November $1.00

CQ

1960 ANNUAL

A Six Tube
uropean Style
5 Mc Converter

ybrid 10 Meter
Transmitter

Versatile R.F.
Monitor

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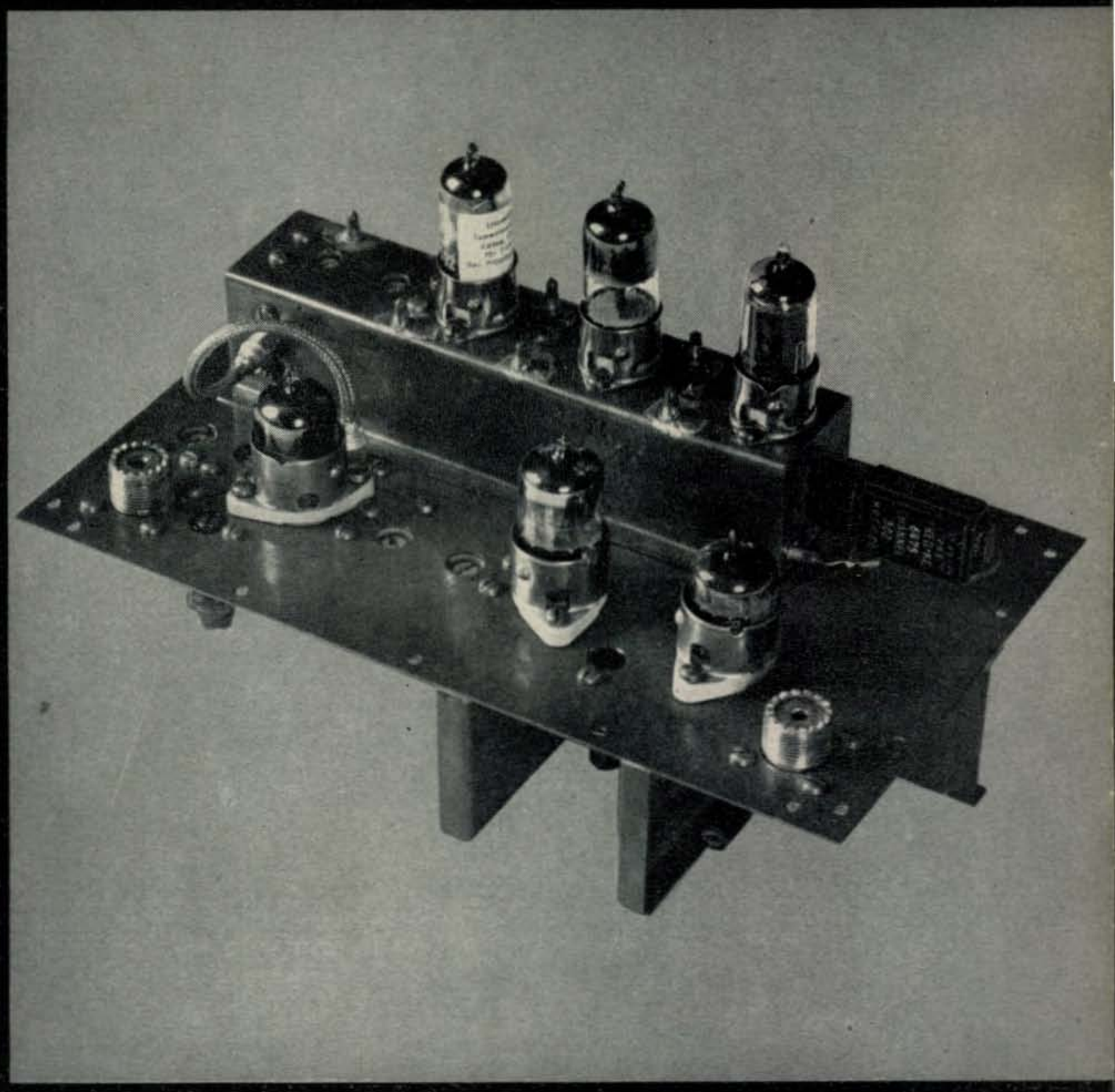
d Predictability

17A Preamplifier
for 144 mc.

e on the "IFNL"



SPECIAL DISTRIBUTOR'S INDEX

The Radio Amateur's Journal

The pride of any room *Collins S/Line*

Those clean, smooth lines of Collins S/Line make this system-engineered single sideband station welcome in your den, ham shack or family room.

The distinctive appearance of Collins S/Line is surpassed only by its advanced circuitry and technical performance. Collins S/Line gives you the cleanest, clearest signal on the amateur bands between 3.4 and 29.7 mc.

Visit your Collins Distributor and discover why Collins S/Line, because of its advanced design and built-in quality, retains its value through the years. Bring your XYL and see why Collins S/Line wins her acclaim for excellence in appearance.

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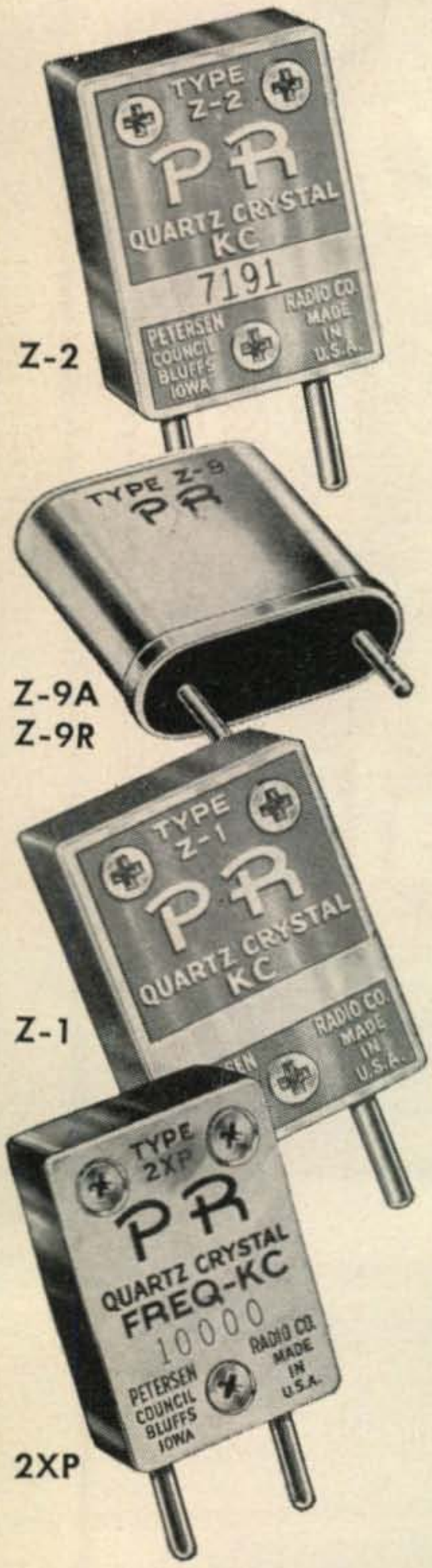
For further information, check number 1, on page 182

It pays to insist on PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934



Z-2

Z-9A
Z-9R

Z-1

2XP

AMATEUR TYPES

40 and 80 Meters, PR Type Z-2

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

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..... **$4.95** 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. **$6.95** 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; calibrated to .005%. (Be sure to specify manufacturer 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 of equipment.)
$2.95 Net

Type Z-9R, Radio Control

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 of equipment)..... $2.95 Net

Type 2XP

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.

COMMERCIAL TYPES

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

Type Z-1, MARS and CAP

Official assigned frequencies in the range. Calibrated to .005%.
1600 to 10000 Kc..... **$3.45** Net

Type Z 1, TV Marker

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

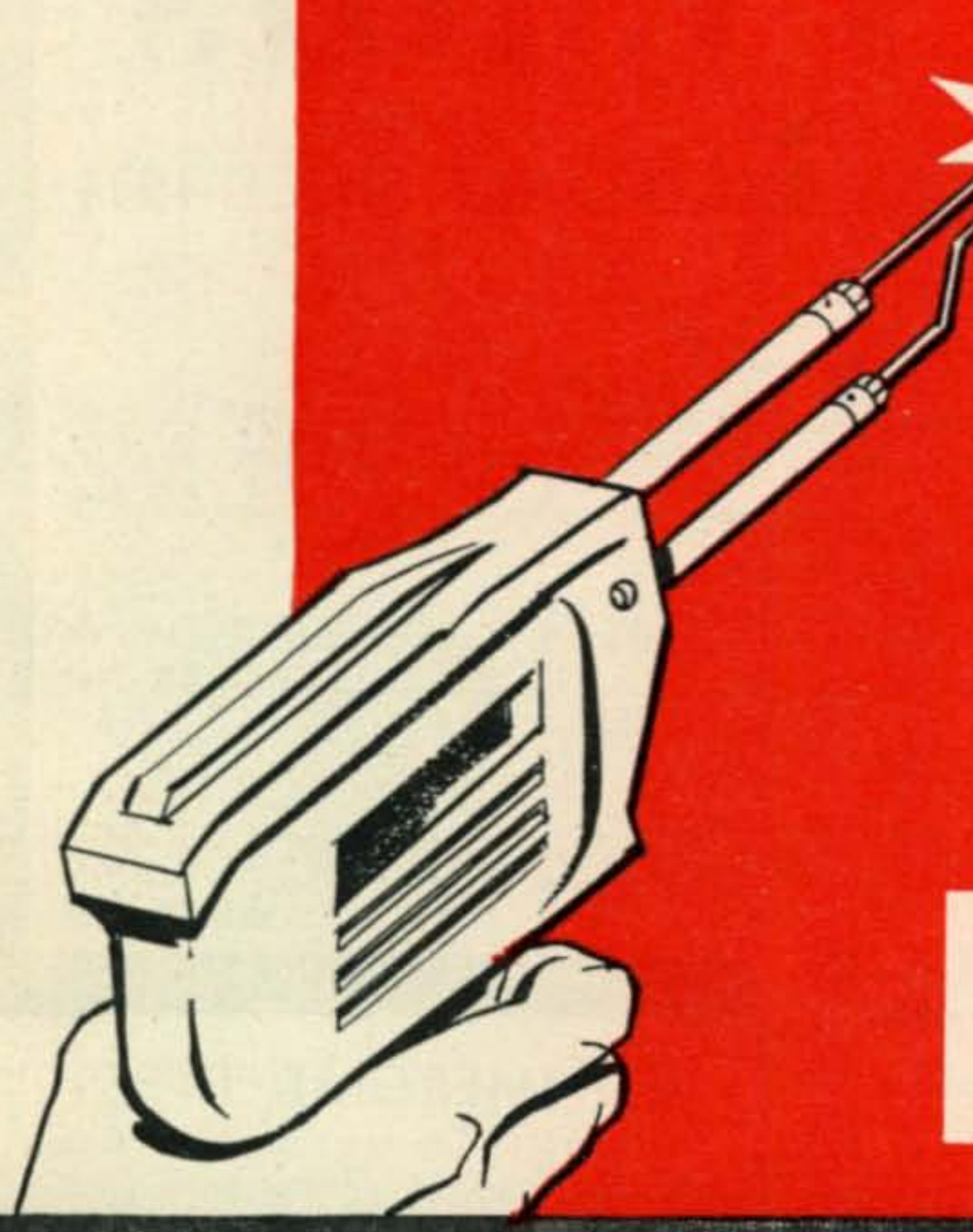
Z-6A

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 182

Very Hot News from hallicrafters



Now you can be a Halli "crafter"! Build this new HALLIKIT AM/CW station. See your distributor.

Two great new kits...a complete, high-performance AM/CW station, from the world's most experienced designers of short wave equipment.

HALLIKITS, we call them—a completely new concept of kit engineering that brings to your workshop, for the first time, these two outstanding advantages:

First, the unparalleled design experience of Hallicrafters' communications laboratories; and *second*, production-line proof of "Constructability" *before you buy*.

Have a wonderful time! Save a bundle of money! End up with a station the most experienced amateur would be proud to call his own.

HT-40 TRANSMITTER, $79.95

A perfect match for the handsome SX-140, both in quality and appearance. Hallicrafters' transmitter leadership is evident in every precision-engineered feature of this crystal-controlled 75-watt beauty—features as important to old-timers as they are to novices.

- **FEATURES:** You get excellent CW performance as well as AM. Full band switching, 80 through 6 meters. Enjoy easy tune-up and crisp, clean styling that has efficient operation as well as appearance in mind. Unit is fully metered, TVI filtered.
- **SPECIFICATIONS:** Maximum D.C. power input: 75 watts. Power output in excess of 35 watts CW, 30 watts peak AM phone. (Slightly less on 6 meters.) Frequency bands: 80, 40, 20, 15, 10 and 6 meters.
- **TUBES AND FUNCTIONS:** 6DQ5 power output; 6CX8 crystal oscillator and driver; 12AX7 speech amplifier; 6DE7 modulator; silicon high voltage rectifiers.
- **FRONT PANEL:** Function (AC off, tune, standby, AM, CW); Band Selector (80, 40, 20, 15, 10, 6); Drive control; Plate tuning, plate loading, Crystal-V.F.O.; Grid Current; Meter; AC indicator light; RF output.
- **REAR CHASSIS:** Microphone gain; antenna co-ax connector; remote control terminals; AC power cord.

SX-140 RECEIVER, $94.95

Doesn't it make sense to team up your skill with the experience of a company who has designed and built more high-performance receivers than any other in the world? Especially when the result is the *lowest-priced amateur band receiver available?*

- **FEATURES:** You get complete coverage of all amateur bands 80 through 6 meters, with extremely high sensitivity and sharp selectivity. Unit has RF stage; S-meter; antenna trimmer; and XTAL calibrator. Tuning ratio is 25 to 1.
- **CONTROLS:** Tuning; Antenna Trimmer; Cal. Reset; Function (AC off, standby, AM, CW-SSB); Band Selector; Cal. on/off; RF Gain; Auto. Noise Limiter on/off; Selectivity /BFO; Audio Gain; phone jack; S-meter Adj.
- **TUBES AND FUNCTIONS:** 6AZ8 tuned RF amplifier and crystal calibrator; 6U8 oscillator and mixer; 6BA6 1650 kc. IF amplifier and BFO; 6T8A 2nd detector, A.V.C., ANL and 1st audio; 6AW8A audio power amplifier and S-meter amplifier; (2) silicon high voltage rectifiers.

P.S. *Both units are available fully wired, and tested. SX-140, $109.95. HT-40, $99.95.*

halli-kits *from* **hallicrafters**

Chicago 24, Illinois

EXPORT SALES: *International Div., Raytheon Co., Waltham, Mass. Canada: Gould Sales Co., Montreal, P.Q.*

...where the new ideas in communications are born!

For further information, check number 4, on page 182

CQ—The Radio Amateur's Journal

November 1960
vol. 16, no. 11

300 West 43rd Street, New York 36, N. Y.

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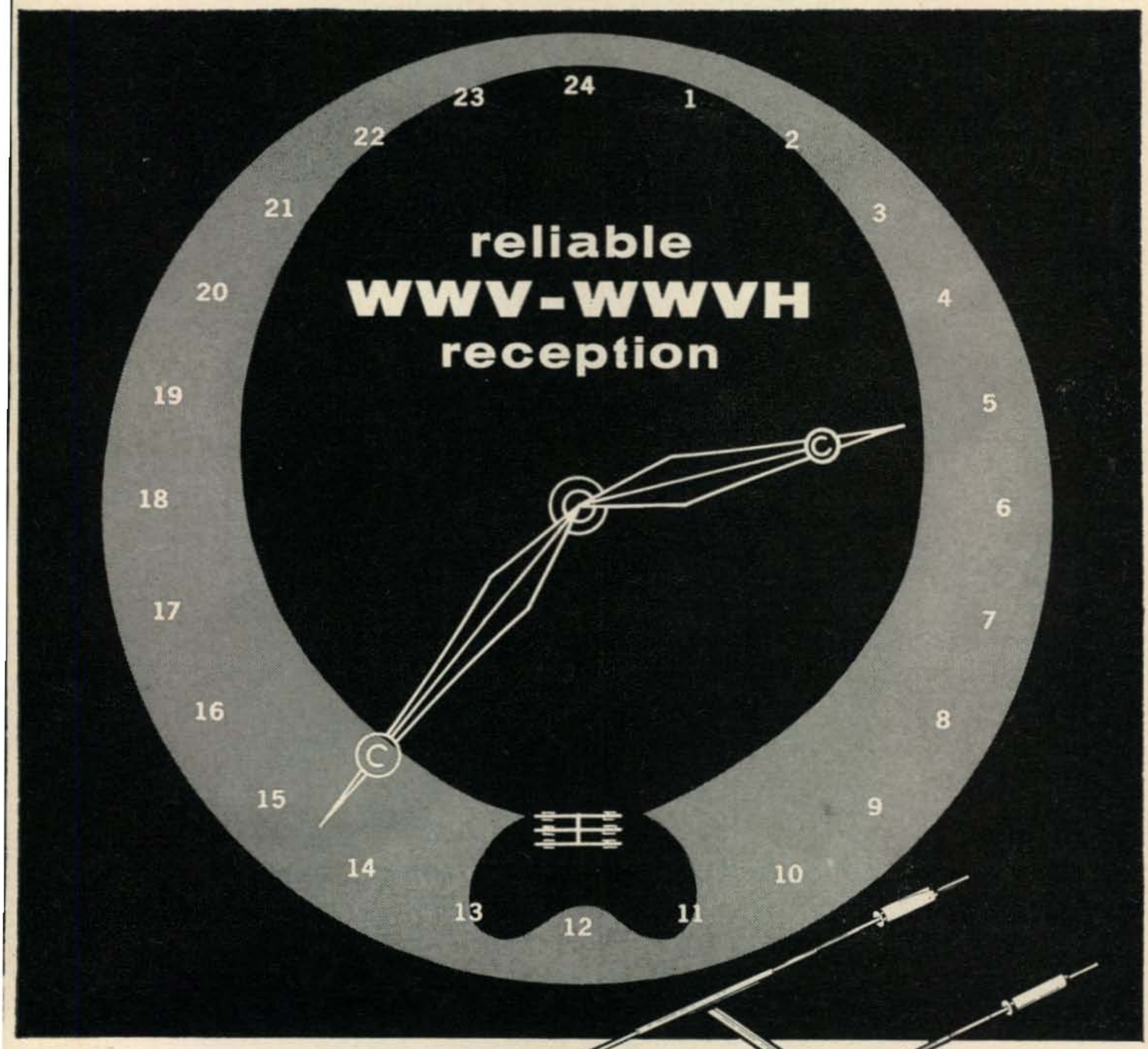

with a MOSLEY WWV-33

3-ELEMENT BEAM ANTENNA

Specifically designed to provide improved long path reception of Bureau of Standards' time, tone and frequency signals on 10, 15 and 20 mc. Uni-directional pattern achieves high forward gain with excellent side and back rejection. Beam is of hurricane construction . . . 100% rust and corrosion proof.

For locations where a bi-directional pattern is permissable, the new Mosley TD-WWV Dipole is the ideal antenna. Completely factory assembled, including 100' RG-58/U coaxial line, antenna features high strength copper-weld wire, ceramic end insulators and weather-stable trap assemblies. ½ wave length resonance at 5, 10, 15 and 20 mc.

Data sheet free on request

MOSLEY ELECTRONICS Inc.

4610 N. Lindbergh • Bridgeton, Missouri

For further information, check number 5, on page 182

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Dick Ross, K2MGA — *assistant editor*

Lee Aurick, W2QEX — *technical editor*

Irving Tepper — *technical editor*

contributing editors

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Ken Grayson, W2HDM — *surplus*

Bob Brown, K2ZSQ — *vhf*

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Irv Strauber, K2HEA
Dot Strauber, K2MGE — *sideband*

CQ, the Radio Amateurs' Journal is published for active hams by active hams. CQ endeavors to be a true and honest reporter for those interested in the hobby. Suggestions for improvement are welcomed.

Manuscripts submitted to CQ should be typewritten double spaced on 8½ by 11 inch paper with adequate margins on both sides of the typewritten copy. Photographs and drawings should be clear and contain adequate explanations. All manuscripts should be accompanied by an envelope and sufficient postage for its return.

CQ CERTIFICATES:

The WPX Award is granted for two-way contact with certain number of amateurs in different prefixes of the world. Full details are contained in the WPX Record Book which is available for 15¢ from CQ. Application forms are free.

The WAZ Award is granted for contacting all of the amateur zones of the world. Current standings of amateurs awarded WAZ will be found in the DX column. A DX Zone map of the world is available free from CQ. Send stamped envelope.

Special SB Certificates are available from the Sideband Department for operators providing proof of contact (QSL cards) with stations in 50, 75 and 100 countries using two-way sideband. Send cards directly to the SB Editor.

TECHNICAL INFORMATION:

CQ's 15-year cumulative index may be obtained free from our circulation department by enclosing a stamped, self addressed envelope (8¢). Most back issues are available at $1 from us. Check our "Back Issue" ad for details on those not available.

THIS MONTH'S COVER:

Featured this month is a European two meter converter illustrating a number of different construction techniques not usually found in American v.h.f. equipment. The complete story starts on page 38.

No doubt you have detected a slightly different style cover this month, which emphasizes the distributor index printed on the special yellow stock starting on page 129. We believe this index will facilitate finding many of the items you have not been able to locate, whether it be parts for home-brew or complete ready-to-go equipment.

For further information, check number 6, on page 182

Just in time for Christmas . . .

HEATHGIFTS

for the Radio Amateur

new through Heath research

$199.95

SAVE UP TO 50%
WITH HEATHKIT
QUALITY ELECTRONICS

NOTE: 6 METER VERSION MODEL HW-10 COMING IN JANUARY 1961

EXPECTED SHIPPING DATE DECEMBER 4, 1960

NEW COMPLETE MOBILE OR FIXED 2-METER TRANSMITTER, RECEIVER COMBINATION . . . ALL IN ONE COMPACT UNIT

- Tracked VFO and Exciter Stages for single knob tuning
- Up to 10 watts RF output to antenna
- Built-in Low Pass Filter
- Built-in 3-way Power Supply for 117 V. AC, 6 V. DC or 12 V. DC operation
- Push-to-talk Ceramic Element Microphone

"PAWNEE" 2-METER TRANSCEIVER KIT (HW-20)

More features, quality, performance and versatility are designed into the new "Pawnee" to bring you the finest in *complete AM and CW facilities* on the 2-meter amateur band. The transmitter section features a built-in VFO with all frequency determining components mounted on a "heat sink" plate for temperature stability . . . plus, *four switch-selected crystal positions* for novice, CAP and Mars operation. VFO and all exciter stages are tracked for convenient *single knob tuning* over any 500 KC band segment (greater excursions require simple re-peaking of final). A *VFO "spot" switch* is provided for zeroing-in signals with transmitter off.

A *6360 dual tetrode final* RF amplifier provides up to *10 watts of power output* to the antenna and a *built-in low pass filter* is incorporated to suppress harmonics and other spurious radiation which might reach the antenna. The *dual purpose modulator* provides a full 10 watts of audio for *high level plate modulation* of the final RF amplifier or 15 watts of audio for *public address operation*, selectable with a push-pull switch.

The receiver is a *superheterodyne* using *double conversion* with the first oscillator *crystal controlled* for high stability. All oscillators are *voltage regulated*. The large, slide-rule type dial with *vernier tuning* provides ample bandspread for both receiver and VFO tuning. Also featured is an RF gain control, BFO, ANL, squelch, AVC on/off switch and *front panel tuning meter*. Meter is automatically switched to read received signal strength or relative power output. Meter and tuning dial are *edge illuminated* for high visibility.

A unique *built-in 3-way power supply* allows 117 VAC fixed station operation or 6 or 12 VDC mobile operation simply by using either AC or DC power cables furnished. The power supply uses heavy-duty vibrator system with silicon type rectifiers in bridge circuit configuration. All sections of the unit are *completely shielded* for maximum stability and noise-free operation.

The "Pawnee" comes complete with *built-in speaker*, two power plugs (AC & DC), heavy duty power cables, primary fused relay for mobile installation, mounting bracket and *push-to-talk* ceramic element microphone with coil cord and mounting clip. Cabinet measures 6" H x 12" W x 10" D.

Model HW-20...34 lbs.... ..... $20.00 dn., $17.00 mo. **$199.95**

more exciting
HEATHGIFTS
to choose from

NEW PHONE AND CW TRANSMITTER KIT (DX-60)

Model DX-60

This successor to the famous DX-40 offers far more than any other unit in its price and power class. Its smart modern appearance, clean, rugged construction and conservatively rated components all add up to ease of assembly and trouble-free operation. New features include a built-in low pass filter for harmonic suppression, neutralized final for high stability, grid block keying for excellent keying characteristics and easy access to crystal sockets on rear chassis apron. A front panel switch selects any of four crystal positions or external VFO. Modulator and power supply are built-in. Single knob bandswitching and the pi-network output provide operating convenience. A tune-operate switch provides protection during tune-up and a separate drive control allows adjustment of drive level without detuning driver. May be run at reduced power for novice operation. A fine kit for the beginner as well as general class amateur.

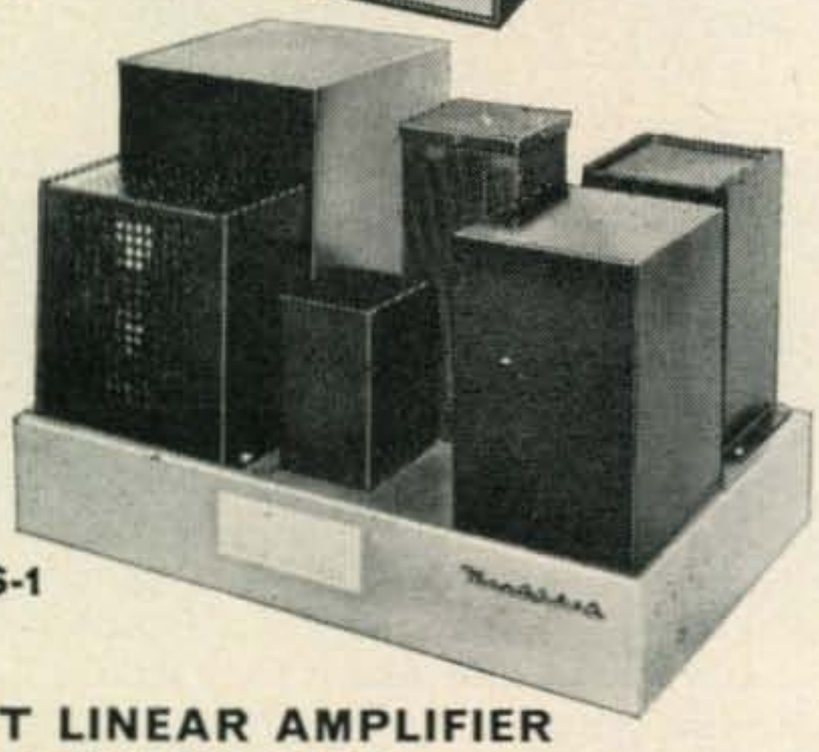
SPECIFICATIONS—Power input: 90 watts peak carrier controlled phone or CW. **Output impedance:** 50-72 ohm (coaxial). **Output coupling:** Pi-network. **Operation:** CW or AM phone—crystal or VFO control. **Band coverage:** 80 through 10 meters. **Power requirements:** 117 V 60 cycle AC, 225 watts. **Dimensions:** 13¾" W x 11½" D x 6½" H.

Model DX-60...27 lbs....$8.30 dn., $8.00 mo.. **$82.95**

Look to HEATHKIT® by DAYSTROM *for the*

Model KL-1

Model GC-1A



Model KS-1

ten transistor battery powered circuit!

"MOHICAN" GENERAL COVERAGE RECEIVER KIT (GC-1A)

Many firsts in receiver design bring you complete portability, high sensitivity, selectivity and stability in this outstanding communications receiver. Features ten-transistor circuit, flashlight battery power supply, ceramic IF "transfilters," Zener diode voltage regulation front end, telescoping 54" whip antenna, S-meter, flywheel tuning and large slide-rule dial. Covers 550 kc, to 32 mc in five bands with calibrated bandspread scales (oscillator tuning) on amateur bands 80 through 10 meters, including 11 meter citizens band. Sensitivity is better than 2 uv for 10 db signal-to-noise ratio on amateur bands. GC-1A quickly converts from battery power to 117 VAC operation with plug-in power supply XP-2 for fixed station operation. 20 lbs.

Model GC-1A (kit)...$11.00 dn., $10.00 mo... **$109.95**

Model GCW-1A (wired)... $19.35 dn., $17 mo. **$193.50**

Model XP-2: 117 VAC power supply for GC-1..... 2 lbs..... **$9.95**

KILOWATT LINEAR AMPLIFIER & POWER SUPPLY KITS

The "Chippewa" and KS-1 power supply combination team up to bring you performance unsurpassed in amateur rig equipment at the lowest cost anywhere! Compare price, features and specifications with any other unit on the market today, and you'll see why any ham would be proud to call this pair his very own! It is the only kilowatt rig with oil-filled, hermetically sealed plate transformer and filter choke and features full kilowatt power in ALL modes of operation (1500 watt Class C capability on dummy load tests). Any of the popular AM, CW and SSB exciters can be used as a driver; provides maximum legal amateur power inputs on 80 through 10 meters, Class AB1 or Class C operation. Power input in Class AB1 attains 2,000 volts P.E.P. with much better linearity than can be obtained with lower plate voltages or other modes of operation.

Model KL-1 "CHIPPEWA" KILOWATT LINEAR AMPLIFIER..70 lbs...$40.00 dn., write for details.. **$399.95**

Model KS-1 POWER SUPPLY...105 lbs. $17.00 dn., $15.00 mo..... **$169.95**

100 KC CRYSTAL CALIBRATOR KIT (HD-20)

Perfect for amateur or service shop use in dial calibration checks of communications receivers. Provides marker frequencies every 100 kc between 100 kc and 54 mc. Transistorized and battery powered for complete portability. Accuracy assured by .005% crystal furnished.

Model HD-20...1 lb.....**$14.95**

now a new improved 6 meter model joins this famous transceiver series

Model HW-29A

new through Heath research

2, 6 & 10 METER TRANSCEIVER KITS
(HW-30, 29A, 19)

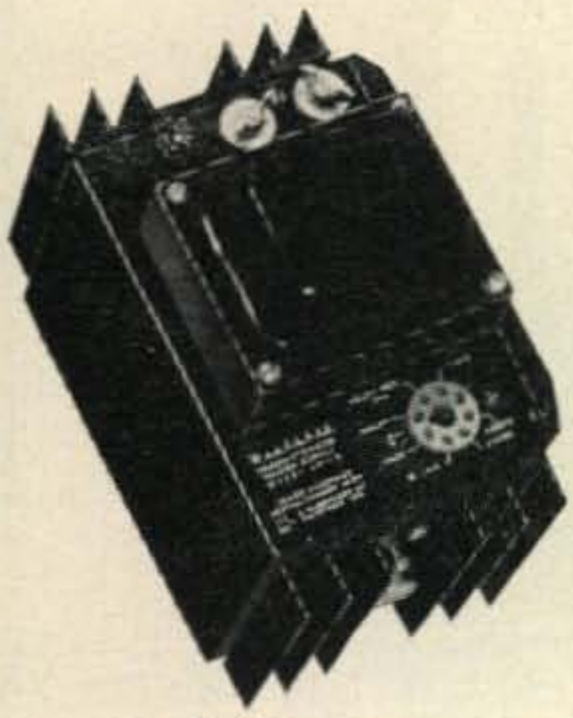
The new 6 meter HW-29A joins "Tener" and "Twoer" to bring you top transceiver performance at the lowest prices anywhere. Like the "Twoer," the new HW-29A multiplies to its output frequency from an oscillator using an 8 mc fundamental crystal for rock steady stability. All models have crystal controlled transmitters and tunable, super-regenerative receivers with RF preamplifiers. Receivers pull in signals as low as 1 uv and the 5 watt transmitter input is FB for emergency work or "local" nets. Features include transmit-receive switch, metering jack, ceramic element microphone, and two power cables. Less crystal. 10 lbs. each.

Model HW-19...(10 meter)..... **$39.95**
Model HW-29A...(New improved 6 meter version) **$44.95**
Model HW-30...(2 meter)..... **$44.95**

Attn. HW-29 owners: Convert your "Sixer" to the new improved "A" model by ordering this easy to install conversion kit. Allows use of 8 mc crystal for maximum stability.

Model HWM-29-1...1 lb..... **$4.95**

best values in Amateur Radio



Model HP-10

UTILITY AC POWER SUPPLY KIT (HP-20)

Furnishes filament and plate voltage for converting Heathkit "Comanche" and "Cheyenne" or other mobile amateur gear to fixed station operation. Delivers 6.3 VAC @ 8 amps or 12.6 VAC @ 4 amps for filaments and 120 watt ICAS DC plate power of 600 VDC @ 200 ma or 600 VDC @ 150 ma & 300 VDC @ 100 ma. Less than 1% AC ripple.

Model HP-20...15 lbs. **$29.95**

MOBILE POWER SUPPLY (HP-10)

Heavy-duty, all semi-conductor circuit furnishes all power required to operate Heathkit mobile gear. With 12.6 v input supplies 600 VDC @ 200 ma or 600 VDC @ 150 ma & 300 VDC @ 100 ma, and —125 VDC @ 30 ma. 120 watt ICAS output rating. Extruded aluminum heat sinks provide efficient cooling of power transistors.

Model HP-10...10 lbs. **$44.95**

new through Heath research

Model HP-20

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SEND FOR YOUR FREE HEATHKIT CATALOG TODAY!

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HEATH COMPANY
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Fill out the order blank below. Include charges for parcel post according to weights shown. Express orders shipped delivery charges collect. All prices F.O.B. Benton Harbor, Mich. A 20% deposit is required on all C.O.D. orders. Prices subject to change without notice.

Please send the following HEATHKITS:

ITEM	MODEL NO.	PRICE

Ship via ☐ Parcel Post ☐ Express ☐ COD ☐ Best Way

☐ SEND MY FREE COPY OF YOUR COMPLETE CATALOG

Name_____

Address_____

City_____ Zone____ State_____

Dealer and export prices slightly higher.

For further information, check number 7, on page 182

In Our Opinion . . . .

Space

Following on the heels of the launching of Echo I, which occurred on August 12, 1960, *CQ* introduced its newest monthly column entitled, "Space Communications." Actually planned a few months prior to the launching of Echo I, the introduction of "Space Communications" was excellently timed and explained quite fully the technical problems involved with Echo I. The National Aeronautics and Space Agency will probably launch more of these satellites in the near future and it is hoped that amateur participation will increase with each new test. During the early days of Echo I, many amateurs, uninformed as to the orbit and speed of the balloon, reported hearing stations and working fellow amateurs never before thought possible. Many of these reports are still under investigation while others have definitely been attributed to the Perseid Meteor Shower which reached a maximum peak during the middle of August. As future launchings of this type are anticipated, we must recognize that careful listening and accurate reporting of such contacts be rigidly maintained. There is no doubt that amateur radio can gain much recognition in the eyes of the public during the progress of these projects. A thorough understanding of the problems of satellite tracking is a must, in order to predict communication path openings. Not unlikely, is the possibility of transcontinental traffic networks established, due to the reflections from 5, 10 or possibly even 100 orbiting satellites. Certainly, a fixed space station is no longer a figment of the imagination whereby communications yielding 100% reliability can be established over distant parts of the globe.

As many ignorant people laughed at "hams" half a century ago, many may laugh at "ham rocketeers" today. We refer you to page 104 for one of the dozens of letters received by George Jacobs, W3ASK since his inaugural column appeared in September.

Here is a tailor-made opportunity for amateurs to participate in an *amateur* project. If successful, and we are sure it will be, no amount of publicity will adequately cover the historic event.

Amateur radio certainly has its work cut out for itself in the next few years. Let's all pitch in and make it a great success.

Our Neighbors to the South

At the end of the year, our neighbors to the south will revoke all reciprocal licensing privileges for United States amateurs, fought for so enthusiastically, and passed only a few years ago. On December 31, 1960, over 200 American citizens now living or working in Mexico will be forced to QRT due to power politics.

If you have ever bothered to check the licensing requirements required by the Mexican Government, you will understand why many of these XE stations will hesitantly close down. Besides a substantial license fee, an applicant must offer reference from one or more persons who have known him for some time. Many of these amateurs now residing in Mexico are businessmen who have seen fit to retire and live their life of leisure in Mexico. Revoking their licenses at this time will, in many cases, deny the main source of pleasure desired in their retirement.

At this time, while many countries throughout the world are opening the doors to amateur operation, it is sad to see our neighbors to the south close theirs.

AMATEURS

CITIZEN LICENCEES

MOBILETTE 61

MOBILETTE 61, International's *new improved* all transistor, crystal controlled converter provides a "quick and easy" way to convert your car radio for short wave reception. MOBILETTE 61, units cover a specific band of frequencies providing a broad tuning range. Mobilette units are miniature size and quickly interchangeable.

Check these all New features . . . New and improved circuit for increased gain . . . New internal jumper for positive and negative grounds . . . New RF amplifier, mixer/oscillator . . . New separate input for broadcast and short wave antennas . . . Mounting bracket for under dash installation.

MOBILETTE 61, is available in a wide choice of frequencies covering the Amateur bands 75 through 6 meters, Citizens band, Civil Air Patrol

CIVIL AIR PATROL AMATEURS CITIZEN LICENCEES

...with improved circuit for mobile short wave reception

Write for International's complete catalog of precision radio crystals, and quality electronic equipment—yours for the asking.

INTERNATIONAL
CRYSTAL MANUFACTURING CO., INC.

18 NORTH LEE • OKLAHOMA CITY, OKLA.

low band frequencies, WWV time and frequency standards. Any frequency in the range 2 MC to 50 MC available on special order.*

Designed for 12 VDC, **MOBILETTE 61** will operate on 6 VDC at reduced output. Power connector plugs into cigarette lighter socket.

See the **MOBILETTE 61** at Your Dealer Today.

Mobilette 61 units cover these short wave frequencies.

Catalog No.	Frequency
630 - 110	6 meters (Amateur) 50 - 51 MC
630 - 111	10 meters (Amateur) 28.5 - 29.5 MC
630 - 112	11 meters (Citizens) 26.9 - 27.3 MC
630 - 113	15 meters (Amateur) 21 - 21.6 MC
630 - 114	20 meters (Amateur) 14 - 14.4 MC
	15 MC (WWV)
630 - 115	40 meters (Amateur) 7 - 7.4 MC
630 - 116	75 meters (Amateur) 3 - 3.6 MC
630 - 117	10 MC (WWV)
630 - 118	CAP (Low Band)
630 - 119	Special Frequencies 2 MC - 50 MC

Complete, ready to plug in and operate . . . . only $22.95

**Special frequencies 2 MC -50 MC.....only $25.95*

For further information, check number 9, on page 182

Letters..... to the Editor

Portugal and Germany

Editor, *CQ:*

With interest, I read the article from K9AMD in the March *CQ* and "Letters", from HB9PL in August, both with reference to license reciprocation. Aside from a number of other countries, a mutual reciprocal agreement exists between Portugal and Germany. As I was required to spend some time in Portugal in 1957 for professional reasons, I inquired in advance, which steps I should undertake to obtain a license in Lisbon. After the usual formalities, and since Portugal was registered as my second domicile, I received, without further complications, my CT license after inspection of my German license by the Portuguese authorities.

At this time I made the aquaintance of W4PN, and his family, who told me the unbelievable story that he tried everything to obtain a license. On my inquiry to the Direcçao dos Serviços Radioelectricos I received the information that Americans need only give licenses to our amateurs under the same conditions. Every "W" will receive a license at once, if his stay is long enough!"

This information makes more sense to me than the stereotyped phrase of the F.C.C., denying licenses to foreigners.

Fritz K. Besgen, DL7BB

Moisture Problems

Editor, *CQ:*

Just thought you would like to know that as a result of the article "Moisture Problems in the Ham Shack," which begins on page 54 in your September, 1960, issue, we have received a good number of requests for our publications relating to the use of calcium chloride to reduce excess humidity.

Apparently, moisture problems are really serious and if any of your readers have missed the reference to our literature and the use of calcium chloride, we will be happy to send free copies of the two publications enclosed on request. These items are "It's Easy to Reduce Humidity," and "Brief MB-30—Air Drying with Calcium Chloride."

Your readership is unquestionably most active, judging from the many requests we have had for copies of our publications, briefly mentioned in the article by Messrs. Root and McCoy.

William F. Reynolds
Editor—CCI NEWS

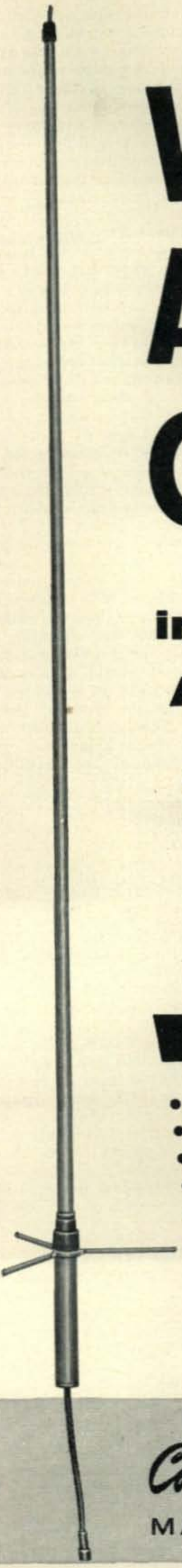
Conditioning The Conditional

Editor, *CQ:*

The recent criticism leveled at the holders of the so-called "mail order" licenses, the Conditional, appear to be quite unfair and have missed the very reasons for the existence of this class.

The Conditional class license is granted to persons living outside a certain radius of an examination point, to the infirmed—those prevented by valid medical reasons from going to an examination point—and to members of the armed forces who cannot always appear in person at an examination point due to duty commitments.

Abolition of this class would prevent otherwise highly qualified persons from obtaining a license and would tend to defeat the entire purpose of the amateur licensing program. There are a great many amateurs in the infirmed class who are bed-ridden or confined to a wheel chair and therefore could not possibly get to an examination center to take the General class test. Most of these amateurs are a great credit to the hobby and most of them can operate



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STATIONMASTER®
Collinear Gain Antenna

is designed to meet the ever increasing need for high antenna gain in minimum space and at lowest cost.

SPECIFICATIONS

- Frequency Range . . . . . **144-174 Mc**
- Omnidirectional Gain . . . . . **5.8 db**
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- VSWR **1.5:1**
- Rated wind velocity . . . . . **100 MPH**
- Weight . . . . . **30 lbs.**
- Element housing length . . . . . **19'**

Communication Antenna Systems for American Business

Communication Products Company, Inc.

MARLBORO NEW JERSEY

circles around the average General. Many of them have had to overcome great obstacles to operate at all, which to my mind gives them a greater right to the air than many Generals have. Amateur radio has brought a very reason for living to many of these unfortunate people and has given them a new lease on life; to prevent them from operating, as several correspondents seem to advocate, would be very cruel and definitely not in keeping with the spirit of our fraternity. Anyone who feels that if they can't take the General exam they shouldn't have a license, should be ashamed of themselves.

Many hams live in very remote areas outside the radius of examination points and even have difficulty in finding a General to administer the test, to say nothing of being able to travel a great distance to an examination center.

As for the servicemen hams, a great many of them are radio operators and electronic technicians. Ham operating for them is like a postman taking a walk on his day-off; during duty hours they are professional, not amateur radio operators, technicians and communicators and they head for their private mike or key every spare moment they get. Again, most of them display operating techniques of which many Generals should be envious. Granted, many servicemen could just as easily take the General exam in front of an FCC inspector, but many cannot; as most readers must realize a G.I. cannot simply tell his boss he's going to take the day off to take a test—the exigencies of the service always come first—those of the individual are always secondary.

No doubt there are some Conditional operators who do not deserve their license, but as one correspondent pointed out, this is the fault of the General who administered the test. If a Conditional gets on the air when he is not properly qualified, the blame lies entirely with the General who helped him on his test; certainly blame cannot be placed on the F.C.C. for providing this class, the Conditional himself can only accept a part of the blame. The test is good, fair and just; it is abused not by the Conditional licensee but by the General ticket holder. If we must criticize the occasional Conditional holder who "goofs," lets put the blame smack-dab on the shoulder of that General or Advanced who gave him the test—that's where it belongs!

Donald P. Hall, K1JWU
7518 Comm. Sqdn, Box 14
APO 238, N. Y., N. Y.

The Crete Lowdown

Editor, *CQ*:

I see in the August issue of *CQ* a list of stations active on Crete and their bands/modes of operation. I have been on Crete for the last 15 months and have operated my own station, SVØWZ for the last 9 months on 7, 14, 21, and 28 *mc* c.w. I am also Station Chief of SVØWT, the Base Club Station.

All operation of SVØWT has been on 14 or 21 *mc* c.w. and phone (A3). No s.sb. (as reported in *CQ*—Aug '60) has been done in the past 15 months and as far as I know none prior to that. No s.s.b. equipment.

SVØWI is listed in the same issue as being active on 7 *mc*. c.w. from Crete. The only man on Crete to ever hold SVØWI returned to the States about a year ago and was never active with that call when he was here. As you know SVØ calls are re-issued immediately (there is a waiting list) upon a licensee's return to the States. The present holder of SVØWI is a Mr. Alfred L. Evans, Dept. of the Army, a Civilian, in Athens.

The current list of Crete calls are as follows:

SVØWC—A little activity with his own equipment 14 and 21 *mc* c.w.

SVØWM—Operates SVØWT

SVØWO—Very active on 14 and 21 *mc* A3 and c.w.

SVØWT—Fairly active between moving the shack (several times in past months). BC-610 and SP-600's which make for difficult hamming.

SVØWU—Operates SVØWT a little.

SVØWX—Operates SVØWT a little—hopes to get on with his own equipment.

SVØWY—Operates SVØWT quite a bit.

SVØWZ—Most active on Crete. 21 *mc* most used.

My old junk at SVØWZ is the same pile I had at KA2SH, but a little more beat up due to a little 10,000 mile trip. Viking II with flat 6146's and a grey bearded HQ-120X. Monday thru Friday normal operating times are as re-

For further information, check number 12, on page 182

ported, 2000-2300 GMT. Week-ends and holidays any time is possible. The only controls on operating hours, is the XYL, Jr. Op., trailer maintenance, yard work, car washing (seldom), PX shipping, and landline telephone ops.

I QSL 100%—naturally, S.A.S.E.'s are appreciated from Stateside contacts. IRC's are not desired and I don't have the time or patience to try and get them converted at the Greek Post Office in Irklion. Greek postage is high—an 80 cent package of QSL's via APO costs $2.00 via Greek surface mail.

M/Sgt S. R. "Sarge" Horn, SVØWZ/W7FTU,
Ex-D4ARJ, 5A4TQ, KA2SH

Australia Award

Editor, *CQ:*

The recently formed Elizabeth Amateur Radio Club is issuing a certificate known as the "Elizabethan Award" to any amateur who has worked a number of Elizabeth stations.

The award, attractively printed black on white is signed by the Elizabeth amateurs listed on the application. Rules:

1. Amateurs residing in call areas VK1 to VK8 inclusive require 8 contacts.
2. Overseas amateurs require 6 contacts.
3. QSO on 50 *mc* or above counts as 2 contacts.
4. QSO with the club station (call not yet allocated) counts as 2 contacts.
5. Short wave listeners may apply, but must include call of station having worked from Elizabeth. (Calling CQ will not suffice)
6. Applications may be made to the Hon. Secretary and should include long details. Date, time, band, etc. (do not send QSL's)
7. All QSO's must be after January 1, 1960.

Some of the calls from Elizabeth are: VK5's — BP, BS, DY, EJ, EU, EV, FY, HA, KD, NO, NQ, PE, PF, QX, ZJM.

Trusting this information will be of some use to you.

Ron Catmur, VK5FY
142 Woodford Road
Elizabeth, North
South Australia

Re: Lighting Protection

Editor, *CQ:*

Probably many hams are using Coax switches with spare outlets which can be used to carry a heavy lead to ground. When the rig is turned off the antenna feed line is switched to Ground position. As in my case the switch is located right at the point of entry to the house so I am not inviting the lightning inside.

R. H. Baynton, VE5VZ
Lloydminster, Sask, Canada

Extra Class Consideration

Editor, *CQ:*

In reference to the letter from W9SCH, August "Letters", I do not entirely agree with some of his suggestions. I have had my General for only one year and have given at least five exams for Novice and Technican licenses. The Novice exam as it stands today is easy for those who have some knowledge of electronics. For some, the Novice exam is hard and involved. To those students for which the Novice exam is too simple, a higher license should be obtained. Personally, I feel that Novices should not have access to any phone transmission as this detracts from the use of c.w. I do not feel that the code required for the Technican license should be changed.

There are a few things that I do agree with in his letter. For one, reduction of power to 200 watts and

[*Continued on page 158*]

Correction

"Crystal Control for VHF", CQ, August 1960

Resistors R_2 and R_4 in fig. 1, page 38, should be 680 ohms rather than 680K.

PENTA PL-175A BEAM PENTODES SELECTED FOR OUTSTANDING NEW "INVADER 2000" TRANSMITTER!

In designing the new "Invader 2000" single-sideband transmitter, the E. F. Johnson Company chose a pair of Penta Laboratories PL-175A beam pentodes for the final amplifier. The 400-watt PL-175A was a logical choice, because it employs Penta's exclusive, patented "vane" suppressor grid, which causes it to deliver more useful output than similarly-rated conventional screen-grid tubes.

If your present transmitter uses conventional 250-watt or 400-watt tetrodes, chances are that you, too, can enjoy the many advantages of Penta's newest tube. Most tank circuits have sufficient tuning range to accommodate the slightly higher input and output capacitances of the PL-175A, and slight retuning is usually all that's necessary to put you on the air with increased power output.

The PL-175A has other advantages, too—such as the lower grid-plate capacitance which reduces neutralizing problems, a complete lack of annoying negative screen-grid current, and a sturdy, solid, one-piece plate cap and seal which has no set-screws or separate parts to loosen or fall off.

Follow the lead of the E. F. Johnson Company's knowledgeable engineers, and get the best for your transmitter—the new Penta PL-175A beam pentode.

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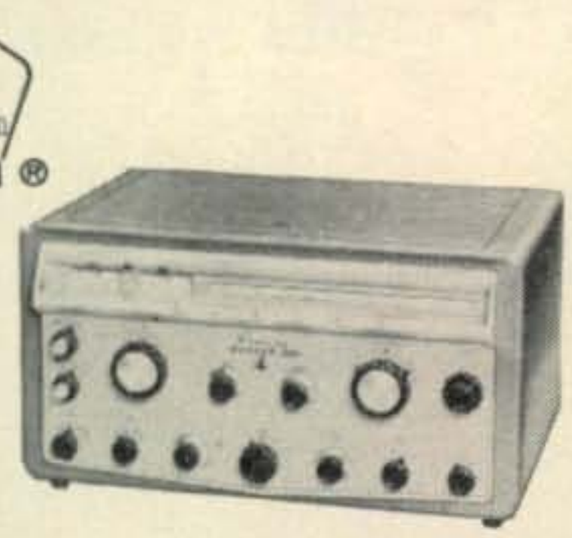
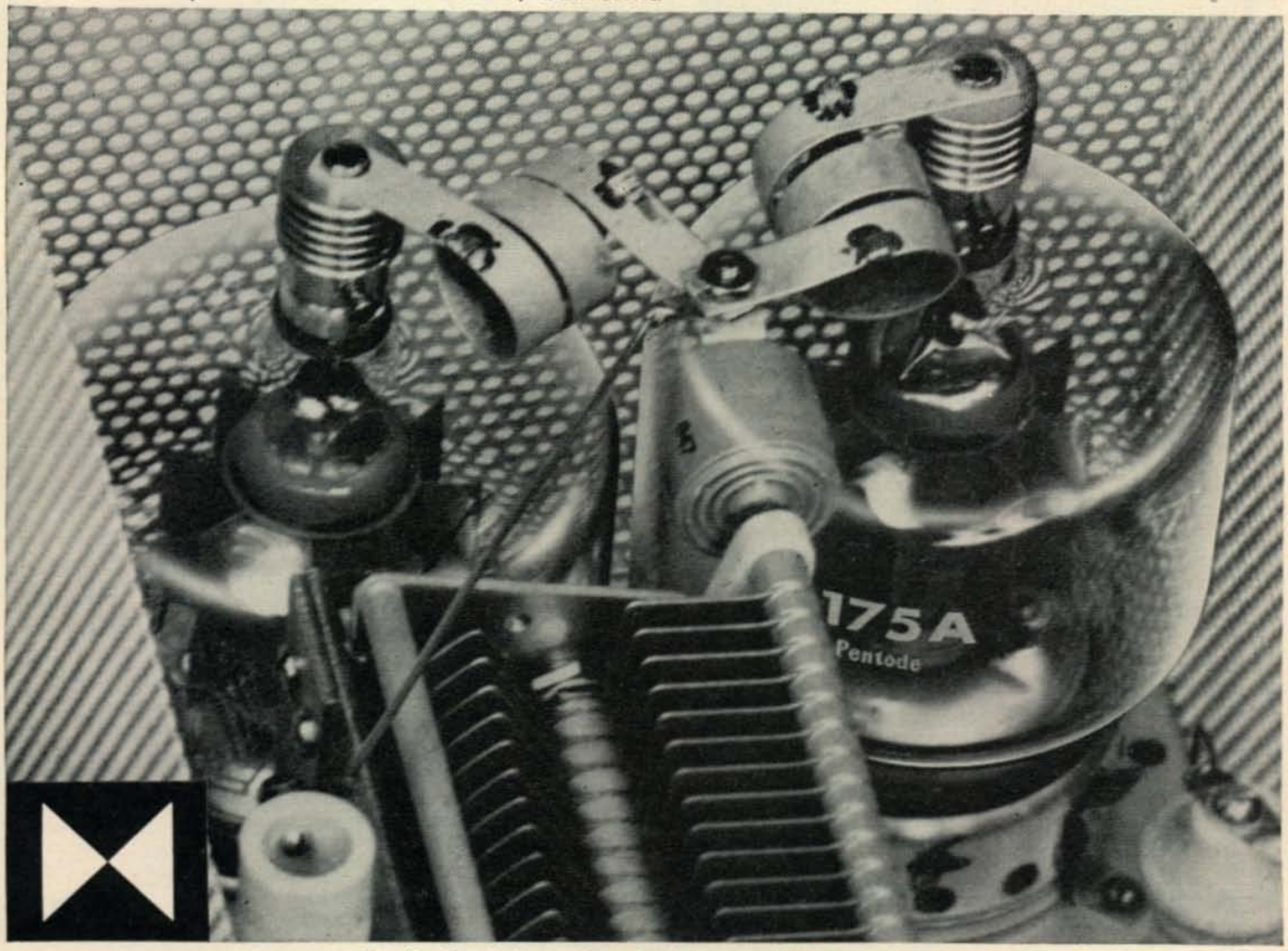
CHARACTERISTICS AND RATINGS		
Filament Voltage	5.0	volts
Filament Current	14.5	amperes
Direct Interelectrode Capacitances		
Input	15.1	$\mu\mu$fd
Output	9.8	$\mu\mu$fd
Grid-Plate	0.06	$\mu\mu$fd
Maximum Plate Voltage	4000	volts
Maximum Plate Current	350	ma
Maximum Screen Voltage	1000	volts
Maximum Plate Dissipation	400	watts

For complete details write for the PL-175A data sheet. Also, ask for your copy of "Transmitting Tubes for Linear Amplifier Service," a nine-page bulletin which shows in detail how and why Penta's pentodes out-perform conventional tetrodes.

TRADE MARK REG. U.S. PAT. OFF.





For further information, check number 28, on page 182

It has come to the attention of this department that many readers are not aware that the announcement service is *free* to all bona fide clubs and amateurs who have valid and timely information to present. Address your correspondence to the announcement section of the editorial office and please submit your material at least 60 days prior to the desired date of publication.

N.Z.A.R.T.

J. G. Sanders, ZL1AUV informs us that the New Zealand Association of Radio Transmitters will hold their 1961 Convention in Hamilton, N. Z. on June 3, 4 and 5, 1961. There is a possibility of early shortages of accommodations so registration should be made as soon as possible. More information may be received from the Convention Committee by writing to P. O. Box 636, Hamilton, New Zealand.

Los Angeles Herald-Express

On August 27, 1960 the *Los Angeles Evening Herald-Express* inaugurated a weekly column entitled "Calling CQ-Ham on Air." This column, to appear every Saturday, is written by Tom Cargo, K6UFL, staff writer for the *Herald Express*.

Southern California, boasting of 24,000 radio amateurs, saw the first article of this series which featured a close-up of Alvino Rey, W6UK, famed electric guitarist.

We reproduce here, Public Notice G-93668 issued by the Federal Communications Commission, dated September 15, 1960 and received by *CQ* September 19, 1960, too late for inclusion in the October issue.

Temporary Use of Amateur Frequencies for Army's Exercise "SOUTH WIND" Not Expected to Cause Interference

The Federal Communications Commission has been asked by the Department of the Army to cooperate in arranging for temporary use of certain frequencies on a non-interference basis to the Amateur Service in the 144-148 *mc* and 220-225 *mc* amateur bands. The request is for the period October 17 to November 12, 1960, and is based on the fact that the U. S. Army Radio Frequency Engineering Office has exhausted all available Government frequencies in the 135-400 *mc* band for radio relay operations needed to support a large Army field exercise (EXERCISE SOUTH WIND) which will involve 100,000 troops in the Elgin, Florida, area. The specific amateur frequencies are:

144.25 *mc*	220.75 *mc*
144.75 *mc*	221.25 *mc*
145.25 *mc*	221.75 *mc*
145.75 *mc*	222.25 *mc*
146.25 *mc*	222.75 *mc*
146.75 *mc*	223.25 *mc*
147.25 *mc*	223.75 *mc*
147.75 *mc*	224.25 *mc*
220.25 *mc*	224.75 *mc*

Although this type of operation would not normally be conducted on amateur frequencies it appears that the proposed temporary military use of these eighteen frequencies as requested, would not cause any undue hardship to amateurs in the area. Because of the locations involved and the directional antennas employed, it is believed that any interference to amateurs will be unlikely, but in the event it does occur, it is understood that the Army will take immediate remedial action.

Compare! The B & W LPA-1

With any of the most popular 1 KW Amplifiers . . . check these 15 outstanding design features . . .

1. Designed for quality performance, yet lowest initial cost—$375.00
2. Designed for long tube life and lowest replacement cost—Type 813's used
3. Designed for a full KW input under CW conditions
4. Designed for 2 KW PEP under SSB conditions
5. Designed for efficiency, in excess of 65% average
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8. Designed for plate current cut-off under key-up conditions . . . built-in bias and filament supply
9. Designed for T-R Switch or Mechanical Antenna Relay
10. Designed for fool-proof operation . . . only two tuning controls
11. Designed for remote control of power supply
12. Designed for use with your own power supply
13. Designed for minimum space . . . requires no more than most receivers
14. Designed with smart clean styling . . . complements other equipment in your shack
15. Designed with heavy duty construction, yet light in weight . . . your XYL can easily move it about

. . . And it's the most copied amplifier by those who build their own.

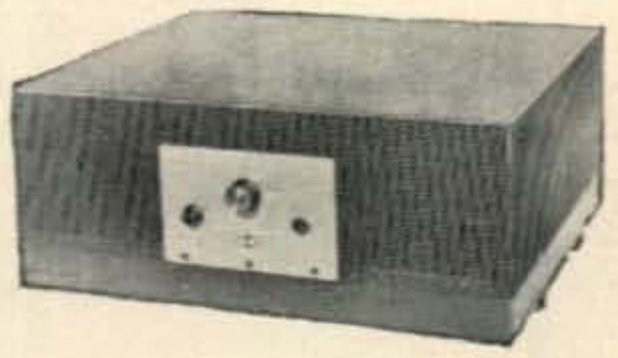
Listen to the LPA-1's on the air. Note the eloquent power packing punch. It can't be drowned out nor ignored . . . it gets through when the going is rough.

See one at your favorite distributor. Discover a real thoroughbred in amplifiers. See its clean, uncluttered design and layout. You'll be amazed at its simplicity, accessibility, quality of components and sturdy construction.

After you have heard and seen a B&W LPA-1 you will want to order one for Christmas. If your local distributor does not have one in stock . . . ask him to get one . . . also write to the factory for complete brochure in full color.

LPA-MU Matching Unit Price $36.00
LPA-MU-2 Matching Unit Price $36.50

LPS-1 Power Supply for LPA-1
Price $205.00



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For further information, check number 15, on page 182

Because of these considerations, the Commission has offered no objection to the proposal and, on behalf of the Army, requests the voluntary cooperation of radio amateurs within interference range of the maneuver area. Such cooperation will not only contribute toward the success of EXERCISE SOUTH WIND but will also further enhance the excellent reputation which radio amateurs have established over the years.

Niagara Peninsula A. R. C.

The Niagara Peninsula Amateur Radio Club has announced an award which is issued to stations making contact with ten members of the club. Members of the club are; VE3AA, AAQ, AFZ, AGB, AIO, ASH, AYS, AUR, BCA, BFJ, BHH, BJR, BKL, BKO, BTI, BTO, BTP, BYA, CEG, CHF, CKU, CMH, COZ, CTM, CVS, CWQ, CYX, CZC, DEB, DEE, DFW, DHK, DQJ, FH, JZ, OC, OL, SU, TW.

More information may be obtained by writing VE3BJR at 590 Brickly Avenue, Niagara Falls, Ontario, Canada.

TV Filters

Lou Epstein, K9REN, has compiled a list of TV manufacturers supplying high-pass filters with information on how to get them. Write to Lou for a copy of this handy list enclosing 10c and a self addressed, stamped envelope.

Terry County A.R.C.

The Terry County A.R.C., (W5HPI) will hold their annual Hamfest on November 13. For more information contact K5LSO, 1004 South 6th St., Brownfield, Texas.

French Reciprocation

F9MH informs us that very shortly, the French Government will remove all existing red tape and reciprocal licensing privileges will exist with all Canadian amateurs no matter what their immigration status may be. We hope this break through is a sign of more reciprocation privileges which will enhance further governments to ease restrictions for amateur radio operation.

Fort Wayne Radio Club

The Fort Wayne Radio Club will hold their 40th annual Feast on Saturday, November 12, 1960. Earl Springer, W9BWI of Indianapolis will speak on "Hams in Outer Space". For further information write: R. Mitchell, W9PEP, 3012 McDonald St., Fort Wayne, Indiana.

MARS BULLETINS

Air Force MARS Eastern Technical Net

Sundays 2-4 PM EST.....3295, 7540, 15,715 *kc.*

Nov. 6—"Trip Report; Impressions Of The Technological Status Of Electronics Production In The U.S.S.R." Mr. E. R. Behn, Bosch-Arma Corporation.

Nov. 13—"Trip Report; Impressions Of An American Engineer-visitor To The U.S.S.R." Mr. R. Popkin-Clurman, Telechrome Corporation.

Nov. 20—"Electromagnetic Compatibility." Mr. D. Wildfeuer, American Bosch-Arma Corporation.

Nov. 27—"Applications Of Ultrasonics." Mr. A. Paley, American Bosch-Arma Corporation.

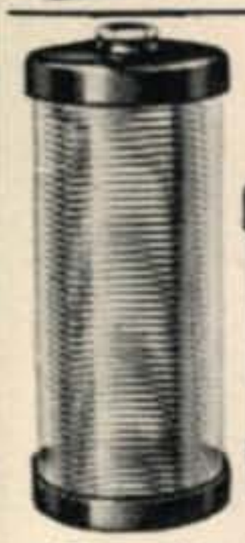
Dec. 4—"Principles Of Guidance And Navigation, And Inertial Devices." Mr. David P. Sarett, American Bosch-Arma Corp.

MASTER MATCHER & FIELD STRENGTH METER

6 or 12 volt models

Complete **$24.95**

Automatically tunes entire band by remote control.



ULTRA-HI-"Q" COILS FOR 80, 40, 20, & 15 METERS

Your Choice **$5.25 ea.**

The coil with the highest "Q" ever obtained. Tested and found to have a "Q" of well over 515. Use with 36" base sect. 60" whip. 3" Dia.

NEW! SLIM-JIM ALL-BAND BASE LOADING ANTENNA COIL

96" WHIP

FOR 10, 11, 15, 20, 40, 80 METERS

SIZE 1⅜" x 19"

Positive action, just slide whip in or out to loading point and lock nut into position.

NO. B-1080

$17.95

MULTI-BAND ANTENNA COILS

New Plug-in type coils, designed to operate with std. 3' base and 5' whip.

NO. 900
10-15-20-40-75

NO. 999
10-15-20 MET

NO. SSB-156
40 & 75 M.

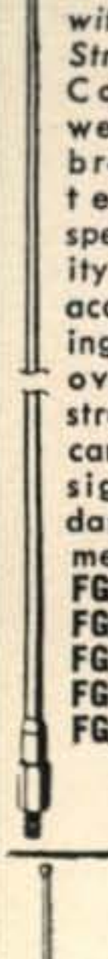
• Rigidly tested & engineered—found to have "Q" of 525 • Handles 500 Watts input • Operates into a 52-ohm cable • Positive contact—noisefree, troublefree operation • Weathersealed • Factory pre-tuned—no adjustments needed. YOUR CHOICE EA **$14.95**

FIBRE-GLAS WHIPS

The Feather-Weight Antenna with Spring-Steel Strength!

Completely weather proof, breakproof antenna with special flexibility that prevents accidental shorting-out against overhead obstructions which can cause loss of signal, serious damage to equipment.

FG-60 60" $4.95
FG-72 72" $4.95
FG-84 84" $5.15
FG-96 96" $5.25
FG-103 103" $6.95



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MONOPOLE ANTENNA

Folded radiating element for installation requiring a ground plane configuration and a wider useful range.

11 Met. . $24.50
10 Met. . 24.50
6 Met. . 16.95
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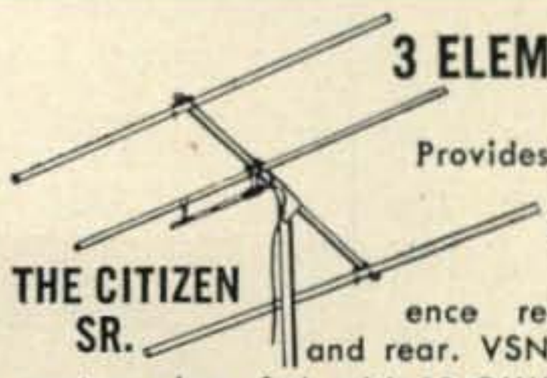
SR-600

3 ELEMENT 11M. BEAM NO. SR-500



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MASTER-MAGIC WAND

New easy-to-install, single band, top-loaded plastic covered fiber glass antenna provides maximum performance at the most useful radiation frequencies.

10 Met.- 5 Ft. L $8.95
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20 Met.- 5 Ft. L. 8.95
40 Met.- 6 Ft. L. 9.95
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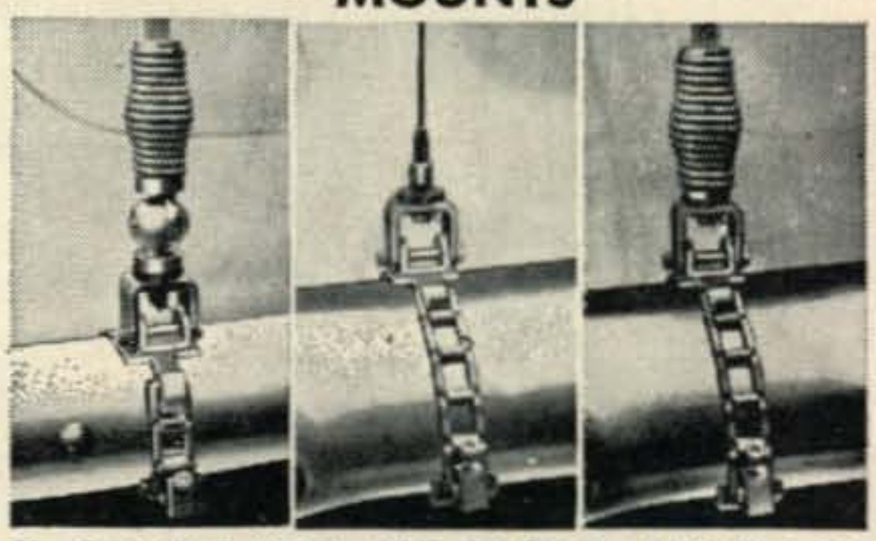
MOUNTS



No.444 $17.80 No.445 $7.95 No.446 $13.45

Adjustable to any bumper. No holes to drill.

SKYMASTER COAX ANTENNA

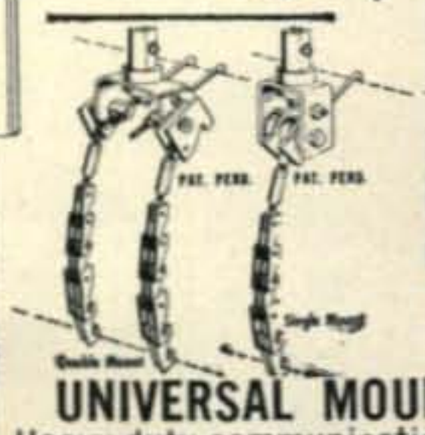
Gets your signal through where others fail. Concentrates signals at the lowest angle, provides omni-directional pattern for best coverage. Matches RG 59/U Cable. SM-700

11 Met. . . . $17.95
10 Met. . . . 17.95
6 Met. . . . 15.95
2 Met. . . . 10.95

11M. CITIZEN BAND ANTENNA

40" base loaded S.S. whip antenna. Fitted with a ¼" dia. brass slug for all-purpose mounts. Low standing-wave ratio on most of band when fed with a 52 ohm coax.

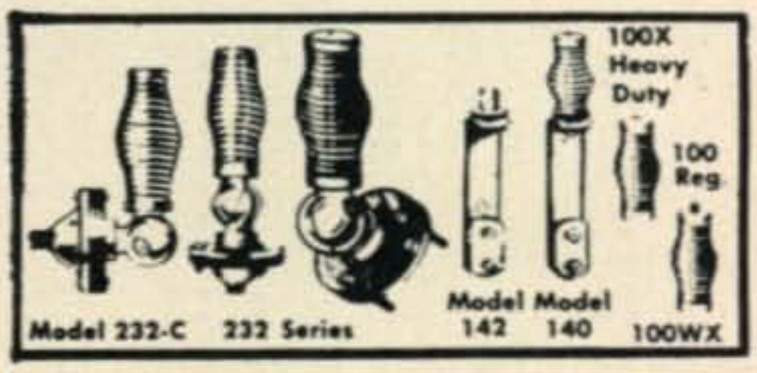
8B-27 **$12.95**



UNIVERSAL MOUNTS

Heavy-duty communications antenna mounts. Either mount can be attached through openings as small as 3/16". Receptacle for spring or whip with phenolic insulators. 3/8"-24-thread.

MM530 Deluxe Dbl. SS. $21.95
MM531 Deluxe Sgl. SS. 11.95
MM520 Dbl. St-Cad. Pl. 7.95
MM519 Sgl. St-Cad. Pl. 4.95



MOUNT

Smaller version of Master Mobile Mounts, less spring. Swivels, mounts in all positions. ⅜"-24 thread for Magic Wand, and all Master Antennas.

No. J-11 **$2.95**

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All products are for Universal Use-Mobile, Home, Marine, C.A.P., Civil Defense, Emergency, etc.

Master Mobile Mounts, Inc.

