-2, 4-7, 11-16, 18-22, 26-30	Below Normal Days Aug. 3, 17, 23-25	Disturbed Days None
(1)	C	D-E	E	E
(2)	B	C-D	E	E
(3)	A	B-C	D-E	E
(4)	A	A	B-C	C-D

Where:

A—Excellent circuit with strong steady signals.

B—Good circuit, moderately strong signals, with some fading and noise.

C—Fair circuit, signals fluctuating between moderately strong and weak, with moderate fading and noise.

E—Circuit not possible.

General Conditions

Typical summertime shortwave radio propagation conditions are expected to continue through the month of August. Except for some fairly infrequent openings on north-south paths, very little DX is forecast for 10 meters. Fifteen meters should produce the best DX openings during the hours of daylight, with conditions peaking during the late afternoon hours. During the early evening hours, and again during the sunrise period, 20 meters is expected to open to most areas of the world. Despite seasonally high static levels, propagation conditions are forecast to be optimum on 40 meters during the hours of darkness, with some fairly good DX openings also possible on 80 meters during the night hours. Because of the high static level, 160 meter openings are expected to be very noisy, and generally limited to distances of less than 2500 miles. A complete circuit-by-circuit DX propagation forecast for August appeared in last month's column.

This month's column contains Short-Skip Propagation Charts for August & September. A considerable amount of sporadic-E propagation is forecast for August and early September, and this is expected to result in numerous short-skip openings on 10, 15 and 20 meters, especially during the daylight hours. During periods of intense sporadic-E ionization, short-skip openings between distances of approximately 1000 and 1400 miles, may also occur on 6 meters. During the hours of darkness, 40 meters is forecast as the best band for short-skip openings, with fairly good short-skip conditions also predicted for 80 meters.

Sunspot Story Reprint

The three part Sunspot Story which appeared in the April, May and June issues of *CQ* has been reprinted as a 28 page booklet. See page 39 for further information.

Perseids Meteor Shower

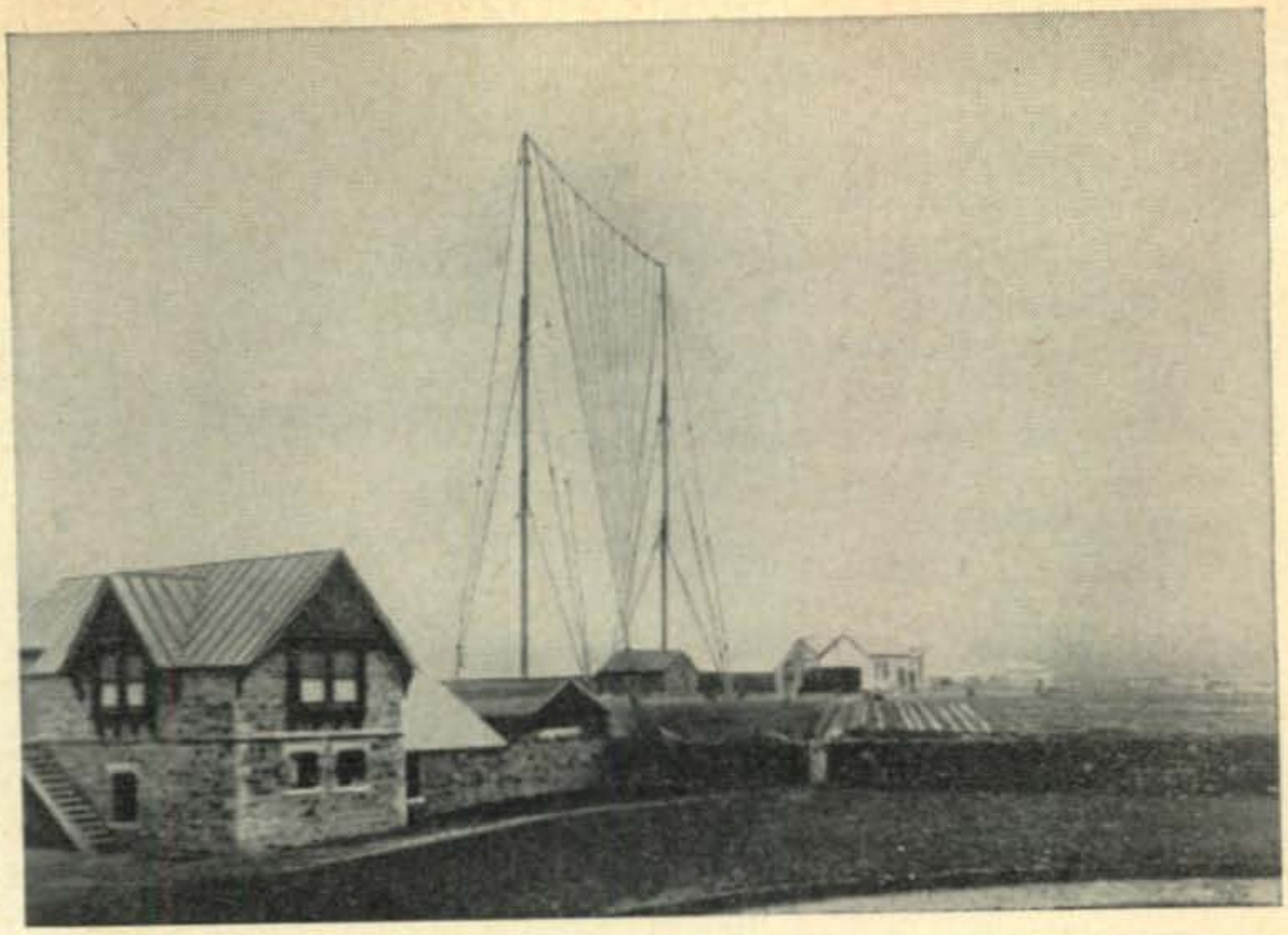
One of the year's most prolonged and intensive period of meteor showers begins during the last week of July, and reaches a peak in mid-August. This period is called the *Perseids*. During the Perseids, meteors enter the earth's atmosphere at the rate of *100 million* a day. Most of these are cosmic particles, no larger than grains of sand, but many will be large enough to leave a characteristic trail, producing the familiar "shooting star" effect in the night sky.

The ionization formed as meteors streak into the earth's atmosphere at velocities up to 50 miles per second, is expected to result in numerous opportunities for meteor scatter openings on both 6 and 2 meters. In years past, reflection from ionization trails produced during the Perseids have resulted in interesting openings for v.h.f. enthusiasts, as well as choice "new states" worked.

Solar Cycle

The sunspot cycle continues to decline at an increasingly rapid pace. The Zurich Observatory reports a monthly mean sunspot number of 50 for May, 1961. This results in a 12 month running smoothed sunspot number of 87 centered on November, 1960. A smoothed sunspot number of 64 is predicted by *CQ* for August, 1961.

The present level of solar activity is comparable to that observed during the late summers of 1940 and 1951.



Original antenna system used by Marconi for first successful trans-Atlantic radio communication experiments, December 12, 1901. Antenna consisted of 150 foot masts supporting 60 fan-shaped wire elements. Location of historic transmitting installation was near the town of Poldhu, in Cornwall, England. *(Photo courtesy Marconi's Wireless Telegraph Co. Chelmsford, England.)*

CQ SHORT-SKIP PROPAGATION CHART

AUGUST AND SEPTEMBER, 1961

LOCAL STANDARD TIME

BAND METERS	50-250 Miles	250-750 Miles	750-1300 Miles	1300-2300 Miles
10	NIL	7 A - 12M (0-1)	6 A - 9 A (0-1) 9 A - 5 P (1-2) 5 P - 6 A (1)	6 A - 9 A (1-0) 9 A - 5 P (2-0) 5 P - 8 P (1) 8 P - 6 A (1-0)
15	NIL	6 A - 9 A (0-2) 9 A - 4 P (0-3) 4 P - 8 P (0-2) 8 P - 6 A (0-1)	6 A - 9 A (2) 9 A - 4 P (3) 4 P - 8 P (2) 8 P - 6 A (1)	6 A - 9 A (2-1) 9 A - 4 P (3-2) 4 P - 8 P (2-3) 8 P - 12M (1-2) 12M - 6 A (1)
20	NIL	4 A - 9 A (1-2) 9 A - 4 P (1-4) 4 P - 10P (1-3) 10P - 4 A (1-2)	4 A - 9 A (2) 9 A - 4 P (4) 4 P - 10P (3-4) 10P - 4 A (2)	5 A - 9 A (2) 9 A - 3 P (4-2) 3 P - 4 P (4-3) 4 P - 10P (4) 10P - 1 A (2) 1 A - 5 A (2-1)
40	7 A - 11A (1-2) 11A - 5 P (2-3) 5 P - 8 P (3-4) 8 P - 11P (2) 11P - 7 A (1)	7 A - 9 A (2) 9 A - 11A (2-1) 11A - 5 P (3-2) 5 P - 8 P (4) 8 P - 11P (2-4) 11P - 7 A (1-3)	7 A - 9 A (2-1) 9 A - 11A (1) 11A - 5 P (2-1) 5 P - 8 P (4-3) 8 P - 11P (4) 11P - 5 A (3-4) 5 A - 7 A (3)	7 A - 5 P (1-0) 5 P - 8 P (3-2) 8 P - 5 A (4) 5 A - 7 A (3-1)
80	5 A - 9 A (3-4) 9 A - 4 P (4) 4 P - 7 P (4-3) 7 P - 9 P (4) 9 P - 5 A (3-4)	5 A - 7 A (4-2) 7 A - 9 A (4-1) 9 A - 4 P (4-1) 4 P - 7 P (3-1) 7 P - 9 P (4-2) 9 P - 5 A (4)	5 A - 7 A (2-1) 7 A - 5 P (1-0) 5 P - 9 P (2-1) 9 P - 3 A (4) 3 A - 5 A (4-3)	5 A - 7 A (1-0) 7 A - 5 P (0) 5 P - 9 P (1) 9 P - 3 A (4-3) 3 A - 5 A (3-2)
160	5 P - 7 P (1-0) 7 P - 9 P (3-2) 9 P - 5 A (4) 5 A - 7 A (3-2) 7 A - 9 A (1-0)	6 P - 8 P (1-0) 8 P - 10P (2-1) 10P - 2 A (4-3) 2 A - 5 A (4-2) 5 A - 7 A (2-0)	8 P - 10P (1) 10P - 12M (3-2) 12M - 2 A (3) 2 A - 3 A (2-1) 3 A - 5 A (1)	8 P - 10P (1-0) 10P - 12M (2-1) 12M - 2 A (3-2) 2 A - 5 A (1)

ALASKA

Openings in Alaskan Standard Time ***

TO:	10*/15 Meters	20 Meters	40 Meters	80/160** Meters
Eastern USA	4 P - 6 P (1)	3 A - 6 A (1) 5 P - 9 P (1)	NIL	NIL
Central USA	5 P - 7 P (1)	5 P - 8 P (1)	NIL	NIL
Western USA	5 P - 8 P (1)	7 A - 3 P (1) 3 P - 6 P (2) 6 P - 8 P (3) 8 P - 10P (2) 10P - 11P (1)	11P - 5 A (2)	2 A - 4 A (1)

***There are four different time zones in Alaska. This Chart is based on standard time in the zone from Skagway to 141 degrees west longitude. Time in this area is equivalent to:

Eastern Standard Time minus four hours;
Central Standard Time minus three hours;
Mountain Standard Time minus two hours;
Pacific Standard Time minus one hour.

HAWAII

Openings in Hawaiian Standard Time***

TO:	10*/15 Meters	20 Meters	40 Meters	80/160** Meters
Eastern USA	2 P - 5 P (1)* 6 A - 12N (1) 12N - 3 P (2) 3 P - 5 P (3) 5 P - 6 P (1)	2 P - 4 P (1) 4 P - 5 P (2) 5 P - 7 P (3) 7 P - 8 P (2) 8 P - 11P (1) 2 A - 6 A (1)	6 P - 8 P (1) 8 P - 12M (?) 12M - 2 A (1)	8 P - 9 P (1) 9 P - 11P (2) 11P - 1 A (1) 9 P - 12M (1)**
Central USA	12N - 4 P (1)* 6 A - 8 A (1) 8 A - 2 P (2) 2 P - 4 P (3) 4 P - 6 P (2) 6 P - 7 P (1)	5 A - 7 A (2) 7 A - 2 P (1) 2 P - 5 P (2) 5 P - 7 P (4) 7 P - 9 P (3) 9 P - 11P (2) 11P - 5 A (1)	6 P - 8 P (1) 8 P - 1 A (3) 1 A - 3 A (2) 3 A - 4 A (1)	8 P - 9 P (1) 9 P - 1 A (2) 1 A - 3 A (1) 9 P - 1 A (1)**
Western USA	11P - 4 P (1)* 4 P - 6 P (2)* 6 P - 7 P (1)* 7 A - 9 A (1) 9 A - 11A (2) 11A - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (2) 6 P - 8 P (1)	5 A - 8 A (2) 8 A - 11A (3) 11A - 2 P (2) 2 P - 3 P (3) 3 P - 6 P (4) 6 P - 8 P (3) 8 P - 12M (2) 12M - 5 A (1)	6 P - 7 P (1) 7 P - 8 P (2) 8 P - 2 A (4) 2 A - 4 A (2) 4 A - 6 A (1)	7 P - 8 P (1) 8 P - 9 P (2) 9 P - 12M (3) 12M - 1 A (2) 1 A - 5 A (1) 7 P - 9 P (1)** 9 P - 12M (2)** 12M - 1 A (1)**

***Hawaiian Standard Time is equivalent to:

Eastern Standard Time minus five hours;
Central Standard Time minus four hours;
Mountain Standard Time minus three hours;
Pacific Standard Time minus two hours.

FORECAST INDICES

Circuits Forecast To Open:

(1) Less than 7 days during each month of forecast period.

(2) Between 8 and 13 days during each month of forecast period.

(3) Between 14 and 22 days during each month of forecast period.

(4) For more than 22 days during each month of forecast period.

Where two forecast indices are shown within a parenthesis, the first applies to the forecast for the shorter distance range, and the second to the forecast for the longer distance.

A - A. M. P - P. M. N - Noon M - Midnight

See the "Last Minute Forecast" at the beginning of the column for the relationship between the Forecast Indices and the day-to-day propagation conditions forecast for August, 1961.

*Indicates time for expected 10 meter openings from Hawaii to other areas of the United States.

**Indicates times for expected 160 meter openings from Hawaii and Alaska to other areas of the United States.

The CQ Short-Skip Propagation Charts are based upon a CW effective radiated power of 75 watts from a half-wave dipole antenna, a half-wave above ground. The Charts are valid through September 30, 1961. These forecasts are based upon basic propagation data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

The Sunspot Story

An avalanche of mail has been received in reponse to the "Sunspot Story; Cycle 19; The Declining Years," which appeared as a three-part, special feature in April, May and June's *CQ*.

For months of data is now available for checking the long-range sunspot prediction contained in Table 3 of this report (page 41, May *CQ*). The comparison between predicted and observed values of 12-month running smoothed sunspot numbers follow:

1960	Predicted	Observed
August	104	101
September	101	97
October	98	93
November	94	87

The present cycle is declining somewhat faster than predicted, but the difference between the predicted and observed values remains at less than 10%.

From John H. Nelson, Propagation expert for RCA Communications, Inc. comes another prediction that peak solar activity for the remainder of the century may be considerably lower than the peaks of the past three cycles. According to a method devised by Mr. Nelson, which takes into account the relationship between the positions of the major planets and the sun, he predicts that:

1—The next three sunspot maxima will be very much lower than the past three maxima.

2.—The maximum of the next cycle (cycle 20) should be on the order of 60 to 70 on the 12 month running smoothed sunspot scale, followed by a slow decline with low numbers.

3—The maximum of cycle 21 should be on the order of 40 to 50 with a very slow decline with very low numbers.

4—The maximum of cycle 22 should be on the order of 45 to 55 with a moderate decline with low numbers.

5—The period from the present until the beginning of the next cycle will also show a slow decline with only moderate to low numbers.

Mr. Nelson further points out that the above forecast was made on rather short notice and that further research might cause him to raise the sunspot numbers to some extent, but the basic statement that the next three cycles will have depressed maxima "will not need to be changed."

Some of the mail received contained opinions that the next few cycles may be *high* cycles. These opinions will be discussed in next month's column.

A note received from Dr. S. G. Lutz of the Hughes Research Laboratories points out that the saw-tooth representation of the solar cycles, and its indication of the low cycles ahead, which was credited to him in Fig. 17 of the Sunspot Story (Page 43, May's *CQ*), is actually the work of John Chambers of the Hughes Communication

[*Continued on page 116*]

The USA-Counties Award

CLIF EVANS, K6BX
BOX 385, BONITA, CALIF.

THE USA-Counties Awards Program got off with a bang on July 25th when *CQ* mailed out hundreds of Record Books filling all orders on hand. Now there is a mad scramble with wiley 'hunters' using every trick in the bag seeking to win USA-CA 500 number ONE.

The writer, Custodian for USA-CA Program, is not unaware of responsibility for fairly determining who *number one* applicant will be. Let's face it, scores of you had ruff lists standing by awaiting the application Record Books. Likewise, Books mailed 3rd class to Eastern hams arrived first, and considering that some applicants used Air Mail, these would arrive at K6BX even before Books arrived in the Mid-West, West or overseas.

While all of you would like to win USA-CA number one, we know you would want to do so fairly and squarely. We have devised a processing system giving equal opportunity to all. For the U.S. and Canada we will take the date of the first application received from East, Central, Mid-West and West, and will add three days to such dates for each area, within which period it will be deemed all applications arrived under conditions of equal competition. The same system will apply for DX countries. After the equal opportunity period has elapsed, we will place all qualifying calls in a 'hat' for drawing, not to determine who is number one but who among all the *number ones* is to be 1A, 1B, 1C and so on, and for same issuance date. Those who have their applications in within the 3-day-date period are considered to have equally won USA-CA 500 *number one*.

Following through with the 'system,' we will skip lower USA-CA numbers and start off other applicants at whatever number level it adds to. Please remember it will take some time for the process to accommodate our DX friends so there will be some delay in issuance of certificates.

Now that we have solved the number one USA-CA problem, let's face the fact that real competition starts with the USA-CA 1000.

As promised, both the *Directory* and the USA-CA Program will promote sponsors for issuance of all-county awards by each of the 50 States. On that score-board now are N.H., Maine, Mass., Ver., Conn., R.I., N.Y., N.J., Md., Del., Pa., Ga., Fla., W.Va., Ill., Ohio, Minn., Wisc. Mo., Kan., Nebr., Texas, Ariz., Mont., Wash., and Calif.

If you haven't already done so, send direct to *CQ* for copies of the USA-CA Record Book; 108 pages of maps and state-county data for just $1.25. (Get two) For the *Directory of Certificates & Awards*, write K6BX for info. GH.

Clif, K6BX

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street, Lynbrook, New York

SSB DX HONOR ROLL

TI2HP	239	ZL3IA	186
W6UOU	231	K4TJL	186
W8PQQ	229	W4OPM	183
W8EAP	225	W2VZV	182
VQ4ERR	218	K8RTW	180
PY4TK	215	K2FW	177
W7VEU	210	K6LGF	175
W6RKP	210	W3LMA	169
W6PXH	210	PZ1AX	168
WØQVZ	208	XE1AE	167
W6BAF	207	W2YBO	160
K2MGE	207	W5RHW	159
W2ZX	206	K2JFV	158
W6WNE	205	W3KT	155
HB9TL	203	W1LLF	153
W3NKM	202	W2NUT	152
W2FXN	201	W2QKJ	150
W2JXH	200	W6YMV	150
K9EAB	200	K1IXG	150
W8YBZ	200	K6MLS	150
MP4BBW	192	W2VCZ	150
W2LV	190	W6EKZ	138
WØCVU	190	K2TDI	142
W5AFX	187	WØPGI	140
W5IYU	187	W3CGS	134

CQ SSB CERTIFICATES AND STICKERS

Worked 50	KØTJW	**Worked 125**	W2VCZ
W8YBZ	**Worked 75**	K4PUS	**Worked 175**
W2LLI	DL6VM	W3KT	K2FW
K3COW	KØRAL	**Worked 150**	**Worked 200**
VE6IN	**Worked 100**	K1IXG	W2FXN
KØIKL	W9EYC	W3KT	**Worked 225**
WA2IWH	K4ASU	K6MLS	W8PQQ
KØRAL			

SSB "Worked All States" Contest
Sept. 9-10, 1961

THE Third Annual SSB" Worked All States" Contest will start at 1500 GMT, Saturday, September 9, 1961 and end at 2100 GMT, Sunday, September 10, 1961. The Contest is again being sponsored by the Single Sideband Amateur Radio Association who will, this year, award certificates to the top ranking contestants in each of the 50 states as well as special prizes to each of the sidebanders who contact all 50 states. Last year, only 7 contestants worked all states and, of these, Bryan, W5KFT, contacted the most sidebanders, to emerge as winner. Read the following rules, prepare to enter the contest, and enjoy a weekend of meeting more sidebanders than ever before.

1. The primary object of this Contest is to work as many s.s.b. stations in as many of the 50 states as possible, via two-way s.s.b. within the prescribed time.

2. Any amateur on s.s.b. is eligible to compete but a special prize will be awarded to the top scorer from the SSBARA membership.

3. Although the Contest covers a span of 30 hours, a participant *must not* operate for more than 24 hours. The six hours of non-operation *must* be consecutive—at the beginning, end, or any six hours during the middle of the Contest and must be reflected in the Contest log. In other words, contestants may select their rest period and may, if desired, operate less than 24 hours. Logs not indicating a 6 hour silence period will be disqualified.

4. Only one transmitter may be operated from any one station at any time.

5. Serial Exchange: The following information must be exchanged and acknowledged during each QSO: Report, Time in GMT, Name of the Operator at the mike, and State.

Sample Log

W2SKE Bill New York

GMT	Sent	Received	GMT		Band
1546	5-8	W3ICQ 5-9	1547	Elsie, Pa.	20
1549	5-8	WØFUH 5-9	1549	Len, Colo.	20
1552	5-9	K9EAB 5-9	1552	Cliff, Ill.	40
1555	5-9	W3ICQ 5-9	1555	Elsie, Pa.	40

Score: Stations (4) × States (3) = 12

6. Scoring: Count ONE point for each station worked, regardless of that station's location. Final score is total number of stations worked, multiplied by the number of states worked (a maximum multiplier of 50).

A station may be worked once on the higher bands (10, 15, or 20) and may also be *worked once again on either of the lower bands* (40 or 80), or vice versa. However, no additional multiplier can be earned by working the same state twice on two bands. Bands from 10 through 80 may be used.

7. Awards: Special awards, to be announced, will be sent to each sidebander working all 50 states during the Contest period.

Certificates will be awarded to the top scoring contestants in each of the 50 states.

The Grand Prize to be awarded to the highest scoring contestant will be a Lifetime Membership in the SSBARA.

An engraved trophy will be awarded at the 1962 Sideband Dinner in New York to the highest scoring SSBARA member. (Specify on your log if you are a member.)

8. Logs: Logs must be postmarked no later than Nov. 15, 1961 and must be signed by the

licensee of the station and by all operators. Logs should be sent to:

SSBARA WAS Contest
12 Elm Street
Lynbrook, New York

The SSBARA WAS Contest is a unique opportunity to discover just how well we can do on sideband in the light of changing band conditions, as well as to provide you with an exciting weekend of contest operating. We urge all sidebanders to participate in this Contest and what's more, to submit their logs so that we can get a more accurate picture of the efficiency and superority of sideband operation.

Here is Rick, K6VVA, winner of the first W8YIN Memorial Trophy during the recent CQ s.s.b. DX Contest. Using under 175 watts p.e.p., Rick did such a fine job that he was second highest scorer in the Sixth District.

Letter from Malaya

One of the blessings of our association with this column is the opportunity we have to learn more about many people through the letters they write to us. A most interesting letter arrived from Dr. Lee Lai Hung, 9M2GA, of Johore, Malaya, which we'd like to share with you.

"I am in private medical practice and have been in it since '56. I was graduated from the U. of Hong Kong in 1953; did a year's internship there and returned to this home town for a year and half service with the General Hospital and then left it to take over the practice from my father early in 1956. My father had been in G.P. here in this small little town for about 30 odd years and it is really a 'country' sort of practice work that I am doing at the present moment.

"I will be 34 come this April. My XYL, Barbara, is from Hong Kong and we are the proud parents of 3 young terrors, the eldest Christina is 5 and the youngest, Michele, is just 14 months. Interposed between the two girls is our son, Norman, who is just 3. You can well imagine the QRM that sometimes creeps out of the room when I am on in the mornings. I would certainly like to send a picture of the whole family one of these days. (Ed. note: we're still waiting, Dr. Lee!)

"I really can not trace back to the moment when I became interested in ham radio. I was first introduced into ham radio when I read about it in the book *Kon Tiki* some years back. It was just an interesting idea then but nothing solid came forth until I found that, in this town itself, there was actually a ham who had newly arrived on transfer from another place. I bulldozed my way into his shack one afternoon and got him to tell me all the details of how to become a ham. Well, since then, the hobby has stuck and I don't believe I would give it up for anything now. Ever since I became interested in this mode, there arose within me the search for perfection. But who has ever heard of the perfect station? And that I suppose is another outlet for the excess of mental energy that I would dare to presume I possess, hi! . . ."

Too often, in our quest for the almighty QSL card, we content ourselves with an exchange of reports. We hope, through this column, to bring you the personality of the man who is at the other mike and, in that way, contribute in a small way to the cementing of firmer friendships through amateur radio and particularly through sideband.

Thanks to Cal, W4ANE, who performed such an excellent job as QSL manager, here is a photo of the members of the 1961 Laccadive Islands DXpedition. L. to r., Rao, VU2RM; Raju, VU2NR; and Karen, VU2BY.

Time for a Change!

Well, it was bound to happen sooner or later and it's hard right now to know if it is now later or sooner. This might sound mysterious but the reason for it is quite obvious. The DX situation has now reached a stage where we have out-powered and out-shouted ourselves and messed up the situation so badly that working DX is becoming a sideband nightmare!

This is not our opinion alone and was recently brought home quite forcibly by a report from the operators of 9K3TL/NZ. Jack, HB9TL, one of the operators of the DXpedition, had some very interesting comments on this operation which go something like this. The proportion of contacts made on s.s.b., using a KWM-2, was definitely *in favor of c.w. not s.s.b.!* The reason? Simply that they could not operate on s.s.b. because of the terrible QRM generated by the operators who fell over each other in their desire to get that "rare one" before he got away! The s.s.b. operators literally drove the expedition from the air, as far as s.s.b. was concerned! The 9K3 operators were forced to turn to c.w. to make their contacts—and contacts they did make, because, in their words, "they could make contacts and give reports without hundreds of stations jamming the frequency and preventing the proper exchange of reports." It seems that the c.w. boys

Scoop! Thanks to Jim, K2AKK, and Fan, WA2GZP, this good looking group includes the first published photo of V. Mayree, K4ICA, who has endeared herself to so many on sideband. Seated, l. to r., Jerry, K4LRA; Neal, K9JTV. Standing, l. to r., Jim, K2AKK; Jerry, W5CME; Joe, K4ZDQ; Fan, WA2GZP; V. Mayree, K4ICA; and Frank, OA4CS.

have learned something which has bypassed the sideband DX'er; and that is, that continuous calling of the DX station while it is giving reports prevents the completion of the exchange with the station worked; cuts down the number of contacts possible and prevents many stations from making any contact at all.

Sideband DX'ers are losing sight of the fact that the DX station will not suffer endlessly the boorishness of the operators who have no regard for others and call endlessly without listening to hear if the DX station is giving a report. It is a constant source of amazement to us that no one recognizes the simple fact, and it is simple, that the DX station *cannot hear anyone when he is transmitting!* Why do stations insist upon calling and calling when there is no hope of being heard? Is it because in that fashion they feel they will overpower the opposition and wear them down? Or do they feel that by making a pest of themselves the DX station will give them a call just to get rid of them? Or is it sheer ignorance of a fundamental fact—that high power and a loud voice doesn't always go hand in hand with making the contact!

How many times have you heard the DX station ask everyone to stand by while he gives a report, only to have dozens of stations frantically call him, blotting out any possible report exchange? Do they expect to be heard while the DX station is still transmitting? How? At one time, "tail ending" was a common practise and tolerated by the DX'ers; now, "tail ending" has been replaced by "tail endlessly" . . . operators are playing percentages instead of skill . . . call long enough and loud enough and maybe I'll be heard. The ensuing bedlam is creating an operating barrier that is far more unsurmountable than the expansion of the 20 meter band to 14.350. Then we complained that we were driving the DX off the band; do you think that the present operating practises are doing anything else? Your kilowatt and beam do not guarantee a contact—there are others with the same potential—do you think that you can "bull" your way through? Can you imagine the noise of a hundred kilowatt-rigs on the same frequency calling and calling and calling? Don't you think that by adopting one simple rule . . . that of standing by when the DX station is transmitting, that there will be more room to make contacts, that everyone will hear his report the first time and not have to struggle for valuable minutes to get it through the QRM, generated by thoughtless operators who seem to be gifted with an endless supply of wind and a paucity of common sense and operating ability?

We can learn a great deal from the c.w. operators who have learned that "standing by" is by far one of the most important tools in the art of working DX. By giving everyone a chance, more stations will make the contact. The recent expeditions to JY2 and 9K3 have proven without a doubt that you cannot make a contact on the basis of high power and a big "sky hook"; it takes some operating ability too and this is something that too many sidebanders have taken no trouble at all to acquire! It can lead only to one thing . . . sooner or later DXpeditions will make little or no effort to work W/K stations . . . not that it would matter if they tried . . . they just plain couldn't hear them in that raucous, snarling, horrendous uproar aimed their way!

Is He or Isn't He?

Back during the early part of this year, Henry, W2MAF, played host to Mohammed, 9K2AM, and his brother and second operator, Reza. Following their visit, Henry sent us some photos of the group and during a chat on the air, asked what we thought of him dressed up as a Sheikh. We didn't see that photo, said we, and why don't you send it to us? Well, photos were sent and returned, sent and returned until finally the truth came out. Henry had penciled a mustache on himself and looked so much like the gentlemen from Kuwait that we had been fooled into thinking we were looking at a photo of 9K2AM

One of the Ukraine's most active sidebanders is Anatoly, UB5FJ, who won top honors in his country in the s.s.b. DX Contest.

This is the photo that had us confused. We won't keep you in suspense! That's Henry, W2MAF, on the left, with Reza, second op. at 9K2AM, on the right.

and his brother. Now that the secret is out, we're pleased to report another evidence of the warm friendships that sideband encourages. Mohammed graciously sent Henry a ticket for air passage to Kuwait and shortly Henry will be leaving for his return visit, his first out of the country! We wish him Bon Voyage!

S.S.B. QSL Verification

Verifying QSL cards for the "Worked 100" certificates and the various stickers sometimes gives rise to questions as to validity which must be resolved. In order for the award to be meaningful, we must have ground rules for playing the game, and, as far as we can, we intend to preserve both the spirit and the letter of these rules. We cannot prevent some of the abuses attendant to DX'ing such as report relaying, use of illegal power or bad operating but we can insist that the QSL cards submitted represent legitimate "2-way SSB."

Cards submitted should be marked "2-Way Sideband" in order to be considered. At times, cards are received which are not so marked and their acceptance must be weighed carefully. Usually the omission is accidental and we can give credit by applying the use of common sense. We see hundreds of cards a month and keep detailed records of all cards received. A quick check of the records will usually provide the needed information. If additional help is needed, we have the DX column edited by Urb Le Jeune and Don Chesser's *DX Bulletin*. If we cannot secure corroboration, we must refuse credit until further information comes our way.

Reports such as "your sideband signals" or "confirming sideband signal" are not the type we like to see; however, where the station has been on sideband for years, such as HZ1AB or ET2US or others of similar long standing, we will accept a report which does not clearly state "2-Way SSB." Where we have made contact ourselves with the questioned station and know for a fact that the station is on sideband and was on sideband at the time of the QSO, we will allow credit even if the card is not properly marked.

There are times when our decisions have been questioned; we make no claims to infallibility but we do carefully consider each QSL card and if your card is rejected, it is done so after a great deal of checking. The best way of course, to avoid difficulties is to request that QSL cards you ask for are clearly marked "2-Way SSB"; from a sideband station, of course.

Sideband Around the World

Thanks to John, ZE4JN, we learn that Molly, ZE1JE, famous for her 10 meter a.m. operating, should now be on sideband, which is welcome news to her many friends . . . Last call to work Barbados on sideband as Mac, VP6WD, will be returning to his home in New Zealand about Sept. or Oct. Mac hopes to continue on ham radio as a ZL1 or ZL2 . . . And speaking of down under, we were most pleased to receive a brief visit from Phil, VK5NN, who was passing through New York in early June . . . Congratulations to the members of the Liga Mexicana de Radio Experimentadores, among whom are many of our most active Mexican sidebanders, who pursuaded their Government to permit foreign amateurs to operate in Mexico after a three year residence and proof of a second class examination. This is truly a step in the right direction of international good-will and we wish that other groups could be as successful in their countries . . . If gardening is your interest, you'll never be at a loss for conversation with Ralph, G3HVY. Our contact with him ended before we could get too deeply into the subject but Ralph sounded like he had much to say about the care and raising of flowers . . . Lilo, formerly DL1SDM, is now DL1SDS, her former call to be reserved for use when mobiling . . . VS9, the Maldives, will soon be represented on sideband, thanks to the efforts of Buck, W4TO, and Ed, K8RTW . . . By this time, Bert, ZS3ES, ZD1ES, should be back in jolly old England, enjoying the comforts of the first home he and his family have owned. Bert has spent so much time traveling that being a homeowner has never been feasible and, when we spoke to him in Sierra Leone, he could hardly wait to start puttering around his home and garden.

A letter from Robby, VQ4ERR, assures us that he is now fully recovered which is good news indeed. Now we look forward to the same sort of note from Joe, EI8P, who has been missing from the

No, this is not a famous television star—even though he calls himself "Uncle Miltie"! But he is a well known sidebander, Milt, W5IXL, of New Orleans, La.

Marriages may be made in heaven but being a ham doesn't hurt. As witness this photo of Donna, daughter of W5IXL, and her new groom, Julius, K5VMN, whose introduction to his beautiful bride came about as a result of a ham get-to-gether.

bands due to a bout with pneumonia . . . Kure Island is now on sideband regularly, thanks to the installation of a Coast Guard Loran station and Jim, KH6EDY. Jim is trying for WAS and last we heard was looking for New Hampshire and Vermont. We bet there are plenty of sidebanders in those two states who are looking for Kure Island! . . . Russ, DL4BS, was honored to be chosen as the American representative to the reception given by the DARC during their convention at Darmstadt in the Spring . . . IS1DKG is expected soon on sideband from Sardinia . . . HV1CN cards are now being handled by W2VCZ; W2BIB, who did such a fine job, being under pressure from too many details of his work . . . Even though Chuck, VK8TB, may have to return to the States without a try at the CR10 Valhalla, he is leaving his rig with Olive and Eddie at VK8OW who are poised to activate this rare spot should the necessary permission come through . . . Congratulations to Tony, DL4ACN, and XYL, who find the new baby daughter much more fun than hamming . . . Joe, OZ7JV, has been waking up with the Copenhagen birds to enjoy many fine contacts with his homebrew 45 watts . . . Maurice, G3NMR, and XYL, Sylvia, are rightfully proud of their teen-age daughter who was accepted at our equivalent of an "Ivy League" high school in England . . . We're waiting to see if Bill, G3BM, is finally convinced of the superiority of sideband. We worked him after he had borrowed a KWM-2 and gladly stood by as he tried to get through with his own a.m. rig but he just couldn't make it. A switch back to sideband and he came through fine again. Need more proof, Bill?

Ami, 4X4DK, has finally completed the studies which have kept him so preoccupied and hopes to finish the final examinations within the next year. Following that, he is planning to come to the States for further studies and will probably wind up in Berkeley, California. Let's hope his dreams come true . . . Bernie, DL3WH, is flying high for a very good reason these days, in addition to being a radio officer for Lufthansa. Bernie has just become engaged to a lovely German fraulein and the hams in his area were planning a big get-to-gether to meet the young lady . . . Vince, VK2VA, joins the list of sidebanders to visit the U.S.A. He is expected in the New York area on July 10th and we hope to have the opportunity of meeting him as we have so many others . . . John, PZ1AY, needs only the state of Utah to complete his WAS . . . Jeannie, EL2N, is one of the newest additions to the sideband ranks; most charming and interesting to chat with . . . Congratulations to Bill, KP4DP, who became a grandfather for the third time and to Uda, OA4J, who welcomed another great-grandchild to his family.

Band Hopping

The general public is now enjoying the dulcet voice of Ann, K8IGG, over their own radio sets since she instituted a program of classical music commentary in February. Ann is thrilled with her new job because she can tape a number of programs in advance and still find time to enjoy herself on sideband . . . Al, W8PQQ, was promoted to Lt. Col. in the Signal Corps Res. Congratulations to him and to Gen. Curtis LeMay who is now Air Force Chief of Staff and to our beloved "Butch", Gen. Griswold, KØDWC, who had added another star and the command of the War College in Washington, D. C. . . . The Royal Orleans Hotel in New Orleans was the scene of much happiness when Donna, daughter of Milt, W5IXL, and XYL, Pearl, was married to Julius, K5VMN, on June 11 . . . Another wedding of interest to the ham fraternity was that of Shirley Ann, daughter of Paul, W3AQN, and Mrs. Stumpf, to Royce Strayer in York, Pa. in May . . . Leave it to the boys in Phoenix—they put on a convention which will serve as a model for many others for years to come. With Bud, K7ASK, as General Chairman; Scotty, K7KCB, Session and Prizes Vice-Chairman; Pete, K7AWI, Publicity and Program Vice-Chairman; George, K7NIY, Registration and Arrangements Chairman; Herm, W7TPG, Official Greeter, and a host of others, the Phoenix Convention exceeded even the advance notices and provided every guest with a weekend that will long be remembered.

Summertime is vacation time for most people but to Arcy, K5SGK, and Mabel, K5SGJ, it means work and more work, trying to keep up with the demands for their refrigeration and air conditioning service . . . Best wishes to Judy, K2KBQ, and Ray, W2DIU, who welcomed their fifth child in May . . . If you wonder why everyone is asking Ken, K7HQF, for the time, it's just to give him a chance to look at the special watch that was presented to him at the Phoenix Convention because he is such a great guy. . . . We were delighted to receive a call from Will, WA6GLF, who made our home town, Lynbrook, his first stop when he arrived in this country from England 18 years ago. Time has done little to erase his delightful British accent and we had a most interesting contact, bringing him up to date on local changes . . . Many thanks to Russ, W6ONK, who furnished us with a very easy-to-read time conversion chart. Even after all these years, we still goof on times around the world . . . We were very happy to learn from Cliff, K9EAB, that his Dad was fully recovered and wish Mr. Corne the best of health from here on in.

We hope that you're all having an enjoyable and relaxing summer. The lure of the beach, the fishing camps, the highways, and many other activities may put a slight dent in sideband activities but we hope you return to full operating in the fall with your usual enthusiasm.

73, Irv and Dorothy

VHF

BOB BROWN, K2ZSQ
C/O CQ, 300 W. 43 ST.
NEW YORK 36, N. Y.

50mc. 144mc. 220mc. 420mc. and above

At long last August is here and it won't be too very long before we're in the midst of our exciting V.H.F. Contest! The full details including all the revised rules and regulations are reprinted below for the benefit of those who may not have seen the July issue. We have tried our level best to satisfy all those who wrote with suggestions for new rules and we think the changes have been for the better. Now it's all up to you. Let's get busy and really make some v.h.f. history! Our next nationwide winner could be you!

CQ World Wide V.H.F. Contest!

August 26-27

Here we go again! Coming next month is the year's biggest v.h.f. contest . . . and this time we have three major subdivisions for your convenience.

When: From 12:00 noon local standard time (includes daylight saving time), Saturday, August 26, 1961, until 12:00 noon local time, Sunday, August 27.

Where: Any v.h.f.—u.h.f. bands, 50 mc and up.

How: Just follow the complete contest rules listed below.

Single Band, Single Operator

A—Operation on any *one* of the v.h.f.—u.h.f. bands may be considered for an award.

B—Contest contacts must include the following exchange of information: county, (section), and state (or country), signal reports, contact number, and handle. *Two way acknowledgement of information must be made.* Contacts shall be numbered consecutively beginning with 001.

C—In the U.S.A. or Canada, sections shall be considered as the *counties* in which the stations are located. In other countries, equivalent political subdivisions shall count as sections.

D—Contacts with mobile stations count the same as all other contacts. However, contest logs from *mobile* stations cannot be accepted for award consideration or listing due to the difficulty in determining the section category of the mobile station. The same is true for maritime mobile, aero mobile, etc.

E—Scoring is as follows:

1. Each completed contact scores two (2) points. Uncompleted contacts do not count.

2. A multiplier of on (1) is received for each new section worked.

3. A multiplier of one (1) is received for each operating hour in which at least one contact is made. (Maximum of 24).

4. A power multiplier of ten (10) is granted for final power inputs from 0 to 25 watts, a multiplier of five (5) for inputs from 26 to 75 watts, a multiplier of three (3) for inputs from 76 to 150 watts and a multiplier of one (1) for inputs from 151 to 1000 watts. Obviously, this applies to the standard plate-modulated transmitter, and due consideration must be given to other equipment. A transmitter with voice controlled carrier, such as the Heathkit Seneca, must be rated by the carrier level (full power input) at *maximum* modulation. Single side-band is rated the same, by power input at maximum modulation. If there is a question as to qualification, drop a line to the v.h.f. editor.

5. If, for example, you were to work 110 stations in 25 different counties, running 50 watts and operating a total of ten hours, your score would be computed as follows:

110 (contacts) $\times$ 2 (points) $\times$ 25 (sections) $\times$ 10 (hours) $\times$ 5 (power multiplier) = 275,000 points.

F—Only *one* operator is permitted during the 24 hour contest period. Others may aid in logging, but the operation for the full period must be by *one* amateur. More than one operator entered in this division constitutes immediate disqualification and transfer to the multi-operator division.

G—Awards will be made to the highest scoring individual operator stations on each *separate* v.h.f. band in every state, province, and/or foreign country from which at least three logs are received. A special gold plaque will be awarded to stations submitting scores in excess of three (3) million points.

H—For qualification in this division, only one band may be worked. If you work both 6 and 2 meters for example, you must enter under the multi-band division. There are individual contests for each band in this division—If you work 6 meters, you will be competing against other 6 meter stations. If you work 2 meters, you will be competing against other 2 meter stations, etc.

Multi-Operator, Single Band

A—Rules for multi-operator are basically the same as that of single operator with the omission of paragraph *E* above.

B—Any number of operators at one station may

be entered under this division; all operators must sign the entry log.
C—Scores submitted under this division will be entered and are competing only with other multi-operator stations.

Single Operator, Multi-Band

Rules for single operator using more than one v.h.f.—u.h.f. band are basically the same as those for single band, single operator entries, except that the contacts and counties worked and scored separately during the contest are *combined* for logging purposes. For example:

If you made 10 contacts on 432 mc, 25 contacts on 220 mc, 100 contacts on 144 mc, 150 contacts on 50 mc, your total contact points would be 570 (285 total 2 points each). If you ran 25 watts on 432 mc, 25 watts on 220 mc, 75 watts on 144 mc, and 175 watts on 50 mc, your power multiplier to be used in final scoring would be one (1). Always use the *highest* power rating to determine your overall power multiplier. If in the above example, your 50 mc power was 100 watts, then your multiplier would be three (3).

Multi operator, Multi-Band

Rules for multi-operator using more than one v.h.f.—u.h.f. band are the same as mentioned above under section *A*. The only difference will be in your award and listing in the actual and final contest results. You will be competing only against other multi-operator multi-band entries.

Logs

A—Logs are available from the log department (c/o Bob Brown, K2ZSQ, 67 Russell Avenue, Rahway, New Jersey) to aid you in submitting your scores. An official log form is not necessary, however. Any sheets submitted with the proper information will be accepted.
B—The following information must be on every entry:

1. Name, call, street address, city, and state, (or country) of station.
2. Division
   a. Single operator—Single band.
   b. Multiple operator—Single band.
   c. Single operator—Multiple band.
   d. Multiple operator—Multiple band.
3. Band or bands operated
4. Total score
   a. Number of contacts.
   b. Number of counties.
   c. Power multiplier.
   d. Number of hours.
5. Signature of operator or operators
   a. Include name, call, address of each operator if more than one.
   b. Number of hours each (if more than one) operated.

C—The following information must be on all log sheets:
1—Your number to other station (beginning with 001); *2*—Time beginning contact and, of course, date; *3*—Call of other station; *4*—Band operated; *5*—His country; *6*—His state; *7*—His signal report; *8*—Your signal report; *9*—His handle; *10*—His number to you; *11*—Time ending contact.

Awards

Proper awards will be made to each station so deserving in his own division. For award consideration under state category (or country), however, at least three contest logs must be submitted from that area. Awards will be made as follows:

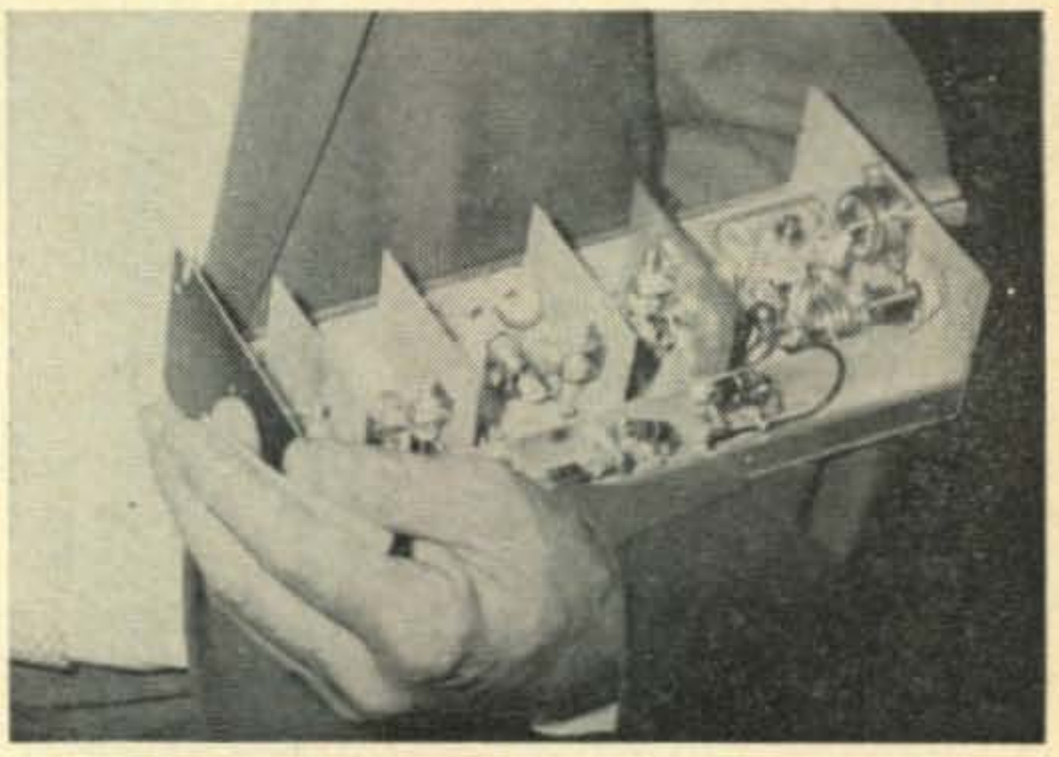
A. Single Operator, Single Band.
   1. Highest World-Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
B Multi-Operator, Single Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
C. Single Operator, Multi-Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
D. Multi-Operator, Multi-Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer.
   3. Three Million Point Plaque. (Each band)
E. Contest Winner
   1. All awards listed above for Highest World Wide Scorer in each division will be compiled and will compete against one another for the final Contest Winner award. Competitors under the Single Operator, Single Band division will be given a 1,000,000 point bonus towards the top winner award.
F. For award consideration and listing, all logs must be in by Sept. 15!

Your contest chairman will handle all contest correspondence, awards, logs, etc. For this reason, please address all correspondence to the address at the head of the column.

Results will be printed in the December 1961 edition.

Picnic and Hamfest

Saddle Brook, New Jersey: The East Coast V.H.F. Society, Inc. will hold its 3rd Annual Old Style Picnic and Hamfest starting at 10 AM on Sunday, August 13th at Saddle Brook Park,



Les Earnshaw's transistorized 220 mc converter at Dayton. The arm also belongs to Les.

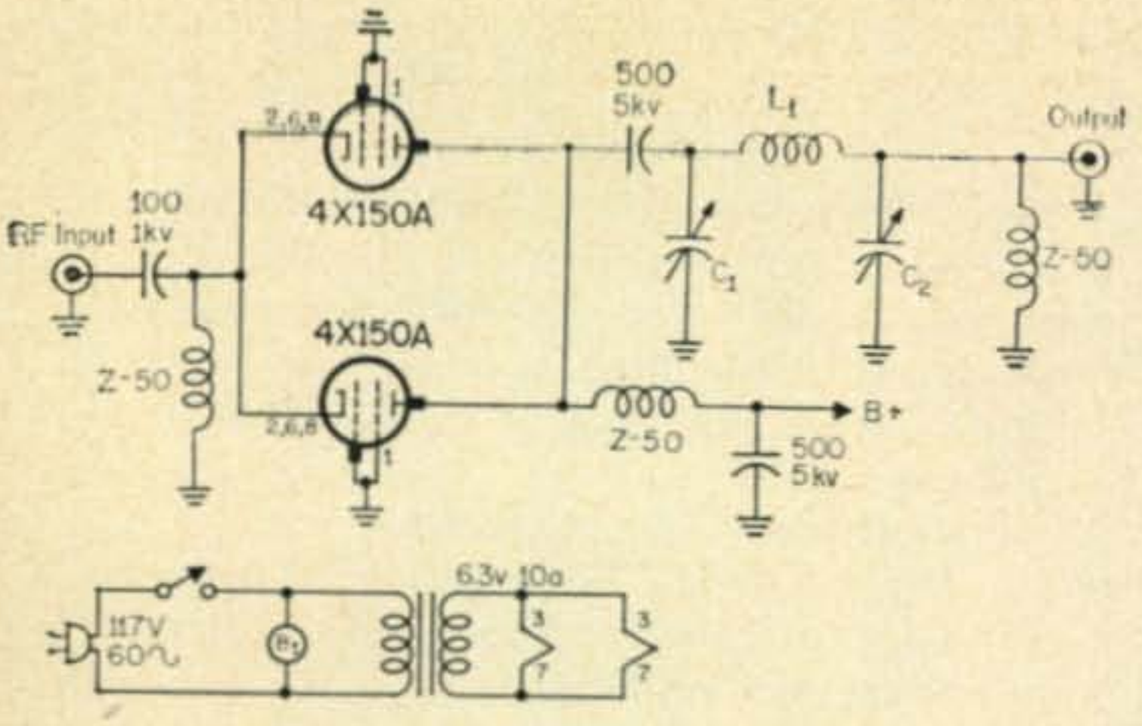


Fig. 1—Schematic diagram of a grounded grid linear amplifier for six meters using a pair of 4X-150A's connected in parallel. (Thanks to George Kupp, K2DQT)

B_1—"Phonograph motor" type blower with 5" blade.
C_1—35 mmf variable with 3 kv spacing.
C_2—250 mmf variable. Hammarlund MC-250M.
L_1—6 turns #10 1" dia., ¼" between turns.