4125 W. JEFFERSON BLVD. • LOS ANGELES 16, CALIF.

AT LEADING RADIO JOBBERS EVERYWHERE

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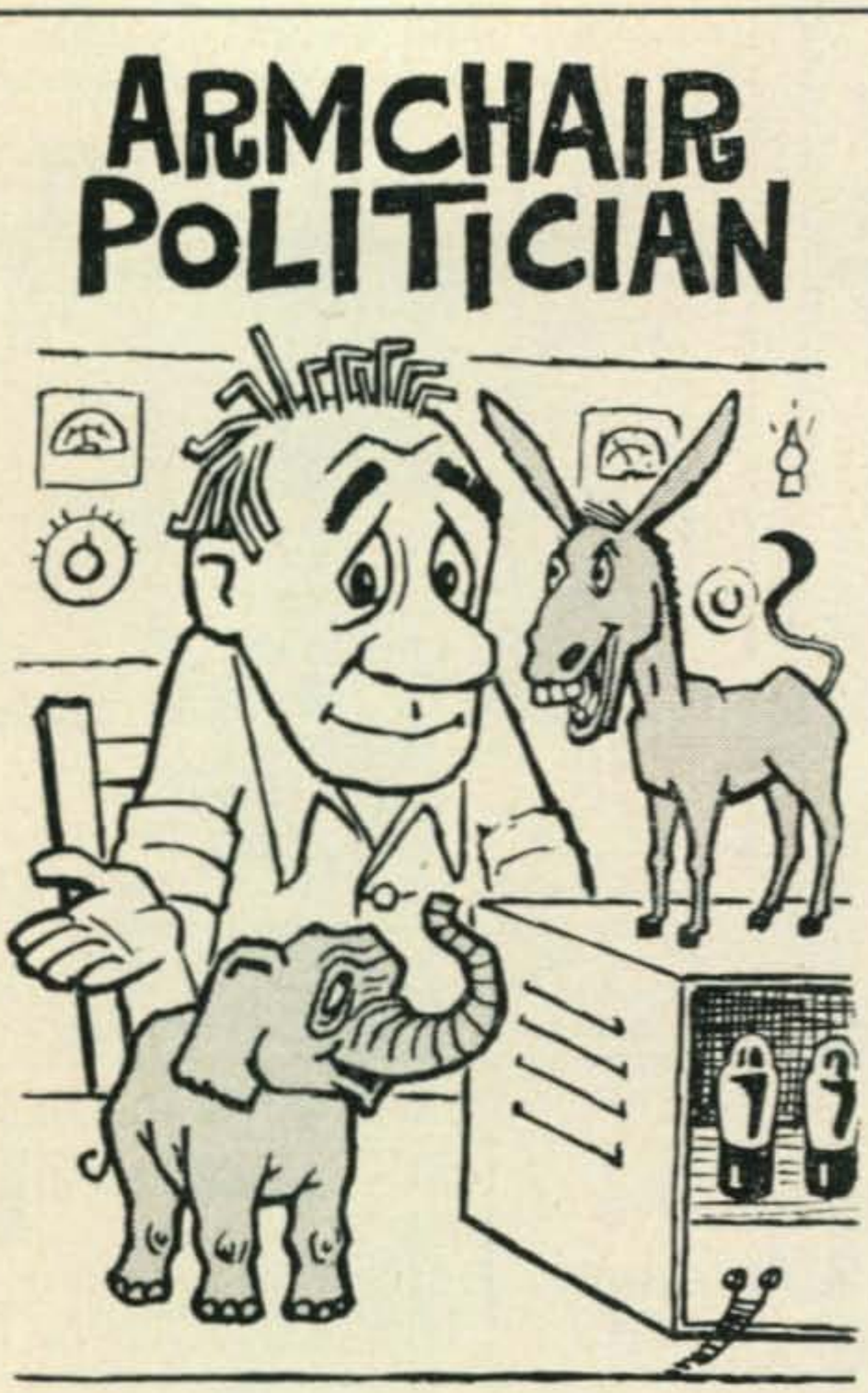


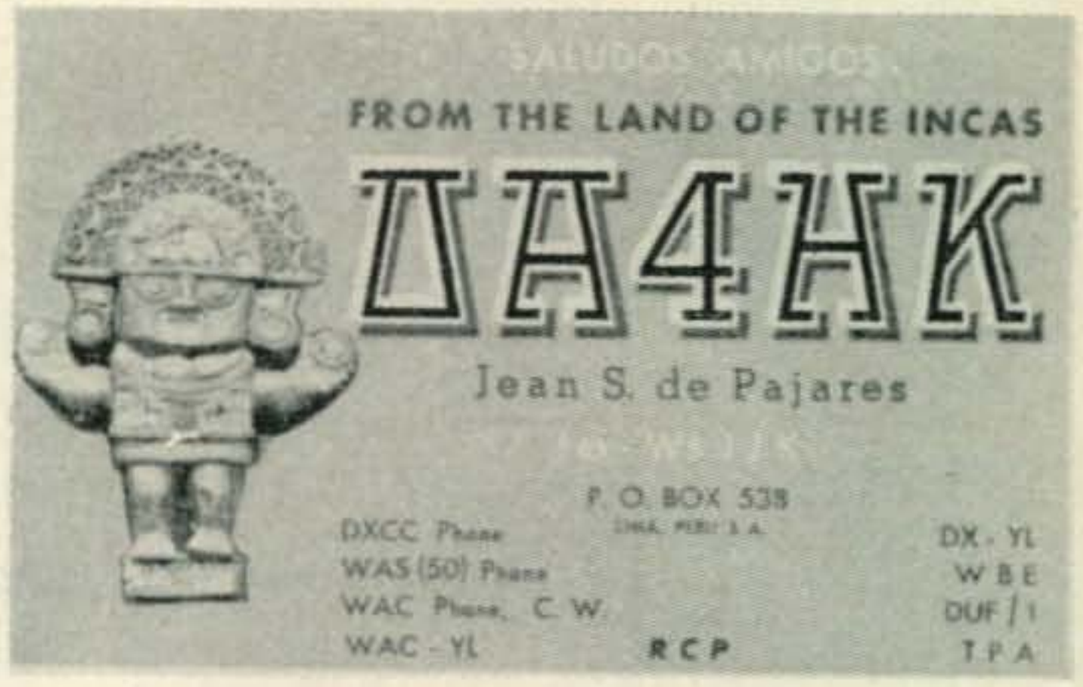
WE'RE not much for soap box oratory or kissing babies, and more often than not we're on the receiving end of a verbal barrage on how to make our magazine, our hobby, and the world in general a better place in which to live. Occasionally, we've been in the fortunate position of being able to express our outspoken selves in an editorial on a controversial subject. If nothing else, this helps relieve inner tensions and lets us forget for a few brief moments the serious affairs of state like copy deadlines and typographical errors.

As we go to press, however, we're not feeling quite so self assured as we view with some concern the state of world events and an internal political struggle within our country that will undoubtedly affect our lives most drastically. In all humility, we urge our readers to take an active part in this political contest by casting their votes for the man they feel offers the strength and diplomacy we need so badly at this crucial time.

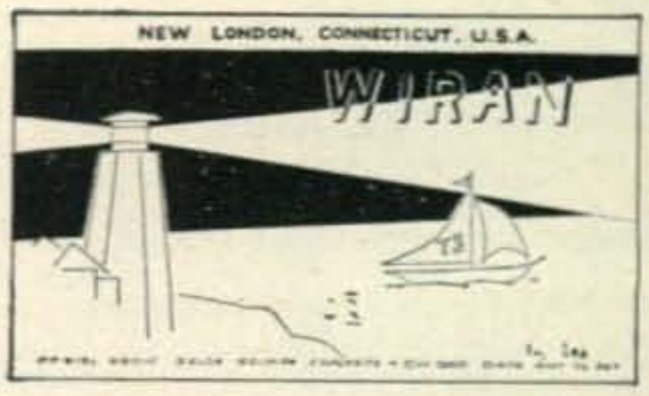
And, might we add, that within our ranks as amateurs we have much at stake in the months and years that lie ahead. As unity has been the foundation stone of our nation, so unity within our hobby is equally essential. Only through such unity will ham radio continue to flourish, and only by keeping informed can we, as amateurs, expect to retain our privileges and our stations. We at *CQ* like to feel that we contribute a bit toward that end, and if such is the case, we're happy in the knowledge that we've done our job well.

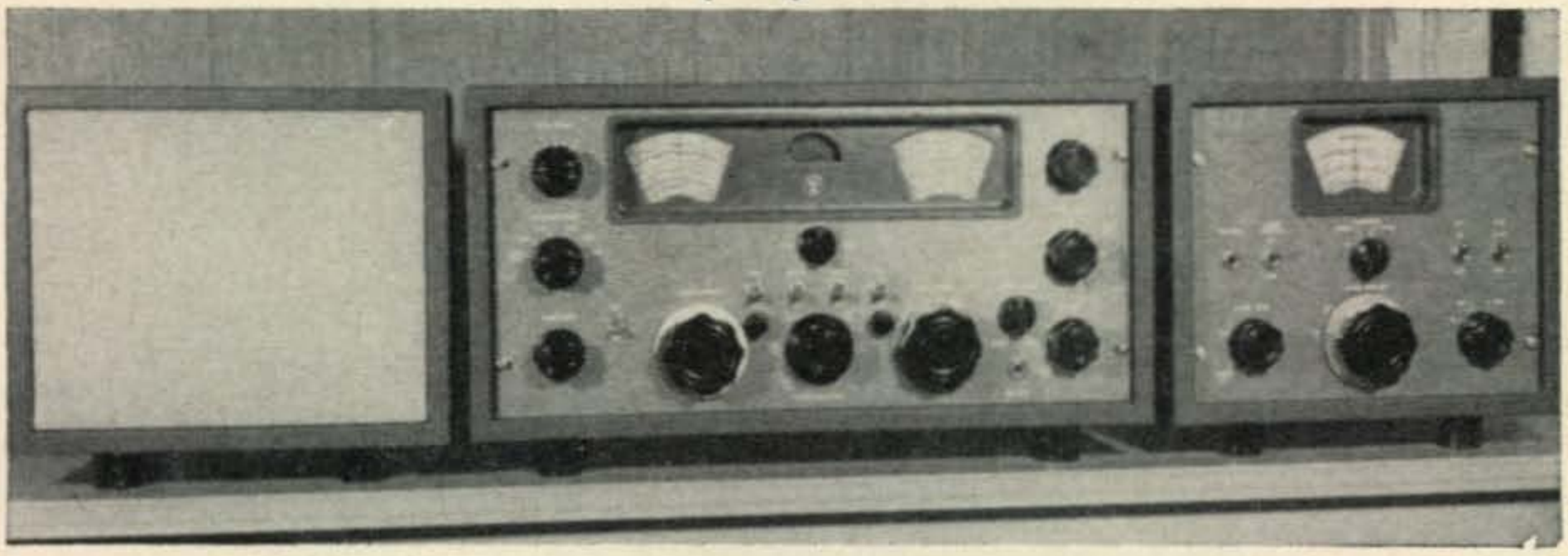
QSL contest

Winner this month is Jean S. de Pajares, OA4HK, of Lima, Peru. Jean is ex W5JJK. The card is a four color silk screen production. A free year subscription to Jean for a job well done.



Runners Up





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Ray de Pasquale	W2DCO
Hank Geist	W1AOH
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Tom Guthrie	K2QGT
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Joe Toman	W2ANX
Bill Deans	W2AZA
Tony Fraiola	W2GBS
Frank Strailman	K1NEW
Adrian Clark	W2PDH
Bill Everett	WA2IEQ
Dom Constantino	W2PMT
James Candido	W2RV

. . . at TMC in Canada

Doug Carroll	VE3BEJ
Alf Sheffield	VE3EB
Ken Holt	VE3ENH
Harry Ashdown	VE3ZQ
Frank Cameron	VE3ANO

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MAMARONECK, NEW YORK

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HT-37

transmitter

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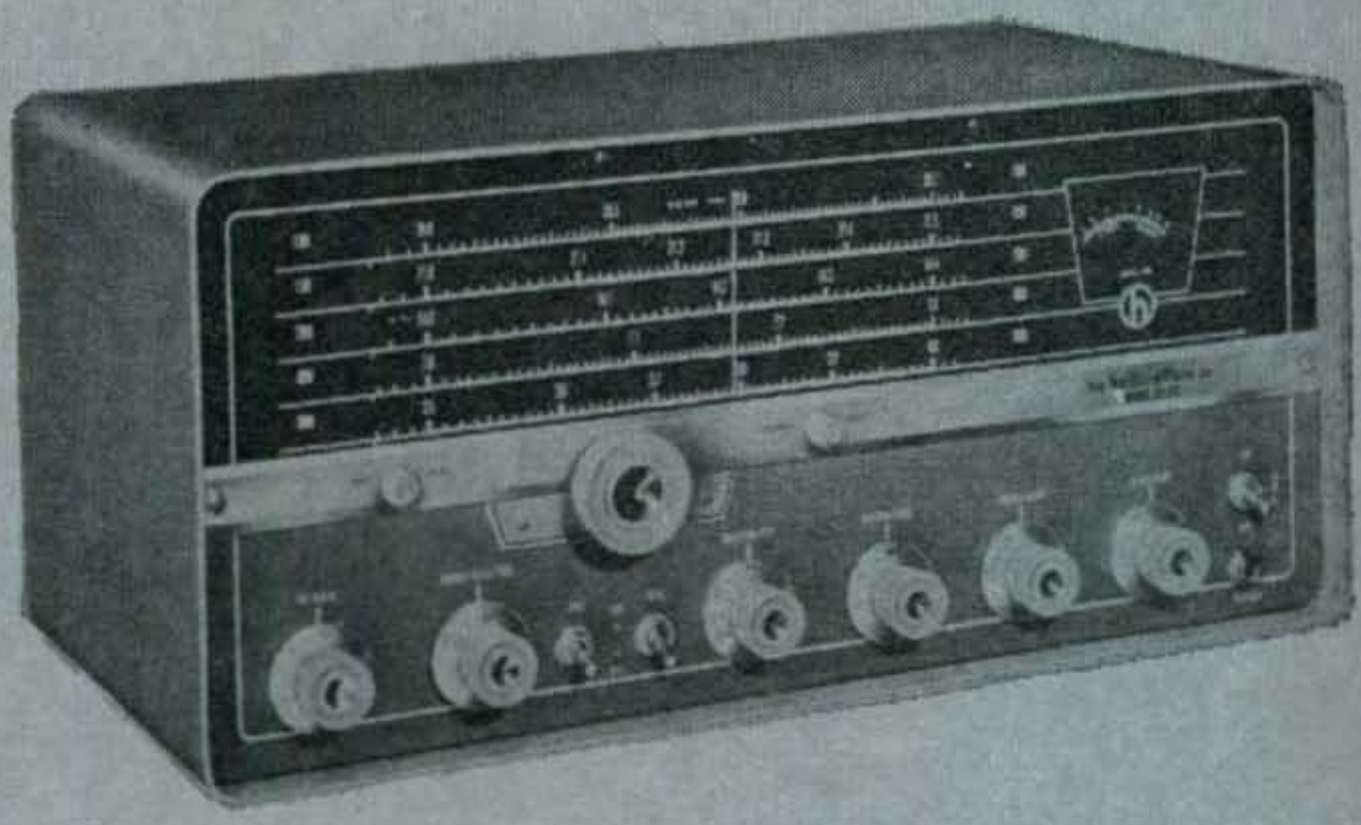
hallicrafters

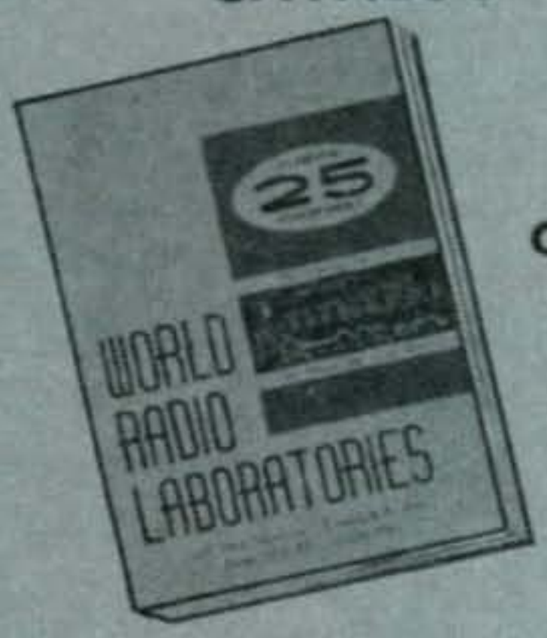
SX-111

receiver

$249.50 $24.95 DOWN $15.00 PER MO.



SILVER ANNIVERSARY CATALOG



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WRL'S huge Reconditioned Equipment Department carries more than 1000 items continually in stock, with turnover of nearly 500 pieces each month. Whenever you buy from WRL's reconditioned department, you are assured that your gear has been thoroughly checked, re-

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25th Anniversary WRL

MERCHANDISE AND A REPUTATION
FOR WELFARE OF THE AMATEUR RADIO FRATERNITY

The Hallicrafters HT-37 Transmitter employs a carefully designed phasing type side band generator developed by the famous team which produced the HT-32A. The HT-37 is a complete table top, high efficiency amateur band transmitter providing SSB, AM or CW output on 80, 40, 20, 15 and 10 meters. Features include 144w plate input (PEP, two tone), instant CW Cal. from any mode, both sidebands transmitted on AM, precision VFO, dual range meter for accurate tuning and carrier level adjustment, ideal CW keying and full voice control system built in. 52 ohm pi network. Carrier suppression down 50 db. Unwanted sideband down 40 db at 1 KC. 18 tubes.

A COMPATABLE SSB STATION OFFERING TOP NOTCH PERFORMANCE AT BUDGET PRICES

The Hallicrafters SX-111 is a dual conversion, selectable sideband receiver covering 80, 40, 20, 15 and 10 meters in 5 bands with a sixth band tunable to 10 mc for crystal calibrator calibration with WWV. It has a sensativity of 1 mv on all bands and 5 steps of selectivity from 500-5000 CPS. A high degree of mechanical and electrical stability is included, as well as high performance. Features include the new Hallicrafters "TEE-NOTCH" Filter, Antenna Trimmer, plug-in laboratory type evacuated 100 KC quartz crystal calibrator, crystal controlled second conversion oscillator, 40:1 tuning ratio, with each band covering the full dial length. Operates on 105/-125V 50/60 cycle AV. 12 tubes.

50% at WRL Equipment

paired, aligned and tested by the five-man technician team at WRL. In short, this equipment will operate as if it came directly from the factory line. With the great demand and subsequent turnover, new lists must be prepared each month. Send for your free lists today.

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"the house the hams built"

How can we help you? What can we do to make Amateur Radio a more satisfying experience for you? Each of us, as well as other hams here at World Radio are pledged to offer you the finest amateur radio service available.

You will like our great new Easy Payment Plan, with as little as 10% down. World Radio is known for its maximum trade offers. Prompt shipment and specialized attention to your orders are keynotes in our operation. And our Reconditioning Department continues to offer the finest used gear at tremendous savings with guaranteed factory-new operation.

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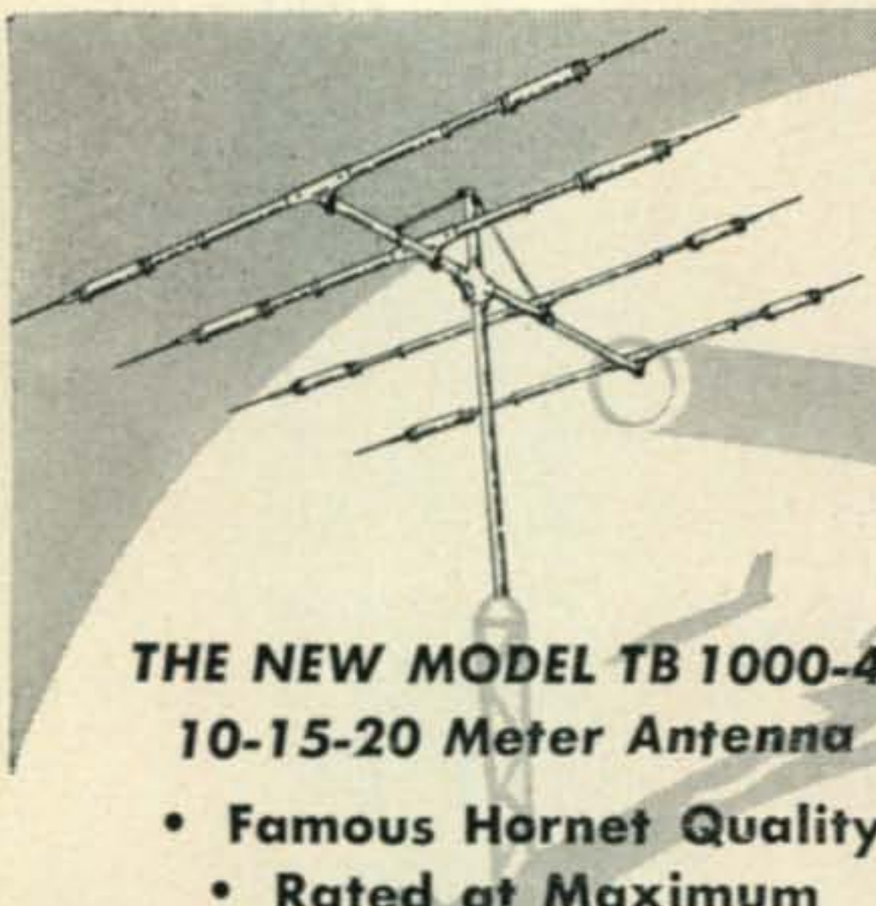
CITY & STATE: _____ CALL: _____



THIS BEAM THINKS IT'S A PIPELINE

YOU WILL THINK SO TOO!

The four triband elements, in operation on each band make the difference —

A Powerful four element punch!

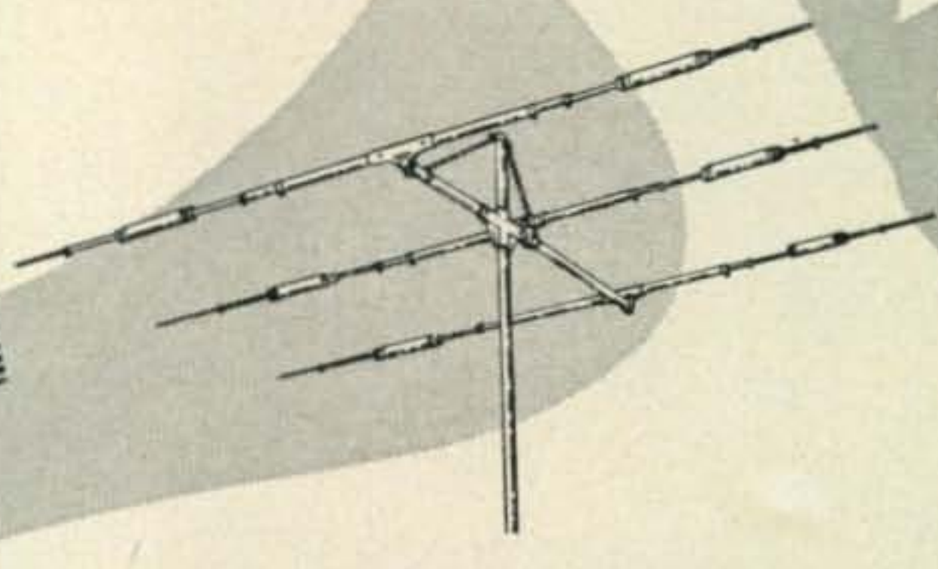
THE NEW MODEL TB 1000-4
10-15-20 Meter Antenna

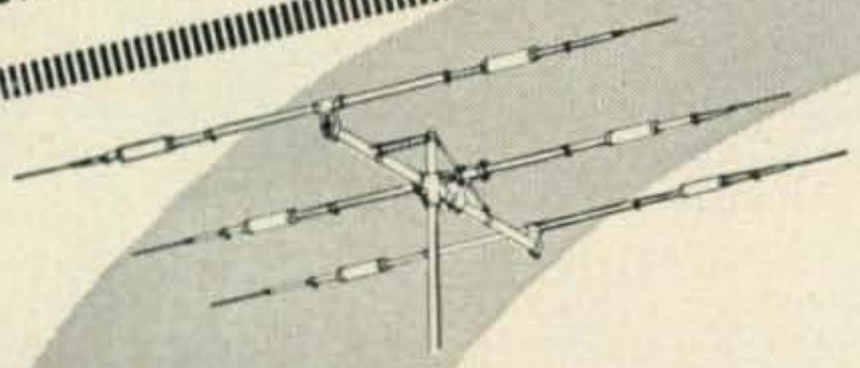
- **Famous Hornet Quality**
- **Rated at Maximum Legal Power**
- **Four Elements On Each Band**

Model TB 1000-4 Cash Price, Only $119.50

NOW AT YOUR DEALERS!

World famous Hornet antennas are now available from dealers. See your dealer today for the model of your choice, or order direct from Hornet.





THE NEW MODEL TB 1000 offers top performance in three element design.

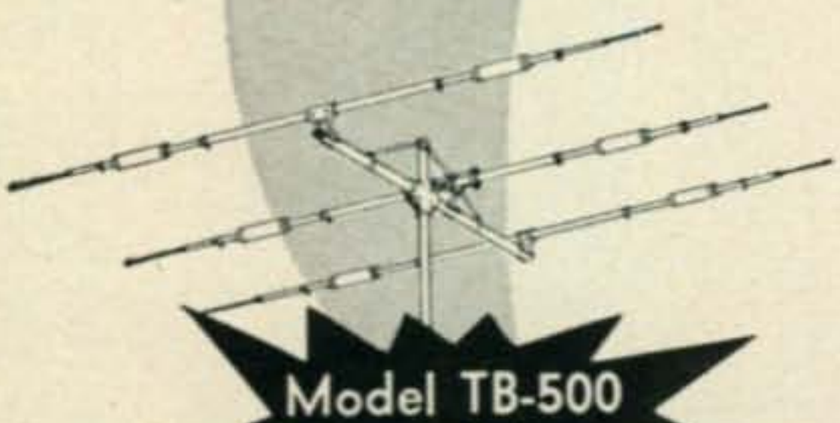
- Famous Hornet Quality
- Rated at maximum legal power

Model TB 1000 Cash Price, Only $89.75

THE NEW MODEL TB 750

This husky antenna replaces Hornet's famous Model TB 600, and is now rated at 750 watts AM or SSB.

Model TB 750 Cash Price, Only $69.95



Model TB-500
Cash Price
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ALL MODELS . . .

• Are Pre-tuned and Easy to Install • Have Custom Fittings of Cast Aluminum • Use a Single 52 ohm Coaxial Transmission Line • Have completely weather-sealed Frequency-Dividers* • Have Elements of 6061-T6 Aluminum

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*Pat. Pending.

THE BEAM WITH A STING
HORNET Antenna Products Co

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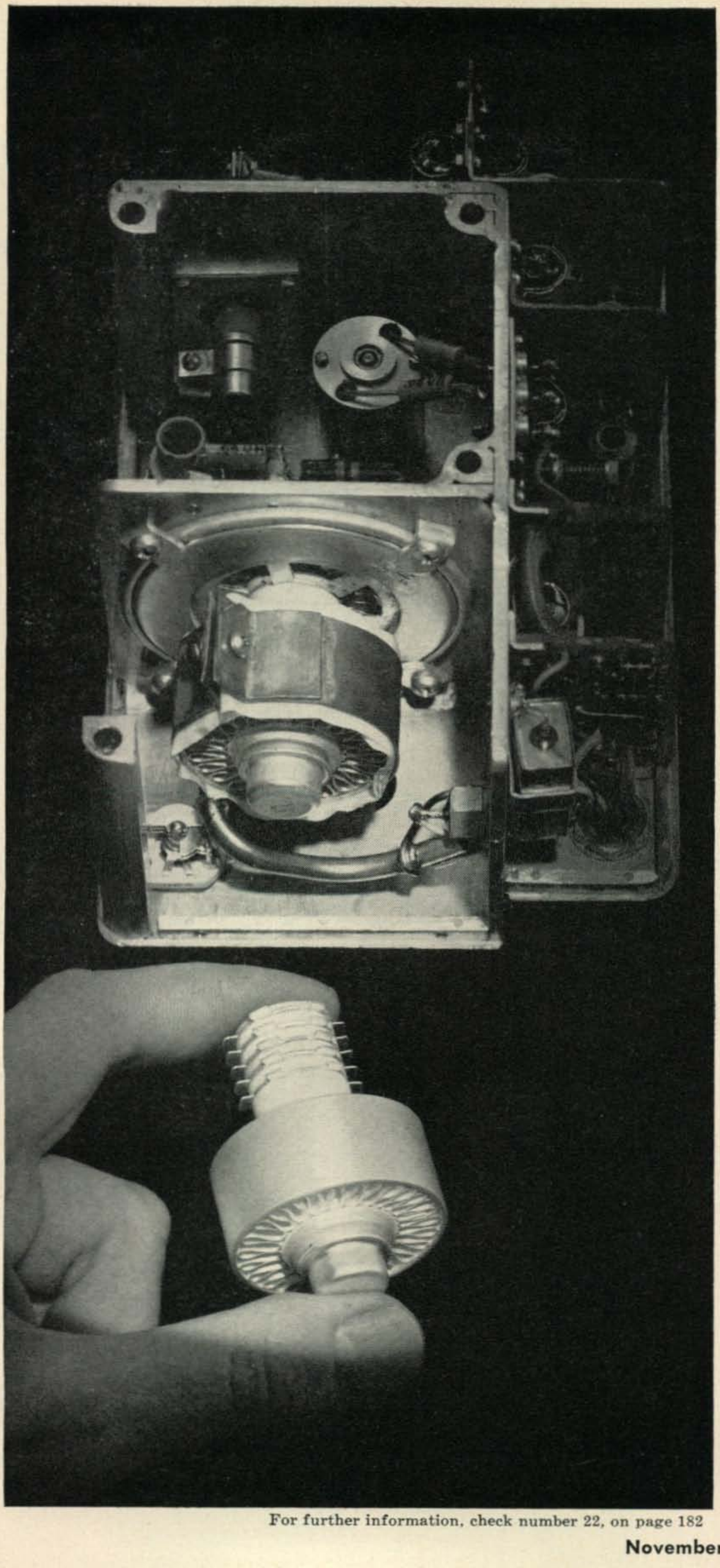

POPULAR AMATEUR TUBE POWERS SPACE AGE TV

The miniature TV transmitter at left has special significance for a space-curious world. It may one day help unravel some of the mysteries of the unknown as it soars, along with a TV camera, through the outer reaches in a sophisticated satellite.

At the heart of this tiny transmitter is an Eimac tetrode, the 4CX300A. This is the same tube so many discerning amateurs have chosen for use in SSB service. The reason: its ruggedness, reliability, exceptional linearity, and long life.

Today, whether it's amateur application, or breakthroughs in space communications, Eimac-pioneered tubes lead the way. Look to Eimac for all your amateur radio tube needs.

EITEL-McCULLOUGH, INC.
San Carlos, California

Eimac

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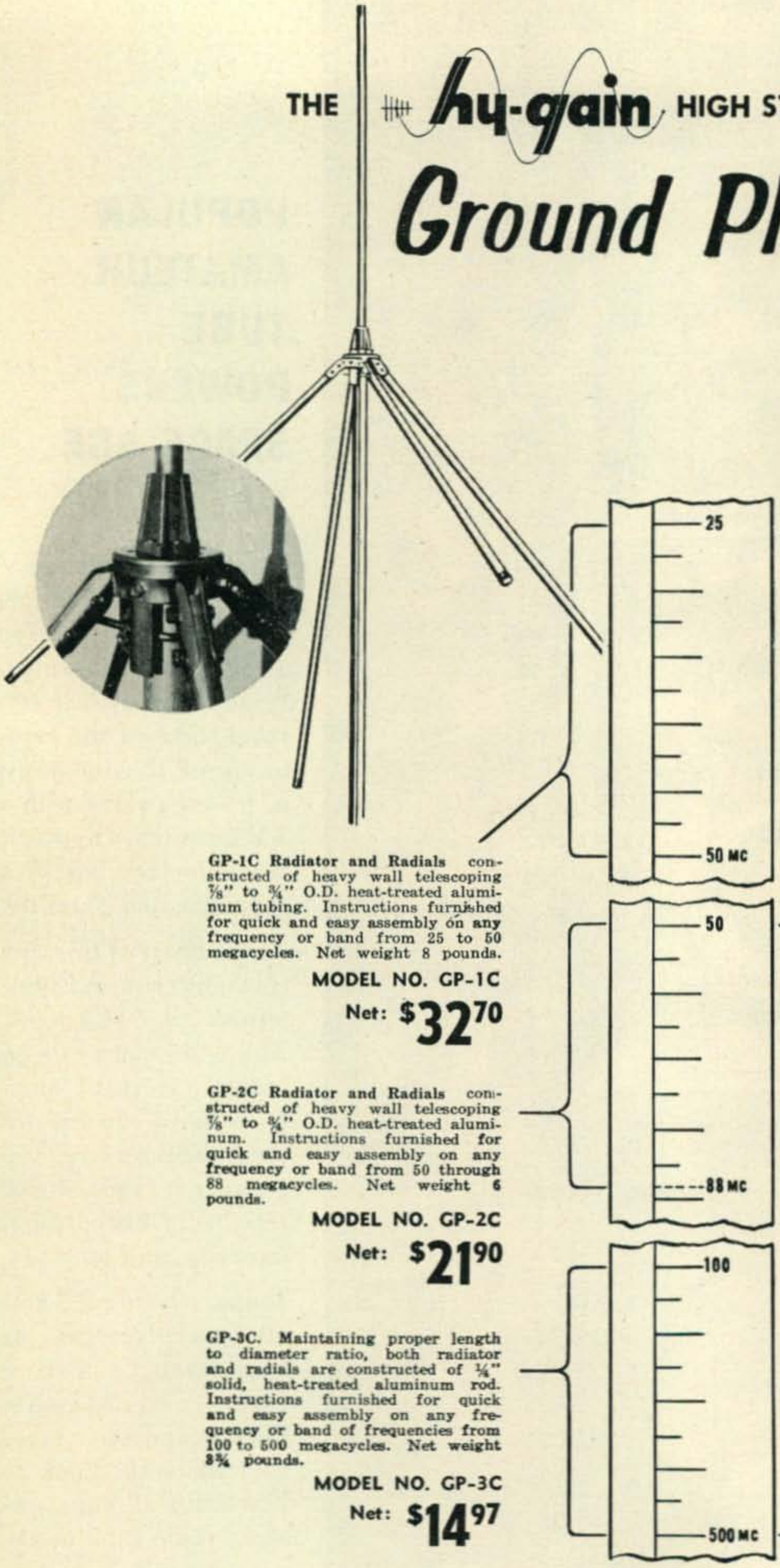
THE **hy-gain** HIGH STRENGTH-COMMERCIAL DUTY

Ground Planes AND DISCONE



GP-1C Radiator and Radials constructed of heavy wall telescoping ⅞" to ¾" O.D. heat-treated aluminum tubing. Instructions furnished for quick and easy assembly on any frequency or band from 25 to 50 megacycles. Net weight 8 pounds.

MODEL NO. GP-1C

Net: $32.70

GP-2C Radiator and Radials constructed of heavy wall telescoping ⅞" to ¾" O.D. heat-treated aluminum. Instructions furnished for quick and easy assembly on any frequency or band from 50 through 88 megacycles. Net weight 6 pounds.

MODEL NO. GP-2C

Net: $21.90

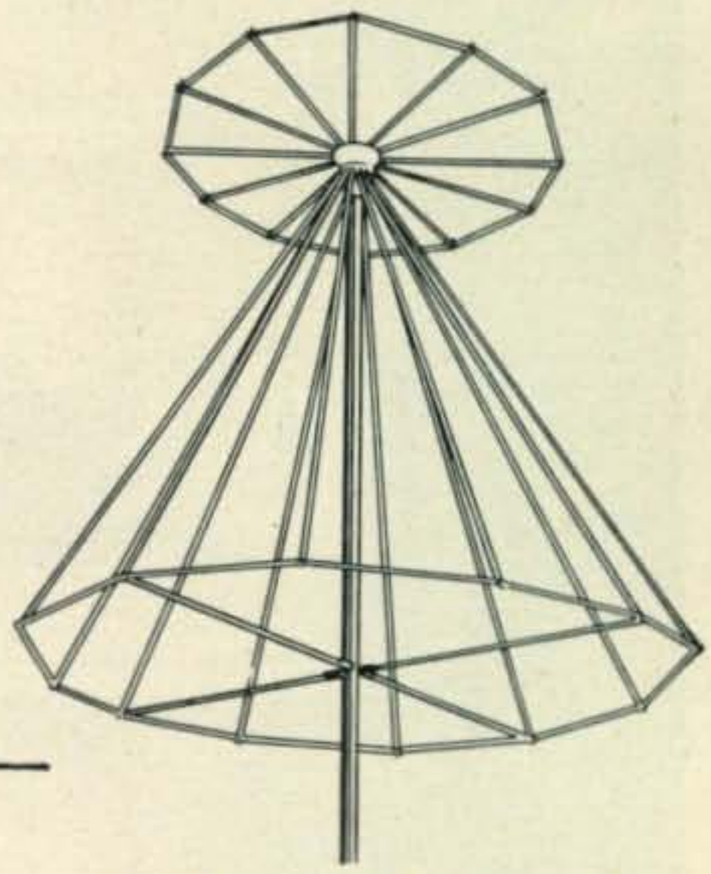
GP-3C. Maintaining proper length to diameter ratio, both radiator and radials are constructed of ¼" solid, heat-treated aluminum rod. Instructions furnished for quick and easy assembly on any frequency or band of frequencies from 100 to 500 megacycles. Net weight 8¾ pounds.

MODEL NO. GP-3C

Net: $14.97

THE GROUND PLANE ANTENNAS

Built to meet exacting commercial standards, the Hy-Gain Ground Planes are heavy duty in every detail. Both radiator and ground plane elements are heat-treated aluminum alloy. Element ends are weather sealed with molded caps. All hardware iridite treated in accordance with military specifications for maximum weatherability. The exclusive Hy-Gain base insulator assembly, constructed of high impact cycolac plastic and heavy guage formed steel, adjusts for all masts from ¾" to 1⅝" in diameter. SO-239 coaxial receptacle is weather protected. Nominal impedance 52 ohms. Preadjusted for better than 1.2:1 SWR by departure angle of radials which also improves low angle radiation. Radiation pattern omni-directional with unity gain.



THE DISCONE ANTENNA

Discone. The Hy-Gain Discone is a unique vertically polarized, omnidirectional broad band antenna with the tremendous frequency range of 50 through 500 megacycles without adjustments. No compromise in efficiency, it maintains unity gain, very low angle radiation, and a nominal impedance of 50 ohms throughout that entire frequency range. SWR less than 1.5:1 over entire spectrum. Constructed of heat-treated alloy aluminum elements. All hardware iridite treated in accordance with military specifications for maximum weatherability. Net weight 7½ pounds.

MODEL NO. DS-1 $29.97 Net:

ONE YEAR WARRANTY — 100 MPH RATING

hy-gain antenna products

1135 NO. 22nd ST • LINCOLN, NEBRASKA

For further information, check number 23, on page 182

For further information, check number 24, on page 182

RADIO HANDBOOK

-gives comprehensive, up-to-the-minute data for designing and building radio equipment

Extensive theory—the Radio Handbook covers practically every phase of radio theory, in simplified, easy-to-grasp form.

Latest design data — all original material—enables you to design any standard type of transmitting and receiving equipment, from medium to ultra-high frequencies.

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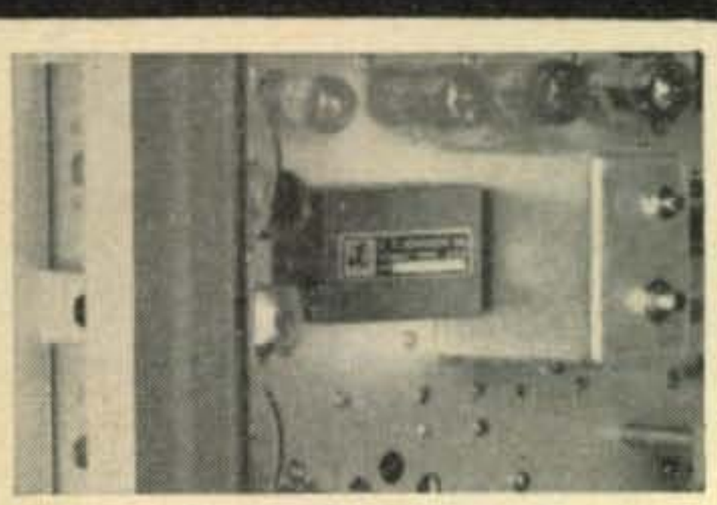
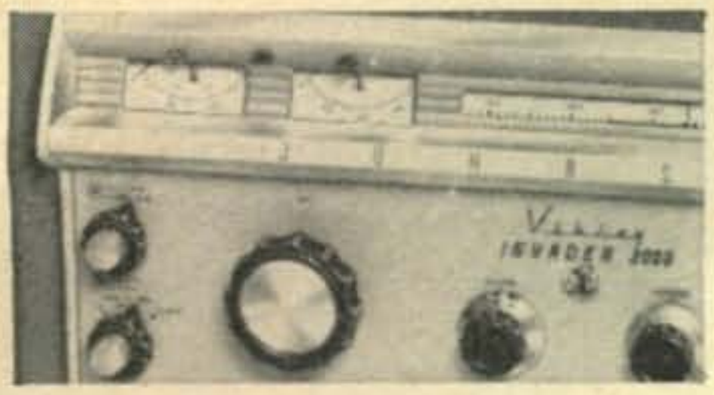
the very finest **SSB** equipment you can buy!

INVADER
AND
INVADER-2000

A superbly engineered SSB Transmitter/Exciter . . . add hi-power conversion for 2000 watts P.E.P. (twice average DC) input SSB!



CRYSTAL FILTER-TYPE SIDEBAND—Exclusive high frequency bandpass crystal filter gives you more than 60 db of unwanted sideband and carrier suppression! Select upper or lower sideband instantly.



SIMPLIFIED OPERATION—Extremely easy to tune and operate! Tune for maximum on the meter and you're ready to go—just a few front panel controls give complete flexibility!

FREQUENCY CONTROL—Instant band-switching coverage 80, 40, 20, 15 and 10 meter bands. Built-in VFO is differentially compensated and factory adjusted for maximum stability—"keep warm" heater element keeps VFO at operating temperature even with equipment turned off . . . NO WARM-UP DRIFT!

Free 8-page "Invader" brochure with detailed specifications and photographs!

INVADER
The transmitter you've been waiting for—with more exclusive features than any other Transmitter/Exciter on the market today! Instant band-switching 80 through 10 meters—no extra crystals to buy—no retuning necessary. Rated 200 watts CW and SSB input; 90 watts input on AM. Unwanted sideband and carrier suppression is 60 db or better! Wide range pi-network output circuit. Fully TVI suppressed. Self-contained heavy-duty power supply. Wired and tested with tubes and crystals.

Cat. No.	Amateur Net
240-302-2	$619.50

INVADER-2000
Here are all of the fine features of the "Invader", plus the added power and flexibility of an integral linear amplifier and remote controlled power supply. Rated a solid 2000 watts P.E.P. (twice average DC) input on SSB; 1000 watts CW; and 800 watts input AM! Wide range output circuit (40 to 600 ohms adjustable). Final amplifier provides exceptionally uniform "Q". Exclusive "push-pull" cooling system. Heavy-duty multi-section power supply. Wired and tested with power supply, tubes and crystals.

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240-304-2	$1229.00

HI-POWER CONVERSION
Take the features and performance of your "Invader" . . . add the power and flexibility of this unique Viking "Hi-Power Conversion" system . . . and you're "on the air" with the "Invader-2000"—a solid 2000 watts P.E.P. (twice average DC) input SSB, 1000 watts CW and 800 watts input AM. Completely wired and tested—includes *everything* you need—no soldering necessary—complete the entire conversion in one evening!

Cat. No. 240-303-2..Hi-Power Conversion, complete.....**Amateur Net $619.50**

FIRST CHOICE AMONG THE NATION'S AMATEURS

Viking

E. F. JOHNSON COMPANY • WASECA, MINNESOTA

choose your features . . . pick your power . . . from the nation's most popular transmitter line!

VIKING "KILOWATT" AMPLIFIER (Above)

The only transmitter that provides maximum legal power in all modes—SSB, CW, and plate modulated AM. Class C final amplifier operation provides plate circuit efficiencies in excess of 70% with unequalled broadcast-type high level amplitude modulation. Two 4-400A tubes in Class AB_2 easily deliver 2000 watts P.E.P. (twice average DC) in SSB mode—provides 1000 watts input AM with two push-pull 810 tubes in Class B modulator service. 1000 watts input Class C CW. High efficiency pi-network output circuit will match 50 to 500 ohm antenna loads.

Pedestal contains complete unit. Excitation requirements: 30 watts RF and 10 watts audio for AM; 10 watts peak for SSB. With tubes. **Cat. No. 240-1000** . . Wired and tested . . . . . **Amateur Net $1595.00**

Matching accessory desk top, black and three-drawer pedestal. **Cat. No. 251-101-1** . . **FOB Corry, Pa. $132.00**

4 ★★★★ *popular transmitters . . .*

"ADVENTURER" TRANSMITTER

"CHALLENGER" TRANSMITTER

"6N2" TRANSMITTER

"NAVIGATOR" TRANSMITTER/EXCITER

"ADVENTURER" TRANSMITTER

Self-contained . . . 50 watts CW input . . . rugged 807 transmitting tube . . instant bandswitching 80 through 10 meters. Crystal or external VFO control—wide range pi-network output—timed sequence keying. With tubes, less crystals.

Cat. No. 240-181-1 . . Kit . . . . . **Amateur Net $54.95**

"CHALLENGER" TRANSMITTER

70 watts phone input 80 through 6; 120 watts CW input 80 through 10 . . . 85 watts CW on 6 meters. Two 6DQ6A final amplifier tubes. Crystal or external VFO control—TVI suppressed—wide range pi-network output. With tubes, less crystals.

Cat. No. 240-182-1 . . Kit . . . . . **Amateur Net $114.75**
Cat. No. 240-182-2 . . Wired . . . . . **Amateur Net $154.75**

"NAVIGATOR" TRANSMITTER/EXCITER

40 watts CW input . . . also serves as a flexible VFO Exciter. 6146 final amplifier tube—bandswitching 160 through 10 meters. Built-in VFO or crystal control. With tubes, less crystals.

Cat. No. 240-126-1 . . Kit . . . . . **Amateur Net $149.50**
Cat. No. 240-126-2 . . Wired . . . . . **Amateur Net $199.50**

"6N2" TRANSMITTER

Rated 150 watts CW and 100 watts phone—offers instant bandswitching coverage of both 6 and meters. Fully TVI suppressed—may be used with the Viking I, II, "Ranger", "Valiant" or similar power supply/modulator combinations. Operated by crystal control or external VFO with 8-9 mc output. With tubes, less crystals.

Cat. No. 240-201-1 . . Kit . . . . . **Amateur Net $129.50**
Cat. No. 240-201-2 . . Wired . . . . . **Amateur Net $169.50**

3 ★★★ *feature-packed transmitters...*

RANGER" TRANSMITTER/EXCITER

his popular 75 watt CW or 65 watt hone transmitter will also serve as n RF/audio exciter for high power quipment. Completely self-con-ined—instant bandswitching 160 rough 10 meters! Operates by uilt-in VFO or crystal control. High ain audio—timed sequence keying VI suppressed. Pi-network antenna ad matching from 50 to 500 ohms. Vith tubes, less crystals.

at. No.		Amateur Net
40-161-1	Kit	$229.50
40-161-2	Wired and tested	$329.50

"VALIANT" TRANSMITTER

275 watts input CW and SSB (P.E.P. with auxiliary SSB exciter) 200 watts phone. Instant bandswitching 160 through 10 meters—built-in VFO or crystal control. Pi-network output matches antenna loads from 50 to 600 ohms. TVI suppressed—timed sequence keying—built-in low pass audio filter—self-contained power supplies. With tubes, less crystals.

Cat. No.		Amateur Net
240-104-1	Kit	$349.50
240-104-2	Wired and tested	$439.50

"FIVE HUNDRED" TRANSMITTER

Full 600 watts CW—500 watts phone and SSB. (P.E.P. with auxiliary SSB exciter.) Compact RF unit designed for desk-top operation. All exciter stages ganged to VFO tuning—may also be operated by crystal control. Instant bandswitching 80 through 10 meters—TVI suppressed—high gain push-to-talk audio system. Wide range pi-network output. With tubes, less crystals.

Cat. No.		Amateur Net
240-500-1	Kit	$749.50
240-500-2	Wired and tested	$949.50

3 ★★★ *exciting desk-top linears...*

COURIER" AMPLIFIER

ated a solid 500 watts P.E.P. input ith auxiliary SSB exciter as a Class linear amplifier; 500 watts CW or 00 watts AM linear. Self-contained esk-top package—continuous cov-age 3.5 to 30 mcs. Drive require-ents: 5 to 35 watts depending on ode and frequency desired. TVI ppressed. With tubes and built-in ower supply.

at. No.		Amateur Net
40-352-2	Wired and tested	$289.50

"THUNDERBOLT" AMPLIFIER

The hottest linear amplifier on the market—2000 watts P.E.P. (twice average DC) input SSB; 1000 watts CW; 800 watts AM linear. Continuous coverage 3.5 to 30 mcs.—instant bandswitching. Drive requirements; approx. 10 watts Class AB_2 linear, 20 watts Class C continuous wave. With tubes and built-in power supply.

Cat. No.		Amateur Net
240-353-1	Kit	$524.50
240-353-2	Wired and tested	$589.50

"6N2 THUNDERBOLT" AMPLIFIER

1200 watts (twice average DC) input SSB and DSB, Class AB_1; 1000 watts CW, Class C; and 700 watts input AM linear. Continuous band-switched coverage on 6 and 2 meters. TVI suppressed. Drive requirements: approx. 5 watts Class AB_1 linear, 6 watts Class C CW. With tubes and built-in power supply.

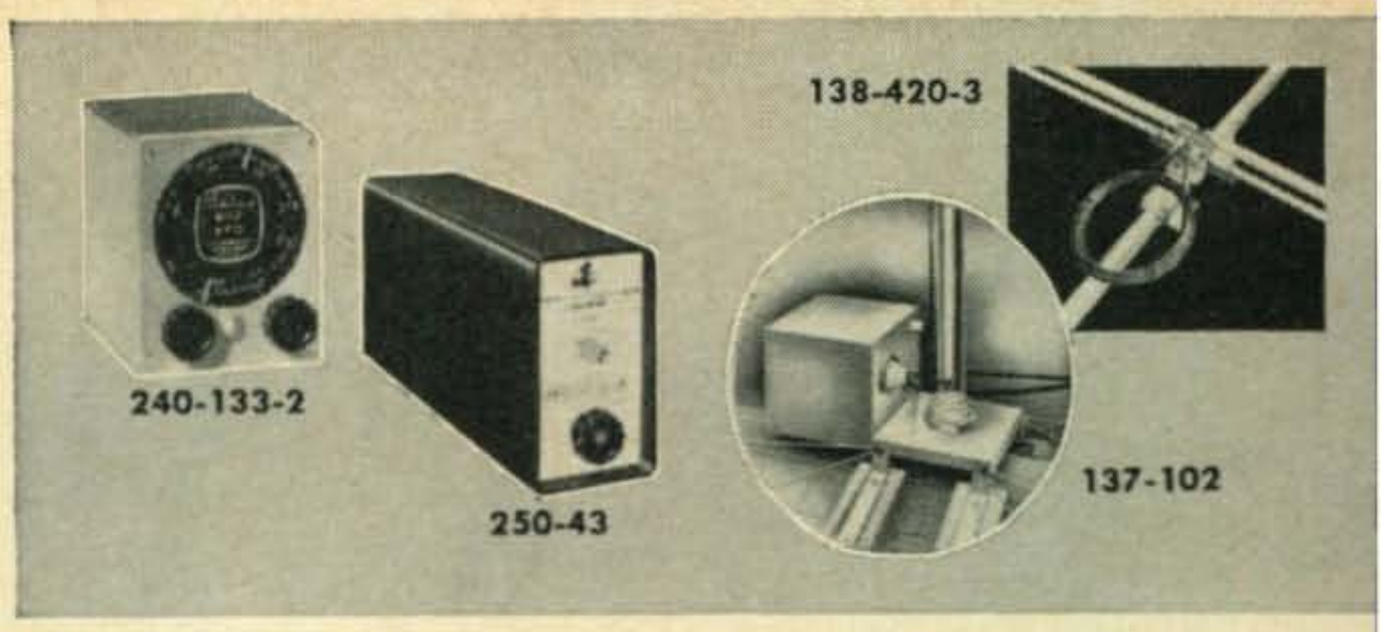
Cat. No.		Amateur Net
240-362-1	Kit	$524.50
240-362-2	Wired and tested	$589.50

FIRST CHOICE AMONG THE NATION'S AMATEURS

Viking

E. F. JOHNSON COMPANY • WASECA, MINNESOTA

Boost performance... add convenience... with these popular Viking station accessories!



"6N2" VFO—Replaces 8 to 9 mc. crystals in frequency multiplying 6 and 2 meter transmitters. Output range: 7.995 to 9.010 mc. With tubes and power cable.

Cat. No. 240-133-1..Kit.....**Amateur Net $34.95**
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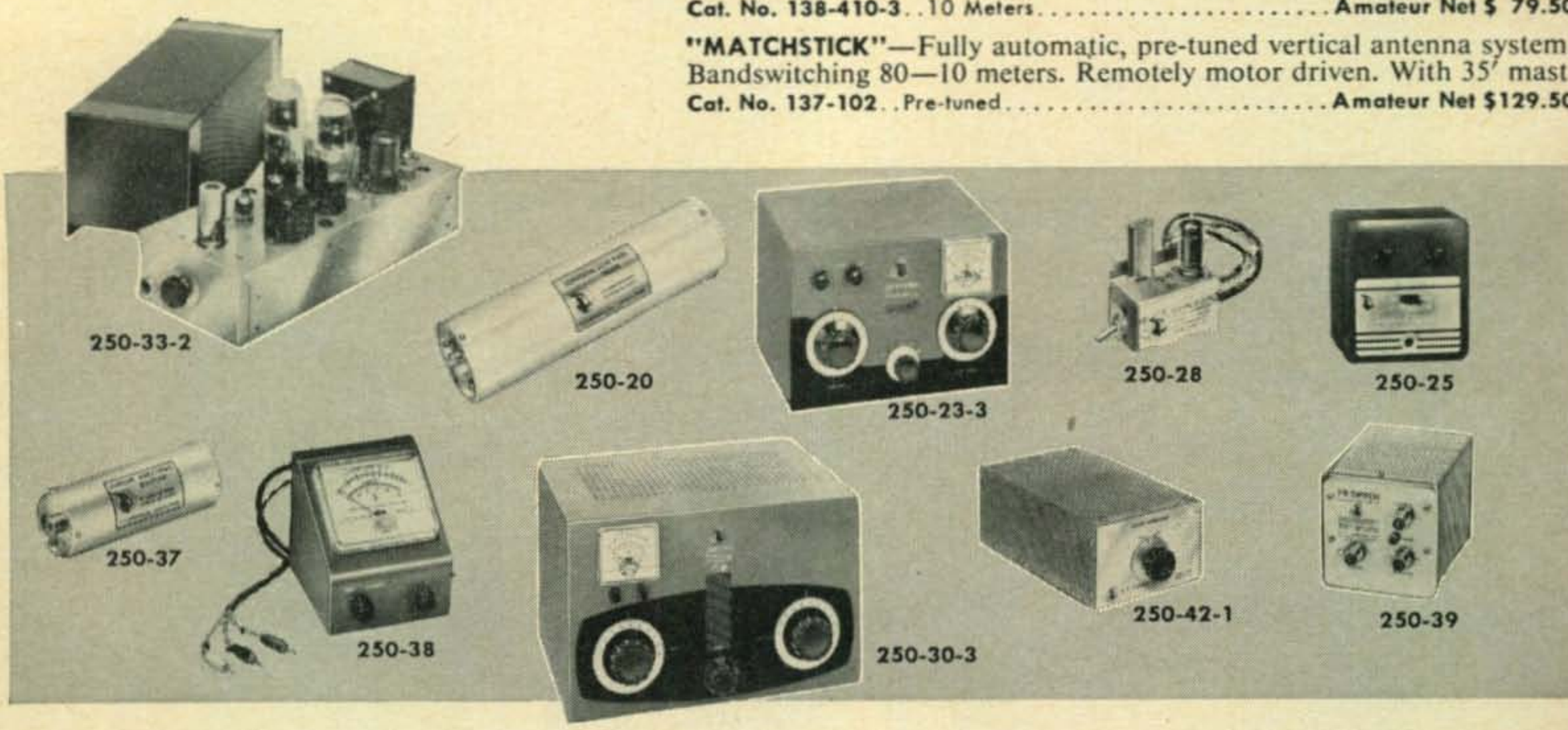

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For further information, check number 26, on page 182

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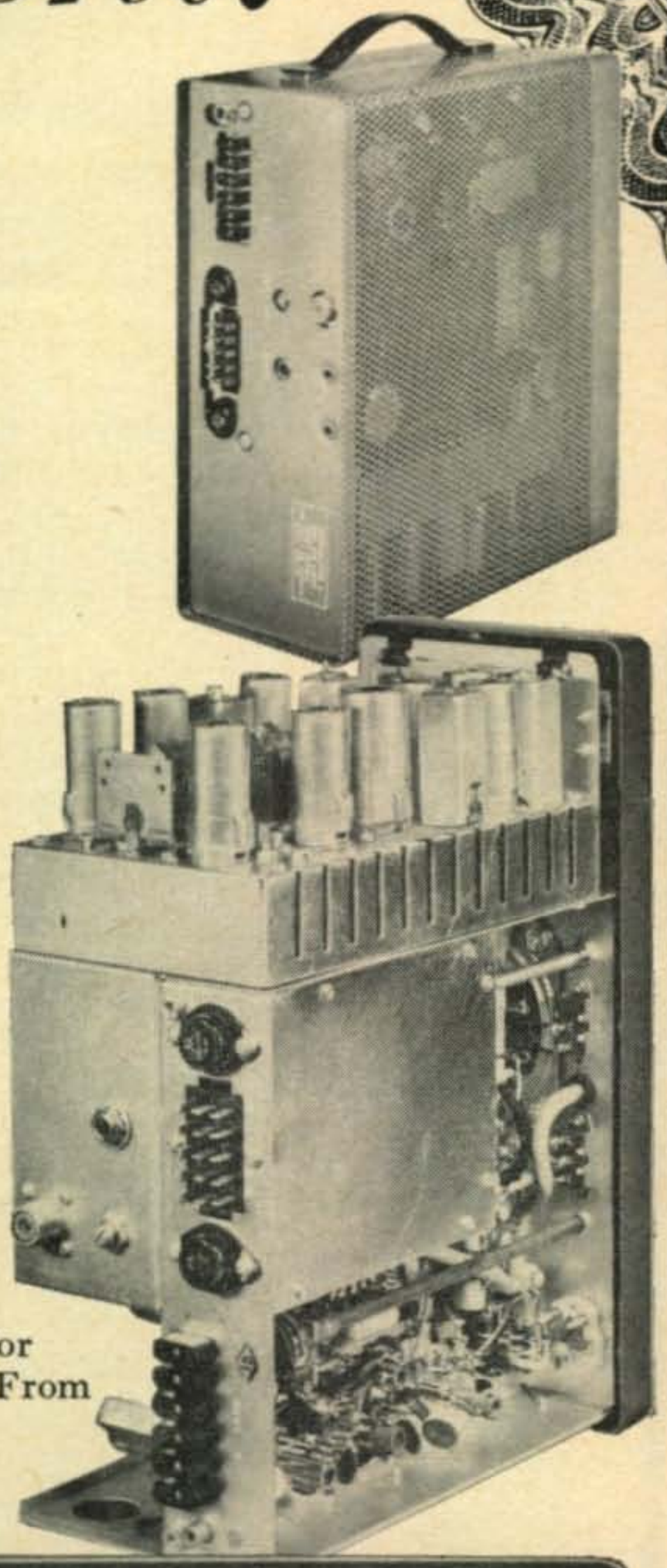

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A Six Tube European Style 145 MC Converter

Dr. Karl Gerhard Lickfeld, DL3FM, V.H.F. Editor DARC
Klingenburgstrasse 30 Mülheim (Ruhr)—Ickten, Germany

Well known European V.H.F. enthusiast DL3FM comments on American 2 meter construction practices and describes a low noise converter which should match anything produced on this side of the Atlantic

Soups are boiled with water on both sides of the Atlantic Ocean, and the fundamentals of *vhf* converter construction are the same in Europe and in the United States. But there are certain differences, which, up to this time, have not yet been shown fully to the American *vhf* enthusiast. In spite of the fact that, so far, *vhf* contacts on 2 meters have not taken place between America and Europe, it surely will be interesting for the American amateur to read and to see how we tried and are still trying to solve the problems of extremely sensitive and stable converters for the 2 meter band.[1]

The attainable sensitivity is limited by the so-called equivalent noise resistance, which, for its part, is given by the physical structure of the front end tube. Effecting factors are, among others, internal capacities and transconductance. The smaller the capacities and the higher the transconductance, the more suited a certain tube is as a low noise preamplifier, because the equivalent noise resistance, R_{eq} will also be lower.

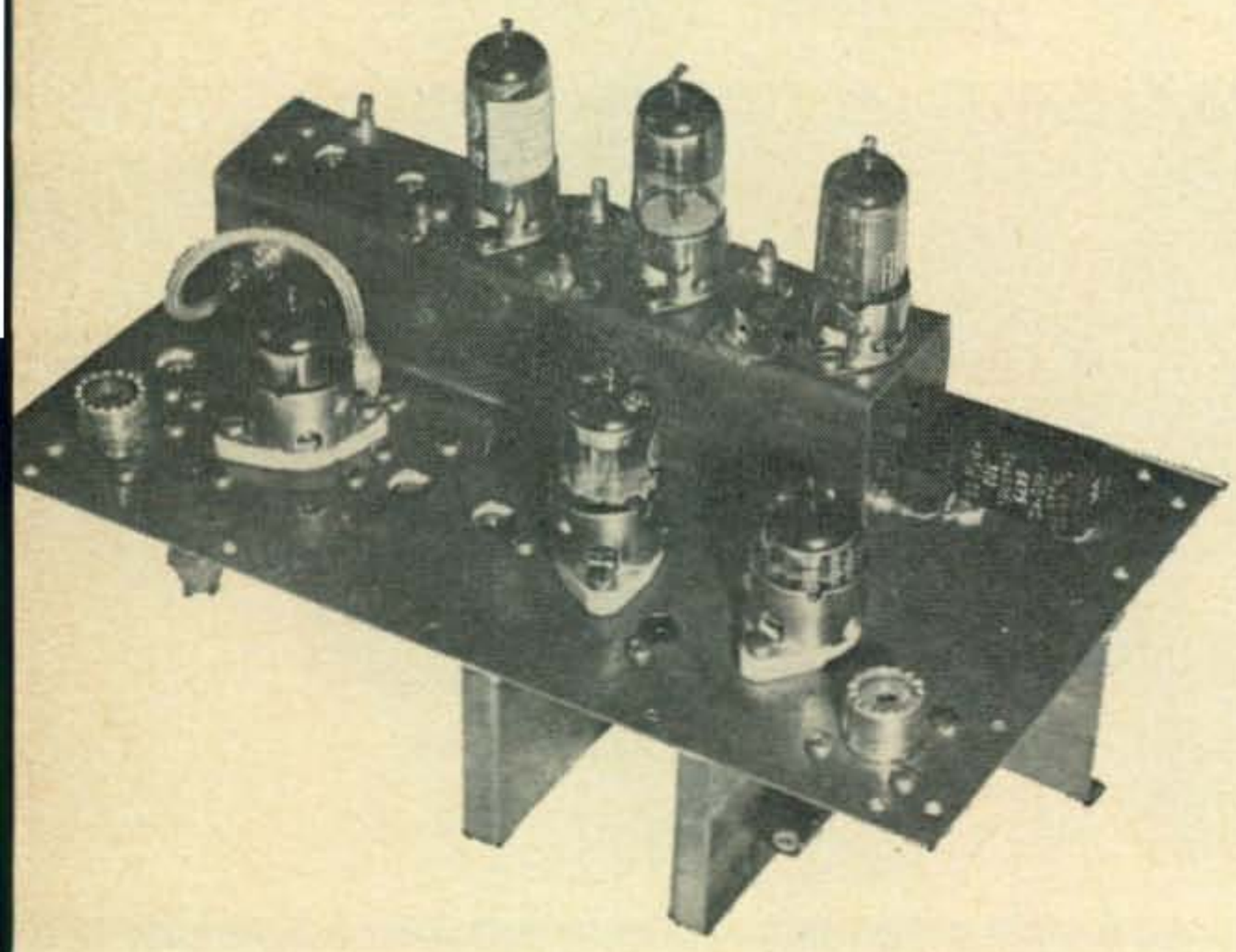
For a couple of years after World War II, German industry did not produce tubes of this kind. We had been forced to use either special tubes which had been developed for the German Army, (unknown to most Americans) or to try to get hold of both a 6AK5 and a 6J6 for a Wallman cascode stage, which achieved widespread publicity a fairly short time after its publication.[2] Two years passed and with increasing popularity of TV, good miniature tubes appeared on the market. Now we have a variety of them, i.e. EC-92, EC-80, ECC-85 and E-88-CC, to name only a few. There are lighthouse tubes on the market having transconductances around 30 *ma/v* but they are very expensive and intended for use in coaxial systems only. So far we have no equivalent of the "gold plated special", 416B. And the famous 417A is not yet in production here but it is obtainable. It is obvious that my choice was the 417A/5842.

As fig. 1 shows, the 417A is used as a grounded cathode *rf* amplifier. The grid coil is self-resonant, and the antenna is connected to a point on the grid coil that gives the lowest noise figure. A small trimmer condenser, to eliminate any reactance is not used between the coaxial receptacle and the coil, since the feed line of my antenna has a standing wave ratio very near 1:1. A trimmer condenser yielded no advantages. The unwanted inductance of the cathode lead is eliminated by means of a small condenser inserted between cathode and ground. Experiments have shown that 50 mmf is a good compromise between lowest possible noise figure and stability.

A surprise for many a reader may be the addition of the relay contacts between the cath-

[1] In region I of the IARU the 2 meter band extends from 144 to 146 *mc.*

[2] Wallman, H., Mac Nee, A. B., Gadsen, C. P., "A Low Noise Amplifier," *Proceedings of the I.R.E.*, Vol. 36, Nr. 6, June 1948



Top view of the converter r.f. and mixer circuits on the copper plate and the oscillator chain on the sub chassis. A short piece of coaxial cable can be seen coupling the oscillator output from J_4 to mixer input J_3. Oscillator tubes from left to right, EC-92, EC-92, 6AU6. Rf tubes from left to right E-180-F, E-86-C and 417A.

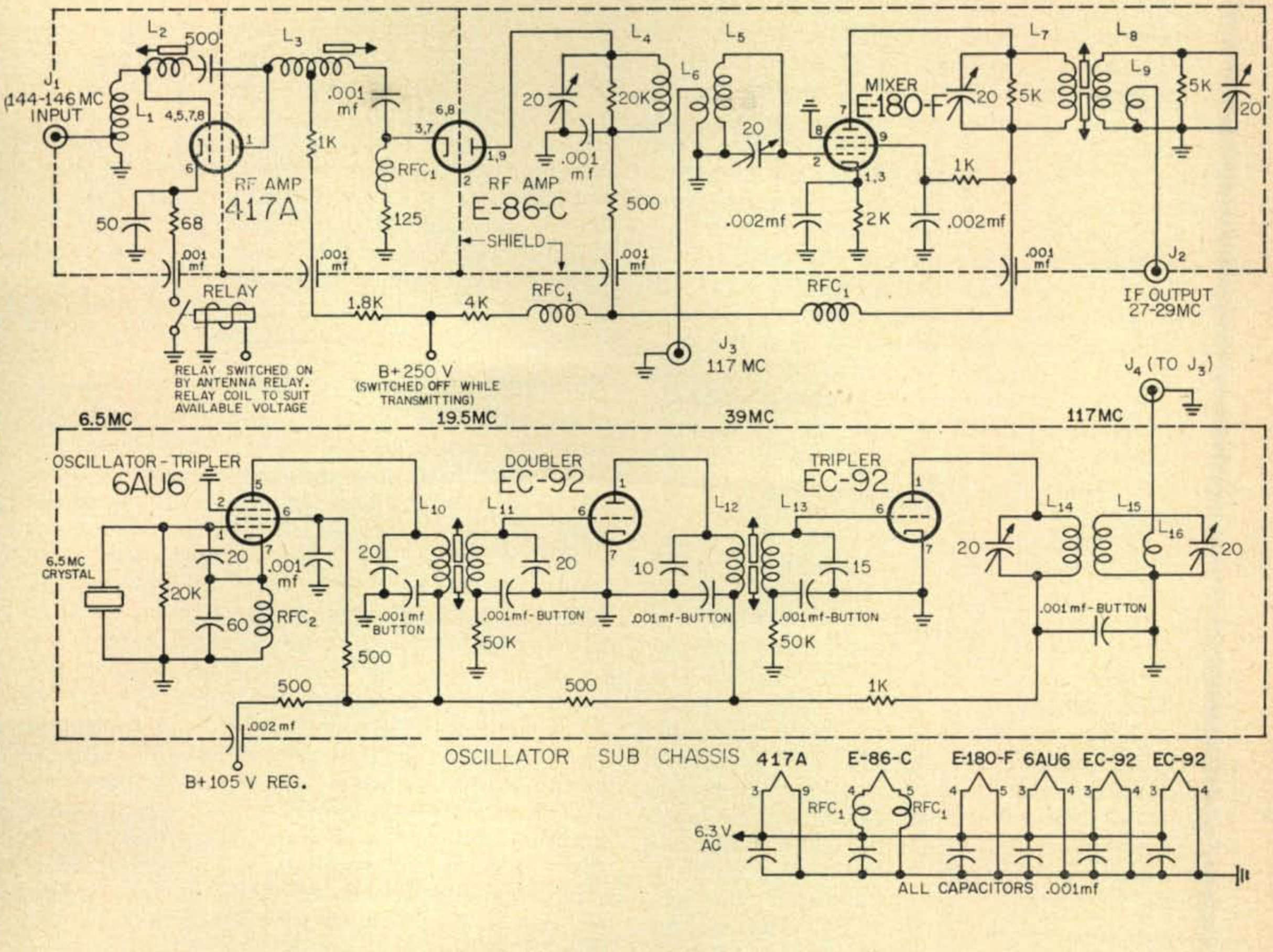


Fig. 1 — Circuit of the European 2 meter converter. The upper dotted enclosure contains the r.f. amplifiers and mixer while the lower dotted enclosure contains the oscillator multiplier chain. The oscillator output at J_4 is connected to J_3, the mixer input, via a short coax jumper.

The shielding is very complete as shown in the accompanying photographs. Each stage in the r.f.-mixer chassis is completely enclosed when all covers are in place thus providing true magnetic shielding.

American tube equivalent of the EC-92 is a 6AB4 and the E-180-F, a 6688.