Saddle Brook, New Jersey (rain date Sunday, August 20th). Free registration for all, combined with ample picnic, recreational, and free parking facilities, makes this event ideal for the entire family to relax in pleasant surroundings. Radio equipment on 2, 6, and 10 meters will be available for general hamming and to "talk-in" those mobileers who may have difficulty finding this well-known location. Prize contests, drawings, games, displays of equipment, and other interesting events for all ages have been planned to make attendance at this hamfest both memorable and profitable.

Food and soft drinks will be available at a nominal charge for those not bringing their own.

This highlight event of the summer season attracts many OT's, YL's, XYL's, and others from both far and near and therefore represents an excellent opportunity to renew old friendships and to make new acquaintances.

The Society, already well known in amateur radio circles for its hospitality, once again extends a warm invitation to young and old alike with a hearty, "See you at Saddle Brook!"

Mailbag

Cheyenne, Wyoming: Our traveling correspondent, Ira, W8KNC/7, writes us at his stay in this rare state. . . .

"Well, quite a lot of events have occurred since I met you last at the East Coast V.H.F. Society Dinner. A good many miles, and a good many entries in the log.

"On my way West, I stopped off at the home QTH in the Huntington, West Virginia area. New 6 meter calls are showing up almost every day. A check-up shows a minimum of 45 active 6 meter stations in operation. Approximately 15 more in the Ashland, Kentucky, and Ironton, Ohio, area.

"I passed through the Cincinnati, Ohio, Indianapolis, Indiana, and Springfield, Illinois, area without making any of the usual contacts. Just the wrong time of day." *Going to have to get after those boys, Ira. I had the same experience last month through Cincinnati, and all the way down to Nashville. Guess we'll just have to set the* 2,000 *watt P.E.P. Thunderbolt in the trunk, eh?*

"No contacts 'till St. Joseph's, Missouri, when Alice, KØMRB, was on the air. Next stop was Topeka, Kansas, where KØREE, Irene, was on the air. Looks like the YL's are the mainstay of operation while the OM's are at work.

"Next stop was here in Cheyenne, Wyoming, where I find a total of 4 active stations on 6 meters. Bill, W7JCF, Bob, W2SJQ/7, Zeke, K7DSK, and myself, W8KNC. I arrived on the 12th of May, and there was nothing other than local activity until Sunday, May 21st. There was a small band opening to Texas and California. I had no luck, but Zeke, K7DSK, made a few contacts.

"On Tuesday, May 23rd, I heard signals about 10:30 AM while on the way to Colorado. Worked a couple of Texas stations. At 12:30, I worked some California stations during lunch time. At 4:30, stations were coming in from all directions. During the 30 mile drive to Cheyenne, stations in Oklahoma, Texas, Arkansas, and Tennessee were worked.

"From 5:50 until 9:00, stations were thick and strong. 38 contacts were made, including 5 new states!

"On Thursday, May 25, the band was again open, mainly to California.

"Friday, May 26, the band opened again at 12:30 to Washington, Oregon, and Montana. I snagged VE4YW at Brandon, Manitoba.

"Sunday, May 28, the band opened early to

[*Continued on page 110*]

Here's XE1DDD with his 432 mc colinear in the background.

Space Communications

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Project OSCAR White Paper

Project OSCAR, amateur radio's introduction to the space age, continues slowly towards realization. While no definite progress can be reported at this time concerning a possible launch date for the 2 meter satellite-borne beacon transmitter, conceived and built entirely by radio amateurs, discussions at very high level continue in Washington in an attempt to include OSCAR as a hitch-hiker on one of this country's satellite shots planned for the near future.

Much has been written in the contemporary technical press since the OSCAR story first appeared in this column this past December. Much has also been accomplished by the steadily growing group of dedicated radio amateurs who are a part of this project. The only remaining hurdles are the intricate discussions that are now taking place in Washington in an attempt to get the amateur bird, which is already completed and standing by ready to go, into orbit.

Just as this column was being completed, the Project OSCAR Association, a hard-core group of radio amateurs who are steering the project's course, released a "white paper" which describes the project in simple terms, outlining its purpose and its aims.

Because of the importance of Project OSCAR to amateur radio, the Editor's of *CQ* feel that the information contained in the project's white paper is of paramount significance, and this paper should be read by every forward-thinking radio amateur.

As a special service to its readers, the column originally written for this month's issue of *CQ* has been scrapped, and in its place there follows the text of the Project OSCAR Association's white paper. This is the Project OSCAR story, right from the people who have lived with it this past year.

White Paper

Project OSCAR means: *O*rbital *S*atellite *C*arrying *A*mateur *R*adio. A new experiment in amateur communications . . . which, for the first time, will allow citizens of many countries to take part in a venture into space.

Why Satellites? Many satellites are now in orbit around the earth. Men from several countries have communicated with these satellites, i.e., have commanded their orbit paths, have received valuable data from them concerning the nature of space—its temperature, its radiation levels, its effect on bioorganisms—and countless other valuable information.

This information is still but a drop in the vast bucket of spatial knowledge that man must fill before he can be reasonably sure of the true nature of the universe surrounding him.

Amateur radio is capable of fulfilling an important role in this great adventure. The tool will be a space satellite, radiating its data in an international amateur band. Radio amateurs will employ OSCAR to further the world's fund of knowledge concerning space and space propagation.

OSCAR Aids Research. Scientists must continue to propound, and engineers implement, a continuing series of outer-space experiments in this search for knowledge.

In a modest way, Project OSCAR proposes to assist these scientists and engineers in gathering additional data which will contribute to their quest.

Radio amateurs throughout the countries of the world will participate in the OSCAR Project.

Numbering over 300,000, these skilled radio experimenters can constitute the most extensive listening, tracking, data-handling, and communications network that could ever be assembled. A program of self-education, in conjunction with Project OSCAR, will introduce radio amateurs to experimental space communications. This vast body of observers will provide mass data that is unavailable by present facilities.

The history of communications is well marked with the significant improvements effected by this group, basically because they are scientific-minded, curious, and are not limited to research projects that have to "payoff" or be discarded!

The Radio Amateur. The radio amateur is a citizen who has been licensed by his government to operate his own experimental radio station, without profit, and in the public good. In order to qualify for this license privilege, he must demonstrate electronic knowledge. He must abide by rules covering use of frequencies, quality and mode of radiation, radiated power, and the like.

Radio amateurs have been licensed, by their individual governments, in more than 200 countries, throughout the globe.

Amateur radio cuts across national boundaries. Through international radio communication among radio amateurs, the cause of international goodwill has well been served many times.

OSCAR, likewise, will cut across national boundaries. But it will do more. It will demonstrate to the world, by way of the Radio Amateurs of the world, that the United States is working toward the peaceful use of space. Substantial benefits will accrue to the United States, and to the world, if an effective effort such as Project OSCAR were properly exploited and publicized.

Project OSCAR will enable amateur radio to reach new heights of electronic competence, operating effectiveness, and public service.

In the past, ham radio has logged a commendable record of technical achievement, and community and national service.

During national emergencies including, of course, war, the amateur ranks have provided this nation, and other countries of the world, with a vast pool of skilled operators, technicians, scientists, and electronic design/ maintenance personnel.

When flood, fire, earthquake and other disasters have wiped out commercial communications, the radio amateur—with his own equipment and on his own time—has provided essential communications facilities. On occasions, he has been the only link between disaster and the outside world.

The amateur numbers professional scientists and technicians in his ranks who experiment in their spare time with projects in their technical fields. The unsubsidized independent radio amateur is capable of making a solid contribution to research. He can answer questions the professionals would get around to, if they weren't busy elsewhere!

Amateur Technical Contributions. Technical designs and improvements, evolved by radio amateurs following their avocation into "useless" areas of the radio spectrum left over from commercial applications, include the following:

Mass cooperation of the amateur body in government projects such as propagation studies: Each participating station is in reality a separate field laboratory. Cooperation of the American Radio Relay League (ARRL), a group which represents the vast majority of American amateurs, in recent International Geophysical Year (IGY) activities is well known.

Pioneering in the use and understanding of new frequency areas in the crowded radio spectrum. The radio amateur has led in this field for over 40 years. Among significant scientific contributions are the following:

Investigation and use of ionospheric skip communication (1923-1927).

Investigation and use of "beyond horizon" VHF communication (1936-1940).

Investigation and use of ionospheric and tropospheric "scatter" communication (1946-1950).

Investigation and use of "long path" high frequency communication (1948-1955).

Investigation and use of sporadic-E propagation for communication purposes (1946-1952).

Investigation and use of trans-equatorial propagation anomolies for communication purposes (1950-1958).

Investigation and use of meteor reflection for communication purposes (1948-1958).

Investigation and use of VHF moon-bounce and satellite ionization communication (1959-1960).

Single sideband radiotelephony, now finding wide use in all radio services, was brought to operational heights for civil and military radio communication by the amateur. Likewise, numerous developments in the field of radio: beam antennas, "single signal" receivers, bandswitching transmitters, and high frequency vacuum tubes were tried and proven on a practical basis by the radio amateur.

The Radio Amateur in Space. In the field of space communications, the radio amateur has already demonstrated capability.

From the date of the first satellite launching, satellite signals have been and are being received, recorded, and analyzed by many amateur stations.

Radio amateurs have succeeded in bouncing VHF signals off the moon to achieve transcontinental communication.

Radio amateurs have communicated on very high frequencies via ionized satellite trails.

Radio Astronomy has become one of the most important tools for space research largely through the pioneering and continued efforts of internationally known radio amateurs who are also amateur astronomers.

OSCAR is Born. What will be the cost of placing an Orbiting Satellite Carrying Amateur Radio into Space?

Very little if a small radio transmitter operating on amateur frequencies could be tucked aboard a vehicle bound for space!

This unique idea was the birth of the Project OSCAR Association.

OSCAR was born inadvertently by publication in 1959 of a radio "ham" article by Don Stoner, licensee of amateur station W6TNS.

Stoner suggested that hams could build their own satellite "if someone only had a vehicle" to get it into space. He, along with F.H. Hicks, W6EJU, and other radio amateurs nursed the idea along and formed the Project OSCAR Association. Interest in the idea quickly spread among local radio clubs and very soon attracted nation-wide attention among radio amateurs, followed by attention from many overseas amateurs.

On October 18, 1960, the Articles of Association for Project OSCAR were formalized in Santa Clara County, California.

The objects and purposes of Project OSCAR are:

To inaugurate radio amateur space communication.

To design and provide radio amateur satellite equipment and assist in its integration with space vehicles.

To compile and publish information which will encourage maximum use of such equipment.

To receive, digest, and study data accumulated as a result of OSCAR launchings, and to provide this data in usable form to assist in the world's space effort.

To embark upon a self-training program to introduce the radio amateur to the new field of space experimentation and communications.

To lead in "state of the art" development of future OSCAR experiments.

OSCAR is an amateur radio project, non-commercial and non-military in nature.

OSCAR Implementation. The nature and magnitude of Project OSCAR require that it be coordinated with a number of groups and agencies. The Project OSCAR Association, composed at present of more than 200 amateurs, is the nominal activating and directing organization for the project.

One very important group is the American Radio Relay League, Inc. (ARRL), a non-commercial association of radio amateurs recognized as the national spokeman for American radio amateurs. Recognizing the worth of Project OSCAR, the ARRL offers its facilities and capabilities to do the following:

Sponsor, support and represent OSCAR in its relations with various organizations—especially with government agencies, and quasi-official groups.

Provide official sanction in the name of American radio amateurs to encourage general world-wide participation in the OSCAR program with particular regard to news dissemination, communications, and data flow from the OSCAR satellites.

The OSCAR Experiments. The first experiment consists of placing a simple beacon transmitter into orbit. Transmissions will be in the internationally assigned two—meter band, between 144-146 megacycles.

The transmitter package would "hitch-hike" into orbit on a space vehicle. There it would depart from the orbiting satellite, becoming a separate, free-orbiting amateur radio space station.

The primary purpose of this beacon is to inaugurate active participation of radio amateurs throughout the world in the development of experimental space propagation and to stimulate and expand the amateur's capability to contribute to further space programs.

Further experiments will include the developing of two-way amateur radio experiments via space satellites. These tests will be conducted by placing additional specifically appropriate stations into orbit in the same manner, from time to time.

The OSCAR program NEEDS AND WELCOMES the participation of all interested amateurs, established radio clubs as well as amateur organizations in other fields such as astronomy, flying clubs, optics, and so on.

Substantial Benefits From Program. The OSCAR program is in the nature of radio amateur experimentation, and is a logical extension of current radio amateur processes involving electromagnetic experiments and random communications.

The Nation, and the world will benefit as amateur radio offers a vast potential for scientific experimentation.

The radio amateur will benefit through his new knowledge and increased proficiency in his art.

The sciences will gain an enthusiastic public.

Finding a place for the radio amateur in various research projects will make him a member of the scientific team, thereby providing something that every team should have: strength on the bench!

The sum of all these contributions is the world's goodwill to the countries which support such a far-sighted program.

In Conclusion. The amateur radio activity about which you have just read is being carried out as a scientific experiment in depth. Such activities reflect the highest traditions of amateur radio. This tradition has consistently added its full measure to our country's technological progress.

Members of the OSCAR Association strongly believe that scientific contributions of a voluntary nature such as this, however small, are essential to uphold the world's scientific advancement.

To this end, the members of OSCAR are dedicated.

Additional information about Project OSCAR, and how you as a radio amateur can participate in it, can be obtained by writing directly to the Project OSCAR Association, P.O. Box 183, Sunnyvale, California, or to the American Radio Relay League, West Hartford 7, Conn. ■

semiconductors

by DONALD L. STONER, W6TNS
P.O. Box 137, Ontario, Calif.

MANY readers have written in requesting an explanation of how thermistors work and how they should be used. I had always felt the termistor was such an uncomplicated device that it did not warrant discussion. However, after doing some research on the subject, I find there is more to the simple thermistor than one might think.

Background

The thermistor actually qualifies as a semiconductor since it can be made either a good or poor conductor. Michael Faraday discovered the effect in 1834 when he noted the high negative temperature coefficient of resistance in certain devices. His discoveries remained a laboratory curiosity until recently. The need for such a device did not appear until WW II and extensive research was undertaken.

How They Work

Thermistors are made of a ceramic-like material and have a resistance characteristic that varies with changes in temperature. Unlike the common carbon resistor, which has a slight positive temperature characteristic, a thermistor has a large negative temperature coefficient—that is, as the temperature of the material increases, the resistance decreases. This characteristic can be applied to many electronic circuits such as temperature compensated oscillators, temperature control, power indication, load switching, time delay devices and instrumentation.

The thermistor characteristic can be applied in two principal ways in electronic equipment, that is, internal and external temperature changes. If a current is passed through the thermistor which does not heat it to the ambient temperature, then its resistance becomes a function of the ambient temperature. This category breaks down further in that the thermistor operating in this mode can be used to produce a voltage versus temperature relationship or it can be used to control a temperature. It is possible to measure or control a temperature within one-thousandth of a degree (0.001°) using an inexpensive thermistor and simple circuitry.

If the applied voltage or current increases, the thermistor will, in turn, decrease resistance. This internal temperature characteristic is also quite useful in electronic work for it permits the device to be used as a regulator or power measuring device.

Construction

Thermistors are made in three principal shapes; the bead, disc or washer and the rod. Any of these forms can, by controlling the chemical mix, exhibit various temperature coefficients.

The bead type consists of a dot of thermistor material, usually less than 0.1 inch in diameter, mounted between two fine wires. The spacing, treatment and composition determine the electrical characteristics of the thermistor. For protection the bead is usually surrounded in some sort of enclosure. This type thermistor is best suited to applications where a small amount of power must make a large resistance change, or where small ambient changes must be detected. The response time, that is, the time necessary for the resistance change to take place (it is never immediate) is very fast and can be made in the order of 0.1 seconds. The bead is quite useful for compensating transistor circuits by inserting it in the bias network.

Disc type thermistors can handle more power than the bead type but they also require more power for a given resistance change. The large diameter types exhibit low resistance and fast response. The thick, small diameter units are high resistance and have a longer time constant. The disc type is useful in power transistor stages for it can be mounted to provide thermal contact with the transistor or heat sink. Some discs have holes in the center so that they can be used in piles or bolted directly to a flat surface.

Rod thermistors are long circular devices with contacts placed at both ends. This configuration will handle moderate power and display a long time constant. The rod type can be used in the same way as the disc style but its chief use is in circuits which require a high resistance.

Practical Applications

Obviously the thermistor can be used in many temperature dependent devices. However, these and tube applications will not be covered here. Our primary interest is in applying thermistors to transistor circuitry.

Assume that you have a transistor variable frequency oscillator which exhibits a drift due to changes in ambient temperature, even when stabilized components are used. The properly designed v.f.o. will have so much capacitance in the tank circuit that the usual compensating capacitance technique may not work. A thermistor replacing the smaller of the two resistors in

the bias network will usually provide adequate compensation or even over compensation. In the latter case, the thermistor should be paralleled with the smaller resistor to reduce the action of the thermistor. A thermistor can also be used to stabilize the oscillator output amplitude by shunting it across the load. If the amplitude increases the thermistor draws more current, lowers resistance and thereby reduces the amplitude to its original value.

Thermistors are often used in Class A audio power amplifier stages. A typical stage might draw 450 ma at 25°C. After the stage has been operating for a time the current might rise to 500 or 600 ma. Further, if the ambient rises to 60 or 70°C, the transistor can easily reach destructive temperatures, due to greatly increased current flow. In such cases the usual technique is to bolt a thermistor to the heat sink and connect it in place of the smaller resistor in the bias divider. This, in turn, reduces the bias on the transistor at high temperatures and returns the collector current to its original figure, thereby stabilizing the stage.

Varistors

A varistor is a semiconductor device which exhibits a marked nonlinear voltage-current relationship. This results in some confusion for the diode quad used in single sideband balanced modulators is also known as a varistor.

There is also some confusion as to the difference between a thermistor and a varistor. The resistance of the thermistor is influenced by both current flow (internal) and ambient (external) temperatures.

The varistor, unlike the thermistor, exhibits only a slight negative temperature coefficient. For example, between 0° and 100°C, the varistor changes about —0.4 to 0.7%/°C. The varistor does resemble the thermistor in that it can be considered a voltage sensitive resistance. These devices are made of silicon carbide and are fabricated in disc and rod configurations. They may be used as circuit protectors, arc or transient suppressors and to stabilize variable load voltages.

I would like to thank Victory Engineering Corporation, Springfield Road, Union, N.J. and the Radio Shack, 730 Commonwealth, Boston, Mass. for the reference material supplied. Radio Shack stocks the VECO devices, including an experimenters kit (M39E394) at $5.00, in addition to an informative data book, *The VECO Basic Thermistor Handbook* (M42F411) for $1.00. It contains far more information than given here and includes a bibliography on thermistors which is worth the price of the book.

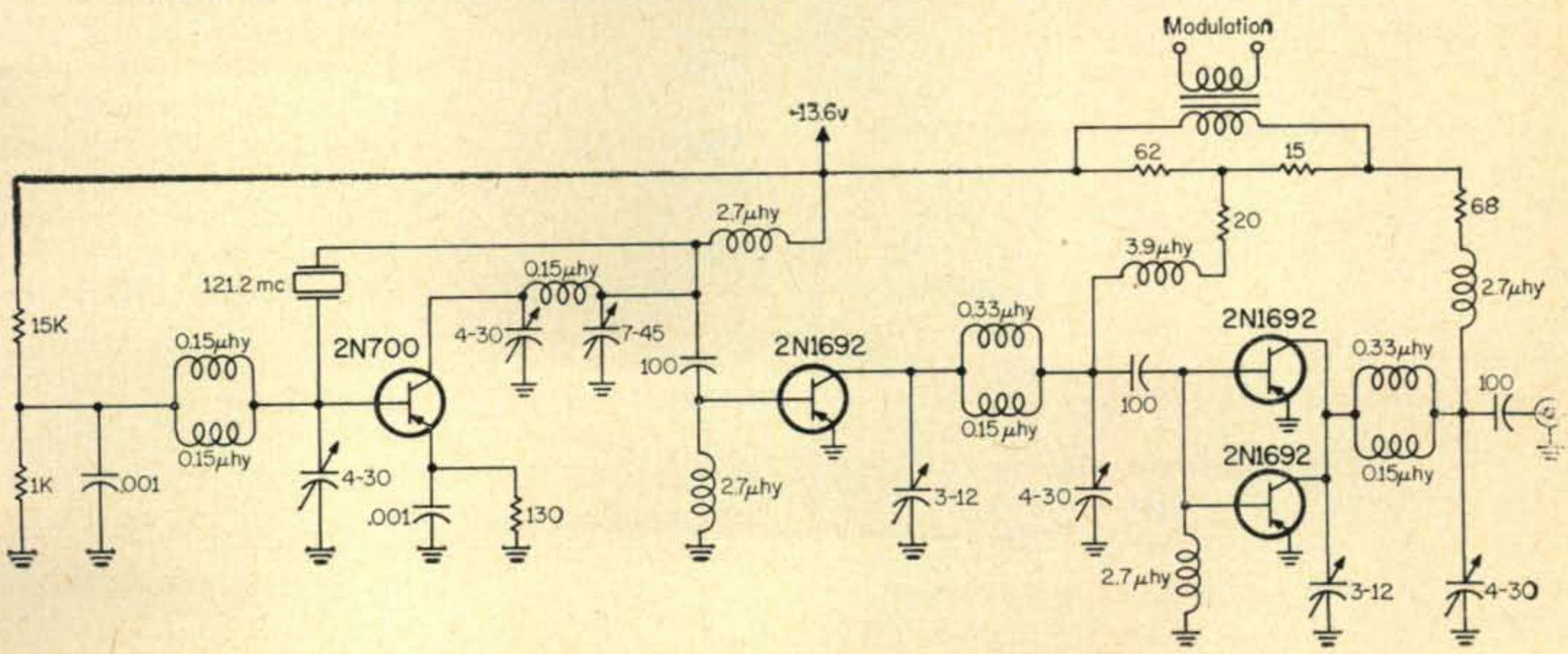
120 Mc Aircraft Transmitter

A recent Motorola advertisment contained an interesting circuit for a 120 mc aircraft transmitter which could be adapted to the two meter band. The schematic and component values are shown in fig. 1. A 2N700 is used as a common emitter oscillator with a 7th overtone crystal connected in series with tee feedback path, between collector and base. A pi-network couples oscillator energy to the buffer which operates in class C. This stage provides sufficient energy to drive the parallel connected final amplifier through an interstage pi-network. The final drives the antenna through an additional pi. Note that both the buffer and final are modulated to provide the greatest depth with the least modulating power. Performance of the transmiter is given as follows: supply- 13.6 volts, peak power output- 1.5 watts, modulating power- 300 mw, efficiency 26.5% overall, demodulating output- 3 volts, supply current- 155 ma, envelope distortion- 2.5%. For more information on this circuit you can obtain a copy of special report #34 from any Motorola Field Office or directly from the company at 5005 McDowell Road, Phoenix, Arizona.

Transistor Bargains

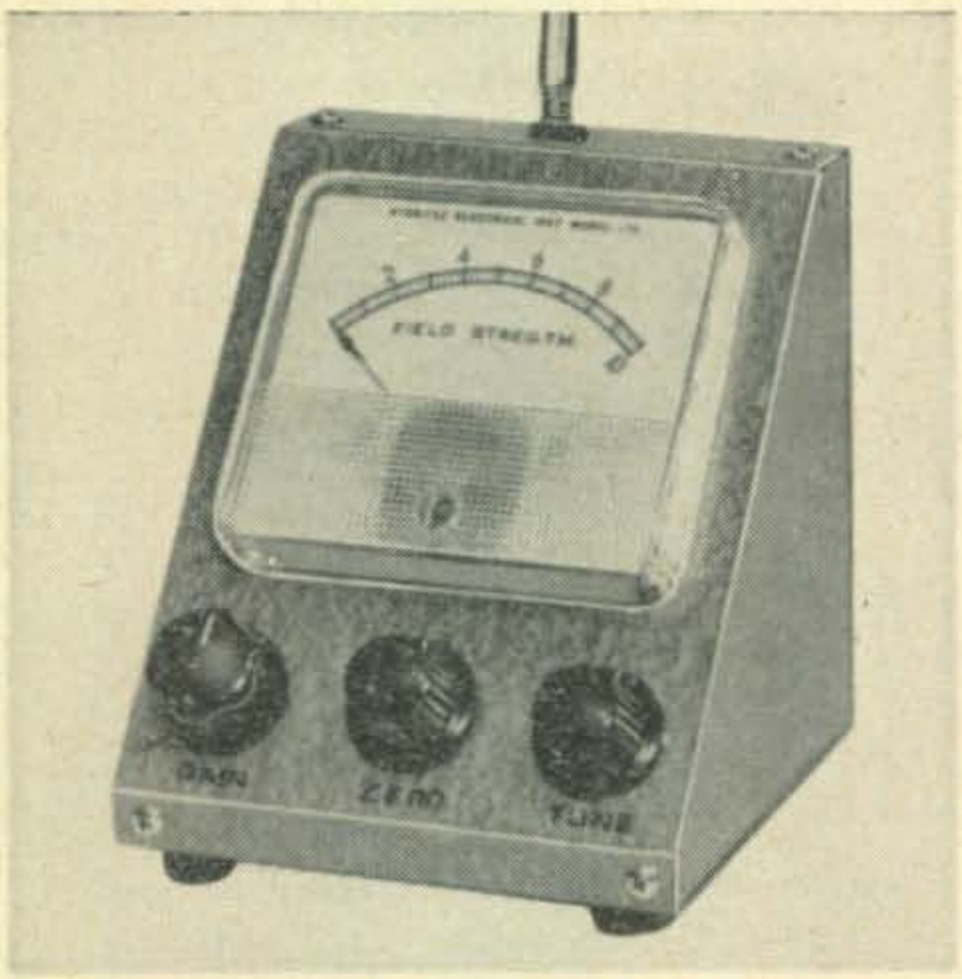
I receive a great number of letters from amateurs and experimenters asking if the bargain-priced transistors from this or that company are a good deal. The conditions vary, of course, but generally speaking you get just what you pay for. I would not recommend them for home-brew equipment because their characteristics vary so

Fig. 1—A transistorized 120 mc aircraft transmitter readily convertible to the 2 meter amateur band. The unit uses four Motorola Germanium Mesa transistors to provide an output of 1.5 watts.



much from unit-to-unit. However, for experimenting and learning how transistors work, these bargain-priced units cannot be beaten.

I ordered some of the transistor specials from Radio Shack in Boston, and here is what I found: The "general purpose diodes" (M95L056) were *not* equivalent to the 1N34A, etc., but rather were subminiature glass silicon diodes similar to the devices used in computers. Normally these diodes would cost several dollars but these gradeouts are a bargain at 5 for 98 cents. Their "B" assortment (4 NPN transistors for 98 cents) transistors were very similar to the GE 2N293 designed for 455 kc amplifiers. However beta varies from 8 to 51, illustrating the point mentioned earlier, but they are still a good buy. Radio Shack's "C" assortment (2 NPN's for $.98) seem to have characteristics more like the 2N169 than the 2N170. They were definitely hotter. The "D" assortment (M95L059) was similar to the 2N107 but had lower beta. The beta characteristics of the four, however, were almost identical. The capping on the 10 watt transistor (M95L261) revealed it to be a Bendix type similar to the 2N234. It appears to be capable of more dissipation than 10 watts, however. I ran the device at 2 amperes on a one-foot square sheet of alumnium and the temperature reached 76°C after approximately 2 hours. It's an excellent buy at 98 cents.



The Lafayette TM-16 transistorized field strength meter.

Transistorized Field Strength Meter

Of interest to QRP fans is the new Lafayette TM-16 field strength meter. The device employs a crystal detector and a d.c. amplifier operated from a 1.5 volt cell. The TM-16 is equipped with an earphone jack to permit monitoring of transmitter audio, a telescoping antenna and battery. The net price is $14.95.

Semiconductor News

Bendix Corporation, Holmdel, N. J., have announced a new PNP switching transistor for power converter service. The 2N638 group is characterized by a —40 to —80 volt collector rating, —5 amperes I_c, and 60 watts dissipation.

General Electric Co., Auburn, N. Y., have a new pamphlet on protecting against voltage transients. Also new from GE is a series of double ended SCR's types 2N1929 through 2N1935. Bulletin 150.12 is available on these units. Bulletin 30.67 describes the 2N1289 high speed computer switching transistor.

Hoffman Electronics, El Monte, Calif., have announced a new solar cell which is electrically opposite from the regular P-N cell. These devices are tailored to give maximum output when in space.

International Rectifier Corporation, El Segundo, Calif., have just announced a line of 300 ma rated mesa diffused junction glass diodes which feature high current, low leakage and low cost. The units are rated between 50 and 300 volts and are priced from $1.07 to $2.80 in single quantities.

Philco Corporation, Lansdale, Pa., is now producing "backward diodes." These devices provide high forward conductance as a result of the tunnel effect which is basic to the operation of tunnel diodes. Backward diodes complement tunnel diodes in computer applications and have the ability to control the direction of current flow making it possible to unilateralize logic gates. A recent press release heralds the end of an era. On June 1, 1961, Philco announced their intention to discontinue the manufacture of vacuum tubes. Many old timers will remember the profuse number of tubes made by this company, including the famous (or infamous) loctal style. Tube use has declined to the point where Philco no longer considers it profitable to continue their tube operations.

Sylvania Electric, Woburn, Mass., have a new booklet on epitaxial and military type transistors, titled the *Semiconductor Selector Guide* and may be obtained by writing Sylvania, 1100 Main St., Buffalo 9, N. Y. Speaking of epitaxial, the 2N705 is now priced at $9.90 in production quantities. Also new is a pancake version of the 2N1225 drift transistor. The "flat" 2N1699 is one-tenth the size of the 2N1225.

New Application Notes from Texas Instruments, Inc., Dallas, Texas, include "Circuit Stabilization using High-Beta Germanium Transistors, Design of a NOR Circuit for use as a Binary Adder," "Diode Recovery Time," "A Discussion of Storage Time," "Forward and Reverse AGC Characteristics of VHF Germanium Mesa Transistors" and "The Photo-Duo-Diode Theory, Measurement of Parameters, and Operation." To illustrate product uses, TI has constructed a stereo high-fi amplifier. The design data is being made available to manufacturers. Also new from TI is a three- ampere controlled rectifier and an associated trigger unit.

Thermolly Company 2130 Irving Blvd., Dallas 8, Texas, have introduced a stud type heat-sink for mesa and planar transistors in the TO-18 package. The two-piece unit features exceptional heat exchange characteristics.

73, de Don, W6TNS

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ham clinic

Some Thoughts On Linears

The ham contemplating s.s.b. operation, suddenly finds himself in unfamiliar technical territory. This is especially true if he desires to use an existing rig containing a good Class C final r.f. amplifier.

In the back of his mind he knows that he must do some juggling of voltages and he must have a good s.s.b. exciter.

Looking through the literature he will find that s.s.b. final amplifiers operate in the so-called Class B region. He will find that a *linear* amplifier is one designed so that the power output is usually proportional to the square of the r.f. excitation voltage. Then he will see that there is a choice between various classes of linears.

Keeping s.s.b. in mind, he looks at the AB-1 amplifier first. This seems to be a very popular class among many hams because no driving power is required. This is so because the grids of the tubes used (should) never go positive. Only driving voltage is required.

The tubes used in the most noteworthy AB-1 circuits are usually pentodes or tetrodes, however triodes can be used too but are not recommended. For good linear operation, the screen voltage applied to the screens of the tetrodes or power pentodes must be stabilized.

Reading on, our newcomer discovers that the class A stage has little or no distortion, but in the case of the AB-1 amplifier there is some, but this deficiency is compensated for by increased power output and better overall operating efficiency.

In a class A stage, the plate current flows *all* the time, while in the class AB-1, only a small part of the *total* current flows all the time. This portion of the total current in the class AB-1 stage is known as "standing" or zero signal current. Maximum current in the class AB-1 circuit only flows when there is excitation.

Unlike the class AB-1 amplifier, the class AB-2 operates so that it does take *some* driving power and the grids of the tubes do draw *some* current. The advantage of the AB-2 circuit is that it is has higher output than the AB-1; but the AB-1 is less critical of driver stage regulation. The common method of swamping the linear input with resistance to present a fairly constant load to the driver requires additional power and there is feed-through loss.

Now how does one set up the conditions for AB-1 or AB-2 operation?

Well, to begin with, just remember that any amplifier can be operated class A, B, AB or C. Remember that the *amount* of bias voltage (all other voltage and current parameters being scaled equally) determines class of operation. In the case of the zero-bias tubes such as the 811A in grounded-grid (GG) operation where no or very little bias is required, the amplification factor of the tubes used is generally very high, and because of this, plate current flow is low *without* excitation. The GG stage comes as close as any being a "pure" class B stage without bias.

Because plate current flows in a class A amplifier constantly, it is said to have an *operating angle* of 360°. The operating angle of the amplifiers in the AB-1, AB-2 class generally falls between 180° and 360°. However, to go below 180° produces intolerable distortion. Only a class C stage can go below 180°.

Now then, what determines how much plate current will flow and when? Naturally, we return to considering *bias voltage*. If we bias a tube to full cut-off this means that we have applied enough negative voltage to the grid of the tube to stop plate current flow. As we decrease the value of this biasing voltage we approach a point where plate current flows until we reach the tube's plate saturation point. In the event that we did not consider the *plate dissipation* of the tube, we may, if the plate voltage and plate current are high enough, burn it up. (Incidentally, this can be done relatively quick with the average s.s.b. rig if a two-tone test signal is allowed to remain on too long).

When sufficient r.f. voltage is applied to the grid input of a linear to overcome the effects of biasing, our plate current will of course also rise. Therefore we must watch the amount of r.f. excitation and not overdrive our linear so that flat-topping and consequent distortion will occur.

Obtaining the operating angle for any tube for linear service is relatively easy if one uses characteristic charts and adopts the practical approach.

Most tube manufacturers publish characteristic curve charts for the tubes they manufacture and these can usually be obtained by writing to their engineering departments. After you get the curves for a particular tube, it is relatively simple to determine the proper bias voltage for given plate currents and voltages, for a particular class of linear operation. In some cases,

you will find that the manufacturer will give you the optimum operating parameters for s.s.b. operation.

In the absence of characteristic charts, but having information on a tube's class B a.f. operating characteristics, you can start from there.

GG Amplifiers

Although first used in u.h.f. and v.h.f. work, the grounded-grid r.f. amplifier was adopted by s.s.b. enthusiasts for a number of good reasons. However, I believe the main reason so many hams use the GG stage is because they had a proper driver to begin with. Realizing that the power available from a small transmitter or exciter is fed through and added to the linear's output and not wasted, convinced them to use GG.

Another good reason for GG is that triodes are used with smashing success. No screen voltage and *generally* no neutralizing are required. If zero-bias tubes are used, little, if any, bias voltage is required.

When a GG stage is used on 10 meters or below, neutralizing may be required. One scheme that has proved successful is the one shown in fig. 1. It is especially effective on 10 meters when an all band pi-network in the output stage is utilized.

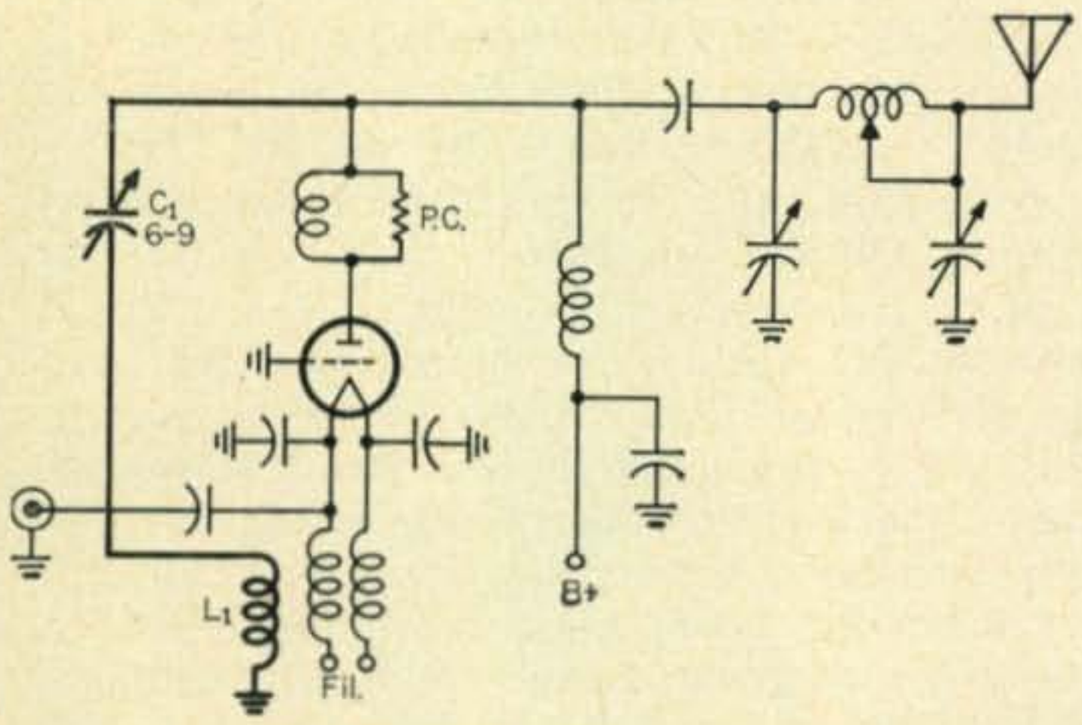


Fig. 1—An effective GG neutralization scheme. Capacitor C_1 can be connected to the output side of the coupling condenser if a variable of proper voltage rating cannot be found.

Linear Power Supplies

The power supply used in the a.m. rig must be capable of supplying *continuous* power to the final r.f. stage as well as the modulator, therefore it must be rather husky. If controlled carrier modulation is used, the a.m. power supply need not be as large as, let us say, the one used in a plate modulated rig; but then you seldom get the smooth modulation you do with plate modulation.

In the s.s.b. rig (even on c.w.), the power supply duty cycle is drastically cut because power is taken only when the key is pushed or when the microphone is used. For this reason s.s.b. power supply components need not be rated as high or be as large as those in the a.m. supply. However, the newcomer must be careful when setting up his first s.s.b. linear and remember that the power supply associated with it (unless he uses his old a.m. supply) is designed for short cycle operation.

Because the power comes from the s.s.b. power supply in short peak "spurts" dynamic stability is a must. This stability is obtained in the s.s.b. supply by using a large amount of filter capacitance.

Most small commercial rigs use high-capacity low-voltage capacitors in series. This cuts the cost and provides good to excellent stability. Bias supplies used with s.s.b. finals must be husky, one should not skimp here.

Most s.s.b. rigs using tubes of the tetrode or pentode types present no problem when searching for a method to stabilize their screen voltages. Even when screen voltages may be as high as 600 volts, voltage regulation (VR) tubes can be used in series to provide sufficient regulation.

Final Conversions

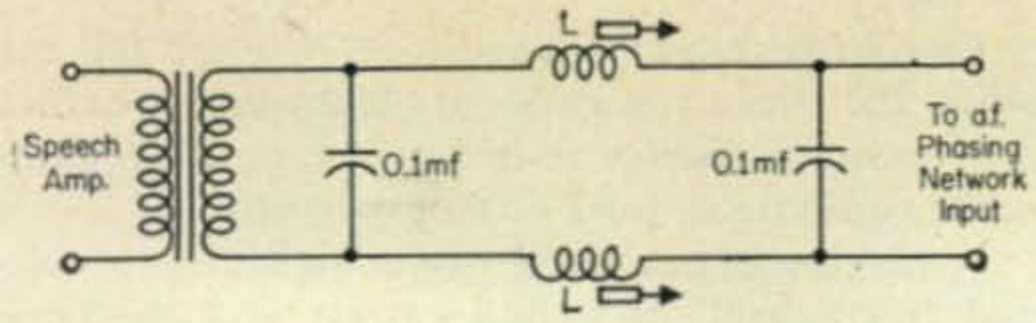
To convert the finals of such excellent and popular transmitters as the 32V-3, DX-100, B&W 5100, DX-40, Viking II, Ranger and others to linear operation is a simple matter.

All of these sets use 6146s in the final (either singly or in parallel). Going to AB-1 operation (to drive a GG stage or other high power finals or to be used as is) envolves two major modifications.

First, the screen voltage of the 6146(s) is stabilized. Using only one tube, the screen voltage will be around 210 volts. This can be done with VR tubes. Then a stiff —50 volts of bias is obtained; this can be obtained in a number of ways from existing low voltage supplies. For a single tube, about 600 volts plate voltage will be required. When parallel 6146s are used, 300 volts may be used on the screens, up to 750 volts on the plates and the bias voltage established at around —55 volts. The peak r.f. grid voltage figured for one 6146 will be around 50 volts. On tune up, using a tone signal, the final plate current can go as high as 265 ma for two tubes. With excitation there should be no grid current (a mil or two is okay); and the plate current meter will kick up to around 180 ma as you speak into the microphone. Don't try (as some hams do with the Apache) to turn up the gain so that the plate current excursions *over* 200 ma! Remember meter inertia! (The power is going out but the meter can't "keep up") Don't try to push *any* linear too hard or flat topping will result. If an SB-10 or other good adaptor is used to get on s.s.b. using one of the rigs mentioned above, these can be driven to full output. Using an adaptor is about the most inexpensive and sure way to use your existing rig for s.s.b. operation.

SB-10 Filter

To improve the voice frequency response of the SB-10 to where it completes favorably with sets in the higher price range, try the filter



L – Miller #6315 4-30 Mhy. (T.V. Width Coils)

Fig. 2—Effective and inexpensive speech filter for the Heath SB-10, that has proved to be a worthwhile addition to the set. (See Stoner's *SSB Handbook* for more info.)

shown in fig. 2. If adjusted properly, I guarantee you'll be mightly happy with the fine signal the SB-10 generates.

This filter should be inserted just ahead of the audio phasing network.

It can be adjusted before installation by feeding a good sine wave signal from an audio generator into it. The signal should have a frequency of around 3000 cycles. The *output* of the filter should be temporarily terminated in the *same* impedance load as presented to it by the network. Then the slugs in the TV width coils should be adjusted for *minimum* indication using a vacuum tube voltmeter or a scope as the indicator.

The unit can be constructed on a an inverted "U" bracket and mounted above the 2Q4 phasing network. Leads coming from the filter should be shielded; and if possible, the coils should be separated by at least 2½".

You can mount and connect the filter right into the SB-10 and adjust it right in the unit if you wish. The gain control on the SB-10 can be used to vary the sine wave input for the input signal should be as low as possible consistent with a readable indication on the VTVM or scope.

Linear Adjustment

Many articles and papers have been written on the methods used for adjusting linear amplifiers. However, there is nothing mysterious about the procedure at all.

Keep in mind these points when "firing up" an s.s.b. rig: if possible, use a good scope and two-tone generator for adjustment. Keep your test time short. Make certain that your exciter is working properly *before* it is connected to the final. It is better to overload a linear slightly than to underload it . . . your voice will seldom kick it past the flat-topping or distortion point if you properly control your gain. Don't use the air for your testing . . . use a dummy load. For proper Z match some GG amplifiers do require swamping. When using any class AB-1 amplifier, if grid current is drawn, your linear is *not* linear.

Linear Construction

For those of you interested in "rolling your own" linears, I suggest that you read the articles (that I enjoyed immensely) in the following issues of *CQ:* June 1961; March 1958; March, July, September and December 1955; October 1954; January, February and May 1956 and April 1958. There are others, but these I believe provide more than enough information for the newcomer to "cut his teeth on."

Observation

Using the large amount of correspondence received by HAM CLINIC as a yard-stick, it is very apparent that many hams are not interested in the design or construction aspects of amateur radio, but these are in the minority. Even the guy who owns a plush commercial s.s.b. station and who ships his equipment to the factory or a service agency when it becomes inoperable is interested in new gadgets which make operating more efficient and more fun. Most of these gadgets, including T-R switches, special vox control circuits, remote tuning assemblies, r.f. power measurement devices etc., are easy to construct. Even the ham who only uses a soldering iron to make doublet connections becomes interested when presented with a good workable gadget that doesn't take an engineer to construct, adjust and use.

Those who lament the demise of the ham constructor do not realize that he is far from gone. Perhaps there are fewer hams who do not write up projects for publication, but I feel that there are more ham constructors today than there were a year or even three years ago.

One of my construction articles which appeared in another publication describing a little 1" pocket oscilloscope brought in 500 letters from readers who had either started building the little unit or who wanted more information before starting construction.

Observed: hams still build whole stations and electronic gadgets but there are too many who keep their construction information to themselves.

Advice: *anyone* who can write a letter or use a microphone can write a technical article describing adventures in the ham workshop. If you are one of the many hams who do construct your own equipment but do no writing, it is suggested that you get in touch with the editor. In addition to getting paid for your efforts you will be helping out fellow hobbyists.

Send in that little gadget or gimmick idea today! Maybe it has appeared before, but perhaps you made the idea better mechanically and electronically . . . let over 90,000 readers see it!

Reader's Questions and Such

Info Notes—Those of you who have been waiting patiently for your ham licenses (modified or new) be assured that the FCC is doing all that it possibly can to speed up the process. Sending letters inquiring about the status of your license etc., will just throw more filings in the gears and slow down the action. So don't do it!

Hats off to Hammarlund!—As anyone knows who has been reading HAM CLINIC, we have emphasized the need for ham equipment manufacturers to remember their *sold* ham customers as well as their prospective ones by supplying them with worthwhile modification information on equipment already sold.

One of the first to do this is Hammarlund. They are now making available their effective noise silencer kit for their HQ-170 and HQ-180 receivers.

Installed in about 35 minutes, this new silencer *works!* No special alignment or test equipment or tools are needed.

For $33.50 this silencer is worth every penny and does increase the value and effectiveness of the receivers it is used on. With a little ingenuity, the same kit can be used on older receivers as long as i.f. frequencies are compatible. As soon as we can round up the info, we'll pass it along.

Thanks Hammarlund for thinking of the second and third hand buyers as well as your new ones . . . this is good business.

Not Enough Time!—We would like to remind readers that we cannot endeavor to design made-to-order complete transmitters, receivers etc. circuits. We just do not have enough time! Whenever we can, we will refer you to solid information sources for complete design information.

Incidentally, those of you who are interested in the design and construction of a complete receiver are encouraged to get a copy of the *Radiotron Designer's Handbook* by RCA. This book covers the subject (and other allied material) in over 1,000 pages!

Static and Meters—"Is it true that there is a possibility that the accuracy of plastic faced meters can be influenced by static electricity? If so, what can be done to minimize the effect?"

Yes, it is true. Obtain some Weston STATNUL(c), a spray which leaves an invisible conductive shield on meters which drains away static charges. You can obtain a bottle of this for $3.95 from Daystrom Inc., Weston Instrument Div. Dept. CQ, Newark 12, N.J. It really does the job on the meters I use!

Using Your Scope For TV—"While up in the mountains on vacation, our little portable TV went out. I found that it was the picture tube. With my ham equipment I had brought along a 7" scope and I thought I could use it as a temporary expedient, but I tried without luck. I know the column is devoted to ham problems and *not* commercial TV, but I feel that this is a *ham's* problem . . . trying to pacify the family while I work DX. Any way to connect up a good scope to be used as a 'picture tube' with a TV set?"

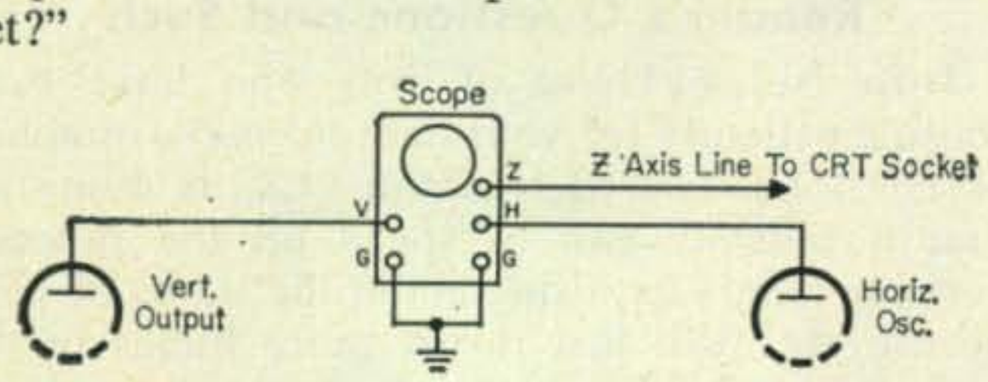


Fig. 3—Using a scope having a Z axis input as a TV monitor. The Z axis is connected to the TV c.r.t. socket grid or cathode pin, depending upon which is modulated.

On your next trip you can try the scheme shown in fig. 3, if your TV "modulated milk bottle" goes out. Glad to help you on this one.

Checking Leaky Capacitors—"Please tell me what the easiest way is to determine whether a coupling capacitor is leaking or not. No elaborate equipment, for I do not own any."

A leaking capacitor is one which allows voltage "feed thru." Best and easiest way to check the coupling capacitor is to lift the cold or grid side, and with a voltmeter having good sensitivity, measure leakage between the lifted end of the condenser and ground or input grid circuit. If there is leak thru, your meter will read *some* of the plate voltage applied to the hot or plate output end. If a full voltage reading is obtained (total plate voltage) the condenser is shorted. A substitution or a signal fed through another capacitor from the preceding stage's plate to the grid of the following tube will give you an idea as to whether or not the condenser is open. Be sure when you check for a leaky capacitor that there is no signal feeding from the output plate.

Air Conditioner "I"—"After installing a 110v.a.c., 60 cycle 7½ ampere window air conditioner in my bedroom, I found it causes the most awful noise in my receiver that I have heard. I called the air conditioning technician and he told me the unit was operating fine. He tried a filter in the 110 volt line but this did not help a bit. How about some assistance 'Doc'? The crackling is driving me nuts."

Well here are a few tips, hope one may solve your problem. First make sure that the unit is properly grounded and not merely through the electrical BX cable outlet. Next, check the tightness of the compressor belt. Sprinkle a little powered graphite on the belt and try if for noise. If this does not work, then check the theromostat connections and point setting. Sometimes if set too close there is arcing. You may have to install a wiping brush on your air conditioner's belt. The brush consisting of nothing but some tempered metal and grounded, will carry the static charges generated by the belt to ground. Next check for loose contact on speed controls (fans etc.)

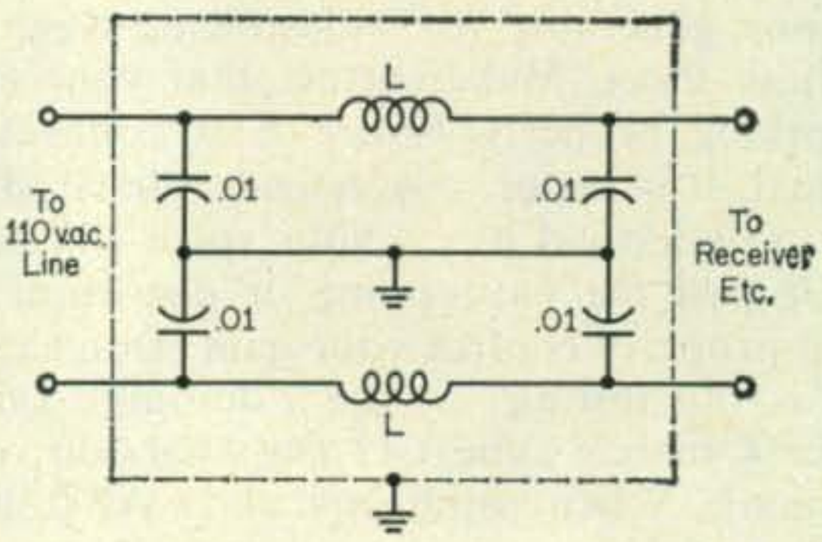


Fig. 4—Brute force line filter for reducing line interference. Coils *L* consist of a 7" winding of #16 insulated wire on a length of 1" broomstick. Coil should be wound in opposite directions.