Coil	Turns	Wire Type	Coil Diameter	Coil Length	Spacing	Form
L_1	4	#18 silver plated	11/32	25/32		Air
L_2	9	#22 enameled	9/32		Close wound	Slug tuned
L_3	9	#18 silver plated	9/32		Wire spaced	Slug tuned
L_4	3	#18 silver plated	3/8	3/8		Air
L_5	2	#18 silver plated	3/8	3/8		Air
L_6	1	Hookup wire	3/8	On cold end of L_5		Air
L_7	12	#22 enameled	9/32		Close wound	Slug tuned
L_8	12	#22 enameled	9/32		Close wound	Slug tuned
L_9	4	#22 enameled silk covered	Wound over cold end of L_8		Close wound	
L_{10}*	15	#28 enameled	9/32		Close wound	Slug tuned
L_{11}*	15	#28 enameled	9/32		Close wound	Slug tuned
L_{12}†	11	#28 enameled	9/32		Close wound	Slug tuned
L_{13}†	8	#28 enameled	9/32		Close wound	Slug tuned
L_{14}‡	4	#18 silver plated	3/8	3/8		Air
L_{15}‡	4	#18 silver plated	3/8	3/8		Air
L_{16}	1	Hookup wire	3/8	On cold end of L_{15}		Air

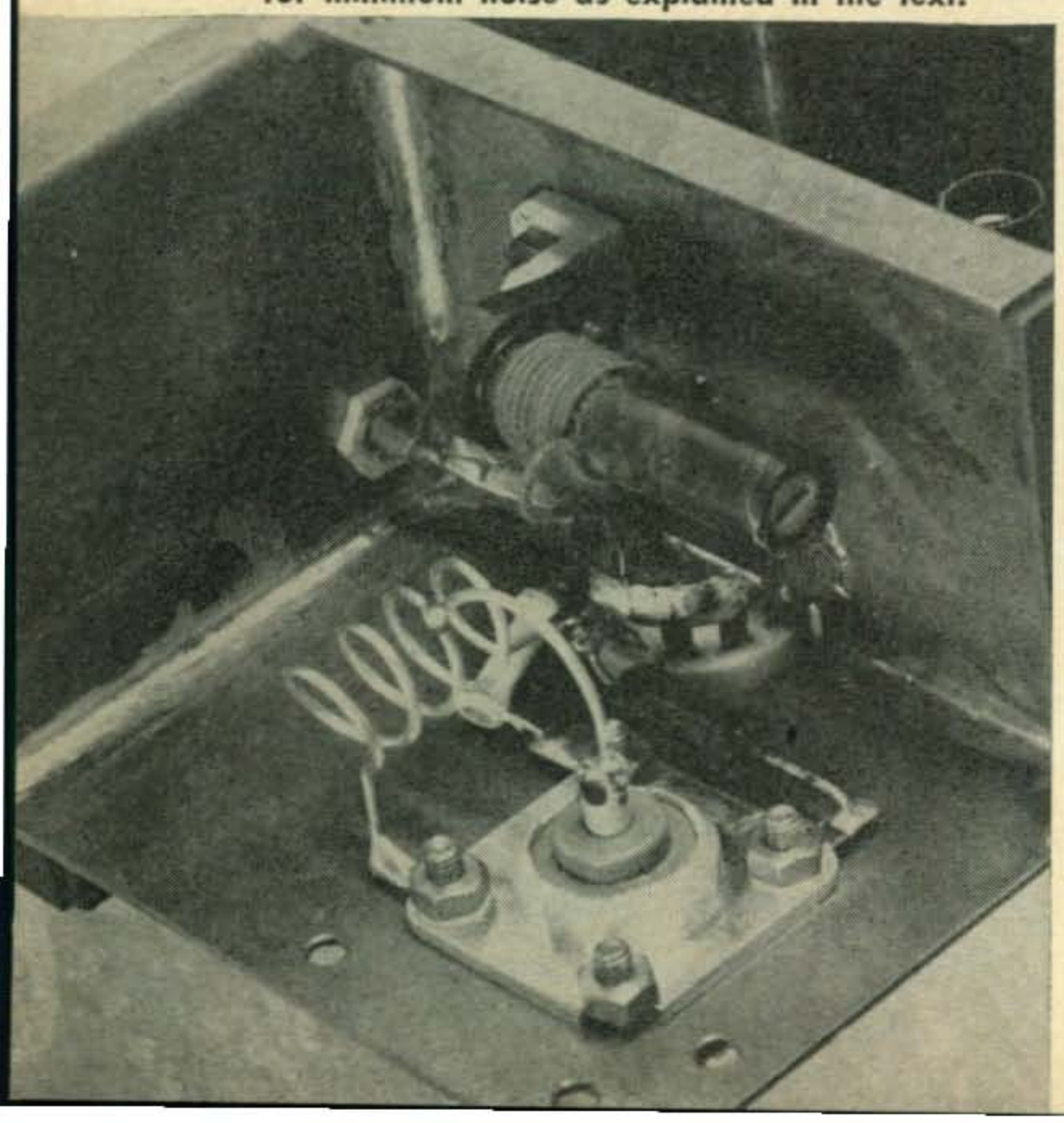
*L_{10} and L_{11} are wound on the same slug tuned form but in opposite directions with a 6/32 space between windings. The form contains a slug at each end.
†L_{12} and L_{13} are wound in the same manner as L_{10} and L_{11}.
‡L_{14} and L_{15} are spaced 5/32 apart and wound in opposite directions. Slug tuned forms are produced by Vogt.

RFC_1	Broad band vhf choke with ferroxcube core. Product of Valvo.
RFC_2	60 turns #22 enameled silk covered wound on a 1 megohm 1 watt resistor.

ode resistor and ground. It is well known that the 417A has a grid which is very sensitive to fairly low *rf* amplitudes. The relay is engergized as soon as the transmitter is switched on, and the contacts are opened. At the same time the plate voltage is removed from the 417A (and from the following two stages too). Since the relay contact is in the *dc* path, the insertion of the relay has no influence at all on the *vhf* qualities of the 417A. Running 250 watts input to a pair of 3C24's and using a Dow-key coaxial relay to switch, the grid current of the 417A is 0.7 *ma.* This is far too much; thus, leaving the grid "floating", when the cathode circuit is opened, the *rf* voltage cannot damage the front end. Neutralization of the 417A is orthodox and no mention will be made here about the principles.

Many enthusiasts have the opinion that only tuning the grid circuit of the first stage determines the over-all noise figure. This is not the case, even if one presumes that the amplification of the first *rf* stage outperforms the following *rf* stages and mixer stage. *The resonant circuit between the plate of the grounded-cathode and the cathode of the grounded grid stage* (L_3) *has a great influence upon the noise figure.* It can be shown mathematically that the old, orthodox method of cascode circuitry is by far the worst, i.e. putting a resonant circuit between the plate of the first stage and *rf* ground. There are two other methods. The first one uses a pi-filter coupling, to couple plate and cathode; the second one uses bandpass coupling. The second method results in a much improved noise figure. The improvement can be as high as 40%. Bandpass coupling, however, is a bit complex, and using pi-filter coupling shows a vast improvement too. As can be seen from fig. 1, pi-filter coupling is in use here. Only dual triodes of special design such as 6BQ7 or E-88-CC, to name an American and a German example, can be series fed as far as the plate voltage is concerned. Isolation between cathode and filament is sufficiently high in these tubes. The converter discussed here, is characterized by a cascode stage of two separate triodes. Therefore plate voltage must be series fed to both the first and the second stage of the cascode amplifier. The pi-filter coil is center tapped, and to prevent plate voltage from reaching the cathode of the grounded grid amplifier, a *dc* blocking condenser is placed between coil and cathode.

Input connector and grid circuitry of the 417A. Notice the grid pins bonded together with a wide strip of copper. The tap on L_1 is adjusted for minimum noise as explained in the text.



Commercial Converter Design Techniques

Recently, band IV and V converters for commercially produced TV receivers appeared on the German market, (continuously tunable from 470 to 790 *mc*). These converters are equipped with a modern miniature triode, having a high transconductance of 14 *ma/v* and an R_{eq} of about 180 ohms. The E-86-C or PC-86 (the difference being the heater voltage) is a grounded grid triode of very modern construction with a nine pin base. This triode can be found in the second stage of the converter.

To suppress cross-modulation and to get as high an image rejection ratio as possible, no grid combinations are used, and bandpass coupling is used wherever possible. A critically coupled bandpass filter is found between the *rf* and mixer sections of the converter. The self-neutralizing frequency of the E-86-C varies around 650 *mc*. A slight tendency to self-oscillate in the 150 *mc* region was suppressed by means of a non-inductive resistor across the plate circuit of the E-86-C. It does not degrade the *Q* of this resonant circuit much and has no influence at all on the noise figure.

The amplification of the first two stages of the converter is such that the noise properties of the mixer tube are masked. Nevertheless the mixer tube, E-180-F[3] has a transconductance of 16 *ma/v* as a class A amplifier and an equivalent noise factor of only 460 ohms as a pentode. As a mixer, transconductance ranges around 5*ma/v*, guaranteeing high amplification. A bandpass filter is found in the plate circuit of the E-180-F. It is over-coupled and swamped on both sides by a 5K resistor.

The choice of the variable intermediate frequency is not only a question of the available station receiver but also a question of fundamental character. At a given number of *rf* stages the image reflection ratio will be better for a higher *if*. Simultaneously, noise properties will be better, since the noise spectrum produced by the oscillator will fall outside the band width of the *rf* stages. As a rule of thumb, it can be said that the *if* should be at least one tenth that of the received frequency. The *if* of this converter varies between 27 and 29 *mc*.

Oscillator Stability

It was noted at the opening of this article that

[3]All German receiving tubes whose numbers are bracketed by letters are long life tubes.

stability was one of two points to be considered as most important. It should be stated that the frequency stability of the oscillator should be the highest possibly attainable. Contrary to widespread opinion, crystal oscillators are not highly stable. Crystal oscillators can be of the "rubber" variety, especially when overtone crystals are used. It was with great surprise that I observed the use of overtone crystal oscillators in American *vhf* equipment which claimed to be "extremely" stable. I have published an article[4] in our German amateur radio magazine, dealing with phenomenological research on overtone crystal oscillators. I showed that they are far less stable than conventional crystal oscillator circuits unless certain points are observed. Extensive lab work on this subject has been done by Schweitzer, DL3TO, with reference to my article. Only under rigid working conditions and in narrow areas of excitation (grid current, plate current and in certain instances screen grid current) can an overtone crystal oscillator be stable. That is the reason why I have chosen the oscillator circuitry, shown in fig. 1.

Oscillator Circuitry

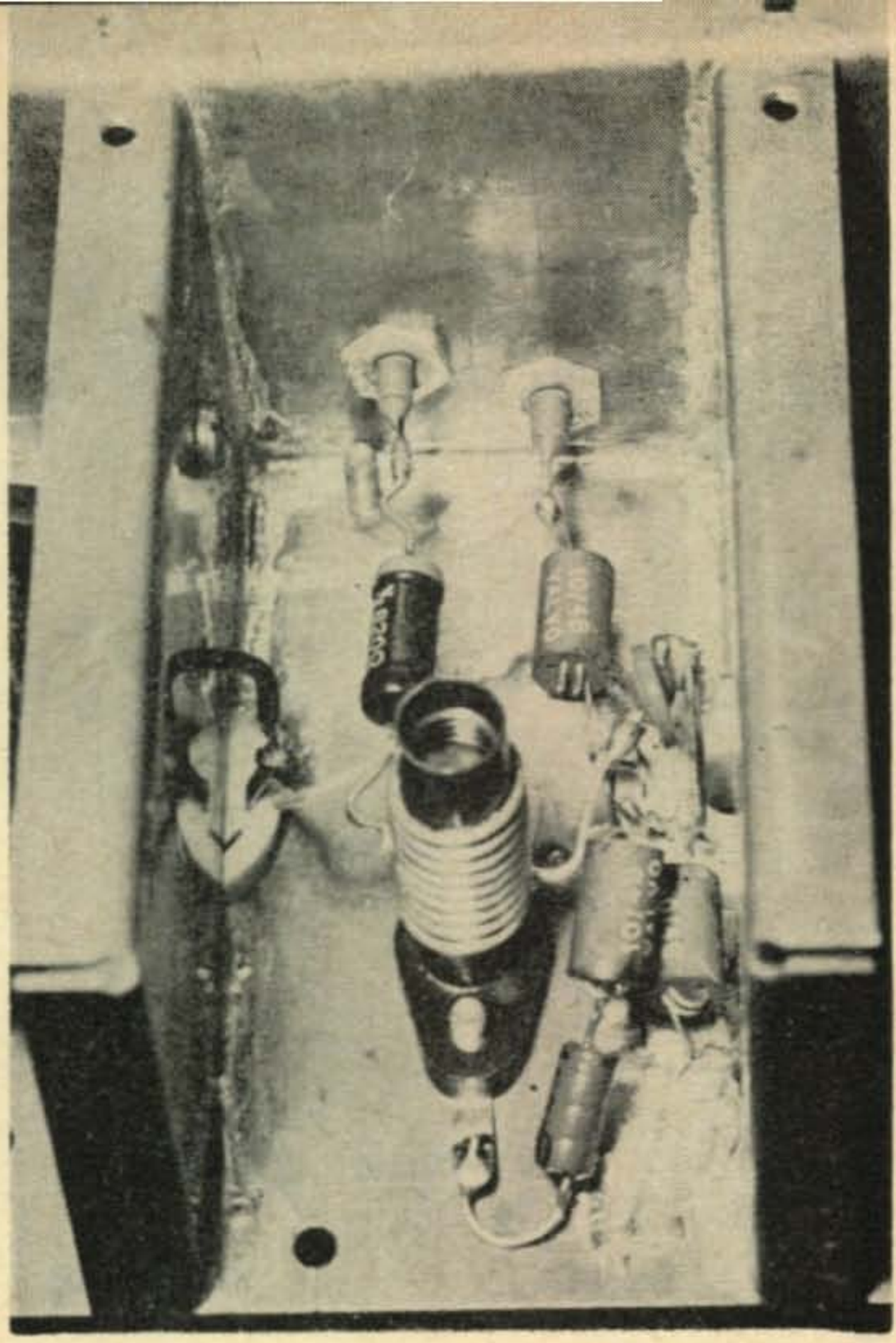
A 6.5 *mc* crystal is connected between grid and ground of a 6AU6, the cathode of which is hot. The capacitive voltage divider guarantees a reliable range of oscillation. Low crystal current is obtained with a low value grid leak resistor thereby providing further high frequency stability. Obviously, the frequency of the crystal is such that it will not fall into the *if* or its image.

The first stage of the oscillator chain is both oscillator and tripler. The plate circuit develops 19.5 *mc* which appears across the primary winding of a highly selective bandpass coupler whose frequency response is extremely sharp. The first EC-92 doubles to 39 *mc* and the second triples to 117 *mc*. The four resonant circuits are integral parts of two bandpass filters, whose primary and secondary windings are loosely coupled. Injection frequency is inductively coupled from the cold end of the secondary of the 117 *mc* bandpass filter. The whole oscillator chain is completely shielded and generous use is made of feed-through condensers and small resistors to filter plate voltage and to prevent unwanted harmonics from entering the *rf* section of the converter.

Physical Arrangement

The photographs show the physical layout of the converter described here. Use is made of copper sheet for the chassis, and for a box to contain the chassis. It can be very often found, in American literature, that use is made of the mounting principle just mentioned. It should be made absolutely clear, however, that there *is* a difference. The difference being that separate compartments are mounted on the bottom of the chassis to act as shields. The copper, forming

[4]Lickfeld, K. G., "Moderne Quarz-Oberton-Oszillatoren," *Das DL-QTC*, April 1958, p. 162



This section demonstrates the method of mounting L_3 and associated circuitry. The v.h.f. chokes are commercially manufactured and have a ferroxocube core.

the shields, creates joints when pressed to the sides and the bottom of the box. This results in a complete *rf* tight shielding system. Contrary to this method, American descriptions usually show compartments which leave slots between the chassis and the box. These slots indicate that *rf* fields can enter compartments from which they should be separated.

The chassis of the converter measures 5½ × 8¼" and is made of 1/32" thick, hard copper sheet. The bottom is divided into four compartments, one of them stretching the full length of the chassis and taking one third of its width. This compartment includes *dc* components only. Two short shields are mounted across the middle of the sockets of the 417A and E-86-C. The large shield is both riveted and soldered to the chassis and the two smaller shields are only soldered. There are a few holes in the large shield, which mount feed-through condensers. It can be seen from the photographs that the wires connecting the feed-through condensers are soldered directly to components, maintaining shortest possible lead length. Orientation of sockets is such, that short leads are obtained, an important point in getting good results. The height of the copper box is 1¾". Further details of chassis construction can be seen from the photographs.

In spite of the fact that tight *rf* compartments were built on the bottom side of the chassis, the oscillator chain was built on a small separate chassis. Its length is 6½" and its cross-section measures 1½" × 1½". It is made from 1/64"

Mixer section of the 145 mc converter. The E-86-C 2nd r.f. amplifier can be seen mounted under the shield at the left. Bandpass filter coils (L_4, L_5 and L_6) and capacitors are mounted to the right of the E-86-C socket. To the right of the mixer (E-180-F) socket are the components for the 28 mc bandpass filter. Notice the "air tight" shielding and use of low inductive copper strap grounds where possible.

sheet copper. The two open sides of this sub-chassis are closed by soldered in copper sheets and the bottom is formed by the main chassis.

The crystal socket can be seen mounted on one end of the two small sides. It was with stability in mind that I used this method, since it provided freedom from thermal influence upon the crystal. Crystals, when possible should never be mounted near tubes. Heat radiation from miniature tubes is such that a wide space should be provided between tube and crystal. Even then, the narrow side of the holder should face the heat source. The HC-6/U metal enclosed overtone crystals are particularly sensitive to temperature changes. Even a touch by finger tip causes considerable drift. Fundamental crystals are less sensitive but nevertheless should be handled with care. A drift of only 5 *cps* would cause a frequency change of 90 *cps* in the case of this convertor and that can push the received signal clear out of the *if* bandpass when very narrow bandwidths are in use.

With the exception of the 117*mc* circuits, all resonant circuits of the oscillator are tuned by means of powdered iron cores. The coils of the 117 *mc* tank circuit are air wound and are tuned by air trimmers.

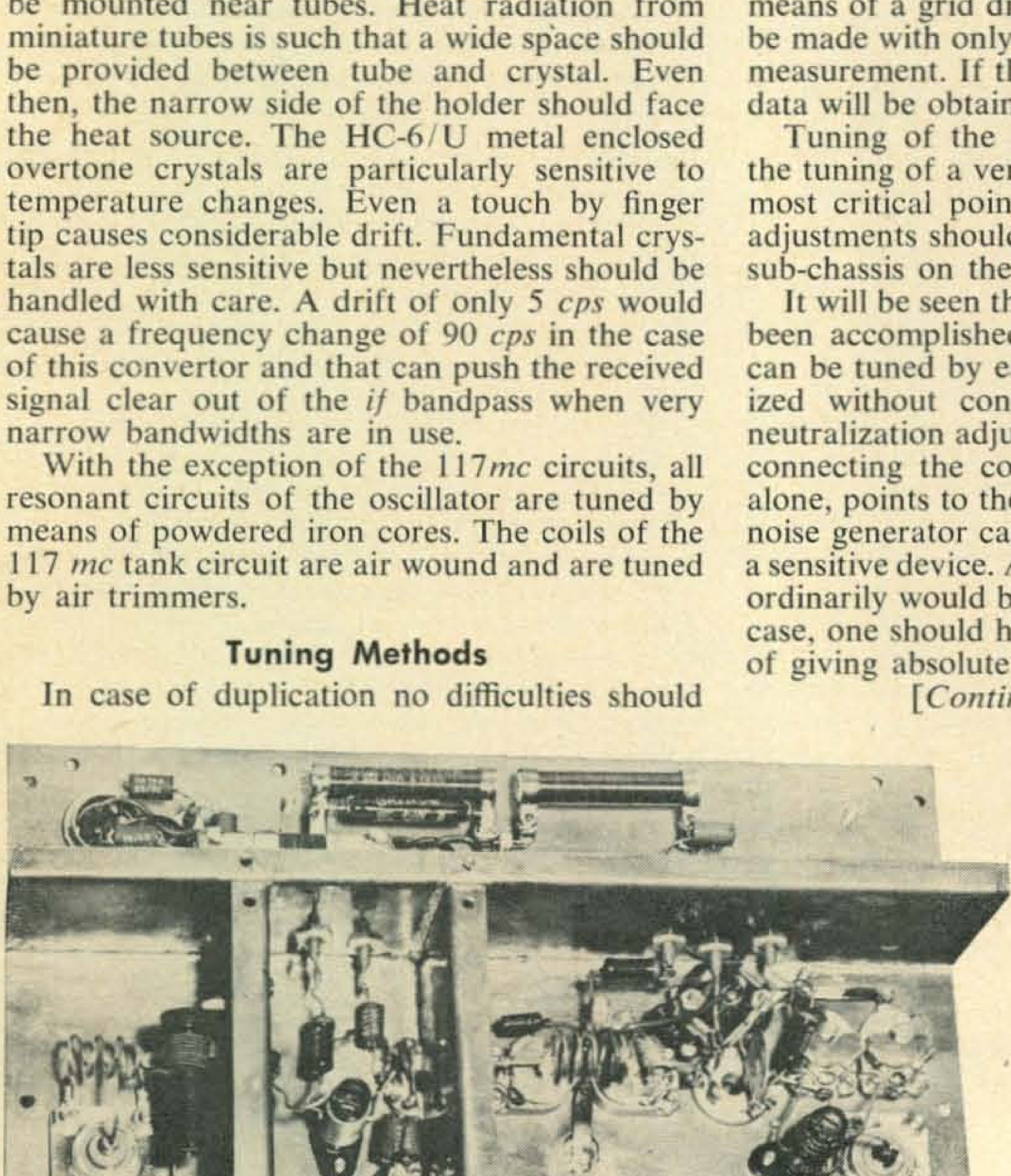
Tuning Methods

In case of duplication no difficulties should arise, although it is improbable that all parts used here can be purchased in the States. I think this description should be more a lecture on principles rather than constructional details. Nevertheless, some information regarding tuning will be of practical value. All coils of the cascode stage, grid coil, neutralization coil, pi filter coil and plate coil must be pretuned by means of a grid dip oscillator. This tuning must be made with only one coil in place during each measurement. If this is not done, erroneous coil data will be obtained due to interaction.

Tuning of the oscillator stages is similar to the tuning of a very low power transmitter. The most critical point is the 117 *mc* stage. Final adjustments should be made after mounting the sub-chassis on the main plate.

It will be seen that after the neutralization has been accomplished, all stages of the converter can be tuned by ear. The 417A can be neutralized without connection to an antenna, but neutralization adjustments must be remade after connecting the converter to the antenna. This alone, points to the fact that only by means of a noise generator can the converter be made such a sensitive device. A crystal diode noise generator ordinarily would be sufficient, but in this special case, one should have a noise generator capable of giving absolute measurements. Such genera-

[*Continued on page 175*]



Under chassis view of layout and shielding. Good use is made of feed-through capacitors and all power components are shielded from the r.f. circuitry.

The "Parasite",

A Tone Modulator For The Grid Dip Oscillator

Edward Burke Jr., W6FTA
814 No. Van Ness Ave.
Fresno 4, California

An easily constructed accessory which further enhances the usefulness of the Grid Dip Oscillator.

Anyone using the Grid Dip Oscillator as a signal generator eventually wishes that some form of tone modulation had been included in the original design.

Measurements of the grid leak current and voltage at the phone jack of a Heath GD-1B indicated sufficient power to operate a transistorized tone oscillator.

Circuit Description

Figure 1 is the schematic of the adaptor unit that performs as a parasitic modulator.

The oscillator is a common base with inductive emitter to collector feedback. Any small transistor type interstage transformer will operate satisfactorily.

This adaptor will AM modulate the *rf* output fully with some FM. Placing a suitable resistor across the terminals of the phone plug will decrease the modulation level.

The modulating frequency is approximately 500 *cps* with the .005 mmf base blocking capacitor shown. If you prefer an unusual signal to facilitate identification of harmonics, a one mf capacitor will give a pulsed signal.

This adaptor can be used with any GDO equiped with a phone jack.

NPN transistors may be used but the connection to the phone plug terminals must be reversed for correct polarity.

Construction

The shield can is an aluminum 35 mm film magazine container with screw on lid. An aluminum U shaped bracket is folded to support the audio transformer. One leg is drilled to fit the threaded portion of the phone plug. Another hole the same size is drilled in the center of the screw on lid. The plug, bracket, lid and transformer are assembled and fastened by a large hex nut. If you have no nut this size, the end of the bakelite shell of the phone plug can be cut off to provide a threaded retaining ring.

The resistors, capacitor and transistor are wired together then pressed into the U shape bracket. The can is then screwed into the lid to shield the entire assembly. ■

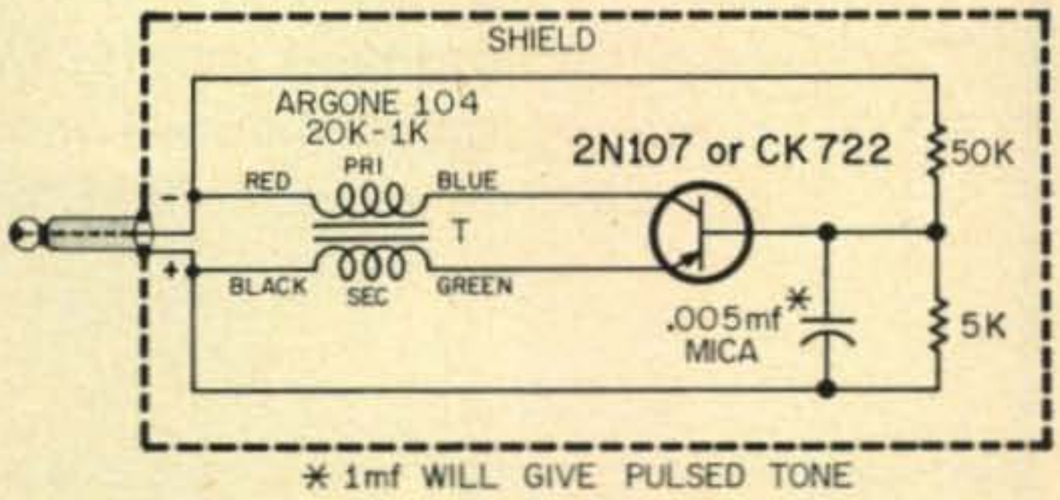
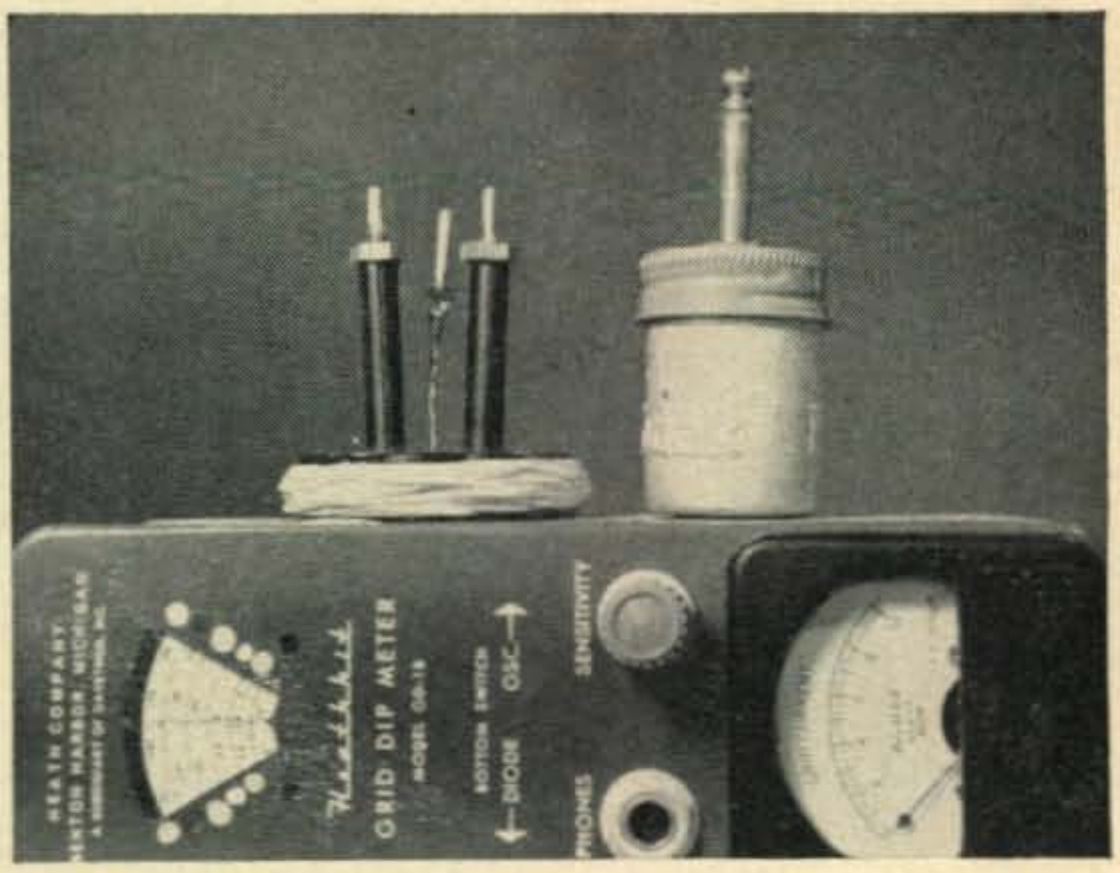
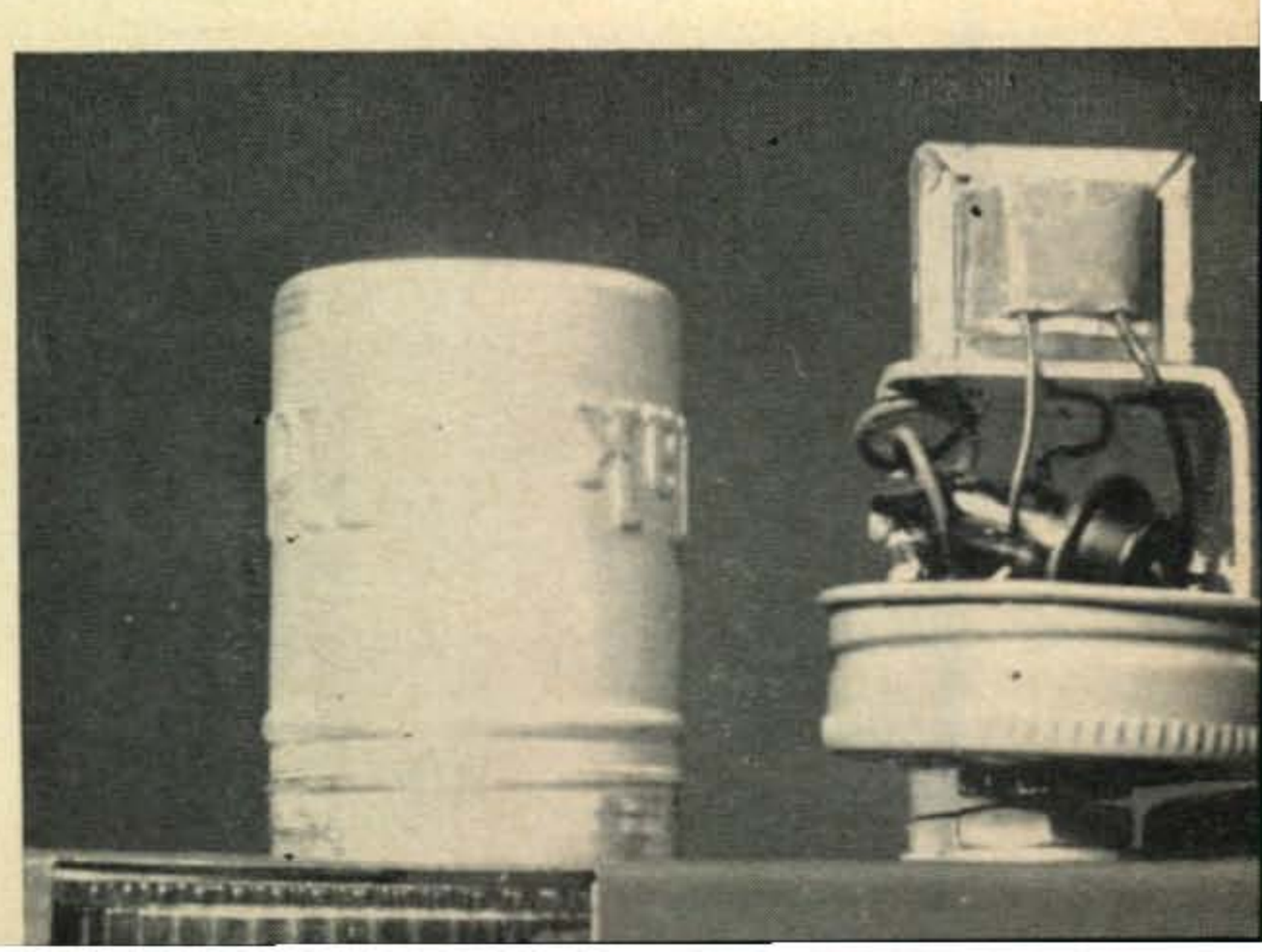


Fig. 1—Schematic of a tone modulator which can be used in conjunction with most grid dippers. Power is supplied by the grid dipper itself. The two resistors may be ¼ watt carbon.



The phone plug and Kodak film holder seem to be made for each other. Sitting next to the parasite is the low frequency plug in coil for the Heath GD-1B grid dipper.



Close up photo illustrating method of mounting the miniature transformer and other components. The metal film container plugs right into the phone jack of the grid dippers.

Hybrid 10 Meter Transmitter

John A. Meissner, K5CXN
John Guerrero, KL7BNJ
Lloyd Crawford, K5OVE

Lytle Engineering Corp.
1404 San Mateo, S.E.
Albuquerque, New Mexico

This small, easily transported, battery-powered transmitter requires no power supply. Plate voltage for the tubes is generated and simultaneously modulated by the transistor modulator. Efficiency is excellent, power input to the final is 5 watts.

The transmitter described in this article is an attempt to combine the efficiency of transistorized circuits with the *rf* power-handling capabilities of vacuum tubes. As it requires only a 12 volt *dc* input, it will probably appeal to amateurs who have transistorized or hybrid auto receivers and who wish to go mobile without the necessity of a separate power supply. Then, too, for field operation, the transmitter is an ideal portable unit when used in conjunction with a transistorized receiver.

The transmitter is essentially a controlled-carrier rig in which the oscillator-driver and the modulator have been transistorized. A vox relay is included in the circuit to conserve battery power and allow for break-in operation. The *rf* and modulator sections are constructed separately on small aluminum boxes and are joined by a short cable fitted with plugs on each end. Power for the transmitter is supplied from dry cells or small rechargeable wet cells. The rechargeable wet cells shown in the photograph of the complete rig have a one ampere-hour capacity and, when fully charged, can provide normal QSO operation for several hours, depending upon the voice intensity of the operator.

RF Unit

The overtone crystal oscillator is of standard design with the exception of C_1, a 10 mmf capacitor from the collector side of the crystal to ground, which prevents random oscillations and subsequent radiation of undesired frequencies. Type 3A4 tubes are used in the output stage because of their availability, low filament, and low drive requirements. The final could be constructed single ended rather than push-pull, but the push-pull arrangement requires little more drive and doubles the power output. Link coupling between the oscillator tank and the grid coil of the final amplifier is used for simplicity and to avoid lowering the *Q* of the oscillator circuit as might occur with capacitive coupling. The link is wound over the cold end of L_1 and over the center of L_3. Relative location of L_1 and L_3 is critical. The two coils must either be shielded from each other or positioned at right angles as shown in the photograph. Such placement prevents excessive coupling from "pulling" the oscillator as the grid circuit is tuned through resonance. Neutralization of the final amplifier is necessary and is accomplished by the gimmic capacitor (C_n) consisting of twisted lengths of No. 20 plastic insulated wire carefully trimmed to proper length (approximately ¼ inch).

The Modulator

A carbon microphone operated from the battery voltage is transformer coupled to the 2N255 driver transistor. The 2N441 transistors[1] work into the modulation transformer to develop equal *ac* voltages in the separate secondary windings.

A silicon diode bridge circuit rectifies the *ac* output of one of the windings producing a 150 volt *dc* plate potential. The *dc* is fed back into the transformer where it is modulated by the voltage produced in the second winding. The result is 100 per cent modulated plate potential for the final—regardless of the intensity of speech at the microphone. In fact, the higher the speech level, the greater will be the power delivered to the final and the "bigger" the resulting signal on the air!

A portion of the rectified *ac* voltage is passed through a sensitive relay to provide voice-controlled operation of the rig. Adjustment of the value of C_{11} will determine the drop-out time of the relay. Contacts on the relay switch the bat-

[1]It can be observed that the modulator is considerably overdesigned and with a few bias resistor changes should be capable of delivering 35 watts of peak power, approximately 15 watts of *dc* plate power, fully modulated.

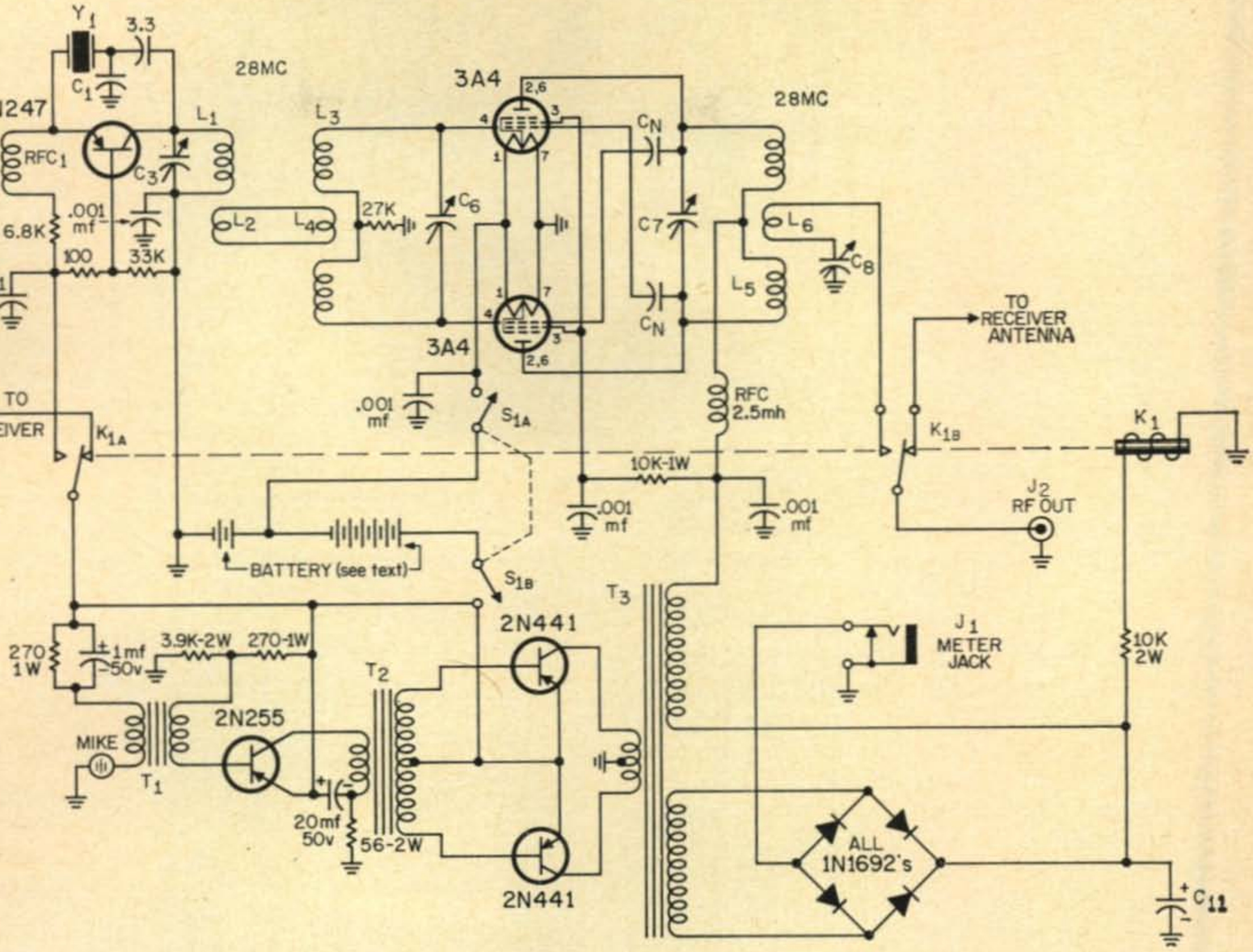
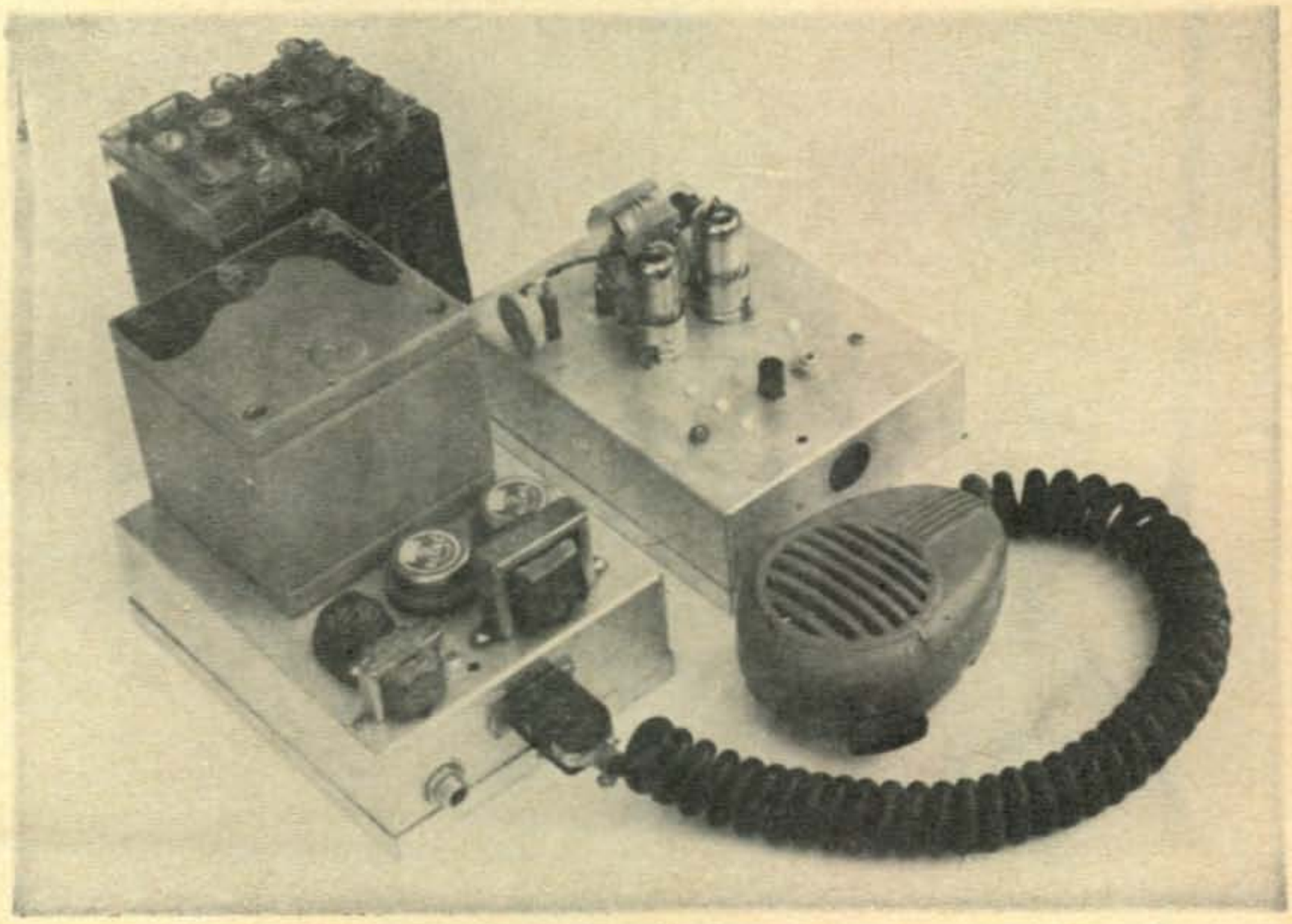
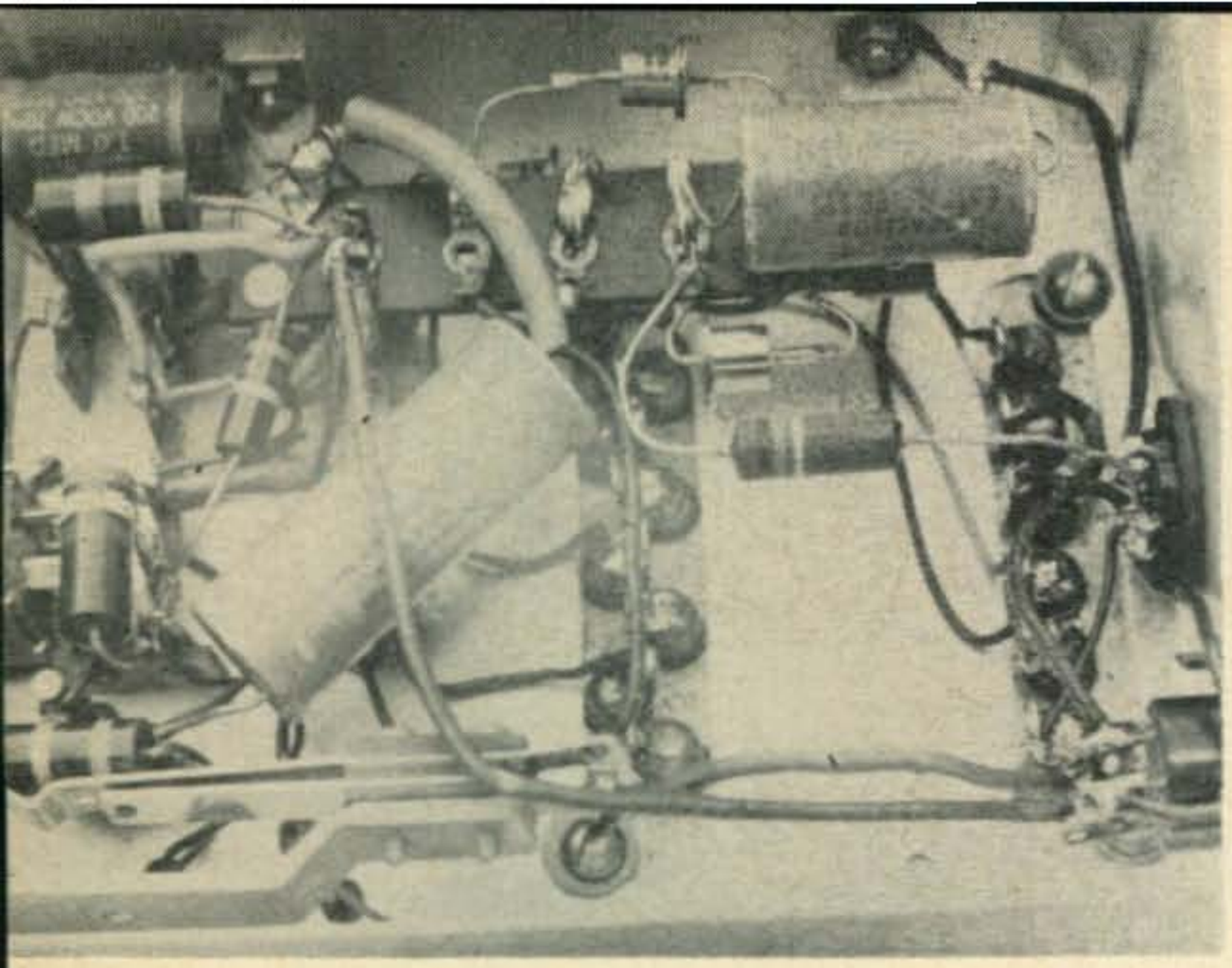


Fig. 1—Schematic of a Hybrid 10 Meter Transmitter featuring a built in vox and capable of 5 watts input. All resistors are ½ watt unless otherwise specified.

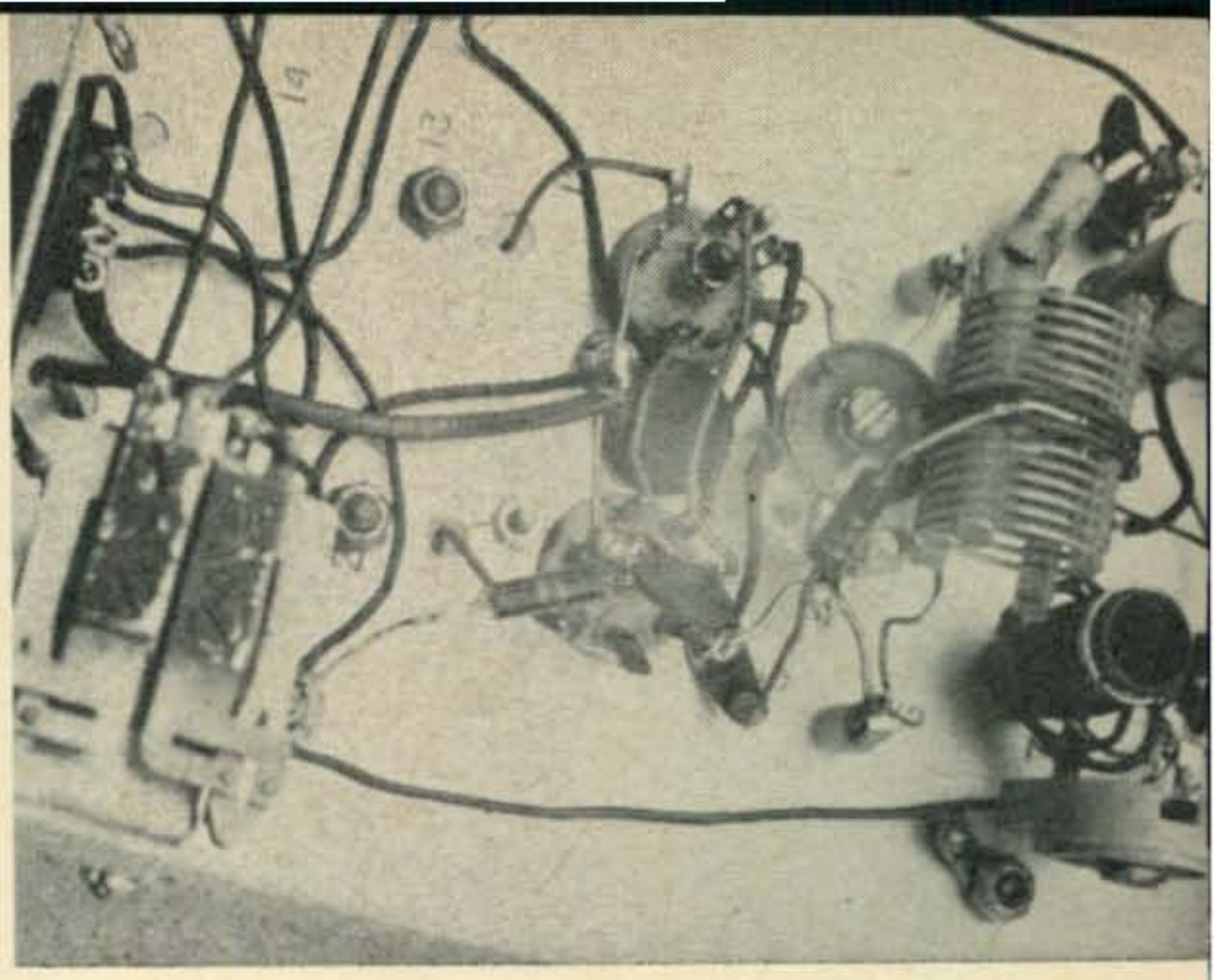
C_1—10 mmf
C_3, C_8—7-45 mmf Ceramic Trimmer
C_6, C_7—3-13 mmf Trimmer
C_{11}—8 mf 150 volt Electrolytic
Cn—Neutralizing Capacitors, See Text
J_1—Closed circuit 'phone jack
L_1—16 turns # 20 enam ⅞" long on ⅜" diam. form
L_2, L_4, L_6—Two turn link #20 plastic covered wire
L_3—15 turns #22 ⅝" diam., long, center tapped
L_5—14 turns #22 ⅞" diam., ⅞" long, center tapped
RFC_1—4.5 mc peaking coil
K_1—10K Plate Relay
T_1—Stancor TA-15
T_2—Stancor TA-16
T_3—Lowyt LP0120 700-1 TO-5 JAN T-27 Grade 1 Class A Vibrator Transformer. From Surplus PE-237 Power Supply. Four in each power supply.
Y_1—3rd overtone 28.5 to 29.7 mc crystal



The modulator and power supply components are mounted on the left chassis and the rf deck is at the right. The switch on the carbon microphone is not used because of the built in vox. The meter jack J_1 is mounted next to the mike connector and below T_1, while T_2 is mounted in front of the two 2N441's. The battery at the rear is explained in the text.



Bottom view of the modulator and power supply showing general component layout. The microphone jack and meter jack can be seen at the left. The 1N1692 diodes are mounted on the terminal strip at the rear.



Under chassis view of the rf deck showing the grid tank of the 3A4's. The neutralizing capacitor can be seen as two wires soldered to pin 4 of each tube coupled together by a short piece of #20 plastic covered wire.

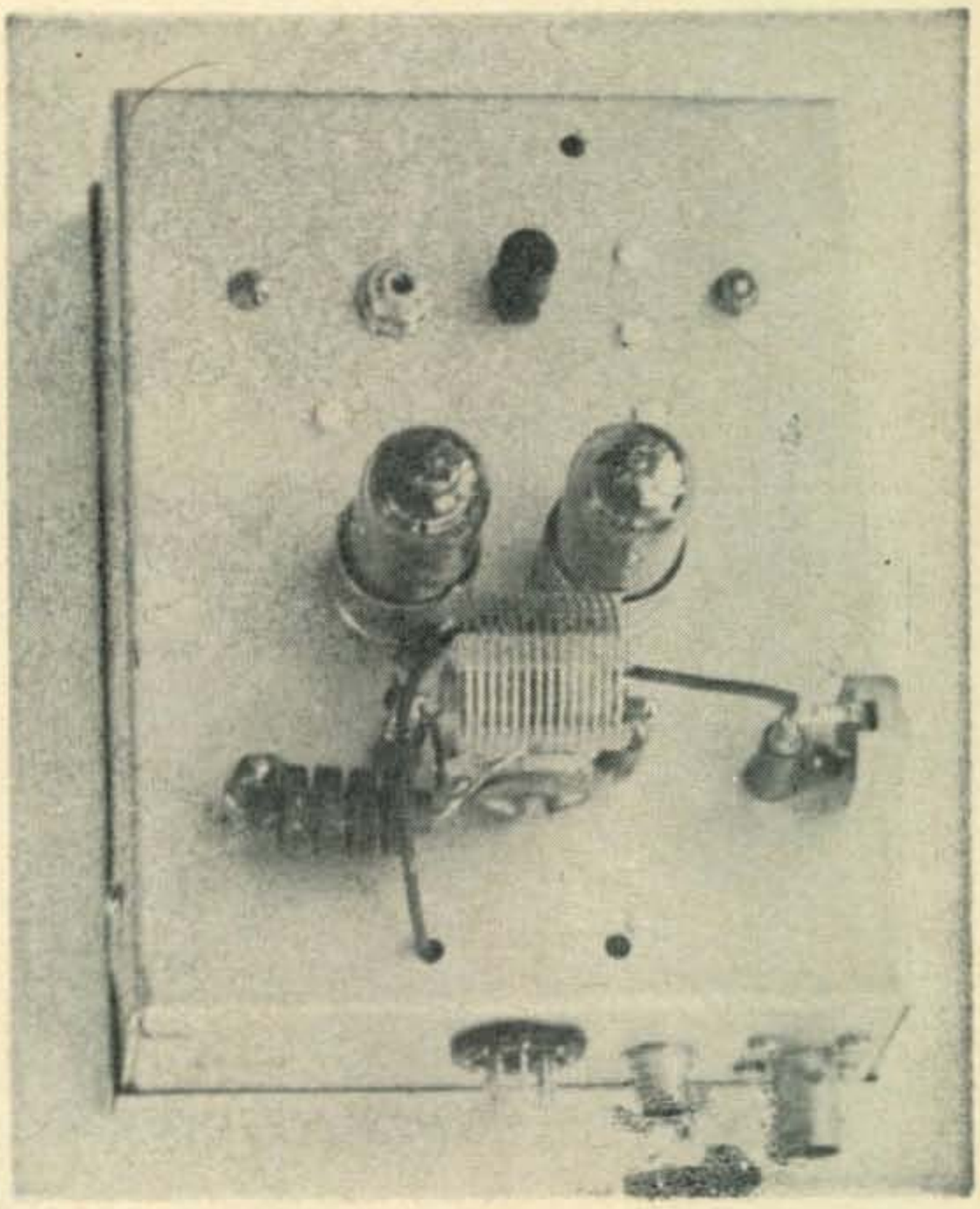
tery voltage and the antenna between the receiver and the transmitter. Unfortunately, excessive filament warmup time prevents simultaneous switching of filament power. The vibrator transformer T_3 was salvaged from a surplus PE-237. This unit contains four of these transformers and may be obtained from Fair Radio Sales Company, Box 1105, Lima, Ohio at a cost of $15.00. This makes the cost of each transformer about $4.00 plus the associated expense of shipping the power supply.

Operation

When the rig is tuned up, 2N247 collector current is 4 *ma* and grid drive to the final is 300 μa. When the rig is loaded to an antenna, a milliammeter plugged into J_1 indicates a combined plate and screen current of 65 *ma*. A steady audio note must be supplied to dip the final. This can be supplied from a small toy whistle. Under normal operation, standby drain is approximately 150 *ma* at 12 volts for the modulator and 200 *ma* at 3 volts for the filaments. With full modulation, the modulator current will increase to one ampere and *dc* power input to the final will rise to about 5 watts.

On the receiving end, modulation is clear and crisp and the S-meter shows the characteristic bounce associated with a sideband signal. The signal is best copied with the receiver *avc* disabled, but otherwise has all the aspects of an AM 'phone signal. Cross-country contacts with the rig have not failed to produce comments on the quality of the signal.

This transmitter does not represent a final design. Power limitations of this type rig seem to depend only on the maximum power which can be generated in the modulator. Current experiments with a 2E26 class C final indicate that excellent results can be obtained with inputs of 40 and 100 watts. For the higher power experiments, several of the LS (Linear Standard) transformers available from U.T.C. are useable.



Top view of the rf deck showing component layout. The tank capacitor, C_7, can be seen snuggled under the tank coil L_5. The antenna tuning capacitor C_8 is to the right of the tank coil mounted on a standoff insulator. Behind the push-pull 3A4's is the mounting nut for L_1 and L_2, as well as the 2N247 crystal oscillator. The components mounted on the front apron l. to r. are, power plug for interconnecting cable, 12 volt output to receiver, and J_2 rf output. Twelve volts d.c. for the receiver is taken out through a separate lead on the interconnecting cable.

Unfortunately, these units are sold as hi-fidelity output transformers and are correspondingly priced. Considering that the price is about as high as the fi, this amateur has torn up his high fidelity music system in order to experiment with a 120 watt mobile rig. ■

Midget Field Strength Meter

E. H. Marriner, W6BLZ
528 Colima Street
La Jolla, California

Here is a field strength meter which requires no power, very few parts and few hours to construct.

You don't need transistors to build a sensitive field strength meter! Using a one inch 0-200 μa meter gives an opportunity to build a field strength meter that you can tuck in your pocket. If you use a 30 mmf straight line condenser the accompanying dial calibration chart can be used. A calibrated dial has been one of the most difficult obstacles for the constructor to make, without having any calibrating instruments or photo processes. Don't pass by this opportunity to own a F.S. meter. If you don't want to cut up your copy of *CQ*, send me twenty-five cents and I will mail you a glossy print of the dial.

The new Air Dux bulk coils make it possible to duplicate this F.S.M. calibration. Dig out all of those old #80 rectifier tube four prong bases and make your own plug-in coils. The bulk coil stock will slide down nicely inside the base with a little sanding on the bottom of the coil. The tube base has a slight taper at the bottom.

When the F.S.M. is finished, check out the coils and set the dial screw by using a known frequency on each band. A word of warning—this meter is very sensitive; don't leave it sitting around the shack with the coil plugged in if you have a high power rig in the shack. It might accidentally burn out the meter. Outside in the yard it will be necessary to have an antenna on the FS meter if you want to make antenna measurements; this will change the calibration slightly. ■

Coil Table

Frequency	L_1 Turns	Wire Size	L_2 Turns	Wire Size
3.5-6.5 Mc	35	#26 enam	14	#26 enam
6.5-11 Mc	32	Air Dux #832	4	#26 enam
12-20 Mc	13	Air Dux #816	3	#26 enam
20-30 Mc	8	Air Dux #816	3	#26 enam

Cut coils slightly larger and prune to fit calibration chart.

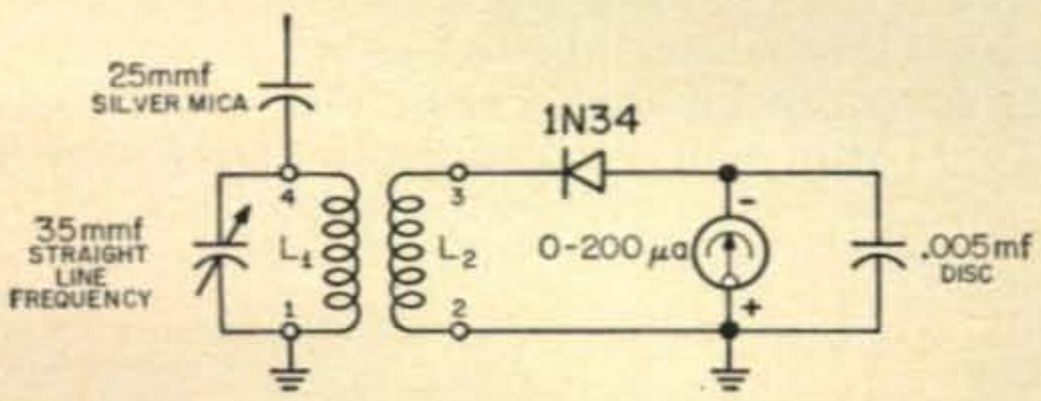


Fig. 1—Schematic of a miniature field strength meter. The 25 mmf coupling capacitor mounts directly to the binding post for use with an antenna.

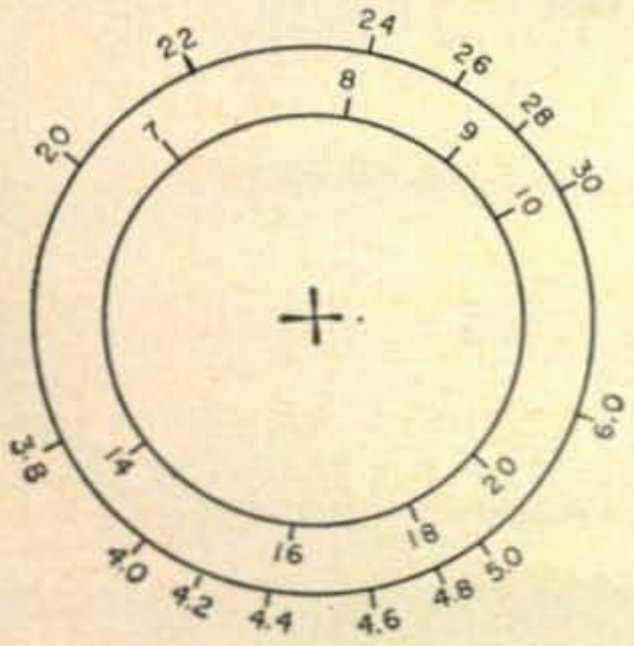
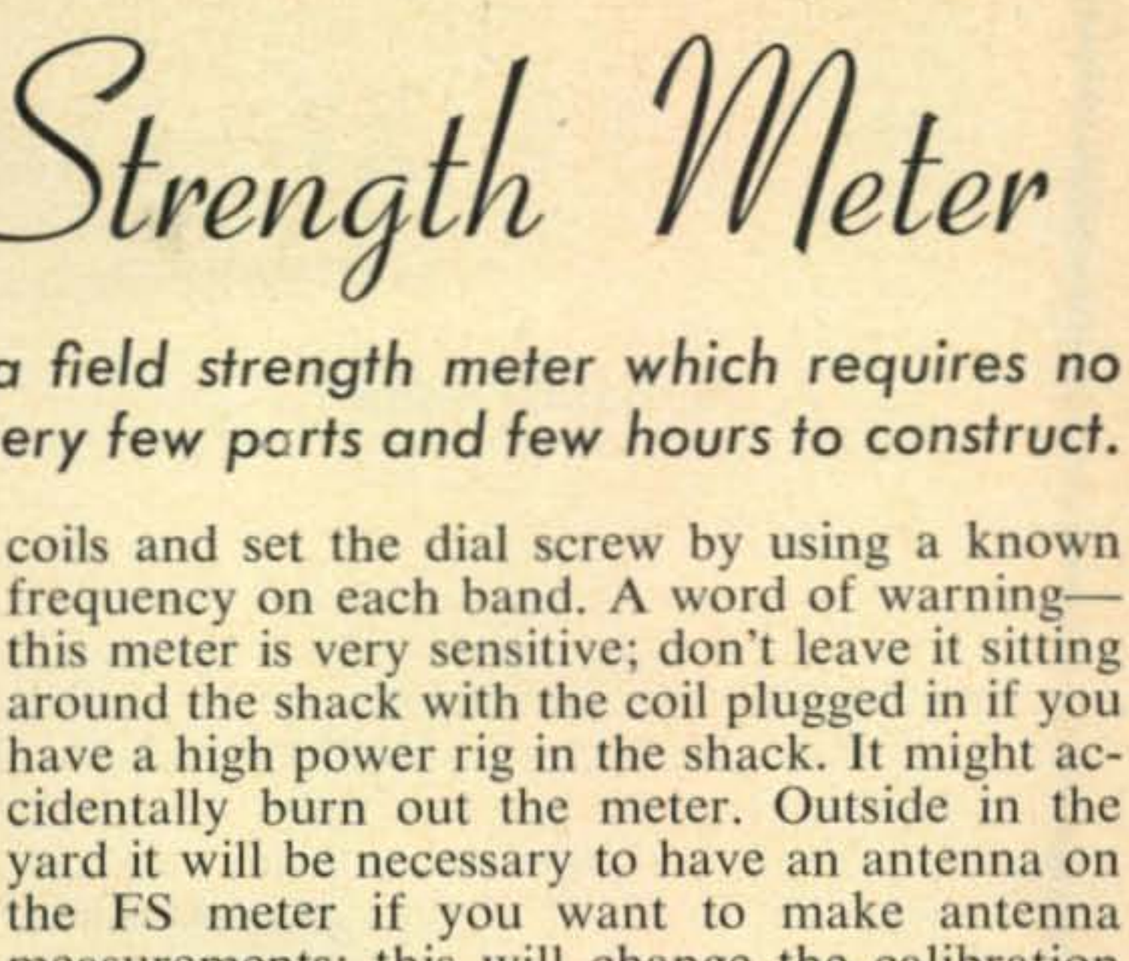
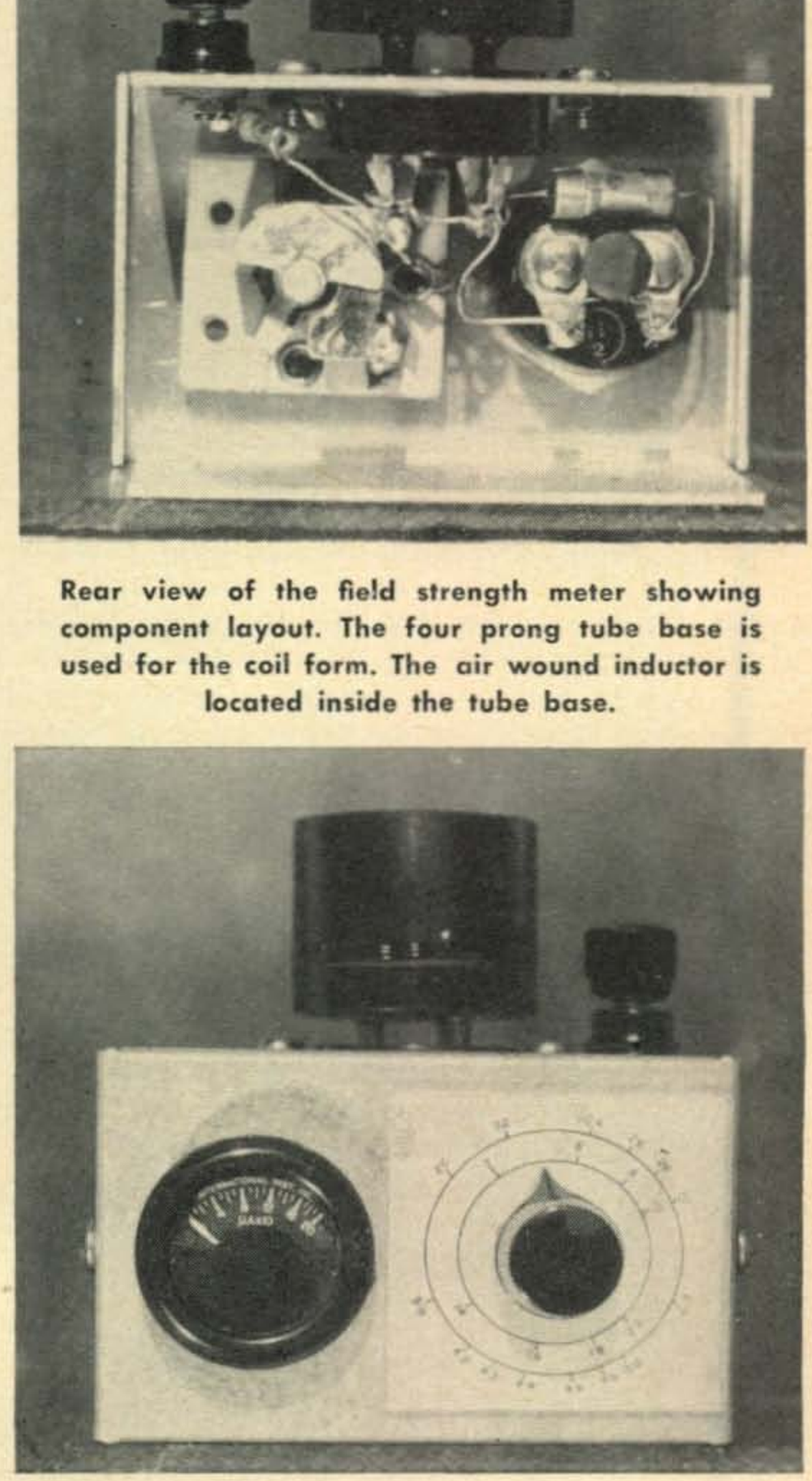


Fig. 2—Calibration chart which may be cut out and attached to the front panel of the aluminum box.



Rear view of the field strength meter showing component layout. The four prong tube base is used for the coil form. The air wound inductor is located inside the tube base.



Front view of the field strength meter built into a 3¼ × 2⅛ × 1⅝ aluminum box. The surplus 200 μa meter is a one inch International Instrument Co. Model 100.

XY—Lamentations

Muriel Gorman
XYL of VE3CMG (Crazy Man Gorman)
219 Warden Wilson Ave.
Whitby, Ontario, Canada

Alac, A Lass and Her Woes.

After reading the article in your February issue[1] by that couraegous XYL (sorry, I mean wife) I say, "you ain't heerd nothing yet!" I was beginning to think I was the only female non-addict who felt that way. I have felt like a one-eyed monster from another planet after all the you-just-don't-understand looks I have been receiving lately, should I dare to venture complaints. When my mate does manage to spend a brief visit with the family he never has two words to rub together, but he's master of the oratory when it comes to explaining why he just has to have a new KWS-1.

Many other wives have problems, I know, but with them it's the cut and dried variety like drinking, other women and gambling. Our mates have more insidious methods of torture. Another woman could have the face and form of Gina Lolabrigida, but if she couldn't produce a 75A-4 she might just as well look like Lassie.

Our two children are beginning to ask who that strange man is who emerges periodically from the basement to relieve his dire needs, and if we had extra plumbing down there we wouldn't even see him that much. Even there he reads a *QST* or *CQ* magazine from cover to cover. Some fathers take their kids out to look at the beauties of nature. Mine takes our four-year-old out to look at trees all right, but instead of pointing out the beauty and color he stands in rapturous awe before a particularly tall straight pine and murmurs, "Gosh, wouldn't that make a lovely antenna!"

The author of the February article mentioned that her social life suffered.—What social life? Unless it's to the house of another ham, where they can *both* disappear ten seconds after the first "hello" and "how are you", he is not even interested. I haven't had a social life for so long, when I do manage to glimpse another human face I feel like a Russian peasant who's just come back from a long stretch in Siberia, or solitary confinement, and can't talk fast enough because it will probably be a heck of a long time before I get the chance again!

I have tried everything from cooking his favorite foods to doing a fan dance in the living room, but I may as well be dressed like Nanook of the North in a sealskin parka for all the effect it has, and I usually wind up taking him coffee and cake down to the shack, even though my baser instinct is to let him have it right in the France America Charlie Echo!

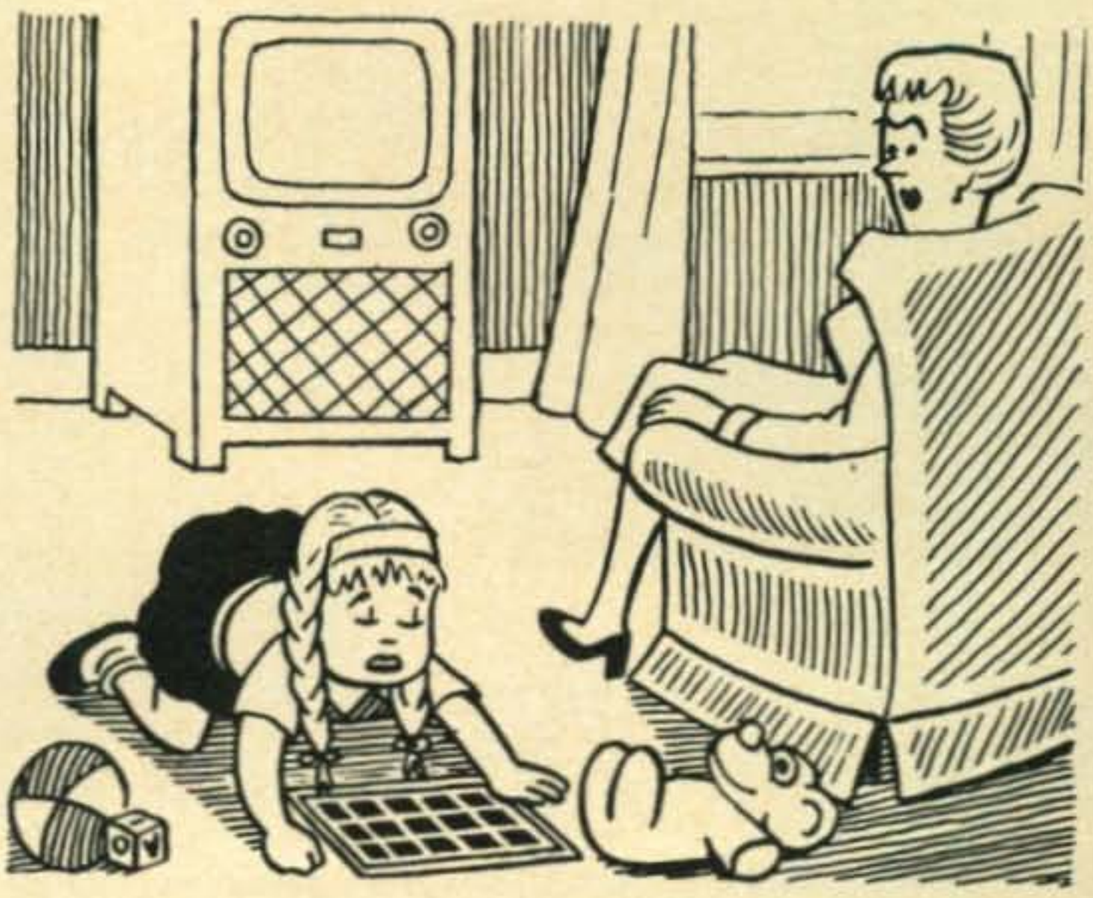
If only he would say, "Look, I intend to spend the next ten hours downstairs, so arrange your program for the evening the best way you can," I wouldn't mind so much. At least I'd know where I stand. But this, "up in five minutes" routine gets my goat. As hour passes dreary hour with monotonous regularity, I brood sadistically and wonder whether I'd draw life imprisonment or the chair if I suddenly ran amok with a hatchet and demolished the rig!

Chores

As for household chores, try to get this XYL's mate to put a washer in a leaky tap He acts as if I'd asked him to build a replica of the Eiffel tower with one hand tied behind his back! So, while I sweep the water off the kitchen floor and out the front door with a broom, he spends the next sixteen hours taking apart, and putting together again, thousands of little wires, parts and tubes.

Ask him to write a letter to his nearest relative, and you'd think I'd asked him to expound Einstein's theory of relativity in Chinese, but he writes seemingly endless cards and letters to other operators without batting an eye. The crowning indignity—he uses my stamps! Talking of stamps, I once innocently remarked, in front of my husband and a visiting "ham," what a good idea it would be to steam off some of the stamps from his QSL cards. They both looked at me with such amazed horror I felt sure I'd grown an extra head—with horns!

Some lucky women have husbands who are



Calling CQ CQ CQ — — —

[1]Karrol, P., "Ham Shackles", *CQ*, February 1960, p. 35.

avid gardeners and they complain they can never coax them into the house until well after dark. What are they kicking about!—at least they have muscular sun-tanned mates who spend their evenings in the living room. At the end of last summer my spouse looked as if he'd just been released from a stretch in Sing Sing judging by the prison pallor he'd acquired from all that time in the basement.

Vacations?

During the summer vacation, does he think of the swimming, boating and just being together for two whole weeks? Are you kidding? While the kids and I are busy packing the badminton set and the swim suits, he's busy filling up the car with *his* equipment, all ready to go mobile. We are lucky if we manage to find room to sit down. He greets the sight of the luggage with the remark, "Do we have to take all that junk!" Junk indeed—! He's a fine one to talk about junk! Our basement is full of it—all his, but would he part with one tiny bit of the stuff—not he! His howls of protest at the mere suggestion could be heard in Persia even without benefit of the rig! Our rec room is just that—a WRECK ROOM! That Frankenstein's brainchild in the basement has caused more fighting words than you hear on T.V. Could *we* tell *them* a thing or three! After one particular stand-up-knock-down bout about how that monster downstairs was driving me mad, and that if I didn't go out I'd go stir crazy, he relented sufficiently to take me to a movie. And what should be sitting between us on the front seat of the car ready to catch any calls from the "fellers"—you've guessed it—a mobile rig! I would have thrown it out the door if I hadn't been in such imminent danger of falling out first, crammed as I was into two inches of space, with the door handle threatening to remove my appendix with every bump and jiggle of the car!

On his day off I can't even use my vacuum or mixer any more between the hours of 8 a.m. and midnight. So, even if we should be expecting the Shah of Persia, he'd just have to ignore the linty rug and settle for bread and jam instead of cake. It's a good thing the opening and closing of the refrigerator door doesn't create any static interference (sorry, QRM) or we would all starve to death!

Our four-year-old has the "bug" too. She uses our floor registers for her rig. She lies on her stomache with her mouth to the opening and shouts, "Calling CQ, CQ, Testing ABCD—over to you Fred!" This household should be named after that new coffee they advertise on TV—Choc Full O'Nuts!

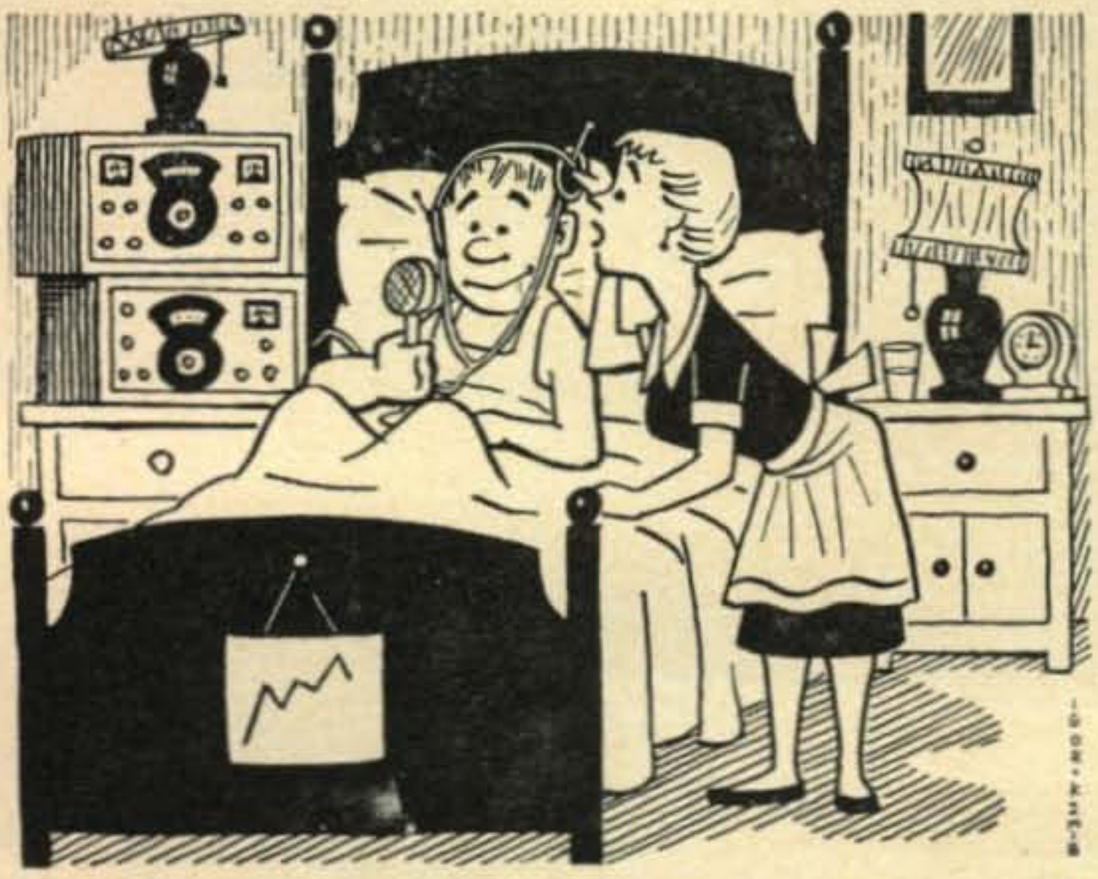
The enthusiasm he can muster for *some* things! He came rushing up one night with face aglow, and shouted proudly, "Waddya know, I just worked one of H.M.'s battleships out on the Atlantic!" — Big deal!! I murmured politely, "How about that!" But he wasn't even listening, he'd gone again to see whether he could contact the OM in the moon. There *must* be some other hobby I could get him interested in to keep him by my side, like tatting—or taffy pulling, perhaps? Oh well, it was only a last desperate thought.

He has very little enthusiasm for most other things, but he'd crawl naked over broken glass across the Sahara desert if he thought there might be a 75A-4 waiting for him at the other side! My theme song, if I had one, would be, "Get outta here with that BOOm! Boom! Boom!", but it wouldn't do any good—he'd only go mobile!

I have tried to be more cooperative. Once, when he was recuperating from a back injury, I foolishly carted all his junk (sorry, I mean equipment) into the bedroom and cheerfully—well almost cheerfully—dusted around chairs and my tea trolley piled high with the stuff. I even removed his ear phones, quite gently, to ask him for the tenth time, "would he like to eat now?" Foolish woman that I was! Six weeks after he was hopping around again like a spring chicken, I was still shoving the stuff around in *our* bedroom and wondering whether it would be any improvement to throw dust sheets over it, or prepare any stray visitor for the first impact by explaining that we had gone into the rag and bone business, and these were our sample pieces! The *time* I had to persuade him to replace his darlings back in the shack. I had to stand over him with a basball bat while venemous lights spewed from my eyes in a "double whammy."

He once had the bright idea of introducing the idea of a "Swap Shop" at the next club meeting, and I heartily seconded that motion, with visions of the stuff disappearing piece by piece in rapid succession. This blissful pipe dream soon vanished when I suddenly realized he might bring home some even more delapidated objects than we already had. He could—and did Anybody wanna buy a hot receiver?

Ah well, I have tried everything, but my fanatic never tires of his "other life," so if I should suddenly develop new twitches I shan't tell him —let the psychiatrist tell him! ■



Would you like to eat now?

A Printed Wire R.F. Sub-Assembly

W. E. Whipple, K1KFE
64 Simpson Dr.
Framingham, Mass.

By use of the popular 6146 and a printed wire board, much of the work in preparing an efficient transmitter is eliminated. With the printed board as the core of the unit greater design flexibility can be obtained.

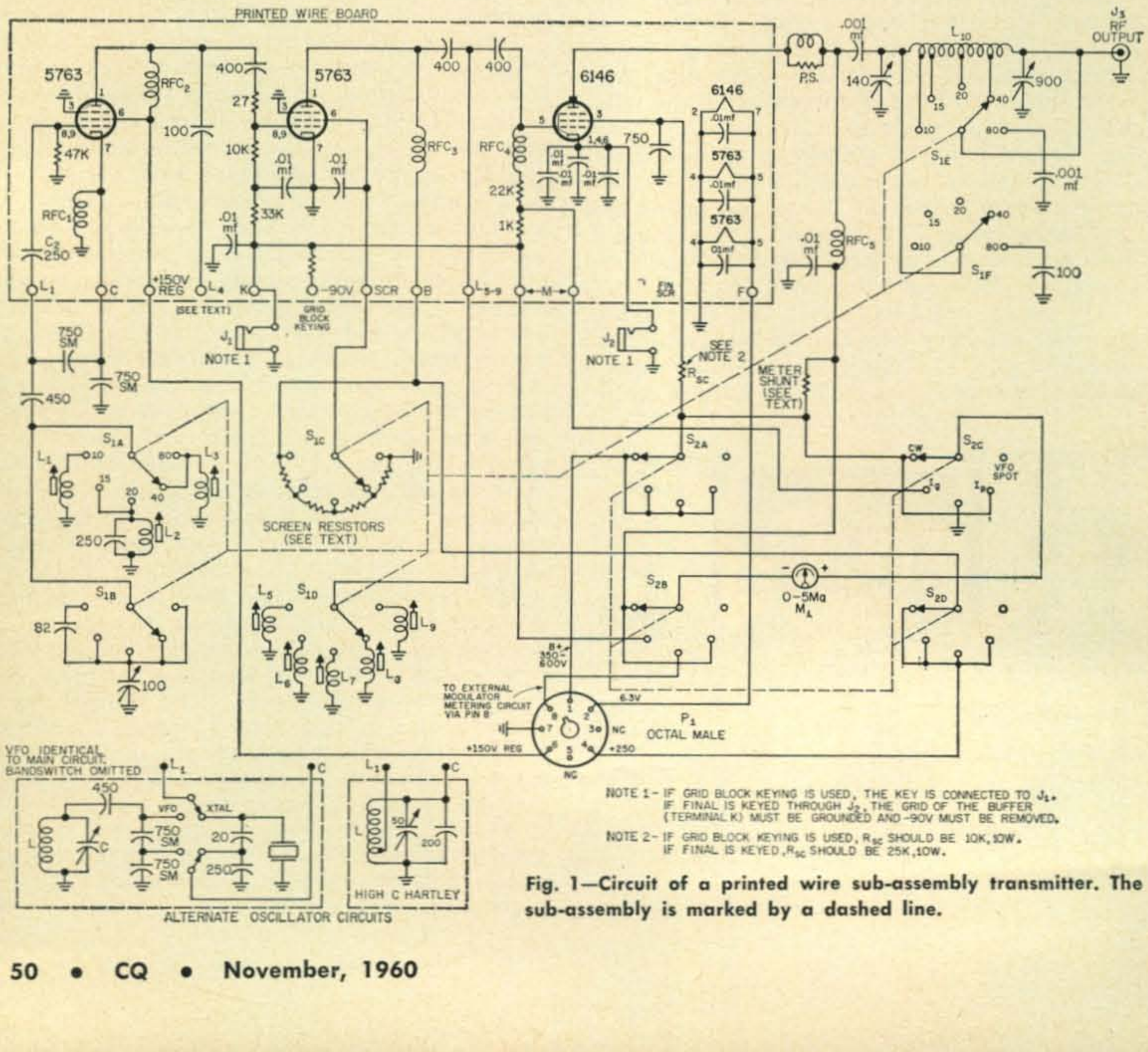
A ham who thinks for himself usually packages his own. How else can he get a rig that suits him, meets his requirements for convenience, number of bands, fits available space and so on? What else gives the ham the satisfaction and pride that goes with operating a rig that he designed and built?

So much for the commercial—this is a description of a printed circuit for a basic transmitter—a sub-assembly to which the builder adds the extras that tailor the rig to his needs. Look at it as a terminal board that provides for easy lead dressing and tie points for each component, thus speeding the time consuming wiring that goes with "rolling your own."

Circuit Description

The first 5763 is used as a crystal oscillator, vfo, or both. The oscillator cathode and the grid, through C_2, are brought out to permit the choice of oscillator tuning circuits. Several oscillator choices are shown in the schematic and chances are your favorite arrangement will work.

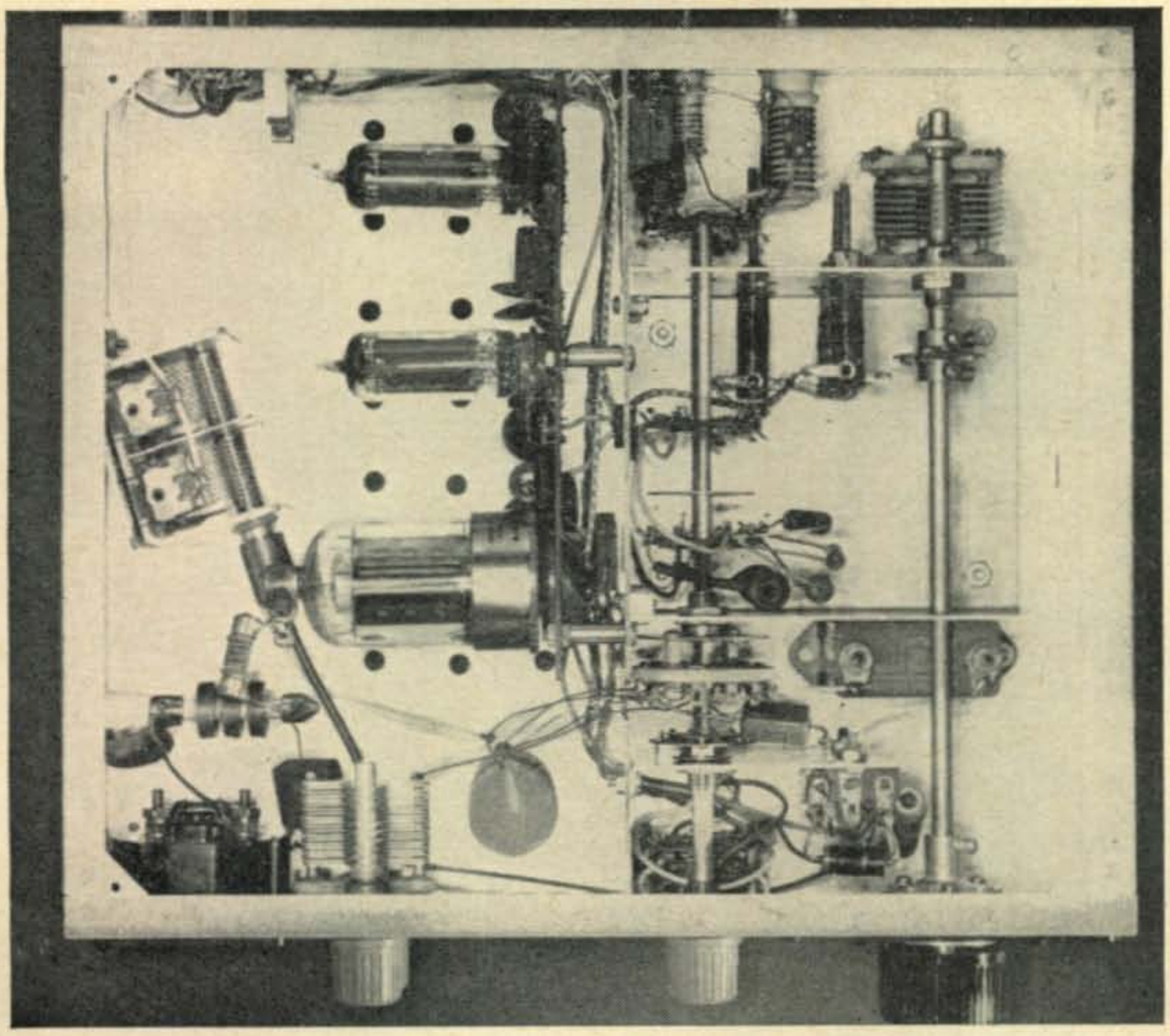
Space is provided for mounting a small slug tuned form on the P.W. board for the oscillator plate coil, L_4. If frequency multiplying of over three times from vfo to final is planned, L_4 may be needed to provide sufficient drive. Inductance $L_{5\ 9}$ are the multiplier plate coils and should be located away from the P.W. board and well shielded. Provision is made for mounting the



NOTE 1 - IF GRID BLOCK KEYING IS USED, THE KEY IS CONNECTED TO J_1. IF FINAL IS KEYED THROUGH J_2, THE GRID OF THE BUFFER (TERMINAL K) MUST BE GROUNDED AND -90V MUST BE REMOVED.

NOTE 2 - IF GRID BLOCK KEYING IS USED, R_{SC} SHOULD BE 10K, 10W. IF FINAL IS KEYED, R_{SC} SHOULD BE 25K, 10W.

Fig. 1—Circuit of a printed wire sub-assembly transmitter. The sub-assembly is marked by a dashed line.



Bottom view illustrating the "dish" type of construction. The v.f.o. components are in the compartment at the upper right, doubler circuitry is in the middle and p.a. components are in the front. The final tank coil can be seen wound on a solid polystyrene rod below the 6146. The antenna loading capacitor is mounted at an angle and tuned with a flexible shaft.

screen resistor for the second 5763 on the board or the screen lead may be brought out for varying the drive to the final.

Eleven 7500 ohm, ½ watt resistors were placed in series from the B plus line to ground and a suitable tap was found for each band. This value of resistor was used simply because it was on hand. It is necessary to provide 2½ *ma* of grid drive. On my rig the taps were as follows:

10 M—6 up from ground, 15 M—11 up from ground, 20 M—7 up from ground, 40 M—4 up from ground, 80 M—9 up from ground.

Grid block keying is included on the circuit board and, if used, several precautions should be observed. The final screen should be fed directly from the low voltage supply (terminal is provided) for the 807, and through a 10 K 1 watt resistor for a 6146 and 2E26. A means of protecting the tube during tune-up and inserting an a.f. choke for plate modulation should be provided.[1,2]

The meter used required a shunt consisting of 2 lengths of 32 copper enameled wire 34½ inches long scramble wound on a suitable form. Since the internal resistance of your meter will probably differ the shunt value will have to be determined by the usual procedures[3].

COIL TABLE

Coil	*Form*	*Wire*	*Turns*	*Wound*
L_1	CTC-PLS-6 Iron Slug	#24 enam.	7	⅝" long
L_2	CTC-PLS-5 Iron Slug	#16 enam.	11	1 1/16" long
L_3	CTC-PLS-5 Iron Slug	#26 enam.	25	close
L_4	LSM-E Iron Slug	#32 enam.	50	scramble
L_5*	⅜" diam. x 1¼" long phenolic Iron Slug	#28 enam.	14	close
L_6*	"	#28 enam.	15	close
L_7*	"	#28 enam.	17	close
L_8*	"	#32 enam.	50	close
L_9*	"	#32 enam.	90	close
L_{10}*	1" diam. Polystyrene	#16 enam.	20 10	20 T.P.I. 10 T.P.I.

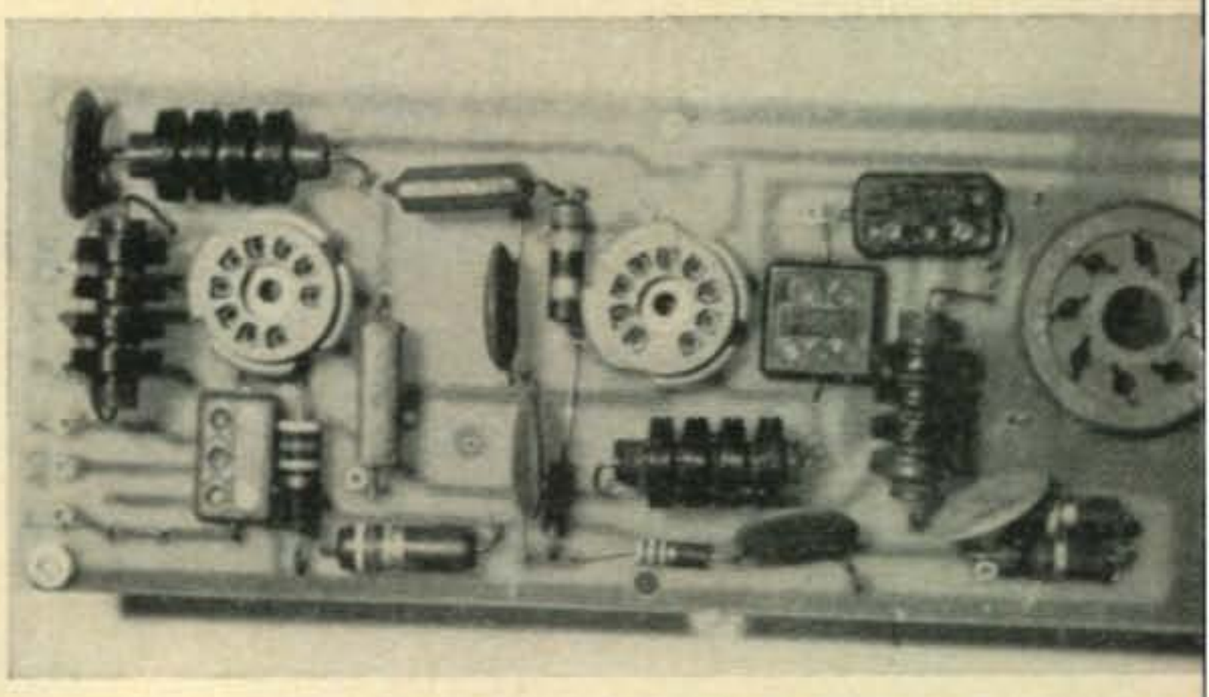
*Surplus forms were used here. Replace with any commercial equivalent type. Not critical.

Construction

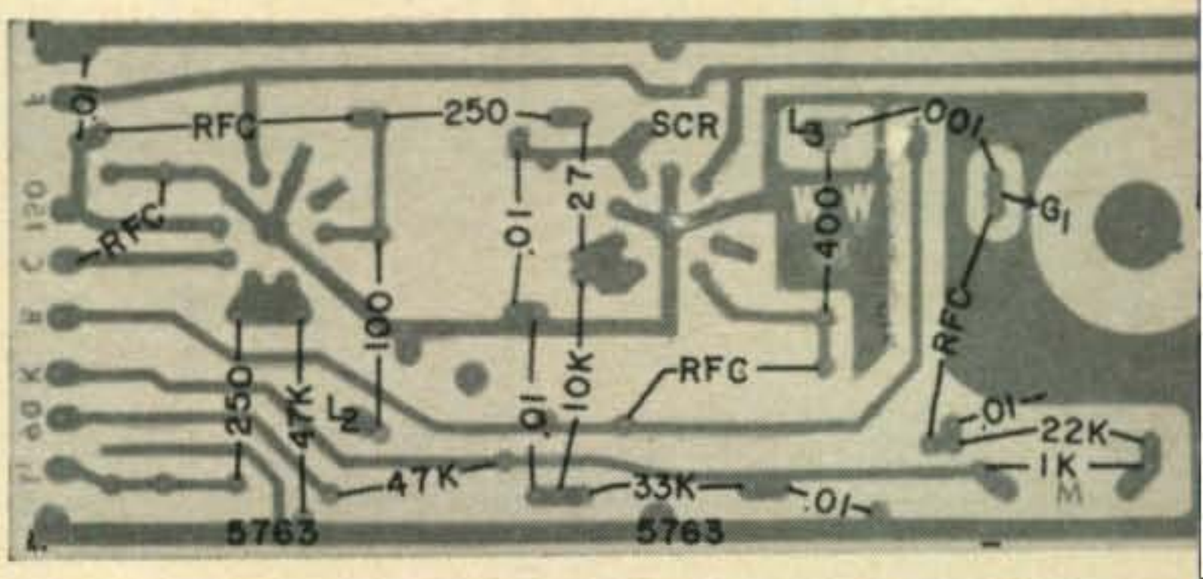
The artwork, printing, and etching phases of construction have been well covered.[4,5,6] The board is 2¾ × 7 inches and should be 1/16" or 3/32" thick. Paper base phenolic (XXXP) is all

[1]Countryman, G. L., "Pygmy Powerhouse Model II", *QST*, October, 1958, p. 11
[2]McCoy, L. G., "A Complete 6146 Economy Transmitter", *QST*, February, 1956, p. 11
[3]Young, E. J., "Shunting The Milliameter", *CQ*, March, 1960, p. 40
[4]Klein, E. L., "Printed Circuits and the Amateur", *CQ*, February, 1956, p. 15
[5]Klein, E. L., "Applications and Components for Etched Circuit Boards", *CQ*, September, 1956, p. 24
[6]Klein, E. L., "Use of Printed Circuit Kits", *CQ*, November, 1956, p. 22

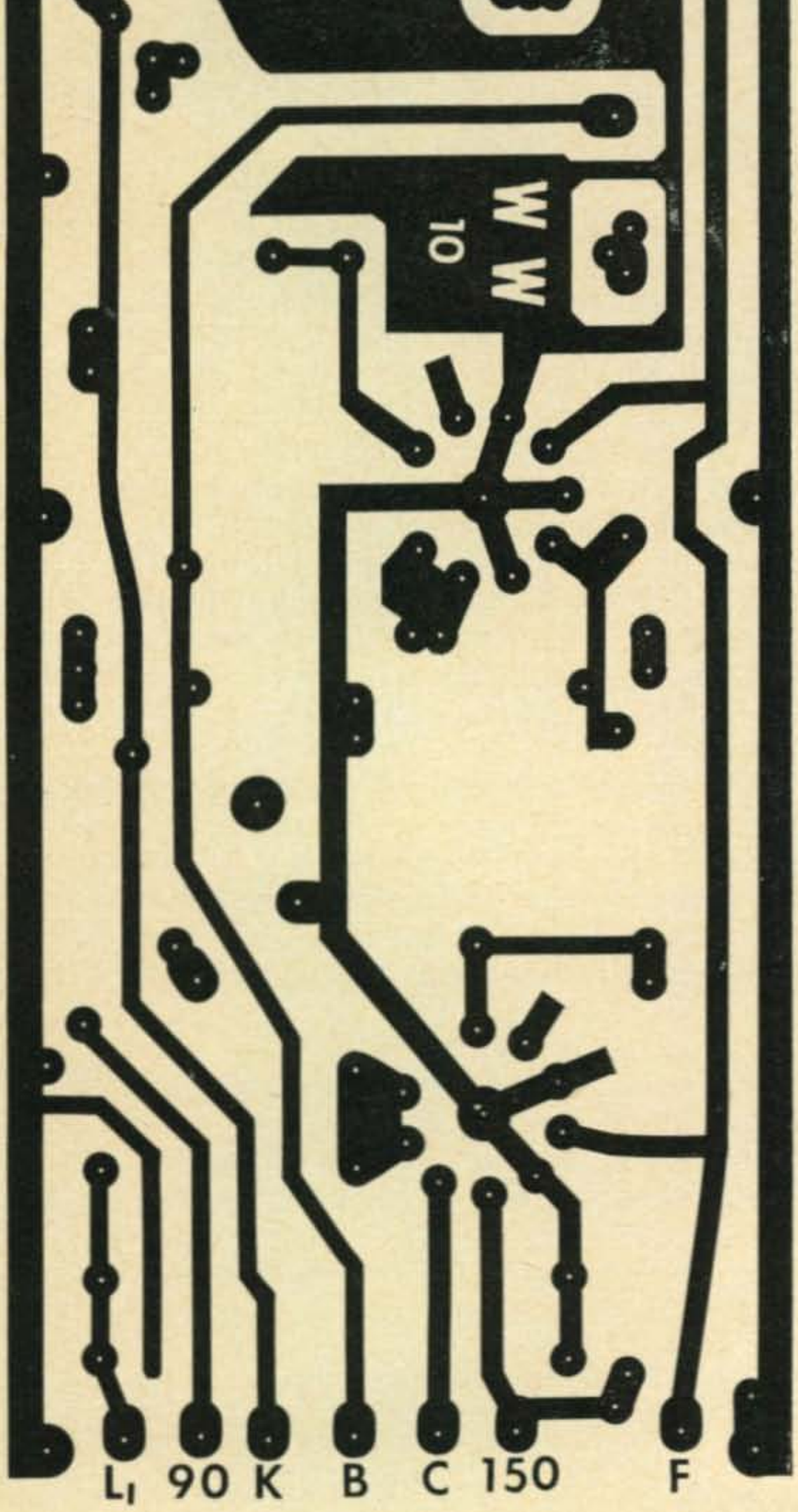
Front view of the transmitter using a printed wire r.f. deck. The v.f.o. is tuned with the National MCN dial at the left. The two knobs immediately to the right are the meter and function switch (top) and bandswitch. The *tune* position is for v.fo. spotting. Plate tuning and antenna loading capacitors are next to the meter. →



Top view of the printed circuit board which can be used in conjunction with a 6146, 2E26, or 807. Power connections are made at the eyelets at the left.



Bottom view of the printed wire board showing component layout.



Printed wire board reproduced actual size. This can be used as a template or photographed.

right, but glass epoxy (G-10) is superior in all respects and well worth the added expense. The single 1 5/32" hole for the final tube socket should be drilled by fly cutter; a chassis punch may crack the board.[7] The 9 pin noval sockets are mounted by inserting the lugs in individual holes and bending the lugs until flat and then soldering them. Place jumpers across the holes on pins No. 3 and 5 on the oscillator 5763 and 3, 5, and 7 on the second 5763.

All components and external wiring should enter from the side opposite the circuitry, except those from the final tube socket.

The final tube socket is secured by lock ring and the notch etched in the copper indicates the key for an octal socket (6146-2E26). For the others, orient the socket for a short grid lead. If a parasitic grid resistor is needed on the final, use it in place of the jumper from the grid to the board.

Application

The rig shown was intended to be used with a Harvey-Wells R9A receiver for a mobile station. By using a 10 × 12 × 3 chassis as the cabinet, the

[7]The author will supply this printed wire sub-assembly on 1/16 inch Epoxy G-10 for $2.50 and on 1/16 inch XXXP phenolic for $2.00. The boards will be printed, etched and come with a single 1 5/32 inch hole.

two pieces fit readily in the author's Rambler. Features important in a mobile rig were included; mechanically stable vfo, few controls and an easy to read meter. By switching the proper value screen resistor along with the band switch a separate panel control is eliminated along with constant checking for adequate drive. By combining the function and metering switch another knob is eliminated. This leaves space for a fair size dial and a 2" square meter without crowding the small panel. There are four bands used at present,—80, 40, 15, and 10. The fifth position on the band switch will probably be used for 6 meters.

Perhaps you have a special rig in mind—maybe a single bander for 160 or 6, an easily duplicated one for C.D. or a club project. What ever the final form the rig will take—it will build faster and better with the printing wire subassembly. ■

Variable Voltage Power Supply

Horton Presley, KØHVK
Ottawa, Kansas

Many hams would like a variable voltage power supply around for that experimental lash-up but few have the thyratrons and sundry special parts that make up the usual variable voltage equipment. Here is a circuit which makes use of any old power output tubes you may have around or even some obsolete stuff as was my case.

I had a chassis from a defunct audio amplifier complete with a rather husky power supply. The only hitch to its further use was that it had 2.5 volt filament windings. Then one day I was mulling over the use of some surplus tubes which looked like metal 6L6's but were labeled 1619. These happen to be directly heated pentodes with 2.5 volt filaments. The handbook lists them as having a bit more power output than the 6L6. I might add that they are presently available on the surplus market dirt cheap at a quarter or less. These and an article by William Creviston in April '53 *Radio TV News* set me to work.

Regulation

You can see from the circuit that the 1619's are triode connected and the input is grid fed from a variable *dc* source. This in turn controls the final output voltage. As Mr. Creviston says of this circuit, the output voltage is not regulated but has as good regulation as any conventional power supply. Furthermore, its regulation is as good at the lowest voltage range as it is at its highest. I use a choke input to improve regulation somewhat. Condenser input would raise the available voltage some. Since differing loads will vary the output voltage, the variable pot cannot be calibrated with any degree of accuracy. A pair of inexpensive *Shurite* meters will probably give you as accurate voltage and current readings as you will need.

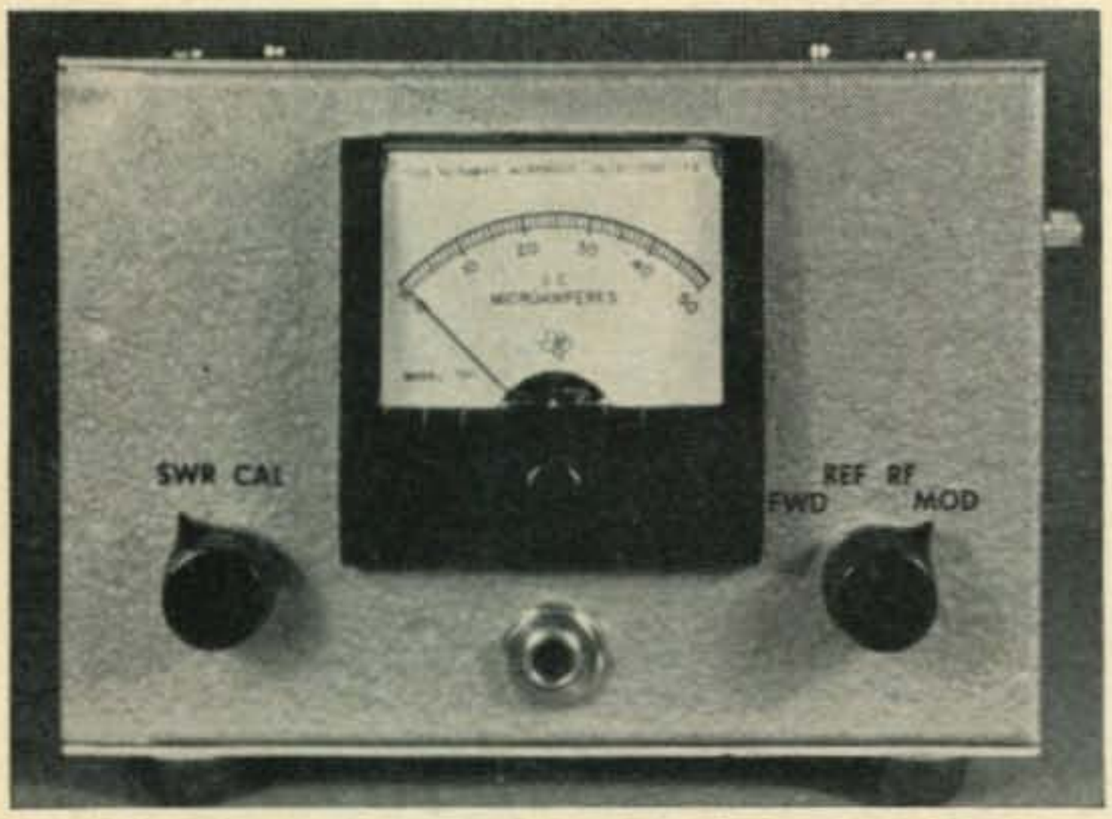
With this transformer I get a no-load variation of from 80 to 520 volts. This would differ, of course, depending on the transformer you are able to scrounge. Mr. Creviston's circuit used 6L6's (6.3 volt filament supply of course) and took the output voltage from the cathodes. He also used a selenium supply where I use the 5U4G.

By mounting a multi-tap filament transformer on the chassis and bringing its terminals to the front on a terminal strip I have a pretty versatile piece of equipment. ■

Fig. 1 — Schematic of a variable voltage power supply using inexpensive 2.5 volt 1619 tubes and a salvaged power transformer. S_2 the center tap switch should be a fairly hefty switch capable of handling full power.

A Versatile RF Monitor

Robert F. Lewis, W8MQU/7
4536 E. 18th
Tuscon, Arizona



The monitor described in following paragraphs was designed to perform varied *rf* metering duties which have heretofore been accomplished by the use of several individual units. Included in these functions are: (1) Comparative forward and reflected power readings. (2) Amplitude modulation indication. (3) Aural *am* monitoring. The meter can be inserted into the 52 or 75 ohm coaxial output circuits of amateur transmitters, regardless of power or frequency. As a modulation indicator the instrument performs a job which has been seriously neglected by Hams in the past, despite FCC regulations. Construction of the monitor requires a relatively small outlay of cash and expenditure of time. Cost of parts, aside from the microammeter, approximates $12.50. Meter prices run between $5.00 and $12.50, with new or "like new" surplus units being available at the lower figure. Building time averages two or three evenings. The only really critical part of the construction is the fabrication of the *swr* sampling line section.

Circuit Description

As an *swr* meter, a bridge circuit is used which was developed several years ago and which has been discussed in other literature. A short section of transmission line is constructed to which are closely coupled two short lengths of copper wire. These pickup "loops" are arranged so that one responds to the "forward" *rf* current. The "reflected" component, which results when the end of the transmission line is not properly terminated, is sensed by the other wire. Output from each of the pickup loops is rectified by germanium diodes, CR_2 and CR_3, then indicated on M_1, the desired circuit being selected by the rotary tap switch SW_1. By means of a variable resistor, R_7, it is possible to adjust the meter reading to full scale in the FORWARD position. Then, by switching over to the other loop, an indication of relative REFLECTED power is shown.

Modulation percentage monitoring is also provided by suitable circuits in the instrument. A small portion of the *rf* line voltage is rectified by CR_1 and converted to direct current. This current will be varying at audio frequencies if amplitude modulation is taking place. A second diode rectifier, CR_4, converts the audio fluctuations into another *dc* component. With the aid of the selector switch it is possible to meter either

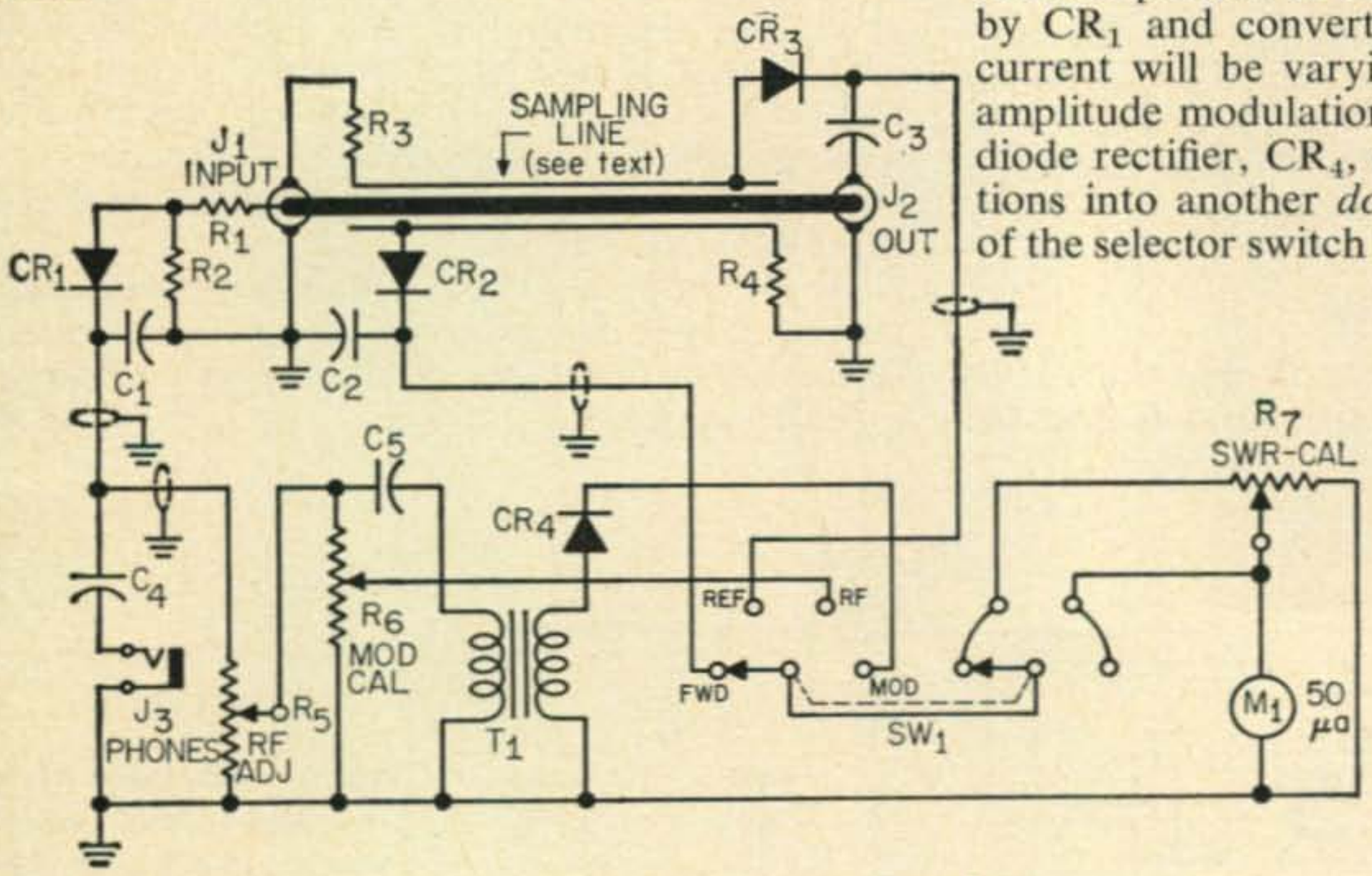


Fig. 1 — Schematic of a forward and reflected power meter with a built in modulation monitor.

Parts List

C_1, C_2, C_3 .001 mfd disc ceramic
C_4 .01 mfd disc ceramic
C_5 .1 mfd, 400v. paper
CR_1, CR_2, CR_3 CR_4 1N34A germanium diode
J_1, J_2 Coaxial connectors Amphenol 83-1-R
J_3 Open circuit phone jack
M_1 0-50 microampere meter 2½" square
R_1, R_2, R_3 R_4 See text
R_5, R_6 2 watt potentiometer, 50,000 ohm
R_7 2 watt potentiometer, 100,000 ohm
SW_1 Rotary selector switch, 2 pole, 4 position Mallory 3234-J, or equivalent, one pole unused
T_1 Interstage transformer, 3:1 turns ratio, connected step down Merit A-2910 or equivalent

the rectified *rf* or audio signal. By proper adjustment of two calibrating potentiometers, R_5 and R_6, with the assistance of an oscilloscope, a reference point can be established so that subsequent settings of *rf* level will give accurate modulation percentage indications. The audio signal which is provided by rectification of the *rf* voltage can be monitored aurally by means of headphones.

Resistor Values

Values of R_3 and R_4 are dependent upon the transmission line impedance. If the monitor is to be used in a 52 ohm line, the resistors will each have a value of 150 ohms. For use in 75 ohm line they must be 100 ohms each. A power rating of ½ watt is adequate in either case. However, the resistors must be of the *non-inductive* composition type. Wire-wound inductive units will lead to inaccuracies, especially with increases in operating frequency.

The values of R_1 and R_2 are not very critical, but depend to some extent on transmitter output power. Generally speaking, the total resistance of R_1 plus R_2 should be from 100 to 200 times the characteristic line impedance. The ratio of the two should be such that not more than 10 volts of unmodulated *rf* appears across R_2. For transmitters having power outputs of under 100 watts, R_1 will be about 7,000 ohms, and R_2 1,000 ohms, both ½ watt. From 100 to 500 watts transmitter power output, 10,000 ohms for R_1 and 500 ohms for R_2 will serve, power rating 2 watts each.

Construction

Much can be learned about the construction of the instrument by studying the accompanying illustrations. The entire assembly is housed in a standard cabinet, four inches high, six inches wide, and five inches deep, with removable top and bottom covers. Components mounted on the front include R_7 (SWR CAL), J_3, SW_1 (FWD REF RF MOD), and M_1, a 2½ inch, square, 50 microampere meter. Calibrating controls, R_5 and R_6, are mounted on the right hand side of the cabinet.

The *swr* sampling section is composed of the following mechanical parts:

a. One straight length of brass or copper rod or tubing, 4⅝" long, ¼" in diameter.
b. Two plastic insulators, cut and drilled as shown in fig. 2.
c. Two lengths of #14 tinned copper wire, 4" long. (Stretch several feet of wire to straighten, then cut to lengths).
d. One aluminum shield strip, cut, bent, and drilled as shown in fig. 5.

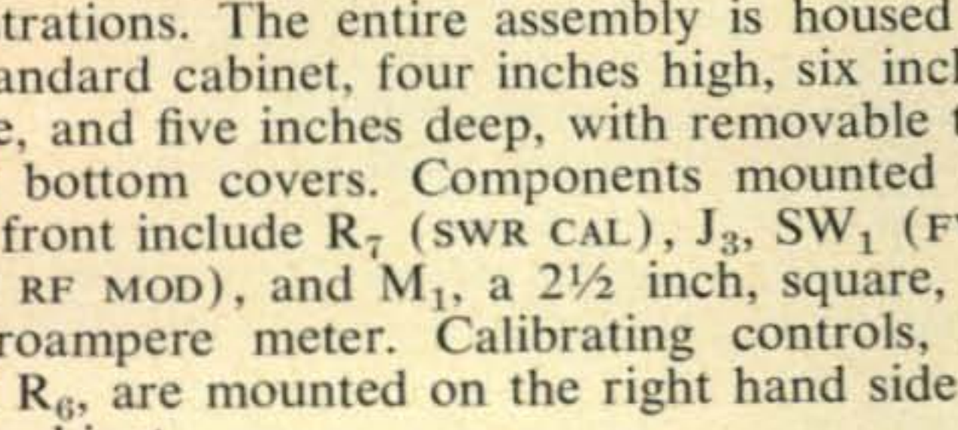
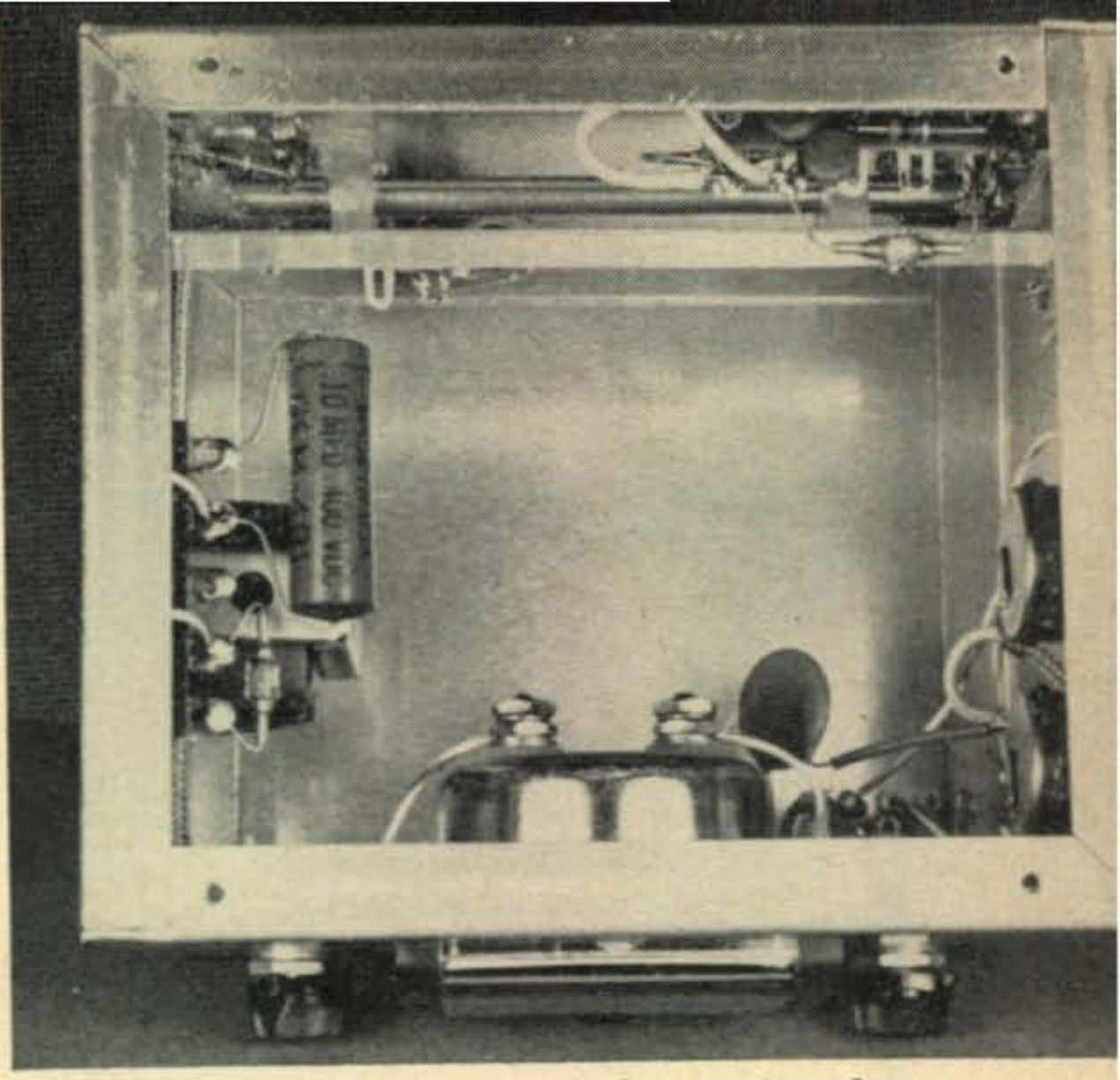
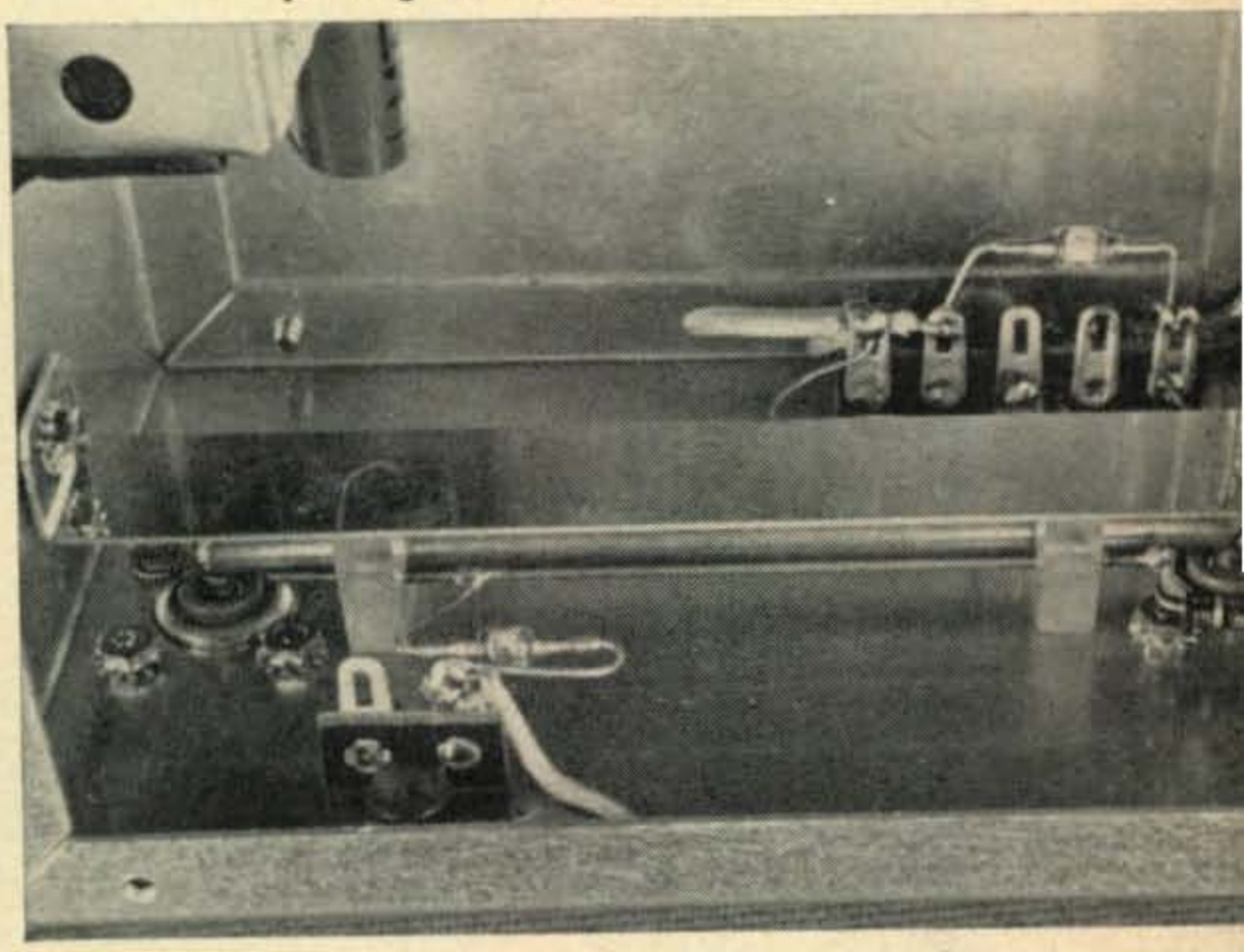


Fig. 2—Dimensions of the plastic insulators.



Looking into the interior of the monitor from above, location of component parts can be readily observed. On the left-hand side are mounted transformer, T_1, plus a five terminal lug strip supporting C_5, CR_4, and T_1 lead.



A closeup shot, from the bottom of the cabinet, clearly shows construction details of the RF line section. The Input jack, J_1, is at the right hand end of the enclosure. The 5 lug strip at the right accommodates C_1, C_2, CR_1, CR_2, R_1, R_2. Supporting CR_3 and C_3 is a 2 lug terminal at the left end.

Sampling Line Construction Details

Assembly details of the sampling line, which is somewhat critical to make, are as follows:

1. Mount two Amphenol 83-1R coaxial connectors in the rear of the cabinet. Center the connectors 2" from the top and space centers exactly 4⅝" apart.
2. Drill two #18 holes in the sides of the cabinet for mounting the shield strip. These should be 15/16" from back of cabinet and 2" from top.
3. With a ⅛" dia. rat-tail file, make a semicircular notch in each end of the ¼" con-

ductor deep enough so it just nicely fits over the center studs of the coaxial connectors. Remove conductor, pre-tin ends and wipe off excess solder.

4. Slip ¼" conductor and the #14 wires through holes in insulators. Place assembly into position over the coaxial connector studs, adjust positioning of insulators and pickup wires to dimensions shown in fig. 3.

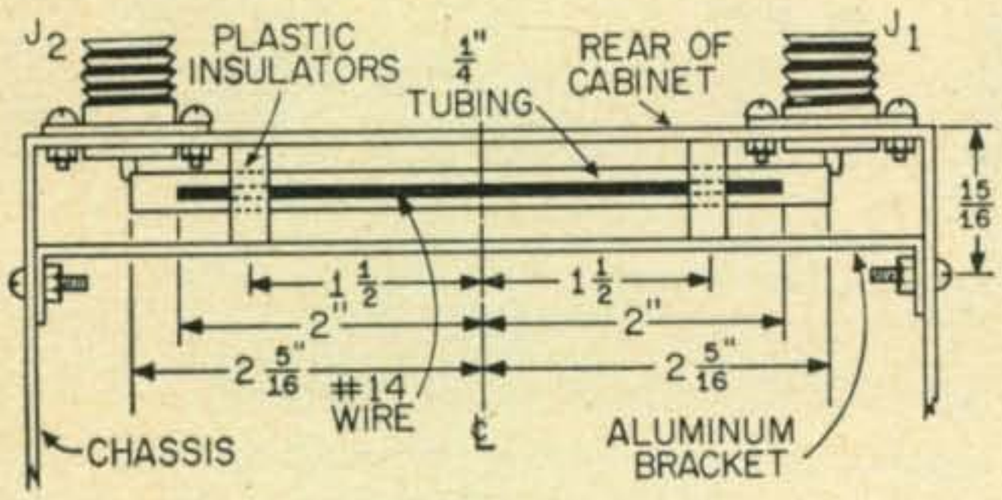


Fig. 3—View of the rear wall of the cabinet, looking from the top.

5. While maintaining the above positions, solder ends of the ¼" conductor to coaxial connector studs.
6. Secure insulators to conductors with a bit of cement.
7. Install terminal strips shown in photograph. Solder into place CR_1, CR_2, CR_3, R_3, and R_4, connecting CR_2 and CR_3 3⅛" from ends of #14 wires.
8. Place shield strip into position as indicated in the illustrations. Secure with hardware. Strip should rest against edge of plastic insulators.

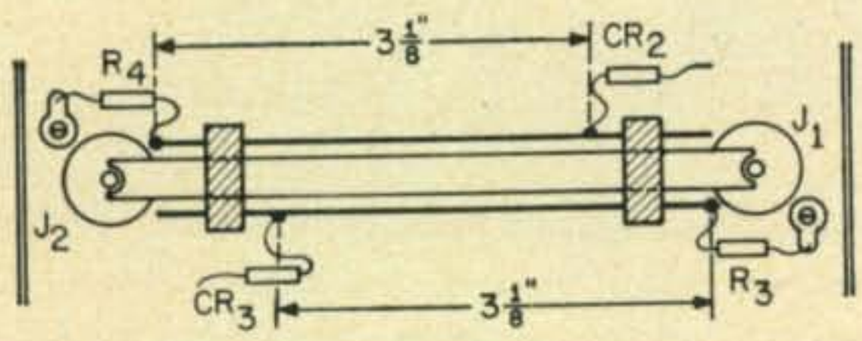


Fig. 4—A view of the rear, as seen from the inside of the box. Note that CR_2 and CR_3 are soldered 3⅛" from opposite ends of the pickup wires, while R_3 and R_4 are connected to the wire ends.

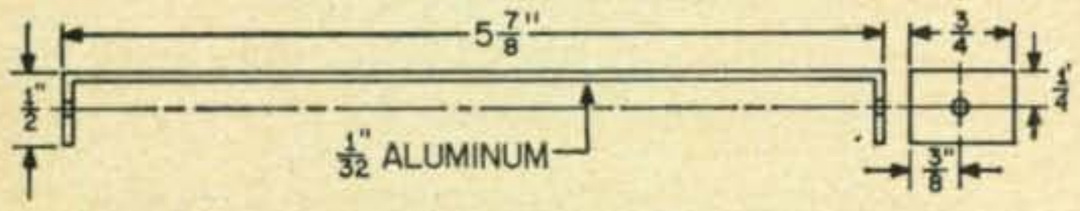


Fig. 5—The aluminum shield strip can be made from an old recording disc from which the acetate coating has been stripped.

The balance of the construction is not critical and, therefore, can be done in any manner desired. A few pointers should be observed, however. First, leads on all parts associated with the *rf* sampling section should be reasonably short. It is suggested, also, that the following leads be shielded in order to prevent stray *rf* pickup: CR_2 to SW_1; CR_3 to SW_1; CR_1 to R_5. All other wiring can be unshielded.

Panel lettering, as illustrated, can be accomplished with the use of decals which are available from most electronic parts dealers. Instructions for application are furnished by the manufacturer. Other titles on the monitor, which do not appear in the photographs, are as follows: INPUT and OUTPUT, over associated coaxial connectors on rear, and RF ADJ and MOD CAL over R_5 and R_6, respectively.

SWR Adjustments

Preliminary testing of the *swr* bridge section of the monitor is accomplished as follows:

1. Connect a short length of the proper coaxial cable from a low impedance transmitter output to the input jack on the monitor.
2. Connect a dummy load of the proper impedance to the output of the monitor. The load may be a manufactured unit or it can be made up of *non-inductive*, composition resistors. For example, for 52 ohms, connect five 270 ohm, 2 watt resistors in parallel. The 75 ohm load can be similarly fashioned, using 390 ohm resistors. These combinations will dissipate only 10 watts of power, so it is necessary to reduce the transmitter output to avoid overheating the load.
3. Turn R_5, R_6, and R_7 to zero.
4. Throw SW_1 to FWD position.
5. Apply transmitter power; check load resistors for overheating. If this occurs, reduce transmitter output coupling.
6. Turn up R_7 until meter reads full scale.
7. Throw SW_1 to REF position. If the instrument has been constructed correctly the meter reading will fall to zero, or nearly so.

The same procedure should be followed when the monitor is connected between the transmitter and antenna system. Due to an increase in pickup loop coupling which accompanies a rise in operating frequency, it is advisable to reduce the setting of R_7 when changing bands. After reapplication of transmitter power, R_7 can then be increased to give a new full scale FWD reading.

Although meters are seldom calibrated in *swr* units, comparable figures can be obtained as follows on a 50 microampere meter:

SWR	REF. PWR. READINGS
1:1	0
1.5:1	9
2:1	15
3:1	24
4:1	30
5:1	35
6:1	39
8:1	45
∞	50

Modulation Adjustments

Adjustment of the modulation metering section requires the use of an oscilloscope con-

nected to show *rf* wave form or trapezoidal pattern. Also, the transmitter should be delivering full power into a dummy load or an antenna system (the latter, only if such testing will not cause QRM to other stations). Calibration steps are as follows:

1. Turn R_5, R_6, and R_7 to zero.
2. Connect the monitor into the coaxial feed line between the transmitter and load.
3. Set SW_1 to MOD position.
4. Couple an oscilloscope to the transmitter to give either envelope or trapezoidal pattern (check oscilloscope instruction manual).
5. Turn on transmitter and adjust for full power output to load. An unmodulated carrier pattern should appear on the screen. If the image is not of usable size change the *rf* coupling to the vertical deflection plates of the scope so that the pattern occupies about ⅓ the height of the screen.
6. Apply a sine wave signal to the audio input of the transmitter with an audio oscillator or by whistling steadily into the microphone.
7. Turn up transmitter audio gain until the oscilloscope wave form shows 100% modulation.
8. With 100% modulation occurring, adjust R_5 upward until the microammeter reads full scale. Throw S_1 to *rf* position. Adjust R_6 so that meter again indicates a full scale reading. Leave R_6 permanently set at this position, locking, or marking for future reference. Any subsequent change in *rf* level should be compensated for by adjusting R_5, only.

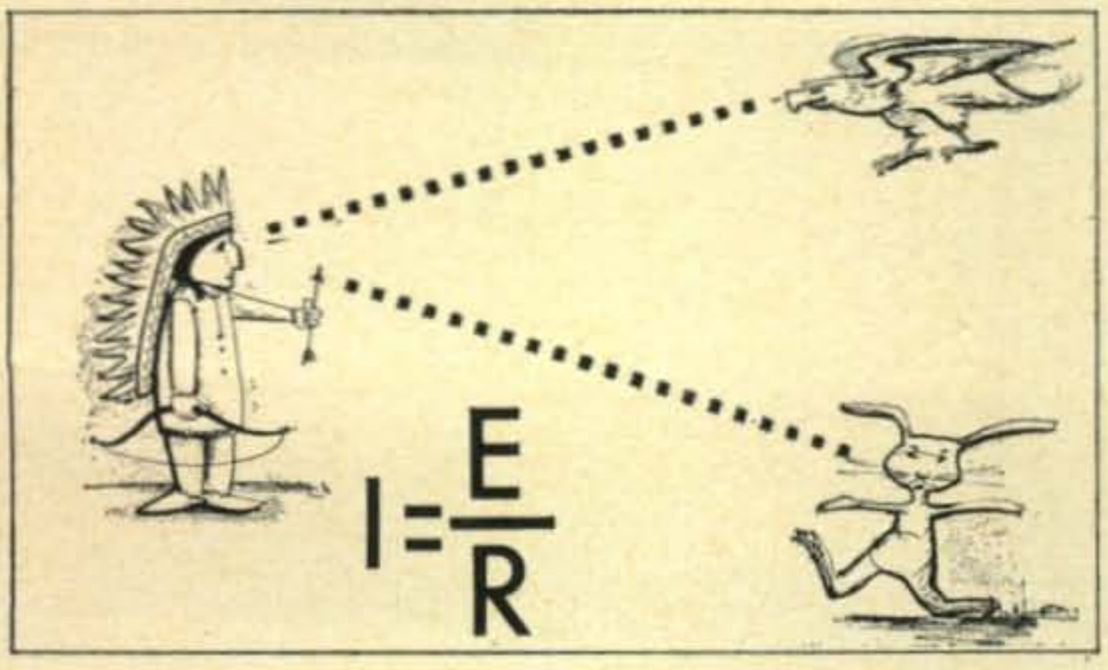
The monitor is now calibrated to give a full-scale deflection on a steady-state sine wave. Due to the complexity of speech wave forms, 100% voice modulation will generally be indicated by an average meter deflection of 60 to 70 percent of the sine wave value. ■

Mathews' Law

W. E. Mathews, K6UGG
173 N. Franklin Ave.
San Gabriel, California

A noted Ornithologist, Zoologist and Ethnologist states a relationship which has proven helpful to students of Electronics

Without going into details of the arduous experimentation and observation which preceded the formulation of Mathews' Law, it would serve our purposes here to state the law at the outset. As with all great truths, it appears obvious at first reading, and if the accompanying illustrations are studied, the principle will not be difficult to remember.



The Indian sees the Eagle above the Rabbit.

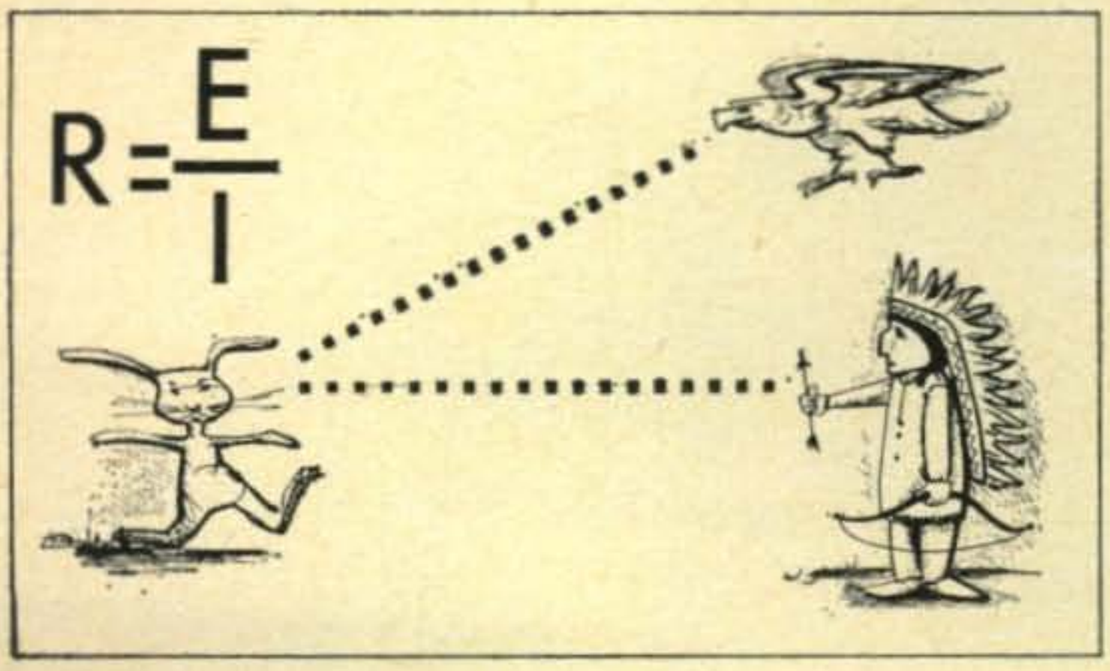
Mathews' Law

Case 1—If an Indian observes an Eagle and a Rabbit, the Eagle will appear above the Rabbit or stated mathematically I=E/R.