I might suggest that you also operate your receiver on a separate power leg of the house's electrical system if you can . . . this will help. If the above pointers do not help, then I suggest as a last resort that you try a brute force filter as shown in fig. 4. This filter will help any receiver

to operate more effectively in a high man-made noise area. Be sure it is enclosed in a metal box, and that the coils are well insulated. Run the ground indicated to the box.

V.T.V.M.—"I have about $30.00 with which I would like to buy a good vacuum tube voltmeter. Please recommend one that you have good experience with and feel is worth the money."

I assume that you are looking for a v.t.v.m. kit. Well, I purchased an EICO Model 221 v.t.v.m. and I am very happy with it. This for $25.95 is a fine instrument. Its high voltage and high meg ranges make it ideal for most ham work. I like the meter protect circuit and its simple "stay-put" calibration. Its 1% resistors make it accurate. Having used it in some critical experiments, I can in fact say that I like it better than a $300.00 v.t.v.m. I once owned . . . this one only went to 300 volts, while the EICO will go to a 1000; a special probe enables it to measure voltages in the kilovolt class.

SX-28—"I guess you still receive a lot of questions on the good old SX-28. My problem is motorboating when I turn up the a.f. gain control. What's my test starting point?"

First check the a.f. tubes, next check the cathode by-pass capacitors in each audio stage.

Phone Patch—"I'm tired of trying to put together a phone patch that will work without hum and which needs no constant adjustment. I'm willing to spend $25.00 for one. Any suggestions?"

My first suggestion is the patch put out by Lafayette Radio for $24.95. This one has a built in monitoring VU meter, master control for receiver and transmitter output and input respectively, is small and smart looking. One of my close friends bought one and is pleased as can be with it. I used it and can say it is hard to beat for the price.

GE Ham News—"On a recent trip to the United States a good American friend gave me a copy of the General Electric *Ham News*. I understand it is available in most European countries. Could you tell me where in Germany I can get a copy?"

Yes. Try Herbert Anger, Taunsstrasse 20, Frankfurt/Main Sud, Germany. HAM CLINIC has a rather comprehensive list of overseas addresses where the GE *Ham News* can be obtained . . . anyone desiring the information may have it by writing in. (Thanks W4ITC, Editor of *Ham News!)*

Readers: look for the handbook by the GE *Ham News* staff on s.s.b. It will contain 160 pages and sell for $1.00 postpaid. You can get it from GE *Ham News,* Receiving Tube Dept. General Electric Co., 316 East 9th St., Owensboro, Ky., if you cannot find it at your distributor's.

Manual Review—The *Tunnel Diode Manual* published by GE (must be GE's month!) for $1.00 is available to those who want to know more about TD circuits, applications and specifications. The manual contains 96 pages with 8 chapters. From theory to specifications, the little manual covers the subject of the use of tunnel diodes in a very readable and concise manner. The math is not complicated and the circuits are clear. For the ham interested in the new semiconductor device which will revolutionize many areas of technical thinking, this is a fine book and highly recommended.

Model HW-30—"My 2 meter Heath Transceiver Model HW-30 has recently developed a hum condition. Hum is reported on my carrier and I can hear it in the speaker. What should I look for first?"

Check C_{32} the 200 volt 100 mf condenser in the power supply section. If this is not the trouble, check C_{31}. Before checking the diodes D_2 and D_3, check C_{33a}, C_{33b} and C_{43} also in the power supply. A shorted NE-2 (power indicator) neon bulb may also add to the cause.

Shack Shielding—"I'm contemplating shielding my entire shack with copper screen. Think it will help reception?"

If you have a real high antenna fed with coax and have an effective line filtering system, you may hear the results. On the other hand, I think it is a waste of time and money unless you are going in for professional receiver alignment.

Coax Relay Noise—"Any effective way to lessen coax relay noise?"

Depends on the relay. If the relay contacts are completely enclosed you can enclose the relay in a good solid wooden box and use glass wool to deaden the vibration. This means floating your relay on the glass wool. This method enables very quiet operation.

Thirty

Soon Autumn will be here and with it the DX season. Perhaps the bands won't be as hot as they were a couple of years ago, but there still will be openings. Now is the time to get your antennas in order and get prepared for some good contacts. Need help?

Thank you for reading the column and writing to us. We still do not claim technical infallability or consider ourselves the hottest of ham hotshots, but we are sincere in trying to help you with your problems.

HAM CLINIC never expects a penny from the hams it assists, but *if* we had kept the $1 and $5 bills which have been enclosed in letters to us we could certainly afford a KWM-2!

One Canadian ham who sent us a good Canadian dime said: "OM, it is hard to obtain US stamps here, so please accept the enclosed dime for return postage. Please remember it represents a little more than 10¢."

For the information of all Canadian and foreign hams, HAM CLINIC will take care of return postage. No coupons, dimes, nickels or centimes need be enclosed in letters. We value international friendship more than that!

For this month then, May God Bless You and Yours (75), Peace and Friendship in Freedom (72) to our overseas friends and 73 to all!

Chuck, W6QLV/W4VZO

Novice

by **DONALD L. STONER, W6TNS**
P.O. Box 137, Ontario, Calif.

THIS month, for a change of pace, let's talk about a new product—the Allied Knight-Kit R-55 receiver. This receiver contains many mechanical and electrical features not normally found in a $65 receiver and should be of particular interest to Novice amateurs.

The R-55 covers the frequencies between 0.53 mc and 54 mc which of course includes the 80 through 6 meter bands. Only six tubes are used, but three are dual purpose which results in rather amazing performance.

The 20 pound receiver measures 11" deep, 14½" wide and 8⅝" high. The front panel is of screened and painted anodized aluminum, while the remainder of the cabinet is painted a grey wrinkle finish.

The tuning dials are screened on plastic and the main tuning and bandspread pointers are driven by dial cords. The electrical bandspread dial spreads each band over most of the dial face.

Only the block diagram is given in fig. 1, for most of the circuit is quite conventional. By rotating the band switch the appropriate coils are connected into the circuit. The coil, in parallel with the tuning capacitor C_1 forms a resonant circuit. Such a circuit has the property of selecting the desired frequencies and rejecting all others. Tuning the main dial or bandspread changes the resonant frequency of the tuned circuits. The bandspread capacitor is connected in parallel with the main tuning capacitor and allows a vernier or fine frequency adjustment. Also connected in parallel with the main tuning capacitor is the antenna trimmer C_3 which is used to compensate for different antenna impedances. The local oscillator is composed of the five oscillator coils (one for each band), V_1 and associated circuitry. The oscillator generates a signal whose frequency is always 1650 kc above or below the signal being received. The oscillator signal is injected into the mixer section of V_1 through the electron stream and heterodynes with the signal from the antenna to produce a new third frequency called the i.f. (intermediate frequency) which is 1650 kc.

The i.f. signal, coming from the plate of V_1, is inductively coupled to the grid of V_2 by transformer T_1. Tube V_2 amplifies this signal and passes it on to V_{3A}, the second i.f. amplifier. Tube V_{4A} detects or rectifies the incoming signal and separates the audio components from the i.f. signal. This stage also acts as an automatic volume control by feeding back a portion of the rectified i.f. signal to decrease the gain of the i.f. amplifier stages. A.v.c. voltage helps keep the volume constant by regulating the amount of amplification these stages give the incoming signal.

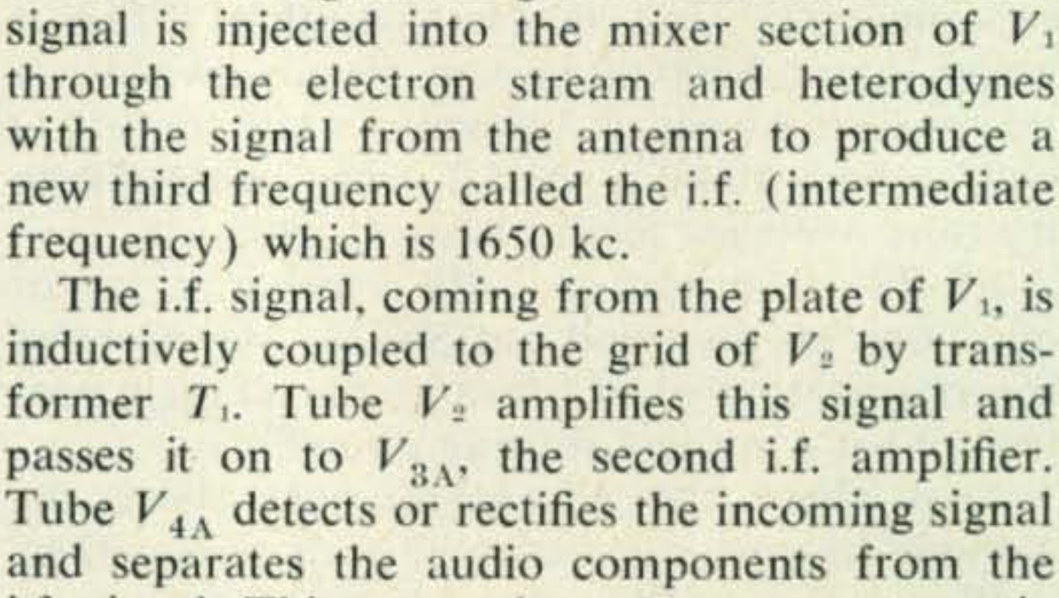
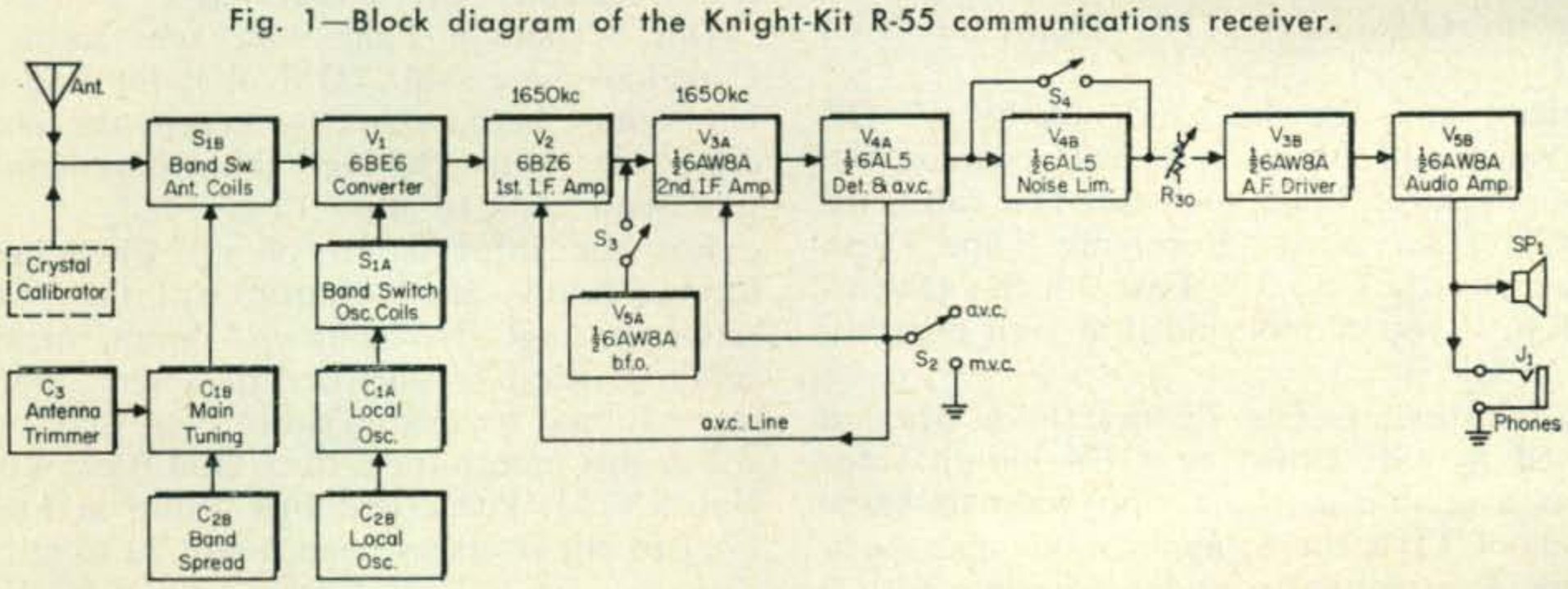
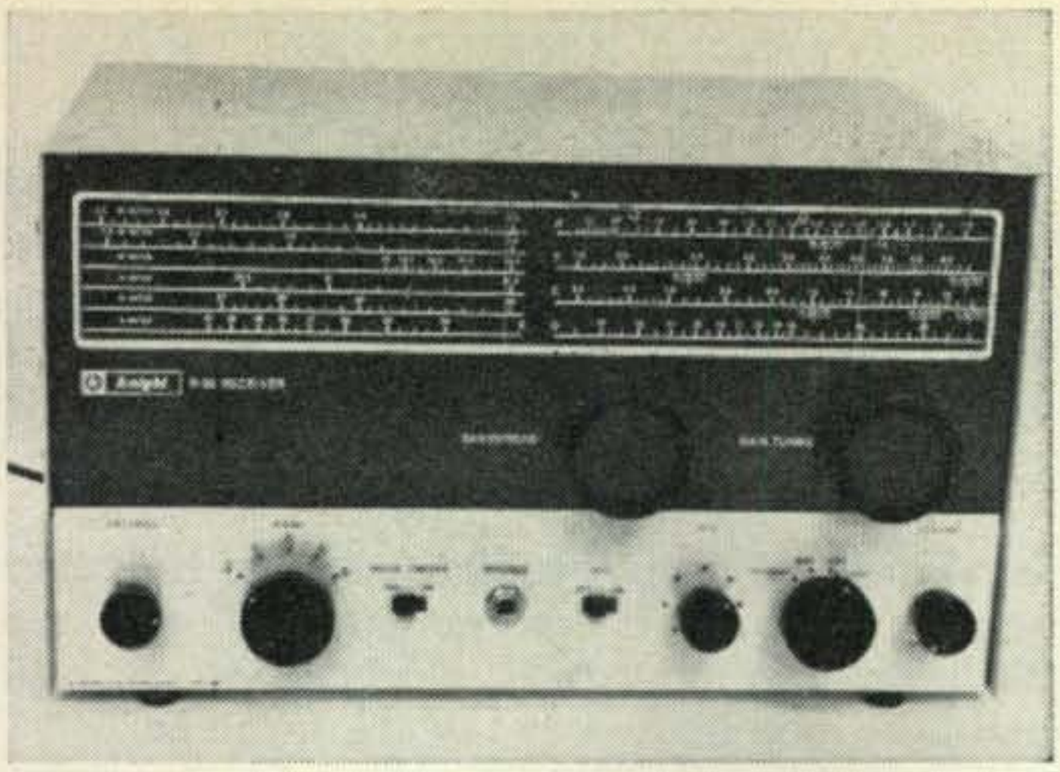


Fig. 2—Schematic diagram of the R-55 noise limiter.

The noise limiter, V_{4B}, shown in fig. 2, is used to remove or reduce pulse interference such as automobile ignition noises and disturbances from household appliances. The resistor net-

Fig. 1—Block diagram of the Knight-Kit R-55 communications receiver.





The Knight-Kit R-55 Receiver.

work biases the diode so that it is normally conducting. When a noise pulse of sufficient amplitude reaches V_{4B}, the tube is driven to cut-off. Because the tube has momentarily ceased conducting, limiting of the pulse amplitude occurs. Switch S_4 allows the signal to bypass the circuit when the noise limiter is not needed.

The detected portion of the i.f. signal (the audio component) goes through R_{30} (the volume control) and on to the grid of V_{3B}, the audio driver stage. This signal is amplified and passed on to the grid of V_{5B}, the audio output stage. The output from V_{5B} will provide more than adequate speaker volume.

The beat frequency oscillator is used for code reception. The b.f.o. generates a signal whose frequency is displaced slightly from the i.f. to create an audio note, on incoming c.w. signals. Switch S_3 removes the b.f.o. from the circuit when it is not needed.

The power supply operates from 117 volts and consumes 60 watts from the line. The supply can be turned off through a terminal strip on the rear apron during standby or transmitting periods.

Your conductor built the Knight R-55 receiver kit in approximately 12 hours and found nothing difficult in the construction steps. The manual is clear and no errors were encountered. If you follow the steps carefully, the receiver should work with no trouble-shooting. The coils and i.f. transformers appear to be prealigned and only a slight touchup is required to calibrate the receiver. The receiver sensitivity is quite high for a 6 tube unit. The selectivity is slightly better than one would expect for a 1650 kc i.f. The high i.f., however, does virtually eliminate image problems below the 10 meter band.

Meet Marie, WV6NXD, who is the XLY of Earl Hickman, WA6LUI.

Balancing price versus performance, your conductor has no hesitation in recommending the R-55 receiver.

New Book

If you can con the folks out of $3.50 be sure to order a copy of *Basic Electricity* from the Government Printing Office. In its 448 pages are described the workings of electric circuits, magnetism, problem solving, a.c. theory, capacitance and inductance, test equipment, generators, motors, magnetic amplifiers and servo-mechanisms. You can order *Basic Electricity* from the GPO by catalog number D 208.11: E12/3/960.

The neat station of Bill, K7JYE, and Bob, K7MDS, Albrant. The boys are plugging away for an Oregon station!

Meters

Lafayette Radio has two meters of interest to Novice operators. The new TM-16 is a transistorized field strength meter and is described in this month's SEMICONDUCTORS column.

Layfayette also has a new S-meter designed to be added to existing communications receivers. It contains a 6C4 in a bridge circuit and is actuated by the a.v.c. circuit in a communications receiver to indicate signal strength for on-the-air report or QSL information. To install the meter it is only necessary to connect four leads to the receiver, a.v.c.; B+, filament and ground. The new TM-59'er is priced at $7.95.

Help Wanted

The following persons have written requesting help with their Novice license. Can you give them a hand?

W8— Don Daso Jr., Box 56, Lodi, Ohio

W9— Bruce J. Thompson, 115 N. Bonxon St., Platteville, Wisconsin. Phone DI 8-2536

WØ— Robert H. Barrett, 8014 Soncrest Dr., Des Moines 15, Iowa. Phone AT 2-2177

VE4— Barry McLarnan, 10509— 76 Avenue, Edmonton, Alberta, Canada. Phone GE 9-3448

[*Continued on page 114*]

RTTY

BYRON KRETZMAN, KØWMR
108 WEST TERESA DRIVE
WEST ST. PAUL 18, MINNESOTA

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc.

80 meters	3620 kc
40 meters	7140 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.6 mc

FOR a long time now, oldtimers have been unhappy with the trend in amateur radio towards commercially designed and built equipment; towards the attitude of new hams that look at amateur radio as just another hobby, a "fun" hobby that makes it possible for them to talk mainly with others interested only in yakking over a different medium. So many of the new hams have forgotten (or never knew) that the very existence of amateur radio depends upon our ". . . proven ability to contribute to the advancement of the art." Every ham, new or old, should get out Section 12.0 of the FCC Rules and Regulations and read again the five fundamental purposes of the Amateur Radio Service.

It was 'ole BeeP, the late WØBP, who said that RTTY is truly the last frontier of amateur radio, where hams still build their own specialized gear; where commercialism is at a minimum. How true this is! Letters received from oldtimers, many with two-letter calls, bear this out. Their interest had become jaded, either by the asinine conversation of hams on the phone bands or by the silly, senseless, messages passed over the c.w. nets. Here, in RTTY is found the opportunity for the conscientious radio amateur to fulfill the fundamental purpose of increasing our knowledge and skill in the use of an advanced technical phase of the radio art, radioteletype.

A Polar Relay Filter Circuit

Back in the March and April issues, in the RTTY COLUMN, we described a simple three tube RTTY converter, or TU. Some criticism was received for using a polar relay instead of an electronic tube to key the local loop to the teleprinter machine. "You will get noise from the arcing contacts," was the dire prediction. Well, we used the polar relay mainly to simplify the building and the adjustment of the TU, keeping in mind that this unit was not going to be built and tuned up in a well equipped laboratory, but in an ordinary ham shack. The simple R-C filter and the shielded wire recommended should keep down noise in most cases, especially where a 20 ma local loop is used to key the machine.

Figure 1 is the schematic diagram of a polar relay contact filter circuit that will eliminate even the most stubborn case of radiated noise from a 60 ma local loop. The object here, like in TVI suppression, is to keep the arcing polar relay contacts from radiating noise by confining it to a box, in this case the chassis of the TU.

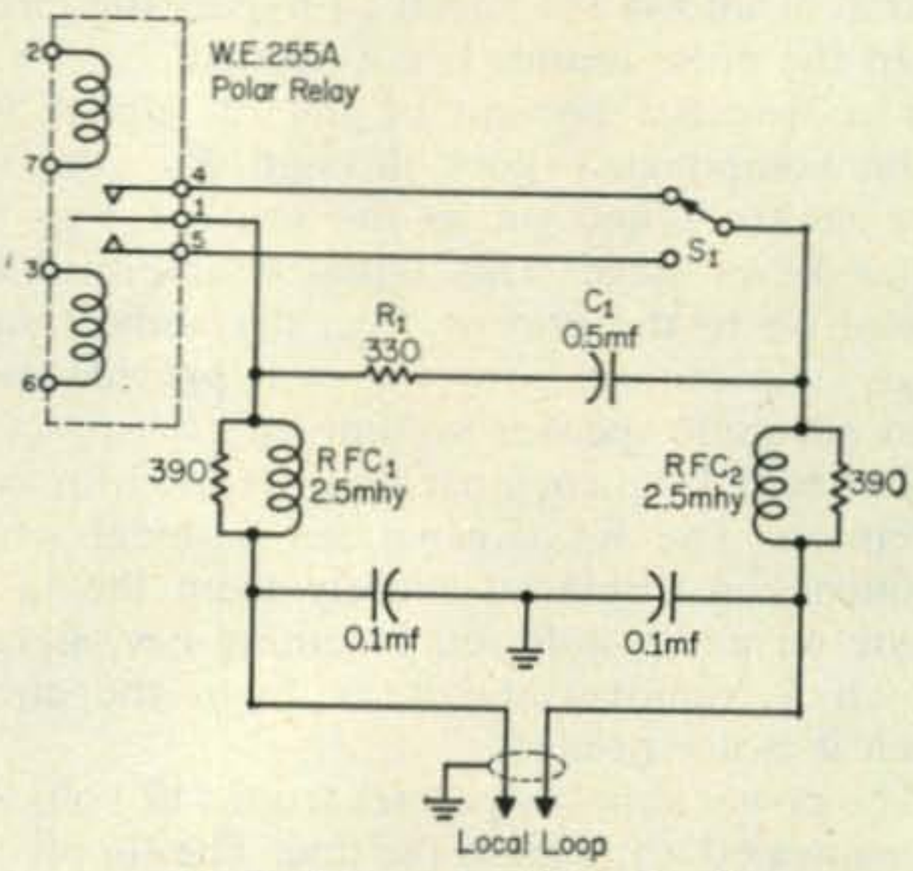


Fig. 1—Polar relay filter circuit.

This is not difficult to do. Just keep the filter components shown in the diagram reasonably close to the socket of the polar relay and use a shielded "floating" local loop (neither side grounded) with the shield grounded to the TU chassis. The s.p.d.t. switch S_1 is the reversing switch used in the original circuit. The R-C circuit consisting of R_1 and C_1 not only reduces arcing, particulary when a 60 ma local loop is used, but substantially cuts down the pitting of the polar relay contacts making it unnecessary to burnish these so frequently. We used a surplus "bathtub" 0.5 mf capacitor for C_1 since that was in the junk box, however, any handly tubular capacitor of the correct value can be used. The exact value of the r.f. chokes, RFC_1 and RFC_2, is not critical. Almost anything from about 1.5 mh to 5 mh that can handle at least 60 ma should work.

Operating Procedure

It doesn't take much effort to form good keyboard operating habits, and it sure makes RTTY a smooth operation. Whether you are operating with f.s.k. on the h.f. bands or with a.f.s.k. on the v.h.f. bands, there are just a few simple rules to follow: When you begin a transmission,

when you reach the end of a line, and when you conclude a transmission *just before you dual-identify*, hit the following keys in this sequence: two CAR RET, one LINE FEED, and two LTRS. (The object here, of course, is to reduce over-printing on the *other* fellow's machine when signals are marginal and some functions are missed.) It is particularly discourteous to the station you are working to leave his machine in the middle or at the end of a line when you switch over to identify with the hand key.

Many modern RTTY stations have some form of automatic control of the starting and stopping of the receiving machine's motor. This control is based upon reception of a steady *mark*, for at least 5 seconds, to start the motor and upon reception of a steady *space* of at least 3 seconds to stop the motor. Whether you are on f.s.k. or a.f.s.k. it is therefore a very good habit to begin a transmission, *after* dual identification, by sending a steady *mark* for 5 seconds or more. (5 seconds isn't long; just count to 10). If you have automatic tape equipment, *never* start the TD before putting on the carrier (on *mark*). and for a count of 10. When you finish transmitting with RTTY, *before* you dual-identify, hit the BREAK button so that you send a steady *space* for about a count of 6 or 7. This assists the fellow on the other end, or rather his control system, in shutting off his machine.

For many years, too, it has been the custom to send three BELLS before sending the BREAK "stop" signal. This gives the fellow you are working time to leave the work bench, read the copy, and get ready to transmit. The experienced RTTYer doesn't hang over his machine all during a QSO, especially when a.f.s.k. is being used, and on the h.f. bands he uses automatic frequency control. The BELLS signal therefore gives him the warning he needs when his turn comes. If a small round-table is in progress, standard practice is to assign different numbers of BELLS to different stations.

On the Bauds

W2QNB/MM uses an Electrocom FSC-250 TU (*CQ*, Aug. '60) and a GPR-90 receiver with his TG-7-B on board the SS *E. W. Sinclair*. W2JAV is active as usual on 20 as well as on 2 meter autostart.