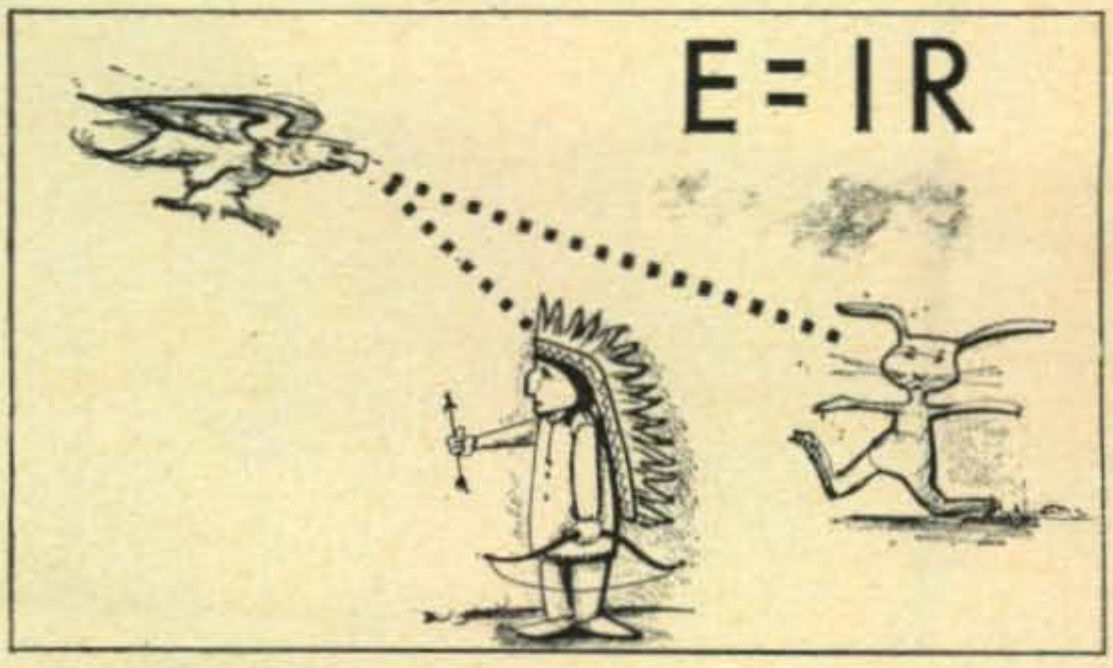
Case 2—If a Rabbit observes an Eagle and an Indian, the Eagle will appear above the Indian or R=E/I.

Case 3—If an Eagle observes an Indian and a Rabbit they will both appear on the same level or E=IR.

Artwork by R. Fredrich



The Rabbit sees the Eagle above the Indian.



Eagle sees Indian and Rabbit on same level.

DXosis – Japan Style

Chaplain, Captain James M. DeMott, K5DED/4, Ex KA2DE
837th AB Gp.
Shaw A.F.B.
South Carolina

For the last year and a half the most avid DXer in KA land has been KA2DE, better known on the bands as Dead Eye. The operator was Chaplain, Capt. James M. DeMott, of the USAF. Jim served as DX Editor of the FEARL News and Treasurer of FEARL during his stay in Japan.

The word which most accurately designates my feelings at this moment is solicitude. That is exactly what I feel as I sit here in my quarters at the Grant Heights Family Housing Annex in Tokyo, and think about so many victims of a very serious, and I'm afraid, incurable disease. DXosis is a disease.

One of my classmates in college planned to study medicine and to become a specialist. I asked him what he intended to specialize in. He said he thought it would be disease of the skin because none of his patients would ever die from a skin affliction and in all probability none of them would ever get well. I am afraid it is very much the same with victims of DXosis.

How else can one develop an ulcer so quickly? What else causes as many divorces, broken homes? What else can motivate a man to stay up so late at night and rise so early in the morning? What, besides driving in Tokyo, can cause a man to lose his religion so fast? What can help the cigarette industry more?

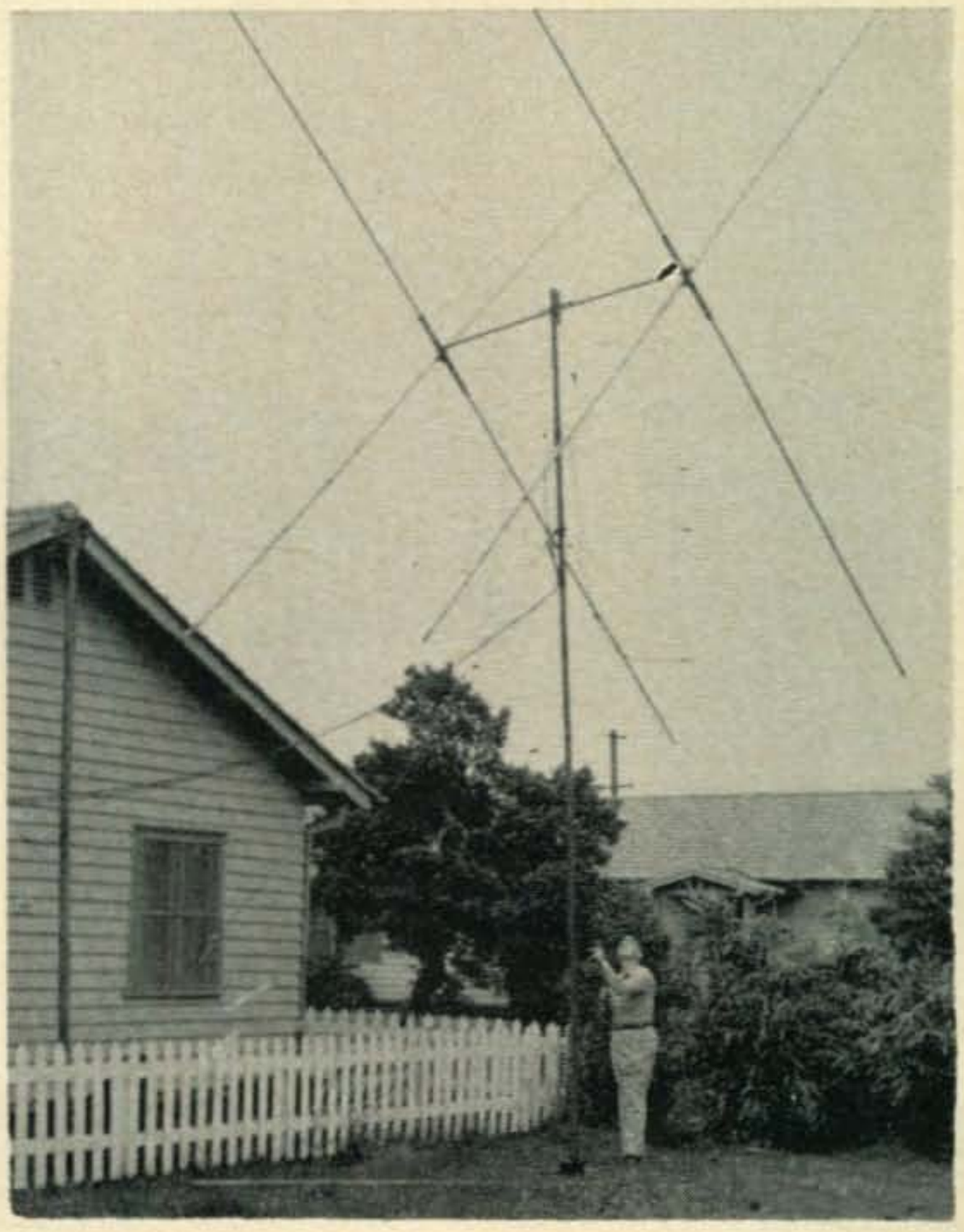
Yes, DXosis is indeed a serious disease and if contracted, like cancer, it has no known cure. However, as the elderly lady next door indicated by her yaking, I'm glad I contracted this dreadful disease. Of all the good things to be said about this disease, the one most important to me is, that I was able to learn more geography and of the culture of foreign peoples in 17 months of operation as KA2DE, than I did in my 21 years of formal education.

The symptoms of this disease are readily noticeable. Some are: staying up all nite, subscribing to the DX mediums, turning first to "DX" when *CQ* and *QST* arrives, erecting higher and better antennas, calluses on your right elbow from tuning the receiver, screaming at the kids as they walk in the shack as you try to work the new one through the pileup, watching for the mailman each day. Yes, all of these and many more, are the symptoms of DXosis.

Licensed as K5DED in August of 1956, I never knew that such a disease existed. In four or

With this Tri Band Quad, KA2DE worked 142 countries and confirmed 126 in just seventeen months on the air. →

An avid phone man but always a warm spot in his heart for c.w., Jim could always be counted on for a QSO before the band went west.



five months of operation I had worked four countries and never knew that men with this disease even existed. The first time I called CQ in Japan a VK5 came back. The last CQ brought forth a LZ2. In 13 months I received DXCC (142/-126), WAZ, WAC-SSB, WAS, WBE-A1, WBE-A3, BERTA, DUF, P6KA, Kroonstad Award, WFKAS, WTFKAS (this one was ruff, really), WTFKR6S, 3rd Marine Division Award, DRF, WAC-YL, OHA, the Dimlight Boys Certificate, and perhaps some others the card catalogue will be checked for later. It was a real thrill to give some 92 W's their first Japan QSO.

Your wives, mothers, and kids may hate me for the advice I am about to give, but if you are not now suffering from DXosis, the following will help you to develope it very quickly. (1) Keep the rig warm at all times. The first thing after arising in the morning, flip on the filaments; take care of your chores and while the XYL is getting breakfast . . . listen. (2) Listen, listen, listen at all hours. Your ARRL operating aids have been telling us this for years. Heed their mature advice. (3) Get to know the big boys. When they're on especially, be on the lookout. Whenever I heard ZL2GX I knew something was up. When I heard W6UOU I knew a new one was on sideband. VE7ZM and VK3AEE are two heard often from Japan that kept me glued to their frequencies, listening. (4) Send your QSLs air mail with SASE and 2 IRC's (2 are usually sufficient). (5) Subscribe to magazines which will help you to know DX station's frequencies, habits and QSL Managers. *"DX The Weekly Amateur Radio News Magazine"* published by Don Chesser, W4KVX, RFD #1, Burlington, Kentucky, has no equal and is a must to every sufferer of DXosis. The *WGDXC Bulletin* is also helpful. Your DX Department in *CQ* and *QST* are also a must. (6) For chasing the DXpedition, two receivers are required. One glued to his frequency and one to search for the station he is working. Once found, tailend with your call only and brag to your buddies the next day. I guarantee a serious case of DXosis if you follow the above instructions and others you've read about and learned by experience.

I have but two words of advice for the W's: (1) on c.w. when the DX station says he is listening 10 up or 10 down he means it. Don't clobber him and lessen QSOs for other stations. Spread out—spread out—spread out. (2) Be patient on QSL returns. Almost all DX stations QSL via bureaus. The classic example of impatience by a W, was when I received 5 air mail cards from him in a 30 day period, four of which were irate. I finally QSL'd him direct so that his case of DXosis wouldn't prove to be fatal. I QSL'd each of my 3000 QSOs from KA2DE almost entirely thru the bureaus.

I almost died of DXosis in March 1960 when my Quad came tumbling down in high winds. DXCC was on the way, and as I had promised my gracious and understanding XYL that I would try to learn how to be a father and hus-

[*Continued on page 174*]

Al Lemesh, KA2AL at his neat setup. He'll be working W's well into 1962.

Dusty Laine, KA2AA, has done a tremendous job as president of the FEARL and is another active KA with 101 countries confirmed.

Dead Eye catching up on the QSL problem. Many W's can thank KA2DE for their Japan card, due to his 100% QSLing habit.

A Transistorized Electronic Keyer

Louis Beregowitz, K2LGY
Sales Engineer
Arrow Electronics Corp.
New York City, N. Y.

Here is another in the long line of electronic keyers. It is self contained, transistorized and has an audio oscillator and amplifier for monitoring. Due to the unusual circuitry there is no interaction between controls. Due to very low current drain the battery life is almost equal to the shelf life.

This keyer was designed with the c.w. man in mind and no effort was spared (both his and mine) in order to give him as complete a unit as possible. The unit consists of two parts; first the keying unit proper and secondly an audio oscillator and audio amplifier which are also keyed so that the operator may monitor his keying. The unit has the following features:

1. Dots and dashes are self completing.
2. Keyed "on" time is adjustable.
3. Space between characters (dots and dashes) is adjustable.
4. Ratio between dots and dashes are adjustable.
5. Sending speed is adjustable.
6. Pitch of audio oscillator is adjustable.
7. Speaker volume is adjustable.

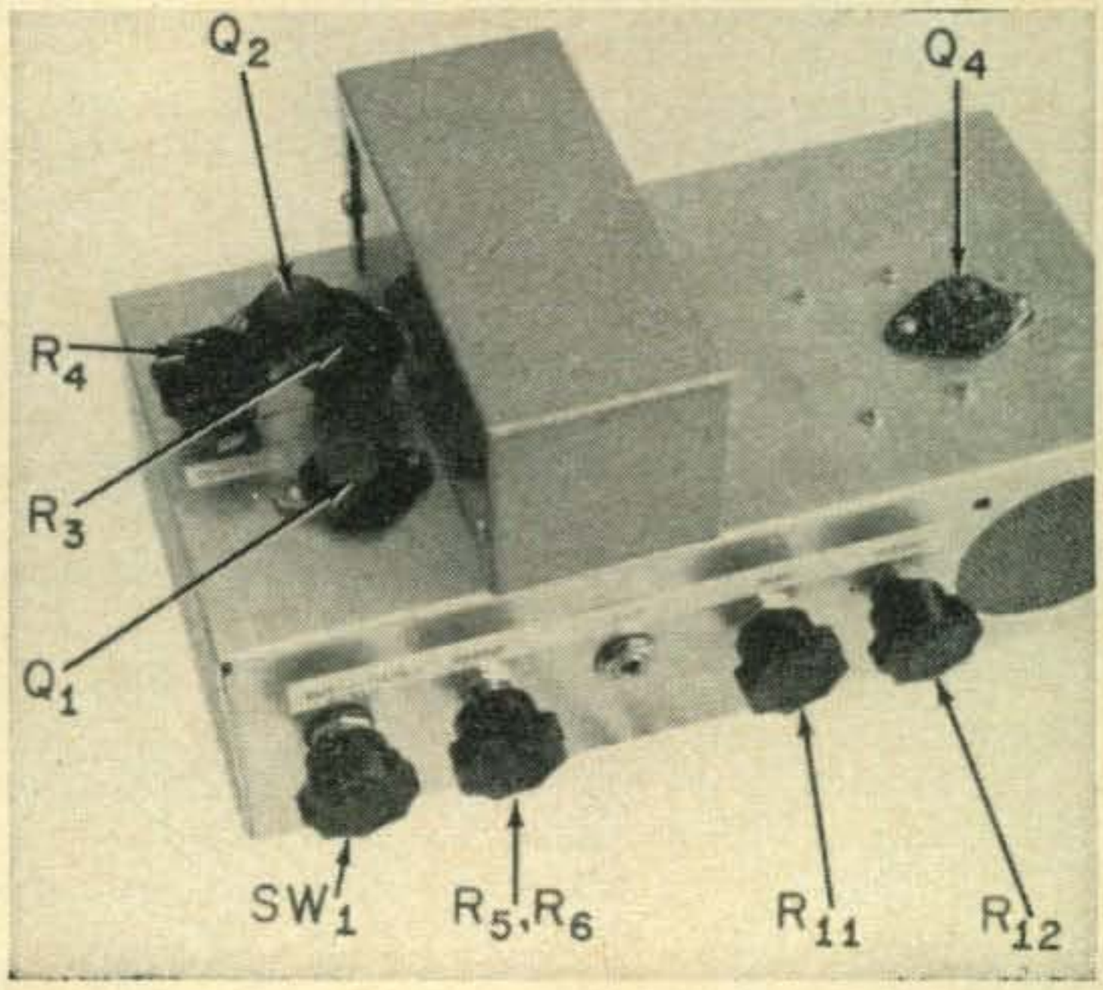
The keyer is completely transistorized, simple to build, inexpensive and very dependable. The transistors used are of the low cost type, (without shopping too hard, they can be purchased for around $1.75 each or less) and despite this are extremely non-critical.

The circuit in the keyer is unique and to the best knowledge of the author appears for the first time.

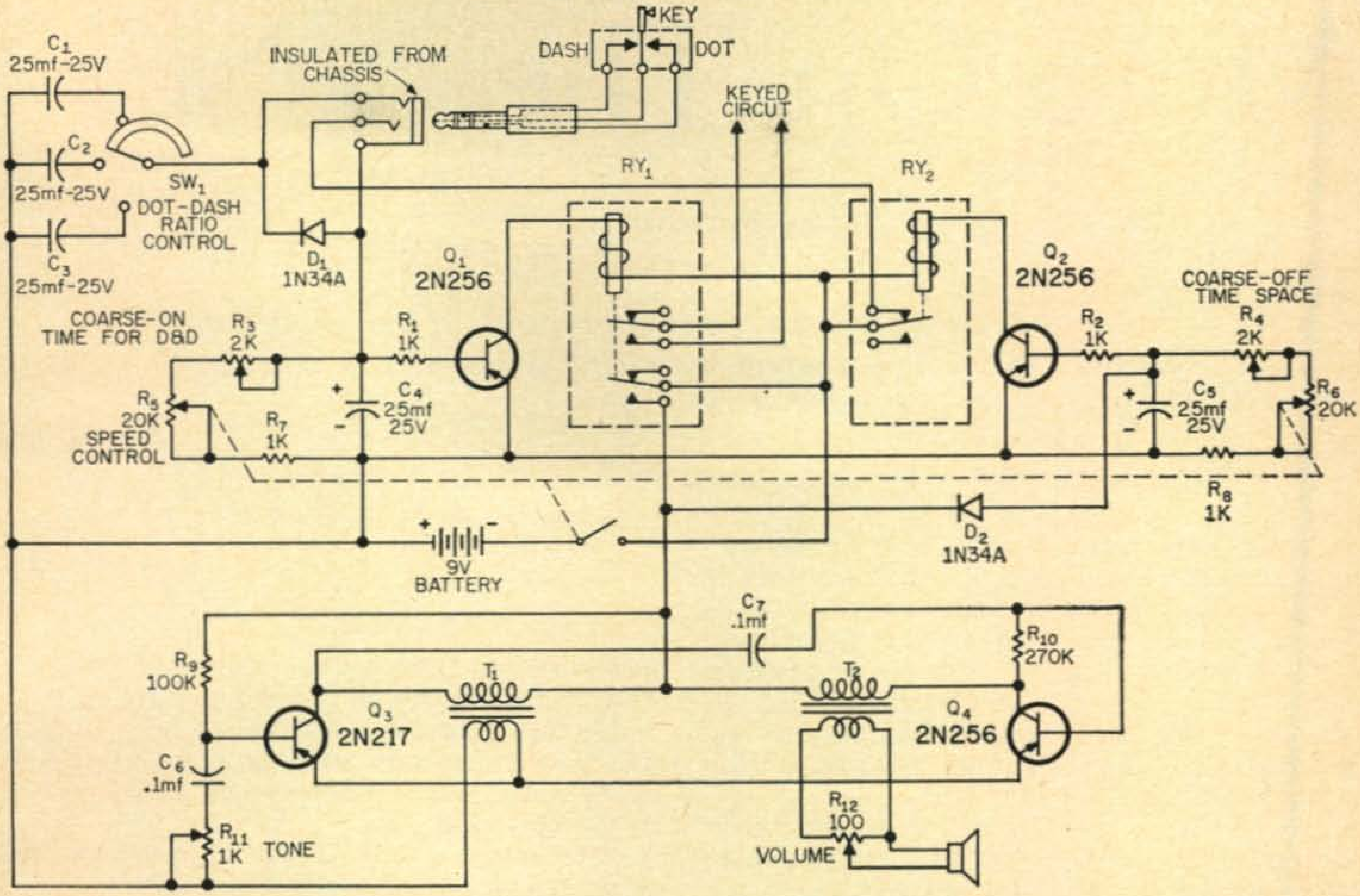
The keying circuit is built around Q_1 and Q_2, with Q_1 and components controlling the keyed "on" time and Q_2 and components controlling the space time between dots or dashes. Q_3 is a straightforward audio oscillator which is keyed by one of the keying relay contacts and Q_4 is an audio amplifier with enough power to drive a small speaker.

Circuit Operation

When key makes contact on either the dot or dash side, a negative bias is applied to the base of Q_1. Q_1 starts to conduct and energizes relay RY_1. This starts the "on" time by closing the contacts of the controlled circuit and at the same time closes the contacts of the negative supply to the base of Q_2. Q_2 starts to conduct and Relay RY_2 is energized. When Relay RY_2 is energized the center post of the key, which connects to the negative bias supply through one set of contacts of RY_2, is disconnected by the opening of these contacts and the negative bias which had been applied to the base of Q_1 starts to decay either through R_3, R_5, R_7 and C_4, which forms the dot circuit, or through R_3, R_5, R_7, C_1, C_2, C_3, C_4, and D_1 which forms the dash circuit. RY_1 remains energized until the negative bias reaches a critical point and the current flow through Q_1 becomes so low that the relay RY_1, can no longer hold. This completes the "on" time for the controlled circuit. When RY_1 opens, the negative bias source for Q_2 base is disconnected and the voltage stored in C_5 is decayed through R_4, R_6, and R_8. The "off" time or spacing time starts at this instant. When the negative voltage on Q_2 base reaches a critical low value RY_2 opens since the current flow through Q_2 cannot hold it closed. This completes the "off" time or spacing time for the keyed circuit. RY_1 cannot start its "on" time



Top view of the keyer chassis.



RY_1—P & B KA11D, 12 volt d.c., D.P.D.T.
RY_2—P & B KA5D, 12 volt d.c., S.P.D.T.
T—Any standard 50L6 Output Transformer.

SW_1—Progressive shorting switch, Centralab PA1035 or equiv.
SW_2—S.P.S.T., part of R5, R6 dual pot.

Fig. 1—Circuit of the transistorized keyer. The two relays are wrapped in sponge rubber for silencing and mounted in the subchassis.

again until the center contact of the key is connected to the negative bias supply which is in series with one of the contacts of RY_2.

So long as the key is held against either the dot contact or the dash contact it will repeat the entire cycle at a rate which is determined by R_5-R_6.

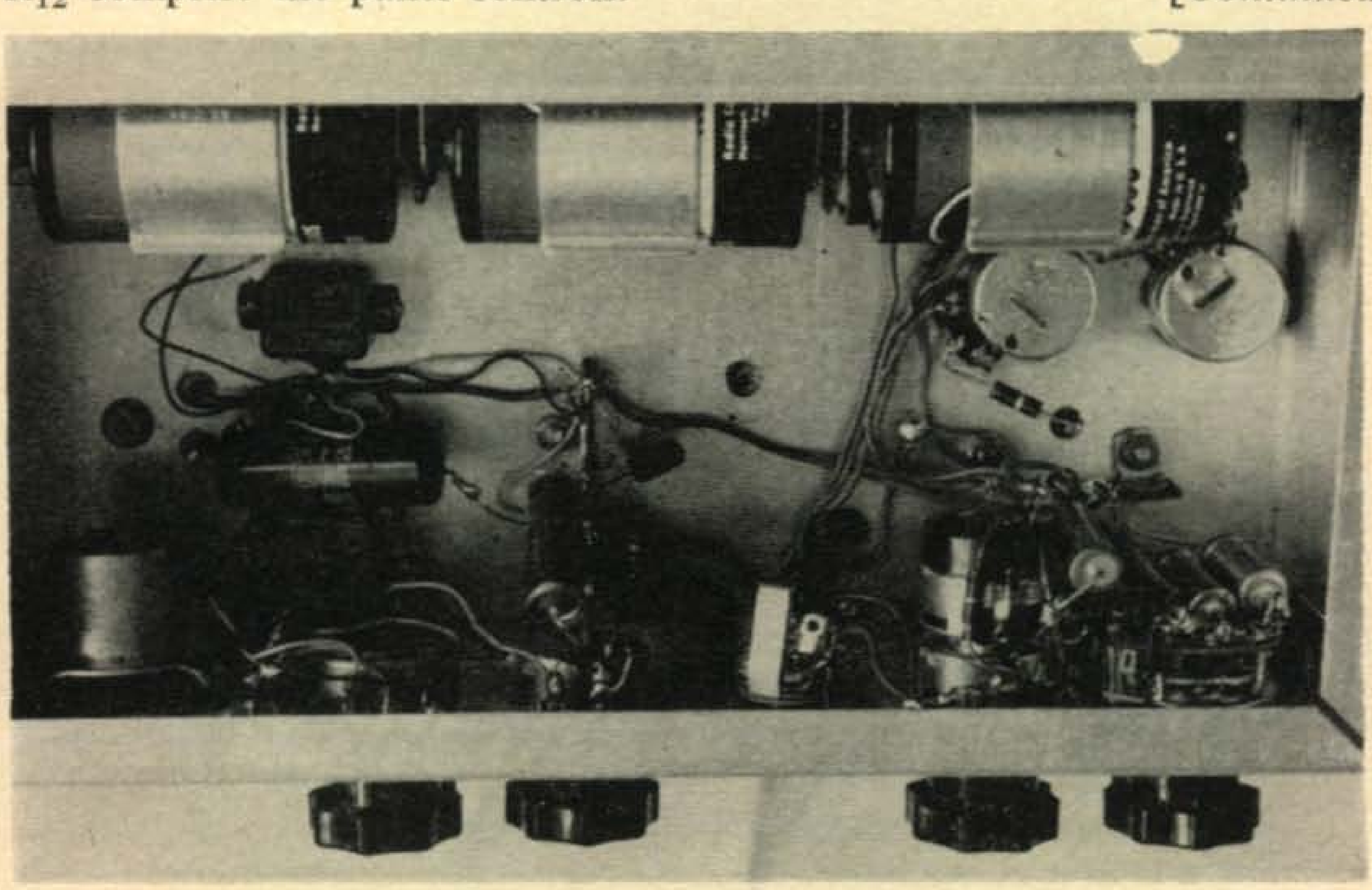
Controls

The controls SW_1, R_5, R_6, SW_2, R_{11} and R_{12} comprise the panel controls.

SW_1 is the DOT-DASH RATIO selector switch and effects the change in ratio by placing capacitors in parallel on the dash side to give a 2 to 1, 3 to 1, and 4 to 1 change. R_5 and R_6 are the speed controls and is a dual potentiometer. SW_2 is also on the same shaft and is on ON-OFF switch for the power supply.

R_{11} is the TONE control for the audio oscillator. R_{12} is the VOLUME control for the audio amplifier. On the chassis, the only other two

[*Continued on page 174*]



Bottom view of keyer chassis. Transistor Q_3 is connected to the terminal strip behind the second pot from the left (TONE). The six cells are stacked on the rear lip of the chassis. They may all be replaced by a single RCA VS 323. The output and oscillator transformers are located above the left hand pot, the volume control. Capacitors C_1, C_2, C_3 are mounted on the rear of SW_1, the DOT DASH RATIO control, on the extreme right.

More On The "IFNL"

Wilfred M. Scherer, W2AEF

The author answers some questions regarding the "IFNL", an s.s.b. i.f. noise limiter which is gaining popularity. Its installation in the 75S-1 receiver is also covered.

As was expected, quite a number of inquiries have been received regarding the operation and installation of the *IFNL*, the s.s.b. i.f. noise limiter recently described in *CQ*[1]. Since many of these inquiries were of a similar or duplicate nature, it is likely that other readers may be concerned about the same situations, so the questions are enumerated and discussed as follows:

1. *Question:* The *IFNL* does a fine job of noise limiting on my such-and-such a receiver, but there is quite a loss of level when it is used. Can this loss be reduced?

Answer: Yes, the insertion loss may be reduced by increasing the size of R_1 to about 2 megohms. This will also reduce the degree of limiting, but this may be substantially offset, if needed, by the addition of a capacitor across R_1, which may be .02 to 1 mf, depending on the desired action. See the two following answers.

2. *Question:* May the degree of limiting be made adjustable by varying R_1?

Answer: Yes, R_1 may consist of a variable resistor of two or three megohms connected in series with a fixed resistor of 270,000 or 470,000 ohms. This will enable the *IFNL* to be adjusted for different degrees of limiting. When a minimum amount of resistance is used, the limiting action will be maximum, while the maximum amount of resistance will result in minimum limiting. The level of insertion loss, caused by the *IFNL*, will be less at the higher values of R_1. A fixed value of 470,000 ohms was used in the model for the 75A-4, since in general this provided good limiting action under quite severe noise conditions, and no need for changes in the degree of limiting were required. An additional control was also thereby eliminated.

3. *Question:* The *IFNL* works fine, and it permits good signal readability through ignition noise, but it would be better if the distortion could be lowered. Can this be done?

Answer: Yes, the distortion may be reduced by increasing the size of R_1 to about 2 megohms, and/or by decreasing the total capacitance across R_1, which in figs. 2 and 3 is

$$\frac{C_1 + C_2}{4} + C_3$$

The limiting action will be reduced at the same time, but it still should be effective for average conditions. The constants, which were used in the 75A4 installation, were chosen to cope with heavy noise pulses—those which kicked the S-meter to around S-9.

There are two types of distortion which may be experienced. One is dependent on the size of R_1, and is indicated when the demodulated s.s.b. signal sounds rough or growly, especially at the lower audio frequencies. Such distortion is low when R_1 is large, about two or three megohms. Both distortion and limiting action increase as R_1 is decreased.

The other type of distortion mainly is dependent on the total capacitance across R_1, and is evidenced by a fuzzy sounding, or paper-like, tail following each s.s.b. syllable. This effect is most noticeable when the capacitance is large, but impulse-noise softening is also better at the same time. Actually, this "tail" distortion is due to the R/C time constant, but since R_1 must primarily be selected for the desired limiting threshold, the capacitance must be selected secondarily in regards to this type distortion.

Each element (R and C) works against the

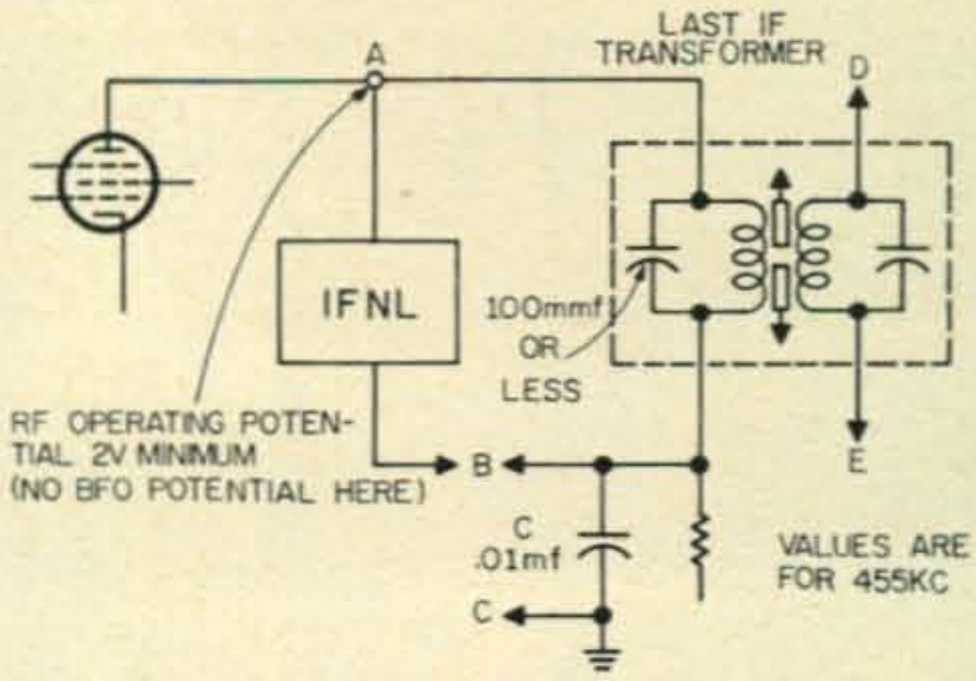


Fig. 1—Three different methods of connecting the "IFNL." Normal connections for the "IFNL" at A and B. If "C" is at least .01 mf the "IFNL" may be connected to points A and C. The "IFNL" may be connected to points D and E if the transformer is working into a high impedance.

[1]Scherer, W.M. "IFNL An SSB IF Noise Limiter", *CQ*, June, 1960 p. 42.

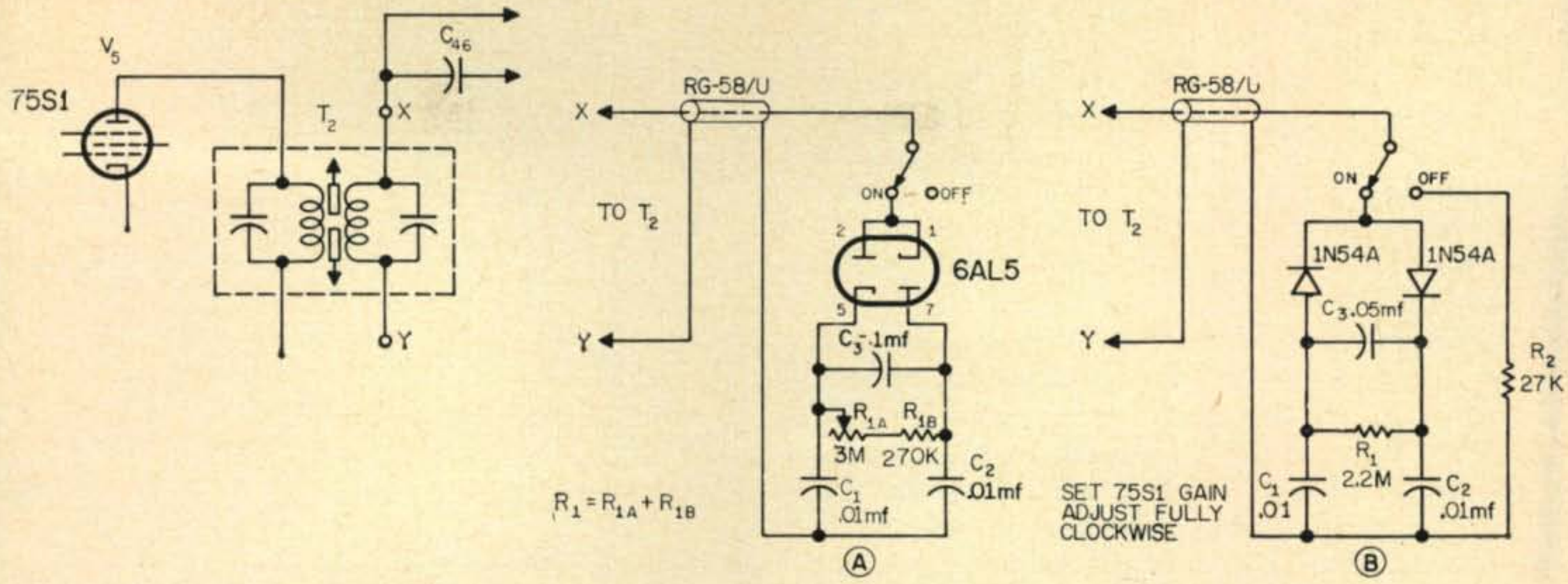


Fig. 2—Two methods of constructing the "IFNL". Both vacuum tube and crystal diode methods are discussed in the text. In both cases they connect to points X and Y of T_2 of the 75S1.

other. So the final selection of values for these components must be a compromise resulting in the maximum tolerable overall distortion for the degree of noise limiting action which is required under the generally prevailing noise conditions. A certain amount of flexibility in this respect may be obtained by making R_1 variable. See *Answer #2*. This will provide a reasonable degree of latitude in the control of distortion *vs* limiting action. Also, if $C_1$and C_2 are each made .01 mf, the best value of total capacitance may readily be determined by trying different size capacitors across R_1, later permanently wiring-in the one which gives adequate limiting and low "tail-distortion" over the range of R_1. See figs. 2 and 3. In addition to making R_1 variable, an all-out arrangement would be to add a switch for the selection of various size capacitors at C_2.

4. *Question:* Can crystal diodes be used in place of the 6AL5 in the *IFNL?*

Answer: Yes; in fact, they do a better job in cases where the maximum available r.f. operating potential at the r.f. transformer is only 2 or 3 volts, because in such a case the r.f. potential will be too low to sufficiently overcome the contact potential of vacuum tube diodes, with limiting action thereby being impaired. This is the reason why crystal diodes were installed in the *IFNL* used with the 20 *kc* filter adapter described earlier in *CQ*[2]. If crystal diodes are used, they should be the high back-resitance type such as the 1N54A, 1N67A, etc. Select those with a back resistance of at least 1 megohm. This may be checked with a 20,000 ohms-per-volt volt-ohmmeter. *Caution:* Do *not* measure crystal diode resistance with a v.t.v.m.! The crystal diode resistances are lower than those of a 6AL5, so the minimum degree of limiting cannot be reduced further by increasing R_1 beyond about 2 megohms. Also, the insertion loss may be higher than when a 6AL5 is used.

5. *Question:* Will the *IFNL* work when it is installed across the primary, instead of the secondary, of T_3 in the 75A-4 receiver?

Answer: Yes, but its effectiveness will be limited due to the relatively lower impedances on the primary side. It is far more effective when it is installed across the secondary of the transformer in this case, because the secondary impedance conditions are more favorable.

6. *Question:* Can the *IFNL* be made to work with a.m. signals?

Answer: Yes, but it is not effective for this mode of operation as are other a.m. noise limiters, especially the *TNS*. For a.m., R_1 will have to be increased to several megohms to avoid high distortion which would otherwise result with a.m. signals.

7. *Question:* Since noise pulses are integrated and lengthened when they are passed through highly selective circuits, would it not be better to install the *IFNL* ahead of the sideband filter?

Answer: Yes, if the r.f. operating potential at such a point is high enough, but unfortunately this seldom is the case. A minimum of about 2 volts r.m.s. is required as set forth in Answer #4. This was also discussed in the original article.

8. *Question:* Is it necessary to shield the r.f. leads to the *IFNL?*

Answer: No, but if the leads are fairly long, the chances of feedback causing i.f. amplifier instability, and of b.f.o. signal pickup which would limit the effectiveness of the *IFNL*, are minimized when shielded leads are used. This will vary with individual installations and different lead lengths. Unshielded leads have been quite satisfactory in many installations.

9. *Question*: When the *IFNL* is installed, may the bottom leg of the circuit be connected to ground instead of to the bottom end of the i.f. transformer winding?

Answer: Yes, if the bottom end of the transformer winding is bypassed with at least .01 mf (at 455 *kc*). See fig. 1. This method, however, is not recommended if crystal diodes are used in place of the 6AL5. The instantaneous surge of the B plus potential through the capacitors, C_1 and C_2, when the *IFNL* is switched on, will eventually damage the crystal diodes.

[2]Scherer, W.M. "20 KC Filter Adapter and SSB Noise Limiter for the 75A4", *CQ*, April, 1960, p. 32.

10. *Question:* May the values of C_1 and C_2 be reduced?

Answer: Yes. This was covered in the original article. With an i.f. of 455 *kc*, C_1 and C_2 may be reduced down to .01 mf as shown in the accompanying diagrams. The time constant will have to be restored by adding a capacitor (C_3) across R_1. This capacitor should be about .05 mf. See *Answer #2*.

11. *Question*: It is understood that the *IFNL* may be disabled by using a switch to disconnect one end of R_1. Is this correct?

Answer: When a 6AL5 is used, from a practical standpoint, the answer is yes; however, the limiting action may not be *completely* removed in some cases. When crystal diodes are used, the *IFNL* cannot be satisfactorily disabled by opening one end of R_1. This is due to the comparatively lower back resistance of crystal diodes.

12. *Question*: How should the *IFNL* be installed in the 75S-1 receiver?

Answer: It may be connected across the primary or secondary of T_2 (the latter is better), but its effectiveness will be limited due to the low r.f. operating potential experienced at these points (about 2 volts). See fig. 2a.

The use of crystal diodes in place of the 6AL5 will do a somewhat better job when the *IFNL* is connected to T_2 but its maximum possible effectiveness still will not be realized, and there will be a noticeable loss in signal level which must be restored by advancing the r.f. gain control (R_{57}) in the 75S-1 fully clockwise. See *Answer #4* and fig. 2b.

The best arrangement for the 75S-1 is to substitute a higher impedance i.f. transformer for T_2, and then connect the *IFNL* across its primary winding. See fig. 3. This will provide better impedance relations and a higher r.f. operating potential for good effectiveness of the *IFNL*. The selectivity will not be impaired by the new transformer, because this is primarily controlled by the characteristics of the mechanical filter.

With any of the above arrangements, the *IFNL* components may be mounted on a plate installed on the chassis in the space which has been set aside for the noise blanker. A shield should be mounted along the front bottom edge of this plate to isolate the *IFNL* from the mixer and front end of the i.f. system. Insulated shielded leads (coax, RG-58/U) should be used to make the connections between the *IFNL* and the last i.f. stage circuits. If T_2 is replaced in the circuit by a higher impedance transformer (T_2a), the former need not be physically removed from the chassis. The new transformer may be mounted on the plate with the *IFNL*. The ON-OFF switch may be attached to the rear of R_1a. The shaft of R_1a should be left long, so that it extends far enough above the chassis to allow it to be easily reached and operated. R_1a also may be mounted on the front panel between the phone jack and the emission switch. The space will be found to be too tight to include the switch as well as the potentiometer. In this case, the switch may be left out by making R_1a

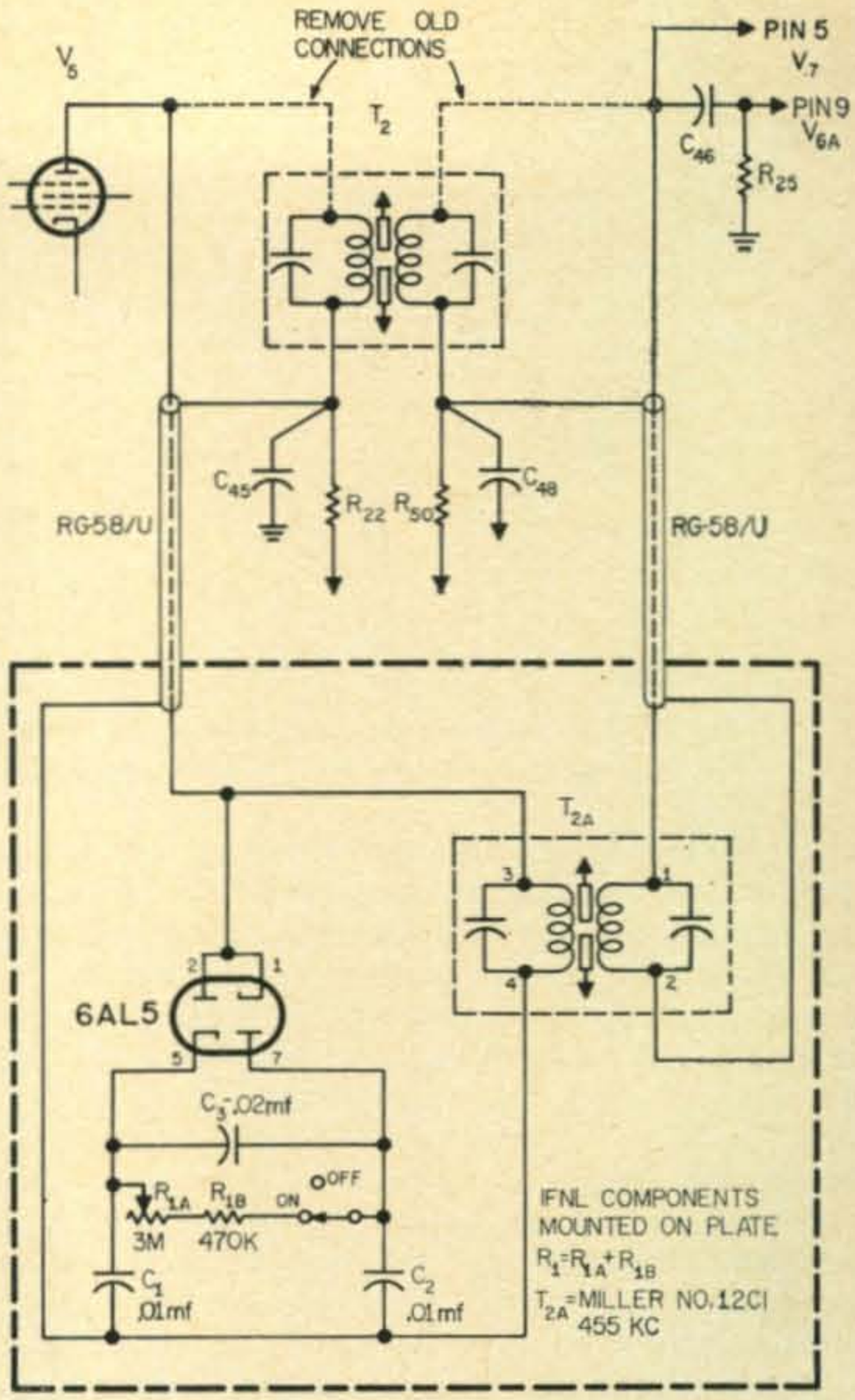


Fig. 3—By substituting T_2a for T_2 in the 75S1 a better impedance match is attained and higher r.f. potential is obtained for better effectiveness of the "IFNL".

ten-megohms, at which setting the *IFNL* will be sufficiently disabled when its use is not required. Shielded leads should be used to the potentiometer with their shields grounded.

When the crystals diodes are used, as in fig. 2b, the insertion loss will be higher than when the arrangement at fig. 2a is used. A 27,000 ohm resistor, R_2, is switched in to provide a similar loss when the *IFNL* is switched out, thus eliminating large level changes when the limiter is switched on and off. When R_1a is set at maximum resistance in the arrangements of fig. 2a and 3, loss equalization is not required. If however, conditions most of the time are such as require R_1a to be set near its minimum value, (at which time the loss level is higher) it may be desirable to add loss equalization as shown in fig. 2b with R_2 chosen for the needed equalization.

If only 6 volt operation of the 75S-1 is contemplated, the 6AL5 heater leads may be connected between ground and the hot 6.3 volt terminal on the tie-point strip to which the v.f.o. cable is connected. For universal operation (a.c. 6, 12 and 24 volts) connect the 6AL5 heater leads to terminals 3 and 4 on the V_5 socket. Then the power-plug connections should be as follows: (Refer to the 75S-1 schematic)—

For a.c. and 6 volt operation, no change; for 12 volt operation, connect the 47 ohm resistor to pins 10 and 11 instead of pins 9 and 10; and for 24 volt operation, connect the 47 ohm resistor as described above for 6 volt use, and also connect a 39 ohm resistor to pins 3 and 9.

Alignment

The alignment procedure is as follows: After the IFNL has been installed, turn the 75S1 operating switch to CALIBRATE, the emission switch to LOWER or UPPER SIDEBAND, the *IFNL* switch at ON, the *IFNL* threshold control, R_1a, at maximum resistance (minimum limiting), and tune the receiver to 14.2 *mc* for a beat note of a little over 1000 cycles. Adjust the tuning slugs in T_2 or T_2a (depending on which circuit is used, fig. 2 or 3) for peak signal as indicated by the S-meter. As the signal level is peaked above S-3, detune the PRESELECTOR TUNING for readings near S-3, because signal levels at this point will give sharper and more accurate peak readings than those made near the S-9 region. Then switch out the *IFNL*. The S-meter reading should remain nearly the same, but if it does not, it may be corrected by changing the equalizing resistor R_2, or by adding such an arrangement if desired. If fig. 3 were used with the switching arrangement of fig. 2b, it would be necessary to add a small trimmer capacitor across R_2 to restore circuite resonance when the *IFNL* is switched out.

Since the *IFNL* is installed ahead of the a.v.c. system, it will deter trains of noise pulses from activating the a.v.c. and desensitizing the receiver during such periods. It will also minimize annoying momentary loss of receiver gain during occasional heavy pops of noise. It may also be noted that the S-meter does not kick up quite as readily when the *IFNL* is used. This is due to the impulse limiting action of the *IFNL*.

Other Questions

Other questions dealt with the installation of the IFNL in different specific receivers; however, it would involve too much to include all these at this time. The data for the 75S1 was included herein, because this was, by far, of the most concern.

The three different circuit arrangements, shown herein, also indicate the various possibilities in values and switching which may be used in connection with other installations. R_1 is also shown as a variable, since it is apparent that most operators just must have an extra control with which to diddle. Another arrangement, for varying the degree of limiting, will be found elsewhere in this issue of *CQ*. An advantage gained with this method is that the basic time constant does not change as the degree of limiting is varied. On the other hand, when a low-e i.f. transformer is used, such as in fig. 3. The circuit resonance will vary at the same time.

The preceding information, plus that given in the original articles, should be sufficient to cover most other situations. In general, the best installation point will be found to be across the primary of the last i.f. transformer. See fig. 1. Also, remember that an important requisite is that the absence of a b.f.o. signal, at the point of installation, is essential. Such signal may be picked up directly from the b.f.o., or it may get through to the front end of the i.f. strip, and thereby be amplified by the time it reaches the i.f. output. This will require good b.f.o. shielding and well isolated leads, with careful selection of ground-return points in the circuits concerned. When shielded leads are used to connect the *IFNL*, realignment of the i.f. transformer will be required. ■

Statement of Ownership

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 AND JUNE 11, 1960 (74 STAT. 208) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION of CQ—THE RADIO AMATEUR'S JOURNAL, published monthly at New York, N. Y., for October 1, 1960.

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5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 36,498.

(Signed) Richard A. Cowan, Business Mgr.

Sworn to and subscribed before me, this 15th day of September, 1960.

HERBERT PARISER, Notary Public
(Commission expires March 30, 1961)

Results of Armed Forces Day 1960

THE NAVY'S participation in the Communications Activities on Armed Forces Day 1960 was again a huge success. The excellent results of the Amateur-to-Military phase of this contest established the Navy as the service leader. NSS had 1101 contacts as compared to the Army's 552 and the Air Force's 308.

The exact totals on the entries for the c.w. and RTTY receiving contests are not available at this time as submissions are continuing to pour in. A preliminary counts on 8 June indicates that approximately 450 copies of the c.w. and RTTY messages had been received. At the present rate the total entries will be very close to last years total of 508.

Over 800 QSL cards have already been mailed, and the remainder are in the process of preparation.

There were 36 volunteer operators that assisted during this one day exercise. An appropriate letter of appreciation with a Certificate of Merit for each of the operators has been prepared and submitted for approval.

A special letter acknowledging the efforts of all personnel at NSS has also been submitted for approval.

A four hour static storm on 21 May caused a great reduction in the number of contacts made. Reports from all areas of the United States are, that NSS was the only service station that could be heard during this storm. However, the amateurs could not be read by NSS due to the low power of their equipment.

Plans have already begun for next years participation which will be the maximum effort exerted to date.

C.W. Receiving Competition

Certificates of Merit have been mailed to four hundred and sixty-seven contestants in recognition of making perfect copy of the Secretary of Defense's International Morse Code (CW) message to radio amateurs on Armed Forces Day 1960. The message was transmitted at twenty-five words per minute by military stations on 21 May 1960. Certificate winners of the c.w. message are as follows:

N1AAU, N1ABA, W1BB, W1BDY, W1BGW, W1BMW, K1CUE, W1DNY, W1ELL, W1GZQ, W1HKI, W1JBB, K1JHH, W1JOS, W1KGH/3, W1LZL, W1MCG, W1MEG, W1RGB, N1RRF, W1SCT, W1SMO, W1SRM, W1TA, AA1WAS, W1WPR, W1YMG, W1YZL.

N2AAL, W2AFZ, AA2AOQ, W2BVE, W2BXW, W2CCD, WA2COO, W2CEV/2, WA2CIG, W2CLQ, W2CPA, W2CXO, K2DDZ, K2DG, K2DSR, WA2EFU, K2EQP, W2FPM, W2FSN, W2GDZ, K2GMM, W2GQN, K2GTC, WA2GUQ, W2HX, W2IAZ, VE2IL, W2JBZ, W2JCA, W2JOA, W2KHA, K2KIB, WV2KIP, W2KW, W2KZM, W2LDE, W2LRW, W2LV, W2LYH, W2MTA/9, W2MZB, W2NMJ, W2NVB, W2OBU, K2OWC, W2PVQ, W2RUF, W2RUZ, K2SAV, K2SSX, W2TFV, W2TPV, W2TUK, K2UGZ, K2UZJ, K2VCO, W2VEN, K2VUI, W2WH, W2YJS, W2ZCH, W2ZMK, K2ZUV, W2ZUX.

W3ADE, W3AHX, W3APQ, K3ATL, W3BKE, VE3BUR, W3CA, W3DWP, W3ECP, W3EOV, W3FAF, K3GEC, K3GOH, W3GOQ, W3GQC, K3HWI, VE3IA, K3IMR, K3IPX, W3JBP, W3LEZ, W3LIV, W3LYN, W3MCG, N3NDV, W3QFS, W3TSG, W3VD, W3WHK, W3ZGN.

W4AGV, W4ANK, K4BAI, W4BI, W4BWZ, W4CH, W4DDQ, W4DGW, K4DRO, A4EFV, K4EHN, W4EJA, K4EKO, W4ET, W4ETD, K4GFL, W4GGD, W4GGJ, W4HQZ/5, W4HXT, W4IMC, K4IVZ, K4JFH, A4KJ, W4KLT, W4KR, W4KVO, K4KWE, W4LAL, W4NFN, W4NPG, W4NWK, W4ORB, K4PSE, W4PVW, K4QAV, W4QUL, W4RHZ, K4RYT, K4SMR, W4SRK, K4SXO, K4THM, K4TNO/5, KN4UWC, W4VCX, W4VNE, DL4VU, K4WAR, K4YOQ, K4YPD.

A5ADC, W5AJG, W5ANR, W5ARK, W5BCE, W5BMI, W5BYJ, K5CAT, K5CDA/MM, W5DD/MM, W5DIW, K5EWK, W5GCJ, W5GKV, W5GOG, W5GRT, W5HAJ, K5HVP, W5HZW, W5IYJ, K5JGZ, A5NDV, W5PCF, W5PVE, W5PYU, A5QUV, W5RIH, W5RIT, W5SM, W5SQB, W5TD, W5USA, K5USA, W5UY, K5WBA, A5ZU, K5ZZF.

N6AAA, N6AAA, N6AAB, N6AAF, W6AAQ, N6ABC, W6AWP, W6AXV, KH6BGW, W6BHG, W6BVY, W6CBX, WA6CFA, W6CG, W6CKU, K6COP, KH6CQS, K6DCF, K6DV, WA6DWV, AFA6DX, W6ELT, K6EPT, K6ESQ, W6ETJ, N6FAC, A6FB, AF6FHI, WA6FKN, W6FNG, KH6FX, W6FYN, K6GB, K6GK, WA6GRD/7, K6SGN, W6GYH, K6GZ, W6HTS, A6HXQ, W6IAH, KH6IJ, WV6IJN, W6INI, K6IZE, W6JAI, AF6KF, WA6KMS, W6KTT, K6LAE, K6LHA, WV6LKJ, W6LN, K6LNG, K6MRR, K6MSL, W6MXO, W6NAZ, W6NBX, K6NBZ, K6NRK, K6NRZ, W6NSK, W6OJW, W6OWP, W6PYN, W6PYZ, W6QIL, W6QQ, W6SAW, K6SXX, W6TED, K6TER, K6TWE, W6UDX, KH6UK, A6USA, A6USA, W6VPC, W6WAW, W6WNZ, W6WPF, W6WPI, W6WQT, W6WTL, W6YJU, K6YKG.

W7BJY, K7BPR, K7CHH, W7DCR, KL7DG, KL7DIR, W7EBS, W7EVW, W7EYF,

W7FIX, W7FOS, W7GTH, W7JU, W7JVK, W7KQV, W7KX, K7KYG, W7LFA, W7LJZ, W7LPM, W7MUS, W7NGW, W7OCX, W7-ODS, W7PGY, W7QLH, W7RIL, W7TIQ, W7UAD, W7YKG, KL7ZF, W7ZL.

W8BKM, W8CJN, W8CLX, W8CXS, W8-DAE, W8FFK, W8FLA, W8GIG, W8GMK, K8HKU, W8HS, K8HTJ, W8HZA, W8IJV, K8JZX, K8KLC, W8KLZ, K8KVV, W8LEX, K8LOU, K8ODW, W8OKN, WA8PHM, W8-QCU, W8QLJ, W8QWE, W8RLR, K8RUE, W8SQU, W8SS, W8SZU, W8TZO, W8VPC, W8ZCW.

K9AMC, W9AOV, W9BMJ, W9CDW, W9-CHD, W9CXY, W9DCY, W9ELW/4, K9GDF, W9GFF, W9HAE, W9HAE, W9HVP, A9IDO, K9IXG, W9JAM, W9JYO, K9KGF, W9KSR, W9LRV, W9MAK, K9NRU, W9OUR, K9PLF, W9PNE, W9QGL, W9RAR, A9TCV, K9THW, W9TT, W9VHD, W9WNB, W9ZAV, W9ZFA, W9ZYD.

WØAH, WØBBY, KØBRS, KØCST, WØDEL, WØDYF, AØECE, KØEMK, KØETY, WØ-FDJ, KØGVB, KØGVW, WØHIC, KØHLA, KØHLC, WØIA, WØIHC, WØJZN, KØLZJ, WØNHZ, AØNSF, KØPIV/3, KØOJQ, KØ-PFV, WØQVA, WØRCV, WØRGS, KØSJB, KØTRI, WØTUT, WØWFP, KØWTG, WØ-WYK.

Andrews, C. P.; Baker, Gerald Allen; Bean; David B.; Becker, Robert E.; Brabner, Douglas; Broz, Frank J.; Campbell, Alan J.; Campbell, James E.; Carnes, Donald B.; Conaway, William R.; Corby, Russell J.; Danell, Dennis L.; Darnell, Jerry L.; Davis, Virgil H.; Devitto, Louis J.; Elgan, Harold C.; Ellis, Kenneth A.; Fretsvold, Robert C.; Fuller, F. V.; Gratta, Joseph F.; Green, Lonnie D.; Hancock, Fulmer B.; Hinkle, William Farrell; Holtz, William J., Jarrell, G. W. Jenks, Robert L.; Johnson, Paul W., Jones Jr., Roy L.; Kruger, Edmund J.; Lawhon, Herman O.; Laycock, Jack; LeBlanc, Ruffin Joseph; Liu, L.; Martin, James E.; Maxwell, C.; McClelland, G. H.; Moats, Otto E.; Mobley, Carl W.; Money, James M.; Moser, Charles E.; Moyes, William E.; Mueller, Walter R.; Myres, R. R.; Nelson, Edmund K.; Nickerson, Jack R.; Noyes, Theodore E.; Phares, Paul L.; Phillips, Rodney L.; Price, Terrance W.; Quinn, James E.; Quinter, Ronald F.; Reding, Patrick; Rickenbrode. Kenneth A.; Saldivar, Edmund S.; Sawyer Jr., Willis R.; Scott Jr., Ralph; Shryack, Louis A.; Simpson, G. B.; Snyder, Richard D.; Springer, W. F.; Steelz, Richard F.; Street, C. J.; Tate, E. V.; Ungari, Jess A.; Veazey, David J.; Wilson, Wade; Woffard, Kenneth L.; Wolf, George; Wolf Jr., George E.; Wood, C. C.; YYoung, Charles B.

Military to Amateur Contacts

Operating on military frequencies AIR, NSS, and WAR, amateurs worked 80, 40, 20 and 15 meters, using c.w., a.m., s.s.b., and RTTY. The three military stations made a total of one thousand nine hundred and sixty-one contacts.

RTTY Receiving Competition

The radioteletypewriter receiving competition featured a message from the Secretary of Defense transmitted at sixty words per minute. A total of three hundred and eighty-nine contestants received a certificate of merit for perfect copy. RTTY winners of certificates of merit are as follows:

N1AAU, W1BGW, K1CLD, W1FGL, W1-IRH, W1OCY, W1VW, W1YFD, W1YHF.

K2AAA, W2AYY, W2BVE, W2BXW, WA2-CBX, K2CXO, K2DDE, K2DOH, W2DXD, K2ECQ, K2EID, WA2EPO, W2FAN, WA2-FLA, W2GOK, W2GQN, W2ICA, W2JAV, W2KGY, K2MTJ, W2NRQ, W2OGM, W2-OKO, W2ORX, W2OTZ, K2OWC, W2PAU, W2QGH, W2RGO, K2RUV, K2SDR, K2SFY, W2TAM, W2TOX, K2TYY, W2UAE, K2-VAM, K2YEL, W2ZMK.

N3ABC, VE3BAD, K3BHK, W3CA, W3-CRO, W3DJZ, W3ENU, K3GCI, W3GSO, W3HCE, K3IUV, W3JNE, W3JZB, W3KMM, W3MHD, W3MWV, VE3OE, W3VVP, W3-ZCS, W3ZCS.

W4ACH, W4AIY, W4AMY, VE4BJ, K4-CBW, AF4CPK, K4DBQ, K4EHN, W4ETD, K4FEO, AF4FGT, K4GFL, K4GZS, W4HXT, W4IBI, W4IRZ, K4KKZ, W4LKR, W4MGT, K4NAS, K4NDE, W4NFN, W4NWK, DL4OZ, K4PSE, K4SCP, K4SMR, W4WMN, W4ZBQ, W4ZGR, W4ZJU.

W5AJG, W5BMI, W5BOT, K5CAT, KZ5CE, KZ5CI, KZ5CI, W5DDJ, K5ECN, W5GCJ, K5GEI, K5GMI, W5GMM, W5HAJ, W5HJ, W5IDZ, W5IXC, W5IYJ, W5JBW, W5JZT, K5KIB/6, W5LGL, N5LTN, W5MUG, K5-NRI, W5OCY, W5RCF, W5SGJ, W5SQB, W5TD, W5TVG, K5VLA, W5VZX, W5UY, W5ZMK.

W6AEE, W6ASJ, W6ASJ, W6AXV, W6BIK, AA6BPI, W6BRY, W6BVY, W6BYS, W6CAP, W6CBF, W6CBX, W6CG, W6CQI/6, W6CQK, WA6DME, W6DOU, W6DOU, K6FCW, K6-FCY, W6FHI, W6FYW, K6GB, K6GID, K6GR, AF6GSX, AF6GSX, W6GGW, K6GZ, WA6HLS, K6HOI, W6HTS, A6HXQ, W6IIV, WA6JCF, K6JDN, W6JOX, K6JPR, K6JWQ, K6JWQ, W6KAR, W6KF, WA6KMS, W6-LAE, W6LDG, W6LKU, W6LPX, W6MAP, W6NRK, K6NRK, W6NRM, K6OCC, W6-OGG, K6OWQ, K6PAV, W6PSW, K6PWA, K6PWH, W6QLB, K6SGQ, VE6UB, W6UJX, A6USA, A6USA, W6UVF, W6UXM, W6VBU, W6VPC, W6WPF, W6YCF, K6ZFS.

W7AMM, K7AUV, W7AVK, W7BEG, KL7-DIR, KL7DIR, W7EVW, W7FEN, W7GLJ, W7GRD, W7HRC, W7JHC, W7LI, W7LPM, W7MC, W7MLT, W7MUS, W7ODS, W7TMF,

[*Continued on page 173*]

A 417A Preamplifier For 144mc.

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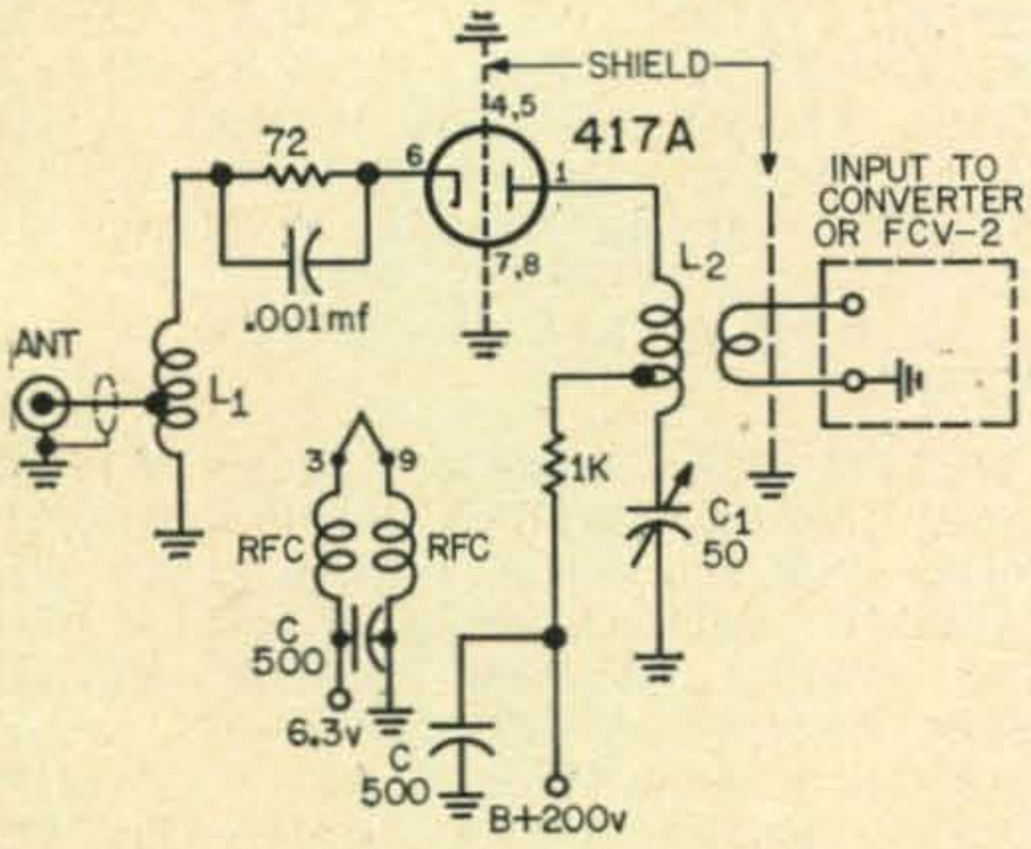
If you have an old two meter crystal controlled converter around the shack that just doesn't have the sock, this 417A preamp will undoubtedly provide better listening for those weak signals.

The "experts" contend that a cascode tube is all that is required to get down to antenna noise on 2 meters. Ignoring this, the soldering iron experts (who perform amazing feats of long-haul DX on two) use the hottest tubes available for their front ends. The authors doubt that "pros" like W6NLZ use 6BQ7's for the first *rf* stage!

To see just how much improvement a hot *rf* stage would make, a *Western Electric* 417A was added to the International Crystals FCV-2 converter. Although the FCV-2 was used as the "guinea pig", the preamplifier will "soup up" almost any converter or receiver.

The simple preamplifier that adds *db's* to a two meter signal is shown in fig. 1 and the accompanying photographs. Although expensive when compared with tubes like the 6BQ7, 6BZ7 and the like, the 417A provides a large improvement in noise figure. It's well worth the extra outlay when trying to copy a "down-in-the-noise" signal.



Parts List

C—Button standoff type capacitor—500 mmfd.
L_1—4¼ turns, #18 enam., ½" diameter, ⅝" long, tap at 2½ turns from bottom.
L_2—8½ turns, #18, ⅜" diameter, ⅞" long, tapped 4 turns from top. The link is 2 turns of hookup wire.
RFC—12 turns, #22 enam., on ¼" diameter form, ½" long.

Fig. 1—The 417A amplifier added ahead of the International FCV-2 converter gives quite a sizeable improvement in the noise figure.

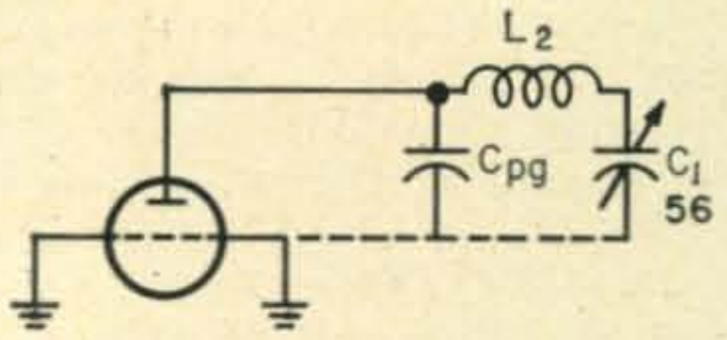


Fig. 2—The so-called series tuning is actually parallel tuning. The capacitor C_1 is really in series with the capacitor C_{gp} formed by the capacity between the grid and the plate.