K5AFN of Texas City, Texas, just got a Model 15 and needs some help. W5TVG is active in the Tulsa (Oklahoma) Amateur Radio Teletypers Society.

W6CG forewarns us of the new International RTTY Sweepstakes to be conducted by the RTTY Society of Southern California, Inc., the weekend of October 21—22. Watch for details next month.

W7OFS of Central Point, Oregon, reports W7VPH, W7MUS, W7LYY, and W7BEG active in his area. W8MCS of Dayton, Ohio, is getting set for 6 and 2 meter a.f.s.k. with his 14 and 15 machines. W8ACN of Cincinatti, Ohio, is on 40. W8KBO, Highland Park, Michigan, has been on RTTY since 1958.

K9DOF of Elkhart, Indiana, built the ILS tuning meter of W2JAV (*RTTY*, April '61). W9GMU is on 20 from Danville, Illinois. W9VMG is on 80 from Fort Wayne, Indiana, with his Model 19 tape equipment.

WØTWG of Bemidji, Minnesota, is building the Twin City TU to go with his Model 19. WØHAH is active again from Minneapolis. KØWMR worked W8UQQ of Columbus, Ohio, on 52.6 f.m. on June 4th.

KR6MF is on from Okinawa on 14,095 kc mornings, 7 to 8 am, reports WØSFU. W4HSF has been operating /VO1 on 20, fsk-ing an s.s.b. rig and using a transistor converter. VE4BJ of Winnipeg, Canada, is on 20 also.

[*Continued on page 116*]

DJ4KW, the RTTY shack of Gerd Sapper, Gersthofen near Augsburg, Germany.

RTTY THE HARD WAY... NO. 2

"Some of the boys at the shop helped me out with that speed conversion problem".

Olivetti page printer at DJ4KW. This machine normally runs at the 50-baud European speed but can be readjusted to the 45.45-baud "60-speed" used in the U.S.A.

YL

BY LOUISA B. SANDO, W5RZJ
4417 ELEVENTH ST. N.W.
ALBUQUERQUE, N. M.

1st YL VHF Contest Results

Congratulations to these top scorers in the first YL VHF Contest sponsored by YLRL: 1st place, K1EAV, Belle Bunney, who had 38 YL contacts in 3 sections for a score of 143; 2nd place, K1KYB, Lu Tinkham, who worked 28 stations in 3 sections for score of 105; 3rd place, W4ERX/1, Genie Weaver, with 27 contacts also in 3 sections for 101 points.

The contest was held April 12-13, and unfortunately the 6 meter band never opened so all contacts were what the girls could pick up locally. But most logs submitted to YLRL V.P., W1ZEN, Onie, had the comment that the contest was fun and all hoped it would be continued another year.

VHF Contest Scores

K1EAV	143*	K3NBS	22
K1KYB	105*	WA6AOE	85*
W4ERX/1	101*	W6WBH	75*
W1ZEN	71*	WA6OKG/6	13*
W1RLQ	56*	W6GQZ	8*
K1RPI	41*	W6HRM (WA6EWW)	6
W1HOY	34	KØMRB	28
K1IZT	33*	KØOSJ	26
K1JIX	22	KØGIC	10
K3JTH	68*	KØOHD	4*

* low-power multiplier

During WRONE's spring luncheon K1EAV, Belle Bunney, was presented with the WRONE award, a silver Paul Revere bowl, for earning top score in the YL VHF Contest. YLRL V.P. W1ZEN, Onie (right), made the presentation.

Cupid is QRL

Remember the column about the W7 teenage YLs in this column back in *CQ* for July 1957? From W7HHH, Bea, we hear that cupid has invaded the ranks of these Oregon YLs.

On March 11 Sherry Jorgensen, W7ZLT, was married to John McNamara at Bend. She was

Sherry, W7ZLT, cuts her wedding cake with OM John McNamara on March 11, 1961.

given in marriage by her father, W7ZLR, and her brother Glen, W7ZLU, was one of the ushers. Her mother Ione is W7ZLS. One of the bridesmaids was Beth McCulloch, K7MAW. Another brother Alan, W7SBR, at the university at Tucson, Ariz., was unable to attend. Sherry and John are at home in Corvallis where he was to receive his degree in Bus. Adm. in June and Sherry works in the registrar's office. Among the guests were W7HHH, Bea; W7DHK, Ollie;

Mary, W7QWX, became the bride of John Rauch on April 1, 1961.

Beth, K7MAW, and Glen, W7ZLU, can now share the same rig after becoming Mr. & Mrs. Jorgensen on April 8, 1961.

W7ETM, Marge; K7DMH, Lavaun, and K7JPI, Betty.

On April 1 Mary Klock, W7QWX, and John Rauch were married at Gresham. She was given in marriage by her father, W7NGG, and her brother Glen, W7QOJ, was an usher. The wedding was attended by W7's ZLR, ZLS, ZLT and her new OM. The Rauch's are also at home at the OSU city where John is studying for his Ph.D. in atomic science, and Mary was to graduate in June with a major in Home Ec.

April 8 was the wedding date of Beth McCulloch, K7MAW, and Glen Jorgensen, W7ZLU, brother of Sherry, W7ZLT. They are at home at Bend where both work and attend Central Oregon Junior College. Prior to the wedding Bea gave a shower for Beth with all of the above mentioned YLs attending as well as K7KQC, Nancy.

We note that two of these gals married nonhams . . . just bet, though, that with all those hams in their families they'll soon come up with tickets and calls of their own! Thanks, Bea, for bringing us up to date on these YLs.

Gwynn Collins, K4AGM, made Phi Beta Kappa at Florida State Univ., after earning the highest grades in her class all four years. She will continue her studies at Tulane Univ. Medical School.

K4AGM

Another YL written up in the teenage series was K4AGM, Gwynn Collins, of Pensacola, Fla. Gwynn has "grown up" too. In June she graduated from Florida State Univ. with a B.S. in Biological Science with minor in Chemistry. Gwynn was elected to Phi Beta Kappa after receiving the Mortar Board Award for the past four years for highest grades in her class (3.9 average in 4.0 system). Gwynn is a member of Alpha Delta Pi social sorority and received the National ADP scholarship award. She was awarded medals by FSU Panhellanic Assn. for scholastic achievements. She also is a member of Alpha Lambda Delta (Freshman Women's Scholastic honorary) and of Phi Sigma (National biological sciences honorary). Topping all this Gwynn has received a scholarship to the graduate school at Tulane University Medical School in the Dept. of Anatomy where she will do research work. Congratulations Gwynn! Proud parents of this brilliant and beautiful YL are W4AXF, Carrie, and W4MS, Eddie.

These YLs were among those attending the All-California YL Convention May 12-14, 1961, sponsored by the San Diego YLRC. L. to r., front: W6VSL, Barbara, president of S.D. YLRC; K5BNQ, Doris, YLRL president for 1961; W7NJS, Beth, YLRL pres. 1958. Standing: W6DXI, Gladys, YLRL pres. 1960; W6CEE, Vanda, YLRL pres. 1954-55. The convention luncheon was enjoyed by 61 YLs.

With the Clubs

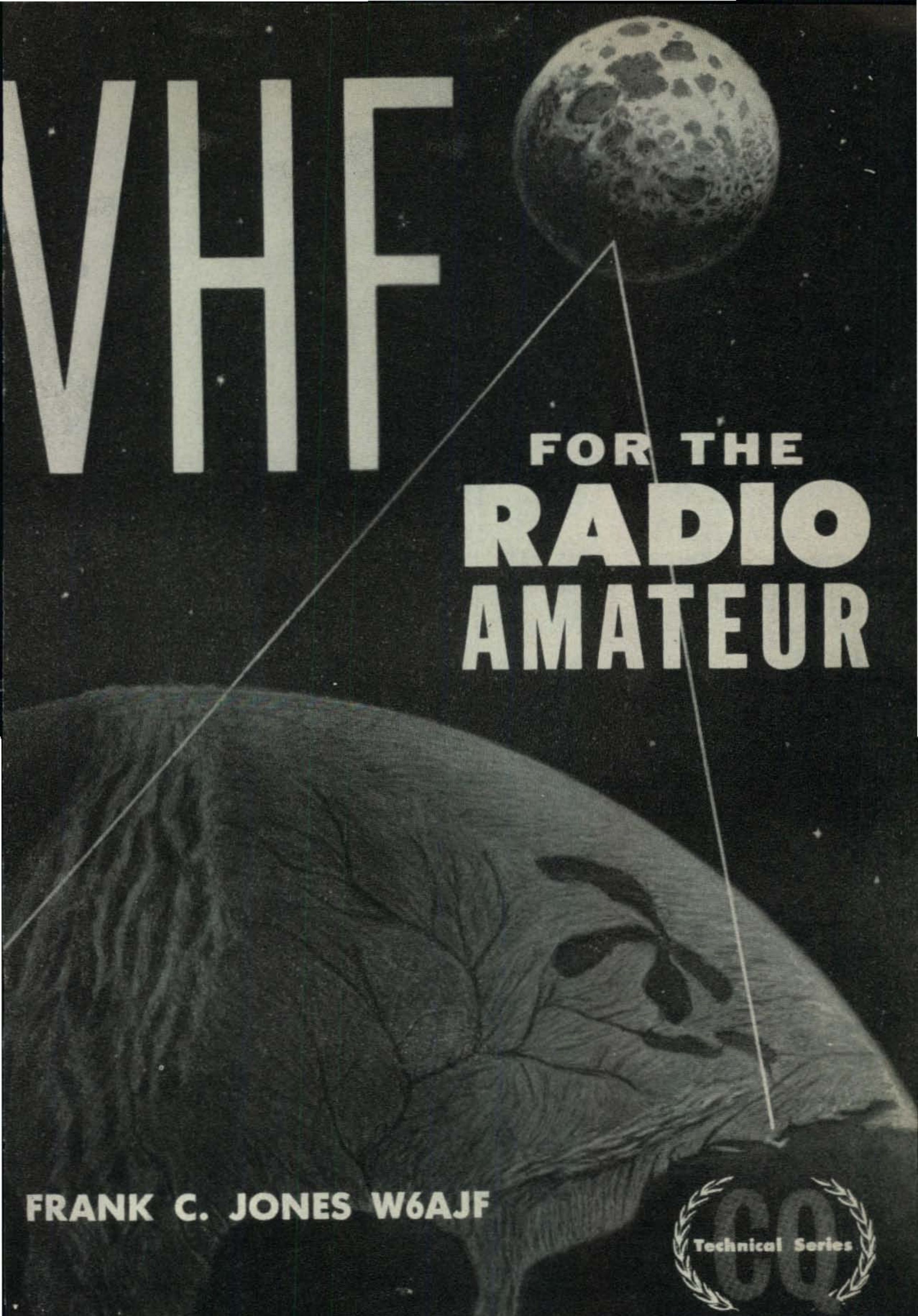
Greetings to the newly organized group known as The Texas Bluebonnets. They are members of a YL v.h.f. net in the Houston area.

The Los Angeles YLRC planned its installation of officers luncheon for June 10 with these YLs to be installed for 1961-62: Pres., WA6AOE, Maxine; V.P., K6OAI, Anita; rec. secy,

[*Continued on page 111*]

YLs attending the Michigan State Convention at Grand Rapids on April 29, 1961, included, left to right, front row: KN8TYK, W8ORP, W8FPT, K8KCQ, K8KCD; second row, W8RIR, W8UAP, K8BPQ, W8WQE, W8QOQ, W8KLZ; third row, K8KQH, W8QPT, W8ATB, W8ONI, W8SNB, K8YEX.

VHF FOR THE RADIO AMATEUR



FRANK C. JONES W6AJF

Technical Series

Switzerland of Caribbean [*from page 65*]

words per minute and proves by an examination at the Radio Club that he can troubleshoot and repair a transmitter.

A warm-weather island known for its hospitality to the tourist, Haiti offers festive living to all who visit, and the boys in the radio club enjoy a good time, too.

"We have at least one big party every year on the club's birthday," added HH2LD," and sometimes we celebrate when a DX ham drops in on vacation."

Since offering the "HH-20" certificate to amateurs who forward a verified list of twenty contacts on c.w. or phone with HH stations, RCH members have been extra busy QSOing and QSLing. French is the national language of Haiti, but most of the fellows speak fluent English. Thanks to the "HH-20" award, lots more hams around the world are getting acquainted with a real "going" club in the "Switzerland of the Caribbean." ■

Notes to Novices [*from page 63*]

2. Study the technical side of ham radio.

Avail yourself of every possible bit of information on your own gear so you will know the *How and Why* to the best of your ability. Study the technical articles in the ham journals!

3. **Build as much of your own gear as possible.**

Build complete from scratch if you possibly can do so. The magazines and handbooks are full of well-designed equipment—designed for Novices. If you just cannot *build* gear, then buy *kits* and assemble them. You'll learn as you do and have a fine set of equipment, too!

4. **Buy as you progress.**

Do not go overboard and literally mortgage your ham future with time payments. Consider each and every purchase as a long time serious investment of your hard earned dollars. (I hope they *are your* dollars.)

No amateur worth his license would sponge off his parents or his family to get on the air with a lot of shiny beautiful gear.

5. **Participate in a broad variety of ham activities.**

Do not become a "typed ham" who works only one band, or engages in just one type of activity.

Support Amateur Radio by belonging to the ARRL and, if possible, to a local club group —be "hep" on Amateur Radio lore, legend, contemporary history and events.

6. **Bring Ham Radio into focus.**

Make *friends* of other hams. You will treasure such friendships throughout your life. Introduce other people to the *right* side of Ham radio through your social contacts and your non-ham association. But do not neglect your school, your job or your outdoor activities. Combine them with Ham activities, where practical.

Ham radio is the greatest, most personally

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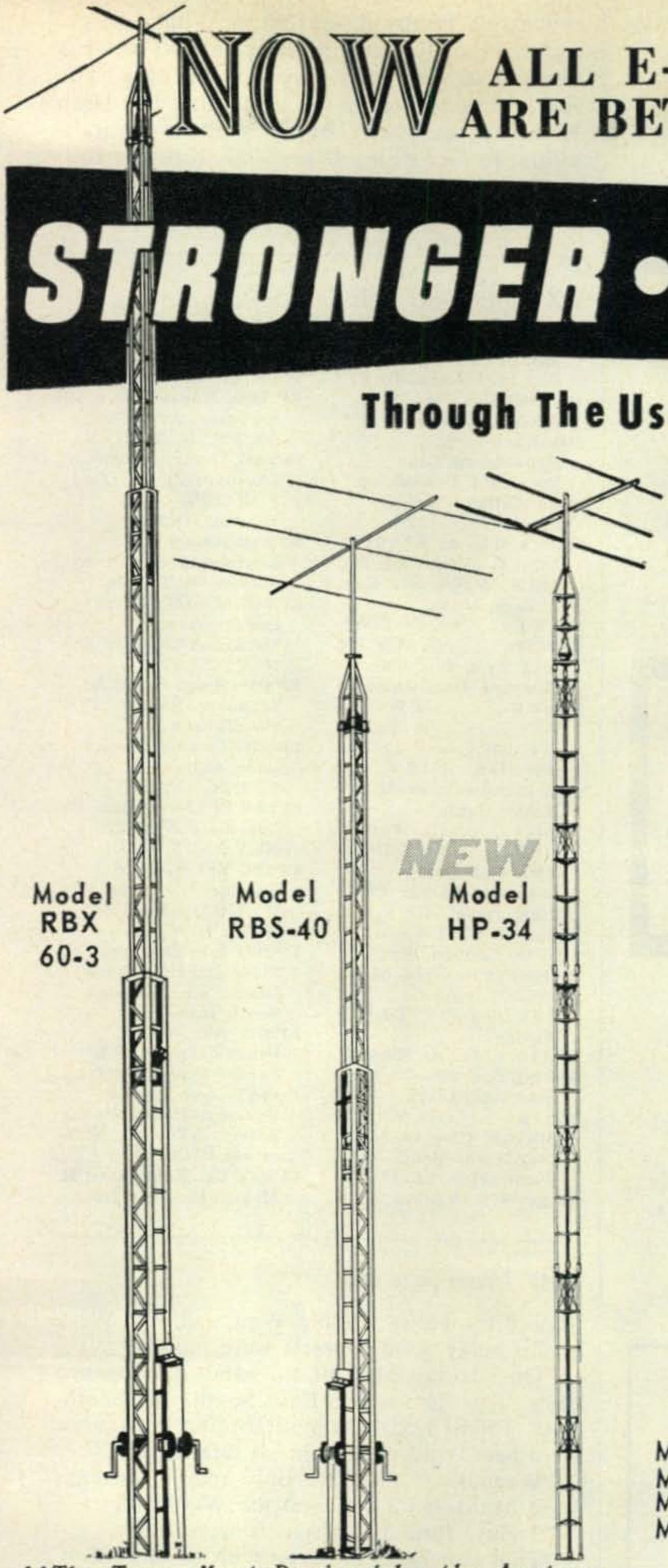
STRONGER • LIGHTER

Through The Use Of 55,000 PSI Steel!



"The Tower Most Desired by the Amateur . . . He Either Owns One Or Wants One!"

Available At HARVEY

Our deluxe line of Crank-up and Tilt-over Towers are now built with 55,000 PSI steel rod and tubing! Now. . . 40% STRONGER and 20% LIGHTER.

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NEW "HP" Economy Series

Here is a low-cost, light-weight, super strong tower made with 55,000 PSI steel. Top quality features include: Hot dipped galvanizing after fabrication, Diagonal bracing, Electric arc welding, and the famous E-Z Way Rotor Head.

Fast, easy erection . . . 10 ft. sections weigh only 29 lbs. Self supporting or building attached models are available in three most desired heights.

Model HP-34	$84.95
Model HP-44	$101.90
Model HP-54	$118.85

Complete with Rotor Head and Mounting Kit for self supporter or building attached.

Model RBS-40P	$169.50
Model RBS-40G	$209.50
Model RBX-60-3P	$335.00
Model RBX-60-3G	$410.00

MOUNTING KITS

Model GPK-S40 Ground Post	$75.00
Model BAK-S40 Wall Bracket	$10.50
Model GPK-X60-3 Ground Post	$125.00
Model BAK-X60-3 Wall Bracket	$17.00

See the complete E-Z Way line at HARVEY . . . your one stop for Quality Ham Equipment!

OUR 34TH YEAR

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103 West 43rd Street, New York 36, N. Y./JUdson 2-1500

For further information, check number 19, on page 126

rewarding hobby in existence! What you get *out* of Ham Radio is directly related to what you put *in*. The ratio may vary but this basic fact remains—there is something in Ham Radio for everyone, but it is up to the individual to *find* it, *use* it and *live* it, to the full.

Ham Radio is not just a hobby—it is a way of life. May it lead *you* down pleasant trails. ■

DX [*from page 73*]

OA5V QSL c/o Marcona Mining Co. Post Office Box 1229, Lima, Peru
OA6AGI Box 751, Arequipa, Peru
OQ5KY Guy van Heddengem, Colon, Post Offix Box 58, Gandajika (Kasai) Congo
PJ5MA QSL to K2AAC: John O. Archibald, Jr., 200 S. Willow St., East Aurora, N. Y.
SVØWT .....via ISWL
T12CME .....via W2CTN
VP5LT Eric, Box 264, Montego Bay, Jamaica
VP6WR .....via W9JFJ
VP6ZX .....via W9JFJ
ex VP7BM Lowell J. Busching, K8IMV, 605 S. Broadway, Santa Maria, Calif.
VR1G .....via W6BSY
VR4CB .....via W7PHO
VS9MB Cpl. David Jeapes, Amateur Radio Club, Royal Air Force, Gan BFPO 180 c/o GPO, London, England
W7HMP/KB6 Uspo 06-50000 Canton Is.
XE1EV Box 314, Tiluca, Mexico
ZK2AB .....via W6ZEN
5A3TQ Box 263, Benghazi, Libya
5A3TR .....via W3ZZE
ex 9N1GW Glen Ward, 6844 Kerby Road, Washington 22, D. C.
9K4A W/K/VE via W2JXH, DX via OD5CT, Box 5043, Beirut, Lebanon
EP QSL Manager, c/o US Embassy, APO 205, c/o PM, N. Y., N. Y.
EP2AG, George Buchanan, J.A.Jones Constr. Co. POB 1836, Tehran, Iran
EP2AR Ismael Koutchesfahany Ave. Soraya 64, Tehran
EP2AT M/SGT Robert Leffert, Armish MAAG, AAG, APO 205, N. Y., N. Y.
EP3HS Heinz Schmidt, Standard Electric POB 709, Tehran
EP3RO Conrad Glade, same address as EP3HS
EP2BB Bill Jochimsen, US Consulate APO 205, N. Y., N. Y.
EP2BC SFC George Stracke, US Army Hospital, APO 205, N. Y., N. Y.
EP2BD Iain Dunbar, 51265 ICEPC, Kharg Island, via Abadan, South Iran
EP2BE Ake Alseus, Diawild Trading Co., Saraye Omid, Tehran
EQ2AT Cmdr. Frank Borsody, USOM-Public Safety, APO 205, N. Y. or via W2AYN
EP1AA Dr. Mohammed H. Masud, Pob 951, Tehran

VHF [*from page 88*]

almost the entire Middle West and Far West. Again many good contacts were made.

"On Tuesday, May 30, the band again opened early. This time to the East, South, and Southwest. From 9:55 AM until 6:30 PM stations were heard and worked in all directions.

"Wednesday, the 31st, only sparce openings were heard—to Texas and the West Coast.

"Today, June 1, no signals were heard.

"That concludes the report up to date, Bob. It sure has been a busy week and a half! The score at present stands at 21 states contacted mobile, plus the VE-4. Hope the action continues! *Well, Ira, I'm sure by now you've found out it did. Keep us posted on your activities!*

Madison Heights, Michigan: Dick Medynski, K8PEJ, dropped a line to let us know that on

May 23 he worked W4YU, Harold, at St. Petersburg, Florida, and W4KJL, Bob, at Jacksonville, Florida.

New Transceiver!

Clegg Laboratories (headed by Ed Clegg, W2LOY), who created all that excitement with their big Clegg ZEUS, is now in production with the 99'er. This transceiver features a dual conversion superhet with squelch, noise limiter, S-meter, a.v.c. low-noise r.f. amplifier, stability, selectivity, vernier tuning, built-in speaker, 8 watt crystal controlled transmitter (standard 8 mc crystals), and 9 tubes plus rectifier with 14 tube performance. This attractive rig (wired and tested) complete with a.c. power supply and either 6 or 12 volt mobile power pack sells for $110.00. Write to Clegg Laboratories, Rt. 53, Mt. Tabor, New Jersey, for further details. One warning, though: Order your's now—mine still hasn't come through due to the trememdous flood of earlier orders. I understand their first run was completely sold out! More details on this when I get mine installed in the mobile.

Thirty

Meanwhile, how about your helping me a bit by sending along your letters on the latest DX, band openings, and v.h.f. activities in your area? Or how about that preamplifier schematic, new antenna design or 432 mc tripler you never got around to sending in? There may be others interested in your ideas. Let's hear from you soon.

Good DXing, Bob, K2ZSQ

YL [*from page 105*]

WA6EAF, Martha; corr. secy, W6VDP, Mary; treas., K6JCL, Genevieve. Special honorees at the luncheon were mothers of club members. June also is the occasion of L.A. club member W6NZP, Evelyn, celebrating her 25th year as a ham. Evelyn says she will have her personal QSO party with special QSL cards—look for her on 20 and 40 phone.

WRONE no longer requires that QSLs be sent in applying for WRONE certificate. A list of the necessary information can be taken from the QSLs, then signed by two licensed Hams to the effect that they have seen the QSLs, or the list may be notarized. Charge for the certificate has been raised to 20¢ for handling and postage.

33, W5RZJ

W6NAZ Show Rebroadcast

Just received word that the Ralph Edwards TV show, *This Is Your Life,* honoring W6NAZ, Lenore Kingston Conn, will be rebroadcast on the NBC network on August 6th. If you missed the original show (written up in this column in May *CQ*), or enjoyed it as much we did, here's your chance to see a fine tribute to a grand YL, and Ham radio operators in general.

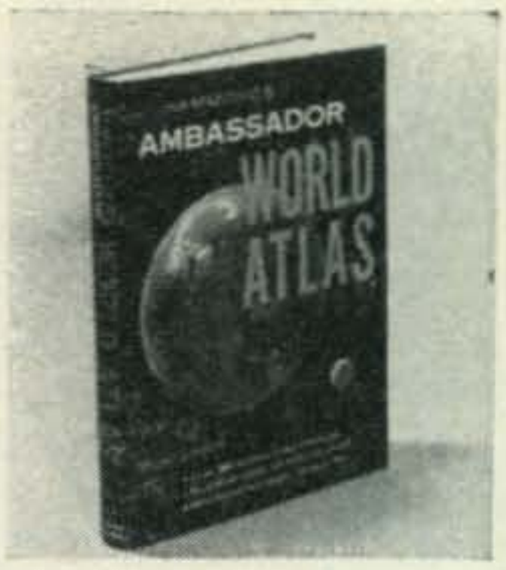
THE CQ HAM MART

19" GLOBE

Here is a chance to preserve your breath for posterity! This beautiful World Globe, made by Hammond, is a must for every hamshack. Plain for $19.95 or lighted for $24.95. The first 10,000 people who jump at this bargain will get a year of CQ at no extra charge.

ATLAS

What! You don't know where Nicobar Island is? Incredible! And with the CQ deal on the Hammond Atlas so reasonable too. This is a reference book that will get good usage around your house if you have any kids. 7 lbs. of colored maps and a gazetteer for only $12.50... and you get a year of CQ.