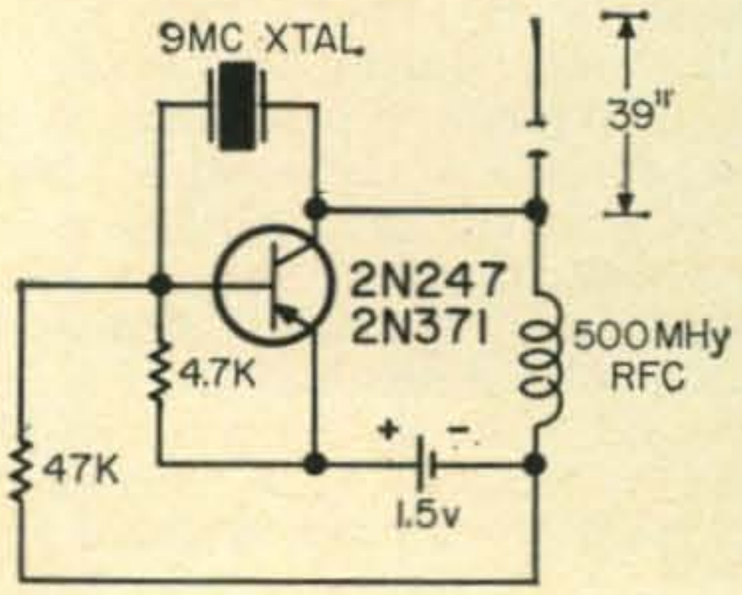
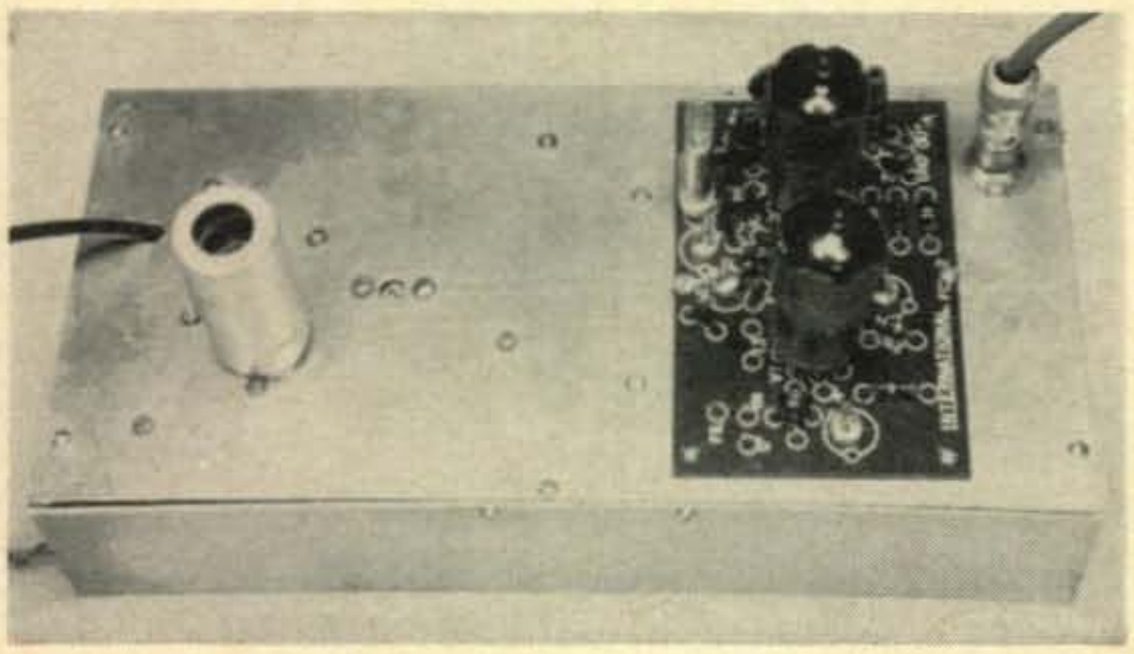


Fig. 3—A 9.0 mc. crystal will give a sizable output from its 16th harmonic when used in this circuit. When a half-wavelength antenna was connected to the antenna terminal, the signal was copied on 144 mc. from two miles away. Since the oscillator draws less than 1 ma., no on-off switch is necessary. The oscillator is a "cinch" for aligning the preamplifier. See text for further information.

Preamp Operation

The 417A is operated grounded grid, the signal being fed into L_1 via a tap part way up the coil. The heater is kept above ground for *rf* by feeding the heater current through *rf* chokes. The plate circuit is connected in the so-called series tuned configuration. In reality the tuning capacitor, C_1, is in series with the grid-plate capacity of the tube and the circuit is actually parallel tuned, as shown in fig. 2. The output is taken via a link to the antenna and ground terminals on the FCV-2 board.

Although no noise figure can be quoted, measurements of a precise nature being the prerogative of the laboratory, it can be said that a noise generator showed a considerable improvement in the signal to noise ratio when compared to the "barefoot" FCV-2.



The 417A and the FCV-2 are installed on a piece of aluminum sheet and screwed to an upside-down chassis.

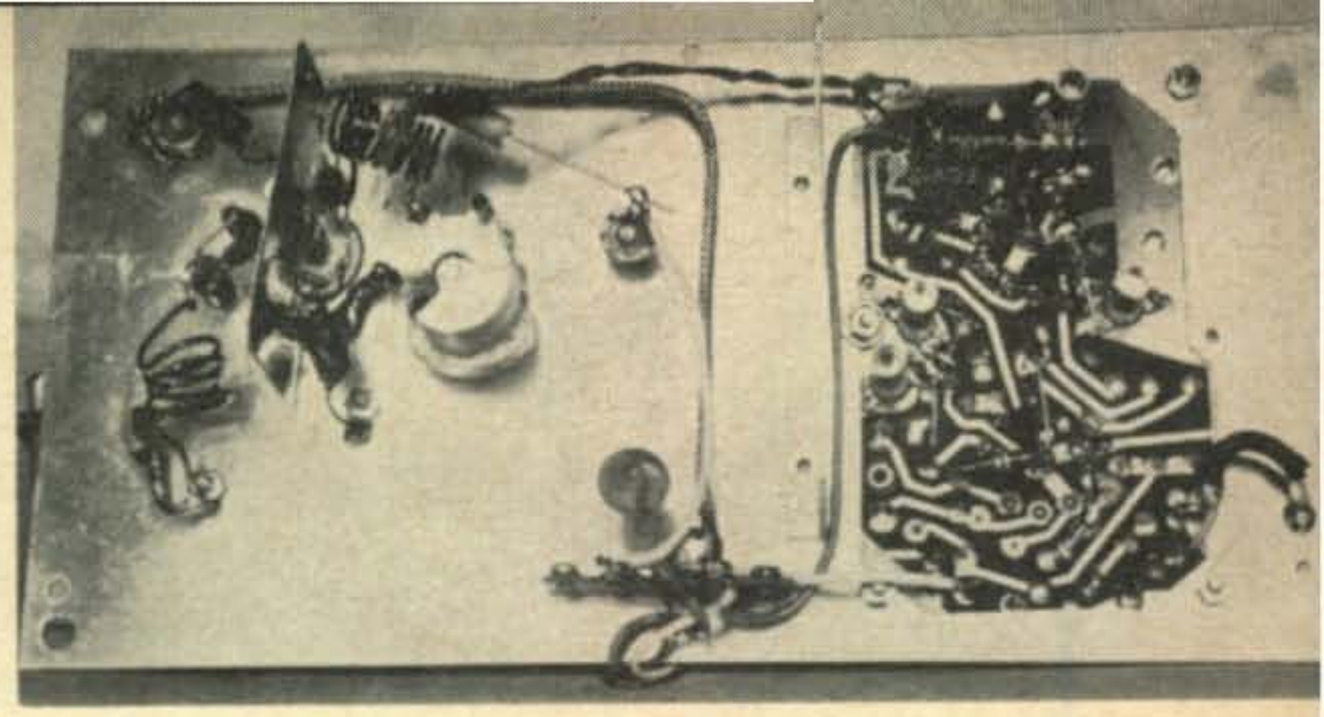
Test Oscillator

Sometimes it is difficult to find a steady weak signal for adjusting converters and receivers. To cover such situations, here is a trick you can employ.

Previous to building the 417A preamplifier, a transistor crystal oscillator was housed in a small container. A quarter wave antenna was connected to the oscillator and the device was installed on a water tower some distance away. The heterodyne without the 417 was just audible in the receiver noise. With the 417A in operation, the signal was loud and clear! As the crystal oscillator was used for a precise frequency marker, only a weak signal was required. This is provided by using the 16th harmonic of a 9 *mc* crystal. The marker oscillator also provides a reassuring indication that everything is working properly even when the band is dead. The circuit for the oscillator is shown in fig. 3.

Preamp Construction

A copper shield 1½" by 2½" is installed across the 417 socket and is held to the chassis by lugs which are soldered to the copper and bolted to the chassis. Pins 4, 5, 7, and 8 are soldered to the shield or center lug of the socket.



Underside view of the preamplifier and FCV-2 converter. Note the liberal spacing between the 417A components and the FCV-2. Do not try to compact the installation or undesired coupling may result.

A small shield is also installed between the FCV-2 and the 417A domain. Button type capacitors (marked C in the diagram) were salvaged from an old ARC-5 which had been laid to rest some time ago. A tie point from the same source is mounted adjacent to the 417A cathode pin and holds one end of the bias components

Noise Figure Adjustments

Using a noise generator, the antenna tap on L_1 should be adjusted for best noise figure. At the same time the coil is resonated by squeezing the turns together or pulling them apart. The resonance point is rather broad as is the antenna tapping point. Capacitor C_1 should be adjusted in conjunction with the piston type capacitor in the FCV-2 unit because there is a certain amount of interaction at a point which yields high gain. Best noise figures are obtained when C_1 is slightly off resonance, although this point too is broad.

As an experiment, the amplifier was aligned on the signal only using the transistor oscillator mentioned earlier. It was necessary to prune the antenna down to 4" to once again receive a weak signal with the 417A installed. The antenna was rotated until the signal was barely audible and the adjustments to the 417A stage made. If a gain in signal strength was realized, the antenna was turned a little away from the oscillator to keep the signal down in the noise. The adjustments, when checked, proved to be every bit as good as those made with the noise generator.

As a matter of interest, a junior operator was sent walking with the little transistor oscillator fitted with the full quarter-wave antenna. The 417A held the signal for two miles when the junior op got tired and sat down. This was observed (and later verified by questioning) by the fact that a slight frequency shift caused by the flop, flop, of the antenna as she walked, suddenly ceased and the signal remained steady! The distance this oscillator was received is all the more remarkable when it is realized that the oscillator is powered by one flashlight cell (1.5 volts) and the 16th harmonic of the crystal was being received! The receiving antenna was a 13 element yagi. ■

Variable I.F. Noise Limiter

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W6FKZ relates his experiences with the IFNL and describes another method for varying its limiting level in a 75S-1 installation.

W2AEF had an article in the June 1960 *CQ* on an i.f. noise limiter (INFL). This unit was installed in a Collins 75S-1 receiver, and did a good job on the auto ignition. But it also introduced considerable distortion to the s.s.b. audio signal. This amount of distortion is not objectionable on c.w. but is quite objectionable on s.s.b.

By replacing the on-off switch in the W2AEF unit with a 25K straight line taper pot, it is now possible to remove all clipping action with the full 25K inserted, and as resistance is removed any amount of clipping desired may be used. A point may be reached where the ignition noise is reduced so an S zero signal is readable where it is unreadable without the limiter.

Reference to W2AEF's article in June 1960 *CQ* on page 42 will give all the details on the 75A-4 installation except for the 25K pot which should replace the switch in that installation, as shown in the accompanying schematic.

This unit has been installed in a Collins 75S-1 and replaces the Collins Noise Blanker which was used, and which was unsatisfactory in its operation because most of my noise problems had no energy radiated in the 40 *mc* region of the spectrum.

All parts except the 25K pot are mounted on the Noise Blanker blank panel, and the pot is mounted in the hole on the front panel that was used for the NOISE BLANKER pot. This hole is located between the EMISSION SW and PHONE JACK. The clearing hole for this pot is already in the chassis, but not in the panel. It is only necessary to drill the panel to match the hole in the chassis.

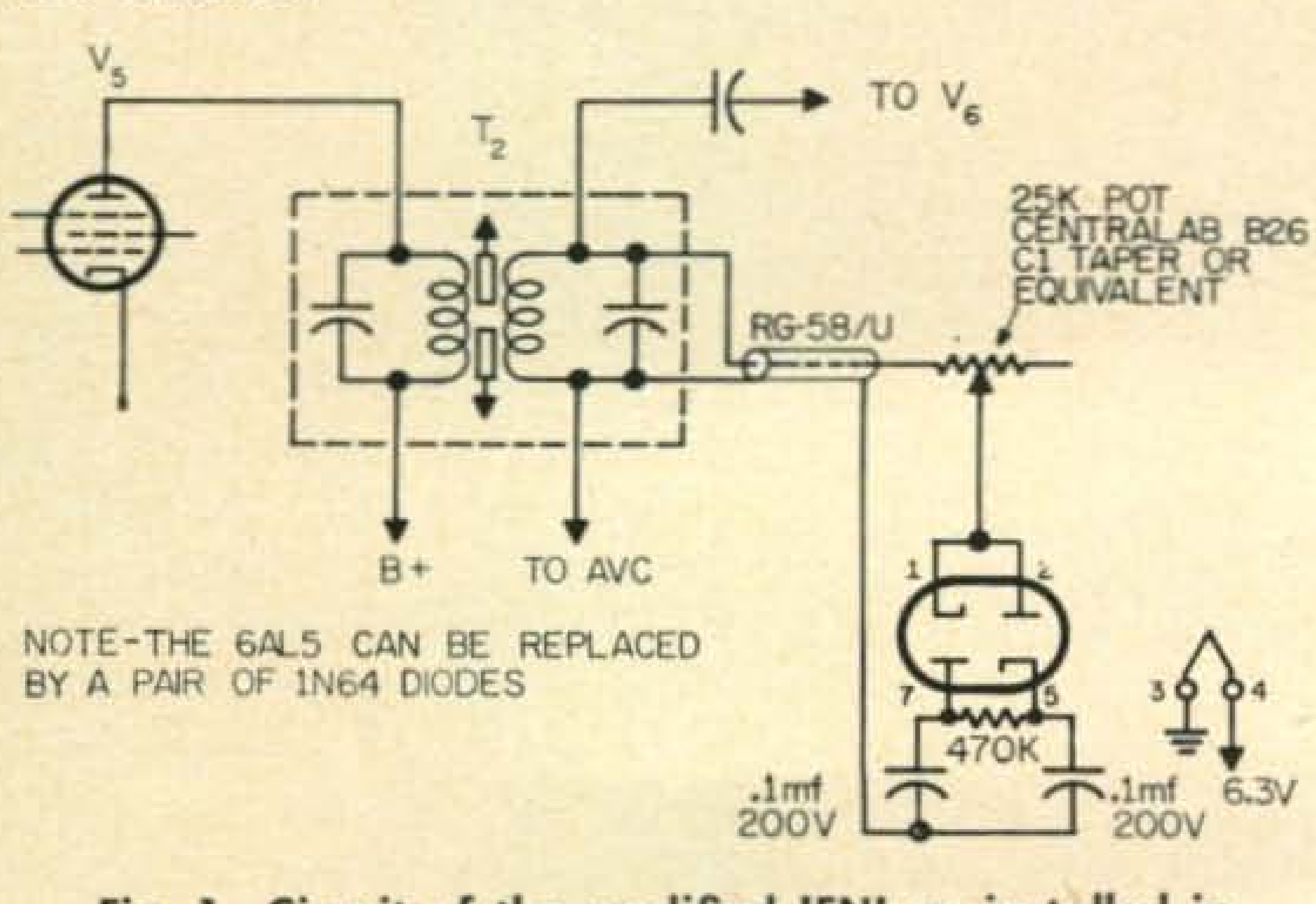

Fig. 1—Circuit of the modified IFNL as installed in the 75S-1.

Two diagrams are shown in figs. 1 and 2. One is the schematic, which can be used in any receiver that does not have b.f.o. injection voltage at the point of insertion, and the other is a pictorial of the 75S-1 installation.

The coax feed from T_2 secondary to the IFNL has the shield ungrounded as in the original. The two pieces of coax from the blanker panel to the pot have the shield grounded, and the exposed ends of all pieces of coax are made short to prevent stray coupling to the rest of the i.f. strip and the exposed wiring at the emission switch and mechanical filters.

Pin 3 of the 6AL5 is wired to the grounded mounting lug of the two lug tie point strip. Pin 4 of the 6AL5 is wired to the tie point in the 75S-1 that feeds 6.3 volts to V_3, V_7 and V_{301}. This unbalances the filament load for portable operation, but the equipment here will never be used for operation on a battery operated power supply. The rest of the wiring is self explanatory and is shown in the pictorial diagram.

A last reminder, don't forget to re-peak the T_2 secondary for maximum reading on the S meter using the XTAL CALIBRATOR for as a signal source.

An added desirable feature you get in the 75S-1 is that the limiter is effective on the a.v.c. also, because a.v.c. voltage is developed in the 6AT6 which follows T_2, and as it does in the 75A-4, ignition noise does not reduce the receiver sensitivity.

[*Continued on page 174*]

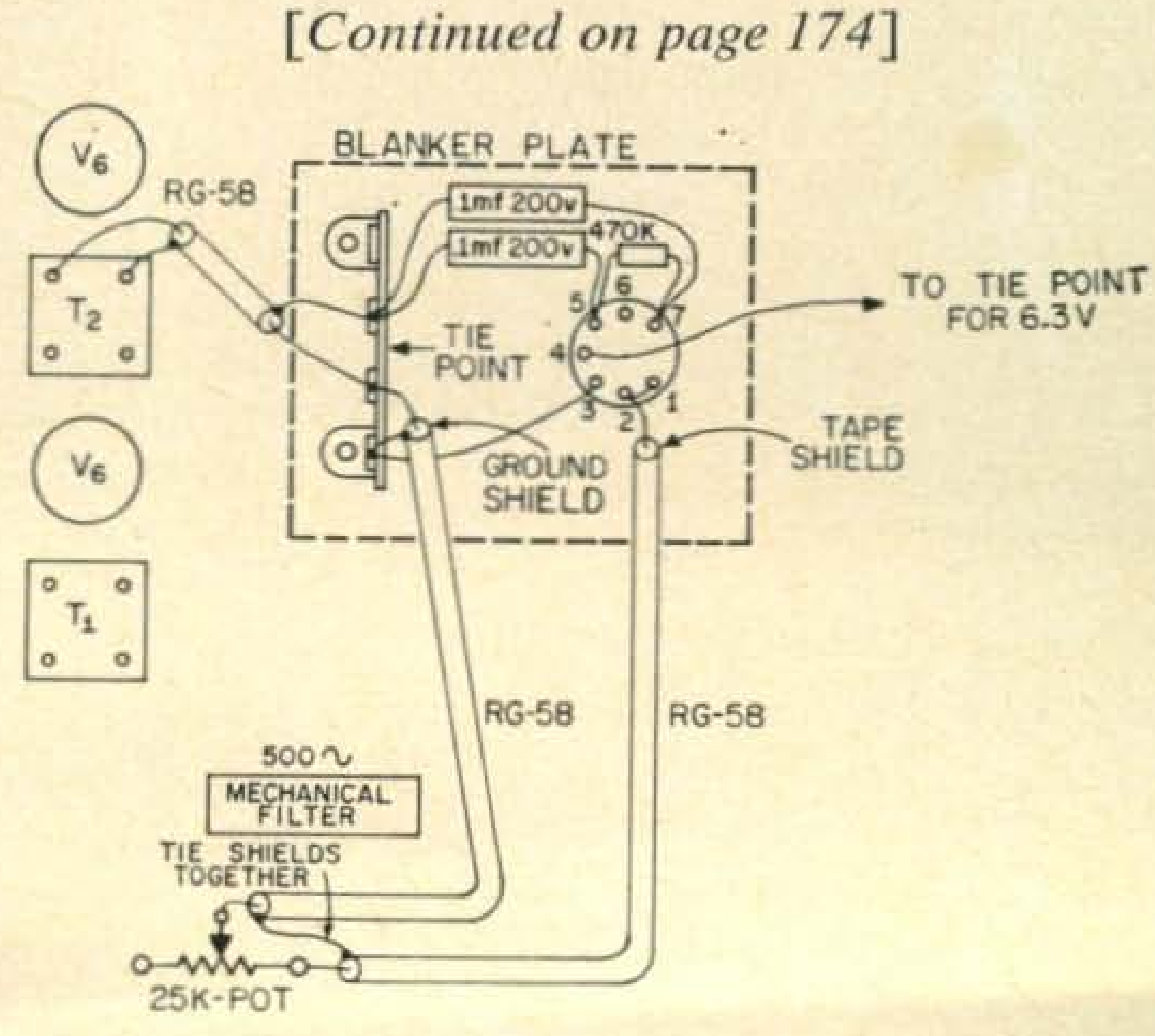

Fig. 2—Pictorial of the installation in the 75S-1.

Modification Of The TCS Transmitter For Coaxial Line

Henry Meiseles, K2UOC
1472 43 Street
Brooklyn 19, New York

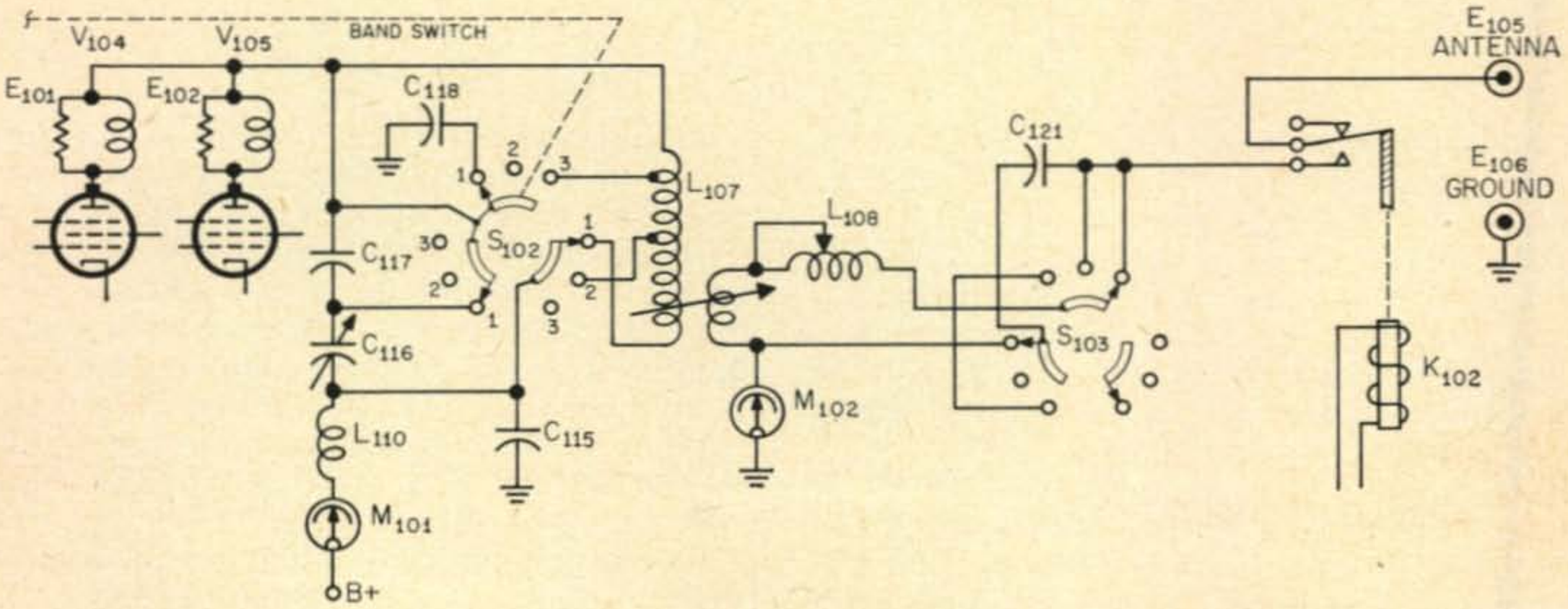

Fig. 1—Schematic of the original TCS r.f. final. Modifications are explained in the text.

The TCS transmitter was originally designed for operation in conjunction with an end fed whip. The original antenna loading network is ideally suited for this type of array. Unfortunately, this does not hold true for low impedance lines.

The object of this modification is to enable the owner of this unit to overcome this deficiency with a minimum of component replacement and mechanical modification. Dwelling on these two points, I would like to remark that a standard broadcast variable capacitor is the only additional part required and in regard to mechanical alteration, there are no visible signs of modification in the improved transmitter. The fact that no chassis work is required should appeal to the less ardent mechanics.

The heart of the modification lies in the replacement of the original link coupled tank circuit with the popular pi-net type of tank circuit. This is accomplished by removing the original tank assembly, utilizing the rotary inductor already mounted in the rig as the new tank coil plus a broadcast variable mounted in place of the removed tank assembly.

Here in outline form are the steps required for modification.

1. Unwire S_{102} shown in fig. 1.
2. Remove the original tank and link assembly, L_{107}.
3. Unwire S_{103}.
4. Remount L_{110} directly adjacent to the PA tubes. Connect L_{110} to PA plates at C_{117}. Run line to M_{101} as in fig. 2.
5. Using original lead, connect L_{108} to stator of C_{116}. Ground rotor of C_{116} directly to chassis.
6. Mount the broadcast veriable on the panel space formerly occupied by L_{107}.
7. Connect remaining lead of L_{108} directly to the broadcast variable.
8. Remove both leads connected to M_{102} and antenna relay.
9. Connect closest terminal of M_{102} to hot side of Cc. Run stiff wire lead between M_{102} and K_{102p}.

The TCS now has a pi-network which will match a wide range of antenna impedances. ■

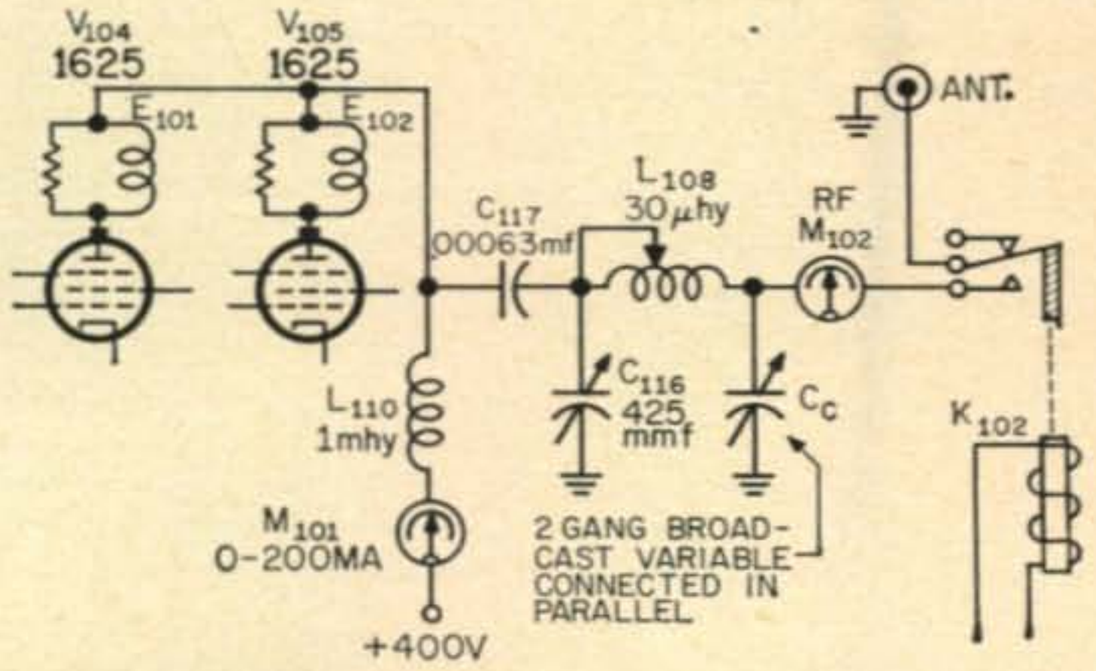

Fig. 2—Schematic of converted final.

Obstacle Gain—Its Use and Predictability

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Glendale, Arizona

Many communication circuits (Civil Defense, traffic nets, and general "rag chewing") can be made more effective by utilizing v.h.f. (or higher) frequencies and the principles of obstacle gain. Moving to the less crowded v.h.f. frequencies helps to reduce co-channel interference, static, and fading. Obstacle gain techniques can increase the "line-of-sight" distance characteristic of the v.h.f. bands.

What is Obstacle Gain?

Obstacle gain is a term used to describe the reduced losses found in a communications path which has an intervening mountain, ridge, or other large obstacle, as opposed to the large ground losses which would exist if the obstacle were not there. Obstacle gain is expressed as the power ratio (usually in decibels) of the signal powers that could be expected to be received with and without the existing obstacle.[1] This reduced loss exists because radio waves are diffracted over and around the surfaces of the obstacle.[2]

Prediction of Obstacle Gain Paths

Prediction of obstacle gain paths can be accomplished by first determining that an obstacle gain path exists and then computing to find whether the path losses are within the capabilities of the transmitting and receiving equipment to be used.

To insure that an obstacle gain path exists one must determine that a diffracting surface many wavelengths long exists in a straight line between the points of desired communication and that it is line-of-sight to both points. In order that the diffracting angle will be small enough to reradiate energy the distance from the obstacle to one end of the path must be at least three miles for each 1000 feet of obstacle height. Finally, the frequency used must be higher than approximately 40 *mc* in order that the ground losses at the surface of the obstacle will not be too great.[3]

Computing the path losses involves converting the transmitter output (*not input*) power, using the graph of fig. 1, to *dbm*.[4] The receiver input power required for communications is found by finding the noise level input from fig. 2 and then subtracting the receiver noise figure in *db*. The receiver input level (in *dbm*) subtracted from the transmitter output level (in *dbm*) leaves the amount of allowable loss between the two.

Next the path losses are totaled. These consist of transmitter transmission line loss, receiver transmission line loss, 37 *db* free space

[1]Dickson, F. H.; Egli, J. J.; Herbstreet, J. W.; and Wickizer, G. S., "Large Reductions of VHF Transmission Loss and Fading by the Presence of a Mountain Obstacle in Beyond-line-of-sight Paths", *Proceedings of the IRE*, August, 1953, p. 968

[2]Kirby, R. S.; Dougherty, H. T.; and McQuate, P. L. "Obstacle Gain Measurements Over Pikes Peak at 60 to 1046 Mc.", *Proceedings of the IRE*, October, 1955, p. 1467

[3]Craig, J. H., "Obstacle Gain Techniques for 50 Mc. and Higher", *QST*, March, 1958, p. 18

[4]*Dbm* is the power level of the signal with reference to one milliwatt taken as zero *dbm*

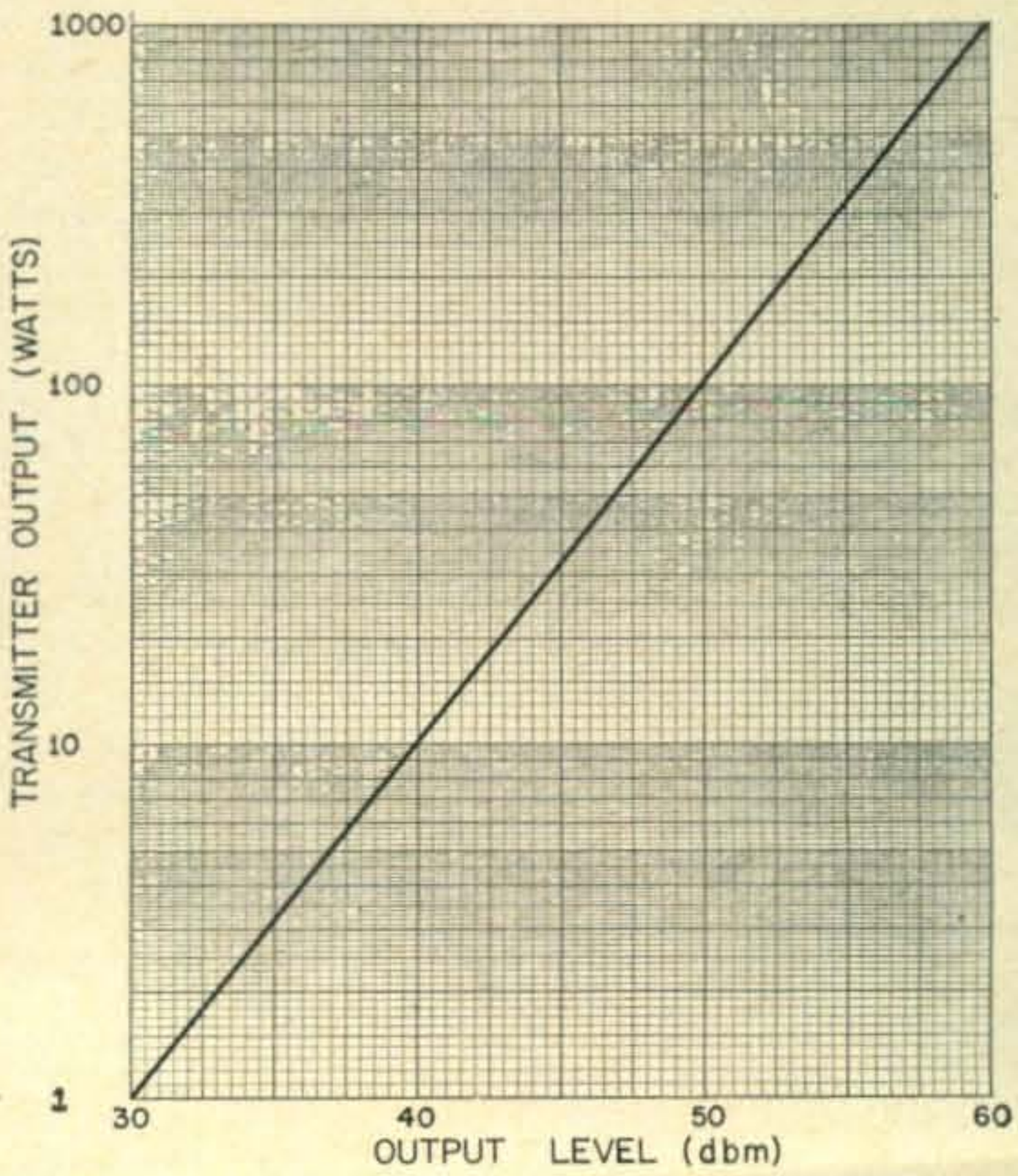


Fig. 1—Graph illustrating conversion of transmitter power output to output level in dbm.

loss, the loss due to distance (from the graph of fig. 3), the loss due to frequency (also from the graph of fig. 3), 40 *db* loss for the first obstacle of the path, and 20 *db* loss for each additional obstacle of the path. From the total losses may be subtracted any gain in the system (i. e. receiver and transmitter antenna gain). If the resultant total of all path losses and gains are less than the allowable transmitter to receiver loss, then communications can be expected when the equipment is actually put into operation. With a loss of 20 *db* at each site, it is apparent that not many obstacles can be hurdled and still have a detectable signal at the other end of the path.

If the obstacle to be considered is a sharp ridge, polarization can be expected to have only a small effect upon signal strength. Vertical polarization provides a gain of only about 0.4 *db* over horizontal polariztion. If the obstacle is more nearly a smooth cylindrical mountain, however, vertical polarization will give approximately four *db* gain over horizontal polarization.[5] Obviously, cross polarization would introduce additional loss.

[5]Neugebauer, H. E. J., and Bachynski, M. P., "Diffraction by Smooth Cylindrical Mountains", *Proceedings of the IRE*, September, 1958, pp. 1625, 1626

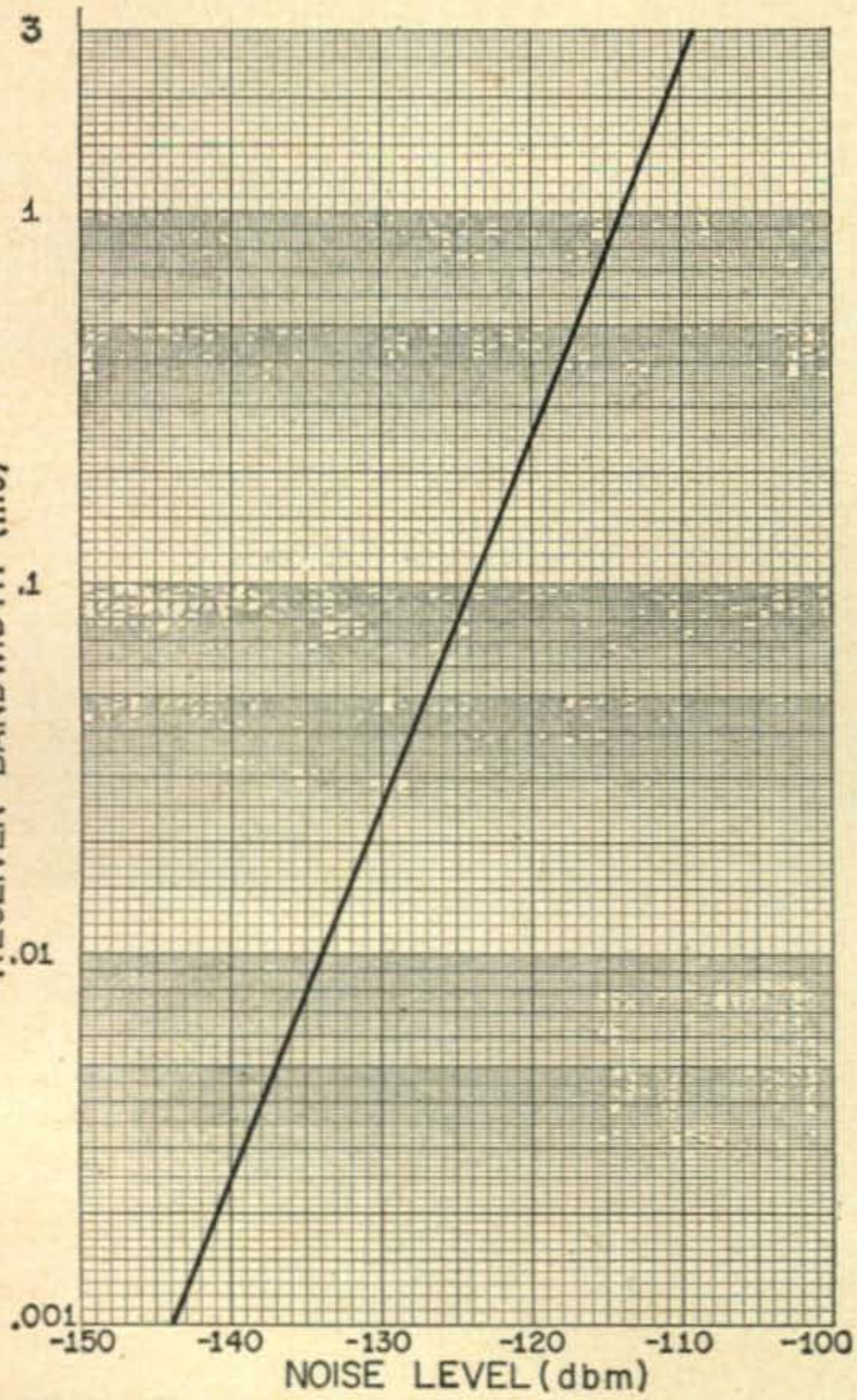


Fig. 2—Bandwidth of receiver determines the input noise level. To be readable, the input signal must be larger than the receiver input noise level plus the receiver noise figure.

Reliability of Obstacle Gain Paths

The reliability of obstacle-gain paths is quite good. Over a 24 hour period signal levels may be expected to vary less than three *db*. The deep fades of tropospheric scatter circuits are virtually non-existant.[6]

Several obstacle gain paths were successfully planned and completed with Craig Kepner, W7FQY, over the Tucson Mountains in Arizona using 50 *mc* mobile equipment. More tests are contemplated upon the completion of some 10,000 *mc* gear which is presently under construction.

In Conclusion

If a short distance communications link is desired for Civil Defense, a traffic net, or because "ole Uncle Ned lives just over the mountain a piece," the possibility of an obstacle gain path should not be overlooked. If equipment is to be built or purchased to accomplish this task, an hour or so with a topographical map[7] and the computations outlined herein will indicate the transmitter power and receiver sensitivity required. ■

[6]Craig, J. H., *Op. cit.*, p. 21

[7]Sectional Aeronautical Charts are ideal. They may be obtained for 25¢ each at the nearest airport, or by writing the Director, U.S. Coast and Geodetic Survey, Washington 25, D.C.

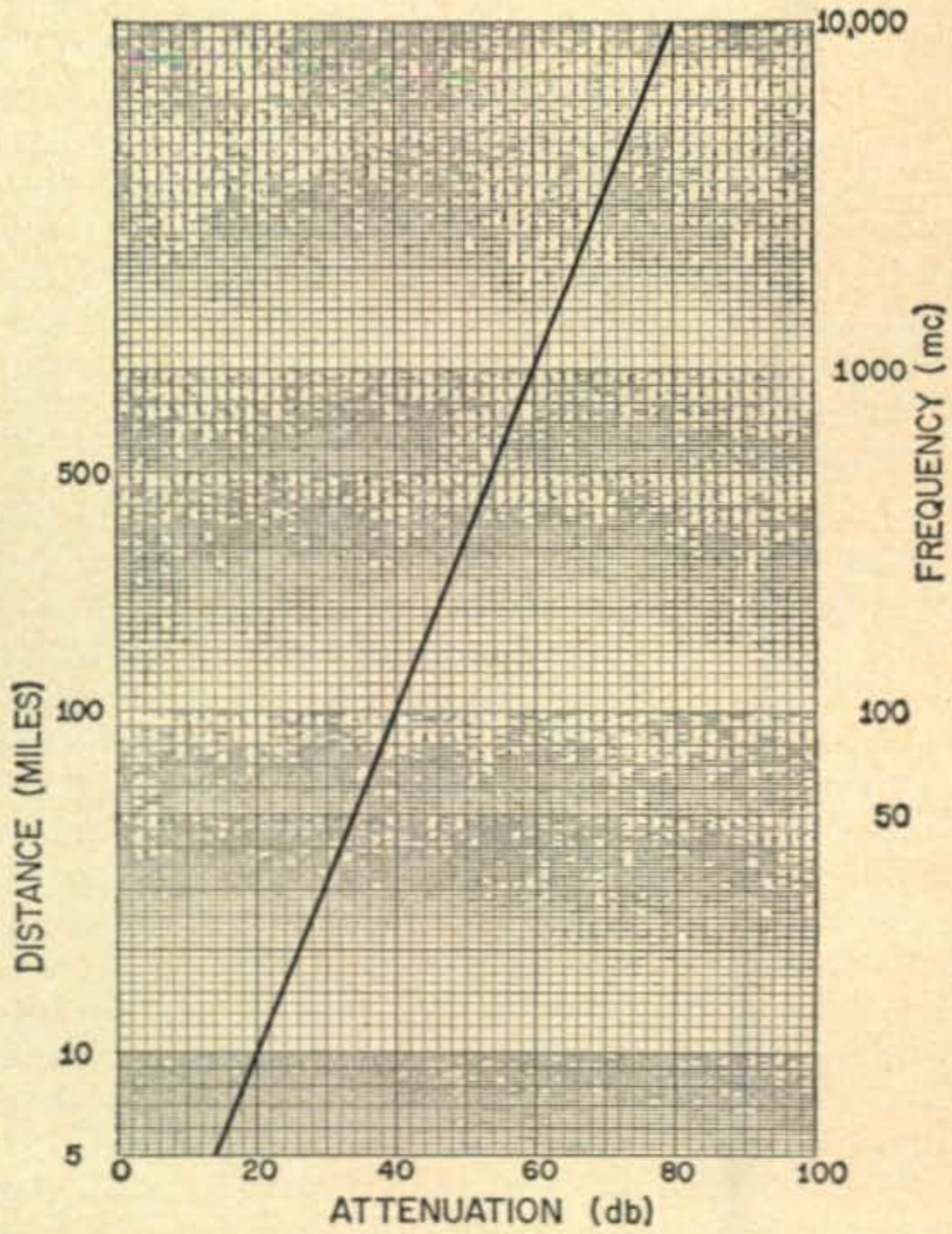


Fig. 3—Path loss due to distance can be scaled off from the left side of the chart and path loss due to frequency can be scaled from the right. Both of these losses must be added to the other losses mentioned in the text to obtain the total loss between the trensmitter and receiver.

Some of My Best Friends Are Novices

W. J. Tancig, K9MYZ
Beecher, Illinois

If you can believe what you read in most of the publications for hams, the newest batch-to-be of Generals will be a lulu. They're tongue-tied on the air, ignorant of the various procedures, discourteous when DX-ing, and, as a whole, a rather sorry lot. And who gave them this exquisite polish, if it exists? You're so right . . . today's Generals.

I didn't take time out to be a Novice, but with some earlier training plunged right into the General. Before going on the air I avidly devoured all articles dealing with procedures and routines so that I wouldn't stand out like too sore a thumb. Came the great day, and staunchly supported by W9FB and K9DDE, I leap-frogged into the air. My first QSO was a snap (wasn't it fellows?) . . . of course, the General on the other end didn't QSL, even when I explained it was my first.

Keys

My next horrible experience was to discover that I am probably the only one on the air using an old-fashioned brass key. The ham of distinction today always uses a bug. And it certainly distinguishes him! It is especially stimulating when the dots are at least ⅔ as long as the dashes. "Sorry, OM, can you make your dashes a trifle longer?" He replies willingly, but never complies. Or runs all the words together. I find the latter is a type of polish which comes under the heading of "exacting operator."

Working Novices

I once asked some of my General friends about the advisability of working Novices, and was given to understand that this was unthinkable . . . till that morning I threw caution to the winds and answered a KN5's CQ. Here was an operator who transmitted uniformly and with precision. He wasn't tongue-tied, and he could copy me. As a matter of fact, I find most Novices like to chat. None of this "On again, gone again" QSO, but genuine conversation. Much of this recent nonsense in the ham publications about stereotyped QSO's is unnecessary—go back to the Novice bands and listen for awhile. I'm sort of amused at the way most Generals run thru the Tnx—RST—QTH—Name formula, and then begin to give out with those dah-dit-dit-dit-dah routines. English classes still teach periods at the ends of sentences, but hams seem to delight in what I now have named the stall-call . . . dah-dit-dit-dit-dah. When you hear this used more than one at a time you might as well reach for the log book, for that QSO is almost over.

And how do Generals try and close? I find the following are the most popular exits . . . at least on forty:

a. QRM
b. QRN
c. Bedtime
d. Rig not operating properly
e. XYL calling
f. Mealtime

I've got a lot of respect for that Novice who was honest enough to tell me he wanted to work a few more stations before closing, and so would QRT. I don't think you have to be windy to have a nice chat, but some recent authors have implied as much. Actually, many operators seem to resent some of the scintillating gems I've put out. There was the night I told some General about the flights of Canadian geese I'd seen that day, and about some antenna experiments I was doing. So what do I get back? "Fb on the Canadian geese and fb on your antenna work. So back to you!" I'm not the most loquacious person in the world, face-to-face, but that. . . .

And who are those hot Generals who can't wait to start a QSO. As a matter of fact they can't even wait for the CQ-ing party to stop and listen. They start dit-ting! "dit . . . dit-dit-dit . . . dit . . . dit, etc., I suppose they hope the other fellow is working break-in and will chop it off. At my speed levels I have never heard this technique work, but it's there every day.

Technical No-how?

Most disturbing to me has been to learn the hard way that the majority of Generals don't know a thimbleful about the technical side of their hobby. The next time you have a few free moments, write down the names of ten hams whom you see frequently. And then check off those who have a pretty fair technical knowledge of the field. This development has been a real shocker. At first, in trying to get on the air, I ran thru the usual gamut of troubles, and asked one ham-friend after another for advice. On the whole, that was a waste of time. Finally, I settled on a young electronics expert at the plant, and got some help there. Later on this boy said he'd like to be a ham, but didn't see any sense in learning the code. Which, I guess, since I'm only on CW, is another story.

Novice Aid

The real gasper turned out to be the figures presented in the October, 1958, *CQ*, by M. J. Hindin. In the course of analyzing annual FCC citations, he presented data for 1952 thru 1956

which indicate that only a third or less of each year's Novices go on to get their General. Personally, I believe the percentage ought to be twice as high. And why isn't it? I suspect the answer is partly two-fold: (1) the Novices don't know where to go for expert help; (2) most Generals don't know enough to give them help.

Of course, anyone can list the difficulties, but how can they be corrected? Will publicity for the Novices, to alert them to the dangers ahead, be enough? Should Novices be restricted to the number of certificates they can acquire? Or the amount of contest work in which they may participate? In a sense, these non-progressing Novices are a fine captive market for receiver-transmitter manufacturers, but I believe the latter would prefer to have these potential Generals forge ahead so they might be more than one-time customers.

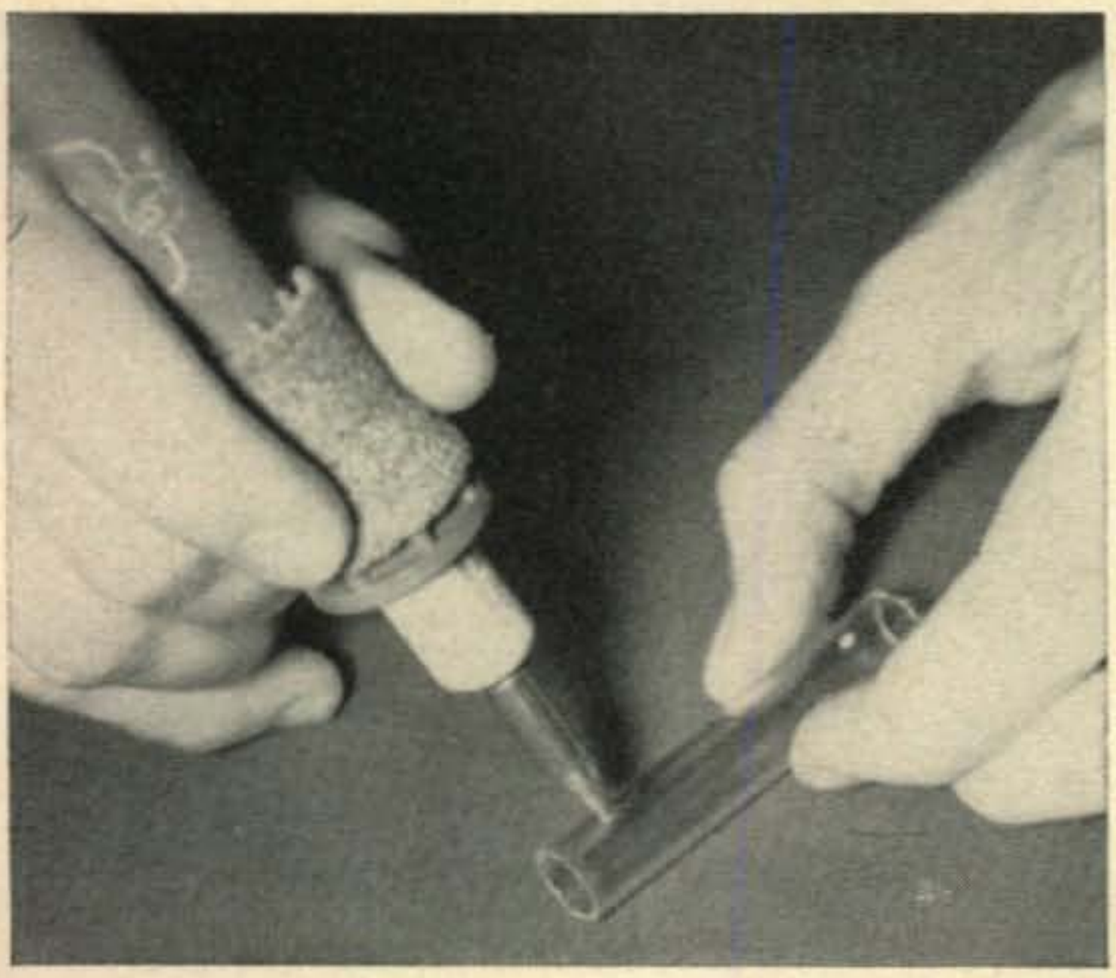
Do we need more stringent license requirements? Should the FCC further limit the activities of Novices? Should the FCC demand more of Generals? I believe the answer to all of these questions should be "no." Can we police and discipline ourselves? Obviously, we not only can but we must! While considerable emphasis is necessary on code for the Novice to improve his speed, and this is available in the form of daily contacts, and the many contests, what is being done about the theory? Although I truly enjoy CW, after watching the many developments in the electronic field, I am about ready to concede that CW may pass entirely from the picture in another generation or less. Will the emphasis then shift to diction and speaking habits, or will we be more interested in theory?

Why can't we start now, and begin to emphasize the importance of theory? Is it beneath our dignity to offer annual awards for the best amateur experimental work on antennas, receivers, transmitters, etc., and handicap according to the length of time one has had a ticket? Even if the awards were only certificates, by spreading them over districts, regions, zones, etc., there would be enough to create quite an incentive. Granted that the judging task might be difficult . . . would it be any more laborious than the Sweepstakes, etc.? I doubt it. And it would certainly be more stimulating to the judges.

Do I believe that this would provide a major impetus for Novices to get their General? Obviously not. Would it improve the desire of most Generals to keep up with their technical knowledge? I believe it could.

Now, it is a well-known fact that, having the code speed, one can sit down, memorize the questions and answers in the License Manual, and be reasonably sure of passing the exam. Does this make hobbyists with a useful technical knowledge of their hobby? It does not. It provides a large body of moderate-speed stenographers using a special short-hand. This situation can only be improved when the people involved develop their own personal desires for additional technical understanding. Unfortunately, there is no simple solution to this problem. Not everyone has access to the variety of books required for adequate learning . . . not even the Handbook (which needs a thorough overhauling) is adequate.

It is conceivable that *CQ*, and its successful competitor, could provide the nourishment which is needed by running a "License" or "Theory" section of about four pages in each issue. Discussion, examples, whys and wherefores would be appropriate, and if the pages were so aranged that they might be clipped out for separate filing, this would be an added bonus. Furthermore, an "Advanced" section might also be in order. It is my opinion that the majority of hams have a great desire to learn more of the technical side of their hobby, but become quite frustrated in their search for study material. We all love the how-to-do it articles, and can rapidly become soldering experts. But not many of us acquire enough skill to tell why-to-do it. We need help to help ourselves—I hope we get it. ■



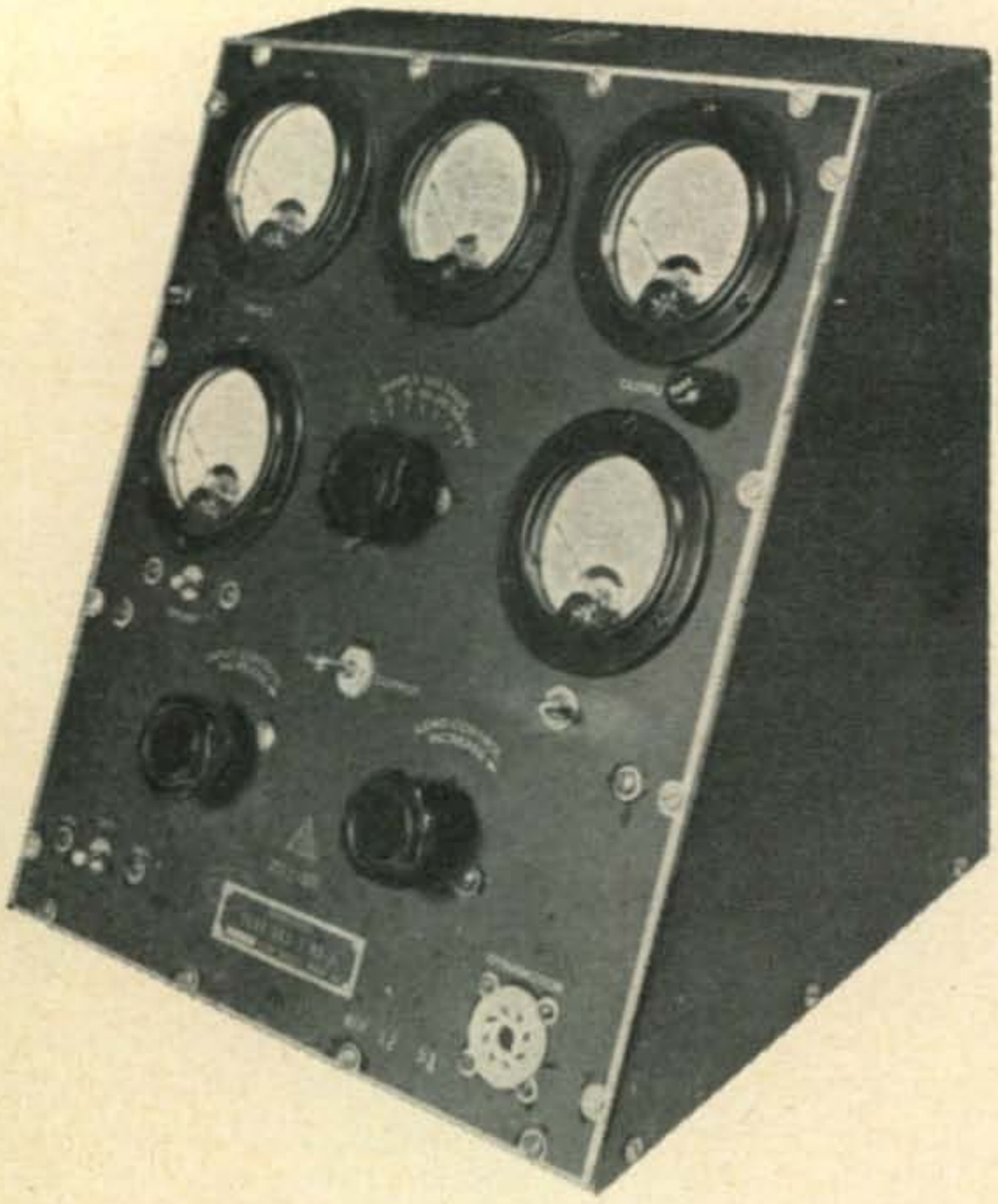
Ham Hints

Coil Form Drilling

When you want to custom-wrap a small coil yourself and the form you are using is plastic or bakelite, you face the problem of indenting the form so as to be able to drill a small hole through it accurately. Obviously, you can't use a center punch on the form for fear of splitting. Solve this problem by using the hot pointed tip of a pencil soldering iron. This way there is no chance of ruining the form or drilling the hole crooked.

Converting The I-83

Roy E. Pafenberg
P.O. Box 844
Fort Clayton
Canal Zone



The I-83 was used to meter a dc source and provide an adjustable load for the testing of dynamotors in field radios. In its original form it has little value in the ham shack. This article describes its use as the nucleus of a versatile test power supply.

The I-83 Test Set, using an external DC supply, metered the input and furnished a metered, adjustable load for the testing of various dynamotors used in field radio sets. The test set is an attractive surplus item solely for the value of the meters contained therein, but it would appear to have no amateur application in its original form. The circuit diagram and parts list are shown in fig. 1.

However, close examination of the unit dis-

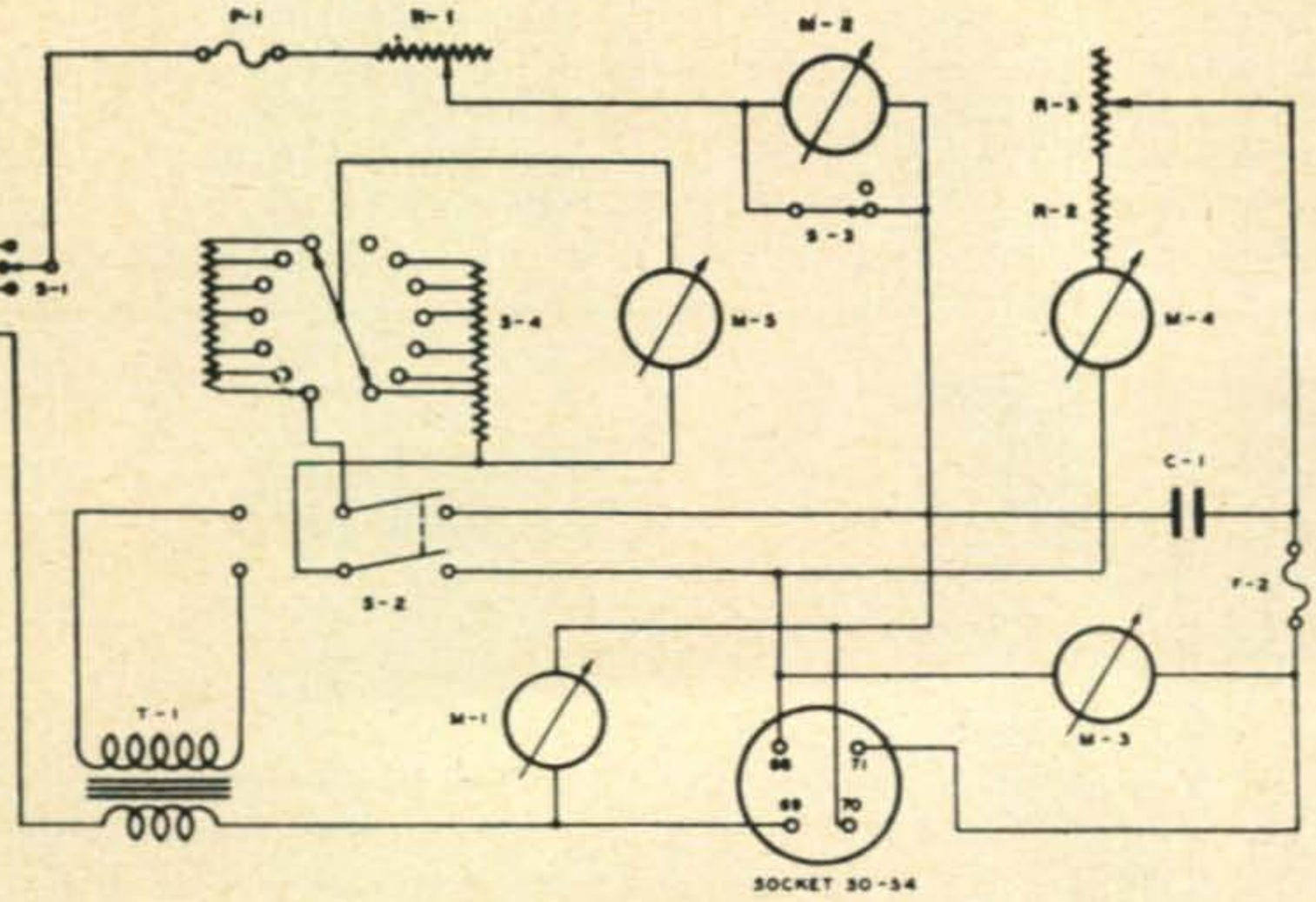


Fig. 1—Original circuit of the I-83 Test set.

C1—2 uf, 1000 v
F1—20 A, 25 v
F2—½ A, 250 v
M1—0 to 35 vdc
M2—0 to 10 amps dc
M3—0 to 500 vdc
M4—0 to 250 ma dc
M5—0 to 2 vac
R1—5 ohms 150 w
R2—200 ohms 100 w
R3—10 K 150 w
S1—1 pole, 3 position—center off
S2—dpdt toggle
S3—Toggle, momentary open, normally closed.
S4—2 circuit 7 position. Spring return to clockwise position

closes sufficient unused space to permit installation of a universal test power supply. Junk box power supply parts were screened and the final result is shown in the photographs. While this unit may be easily duplicated, no parts placement or mechanical details will be shown since they will depend on the components available.

Conversion

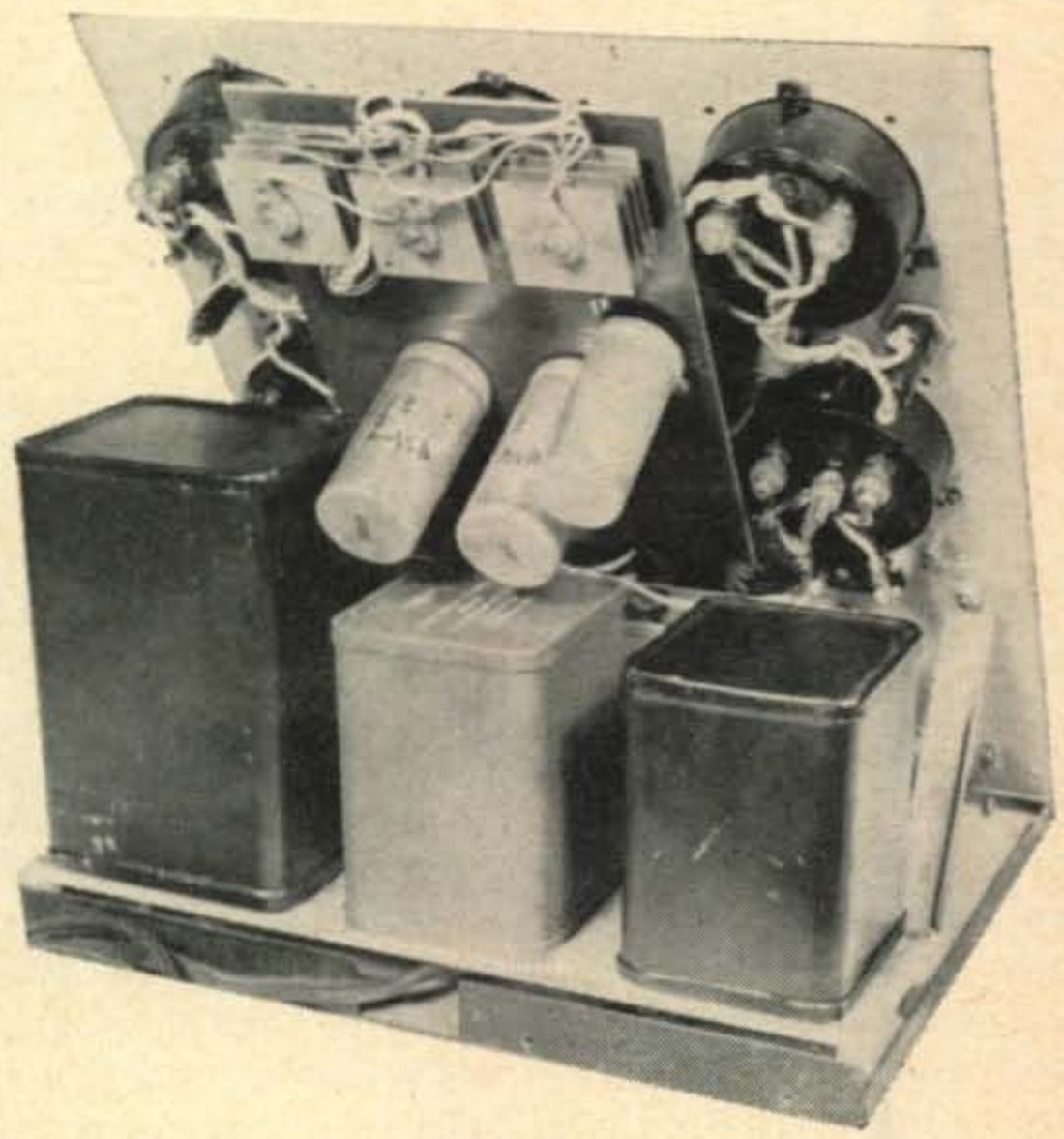
After stripping the existing wiring, an "AC ON" toggle switch is mounted on the front panel, symmetrically located in relation to the *dc* ammeter shunt switch. The *dc* ammeter internal shunt should be altered to one ampere full scale and the external shunt and switch wired as shown in fig. 2.

The special front panel connector should be replaced by an octal socket. Further, a more finished job will result if the etched front panel is reversed, the new front repainted and appropriate decals applied. The *ac* voltmeter is replaced by a 0-15 dc milliammeter which may be switched to measure the bias supply voltage and current.

The schematic of the unit as constructed is shown in fig. 2. Original components are indicated by reference symbol. Parts values are not critical and the circuit will necessarily be modified to suit parts on hand. The selenium rectifiers used were made from a single high voltage stack of unknown vintage, dismantled and assembled into three paralleled units, wired in full wave bridge configuration. The completed instrument supplied the following voltages:

1. 6.3 Volts *ac* .....3 amperes
2. 11.3 Volts *ac* .....3 amperes
3. 0 to 6 Volts *dc* .....3 amperes
4. 0 to 11 Volts *dc* .....3 amperes
5. 0 to 360 Volts *dc* ....150 milliamperes
6. 0 to 30 Volts *dc* .... 15 milliamperes

A later version of the I-83, known as the I-199, is also available in surplus channels and is amenable to the same treatment. Either of these units, modified as described, provides a convenient source of test voltages and will go far to reduce the potentially lethal haywire in temporary test hookups. ■



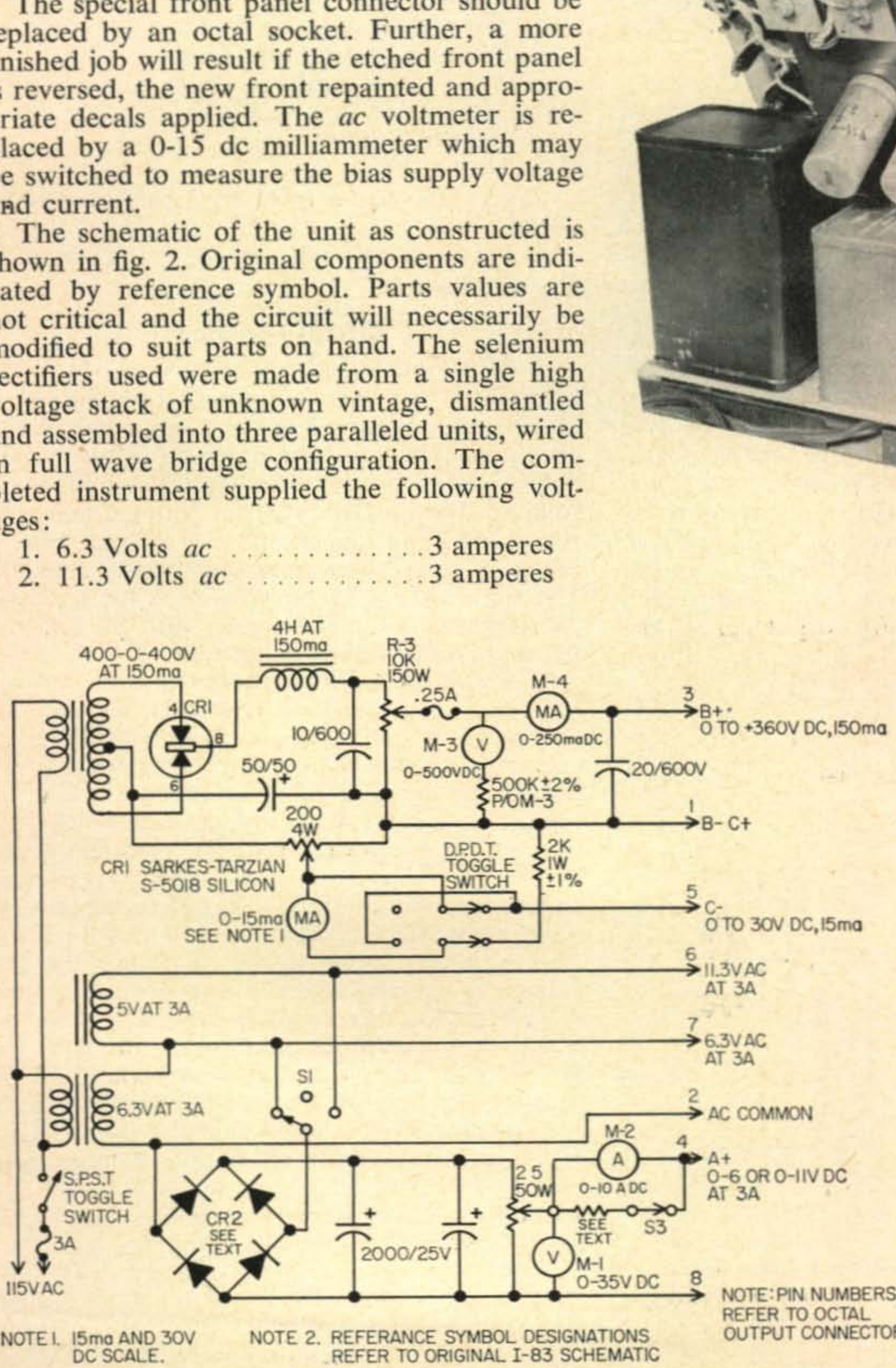


Fig. 2 — Circuit of the bench power supply constructed from the I-83

Weak Signal Detection

Lt. Col. Harry Longerich, DL4RX/W2GQY
318th USASA BN
APO 66, NY, NY

Many interesting amateur contacts have gone by the board simply because the signal was not Q-5 copy. A low-noise front end[1] was constructed which increased the signal-to-noise ratio considerably. The *if* selectivity was increased by the addition of a "Q" multiplier and a "T" notch filter. The "piece de resistance" was the triple triode product detector which should have been the final touch, but wasn't. The signals improved but they did not sound as clear and sharp as was desired. In addition a separate diode had to be employed for proper AM reception. A survey of available literature[2,3] indicated that a square-law or weak signal detector, when properly adjusted, would increase the overall selectivity and sensitivity of the station receiver. The disadvantage of such a detector is that the available output voltage, without distortion, is about forty five per cent of the voltage attainable from the same tube acting as an audio amplifier. When signals in excess of forty five per cent are applied to the input of the detector, plate rectification occurs on modulation peaks, and when this action combines with the effects of grid rectification it tends to flatten the positive peaks. By proper adjustment of the signal input capacitor these effects can be held to a minimum. A high level screen grid detector, when used in combination with a *bfo* signal which is mixed or heterodyned in the same tube, results in a relatively distortionless audio output signal. The following features are considered desirable for a good second detector:

a. Minimum loading effects on the last *if* stage.

b. A single detector tube for AM, SSB, and CW.

c. High audio output.

d. Existing *bfo* should be utilized without modification.

e. The circuit must be simple and foolproof.

f. Utilize a conventional tube.

g. The output voltage from the detector should be, within practical limits, a linear reproduction of the input voltage.

h. No balancing control.

i. The *bfo* signal must not "pull" the input signal.

j. The resultant audio output voltage must be clear and sharp.

Circuit Function

A 6BA7 pentagrid mixer tube was selected because of the excellent internal shielding arrangements. Figure 1 is the completed circuit and it can be used in practically any superheterodyne receiver. The circuit functions as follows: The control grid, pin 7, the screen grid, pin 1, the plate, pin 9, and the cathode, pin 3, are used as the high gain screen grid detector. The suppressor grid, pin 6, is used for injecting or hetrodyning the *bfo* voltage into the electron stream. Pin 2, which is normally the oscillator grid of the 6BA7 is connected to ground. The *bfo* voltage was at first connected to the cathode and then to the oscillator grid with the suppressor grounded. The circuit operated but the gain of the detector was considered too low. By injecting the *bfo* voltage into the electron stream through the suppressor grid, the resultant audio output level increased and signals were clear and sharp. In addition AM phone signals exhibited apparent exalted carrier characteristics. This is possibly due to the fact that the *bfo* voltage is injected between two positive potential electrodes (screen-plate). Earlier when injected at the cathode and oscillator grid, the *bfo* voltage, due to its large magnitude, (compared to the signal voltage) controlled the space current flow to the extent that the overall gain of the circuit was reduced. Output voltage from the *bfo* is connected to the suppressor grid. No grid return is provided. The signal voltage is fed to the detector through coupling capacitor, C_2 to control grid, pin 7. R_1 is the grid-leak. The plate circuit of the detector uses a high inductance audio choke and the capacitor, C_4, limits

[*Continued on page 159*]

[1] Longerich, H. and Smith, R. D., "Low-Noise Receiver Design", *QST* March 1955, p. 20.

[2] AARL *Handbook*, 1958 Edition, pp. 90-95.

[3] Terman, F. E., *Radio Engineer's Handbook*, 1943 Edition, pp. 562-569.

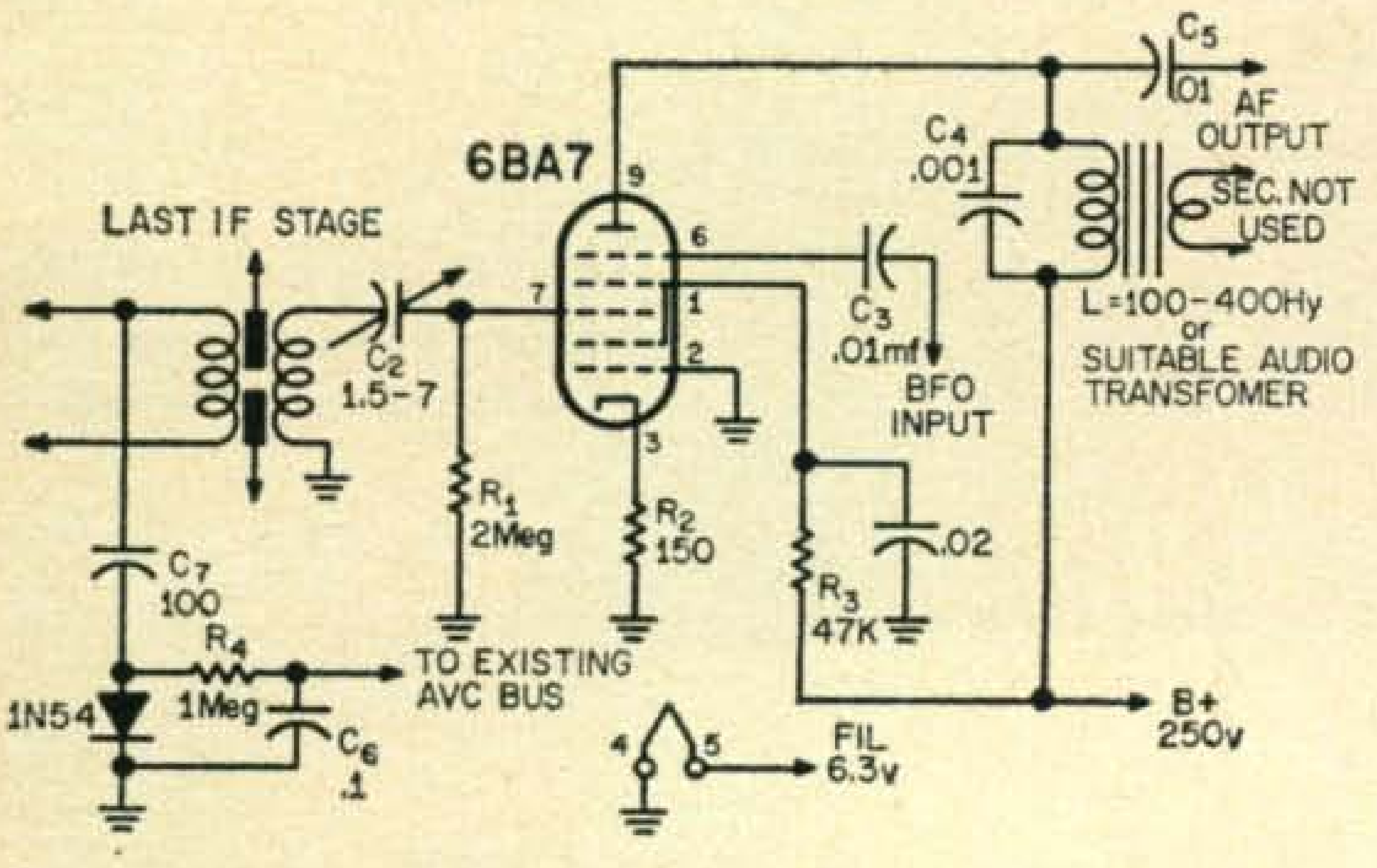


Fig. 1—Circuit of the weak signal detector. Suppressor grid is deliberately without a d.c. return. If the detector is used with receivers that have very low gain R_3 may be reduced to 20K and R_2 may be eliminated.

Voice of America Amateur Radio Program

CQ, CQ, CQ to all radio amateurs and shortwave listeners from the Voice of America. Every week the Voice of America broadcasts the VOA Amateur Radio Programs to all areas of the World at various times throughout the day. The program consists of 15 minutes devoted to the latest gossip on the ham bands, interviews with radio amateurs around the world, propagation forecasts, and discussions of the latest technical news of interest to radio amateurs and shortwave listeners.

The broadcasts, in the English language, are written and voiced by Bill Leonard, W2SKE, one of America's leading news commentators, and a very active radio amateur operator. Gene Kern, W2BAK, produces the program, and propagation forecasts are by Bill Dulin, W4ETT, and George Jacobs, W3ASK with radio amateurs *everywhere* invited to participate.

The distinctive QSL card of the VOA is available for exchange with listeners of the Ham Show, and W2SKE and the gang are looking forward to receiving QSL cards from radio amateurs and shortwave listeners *everywhere*. Listeners may forward their QSL cards to: Either of the following addresses.

Bill Leonard		Amateur Radio
Post Office Box #29	or	Box 922
Geneva 12, Switzerland		Washington 4, D. C.

The complete world-wide broadcast schedule for the VOA Amateur Radio Program, effective Sunday September 4, 1960 is as follows:

Time (GMT)	Time (EST)	KC	*Station*	*Beam*
2115-2130 (Sunday)	4:15-4:30 PM (Sunday)	1259	Courier, Rhodes	Middle East/S.E. Europe
		3980	Munich, Germany	Europe
		6185	Munich, Germany	Europe
		7260	Courier, Rhodes	Middle East/S.E. Europe
		9520	Thessaloniki	Europe
		9530	Courier, Rhodes	Middle East/S.E. Europe
		9615	Tangier, Morocco	Europe
		9635	Munich, Germany	Middle East/Europe
		15235	WDSI, USA	Europe
		15415	Munich, Germany	East Africa
		15440	Munich, Germany	West Africa
		17710	WLWO, USA	West Africa
		21505	WDSI, USA	Europe
		21610	WLWO, USA	West Africa
		7160	Okinawa	North East Asia
		9545	Okinawa	North East Asia
		9700	Manila	North East Asia
		11960	Manila	North East Asia
		17770	KCBR, USA	Far East
		21740	KCBR, USA	Far East
		25630	KCBR, USA	Far East
Time (GMT)	*Time (EST)*		*Station*	*Beam*
2215-2230 (Sunday)	5:15-5:30 PM (Sunday)	173	Munich, Germany	Europe
		1196	Munich, Germany	Europe
		1259	Courier, Rhodes	Mid East/S. E. Europe
		3980	Munich, Germany	Europe
		6185	Munich, Germany	Europe
		7260	Courier, Rhodes	Mid East/S. E. Europe
		9520	Thessaloniki	Europe
		9530	Courier, Rhodes	Mid East/S. E. Europe
		9615	Tangier, Morocco	Europe
		9635	Munich, Germany	Mid East/S. E. Europe
		11875	Tangier, Morocco	Europe
		11895	Philippines	Central East Asia
		11960	Manila	North East Asia
0315-0330 (Monday)	10:15-10:30 P.M. (Sunday)	9545	Munich, Germany	East Africa/Mid East
		9615	Tangier, Morocco	Europe
		9650	WDSI, USA	Europe
		9740	Tangier, Morocco	Europe
		11740	Munich, Germany	East Africa
		11830	WDSI, USA	Europe
		11890	Tangier, Morocco	Mid East/South Asia
		11920	WLWO, USA	N/W Africa
		15245	WLWO, USA	N/W Africa
		15320	Tangier, Morocco	Mid East/South Asia
		11835	Colombo	South Asia
0415-0430 (Monday)	11:15-11:30 P.M. (Sunday)	1196	Munich, Germany	Europe
		6100	Munich, Germany	Europe
		9545	Munich, Germany	Mid East/Europe
		9615	Tangier, Morocco	Europe
		11740	Munich, Germany	East Africa
		11785	Tangier, Morocco	Middle East
		11845	Tangier, Morocco	Europe
1030-1100 (Monday)	5:30-6:00 AM (Monday)	9535	Philippines	Central East Asia
		9670	Okinawa	S. China/S. E. Asia
		9710	Okinawa	Central East Asia
		15185	Philippines	South & S. E. Asia
		15330	Philippines	South East Asia

CQ Reviews:

The Collins KWM-2

Lee Aurick, W2QEX,
Technical Editor; CQ

The KWM-2 is, by definition, a transceiver in that most tuned circuits and several tubes function in both transmitting and receiving. It is, however, the fanciest transceiver your reviewer has ever seen. After more than a month of intensive operation there is an ever growing appreciation of the extreme flexibility of this highly compact, complete station. Operation has included both fixed and portable installations in association with a wide variety of antennas on 80 through 10, and on c.w. as well as s.s.b. The KWM-2 incorporates features not to be found in most contemporary equipments and is therefore appropriately priced for the more discriminating amateur.

General

The KWM-2 operates between 3.4 and 30.0 *mc* on either c.w. or s.s.b. Basically, it is a double conversion receiver and a double conversion transmitter. Both transmitter and receiver make use of common oscillators, common mechanical filter, and a common r.f. amplifier. The low-frequency i.f. for both is 455 *kc* while the shared high frequency i.f. is 2.955 to 3.155 *mc*. The latter is a band-pass i.f. designed to complement the 200 *kc* coverage of each of the 14 bands. Crystals are provided for 12 of these bands, and crystal sockets and band switch positions are included for two additional 200 *kc* bands between 28 and 30 *mc*.

Either sideband as well as c.w. may be selected by the emmision selector switch. The chassis, cabinet, and panel are of aluminium construction, and the wrap-around cabinet is perforated for ventilation. Access to tubes and adjustments is through the hinged top cover. The KWM-2 does not contain any power supplies, and jacks for connecting these important items, as well as auxiliary gear, are at the rear of the cabinet. A large measure of flexibility is provided by the many accessory jacks found here.

The r.f. power input is 175 watts PEP on s.s.b. and 160 watts on c.w. The complete unit measures 7¾ high × 14¾ wide × 13¼ deep and weighs in at 18 lb. 3 oz.

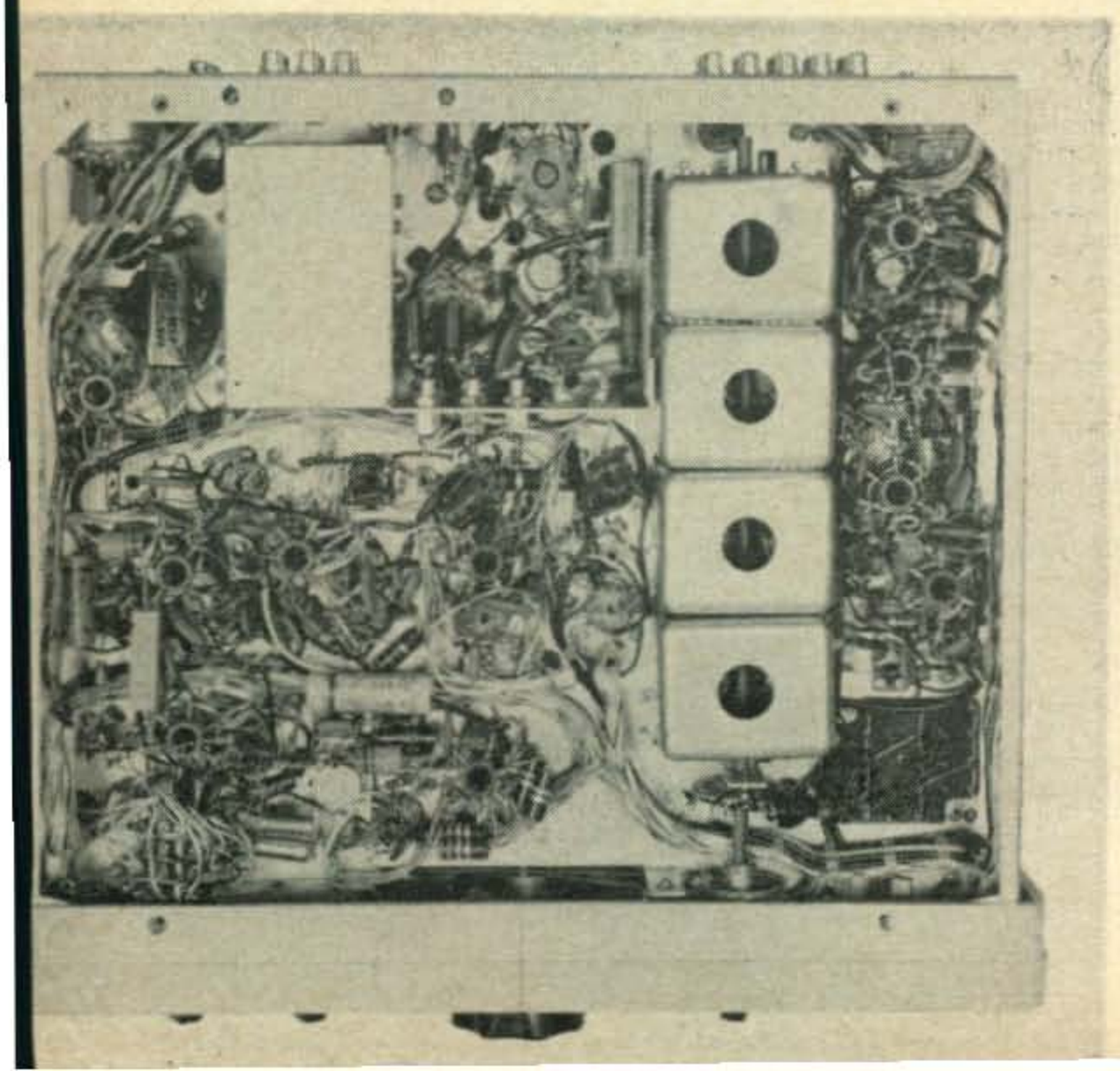
An accessory power supply, the 516F-2, is required for 115 volt a.c. operation, and the 516E-1 or 516E-2 are used for 12 volt or 24 volt operation, respectively.

Many accessories are available for use with the KWM-2, but space will not permit discussion of the added flexibility they provide.

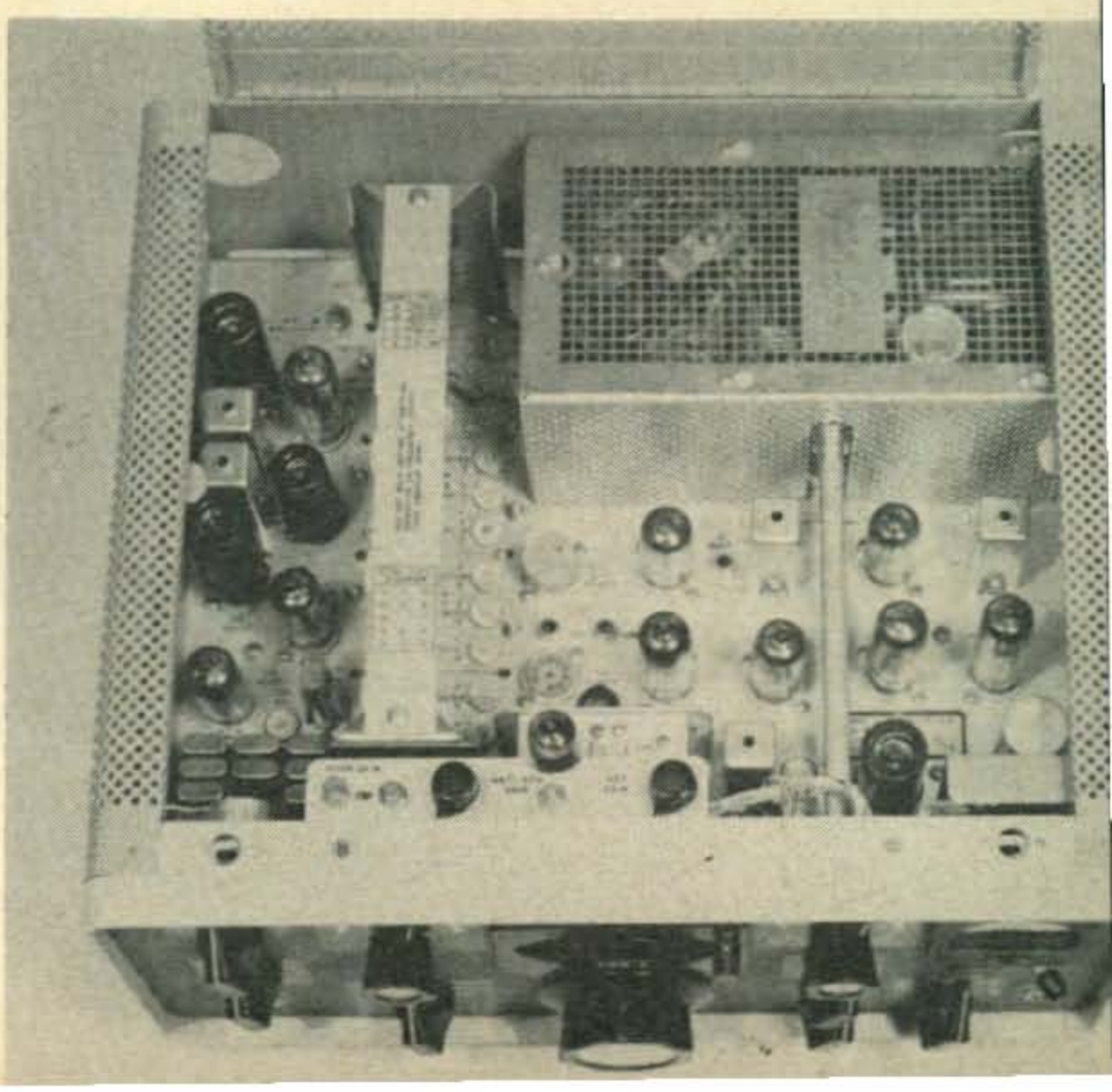
Transmitter

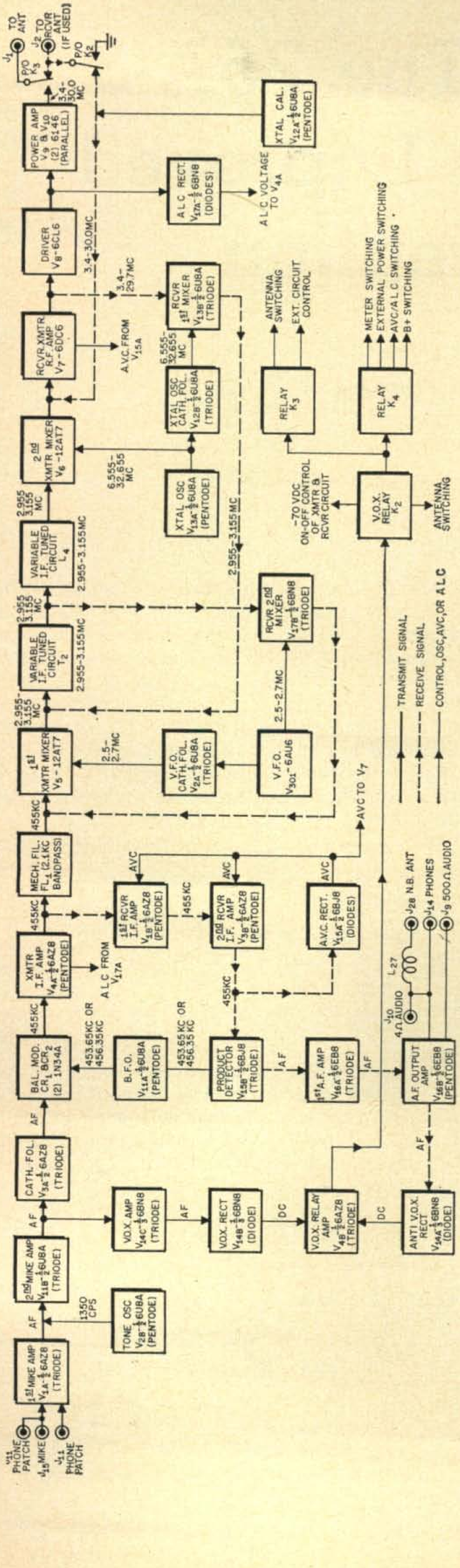
The speech input, either microphone or 'phone patch, is fed to the grid of the first audio amplifier V_{1A}, amplified, and then coupled to the grid of the second audio amplifier, V_{11B}. This output is coupled to the grid of V_{3A}, the cathode follower, through the MIC GAIN control. Output from this point is fed to the balanced modulator. In TUNE, LOCK, and CW positions of the EMISSION switch, output from V_{2B}, the tone oscillator, is fed to the second audio amplifier grid. Some of the output from the second audio am-

Power amplifier and driver compartment is located at top center. Extensive use has been made of vector sockets for wiring simplicity.



The power amplifier compartment is located at the rear right. The 14 high frequency crystals, (12 supplied) are at the bottom left.





plifier is then fed to the grid of V_{14_C}, the vox amplifier, to activate the vox circuits in c.w. operation. Part of this signal is also fed to the grid of V_{16A}, the receiver 1st a.f. amplifier, for c.w. monitoring.

V_{3A} output and b.f.o. voltage feed the carrier balance potentiometer. At this junction both sidebands are coupled to the grid of V_{4A}, the transmitter i.f. amplifier. This amplifier output is fed to the 2.1 *kc* mechanical filter, FL1. Through a pass band centered at 455 *kc*, this filter passes either sideband depending upon the sideband polarity selected with the EMISSION switch. This switch selects either of two b.f.o. crystals to determine which sideband will be transmitted. The single sideband output of FL1 is now fed to the grids of the 1st transmitter balanced mixer, V_5, which are connected in push pull.

We now have an honest-to-goodness single sideband signal, but it's still at 455 *kc*. The plates of V_5 are connected, likewise, in push pull, but the v.f.o. signal is fed to both grids in parallel. The result is that the mixer cancels the v.f.o. signal, and converts the 455 *kc* single sideband signal to a 2.955-3.155 *mc* single side band signal. The transmitter frequency is determined, within this pass band, by the v.f.o. frequency. This energy is fed through two tuned variable i.f. circuits to the grids of the second transmitter balanced mixer. Here it is heterodyned with the high frequency injection signal selected by the appropriate crystal in oscillator V_{13}. In this way the high frequency injection signal is cancelled within the mixer and the band pass signal is converted to the desired output operating frequency.

Slug tuning is employed between V_6 and V_7, V_7 and V_8, and V_8 and the final amplifier. These controls are ganged to the front panel EXCITER TUNING control. The signal is amplified by V_7 and V_8 and this output drives the power amplifier, V_9 and V_{10}. Output is coupled to the antenna by means of a pi-network through the transmit/receive relay, K_3. A high degree of power amplifier linearity is maintained through the use of negative r.f. feedback from the plates of V_9/V_{10} to the driver cathode circuit. The last two transmitter stages are neutralized to ensure stability. The ALC rectifier, V_{17_A}, rectifies the detected envelope present, on signal peaks at the final grids, and this output is used to control the gain of V_{4_A}. This automatic-load-control feature prevents overdrive of the power amplifier.

Receiver

The received input signal is applied to the grid of V_7, the common transmitter/receiver r.f. amplifier. Following amplification, the signal is fed through a tuned circuit to the first mixer, V_{13_B}.

At this point, the high frequency injection signal is fed to the cathode of V_{13_B}. The differ-

[*Continued on page 159*]

Modifying The 75A-3 Receiver for Improved SSB Reception

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The slow tuning rate, excellent signal to noise ratio and the mechanical filter of the 75A-3 receiver make it ideal for SSB reception. However, the diode detector and the lack of a.v.c. action leave something to be desired.

The installation of a product detector and a few simple changes in the a.v.c. circuit do the job quickly. No new controls are added and the outward appearance of the receiver remains unchanged. The original circuit can be restored qiuckly if the receiver is to be traded in.

Product Detector Construction

The receiver's existing b.f.o. is used for carrier injection, making a separate b.f.o. and its associate control unnecessary. The product detector is built on a galvanized steel chassis. Galvanized steel was used because it provided easier soldering of ground connections. The dimensions are 2½" square by 1½" deep. The filter condenser, if a can type is used, may be mounted on the front lip and the 6U8 is mounted on the top. An 8 prong male plug is mounted on the bottom of the chassis and the entire unit plugs into the NBFM socket on the 75A-3 chassis.

The product detector circuit is shown in fig. 1. It is extremely simple as it uses the triode section of a 6U8. The b.f.o. input is fed to the cathode, pin #8. The i.f. output is picked up from the plate of the last i.f. stage, V_7, and fed to the grid, pin #9, of the 6U8. The combined signal appears at the plate, pin #1, of the 6U8 and is fed to pin 2 of the NBFM socket through the filter network, where it is applied to the first audio amplifier when the MODE switch is in the f.m. position.

The changes in the receiver are detailed below:

1 - Check the existing coax cable from the b.f.o. to pin 4 of the NBFM adaptor socket to be sure you have b.f.o. output there.

2 - Remove the jumper on S_3, the MODE switch, as shown in fig. 2. It is located at the left of the center wafer when viewed from the front of the cabinet.

It can readily be checked because screen voltage will appear at V_{12} when the MODE switch is in the c.w. position and when switched to a.m. or f.m. no voltage will appear because the screen is grounded. Cutting the jumper

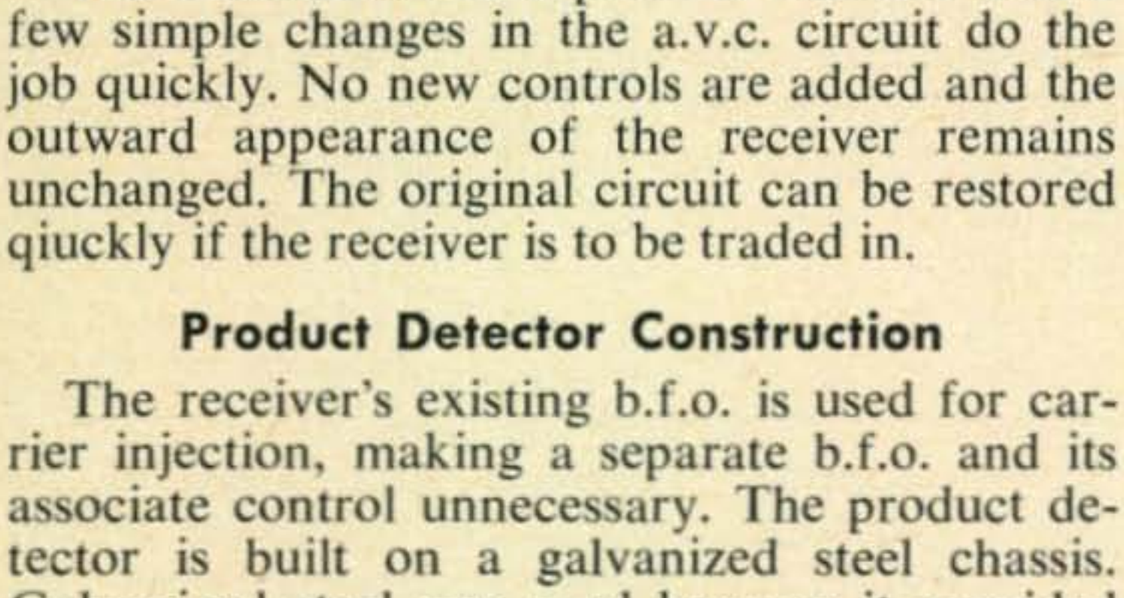

Fig. 1—Circuit of the product detector that may be plugged into the NBFM adaptor socket of the 75A-3.

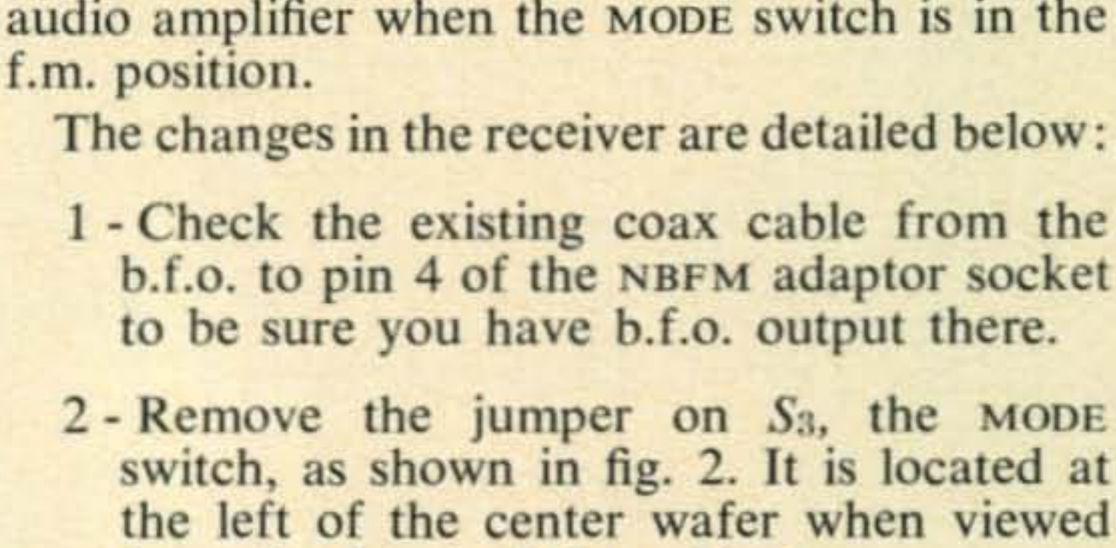

Fig. 2—Circuit modifications in the bfo circuit.

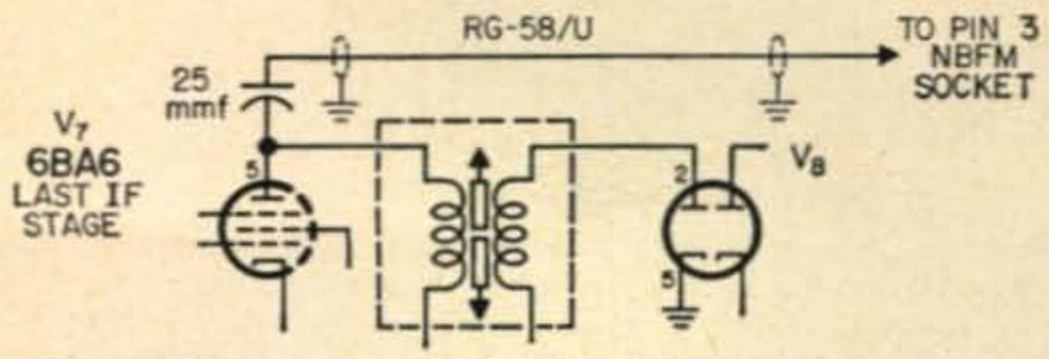

Fig. 3—The output of the last if is coupled to pin 3 of the NBFM adaptor socket through a 25 *mmf*.

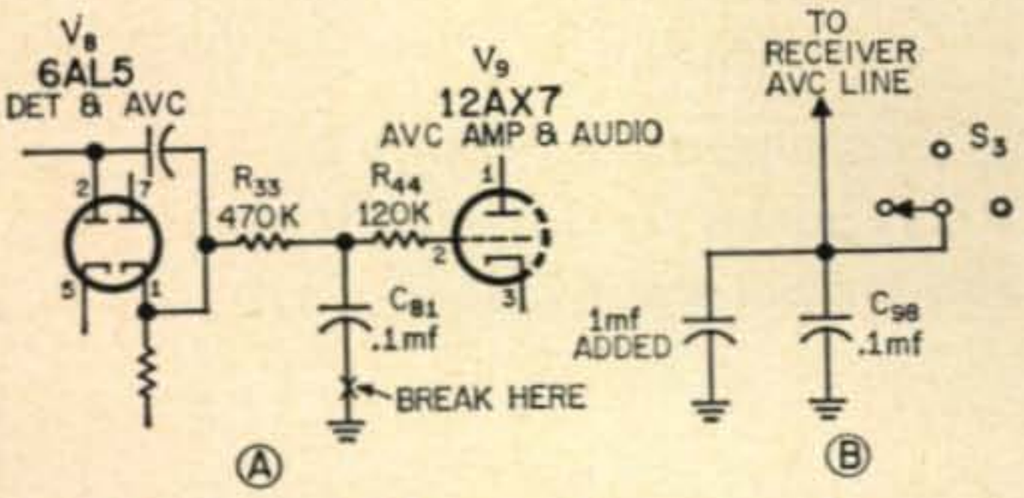

Fig. 4A—Removal of C81 makes possible a fast avc attack. 4B—Addition to the 1.0 *mf* capacitor provides slow release.

causes the screen to be grounded in the a.m. position only.

3 - The i.f. signal is picked up at pin 5 of the last i.f., V_7, a 6BA6, as shown in fig. 3. A 25 mmf capacitor is placed in series with a length of RG-58/U coax and the signal is fed to pin 3 of the NBFM adaptor socket. Be sure to locate the 25 mmf capacitor at the plate of V_7 so that it will help isolate the cable capacity and not disturb the i.f. alignment.

Operation for CW and SSB

C.W. reception can be accomplished in the CW and FM position of the MODE switch. In the CW position reception is without a.v.c. while in the FM position the a.v.c. is active.

Sideband is also received in the f.m. position. With the s.s.b. adaptor, the sideband signals will now tune very smoothly and the audio level will be the same as a.m. signals (for the same setting of the audio gain control).

AVC Circuit Changes

The a.v.c. modifications only consist of 2 changes. The 0.1 capacitor, C_{81}, at the junction of R_{33} and R_{34} feeding into the a.v.c. amplifier, V_9, is lifted from ground. This change makes possible fast a.v.c. attack necessary for s.s.b. This circuit area is shown in fig. 4A.

The second a.v.c. modification provides slow a.v.c. release. A 1.0 *mf* capacitor is simply placed across the a.v.c. line as shown in fig. 4B.

The operation of the revised a.v.c. circuit is such that the local *kw* signals are reduced in audio level to that of DX signals. If it is desired to reduce the sensitivity during evening hours, to escape the QRM, the a.v.c. action is still quite effective and this cannot be said for many other a.v.c. circuits. Automatic volume control action in the a.m. position is slower than optimum but it is a very satisfactory compromise. ■

W6MLZ Wins G-E Citation

Ray, W6MLZ, on the left, receiving his G-E Citation from regional manager B. S. Angwin.

RAYMOND E. Meyers, W6MLZ was honored and awarded a plaque at a ceremony in the Sheraton West Hotel by B. S. Angwin, G-E regional manager who was director of this year's Western Electronic Show and Convention.

The citation says: "For promoting international good will through his skillful planning, organizing, establishing and operation of extensive world-wide radio communications during the Ninth Plenary Assembly of the Consultative Committee on International Radio (CCIR) held in Los Angeles in April, 1959. The special radio station, K6USA, handled more than ten thousand important communications during the conference."

Herbert Hoover Jr., W6ZH, was one of the radio amateurs who worked with Ray last year in setting up radio service for the world convention delegates.

The communications service W6MLZ directed at the CCIR meeting involved a special act of Congress to permit foreign hams to send amateur radio messages.

Approximately 10,000 contacts were made by the station with amateur radio in about 100 foreign countries during the month-long 24-hours-a-day operation of station K6USA by both American and foreign amateurs attending the session.

The station included five transmitters, operating at 1 *kw* each. Operation was on 80, 40, 20, 15, and 10 meters and employed c.w., a.m., and s.s.b.

Calculating The Efficiency of Class B Linear Amplifiers

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Camarillo, California

With class B amplifiers becoming more popular, much discussion centers on its efficiency as compared to class C. Here is a discussion that should go a long way toward clearing up your misconceptions.

Disregarding the weather and your "handle" one of the most prevalent topics of conversation among ham operators and experimenters is the efficiency of a class B linear amplifier. It would seem therefore, that a few words on this subject, pointing out some of the things everyone seems to know but no one considers, would be in order.

Linears for AM

In regard to the class B linear, there seems to be a large amount of confusion and fallacious thinking in the amateur ranks concerning, principally, the advantages and disadvantages of using class B linear amplifiers for amplitude modulation phone operation. A few words on the theory of this type of amplification may help clear this matter in the minds of the fraternity.

The paramount question regarding class B linear amplification seems to be one of efficiency, the value of 30 percent being the one frequently given as the unqualified answer. Let's look into this. The efficiency of an *ideal* class B amplifier having linear characteristics and operating exactly 180 degrees during each excitation cycle is expressed as

$$\text{Efficiency (in percent)} = \frac{\pi}{4}\left(1 - \frac{E_m}{E_b}\right) 100$$

where E_m is the minimum instantaneous plate voltage and E_b is the normal plate supply voltage.

Now ideally the instantaneous plate voltage would vary from the plate supply value to absolute zero during the modulation cycle. This zero value is, of course, unattainable in practice, (a value of 0.2 being the best reasonable figure) however for the sake of this explanation let us assume zero can be reached and have a look at our equation

$$\text{Efficiency (in percent)} = \frac{\pi}{4}\left(1 - \frac{E_m}{E_b}\right) 100$$

$$= \frac{\pi}{4}(1 - 0)100$$

$$= 78.5$$

This shows that the theoretical value for a class B linear amplifier can reach 78.5 percent, *under one condition;* that of being under full modulation with the *rf* source driving the plate current to zero on the positive peaks of the grid excitation. We have already stated that such an operating condition is not possible in practice, but it is possible to drive it down to a figure of 20 percent of the full plate supply value. Converting this 20 percent to a decimal and substituting into our equation we have

$$\text{Efficiency (in percent)} = \frac{\pi}{4}\left(1 - \frac{0.2}{1}\right) 100$$

$$= (0.785)(0.8)(100)$$

$$= 62.8$$

This then is a reasonable efficiency figure for a class B linear amplifier using full modulation. It agrees, by the way, quite well with the value of 60 to 70 per cent as given by the ARRL *Handbook* and several other texts. Under this condition it does not compare too unfavorably with a class C plate modulated amplifier which operates with a normal efficiency of approximately 75 percent.

If the value of 30 percent is the one heard most often for class B efficiency how, then, does this discrepancy come about? When one speaks of the efficiency of an amplifier it is most frequently done with the plate dissipation of the tube (s) in mind. That is the determining criteria in most cases of transmitter design. Keeping that fact before us let us examine the operating conditions of your linear with the *rf* excitation applied but no modulation present. Under this condition the instantaneous plate voltage is driven, by the excitation, to approximately 50 percent of the plate supply value. This is done to allow the instantaneous value of plate voltage to swing from zero (theoretically again) to the full supply voltage when under full modulation.

[*Continued on page 158*]

CQ Awards Honor Roll

Worked All Zones **The following list contains the call letters of those top DXers throughout the world who have qualified for the Worked All Zones Award as of September 10th 1960. Calls are listed in alphabetical order by call area and country.**

RADIOTELEGRAPH

W1AB
W1ACB
W1AJG
W1AZY
W1BFT
W1BGA
W1BGW
W1BIH
W1BIL
W1BLO
W1CTW
W1DHO
K1DMG
W1DQH
W1EIO
W1EOB
W1EQ
W1FFO
W1FQA
W1FZ
W1GKK
W1GVZ
W1GYE
W1HGT
W1HX
W1HZ
W1ICP
W1IJB
W1JYH
W1KXU
W1LHZ
W1LQ
W1LZE
K1MLI
W1MV
W1NHJ
W1NLM
W1ODW
W1OJR
W1OOA
W1OOS
W1OTX
W1PFA
W1QJR
W1QNC
W1TSL
W1TYQ
W1WDD
W1WLW
W1WY
W1ZD
W1ZW
W1ZZK

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W2AEB
W2AGW
W2AQW
W2AYJ
W2AYU
W2AZS
W2BAC
W2BBS
W2BHU
W2BOK
W2BRV
K2BU
W2BXA
W2BYP
K2CD
W2CNT
K2CPR
W2CWK
W2CZO
K2DCA
W2DEC
W2DGW
W2DOD
W2DS
W2DSU
K2DSW
W2EQS
W2ESO
W2FBS
K2FC
W2FCQ
W2FSN
W2FXA
W2FXN
W2GDX
K2GFQ
K2GMO
W2GNQ
W2GT
W2GVZ
W2HMJ
W2HO
W2HSZ
W2HTI
W2HQL
K2HXL
W2HZY
W2ICO
W2IOP
W2IRV
W2IWC
K2JGG
W2JT
W2JVU
K2KCE
W2KED
W2KJZ
W2KUW
W2LAX
W2LPE
W2LV
K2LWR
W2MUM
W2NUT
W2OBX
K2OEA
W2OGE
K2OLS
W2OTC
W2PCJ
W2PEO
K2PIC
K2PKT
W2PTD
W2PTI
W2PZI
W2QHH
K2QHL
W2QJM
K2QXG
W2RA
W2RDD
W2REF
W2SAW
W2SHZ
W2SSC
W2SUC
W2TQR
W2TVR
W2TWC
W2TXB
W2UFT
K2UKQ
K2UPD
W2UTH
W2UVE
W2UZF
W2VND
K2VUI
W2VYX
W2WS
W2YTH
W2ZGB
W2ZVS
W2ZY

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W3AEL
W3ALB
W3AOH
W3ARK
W3AS
W3AXT
W3AYD
W3AYS
W3BCY
W3BES
W3BHV
W3BQA
W3CA
W3CGS
W3CPV
W3DBX
W3DRD
W3DWY
W3ECR
W3EFZ
W3EOB
W3EPR
W3EPV
W3EVW
W3FYS
W3GAU
W3GEN
W3GHD
W3GRS
W3IMV
W3IPO
W3IXN
W3IYE
W3JKO
W3JNN
W3JTC
W3JTK
W3JW
W3JZY
W3KA
W3KDP
W3KFQ
W3KPI
W3KT
W3KVQ
W3KZQ
W3LMA
W3LMM
W3LMO
W3LOE
W3LUD
W3MFJ
W3MFW
W3MJF
W3MVQ
W3NCF
W3NKM
W3OP
W3PGB
W3RBF
W3RPG
W3RSR
W3RUT
W3RZL
W3SOH
W3SWV
W3TMZ
W3UXX
W3VKD
W3WGH
W3WU
W3WV
W3ZAO

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W4AAU
W4AH
W4AIS
W4AIT
W4AIX
K4AW
W4AZK
W4BFR
W4BJ
W4BPD
K4BVQ
W4BYU
K4CLT
W4COC
K4CTU
W4CXA
W4CYR
W4CYU
W4CYY
W4DHZ
W4DKP
W4DQH
W4EO
W4EPA
W4FFV
W4GRP
K4GSU
W4GXB
W4HA
K4HFS
K4ICK
W4IFN
K4IIC
W4IMI
W4JAT
W4JII
W4JJL
W4JV
W4KFC
K4KOY
W4KWC
K4LNM
K4LPW
W4LVV
W4LYV
W4LZF
W4ML
W4MR
W4NBV
W4OM
K4OMR
W4OPM
K4PDV
W4PLL
W4QCW
K4QIJ
W4QT
K4RID
W4SHX
W4SXE
K4SXR
W4TM
W4UXI
W4VPD
W4VYP
W4YGZ

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K5ABW
W5ABY
K5ADQ
W5ADZ
W5AFX
W5AWT
K5BGB
K5BGT
W5BRR
W5BZT
W5CE
W5CEW
W5CKY
W5DA
W5DML
W5DRU
W5EGK
W5FFW
W5FNA
W5FXN
W5GEL
W5GNG
W5HDS
W5HJA
W5IAH
W5JUF
K5KBH
W5KC
W5KF
W5KLB
W5KUC
W5LGG
W5LGS
K5LIA
W5LP
K5LZO
W5MMD
W5MY
W5NOT
W5NUT
W5NW
W5OGS
W5OLG
W5PM
W5PQA
W5PZL
W5QN
W5QVZ
W5RS
W5TIZ
W5TPC
W5URU
W5UX
W5VIR
W5WZQ

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W6ADP
W6AFI
W6ALQ
W6AM
W6AMA
WA6AMZ
W6ANN
W6AOA
W6AOD
W6AQP
W6ATO
W6AUT
W6AVM
K6AYA
W6AYZ
W6BAM
W6BAX
W6BIF
W6BIL
W6BPD
W6BSY
W6BUD
W6BUO
W6BUY
W6BVM
W6BYB
W6BYH
W6BZ
W6BZE
W6CAE
W6CEM
W6CG
W6CGP
W6CHV
W6CIS
K6CQM
W6CTL
W6CTO
W6CUL
W6CUQ
K6CWS
W6CYI
K6CYO
W6CYV
W6CZQ
W6DBP
K6DDO
W6DFY
W6DI
W6DIX
W6DLY
W6DUB
W6DUC
W6DVB
W6DZZ
W6EAK
K6EC
K6EDE
W6EFM
W6EFR
W6EGB
W6EHV
K6ENL
W6ENV
K6ENX
W6EPZ
W6ETJ
K6EVR
K6EWL
W6EYC
W6EYP
W6FHE
W6FHW
W6FLT
W6FOZ
W6FSJ
W6FUF
W6FZL
W6GAL
W6GDJ
W6GFE
K6GMA
W6GMC
W6GMF
W6GPB
W6GSL
W6GWW
W6HJT
W6HX
W6IBD
W6ID
W6IDZ
W6IFW
W6IPH
W6ITA
W6JH
W6JHV
W6JK
K6JQJ
W6JZP
W6KBC
W6KEK
W6KEV
W6KG
W6KIQ
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W6KRI
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W6LEE
W6LER
W6LGD
K6LGF
W6LN
W6LRU
W6LS
W6LTV
W6LW
K6LZI
W6MEK
W6MHB
W6MJB
W6MJY
W6MLY
W6MUC
W6MUF
W6MUM
W6MX
W6NGA
W6NHA
W6NIF
W6NJU
W6NNV
W6NRQ
W6NTR
W6NWI
W6NXP
W6NZ
W6OBD
W6OEG
W6OES
W6OF
W6OMC
W6OME
W6ONK
W6ONZ
W6OSU
K6OWQ
K6OXU
W6OYD
W6PB
W6PCS
W6PDB
W6PFD
W6PH
W6PHN
W6PKO
W6PLK
W6PQT
W6PUY
W6PZ
W6QD
W6QDE
W6QNA
W6RAN
W6RDR
W6RLN
W6RLP
W6RLQ
W6RM
W6RW
K6RWO
W6RZS
W6SA
W6SAI
W6SC
K6SHJ
W6SIA
W6SN
W6SQP
W6SR
W6SRF
W6SRU
W6SUQ
W6SYG
W6TEU
W6TI
W6TKX
W6TPJ
W6TT
K6TXA
W6TXL
W6TZD
W6UCX
W6UHA
W6UJ
W6UNP
W6UOV
W6UQQ
W6UYW
W6UZX
W6VFR
W6VSS
W6WB
W6WJM
W6WKU
W6WO
W6WQT
W6WTH
W6WWQ
W6YMD
W6YMH
W6YK
W6YY
W6YZU
W6ZCY
W6ZEN
K6ZMB
W6ZMX
W6ZUI
W6ZVQ
W6ZZ

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W7ABO
W7AC
W7ADS
W7AHX
W7AJS
W7AMX
W7AQB
W7ASG
W7AUS
W7BD
W7BE
W7BGH
W7BTH
W7CAB
W7CKY/KL7
W7CNM
W7CSW
W7DAA
W7DET
W7DJY
W7DXZ
W7DZ
W7EJD
W7ENW
W7ETK
W7FB
W7FLD
W7FZA
W7GBW
W7GHB
K7GIE
W7GUI
W7GUV
W7GXA
W7HIA
W7HKT
W7HXG
W7IWH
W7IYA
W7KTN
W7KWA
W7KWC
W7LYL
W7MCT
W7MGT
W7NRB
W7OY
W7PB
W7PHO
W7QGF
W7QON
W7RT
W7SGN
W7VY
W7WVE
W7YGN
W7ZAS
W7ZOH

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W8AE
W8BHW
W8BOJ
W8BRA
W8BSH
W8CDT
W8CED
W8CLR
W8CRI
W8CQ
W8CWY
W8DAW
W8DEN
W8DFQ
W8DHC
W8DLZ
W8DMD
W8DSZ
W8EWS
W8EYE
W8FRW
W8GLK
W8HGW
W8HMI
W8HUD
K8IKB
W8ILG
W8IRN
W8JIN
W8JBI
W8JRB
W8JSU
W8KIA
W8KML
W8KPL
W8KZT
K8LSG
W8LY
W8MCC
W8MPW
W8MTQ
W8NBK
W8NJC
W8ONA
W8OYP
W8PQQ
W8QFA

W8QFR
W8RSW
W8SDR
W8SYC
W8SZS
W8TJM
W8TLL
W8TMA
W8TTN
W8TTS
W8UAS
W8UMR
W8UPN
W8VLK
W8WBV
W8WZ
W8YIN

◆

W9ABA
W9ABB
K9AGB
K9AVQ
W9BPW
K9BVR
W9BZB
K9CAZ
K9CJK
K9CLO
K9DNR
W9DUY
W9DWQ
W9DYG
K9EAB
K9ECO
W9EHW
W9ERU
W9ESD
W9EU
W9EXY
W9FBI
W9FDX
W9FID
W9FJB
W9FKC
W9FVU
W9GDI
W9GFF
W9GHK
W9GIL
W9GRF
W9HCR
K9HOL
W9HTY
W9HUZ
W9INN
W91RH
W9IU
W9IWX
K9IYW
W9JUV
W9KA
W9KMN
W9KXK
W9LIL
W9KOK
W9LNM
W9LSV
W9MBF
W9MQK
W9MUJ
W9MZP
W9NDA
W9NRB
W9OTS
W9PIO
K9PJN
W9PQA
W9QGR
W9QIY
W9QLH

W9QNO
W9QYW
W9RBI
W9RH
W9RKP
W9ROU
W9RQM
W9SFR
W9TPA
W9TQL
W9UX
W9UXO
W9VIN
W9VND
W9VW
W9VZP
W9WCE
W9WFS
W9WHY
W9WIO
W9WJH
W9WNB
W9WYB
W9YFW
W9YNB
W9YOR
W9YSQ
W9YSX

◆

WØAGO
WØAIH/VE3
WØAIW
W/AJU
WØANF
WØAZT
WØBCI
WØBFB
KØBIT
WØBSK
WØBTD
WØCDP
WØCTW
WØDEI
WØDMA
KØDMY
KØDQI
WØDU
WØDVZ
WØELA
WØEWH
WØFFV
WØFNN
WØFUH
WØGUV
KØGXR
KØHGB
WØHX
WØKOK
WØLPA
WØLVA
WØMCX
WØMLY
WØNLY
WØNTA
WØNUC
WØOUH
WØPGI
WØPNQ
WØQDF
WØQGI
WØQVZ
WØQYE
WØRBA
WØSMV
WØSNL
WØSYK
WØTJ
WØUOX
WØUQV
WØVBK

WØVBQ
WØVKB
WØYTL
WØYXO
WØZYB

◆

Chile
CE3AG
CE3AX
CE3DZ
CE3HL
Morocco
CN8BP
CN8DJ
CN8GU
CN8JX
Cuba
CO2SW
Anzola
CR6BX
Macau
CR9AH
Uruguay
CX1BZ
CX1FY
CX2CO
Germany
DJ1JW
DJ1BZ
DJ2LK
DJ2AE
DJ2BW
DJ2LM
DJ2WN
DJ3BB
DJ3JZ
DJ3KR
DJ4DN
DL1AU
DL1BO
DL1BS
DL1DC
DL1DX
DL1EE
DL1FF
DL1GU
DL1GV
DL1IA
DL1IB
DL1KB
DL1LT
DL1LZ
DL1MF
DL1QT
DL1YA
DLIYQ
DL1ZM
DL3AO
DL3BJ
DL3BK
DL3DD
DL3FM
DL3LB
DL3LL
DL3RK
DL3WV
DL6DE
DL6EN
DL6EQ
DL6GP
DL6MK
DL6OS
DL6YK
DL7AA
DL7AB
DL7AD
DL7AH
DL7CS
DL7CW

DL7EN
DL9PF
DL9PX
DL9TJ
Philippines
DU7SV
Eire
EI3R
EI4Q
EI9U
EI9Y
France
F2BS
F3AT
F3CB
F3DM
F3FA
F3YR
F3ZU
F8BS
F8TM
F8VQ
F8WK
F8XT
F9EJ
F9ER
F9IL
F9MS
F9RS
F9TX
Algeria
FA8RJ
England
G2AJB
G2AOL
G2CNW
G2FSR
G2GM
G2IO
G2LB
G2MI
G2PL
G2VD
G2YS
G3AAE
G3AAM
G3AJP
G3ATU
G3AZ
G3BHW
G3BI
G3BKF
G3CSL
G3CQE
G3DO
G3DOG
G3DQC
G3DQO
G3ESY
G3EYN
G3FKM
G3FPI
G3FPQ
G3FUR
G3FXB
G2FYT
G3GCD
G3GFG
G3GGS
G3GSZ
G3GYH
G3HCL
G3HFJ
G3HLY
G3IMV
G3IOR
G3JAF
G3JHZ
G3JZK
G3KHE

G3KKP
G3LP
G3TK
G3VA
G3YF
G4CP
G4MJ
G4TM
G5BJ
G5GK
G5VU
G5YV
G6BS
G6QB
G6RC
G6RH
G6UT
G6XA
G6XL
G6YQ
G6ZO
G8FW
G8GP
G8IG
G8IP
G8JO
G8KP
G8KS
G8KU
G8QZ
G8TD
G8UG
Northern Ireland
GI3AXI
Scotland
GM3DHD
GM3EST
GM3LYS
GM5RH
GM6MD
Wales
GW3BNQ
Hungary
HA5BI
HB9DB
HB9ET
HB9EU
HB9GJ
HB9HZ
HB9IM
HB9J
Switzerland
HB9KB
HB9KC
HB9MO
HB9MQ
HB9MU
HB9NL
HB9TL
HB9TT
HB9UL
HB9X
Italy
I1ALU
I1AY
I1ER
I1FO
I1KN
I1SM
I1UB
I1XK
Sicily
IT1TAI
IT1ZGY
Japan
JA1AA
JA1AB
JA1AG
JA1BF

JA1CC
JA1CR
JA1DM
JA1GC
JA2AT
JA2BL
JA2DW
JA2JW
JA2KG
JA3AA
JA3BP
JA3DY
JA3FT
JA3UI
JA5AI
JA6AD
JA6AO
JA7AD
JA8AA
JA9AA
JAØAC
KA2DE
KA2NY
Mariana Islands
KG6AL
KG6GD
Hawaii
KH6AUJ
KH6AYG
KH6BA
KH6BLX
KH6BTX
KH6CD
KH6CT
KH6DKA
KH6DQ
KH6IJ
KH6KC
KH6LG
KH6MG
KH6MI
KH6PM
KH6PY
KH6QH
KH6VP
Palmyra Islands
KP6AA
Virgin Islands
KV4AA
Norway
LA1K
LA2B
LA3DB
Puerto Rico
KP4KD
KP4YT
Alaska
KL7BHE
KL7MF
KL7PI
KL7PIV
KL7PJ
KL7UM
LA4DD
LA5HE
LA6U
LA7Y
LA7Z
LA8LF
Argentina
LU5AQ
LU6DJX
LU7AS
LU8EN
Lebanon
OD5LX

Austria
OE1BH
OE1CD
OE1FF
OE1RZ
OE3RE
OE3WB
OE5JK
Finland
OH1QE
OH1SN
OH1ST
OH1PI
OH1TM
OH2HK
OH2HW
OH2LA
OH2LX
OH2MB
OH2NB
OH2TM
OH2XK
OH2YV
OH3NY
OH3QC
OH3RA
OH3RS
OH3SE
OH3TH
OH5NJ
OH5NK
OH5OP
OH5OU
OH5PE
OH5RH
OH6OA
OH6RC
OH7OU
OH8QA
OH9RD
Czechoslovakia
OK1AEH
OK1AW
OK1CG
OK1CX
OK1FF
OK1HI
OK1JX
OK1KKJ
OK1KTI
OK1LM
OK1MB
OK1MG
OK1MP
OK1PD
OK1RW
OK1SV
OK1WX
OK1XQ
OK2AG
OK2NN
OK2SO
OK2UD
OK3AL
OK3DG
OK3EA
OK3EE
OK3HM
OK3MM
Belgium
ON4DM
ON4FQ
ON4JW
ON4LB
ON4MN
ON4QF
ON4QX
ON4TA
ON4TX

Denmark
OZ3GW
OZ4RT
OZ7BG
OZ7SN
OZ8SS
Faeroes
OY7ML
Netherlands
PAØFX
PAØLOU
PAØLY
PAØPN
PAØRLF
PAØTAU
PAØVB
PAØVO
Sumatra
PK4DA
Celebes
PK6HA
Brazil
PY1AJ
PY1BG
PY1GJ
PY1HQ
PY1HX
PY2CK
PY3QX
PY4AO
Sweden
SM2BCS
SM3AGD
SM3AKM
SM3AKW
SM3ATY
SM3BIZ
SM3EP
SM4AEQ
SM5AHK
SM5AJR
SM5AJU
SM5AQB
SM5AQV
SM5ARR
SM5BCE
SM5BFE
SM5BPJ
SM5BRO
SM5CCE
SM5CO
SM5CXF
SM5KP
SM5KV
SM5KX
SM5LL
SM5LN
SM5WI
SM5WZ
SM5YG
SM6AMR
SM6VY
SM7ID
SM7MS
SM7QY
SM7TQ
SM7YO
Poland
SP1JV
SP5AA
SP6FZ
SP6RT
SP7HX
SP8CK
SP9DT
Sudan
ST2AR
Greece
SVØWP
U.S.S.R.

UA1CB
UA3BN
UA4IF
UA9CL
UA9CR
UA9DN
UA9VB
UB5AQ
UB5KAB
UC2AA
UC2CB
UF6FB
UQ2AN
UR2BU
Canada
VE1EP
VE1PQ
VE2AIO
VE2NV
VE2WW
VE2YU
VE3BWY
VE3CFG
VE3CIO
VE3DIF
VE3EU
VE3IR
VE3JZ
VE3KE
VE3QD
VE3RE
VE4RO
VE5JV
VE5KG
VE5TK
VE5VL
VE6AO
VE6BY
VE6JR
VE6MN
VE6NX
VE6VK
VE7CE
VE7CQ
VE7HC
VE7JB
VE7KC
VE7KJ
VE7MD
VE7QL
VE7SB
VE7VC
VE7ZK
VE7ZM
VE8AW
VE8PB
Australia
VK2ACX
VK2AM
VK2DI
VK2HZ
VK2NS
VK2PV
VK2QL
VK3BZ
VK3CN
VK3CX
VK3EK
VK3HL
VK3JE
VK3NC
VK3RP
VK3YL
VK4AL
VK4DO
VK4EL
VK4FJ
VK4HR
VK4SD
VK5JS

VK5KO
VK5MF
VK6DX
VK6KW
VK6RU
VK6SA
VK7CH
VK7LZ
Newfoundland
VO1DX
Northern Rhodesia
VQ2GW
Hong Kong
VS6AE
India
VU2MD
Mexico
XE1PJ
Burma
XZ2TH
Yugoslavia
YU1AG
Jordan
ZC1CL
Cyprus
ZC4IP
Southern Rhodesia
ZE3JO
New Zealand
ZL1AH
ZL1AJU
ZL1BY
ZL1GX
ZL1HY
ZL1PV
ZL1RD
ZL2AFZ
ZL2AI
ZL2CU
ZL2GX
ZL2HP
ZL3DX
ZL3GU
ZL3IS
ZL4BO
South Africa
ZS1OU
ZS1RM
ZS2AJ
ZS2CR
ZS2EC
ZS2X
ZS6A
ZS6AJQ
ZS6CT
ZS6DW
ZS6FN
ZS6IF
Tunisia
3V8AB
Israel
4X4CJ
4X4FQ
4X4KK
4X4RE
Libya
5A5TE
5A5TH
5A5TO
Saarland
9S4AX

RADIOTELEPHONE

U.S.A.
W2APF
W2BXA
W2DEC
W2HTI
W2JT
W4DQH
W5KBU
W6AM
W6GVM
W6ITH
W6YK
W6YY
W7MGT
W7PHO
W8BF
W8KML
W8PQQ
W9NDA
W9RBI
W9WHM
W9YSQ
W9YSX
Morocco
CN8MM
Uruguay
CX2CO
Germany
DL3LL
DL7AA
DL7AB
DL7BA
France
F3DJ
F8DC
Algeria
FA8RJ
England
G3BYM
G3FKM
G3HLS
G8GP
G8IG
G8KS
Northern Ireland
GI3KVQ
Wales
GW3AHN
Switzerland
HB9J
Italy
I1AOF
I1SM
Japan
JA1ACB
Hawaii
KH6OR
Argentina
LU6AJ
Austria
OE2YL
Czechoslovakia
OK1MB
OK2AG
Belgium
ON4DM
ON4RC
Brazil
PY2CK
Sweden
SM5CO
SM5LL
U.S.S.R.
UR2BU
UQ2AN
Kenya
VQ4ERR
New Zealand
ZL1HY
ZL1KG
ZL2GX
ZL4BO
South Africa
ZS6Q
Israel
4X4DK
Kuwait
9K2AZ

SINGLE SIDEBAND DX CHASERS LIST

THE following amateurs have received awards and endorsements for two way communications using single sideband. Many of the "lower" scores have not been heard from for some time, so how about it fellas, let's keep this listing current! Send your reports and cards to the Sideband Editors, K2MGE/K2HEA, 12 Elm Street, Lynbrook, Long Island, New York.

216 K9EAB, TI2HP, TI2RC
214 W4IYC
212 W6UOU
206 W8PQQ
202 VQ4ERR
200 W8EAP
194 W6PXH
190 W2JXH, PY4TK
185 WØQVZ
182 K2MGE
181 W6RKP
180 W6BAF
176 W6WNE
175 W3SW, W8GCN, W8YBZ
174 MP4BBV
172 TG9AD
165 ZL3IA
164 WØCVU
162 VE3MR
160 K6GMA, VK3AHO
159 W2LV
156 WØFUH
155 W1OOS, W5IYU
153 K2FW
152 W3MAC, K4TGL, K6LGF, HB9IE
151 K6ZXW, HB9TL
150 W2VZV, W5RHW, W7VEU, ON4DM, 4X4DK
148 W8YIN
146 XE1AE, K2HEA
142 W2FXN
138 W5KFT, K8RTW
137 W1GR
136 W3VSU, VE3ES
135 KØCTL
129 W4OPM, W9QNO
128 DL4AS
126 W6VUW
125 VE6VK
124 W2CFT, W8ACT
123 W1EQ, W5DA
122 W1TYQ
121 W2ATJ
120 K6MLS
118 W1DCE, W2OTZ, W6UPP, ZL3AB
117 W2MAF, W7DLR
116 VE1NH
115 W1JSS, K8EWK, KZ5WZ
114 W9ROU, KØKWY/4, DL1VR
113 W3GHD
112 W4UWC
111 W8JXY, YV5ABD
110 W4ANE
108 W3LMA, ZS5DW
107 W7EOI
106 K2QXG
105 W3CGS, W9WIO
104 W3ICQ, W6HYG, VE4CP
103 K2EWB, W3FWD, W3PGB, W6YMV, SM6SA, YV5AFF
102 K1IXG, W1LHZ, K2JXY, K7GIE, W9CYL, K9KKR, GM3CIX, I1AMU, PY2JU
101 W1ICW, W1WDD, K2TDI, W3HQO, K4YUX, W6GT, K6HFZ, K6HZP, WØUUV, VE2KW, VE6TF
100 W1ADM, W1AOL, W2BLP, W2GNQ, W2HMJ, K2HUK, K2JFV, K2LGS, W2MA
VE3BWY W2NUT, W2OQO, W2QKJ, W2YBO, W3KT, W3NKM, W4BYU, W4CDY, W4HIM, K4HXF, W4INL, W5AFX, W5BGP, W5FDZ, W6BAY, W6IAL, W6ITH, W6QFE, W6TNS, W6TOT, W6ZEN, K7GHE, W7IAA
W7ZAS W8BKO, W8DJP, W8DMD, W8JDV, W8JXM, W8MG, W8MPW, W8MXS, W8QNF, W9HP, W9YHE, KØABH, DL4GX, F7AF, TI2EV, TI2IO, VE3BKL, VE3RE, XE1SN, YV5FK, ZL3PJ

WPX The following is a list of amateurs holding WPX and the number of prefixes worked. This list has been compiled as of September 25, 1960. Everyone is encouraged to work as many different prefixes as possible and submit their cards to the DX Editor, Urban Lejune, W2DEC, at Box 35, Hazlet, New Jersey.

C. W. ONLY

569 W2HMJ
517 W6KG
505 W8KPL
483 W5KC
460 W9YSX
455 W1NLM, K6CQM
443 W2EQS
434 W4OPM
432 K9EAB
428 K5LIA
427 W1EQ
426 K6SXA
418 W8PQQ
415 W3BQA
414 W9UXO
413 W8LY
411 W2PTD
409 W6WO, K9AGB
407 W5AFX
405 W3OCU
403 W8JIN
402 PY4OD
401 W5LGG
400 W2MUM
390 K2UKQ
377 K4JVE
367 W9DYG
365 W4AZK
361 W9QGR
359 SM5AJU
357 WØMCX, VE3DIF
356 W5OLG, DL7CS, KL7MF
355 W2GVZ
353 W5AWT, WØPGI
352 W9WCE
351 W5DA, HB9TT
350 K2PFC
349 W1IJB
344 W9IU
330 W6YY, IT1AGA
329 W2NUT
328 DL1QT
327 WØSNL
326 LU8EN
324 DL3RK
322 W6UNP
318 EA4CR, G3EYN, LA6CF, SM7EH
316 W2GT, DJ1VS, VK6WT
315 W9UX, OH3TH, PAØLY, SM7TQ
314 W1NHJ, DJ3BB, SM5AHJ, SM5BCE
313 W1IUU
312 SM5WI
311 W2HO, W5BRR, W8RQ, W9WIO, SM5AHK
310 W3GHD, W3PGB, W9BPW, W9UX, OH3TH, PAØLY, PAØVB, PAØVO
308 WØAUB, DJ3BB, SM5AHJ, SM5BCE, W9YNB
307 W6RLP
306 W2SAW, K4IEX, W8RSW, OK3DG, UA9DN, W3GHD, W9BPW, W9UX, OH3TH, W5AZB, WØGUV, VE3BWY
305 W2TP, K4HXF
304 W1BFT, W1EIO, W1FZ, K5JZY, W6NWI
303 W7ABO, K8IKB, W8UMR, W9VIN, OK3EA
302 W3DBX, K9CLO, WØDMA, OK1KKJ
301 W2DGW, W4HYW, W4IMI, W8IBX, W8TTN
DU7SV K6RTK, JA2JW
OK1AEH LU5AQ
SM5CCE OK1CX, ZL4CK
300 W1HWH, W2FXA, K2ZKU, W3BCY, W3LMA, W3SOH, W4GXB, K4KOY, W7TPE, DL9KP, PY4AO, SM5BPJ, SP6FZ, VE3CIO

S.S.B. ONLY

275 K9EAB
263 K2MGE
257 MP4BBW
250 W8PQQ
246 W1GR
231 TI2HP
222 W4OPM
221 HB9TL
212 W3MAC
208 DL4AS
200 W3VSU
197 XE1AE
181 K2HEA
170 W6BAF
166 W8BKO
165 W2JXY
164 VE3MR
162 YV5FK
160 TG9AD
157 W8YIN
155 W1TYQ
153 W5RHW
152 W2VZV
151 W8YBZ
WØCVU K2JFV, W2GNQ
W2OTZ K2TDI
W2TP WØFUH
W8JXY 150
W6VUW W5DA
150 K6HZP

PHONE ONLY

497 W8WT
454 G3DO
430 CT1PK
366 W9YSQ
363 PAØHBO
354 PY2CK
353 5A5TO
327 W8PQQ
323 W9WHM
315 W5ERY
314 W3AYD
312 I1CBZ
306 W3DJZ
ZP5CF
305 DL3TJ
304 SM3BIZ
302 W9UZC, F8PI, PY1NC
301 W9PQA
300 VE1ADE

DX DX DX DX DX DX DX DX

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

The following certificates were issued between August 11th, 1960 and September 11th, 1960:—

WAZ

1411	DL1EE	Igor Falster
1412	VE5KG	James G. Little
1413	DL9PF	Walter Vedder
1414	K2UKQ	Kay Gaynor
1415	K1DMG	Daniel Gravereaux
1416	DJ3BB	Herbert Machlitt
1417	W1NHJ	Shailer A. Herrick, Jr.
1418	F8WK	Roger Mons
1419	W6BSY	C. E. McHenry
1420	W4QT	Ward Buhrman
1421	CR6BX	Jorge Sotto-Mayor Rego
1422	K4OMR	Raymond H. Porter
1423	W9QYW	Arlan Bowen
1424	W9FBI	W. O. Hodgson
1425	W1GVZ	Joseph R. Alfano
1426	VE6BY	Arthur R. Craig
1427	W2RA	Robert Anders
1428	SP9DT	Janusz Twardzicki
1429	W3JW	Ned Culler
1430	G3LP	Norman F. O'Brien
1431	W6FUF	Peter Wolf
1432	VK4SD	A. H. Sharland

CW WPX

133	DU7SV	Voltaire Sotto
134	K6RTK	Fred Hitchcock
135	W9WCE	John G. Kuespert
136	W6NWI	Bill Jago
137	W2TP	H. G. Mustermann
138	ZL4CK	W. F. Self
139	W7ABO	Francis A. Burnell
140	F9IL	Edmond DuBois

PHONE WPX

22	XE1AE	Fernando L. Vallarta

SSB WPX

36	K2TDI	Gene Simring

When the top 50 *kc* of 20 meters was recently opened to phone operation, I had the feeling that the move was both premature and extremely inconsiderate to our fellow hams. I went as far as to ask that a portion of the 50 *kc* be voluntarily set aside for the exclusive use of DX stations. Now, in looking back, two very obvious facts have emerged. One, that it has become very difficult and, at times, virtually impossible to work DX in this porton of the band and, two, which is far more important, there is growing resentment of the part of the DX operators toward the W hams for the action we have taken.