COMMAND SETS

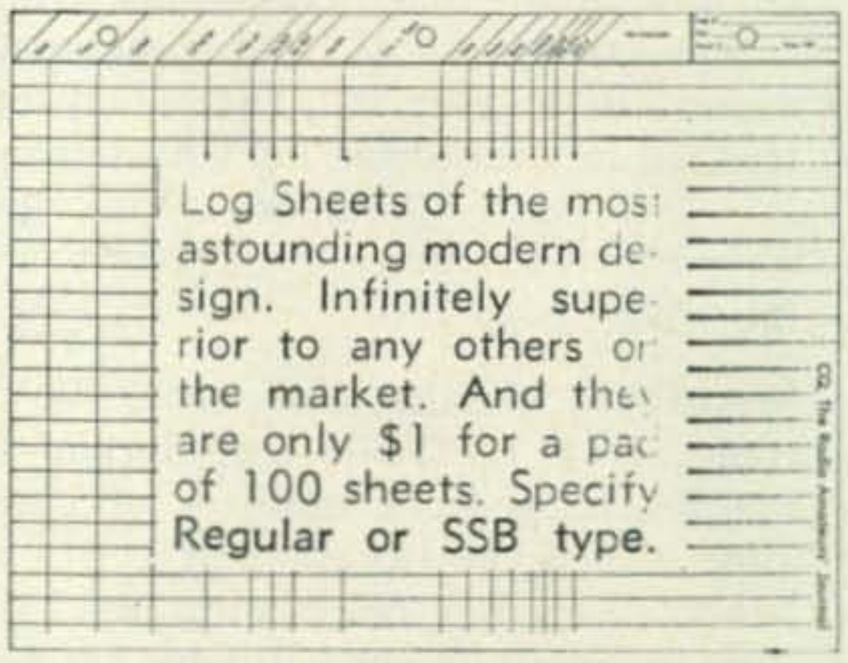
This IS a collection of reprints, containing all of the available information on the conversion of the popular "Command" transmitters and receivers into good ham transmitters and receivers. Invaluable for Novice, Technician, General, Advanced and Extra class operators. 136 fabulous, amazing terrific pages for only $1.50 postpaid.

MOBILE HANDBOOK

Anyone who tries to go mobile without getting this book should register for a sanity hearing. Bill Orr, W6SAI has put everything you need to know in this book. Build-its by the dozen... solutions to ignition problems, keeping the battery charged, noise... only $2.95 postpaid.

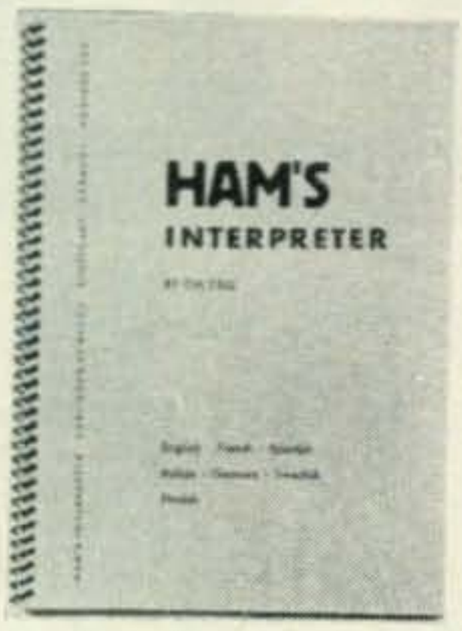
CODE RECORD

Learning code is a snap with this record. Speeds from 3 to 16 WPM, depending upon turntable speed. This 12" LP record has on it all you need to learn the code for both the Novice and General License. $3.50 each.



HAM'S INTERPRETER

Now you can talk in broken French, Spanish, Italian, German, Swedish and Finnish. This handy little book gives all the popular ham conversation in seven languages, including letters and numbers. Only $1.50 postpaid.



TVI HANDBOOK

W1DBM's newly written TVI book (2nd edition) covers all aspects of curing TVI from both the Ham's viewpoint and that of the TV viewer or the TV serviceman. It includes 2- and 6-meter TVI as well as Citizen's Band, Industrial, Medical and Utility TVI. Profusely illustrated with diagrams, photos, charts, tables and FCC regulations pertaining to radio and television interference. Price $1.75 postpaid, USA, $2.00 Foreign.

BINDER

There is no other good way to keep your back issues. Make 'em neat. We supply the binder, with the year embossed in gold, not merely a sticker which will come off later. Specify what year you want stamped on your binder. $3.50 each.

BOUND VOLUME

By far the handiest way to keep your library. Why not go first-class? This impressive volume is only $10.00. We only made a few of them this year, so Don't expect to get one later.

CQ ANTHOLOGY

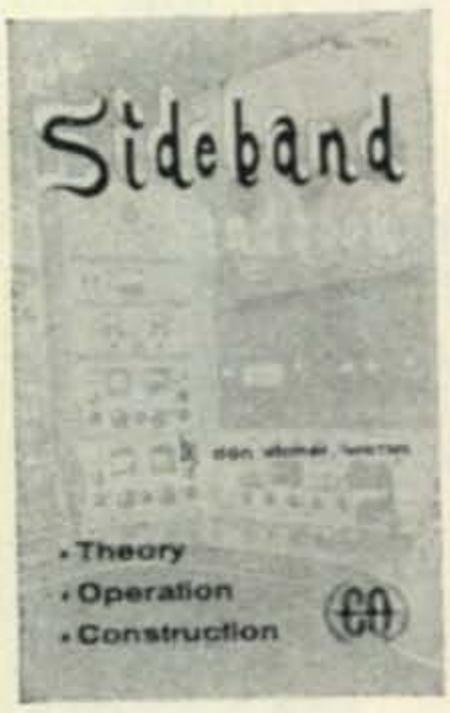
Most amateurs do not have a good file of back issues of CQ. So we've looked back through the years 1945-52 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out. The price is a paltry $2.00.

HI-FI BOOK

This nifty volume contains the latest dope on amplifiers, preamplifiers and equalizers plus a buyer's quide of component manufacturers! Over 150 — 5½" x 8½" pages of heavily illustrated descriptions covering Hi Fi Audio Components—the greatest publication value in its field today. Only $2.50 per copy.

DX ZONE MAP

Brand New! Amateur Radio World-Wide DX & Zone Map complete, accurate and up to the minute with Prefix, Zone Boundaries, Great Circle beam bearings. 4 Colors, 36 by 42 inches on heavy vellum map paper. Mailed in heavy cardboard mailing tube. Only $3.00.



SIDEBAND HANDBOOK

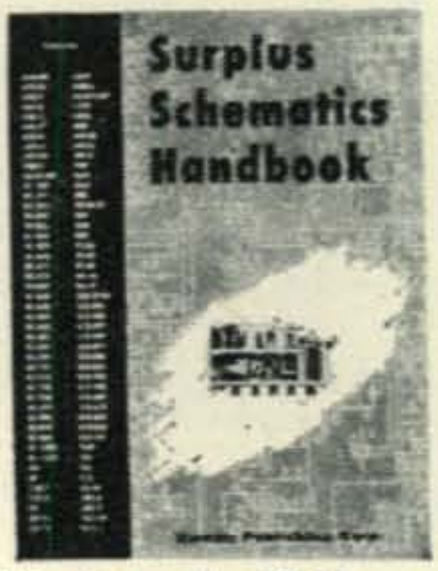
Written by Don Stoner, W6TNS, was almost one full year in the preparation of this terrific volume. This is not a *technical* book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers. Price, only $3.00.

CQ LICENSE GUIDE

212 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator. All this for only $2.50.

SURPLUS SCHEMATICS HANDBOOK

This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many times more difficult than the most involved puzzle, and purchasing a single instruction book can run as high as $3.50. Why knock yourself out when you can have a book with complete coverage on hand in your library? All this for only $2.50.



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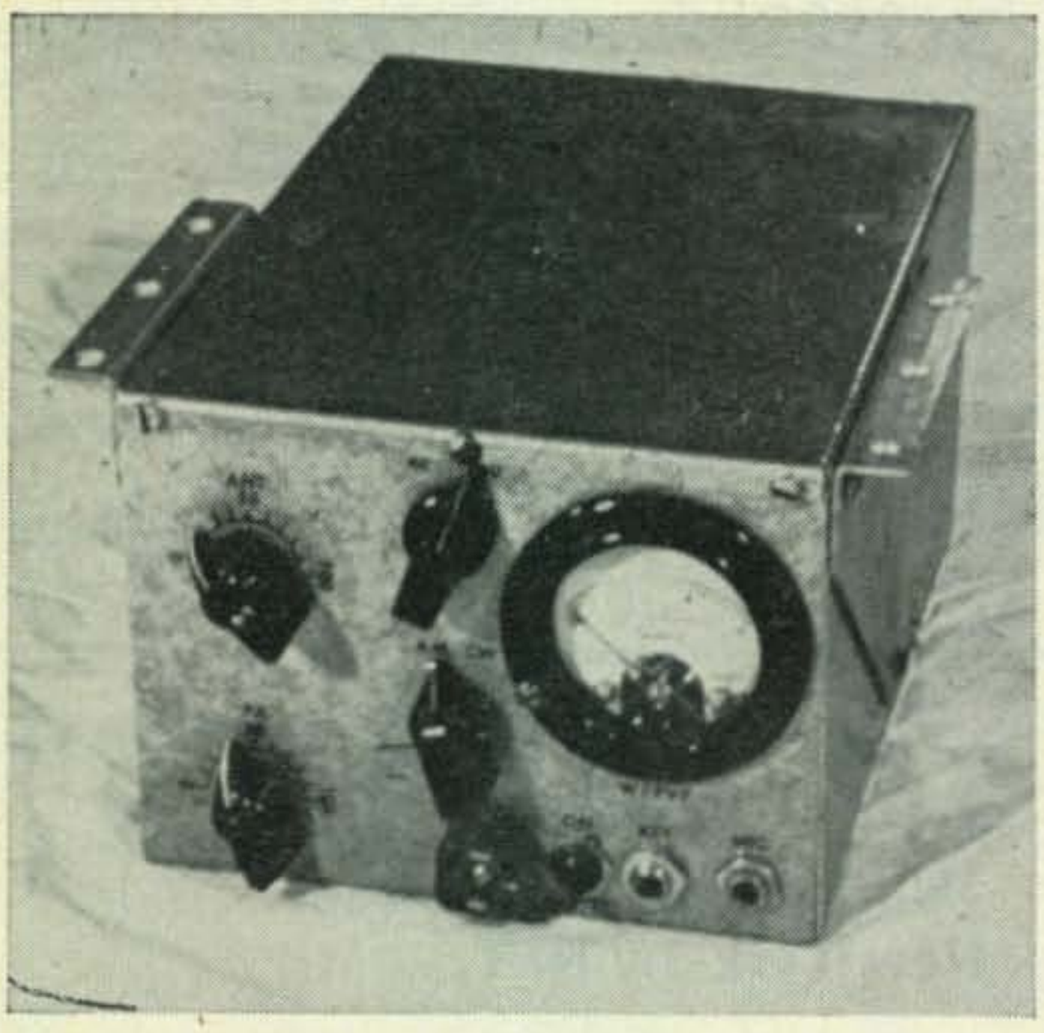
Hybrid Transmitter [*from page 57*]

with a grid dip meter. They can then be pruned until proper resonant frequency is obtained.

9. In case you feel you're getting something for nothing, you're not. In a standard a.m. phone rig, a 10 watt plate power input requires a 10 watt power supply plus a 5 watt modulator. This type of rig requires a 15 watt modulator for 10 watts modulated plate power input, so a relatively large modulator is required. It was felt by the author that it was much easier to build a large modulator and clamp circuit than to build a smaller modulator and power supply. This also simplifies circuitry, makes the unit physically smaller and more efficient.



Transmitter all buttoned up and ready to be mounted beneath the dashboard. The upper left hand control is C_4, ANTENNA TUNING; beneath it is C_3, P.A. PLATE. The knob in the upper center is the BANDSWITCH and beneath it is the A.M.-C.W. switch. Crystal socket, on-off switch, key and mike jack are located in the lower right corner.

Several local stations were worked on 3.9 mc when the rig was installed as a mobile and the reports were all enthusiastic. The modulation is clean and very readable, probably due to the constant 100 percent modulation. The strength of the received signal varies because of voice variations from the modulator and is easily readable at very low signal levels. When the rig was used with a standard broadcast band receiving whip antenna (and no loading coil) the range was found to be about 5 miles. This could have been extended greatly with a loading coil and larger whip because the signal was still S9, but QRM from high power stations made receiving difficult.

The parts used in this rig are inexpensive and not critical. Most of it can be assembled from junk box parts, and it sure helps to keep from buying a power supply. Because the unit is small, it can be mounted under the dash and this will eliminate all kinds of control box and power cable wiring. All in all, I have been very pleased with this rig and am sure you will be, too. ■

Novice [*from page 101*]

Who's DX?

Ray Page, WA6GOP, writes to say that JA1DMX, Aki Akigoshi Ito, 5-231 Hakamachi, Urawa City, Saitama-Pref. Japan, reports hearing many WV and WH stations at 0830 to 0930 GMT about 7175 kc. Aki says "I hope to QSO with many WV-WH stations so I will call CQ W-Novice about 7000 to 7030 kc at 0830—0930 GMT." Don't forget that JA hams can't work in your part of the band so you must look for them at the low end. Aki runs 15 watts to an 807 and has a 9 tube receiver. If you work him, he can be reached for QSL purposes through JARL, P. O. Box 377, Tokyo, Japan.

Letters

How's this for an unusual situation? We have more letters this month from General Class operators than from Novices! How about taking pen-in-hand before we are forced to change the name to "General"?

We could do worse than to lead off this month with a pretty gal! Marie Hickman, WV6NXD, 2400 3rd St., Atwater., Calif., has racked up a total of 40/37 on her WAS scoreboard and DX includes KP4, WL and KH. Marie had to slow up though, for she burnt her key hand recently while cooking.

Johnny Olsen, KN9ZKE, 626 Rice Avenue, Bellwood, Illinois, has been pounding brass since July 25, 1960, and has a WAS of 46/34 along with a start of DXCC of 8/4, including an HB9 QSO. John's rig consists of a Globe Scout 40A, a home brew keyer and an SX-71 receiver. A 40 meter dipole and another for 15 constitute his antenna farm. Johnny will be glad to sked anyone needing Illinois for WAS and would like skeds with Idaho and Utah. Look for him on 21.104, 21.147 and 7158.

Bud Riegent, 3023 Allen, St. Louis 4, Mo. has been KØYIP since September but still likes to QSO in the Novice bands. Bud suggests that anyone with an HQ-110 try replacing the 6C4 local oscillator with a 6100 tube. He claims it brought the signal up 4 or 5 db. He adds that it doesn't take high power to work 'em. Bud placed 4th in the Sweepstakes for Missouri using a DX-40 and folded dipoles.

Bob Ledford, K9YGM, Box 12, Airport Station, Moline, Illinois writes to say that he is also roaming the Novice bands for he likes a good rag-chew so much so that he only worked 38 states and one chunk of DX during his Novice days. Bob is working on an upcoming new Novice—his dad!

Speaking of ham-families, meet Bob and Bill Albrant, K7MDS and K7JYE respectively, of Box 18, Oakridge, Oregon. The boys will be on the 1st and 3rd weekends of the month, on 7163, looking for Novice contacts between 2100 and 2300 PST.

That loads our final for another month. Don't forget to keep those letters and pictures coming!

73, de Don, W6TNS

Propagation [*from page 80*]

Division. Appropriate credit should go to John for his novel suggestion.

Many of the letters received asked if any information was available as to the frequency used by Marconi when he first bridged the Atlantic by radio. Research conducted on this subject by the Marconi's Wireless Telegraph Company of Chelmsford, England indicates that while no techniques were available at the time (1901) for accurately measuring power and wavelength at low frequencies, evidence suggests that the power to the antenna was probably about 10 kilowatts, and the wavelength somewhat less than 2000 meters (150 kc). A picture of the actual antenna system used by Marconi for this historic event is shown elsewhere in this column.

A special report, covering the pioneering work that Marconi did in the field of radio communications, is scheduled to appear in December's *CQ* to mark the 60th anniversary of his historic success in bridging the Atlantic by radio.

73 for now, George, W3ASK

RTTY [*from page 103*]

Filters for the Twin City TU

Of interest to the fellow who isn't sure of the calibration of his audio frequency oscillator, completely tuned-up filters for the Twin City TU have been made available for $6.95 by an RTTYer, Jack Pitts W6CQK. Jack has also made available the band-pass input filter (*CQ*, April '61) for $6.95; and, he can also supply the 255A polar relay, all balanced and with a socket, for $3.25. For the fellow who *is* sure of the calibration of his audio oscillator, Jack has the 88 mh toroid telephone loading coils for $1 each or 5 for $4. W6CQK's QTH is 1307 Alameda, Redwood City, California. *(all prices are postpaid, a real good deal)*

Please Help!

When you write the RTTY COLUMN, be sure to include a *self-addressed stamped envelope . . .* this is only fair. Surely you can spare a stamp and envelope if the information you seek is worthwhile. Help us to help you—remember the stamp and envelope!

Fussin' by the Old Man at the Green Keys

"Some real stinkin' RTTY sigs have been heard lately. On 80 mostly. Fellers just can't seem to sit their shift smack on 850. Wonder what they use fer tuner-helpers, if any. And 3 inch pitcher tubes goin' for only a buck and a half at Surplus Sam's. Should be worth sellin' an extra rooster. Heard a joker on 3640 'tother nite. Callin' CQ for the 'steenth time. His shifter chirped like a leghorn peckin' its way outa the shell. And it had so much hum it made *two* lines on my pitcher tube."

73, Byron, KØWMR

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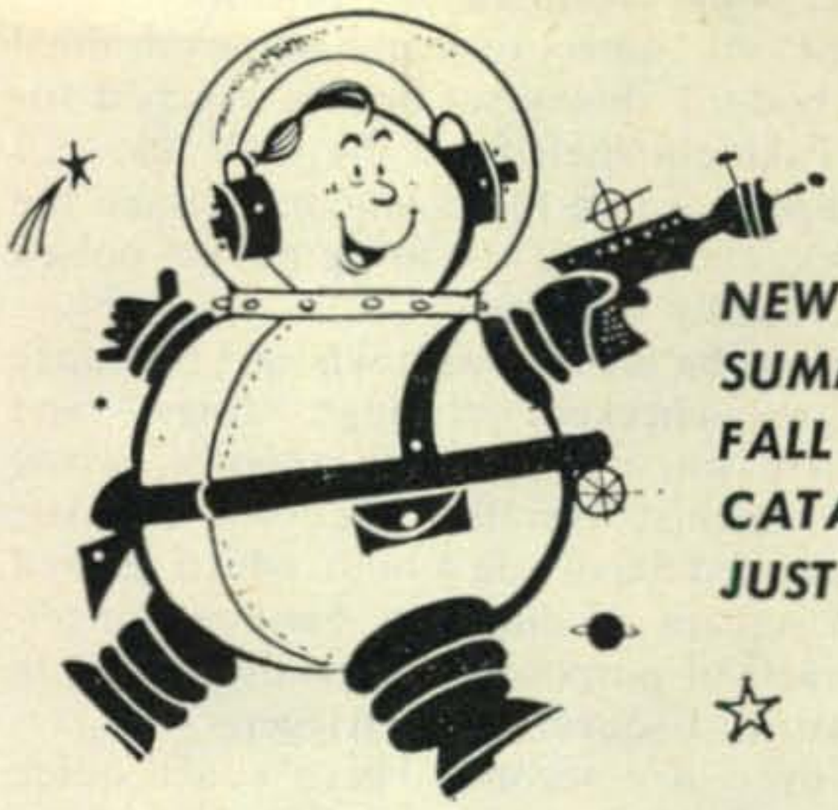

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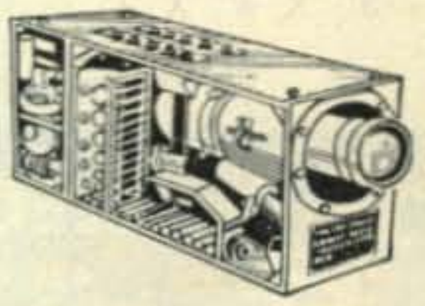

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S. A. R. L.

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Ham Dirge [*from page 66*]

my bloodshot eye. Slowly a horrible impulse seized my brain: this instrument, once such a joy to me, could again be my release.

All conscious control over my actions drained from my body. I slowly sat up and reached for the gun. Taking a shell from the shelf above, I steadily slipped it into the chamber. I closed the bolt. "Click, click," and the firing pin sat poised above the deadly charge.

I looked at the brother with whom I had once roamed, rosy-cheeked, through forest and meadow. He sat, now pale as a ghost, wispy shoulders hunched over that accursed key. His glassy eye rested fixedly on a bulb, which glowed with each scream produced by his bony finger. For all practical purposes he already existed in another world. I squeezed the trigger.

It was over in a second. There was a quick scream, then the sigh of escaping life. Then came the silence, a beautiful, palpable silence that rolled over me like a warm breeze. There was no thought of the magnitude of my crime—only a blessed sensation of peace and freedom. I let the weapon fall and sank back onto the pillow.

Even as I drifted into oblivion I knew that mine was a hollow victory. I could already hear Roy rummaging for something to replace the shattered tubes. ■

Improved Metering [*from page 62*]

first; however, the degree of overload will be within safe limits. If this should cause any concern, a 20 mf electrolytic capacitor, C_2, connected across R_3 (B plus to ground) will dampen the initial surge.

When diode detection is to be employed, place the function switch at the DIODE position and advance the SENSITIVITY control. Maximum sensitivity will be realized when the control is full on (arm of R_1 at opposite end from ground connection). Whenever a grid dipper is used as a diode detector, the contact potential, generated by its vacuum tube, will produce a residual reading on the meter. This usually is 25-50 microamps, but with the amplification obtained with the new arrangement, the residual reading, at maximum sensitivity, will be between one quarter and one half scale on the meter; however, this will not impair the overall effectiveness of diode-detected readings, as these also will be proportionately amplified over those normally obtainable. This added sensitivity will be found extremely advantageous for detecting low level r.f. energy. In this connection it will make the grid dipper very useful for tuning up transistorized equipment.

Since the headphone jack is already grounded to the panel, it is necessary to capacitively couple it to the collector circuit for headphone use. If the jack is to be used for applying audio modulation to the instrument by means of the Millen a.f. oscillator adaper, it will then be necessary to wire the jack inserted in the ground lead of the sensitivity control. ■

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TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00. P.P. DePaul, 309 South Ashton, Millbrae, Calif.

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WANTED: Teletype printers, perforators, reperforators transmitter-distributors, test equipment: Model #14, #15, #19, #26, #28, etc. All types Collins receivers, 51J, R-388, R-390, 75A, etc. Cash, or trade for NEW amateur equipment. Write Tom, W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048).

WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft. Box 399, Mount Kisco, N.Y.

SP-600 JX26 Hammarlund receiver .54-54 mc, $295.00. SP-600 JX17 $395.00. Collins 51J-2, 51J-3, R-390A etc. Teletype, Kleinschmidt printers. RTTY converters. Alltronics-Howard Co., Box 19, Boston 1, Massachusetts (RIchmond 2-0048).

CANADIANS

Complete stocks of nationally advertised products always available at SMALLEY'S — ham headquarters for Western Canada. Ten licensed hams on our staff to serve you.

- TRADE-INS ACCEPTED
- USED HAM EQUIPMENT
- SEND FOR SPECIAL FREE HAM BULLETIN

Pioneer ham suppliers since 1920. Specialists in HI-FI, TELEVISION and INDUSTRIAL ELECTRONIC EQUIPMENT.

Smalley's RADIO LTD.
1105 - 7th Ave., S.W., Calgary, Alta.

For further information, check number 33, on page 126

GUARANTEED CRYSTALS!

ALL MARINE FREQ.-FT-243, DC-34 Holders. Tol. .005....$2.00
POLICE, C.A.P., CD, MARS. Tol. .01% $1.89
CITIZENS BAND—11 METERS—.005% TOL.
26.965 to 27.225 MC, 3rd Over. Herm. Seal. or FT-243..$2.50
13.4825 to 13.6125 MC, 2nd Harm. Herm. Seal. or FT-243 $2.50
6741.25 to 6806.25 Kc, 4th Harm. FT-243 only.....$2.00

SPECIAL! STOCK CRYSTALS
FT-243 Holders 5700 KC to 8700 KC in steps of 25 KC's
SEND FOR FREE CATALOG

79¢ ea.

DC-34 Holders 1690 KC to 4400 KC steps of 1 KC....ea. $.79

NOVICE BAND FT-243 Fund. **$1.19 ea.**
80 Met. 3701-3748—Steps of 1 KC. FT-243
40 Met. 7150-7198—Steps of 1 KC. FT-243
Dbl. to 40 Met. 3576-3599. Steps of 1 KC. FT-243
15 Met. 5276-5312—7034-7083 Steps of 1 KC. FT-243

FT-243—2 Meters (Steps of 1 KC) $1.19
FT-243—6 Meters (Steps of 1 KC) $1.19
FT-243—From 3000-4000 .....$1.19
FT-243—From 1005-2999 (Steps of 5 KC) $2.39
FT-241 SSB Low Freq. Xtals 370 to 540 KC
(Steps of 1.852 and 1.388) .....$.69
FT-241 SSB Matched Pairs $2.39

Open Friday Evenings until 9 P.M.

Include 5c per crystal for postage (U. S. Only) Calif. add 4% Tax. No. C.O.D'S. Prices subject to change. Ind. 2nd choice; substitution may be necessary. **Min. Order $2.50.**

"The House of Crystals"

U. S. CRYSTALS, Inc.
1342 S. La Brea Ave. Los Angeles 19, Cal.

For further information, check number 34, on page 126

Interrogation: Applications are now being accepted for Election into our Research and Administration staff. The function of the organization is non-profit in nature, and will work under contributions and grants. The purpose of the organization is Research in Extra-Terrestrial phenomena; i.e. Radio Astronomy, Propogation, Scatter, etc. If you are seriously interested and would like more information write: Radiometric Research, Ltd., P.O. Box 4335-Annex, Las Vegas, Nevada.

Wanted: R-388/URR receivers, any condition. Electronicraft, Box 399, Mt. Kisco, New York.

WANTED: TELETYPE TG-7, Models 14, 15, 19, 26, 28, printers & reperforators: Rcvrs & xmtrs: AN/GRC-3 & higher, RT-66, -67, -68; Collins 51J, 17L3, -4, 18S-2, R-388, -390, -391; ARN-14 and -30; APR-9, -10, ARC-21, -27, -34; APS-10, -31, -33, -42, etc. BC-639 Receivers and TEST EQP'T, TS or AN/URM. We pay freight. Amber Industrial Corp., 75 Varick St., New York 13, N.Y.

WANTED: World War I French L-3 Amplifier, Mu-Rad receivers and R.F. Transformers for electrical test. Buy, borrow, trade. Also UV206, UV208 tubes Grote Reber, Research-Cottrell. Bound Brook, New Jersey.

GARAGE DOOR OPERATORS $59.95. Rugged chain drive automatic units. Highest quality. Free literature. DEMSCO, INC., Sebring 22, Ohio.

In the Southwest—It's MANNIE'S for Gonset, B&W, and National. Mannie's, 230 South Main Street, Las Cruces, New Mexico.

Super directional microphone picks up a whisper at great distances. Used by detectives, broadcasters. Build for $6.00 with simple materials. No technical skill or special tools needed. Simple plans anyone can follow $2.50. Dee Company, Box 7263, Houston 8, Texas.

QSL's-SWL's, samples 10¢. Malgo Press, 1937 Glendale Avenue, Toledo 14, Ohio.

QSL's. SWL's XYL-OM's. (Sample assortment approximately 9¾¢). Covering designing, planning, printing, arranging, mailing, eye-catching, comic, sedate, fantabulous, DX-attracting, protoypal, snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minnesota.

QSL's—"Brownie" W3CJ1, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QSL's-SWL's: 100 2-color glossy $3.00; 100 QSO file cards $1.00; Sample 10¢. Rusprint, Box 7507, Kansas City 16, Missouri.

QSL's four colors glossy stock forty design send $5 for 200 and get surprise of your life. 48 hour service satisfaction guaranteed, Constantine Press, Bladensburg, Md.

GLOSSY 3-color QSL cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, New Brunswick, N.J.

QSL's, SWL's. That are different, colored, embossed card stock and "Kromekote." Samples 10¢. Home Print, 2416 Elmo, Hamilton, Ohio.

QSL's Samples 15¢. Rubber stamps: Name, Call, Address $1.35. Harry Sims, 3227 Missouri Avenue, St. Louis 18, Missouri.

QSL's-SWL's. Samples free. Kolor Kard Press, Box 9445, Austin 17, Texas.

QSLs—Outstanding—Original—Reasonable prices. Samples 10¢. Super Quantity 25¢. Reasonable. VYS QSLs, 1704-C Hale, Ft. Wayne, Indiana.

QSLS? SWLS? WPE? CB? Largest Variety samples 20¢. (refunded). Sackers, W8DED, Holland, Michigan.

QSL's, SWL's samples 5¢. Nicholas & Son Printery, P.O. Box 11184, Phoenix 17, Arizona.

WØCVU back on the air. Lost Telrex Xmas tree because tower failure. Using 20 meter wide-spaced Telrex and Hy-Gain Thunderbird.

DX-100 Owners: Increase your power output by 50%. Run 240 watts a.m.-300 watts c.w. or s.s.b. Additional 6146 installed in final and all modifications made to increase grid drive and audio. We furnish complete kit of parts and step by step instructions for only $19.95. Order or write for details. Similar kit also available for the TX-1 Apache. W4KUR—W4NZS, Best Radio & TV Service, 610 N. Madison Avenue, Goldsboro, North Carolina.

Wanted: Heath XC-6 six meter converter K3AGG, 27 High Street, Carbondale, Penna.

Used Instruments For Sale: Large selection of slightly used Heath, Eico and Knight signal generators, scopes, VTVM's, Q Meters, and oscillators. Send for list with prices. Wells Electronics Company, 1701 S. Main St., South Bend 23, Indiana.

Mobile power supply for G-76 transceiver. Almost new. First $95 takes. Will ship. Bill Hunter, K6QAT, Box 194, Bellflower, Calif.

"Hamfesters Radio Club announces its 27th annual picnic on Sunday, August 13, 1961 at Santa Fe Park near Chicago. For more information write W9ALS.

For Sale: HT-37 $400.00, Viking "500" $700.00. KØOAD/7 Bob Gammon, 326 South Kenyon Drive, Tucson, Arizona AXtel 6-0106.

Sell: Hallicrafters SX-28, Harvey Wells TBS-50C. Both in good condition. Best Offer. Joseph M. Alvarino K2EFV 684 Onderdonk Ave. Ridgewood 27, New York.

Complete Station: NC-270, speaker, phones; Ranger, mike, key, relay; TA-33 Jr. beam, rotator, mast, cable, connectors and extras. Ready to go on the air, $500. WA2TDH. Leedham, 101 West 23, NYC. WA 4-1825.

813 Transmitter for sale. Three control type first shown January 1954 QST and subsequent handbooks—$150. Complete with power supplies also Heath SB-10 wired—$80. Write: Milton Taffet (W2ERJ) 31 Elliot Rd., Great Neck, L.I., N.Y.

Premium Quality Used Equipment—Over 1,000 units—reconditioned with trial plan and full 90 day guarantee—terms available—write for free lists and top trade-in offer on your present equipment. World Radio Laboratories, Box 919, Council Bluffs, Iowa.

Have DX-100 as new not modified $160, GPR-90 & spkr $390, Model A slicer any reasonable offer, BC 248 110 v.a.c. and Q multiplier, $70, 4-125 A, $20, 813, $7, 8020, $2, 860, $2. Will ship all or any part first check has preference. W8QJR Box 546 McComb, Ohio.

Hammarlund HQ-110C, clock and speaker $180.00. Hallicrafter SX-32 $115.00. Modified globe scout 85 watts phone $60.00. K4WWL 312 Bryant, Dalton, Ga.

1960-TX-1 Apache Mint Condition—$200.00. Allen Blackledge—1923 N. 3rd Avenue, Laurel, Mississippi.

Selling Out: W3MCG going ET3 land. Eldico SSB-100 s.s.b./c.w./a.m. xmtr $275. 3-811's GG linear w/pwr supply 750 watt c.w. $125; both for $369. Many other items, S.A.S.E. for list. R.D. 1 Bx 492, Gibsonia, Pa.

Trade: Vornado automobile air-conditioner for mobile gear. Captain Frank Johnson, 59th Signal Company, APO 34, N.Y., N.Y.

W9JS still looking for that old banjo. Prefer Bacon, Epiphone, Vega, or Paramount. Lots good ham gear to swap or buy. Send full details to Rich, 419 E. Willow, Wheaton, Illinois.

Schematics, Parts, Components Free Catalog: Lezlew Electronics, Box 895, New Brunswick, N.J.

Sale: Gardiner, type 5, automatic code sender, with tapes $22.00. Captain Frank Johnson, 59 Signal Company, APO 34, N.Y., N.Y.

Collins KW-1 like new many extras terms to responsible purchaser. Lloyd Norberg W7EHQ 2502 Jefferson Avenue, Tacoma, Washington.

Low, low prices on good a.m. gear. Rangers, $164.95. Apaches, $199.95. DX-100S, $159.95. 5100B, $249.95. Real deals on s.s.b. gear, too. H & H Electronic Supply, 506-510 Kishwaukee, Rockford, Illinois.

Few surplus 826's, 6V6's, etc. 25¢; 803's $3.00. William Clark, 801 Sutter St., San Francisco.

BC-1004 in gud condition, best offer over $100. S-85 (like new) W/QF1, $90. DX-40 in gud condition, $50. Richard Wilkins, K4VHH, Route 1, Woodstock, Va.

32V-3 Collins finest amateur transmitter like new $399. Easily adaptable to s.s.b. allowing s.s.b., a.m., and c.w. Box 493, Abilene, Texas.

Syracuse VHF Club 7th Annual Roundup October 7, 1961 Three Rivers Inn Speakers, Awards, Floorshow, Steak dinner, many prizes, Write K2TXX 233 Ester St., Minoa, N.Y.

For Sale: Polar Relays Type 255A $2.00 postpaid WØZKN, 1061 Gabriel Dr., St. Louis 37, Mo.

Ranger, A-1 condition, one year old, push to talk $185.00. K2QWG First certified check.

Cleaning House—KWM-1 with noise blanker, 312B-1 spkr., 516E-1 a.c. and 516F-1 d.c. power supply, Mosley MA-3 and mount, 850.00. Viking, FW 6&2 T-Bolt, 325.00. Gonset G-50, 200.00. Gonset G-76 & a.c.p/s, 375.00. RME DB-23, 25.00. Hickok 820 Caddy Pal, 55.00. Viking KW Matchbox, as-is 25.00. Masco RK-6 Disc Recorder, 25.00. Webcor 210 Tape recorder, 35.00. Wollensak 1500 Tape Recorder, 70.00. Also complete Ling ham TV station. Write for details. W5VVF—Box 776 Kermit, Texas.

Sell—Apache $235, GSB-101, $275, KW Matchbox-$75, HRO6O, 2-80, BC and 2 Mtr Conv-$450, 40′ Tower, 20-10 beams and accs-$75. Hickok Tube Tester $125, SW-54-$35. D104 and some accs. One deal $900. K1OAV Andrew, 45 North St., Danbury, Conn.

HT-32A Year Old Perfect Condition $450.00 Will Not Ship. Richard Fries, 2209 E. Penna. St., Allentown, Pa.

Heath AR-3 used little, $20.00. "Bug" $7.50, fair condx. Wanted: DX-20 under $30.00. Snowden, 7AD, Box 1078, APO-241, N.Y.

Clean-up Bargains: 400 watt plate-modulated Pi-final Transmitter $150; Meisner VFO $20; NC-183-D Receiver w/matching speaker $175; Viking VFO; Regency all-band transistor Converter; 150 watt 2-6 meters tabletop unfinished Transmitter $37; DB-23 Preselector; Eldico 100-A SSB Transmitter $260; PA Amplifier; Signal Generator; DX-20 $20; etc. Hurry. Vergne, K2KGU, 420 Riverside Dr., New York 25, N.Y., MO 6-8513.

For Sale: Heathkit MR-1, MT-1, HP-20. Best offer ever $235. Steve, 7008 35½ Avenue North. Minneapolis 27, Minnesota.

Peoria Hamfest, Sept. 17, Peoria Area Amateur Radio Club. Tickets $1.00 until Sept. 9. Write Steve Perry, K9AXG, 505 E. Jefferson St., Washington, Illinois.

Wanted HT-32 or HT-37. Also kw linear. State condition and price. W2GJ, 12 Harbor Road, Oyster Bay, New York.

A Steal At $325: 1000 Watt Transmitter, in Bud cabinet, 6-160 meters, quality construction. Plate modulation. Commercial v.f.o., exciter included. Modified 522 for 2 meters, 20 watts, w/ps $30. Techcraft Converter 5 tubes, sensitive. Spreads 2 meters over 6-10mc, $25. Superpro Receiver w/ps, speaker, and cabinet. 1.5-40mc, recently aligned, $90. RAX Receiver w/ps 7-28mc, $20. All above operating now. Unfinished 250w. c.w. rig w/1250v. ps, $15. Reason for selling all above: college. WA6ABZ, 1055 El Medio, Pacific Palisades, Calif. GL 4-4607.

Dummy Load, 200 watts ICAS; 52 ohm flat, all bands to 2 meters. DL 200 kit. $7.95 postpaid. Ham Kits, Box 175. Cranford, N.J.

Sale Complete s.s.b. Station, SX-111; Heath Apache and SB-10 all in new condition. Also mike and cables $550 Also have Heath Tube Checker, VTVM, and Sig. Generator. K. M. Olinger, W8JSF, 6434 McHugh Pl., Cincinnati, Ohio.

For Sale: Lot of Ham Goodies. Moving; can't take it. Send for list. Make your price. H. J. Hoover, K4PIJ, 1126 Elizabeth St., Eau Gallie, Fla.

SELL. Complete station. All components in good working order and for sale separately. 20-A exciter with 458 VFO $160.00 Homebrew pr. 813 GG final and driver with hvy. duty pwr. supplies. 75A-1 rovr. with C.E. slicer and Q multiplier $190.00. Model 26 teletype with table $65.00. Term. unit, polar relays, electronic key, Jones micro match and a score of other items. Write for list. All inquiries answered. W8CVA, Don Baker, 3416 Pickwick Pl., Lansing 17, Michigan.

Wanted: Tekeronix Scope. Cash or trade. H. T. Cervantes, W2DB, 190 Croton Ave., Mt. Kisco, N.Y.

Clearing Shack. Three 211's $2 each, 813-$14, Heath Balun Coil $8, BC-375-E Transmitter with Manual Less Tubes $24, Tuning Units $4.95, Cases $1.50 each. All above new condition. Following equipment excellent condition: BC-348Q with 110 power 80, S-40 receiver with "Q" multiplier $55, CBY (BC-455) Receiver 6-9.1 mc $8, T20 and T22 Transmitters converted 80 and 40 less power $8. L. B. Daniel, K5SMM, 466 Cummins Street, Jackson 4, Mississippi.

FOR SALE: Factory wired Viking Valient transmitter. Excellent condition. $325. Gerald Hartenstein, K2QEY, 328 Montgomery Avenue. Oceanside, L.I. RO 6-1974.

"The VHF Amateur"—At last a magazine for VHF'ers! Don't miss a single issue! Send $2.00 for year or $1.00 for six big issues . . . 67 Russell, Rahway, N. J.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash to reach item that you want preserved. 24-hour service. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N.Y.

CALL LETTERS may be applied to any surface. 2" sets 60¢, 3" set 80¢. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N.Y.

FOR SALE: Surplus electronic equipment, parts, tubes. Free listing. Enormous stocks. US #1 Electronics, 1922 Edgar Road on US #1, Linden, New Jersey.

MY LOSS IS YOUR GAIN: New: PL5D22 (4-250A) Tube $15.00; 6146 several at $2.50 each; 3E29 $3.00; 75TL $3.00; 808 $1.00; HY4OZ $2.50; Johnson Rotary Inductors 229-202 $5.00; 229-201 $4.50; Collins Modulation Transformer for ½ KW $10.00; Grid Dipper $5.00; 100 Kc Xtal Calibrator (complete) $8.00. Other Miscellaneous, send for list. KØMVR, 424 20th Street, N.E., Cedar Rapids, Iowa.

Original QSL's . . . Dime . . . Filmcrafters . . . Martins Ferry, Ohio.

A-5 — One-inch Vidicon Deflection Components. 5-Piece Model VK-100 Tube Type or Transformer Type Kit: Has deflection yoke, focus oil, alignment coil, horizontal and vertical output transformers. $99 Net. Also, 3-piece Model VK-200 Direct Drive or Transistorized Kit: Has deflection yoke, focus coil and alignment coil. $89 Net. Components available only as above kits. Send check or money order. 10 day unused-undamaged return privilege. Cleveland Electronics Inc., Deflection Components Div., 1947 E. 61st, Cleveland 3, Ohio.

C. Fritz for QSLs that guarantee better DX returns! Samples 25¢ deductible. Box 1684 Scottsdale, Arizona (formerly Joliet, Illinois).

ARE YOU MOVING?

If you expect to move, and IF you know your new address now, and IF you don't want to miss any issue of CQ here are three things you can do right now!

1. Tear your name and address label off the wrapper of this issue and paste it in this box right over these words, or make a complete and accurate copy of your old address label
2. Print your name and NEW post office address in the lines below

(Name)

(Number and street—or Route)

(City) (Zone) (State)

3. Cut out this whole box and mail it to: CQ Magazine, 300 W. 43 St., New York 36, N. Y.

DID YOU KNOW
HAM SHOP ADS ARE NOW 5¢ PER WORD?
(See Page 120)

For further information, check number 42, on page 126

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CQ Magazine, Dept. RS

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New York 36, N. Y.

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Void after
August 31, 1961

Please send me more information on your ads in the Aug. 1961 CQ keyed as follows:

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ADVERTISING INDEX

LAFAYETTE
HAM SHACK VALUES

THE LAFAYETTE HE-30 Professional Quality Communications Receiver

99.50

- TUNES 550 KCS TO 30 MCS IN FOUR BANDS
- BUILT-IN Q-MULTIPLIER FOR CROWDED PHONE OPERATION
- CALIBRATED ELECTRICAL BANDSPREAD ON AMATEUR BANDS 80 THRU 10 METERS • STABLE OSCILLATOR AND BFO FOR CLEAR CW AND SSB RECEPTION • BUILT-IN EDGEWISE S-METER

Sensitivity is 1.0 microvolt for 10 db, Signal to Noise ratio. Selectivity is ± 0.8 KCS at —6db with Q-MULTIPLIER. TUBES: 6BA6—RF Amp, 6BE6 Mixer, 6BE6 OSC., 6AV6 Q-Multiplier—BFO, 2-6BA6 IF Amp., 6AV6 Det-AF Amp. ANL, 6AQ5-Audio output, 5Y3 Rectifier.

Top Value Communications Receiver

KT-200WX
in Kit Form
64.50
5.00 Down

- Superhet Circuit Utilizing 8 Tubes and Rectifier Tube • Built-in "S" Meter with Adjustment Control • Full Coverage 80-10 Meters • Covers 455kc to 31 mc • Variable BFO and RF Gain Controls • Switchable AVC and Automatic Noise Limiter

The Communications Receiver that meets every amateur need—available in easy-to-assemble kit form. Signal to noise ratio is 10 db at 3.5 MC with 1.25 microvolt signal. Selectivity is —60 db at 10 kc, image reflection is —40 db at 3 MC.

HE-28 RF WATTMETER AND SWR BRIDGE

37.50

150 watts full scale—Built-in dummy load—Wattmeter ±5% to 54 mcs. SWR ±5% for in line use.

MODEL TM-15 WAVE METER

8.95

Checks transmitter output for harmonics, parisitics, and out-of-band operation. Provided with magnetic feet. Ideal for the novice.

MODEL TM-14 FIELD STRENGTH METER

6.95

Complete, no wires to connect. Monitor transmitter output, check antennas, etc. Perfect for mobile, provided with magnetic feet.

LAFAYETTE RADIO

165-08 LIBERTY AVENUE, JAMAICA 33, N. Y.

OTHER LOCATIONS

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100 6th Avenue	24 Central Avenue	542 E. Fordham Rd.	182 Route 17	110 Federal Street	139 W. 2nd Street

For further information, check number 40, on page 126

For further information, check number 41, on page 126

TWO SET PERFORMANCE FOR THE PRICE OF ONE

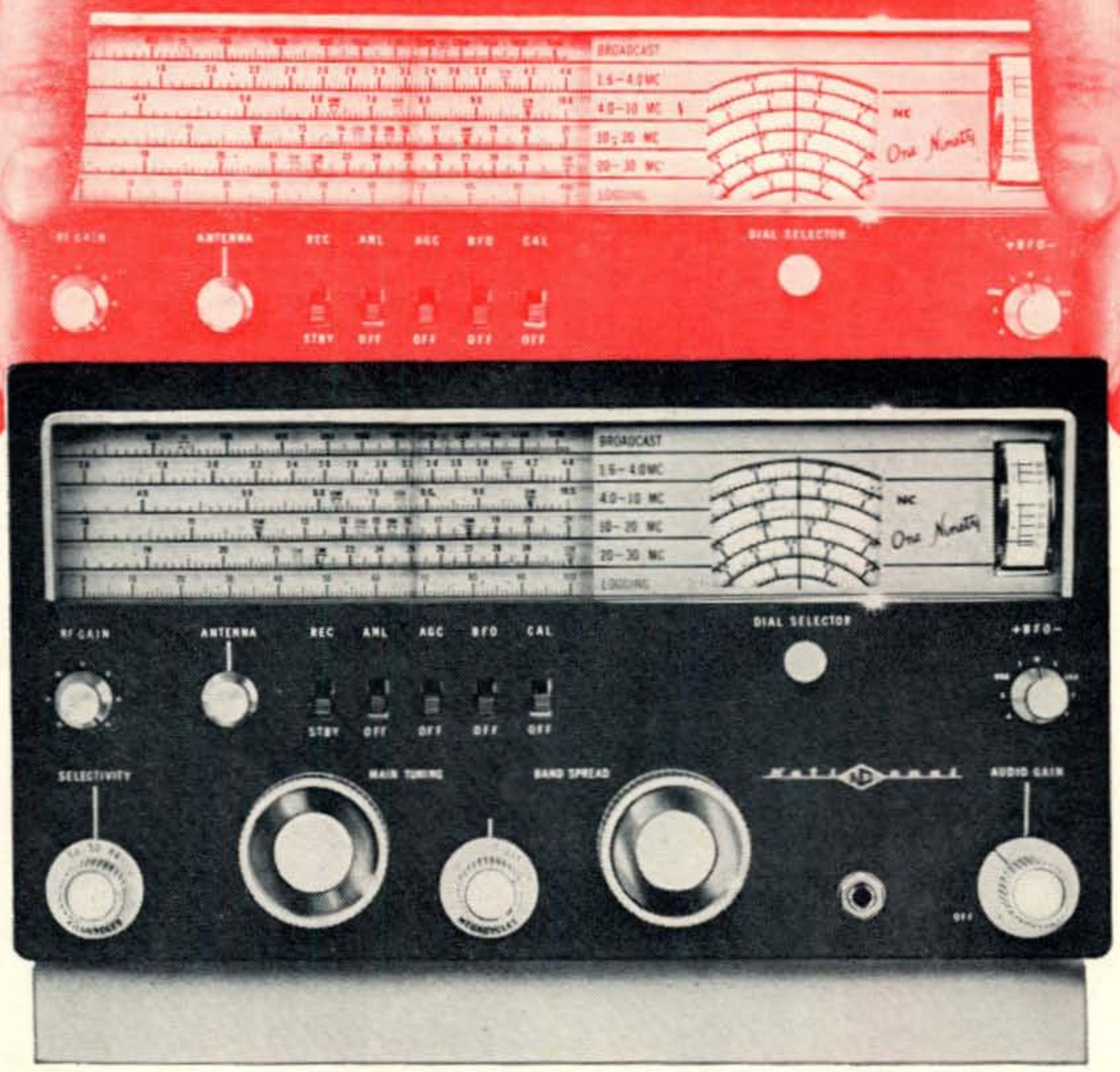
- **Exclusive Dial Selector** instantly converts the finest amateur receiver for the money into the receiver for the SWL by providing calibrated amateur or foreign broadcast bandspreads at the flip of a knob.
- **Double Conversion** for maximum image rejection.
- **Variable IF Selectivity** with ferrite filter for 600 cycle CW, 3 kc SSB and 5 kc AM bandwidths.
- **Five Main Tuning Ranges** for uncrowded calibration from 540 kc to 30 mc.
- **Built in 60 to 1 Bandspread Vernier** for maximum tuning ease.
- **Separate Product Detector and Full SSB/CW AGC**
- **Sensitivity** better than one microvolt for 10db S/N.
- **Voltage Regulated** oscillators and ceramic coil forms for maximum stability.
- **Flip Foot** for maximum operating convenience.

NATIONAL'S NEW NC-190

Only $19.95 down*

Suggested cash price: $199.50.
NTS-3 Matching Speaker: $19.95

(slightly higher west of the Rockies and outside the U. S. A.).
*Most National Distributors offer budget terms and trade-in allowances.



NATIONAL RADIO COMPANY, INC. MELROSE 76, MASS.

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Specifications Subject To Change Without Notice

For further information, check number 2, on page 126

BEAM POWER

for All Powers

Whether you're on SSB, AM, or CW—QRP or QRO—there's an RCA beam power tube for every amateur transmitter power level and for frequencies to 450 Mc and beyond.

Beam power tubes make it practical to build compactness into your rig. They do the job with fewer stages, less expensive components, fewer controls. RCA beam power tubes deliver the power with relatively low plate voltages. Thousands of commercial transmitters prove out these facts.

For more useable "transmitter watts" for your dollars, "Socket-up" with RCA beam power tubes. Check the chart at the right for the types you need—and order direct from your RCA Industrial Tube Distributor.

Popular RCA "Beam" Power Tubes for Transmitter Application
(listed according to power-input ratings)

RCA Type	Class of Service	Max. Plate-Input Watts■	Max. DC Plate Volts■	Max. Freq. For full Input (Mc)	Max. useful Freq. (Mc)	Heater (H) or Filament (F) Volts
5763	CW AM	17 15	350 300	50	175	6.0 (H)
6417	Same as RCA-5763, except for heater voltage					12.6 (H)
2E26	CW SSB AM	40 37.5 27	600 500 500	125	175	6.3 (H)
2E24	Same as RCA-2E26, but has quick-heating filament					6.3 (F)
6893	Same as RCA-2E26, except for heater voltage					12.6 (H)
832-A*	CW AM	50** 36**	750 600	200	250	6.3▲(H) 12.6●(H)
807	CW SSB AM	75 90 60	750 750 600	60	125	6.3 (H)
1625	Same as RCA-807, except for heater voltage and use of medium 7-pin base					12.6 (H)
6524*	CW SSB AM	85** 85** 55**	600 600 500	100	470	6.3 (H)
6850*	Same as RCA-6524, except for heater voltage					12.6 (H)
4604	CW	90	750	60	175	6.3 (F) quick-heating
6146	CW SSB AM	90 85 67.5	750 750 600	60	175	6.3 (H)
6883	Same as RCA-6146, except for heater voltage					12.6 (H)
829-B*	CW SSB AM	120** 120** 90**	750 750 600	200	250	6.3▲(H) 12.6●(H)
7203/ 4CX250B	CW SSB AM	500 500 300	2000 2000 1500	500	—	6.0 (H)
7094	CW SSB AM	500 400 335	1500 2000 1200	60	175	6.3 (H)
813	CW SSB AM	500 450 400	2250 2500 2000	30	120	10 (F)

*Twin-Type **Total for both Units ▲For parallel-heater connection
●For series-heater connection ■Max. Ratings for amateur use

For technical data on any of these types write RCA, Commercial Engineering, Section H-15-M, Harrison, N. J.

The Most Trusted Name in Electronics

RADIO CORPORATION OF AMERICA