The following letter which appeared in the Willamette Valley DX Club's bulletin was written to W7VEU from HB9TL, who is a very prominent European DX operator. This feeling which is very aptly stated by Jack is not only his point of view, but one that is almost universally held by DXers throughout the world.

"Dear Bud, for the nice QSO this morning I want to thank you very much. It is only on rare occasions that we DX stations may have so free a discussion with W's on the band and here are the ways many a DX-ham looks at the change that took place on 20 meters.

"I am taking the liberty of expressing my personal feeling as well as those of many NON-W's about the extension of the American phone band, knowing that what I have to say cannot possibly be published by any American ham magazine. The time elapsed, since the change has brought about, has not settled the argument at all. It has only shown the hopelessness of our situation. There is more and more a very strong feeling against the change among DX stations as it is hurting us very badly. Quite a number have turned away in disgust when they have seen the fruitless struggle against over-powering QRM caused by W's. In fact it has become very difficult for us to carry on contacts with our friends in most parts of the globe. For us the VK/ZL's and particularly the pacific area became nearly impossible to contact. The reason is that the South and Central Americans as well as the VE's come thru the same time as the W's and they get covered up with W-QRM. With the Pacific and VK/ZL the conditions are a bit different. Either we have the QRM from W1-W4 which covers them or they have it from the W6's which cover us Europeans. Either way it has become nearly impossible.

"We think it was just not quite fair when the ARRL forced thru the proposal of the extension and the arguments behind it were not altogether sound. The extension of 50 *kc* has not brought you any relief from QRM, but brought just another batch of very inconsiderate operators to the band, nor did it prevent the commercial stations from moving in. The change has produced, and we feel the effects already, the following situation. The 'pros' have moved in it greater number than before as they make use of the fact that the W-QRM has forced us out and that at times when there is no skip that portion is now quite clear. Before we used to fight those stations with automatic keyers and we invariably managed to make them move. Now that you forced us out you just cannot blame us for not clearing the portion of commercials for you. This situation will have its effects soon as maybe the W's will be allowed to keep it but our governments will take it from us for not using it. (remember what happened to your 11 meter band —same argument, hi.) So with our forced change you exactly produced for us what you wanted to prevent. At least for us it means sure

loss of a privilege we cherished and our only hopes are to find a solution whereby we have a chance too on the top end. If it is true that manufacturers of ham gear had a hand in it, we think the situation takes a dim view. Are your commercial interests ruining your reputation too? Because of a couple of dollars is it worth-while ruining amateur radio and its global fraternity?

"The other meaning of the change is even simpler. It boils down to the fact the tough guy takes what he wants from the boy. You, the better organized and bigger in number went and took what used to be ours and we didn't even have a chance to defend our point of view without being told that it is strictly an internal U.S. affair. Isn't this exactly the idea you W's would not like to be noted for? But it seems ham radio, in your opinion, works on the basis of a different philosophy. I thought that ham radio is an art of communications, whereby we could discuss things even on a world wide basis. But the FCC must surely have known that an extension like that has some effect on DX fellow hams. More and more the feeling creeps up that amateur radio becomes pretty soon strictly an American hobby. Together with the big drive for reciprocal licensing we foreign hams are of no concern at all as you squeeze us out and in order to fill in the missing countries you send your boys over. Your interest in reciprocal licensing we know, but have you ever thought if it is our interest too to have a W-call and join the 200,000 operators?

"Looking at it from the point of numbers of hams, the whole change takes even a more dismal view. Considering the U.S. has approximately one-third more amateurs than the rest of the world, it does not mean that you can squeeze us out. Looking at the frequency allotment you have already so many more operating privileges than any other nation in the world. Let us consider just the band where our interests lay together. You have 200 *kc* more on 80, 200 *kc* on 40 and on 20, 15 and 10 meters you take by far the bigger portions. Adding all you will see that you had already more space in proportion to number of hams without taking out 50 *kc*. We will not go so far as to say in order to remedy your QRM on 20 meters that you would not be entitled to additional frequencies. But why couldn't the issue have been talked around a bit more before the FCC made the move? We honestly think we foreigners should have been able to state our case too. Especially that such a change has world wide effects. Maybe we would have come up with a solution agreeable to both sides. Why couldn't we have split the top 50 *kc?*

"But now that we DX-stations are confronted with a 'fait accompli' you might say that there is no use crying over it. But we will not find any substitute for those precious frequencies we lost and we realize that it is impossible to make an agreement with partly very inconsiderate W-operators. If we still would like to keep the privilege of operating in the top 50 *kc* and have some fun on 20 meters too, it leaves us only one alternative. You carried a fight to our doorsteps

HB9TU during his stay in Liechtenstein where he operated as HB1TU/FL. Albi proudly holds his new "S" line receiver.

OK2RT, Juri, and his junior op tuning the band from their home in Ostrava. (Tnx K2UKQ)

BY1PK QSL

as we had no chance to defend our point before.

"As we will not take it sitting down either, we see just one solution. If we can hurt you as bad as you are hurting us maybe you W's will sit together and talk it over again. It is not in the power of DX operators to change FCC ruling but we possibly can make you wish you did something to correct the situation. Thru the organization of DXpeditions where no W's are worked or QSL'ed we may achieve our goal. Why could we not split the top 50 *kc* giving us a chance to keep the portion and have some fun too. It is up to you to find some solution.

"I know, Bud, I am sticking my neck out for a good beating but I have never seen the feelings of DX-boys expressed in any of your ham publications. I am looking for you on 20 meters for another nice QSO."

73's Jack C. Laib, HB9TL"

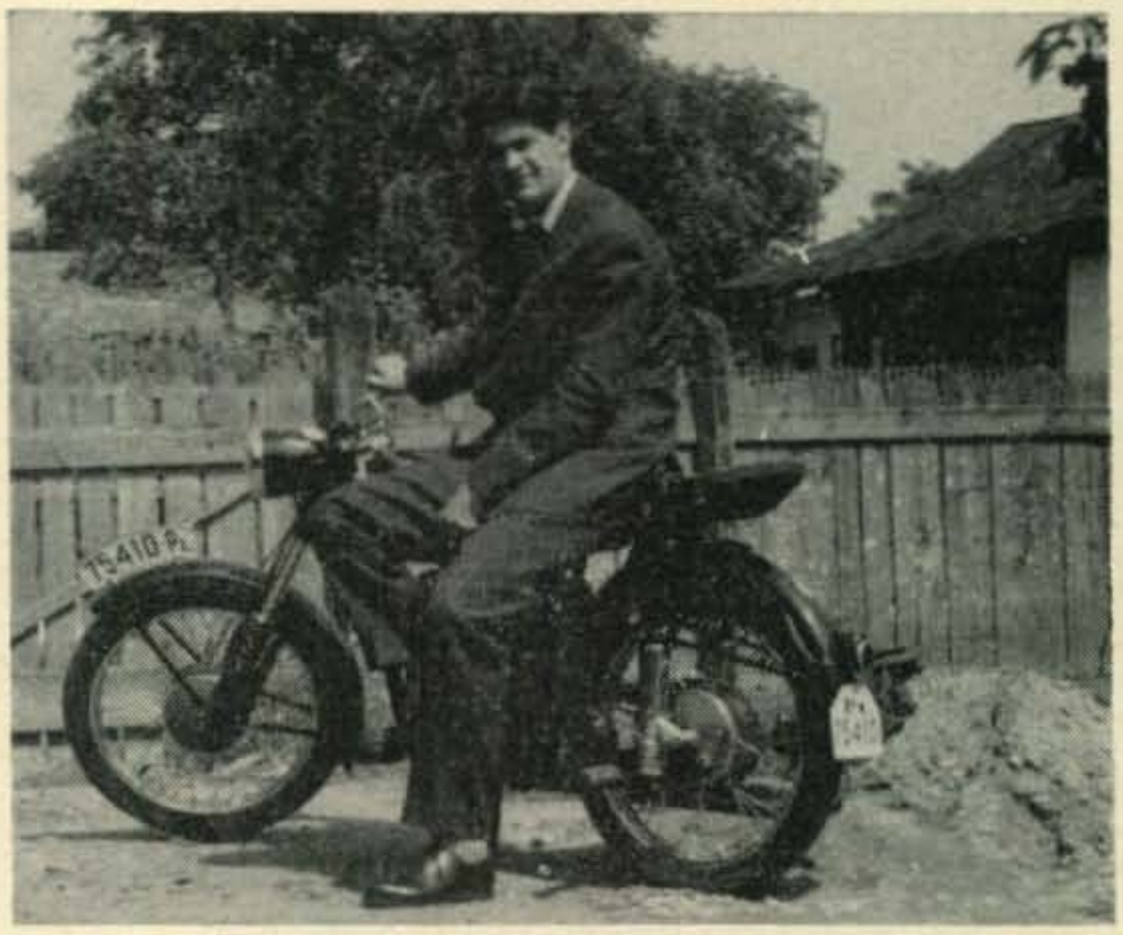
To me, this is a very sad testimonial. It shows what a few individuals, who are hungry for gain, whether it be financial, prestige, or power, can do once they put their minds to it. We DX operators have one of the greatest vehicles in the world for the promotion of international good will and no gain, even working a new country, is worth it if we are to lose our ideals. Are we going to have our say in the matter? Assuming we have a little less QRM (which is very doubtful) with the addition of these few *kc*, is the price we're paying really worth it? The choice is up to you.

The following article, which appeared in the FEARL (M) News, is a good example of what we can do to help our fellow hams and also promote international good will.

"About six months ago, Harvey KA2IE wrote HAM CLINIC, in *CQ* for the name of an amateur operator in a foreign country that was desirous of securing copies of *CQ*. Chuck, F7FE/W6-QLV responded with the name of Karta Ram, VU2KM of New Delhi, India. Upon corresponding with Karta, it was discovered that he was operating with home brew equipment and was using an ear phone for a microphone. With the help of Bill, KA2BW, Harvey made up a package of one used volt-ohmmeter, one crystal microphone, and a wide selection of resistors and capacitors and forwarded them to VU2KM. On 27 July, Harvey received a letter of tnx and it read in part as follows:

"Dear Harvey: I received your invaluable gift parcel containing volt-ohmmeter and nice crystal mike with other radio parts. My joy knew no bounds when I saw volt-ohmmeter and mike. I connected mike in the speech amp immediately and got many good reports as to modulation from Indian stations and DX. The mike has boosted up considerably the signal strength and quality. The voltmeter also did its job well and now I am sure that 450 volts is input voltage to final at 140 ma. Some of the articles in the *CQ* magazine are very interesting and will go long way improving my technical knowledge now.

"I am all the more thankful and indebted to your kind offer of help if needed about component parts. I shall seek your kind help if I will need it. Thank you for your generous help in my hobby and trouble you take for me. Kindly let me know if there is any service for you from me.



Boris, YO3IA, about to start on a trip. I'm surprised Boris does not have a call letter license plate. I thought that New Jersey was the only place in the world which doesn't. (Photo K2UKQ—caption W2DEC)

The other Indian operators in New Delhi can use the things you gave also."

This amateur has a family of six to support on approximately $38 American dollars per month, and with $17.80 per month for rent, it's a wonder he is on the air. Remember; a friend in a foreign country today goes a long way to make America strong."

Do you really need all those books on the shelf?

Letters

The following letter from K2QXG needs no explanation.

"I am going to give the low power boys a break. I am QSL manager for VK9VM, New Guinea and JA5AI. We sked a 3 way every Friday at 1100 to 1200 GMT. When we finish, the mob descends on them, especially VK9VM. *If* you feel the idea worth a try, how about a mention that anyone needing either for DXCC, send

me a card requesting a contact and giving the Friday they will be on for *sure*.

"When we finish our sked QSO on 14.070, JA5AI will go up 5 *kc* and VK9VM will go down about 5 *kc*. I will send them the list of all wanting contacts. *They* will call the *W's* in turn giving only report. Must be contested type QSO only and no yacking. That will give the QRP boys a chance."

The line forms on the right. Thanks for the help Mac.

The following letter was "lifted" from the WGDX Bulletin.

"As I promised, I am sending you the data on the India Ocean DXpedition coming up this October. As you know the participants are: W4BPD, WØMAF, WØUQV, and myself. Possibly VQ4AQ and FB8BC will join us for a portion of the trip, but this is not confirmed as yet.

"The travel reservations are made and confirmed. The WØ contingent will leave Kansas City on October 12th and arrive Nairobi the morning of October 14th. W4BPD is presently in Europe and the plans are that we will rendezvous in Nairobi on October 15th. From this point VQ4ERR has taken care of the arrangements.

The S.S. Kampala sails from the Port of Mombassa for the Seychelles October 17th, arriving Port Victoria, Seychelles October 20th. The Radio Officer of the Kampala has agreed the Maritime Mobile operation aboard the Kampala, so we will probably operate VQ9AIW/MM.

Floyd McCoy, VR6AC, left, during his recent visit with Judge, K7GCO.

"Four or five days is the time allocated for the stay at Port Victoria, Mahe. Then the return trip to East Africa aboard the 50 foot schooner 'Marsoulin', via Agalega, Farquhar, Astove, Aldabra, Comoro, etc. The exact itinerary and timing will be determined by the schooner Captain's recommendations and the weather. Thirty days have been allocated for this portion of the trip.

"The licensing situation is tricky. The call VQ9AIW has been renewed for the remainder of the year. Harvey Brain, the schooner's captain, also has the call VQ9HB. Also, effort will be made to secure VQ9 calls for the other members of the party. In the Seychelles the prefix will be VQ9; at Agalega, VQ9, Portable VQ8; and at Aldabra, VQ9, Portable VQ7. Astove is French so the call at the moment is unknown.

"Five hundred pounds of radio gear was shipped to the Seychelles in June and the remainder will be picked up in Nairobi. The transmitters are all 100 watt, 10 thru 80 meters, c.w., a.m., and s.s.b. But, I doubt that any of the bands other than 20, 15 and possibly 10 will be useful for QSO's to the U.S.A. In general, the following frequencies will be used:

CW	AM	SSB
28020	28420	28620
21020	21220	21420 or 21220
14020	14120	14349 or 14120
7020		

W4TO and the Southeastern DX Club have agreed to handle the QSL's. The QTH:

Southeastern DX Club
Box 10821, Station A
Atlanta, Georgia

"For direct reply the S.A.S.E. is a must. All other cards via the Bureaus. Also, no bucks, this is still a hobby. 73, Lee, WØAIW"

DX Station Of The Month

This looks like the Willamette Valley DX Bulletin this month. The article and picture of AP2CR was too good to pass up, and I would like to thank Editor, Bud Shearer, W7VEU, for making it available for use here. The following is in AP2CR's own words. "Colin Richards (AP2CR) may be familiar to DX-hunters as the only single-sideband station in Pakistan and long established sidebanders may well have worked him many years ago for he has been on 20 meter single-sideband from Pakistan since 1953. He thinks he may have been the first single-sideband station in Asia outside the KA's and he still recalls the early days of interminable 20 meter CQ's on s.s.b.—only to be answered by an A3 station complaining bitterly of his 'dreadful modulation'. But as thousands of converts have since discovered single-sideband paid off and AP2-CR's QSO's with such pioneers as G2IG, HB9-FU and OZ7BO were as simple and reliable as a land-line hook-up.

AP2CR, Colin Richards, operator of the only single sideband station in Pakistan. He can be heard on 20. (Photo courtesy of Willamette Valley DX Club Bulletin)

Juan, HK4JC, at his rig and on the top and with his XYL Josefa ex YV1BM during a trip in Medellin. (Tnx K2UKQ)

With the rig shown here (15 watts) Paul, F3II, recently made WAC in seven hours time. Who said you need a KW. (Tnx F3II)

This is the completely home brew station of Manuel, EA8BF. Its easy to see what you must do to get your card on his wall. (Tnx K2UKQ)

Colin's business is that of telecommunications engineer, though he reckons to be a 'general practitioner' and not by any means a radio specialist. His home base is in G-land where he is an engineeer with the British Post Office, but he was asked to visit Pakistan in 1951 to advise their Posts & Telegraphs Department on a scheme for a training organization. Apart from breaks for home leave he has been stationed in Pakistan continuously since that date. His early rig was a phasing type exciter with home built p.a. using 807's in push-pull amateur construction is no easy game in a country where there are no component shops and where war-surplus gear does not exist, and he frequently had to wait until his next visit to Karachi, a thousand miles away, to track down a resistor or some basic item which could not be found in the junk box.

No special DX man himself, AP2CR is happy to give people their first AP2 and he QSL's 100%—but he confesses to enjoying the friendly side of amateur radio and the ragchews rather than the rubber-stamp type of QSO. His QTH at Haripur is in the historic North West Frontier region of Pakistan and although it is not high enough to mitigate the fierce heat of summer it is surrounded by the foothills of the Himalayas which reach up to vast peaks of perpetual snow in the distant background. His nearest sideband neighbors are YA1AC in Kabul and 9N1GW in Khatmandu. Colin, his XYL and Alun (aged 4) enjoy their exile in spite of the lack of amenities (50 miles to the nearest doctor, hospital, library, cinema-or, for that matter, to buy a pound of butter). Leisure hours lean heavily on home-made entertainment and along with amateur radio, stereo, hi-fi helps to fill the gap. Colin claims to be a violinist with a promising past and he finds that his early experience of orchestral playing helps him appreciate recorded tours-de-force. A recently-acquired KWM-1 has, he says, given him a better and a stronger signal with a tenfold reduction in the size of the rig, with the added advantage that he is able to jack it into the car and provide mobile QSO's from such exotic spots as the Khyber Pass. His a.c. power supply caters for a line voltage that varies from 150 to 250 and is, he says, of monumental proportions—being built from war-surplus parts. He says that if he could find a lighter and more compact a.c. power unit he would skip across to East Pakistan this summer and put another sideband country on the map."

Who What Where

AP West Pakistan—From AP2AD, we learn that both AP5B and AP4M were phonies. AP4M has never been officially issued and the person who held AP5B has given up his license years ago. The AP QSL Bureau is Box 4074, Karachi, and AP2AD's direct QTH is: Ahmed Ebrahim, P.O. Box 65, Lahore, West Pakistan.

CX Uruguay—CXØM is the yacht, Alferez A. Campora that is making a trip around the world. QSL's will be answered via RCU (Tnx CX2AM, W6NVM and W2GIP)

El Liberia—When not bothered by such small things as a siege of malaria or elephant hunts (two killed last month) Ken, EL4A reports things are very good on the DX front. Some of the better DX worked includes UM8KAB, UL7KBH, FF7AB, ZD1AW and PX1PF, although he did miss JT1AB, whom he needs for WAZ. Ken suggests that many are missing a good DX band by not trying 40 meters. In one sitting, he can fill a page in his log book with stations in all call areas. Wait 'till 20 really starts to go dead Ken, then you'll have a lot of company.

EP Iran—The FCC has removed the ban on U.S. stations working Iranian stations with EP prefixes. W2AYN, who has been operating /EP, is also licensed as EP5X and has been using that call. Other active stations are: W3ZA/EP, occasionally K4ORQ/EP, and DL3RO/EP.

FL8 French Somaliland—Rudy, W3ZA (OD5-CT) was assigned the call FL8ZA and will be operating in Djibouti, French Somaliland for a period of three or four days beginning about December 8th. He extends an invitation for someone to join him on the trip.

KH6 Hawaii—KH6DMP formerly KA8KW has received orders from Hawaii to Rome, N. Y. Col. "Jerry" Branch will acquire a W or K2 as soon as he is in position at his new location. Anyone still needing QSL's for QSO's with eitehr of the above calls please forward to Box 336, Griffiss Air Force Base, N. Y. An attractive color foto scene of Hawaii will be sent for KH6DMP QSO's requiring QSL's and a novel Oriental QSL for those still needing a card from former KA8KW QSO's while in Japan. Switch will be pulled permanently at KH6DMP about Sept. 5, 1960.

KR6 Okinawa—KR6KV will be giving 40 meters a go this season between 7005-7030. He is especially looking for W contacts. (Tnx W2EBG)

PY7 Fernando de Norohna—Don't pass up PY7LJ on 21 *mc* as he is on Fernando de Norohna. He likes c.w. around 1900-2100 GMT.

VK9 Norfolk Island—VK9RH is a new station on Norfolk, active around 2300 and 0700 GMT on 14 *mc*. (Tnx DXer)

VK9 Cocos Keeling Island—VK9HC has left Cocos because of illness in his family, however, VK9DJ is a new station there. Look for him around 12-14 GMT on 14 *mc* c.w. (Tnx DXer)

VR1 Gilbert & Ellice Islands—VR1D (Ex ZL1ABZ) is active on 20 meter phone now. He prefers 14.32 *kc* around 0530-0700 GMT. VE7ZM is frequently MC. VR1B is QRV from 0900 to 0930 on 14120 phone and sometimes around 2200 GMT on 14085 or 060 c.w. (Tnx DXer)

VR6 Pitcairn—VR6TC should be returning to Pitcairn about the time you read this. Thanks to the efforts of W4TAJ and W5OLG Tom will have a new HQ145C receiver. All QSL's should go to W4TAJ.

ZA Albania—ZA1KC is a legitimate station and does QSL. A few IRC's and a card to P. O. Box 42, Tirana, Albania will do the trick. He prefers 7 *mc* with a try on 20 meters every now and then. ZA2BAK apparently is a pirate. (Tnx DXer)

ZD9 Gough Island—A new station has appeared on this island. His name is Wynand and he prefers 14034 *kc* around 1600 to 1730 GMT. This one counts the same as Tristan de Cunha. He also operates 15 meter phone around 21.2. ZD9AJ should also be active soon. He will be there for at least a year and requests QSL's to ZD9AM be sent c/o G. P. O. Capetown, South Africa via Tristan de Cunha, South Atlantic. (Tnx DXer).

Certificates

"September 20th" Certificate

Conditions: In order to celebrate the 1st anniversary of its foundation, as well as to honor the heroes of the historic (Rarroupilha) Revolution of 1835, the House of Gaucho Radio Amateur hereby creates a certificate that is to be both permanent and international in its distribution, and to be granted to all duly licensed amateur radio stations throughout the world.

Conditions for obtaining this certificate, which is to be known as the C-20-S are as follows:

1. The C-20-S will be granted to all stations that present proof of contacts with PY-3 stations, according to the following schedule:

PY-3 stations: 100 contacts;

PY-1, PY-2 (except Golas), PY-5, CX, LU (except LU-W, X, Y, Z) stations: 75 contacts;

PY-4, 6, 7, 8, 9 and the state of Golas; LU-W, X, Y, and Z, and other South American stations: 50 contacts;

Central and North American, and African stations: 30 contacts;

European stations: 20 contacts.

Asian and Pacific Island stations: 10 contacts.

2. All amateur bands may be used.
3. The C-20-S will be granted both for c.w. and phone.
4. Minimum signal is to be R-3.
5. QSL's, accompanied by a log, shall be sent to the Casa do Radio Amador Gaucho, P. O. Box 1119, Porto Alegre, RS, Brasil. In place of the QSL's, a log of contacts, duly verified and authenticated by the local amateur organization, is also acceptable.
6. QSL's—or authenticated logs—sent by foreign amateurs shall be accompanied by 3 International Reply Coupons, or their equivalent in American dollars.
7. For the C-20-S are valid all contacts made later than October 19, 1958, date of the anniversary of the C.R.A.G.

Baymen Diploma

To celebrate the forming of the British Honduras Radio Amateur Club, the Baymen Diploma is being issued. The conditions for obtaining this diploma are as follows:—

1. Four contacts should be made with VP1 land.
2. Any band or bands may be used.

One of the best known and long time OK DX'ers, OK1FF, and his very neat station. From the smile on Vlad's face, it looks as though he just landed a new one. A *kw* is used on all DX bands. (Tnx K2UKQ)

Mike, W3AYD, winner of the Bermuda contest with his XYL who will send an expense-free week in Bermuda as the prize in winning the contest. A similar contest will be held next year so get your gear ready. (Tnx VP9L)

The rig of FB8CJ. Although the picture was taken when George was FK8AO, the same rig is still in use. (Tnx K2UKQ)

3. All types of emission are permissible.
4. All amateur radio stations in the world are eligible.
5. Stations must submit 4 QSL cards and $1 U. S. or 10 IRC's to cover postage.

Mail Bag

I receive many letters every month from young DXers (in terms of DXing, not age) inquiring where they are going wrong with their QSL policies as they have very poor returns. There are several things which are important if cards are to be extracted for QSO's. First, it is best to keep yourself well informed at all times. This means reading the QTH list in both CQ and QST, since the lists are relatively up to date and many of the calls shown in the call book are obsolete by the time they appear. Another source, which is valuable from a QTH standpoint, is the "DX-QSL News Letter" published quarterly by Clif Evans, K6BH, Box 385, Bonita, California. Clif lists (1) all the world's official QSL Bureaus; (2) a.r.r.l.'s U. S. QSL Bureaus; (3) QSL managers for rare DX stations the world over; (4) QSL QTH's of rare DX stations the world over and much additional information dealing with QTH's. Single copies are $.40 each and yearly subscriptions (four copies starting with any quarter) are $1.25—all by first-class mail. Any QSL from a DX station's QSL manager should include, with your QSL, a self-addressed, stamped envelope.

Another mistake may find out after sending many IRC's is that, in most cases, it just doesn't work. This is not necessarily the fault of the DX station as it is at the discretion of the local postmaster to redeem the IRC's and many cannot tie up the funds necessary in redeeming these IRC's. A much better way, if you desire QSL's, is to send uncancelled stamps of the particular country along with your QSL. This sounds as though it would be very expensive, however, it is usually less expensive than sending IRC's. W2SAW has a very comprehensive supply of unused stamps from almost every country and a typical example of cost is in the case of Madagascar. If you desire a direct, air mail return of your QSL from Madagascar, four IRC's ($.60) are necessary, however, the stamps which W2SAW can provide costs only $.42. My own use of these stamps was nothing short of amazing. If you are interested, drop "Sax" a S.A.S.E. and he will send you a list. His QTH is: 466 Weaver Road, Webster, New York.

Another way of keeping yourself well informed on both QTH's and presently active stations is, again, the DX pages of both CQ and QST and, in addition, through a good DX bulletin. There are many available and among the best are: The DXer, published by Sven Elfving, Solgardsgaten 15, Ornskoldsvik, Sweden, Europe; The West Gulf DX Club Bulletin, P. O. Box 450, Odessa, Texas; and DX published by Don Chesser, W4KVX, Burlington, Kentucky. A card to any of the above will give you information and the subscription rates.

That's about it for now. I'll see you again next month. Please note new QTH at the head of this column.

73 es DX, Urb, W2DEC

ham clinic

CHARLES J. SCHAUERS, F7FE/W6QLV

C.Q. Magazine, 300 West 43rd St., New York 36, N. Y.

Thoughts on V.H.F.-U.H.F. Converters

"How is it," HAM CLINIC is often asked, "that one cannot buy a good v.h.f.-u.h.f. receiver?"

The answer is relatively simple. Manufacturers cannot yet see a wide enough market to justify the large outlay of money for research, design and development.

Hallicrafters was the last manufacturer to produce a v.h.f. receiver, and this, because the military needed it.

Since World War II, the number of radio amateurs has increased in the United States by nearly 300% Many of these hams are turning to v.h.f.-u.h.f. communication. It is highly likely that one of the major radio receiver manufacturers will be coming out with a good stable v.h.f.-u.h.f. receiver before 1965, when it is expected that there will be close to 265,000 licensed U.S. hams.

In the meantime, those of us interested in the 1¼, 2 and 6 meter bands (and lower), will have to be content with converters.

Converters are much easier to design electrically and mechanically than a complete receiver and cost much less. Actually, some of the converters now available on the market, and ranging in price from $12.00 to $134.00, are very efficient if used with a good communications receiver and proper antenna system.

The two largest problems facing ham converter designers are *noise* and *image suppression*. However, if some of the new low noise tubes are used and proper circuitry designed around them, the ham designer can come up with a very acceptable converter with a good signal-to-noise ratio and tolerable image suppression.

But it is quite a difficult task for the average ham to produce a converter that will compare with commercially available equipment. This is realized when the amount of test equipment needed to produce a stable, low-noise, highly selective unit is considered.

Tapetone Inc., 10 Ardlock Place, Webster, Mass. is now producing what I consider to be "tops" in converters for the ¾ meter band. By using a double tuned cavity preselector, followed by a crystal mixer and low-noise i.f. preamplifier they come up with a low noise figure of 6.0 *db*; a gain of 20 *db;* image rejection greater than 50 *db* and i.f. rejection greater than 80 *db!* Various i.f. output frequencies (28 to 54 *mc*) are available. Their Model WTC-432 is, in my estimation, second to none in modern circuitry approach, at a reasonable price.

Converters using parametric circuits will no doubt make their appearance as interest in the very high and ultra high frequencies increases.

Tube Shields

The lead-off piece in the April, 1960 issue was "Extending Tube Life." Many requests were received relative to where one could obtain the heat dissipating tube shields which can replace the regular "glossy" and "heat holding" JAN shields.

A letter to Mr. John E. Markley, Jr., v.p. of the IERC Division of the International Electronic Research Corp., 135 West Magnolia Blvd., Burbank, California, elicited the following information: "small as well as large orders from radio amateurs receive equal consideration. IERC does not sell through distributors but deals with customers directly."

"Shields for most tubes found in the ham communications receiver or the exciter stages of a transmitter, sell for $1.00."

The following tubes (followed by the IERC shield number) are a few examples in which most hams are interested:

6CL6-TR6-6025H; 12AX7, 12AT7, 12AU-7-TR6020H; 5763-TR6025H; 6AU6-TR5020H and 6BZ6-TR5-5020H.

Incidentally, those of you who have SB-10s and are having 6CL6 trouble, try the IERC shield to cut down the heat to a good operating point.

IERC will accept C.O.D. orders from hams. Write them for more info.

Observation

Updating old receivers has been a frequent topic in this column. We realize that many hams have old receivers which they cannot or do not wish to replace with a more modern set, so it is natural for them to desire any information they can obtain which will enable them to make their sets perform better.

Now, along comes a reputable receiver manufacturer, Hallicrafters, who offers some information on improving the stability of older receivers. HAM CLINIC takes its hat off to this fine company!

Drop a card or note to Fritz Franke, Halli-

crafters Inc., 4401 West 5th Ave., Chicago 24, Illinois and ask him for the latest bulletin on the "updating" of old receivers . . . and *do* mention *CQ*.

Observed: contrary to what many hams think, most manufacturers *do* take the time and *do* make the effort (outside the regular day-to-day business routines) to help radio amateurs when the need exists. We hams must remember that it costs money to furnish technical information on old equipment; the engineers and other help of manufacturers do not (and cannot) work for nothing. So when a manufacturer (out of the goodness of his financial resources) goes out of his way to render a service that cannot normally be expected, we hams should appreciate it

75 to Hallicrafters!

Questions

Anti-mike in-motion Laws—"I understand that some States have laws against using a hand-held mike while driving. If so, which States?"

Never heard of this yet, but if there are such laws in existence, I'm for them! A ham mobileer should have both hands on the wheel when his car is in motion. If he wants to operate while speeding down the highway, then he should use a chest mike and VOX operated transmitter. Anyone have any information on which States have "anti-mike" laws? We would appreciate your help.

A.C. Load—"Does a step-down (unloaded) transformer connected to an 110 volt a.c. line take enough power to worry about?"

No, it does not.

SX-101 MK III A.V.C.—"I have been very contented with my SX-101 but it suddenly does not work on a.v.c. Tubes are OK and all parts checked with an ohmmeter seem OK. Now what should I look for?"

Check V_7 (6BJ7) again. Make certain that S^4 is making contact and does not have loose connections. Recheck R_{12}, 100K resistor which connects to terminal #6 of T_1 feeding the 6BA6, V^4.

Panadaptor BC-1031A—"I own a surplus panadaptor BC-1031A, but the gain control does not work, even though it checks out fine. Any suggestions?"

Yes: Check C_{101} (.1 mf) capacitor in the cathode of the bandpass amplifier—bet it is shorted.

Apache & SB-10 (Again!)—"You must receive a lot of mail on the Apache and SB-10 but here's another. Tell me, I connected up the SB-10 and TX-1 as directed using a Dow relay and it worked fine. Recently, I decided to look inside the SB-10 and check it over. In disconnecting the wires, I flashed one against the chassis, and since then, my VOX won't trip my antenna relay. Before I dig in, what should I look for first?"

First check the line filter coils on the accessory socket, Pins 2, 3 and 4. Then make certain that your a.c. input line is on the correct terminal of the SB-10 connection strip. Bet you blew one of the small line chokes

SB-10 Stability (and again!)—If you run into a small amount of instability in the final of the SB-10, bridge the final coil (in the 6BQ5 output) with a 2 watt 8000 ohm resistor. Neutralization will more than likely not be necessary. (Thanks, and 72 to AL, EA4BF)

Mechanical Filters: "I obtained one of the Collins mechanical filters (discontinued model), I'm going to use it in one of my receiver i.f. stages. Are there any technical or other precautions to be taken in using this filter for such an application?"

Yes. Anytime a mechanical filter is used in bandpass circuits, there are certain precautions that must be taken if full advantage is to be derived from its steep skirt rejection capabilities. First, short wires must be used between the filter terminals and the termination circuitry; and there must be effective shielding between the filter input, shield and output. These measures prevent the input signal from partially bypassing the filter through inductive or capacitive coupling or ground loops.

These Collins filters now go for $26.50 (as long as they last) and come in 2.1, 3.1 and 4.0 *kc* bandwidth. They can be used in s.s.b. circuitry as well as in receivers.

For a terrific application, see the March-April 1957 (Vol. 12-No. 2) of GE *Ham News!* This issue contains full information on constructing a 455 *kc* mechanical filter receiver adapter. It replaces the first i.f. tube in nearly any receiver having a 455 *kc* i.f. system.

You can obtain one of the filters from Collins at its Burbank, California plant, as well as full information on these wonderful electronic marvels.

Information relative to the use of mechanical filters in s.s.b. circuitry can be found in Stoner's *S.S.B. Handbook*.

Drake 2-A Receiver—"I have a chance to buy a used 75A-1 receiver to which I would like to add a product detector for s.s.b.; but I also have my eye on the Drake 2-A receiver. We all know the fine reputation of Collins equipment. What would you do if you had a choice to make?"

Personally, I'd take the Drake 2-A. It is a triple conversion superhet using crystal controlled high frequency oscillators, a highly stable variable oscillator tuning the same range on all bands, and a steep-sided *LC* filter at the 50 *kc* i.f. for selectivity.

It has separate r.f. stage tuning and any incoming signal can be quickly peaked—there is no "broadband input" compromise. It has two detectors and its claimed sensitivity is greater than the 75A1; less than ½ microvolt for 10 *db* signal to noise.

Although I do not yet own one, I intend to. Its light weight, 14.5 pounds, appeals to my "wandering spirit."

I did own a 75A1 and it is a very fine receiver mechanically and electrically and many hams are still using them. In this instance, I *personally* suggest you take the Drake.

HQ-140—"My HQ-140 has operated fine for me a very long time, but lately I notice that the slightest vibration affects received s.s.b. signals. Any info?"

Yes. First check the swaging of the oscillator section variable tuning capacitor. Sometimes, with use, a plate will work loose and it's a hard "ziggidy" to find. Next, check the retaining nuts on capacitor tuning compartment for tightness. Check all loose wiring. This set is built like a battleship and this is the first instance we have heard about mechanical instability.

NC-125 Backlash—"Ever since I had my NC-125 I've had backlash in it. What's the cure?"

In shipment sometimes the anti-backlash gears in this receiver become unwound due to shock. To correct it, set the band spread pointer at zero on the logging scale. The bandspread tuning capacitor should be fully meshed. The white metal gear should be set so that its long set screw is ⅛" from the stop pin (this long set screw serves as a stop on the other end of the tuning range). With the bandspread tuning mechanism in this position, loosen the set screws and slide the white metal gear out of mesh. Wind the free brass gear one tooth and re-engage the white metal gear.

General coverage may be set up in the same manner, except the general coverage pointer should be set at 100 on the logging scale. Final check of proper positioning of the dial vs. tuning condenser would be made on a known frequency (local BC station). That's all there is to it. *Thanks* National!

32S1 VOX Improvement—"The VOX circuit in my 32S-1 seems overly sensitive to outside noise. Any modifications out on this?"

Yes. Write Collins and ask for Bulletin No. 1, dated 6-30-59. The modification involves adding capacitors to roll off the high frequency response of the VOX circuit. Voice power is centered in the lower frequency range and sensitivity to the desired voice signal will not be affected; however, a considerable reduction in response to room noise will occur. Operation of the VOX circuit varies greatly with the type microphone used and the operator. A switching transient is eliminated (which causes VOX instability) by adding a 2 *mh* choke. Changing C_{118} from .01 mf to .1 mf will result in improved breakin operation on c.w. Changing C_{119} to a .022 mf condenser will increase the hold-in time of the VOX relay. The bulletin recommends the changes only if the VOX operation does not suit you.

Here are the detailed modification steps for those too lazy to write Collins: 1. Lift cover of unit; 2. remove two screws on top of the unit. Retain. 3. Remove four legs on bottom of unit. Retain. Slide out Chassis. 4. Locate C_{119} (.01 mf capacitor) between pin 5 of V_{10} and VOX relay contact. Remove and discard. Replace C_{119} with a .022 mf capacitor, 400 volts $\pm 10\%$. 5. Locate C_{118} (.01 mf capacitor) between pin 1 of V_{14} and pin 2 of V_{10}. Remove and discard. Replace C_{118} with a .1 mf capacitor, 400 volt. 6. Add a .0047 mf capacitor C_{179} from pin 1 of V_{14} to ground lug. 7. Add a 100 mmf capacitor, C_{180}, from pin 2 of V_{14} to ground lug. 8. Add a 2 *mh* r.f. choke, L_{28}, from tie point on terminal strip, directly in front of CARRIER BAL pot which is junction of .01 mf capacitor and b.f.o. test coax to convenient ground lug. 9., 10, and 11: slide chassis back into unit; replace 4 legs and associated hardware and finally, replace 2 screws on top of unit.

Units above serial number 1475 will have all modifications incorporated; and there is a possibility that *some* of the units below this number may have *some* of the modifications. *Thanks* Collins!

417A Converter—"*CQ* ever print an article using a 417A in a two meter converter?"

Yes. See the March 1956 issue and W6AJF's FB article.

HQ129X—"Where can I get some info on improving an HQ129X?"

See the April 1952 issue of *CQ*.

CW Monitor—"How about a real simple circuit using a transistor or two for a c.w. monitor?"

See fig. 1. Potentiometer R_1 is adjusted for the desired tone. The pickup coil may be placed anywhere near or in the transmitter. If the gadget doesn't immediately "take-off" reverse the primary winding connections of the transformer.

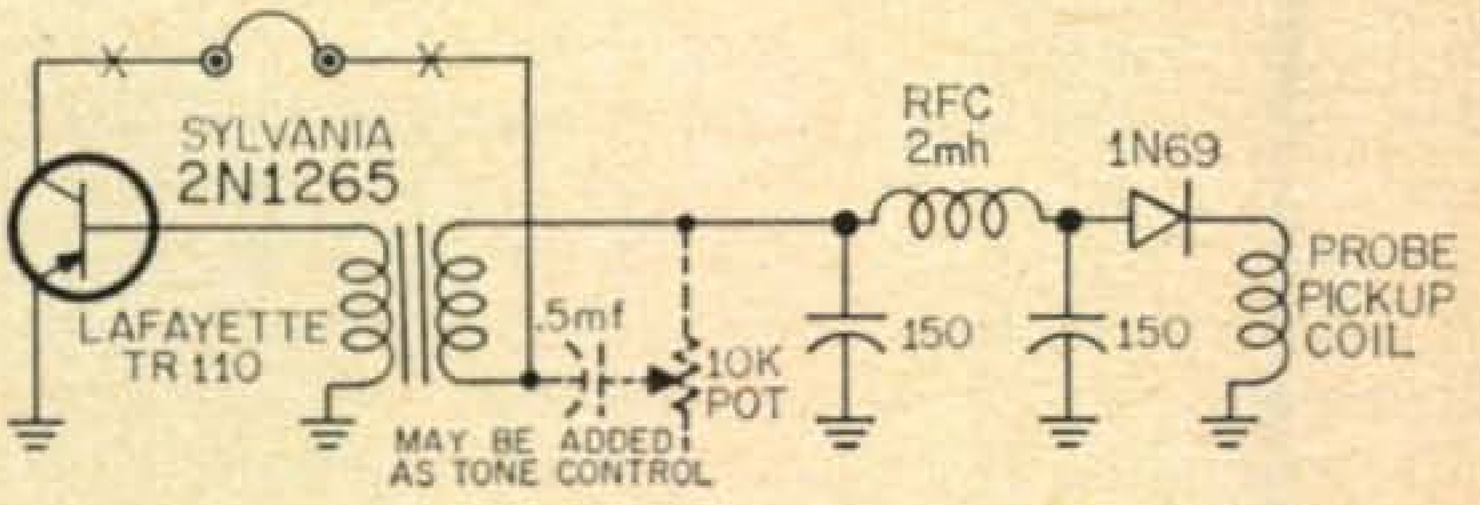


Fig. 1—Circuit of a c.w. monitor.

Viking II Feedback—"On 10 meters I get audio feedback and can hear the modulation transformer talk back. Any simple cure?"

Not for the transformer, but if you will place a 2½ *mh* r.f. choke in series with mike input to V_1 (6AU6) and by-pass it on the grid side with a .001 mf ceramic capacitor, this will help to cut down the feedback. Are you sure you are not "hitting" your audio a mite hard? This will cause transformer chatter. Another thing, make sure that your antenna is terminated properly and that you *do* have a good ground.

Full Transmitter Design—"How about designing a transmitter for me. It should have the following specifications. . . ."

Sorry, HAM CLINIC does not do complete equipment design; there isn't enough time available to do it. Suggest that you consult *CQ's* index (available from the office for a self-

[*Continued on page 160*]

VHF

BOB BROWN, K2ZSQ
67 RUSSELL AVENUE
RAHWAY, NEW JERSEY

50mc. 144mc. 220mc. 420mc. and above

There has been quite a bit of chatter lately regarding new commercial equipment available for the v.h.f. bands—And with good reason! A lot has been said pro and con commercial gear, but the fact remains that a large percentage of the v.h.f. fraternity does invest in manufactured equipment.

For example, while I was enjoying myself at the East Coast VHF Society's Hamfest on August 14, I got a chance to talk with Verne Robertson, W1EGE, of Tapuetone, Inc. Also got a peek at their new WTC series converters for 432 and 1296 *mc*. Verne tells me of a *Japanese* company that is putting out 6 and 2 meter converters en masse. Just about everyone is realizing the potential in today's v.h.f. gang. When the Japanese industry starts putting out v.h.f. gear there is no question about it!

Took a drive down to Asbury Park last week to see what Telrex had to offer and was really shocked! I'd heard a few fellows on six with eleven element arrays and found out that W2-BDS has three models in production, from 27 to 47 feet in boom length with up to 19 *db* gain. Couldn't resist the temptation and bought one on-the-spot and must say that they really live up to their claims. This time last year anyone with a 6 element yagi on six meters was considered to have the ultimate—now it's an 11 over 11! What next?

Great strides have been made in v.h.f. work in the last few years and I'm sure that with the things to come from commercial manufacturers even more records will be broken in the very near future.

CQ's Century Club Awards

It has been some time since these awards have been mentioned through this v.h.f. column. With the increase in activity and population on our bands above 50 mc certain changes must be made in this award. First off, I'd like to mention that a *new certificate* is being run off for this purpose. This new award is offered to all v.h.f. enthusiasts the world over as follows:

1.) The *CQ Century Club Award* is offered to those who have met with the following qualifications *in one year's time* . . .
   A) 50 *mc* entrants must show a list of *150 contacts* within one year with the proper QSL's on hand to present as verification if requested. This list must consist of just those whose card you have received. Each entry must have the call of that station and the date worked. Number them one to one hundred fifty in any order they may occur (Chronological listing is not necessary.) Make sure the two dates furthest apart do not exceed one year between.
   B) 144 *mc* entrants must show a list of at least *100 confirmed contacts* with the information above.
   C) 220 *mc* entrants must show a list of at least *50 confirmed contacts* with the information given under 50 *mc* award.
   D) 432 *mc* entrants must show a list of at least *25 confirmed contacts* with the other information given under the 50 *mc* award.

Certificate

ROHO Certificate

The handsome certificate displayed in this column is offered by the Royal Order of Hootowls. In order to qualify, you must work a member between 2400 and 0100 local time on

This neat certificate is offered by the Royal Order of Hootowls. See certificate item in this month's column.

Saturday night on the six meter band. No "relay" nominations will be excepted . . . All QSO's must be point-to-point. Member station must write giving date, call, full name, certificate number, and also the date, call, full name of the station being nominated. Nominated stations must enclose 50¢ to cover printing and mailing. Mail nominations to: *Lee M. Singleterry, Sr., W7YJE, 1914 Ballinger Road, Seattle 55, Washington,* giving full information—by member station. Annual Picnics are held for members regularly.

Here's just some of the tremendous turn-out at last year's East Coast VHF Society's Annual Dinner. Plan on attending this year! Details next month. (Photo courtesy National Electronics)

2.) Each list must be accompanied by a statement reading, "We, the undersigned, hereby verify that Joe Smith, K5XXX, displays the cards listed from actual on-the-air contacts." This statement must be signed by at least two witnesses (preferably licensed amateurs).

K2HAC's shack when it's clean!

3.) The cards themselves may be sent instead of a list but adequate postage must also be included for their return.
4.) There is no limit to how many certificates one may earn. How many can you get in one year's time?
5.) Lists and statements should be mailed to: *CQ* Century Club Awards, c/o Bob Brown, K2ZSQ, 67 Russell Avenue, Rahway, New Jersey.

Certificates will be dated bearing the date of the first QSO listed as well as the very last. Thus you can take off on a new award from the last date appearing on the certificate. Good luck with the certificates, boys. Those with outstanding records of several certificates within one year's time will be mentioned in this column.

CQ World Wide VHF Contests

Due to an editorial change in this department there was no August *CQ* WW VHF Contest this year. We know how many fellows were anticipating it. At this time we'd like to announce that the *next contest will be held in February, 1961,* and the following one in August. More details will be available in the near future regarding the dates, times, multipliers, etc. We *can* tell you that this is going to be the biggest v.h.f. contest ever run, with power multipliers for the low power men, 24 hour multipliers for "No-Dose" addicts, and more opportunities to get that new section or state than you ever dreamed possible Make a mental notes to get your club out "thar" on that mountain top QTH in February. There will be trophies, plaques, and certificates for the winners!

More Words On CW

I've been quite pleased lately to notice the change that has occurred in our 100 *kc* segment on 6 meters. More and more fellows are using the 'ole key jack and working new states. Just heard, for instance, that Ed Clegg, W2LOY, snagged Wyoming and Montana on aurora the other night. Boy, could I use those states! And there is no excuse for it either—Been doing too much phone work. The 2 meter men haven't fallen by the wayside either . . . not by a long shot. C.w. has a lot to offer there in the form of tropo work and meteor shower, to name a few. So, boys, let's get with it—Dust off your old J-38 and snag some choice v.h.f. DX.

Proposals

Speaking of c.w., just take a good look at the 144 *mc* band. For years now there has been an unofficial understanding between 2 meter men regarding allocations. You'll notice that the lower 100 *kc* is more or less exclusively used by the c.w. DX'ers. There is no quarrel about it, just plain common courtesy. The 'phone men stay up above 144.1 while the c.w. men make the most of 144.0 to 144.1 *mc*.

The same thing was done on 50 *mc*, up to the time that our lower 100 *kc* segment came into effect. Our aurora DX men found the first 100 *kc* almost completely free of 'phone QRM during that condition. Now 'phone operation above 50.1 is mandatory. More and more lately I've noticed the 50.1 to 50.2 *mc* segment being used for extended ground wave work, aurora 'phone, and various other forms of propagation—to their fullest. Almost every night, though, a W2 working into Rhode Island or Massachusetts is plagued by local QRM. I propose an unofficial segment of 50.1—50.2 *mc* expressly for this purpose. Local rag-chewers will find that even now, more and more of the boys are moving up above 50.2 *mc* just out of common courtesy. The second hundred *kc* is where you're

Here's a view of Bob Morrison's (K2RRG) 6 meter station before he left for W8—land.

going to find your DX anyway and I'm sure it will be much appreciated if, when you get in to a local chat, you QSY above 50.2 *mc.* Another point to consider is that stations outside the metropolitan areas use the bottom edge of the band and, if you're looking for these boys, that's where you'll find them. I can recall without much difficulty many QSO's that have been broken up by locals unintentionally. Around the New York City area, for example, many stations are already complying with this arrangement, making long-haul ground wave contacts possible once again. Our thanks.

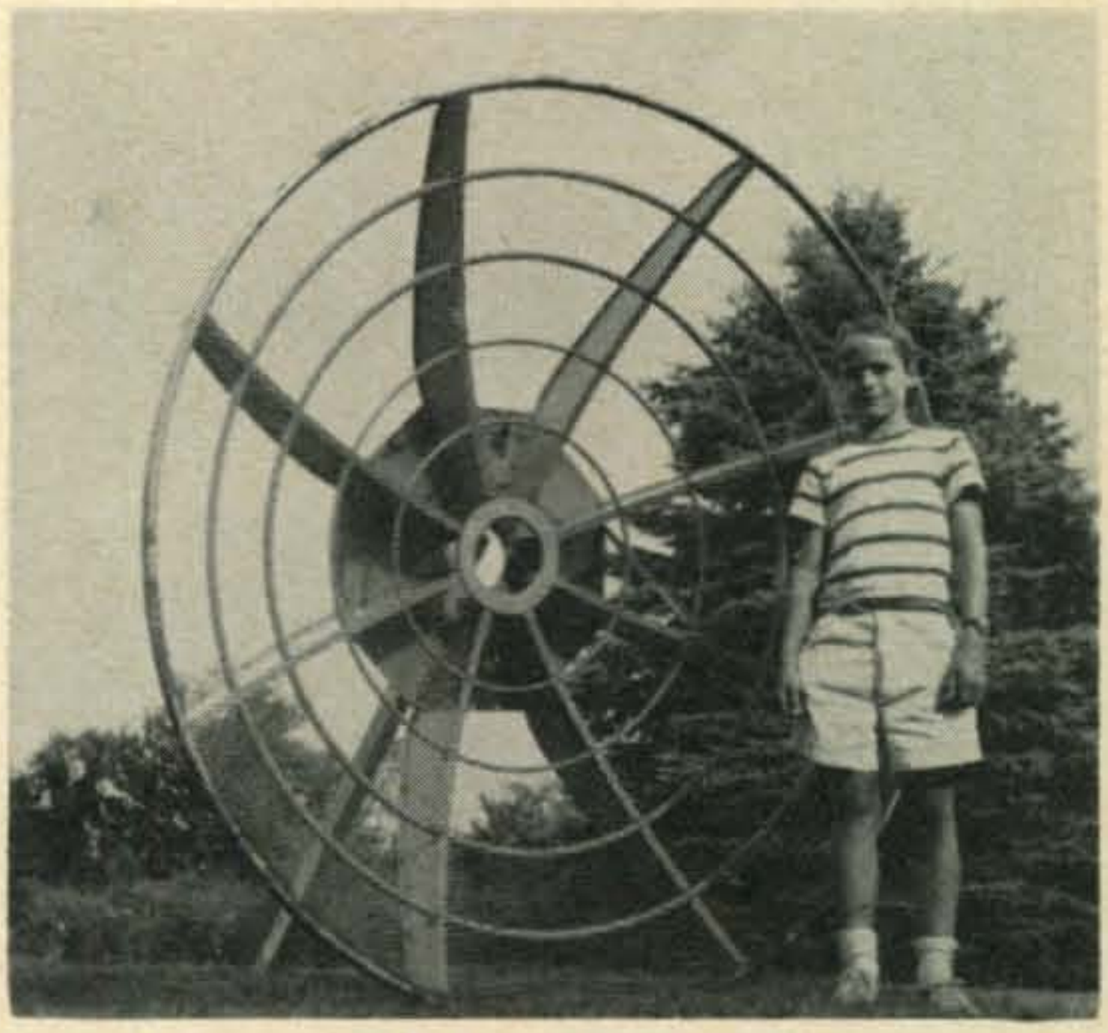
Propagation

As mentioned last month, my own personal interest in v.h.f. is mainly one of extending my own "working radius" or, rather, improving upon my knowledge of propagation and its effects on v.h.f. I've found, though, that quite a bit of the knowledge required is operating skill rather than a complete understanding of propagation. I know very few v.h.f. operators who are "authorities" on all the propagational phenomena, but many more of our various "DX-'ers" are good sharp operators with just a little more understanding and fundamental knowledge of one phase of propagation. Good examples of operating skill are W2AZL, KH6UK, K2MUB, W4GJO, and countless others who are recognized by their courtesy on the air and their ability to work out when "the band is dead." *Skill and know-how go hand in hand.* Most fellows, though, are thoroughly convinced that they can't work DX except when the band is "open" (Sporadic E and temperature inversions) so spend most of their time working locals. *This is the greatest hinderance to the furthering of v.h.f.* All too many fellows shun the word "propagation".

If you'd like to know more about propagational effects on the v.h.f. bands, drop me a line and let me know. I'm willing to convey what little I do know about propagation as well as doing a little research on the subject. Some very good articles have been written on the subject in *CQ, QST,* and *The VHF Amateur.* I have, by the way, several back issues of the latter with an article on the *Troposphere* by Bob Morrison, K2RRG, which I'll be only too happy to send along. Just drop a line and let me know.

Sporadic *E*—Mapping System

While we're talking about propagation, I'd like to announce that, in the near future, we'll be running an extra feature in this column—A mapping system of 6 meter Sporadic *E.* This has been done in the past, but not so recently, and, it appearing that our beloved *F2* will be no more for another 8 years or so, it is almost imperative that we make the most out of Sporadic E. This form of cloud ionization is responsible for "openings" which have been occurring off and on all summer, enabling us to make contacts 800-1100 miles away with S9 signals. The object of this mapping system is to learn more about how it happens, where the cloud is (a disputable subject, generally thought to be in the center of the two points, i.e. between W4 and WØ, etc.), and, most of all, to determine the pattern. Maps will be sent to prominent stations in each area on which records of cloud approximation and length of duration as well as the actual extent of the opening may be recorded. These maps will be correlated and compiled and the net result of each individual opening will be printed, if all goes as planned. In checking with some of the local gang, I find quite a bit of interest in the subject, and W1DEI and K2MUB have already agreed to help all they can. If you have the time, please let me know. As soon as I hear from enough of the boys, we'll get started.



K1AUD's new 6' dish for 3,500 *mc.* Wayne wants me to mention that the boy in the picture is *NOT* K1AUD—hi!

Echo One—Satellite Work

Numerous reports have been received regarding work "via satellite scatter". Quite a bit of interest has been provoked with questionable results. At this writing I have not yet been able to confirm any, but we are trying. Many con-

tacts which had been believed to be satellite scatter proved to be the results of the Perseids Meteor Shower which occured at practically the same time as the Echo One was released. We suggest you check George Jacob's (W3ASK) "Space Communications" article for more details on this.

For example, John, W7RT, feels the balloon possibly had something to do with the "opening" —due to the brief period KL7FLC was heard on August 19 at 2345 PST. (Thanks to W7MKW for this note.)

John T. Neuner, W3AGT, writes:
"On Tuesday, August 16, 1960, at 7:30 p.m. EDST, a two way contact on 50 *mc* was made and maintained for a two minute period between this station at Pittsburgh, Pennsylvania, and VE1BC at Halifax, Nova Scotia. Each station had *two complete transmissions* making it an acceptable contact.

"Now this in itself is not unusual, but for the fact that at that time there was no recognizable phenomena or propagation aids such as Sporadic-*E*, aurora, etc. However, the satellite Echo One was pasing over and was at an angle of approximately 22½° above the horizon and due east of my location with my antenna beamed directly at it.

"I do, of course, accept the fact that this could have been the result of some unstable band conditions such as have been experienced by many, but also it could have been perhaps a "first" Echo Bounce between Nova Scotia and Pennsylvania on 50 *mc*. I do like to consider it as such in the absence of anything to the contrary. Who knows? Maybe Bill, VE1BC, and I have been installed in a small niche in the progress of space communications." *What do you think, fellows? Let me know your opinions on this matter. I know very little about the "bounce condition" except what I've been able to find out recently, and certainly not enough to rubber stamp this one way or another. Let's hear from you.*

Wayne K1AUD, looking as he did before he snagged that Maine contact.

Trade—432?

Just got a letter from **Norm Shaw, W8GVG,** with his comments on a very-much discussed topic:

"I am very much in favor of your proposal to trade the lower 12 *mc* of the 420 to 450 *mc* band for one KW on the remaining portion (18 *mc*) —resulting in an amateur band between 432 to 450 *mc*. I do think all the amateurs on these frequencies or those contemplating such use, should go along with this proposal." *Well, Norm, there are a lot of boys behind you—agreed . . . you have a point.*

I wholeheartedly believe that something can be done about the situation. In all actuality, the first 12 *kc* aren't being used, as most boys triple up from 144 *mc* landing on 432 *mc*. And if you don't believe the *kw* wouldn't be appreciated, just ask KH6UK! No action can be taken until enough interest is provoked to warrant it. We suggest you write a letter to: Federal Communications Commission, Washington 25, D.C., and also the ARRL regarding the matter. The FCC will act if enough people write about it. Your letter counts! Don't put it off!

First Washington 50 mc WAS

Good 'ole Hugh, W7MKW, sent a line along regarding latest 50 *mc* doings in his portion of the West Coast.

"On Sunday, September 4, 1960, at 2220 PST, W7RT began hearing the automatic call wheel of KL7FLC on Fletchers Ice Island . . . 20 minutes later the ice floe station stood by for calls and W7EMX of Bellevue was first Puget Sound station to QSO him. John, W7RT, worked KL7FLC for #50 for WAS at 2255. The signals from KL7-land remained "in" for about an hour and a half with W7RDY (Everett, Washington) completing 50 *mc* WAS at 2350 PST with a KL7FLC QSO. At 2353 Ken, W7INX, of Portland, Oregon, racked up state #49 by working KL7FLC (Ken is shy only KH6 now).

"These KL7FLC contacts enabled the first two 50 *mc* WAS by Washington stations, and were first Washington—KL7 contacts on 50 *mc* since Alaskan statehood . . . a big night!"

FY7YC/FM7—Martinique!

Just got word that FY7YC is active on 50.040 *mc* c.w. and phone. Power is 60 watts. Rig is screen modulated. Antenna is a 4 element beam —Rcvr, BC 342 and crystal controlled converter.

Wayne (K1AUD)'s shack showing the 250 watt final for 6 meters among other juicy equipment.

Another new one—FM7WU is active on 50.060 *mc* c.w. and phone also. For more information and skeds write via WA2ASM.

Keying the 829B

Dick K1CXX, of that rare state of Maine lets loose with a little item of interest.

The accompanying diagram, fig. 1, is the circuit he uses on the 829B final on his 6 meter rig. Dick keys the cathode of the 5763 which he uses as the driver. With the key up the plate current is under 10 mils. The 6BQ6 is a much better clamp than the 6AQ5 tube. "This circuit could be added to the rig described in the June issue of *The VHF Amateur*," Dick says, "or any standard 829B rig. As usual," he continues, "parts and values used were what we had in the junk box so values used may be off some from the accepted values for this type of circuit."

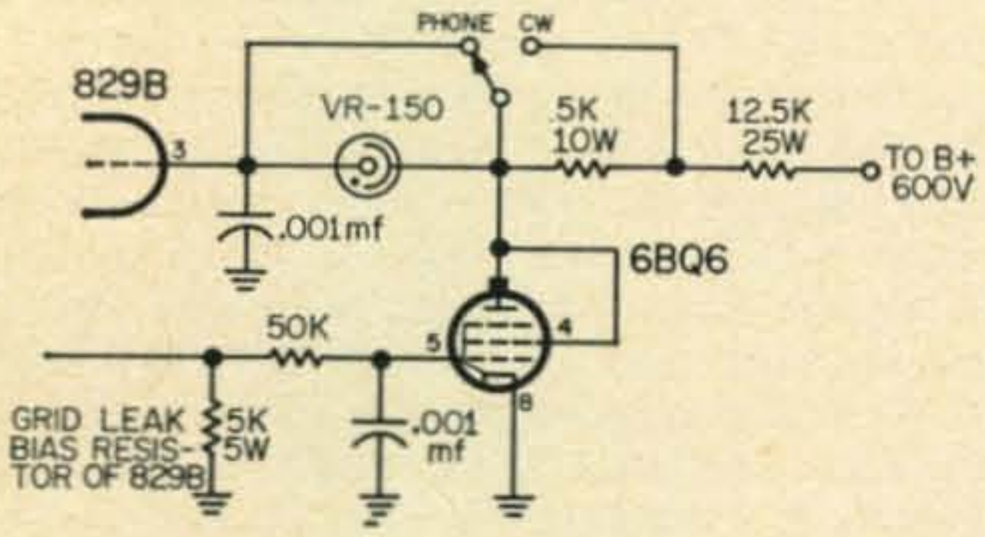


Fig. 1—Clamp circuit used in the final of K1CXX's rig.

Mike Pre-Amp

Another item, from Jack, K2HHS, via WA2INO, is a transistorized mike pre-amp shown in fig. 2. Although not a "v.h.f. only" item, we think it is worth mentioning. As shown in the schematic, a switch is used to vary gain from 11 to 26 *db*. 40 *db* gain is attainable if the 68K resistor is eliminated. The entire unit can be built in a 1½ × 2 × 2½" *Minibox*.

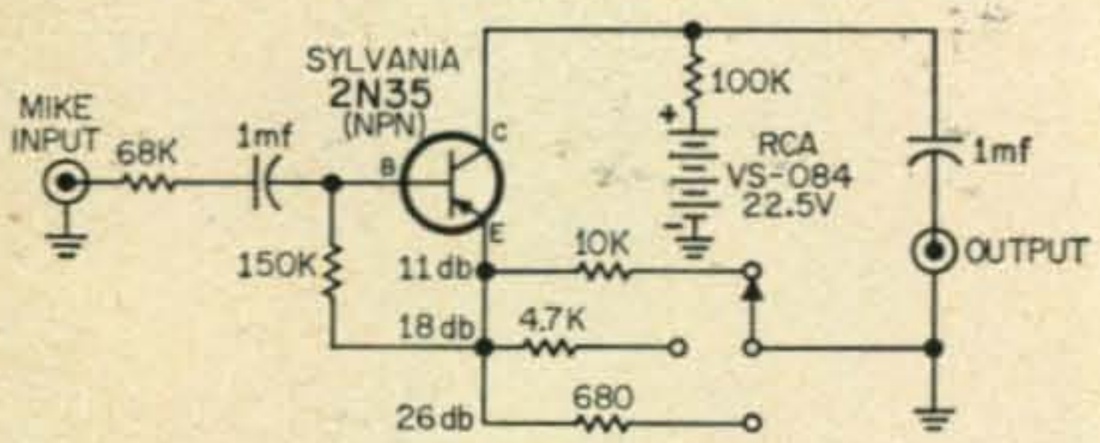


Fig. 2—Transistor preamplifier used by Jack, K2HHS. A gain of 40 db is possible as explained in the text.

Note

Please send your letters, pictures, etc., to me by the 5th of the month. Address is at the head of the column—Use that QTH . . . Any mail sent to the CQ office in New York is just forwarded to me anyway, resulting in delay. The success of this column depends solely on you. write now!

Mailbag

Lethbridge, Alberta, Canada: W1GEF sent us the following card he received from Bob Henry, VE6DB . . .

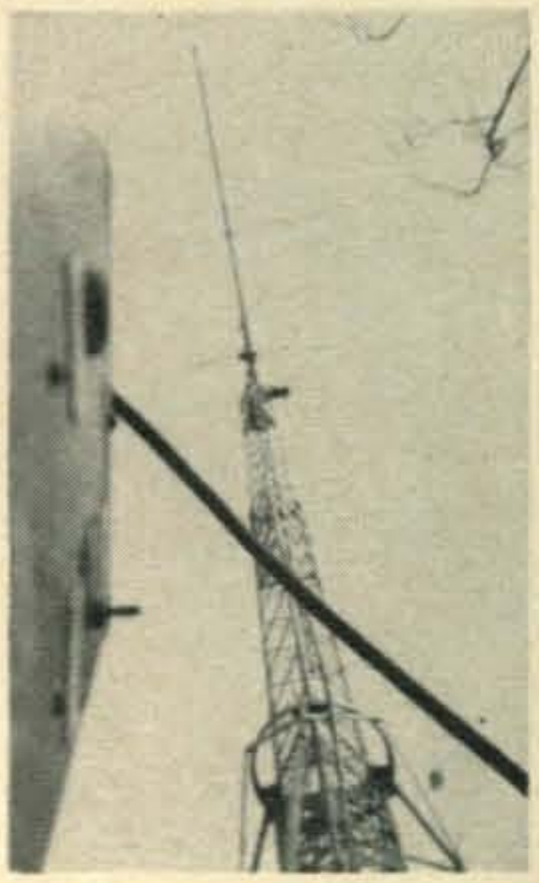
"I heard you on aurora reflection on August 16 when we had a fairly fb show of it. Your signal was Q5 S6-9 for at least an hour as far as I remember and very Q5 as long as I heard you. I called you several times but had only about 14 watts and I guess that was not enough. My frequency is usually about 50.285 but at times I'm on 50.04 A3 or 50.25 *mc*.

"I heard many from W1, W2, W3 and W4 and also W9 and WØ—as well as Canadian VE3 and VE4. The best I could do was to work VE4, W9 and WØ. Hope to have 100 watts soon so I may be able to get through to your land then. There are several on in Lethbridge (6 meters) now and all would be glad to work down your way. Pass the word if you don't mind and we may have a bit of fun out of it some night." *Our thanks, Art, for Bob's words—And to you, Bob, we'll be listening, hi! Try c.w. on your 50.040 mc rock, as so many stations are on during aurora nowadays we have QRM just working state-siders. Keep the news coming, Bob!*

Westport, Connecticut: Wayne Van Dyck, K1AUD, the "voice of Connecticut," emits with . . .

"Am in the process of getting settled down at the college QTH in Lancaster, Pa. Hope to have the 'ole rig on from there soon.

"Worked K1IIM/1 in Maine on ground wave Sunday morning, August 28 (1135). New state for me! First with the 250 watts running 10 to 15 *db* over S9 then with the Gonset II barefoot, still above S9." *You're making us drool, Wayne. Keep up the good work—but next time please don't mention your checks with the Communicator. Let me accredit it to your high power, at least—To think . . . I was on that day and didn't hear a thing. Oooooh!*



K2RRG's six-over-six for six meters on a rotating tower. Control box at the left is for automatically lowering and raising the tower.

Wilbraham, Massachusetts: Bill Rosner, W1RFU, comes through with the following notes on his activity during the June VHF Contest . . .

"Made quite a run of it on 220 *mc* as well as 50, and 144. On 220 *mc* alone I worked W1NB-

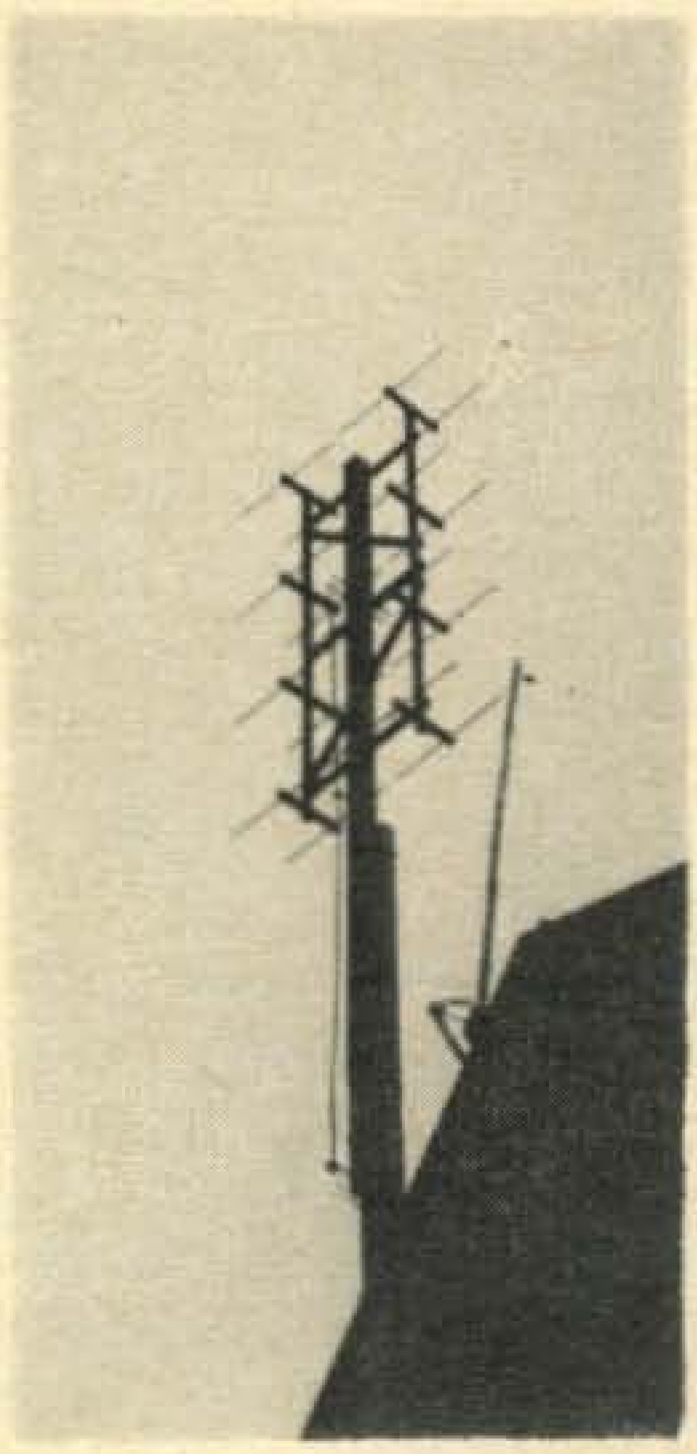
N/1, K2CQG/2, W2LWI, W2ALL/2, W1MHL/1, W1AJR, W2BVU/1, K2QJQ, W2JGJ/2, W1UIZ/1, W1HDF, W1YDS, K1GAY/1, and W1OOP. Condition did not seem too good most of the time.

"Where were all the S.N.J. stations? I didn't work this section on *any* band. Did work W3JZY/3 (Maryland) on 6 and 2, though.

"Looks like we'll have some 1215 *mc* work in the Springfield, Massachusetts and Hartford, Connecticut area with converted *APX6's*. Forty-five units are in this area, but not all on.

"I built up a 220 *mc* 13 element long yagi Saturday AM before the contest and put it above the 6 meter beam. Seemed to work OK." *Congratulations, Bill, and keep up the good work. And don't forget about our CQ WW VHF Contest coming up in February!*

K1AUD's 6 meter five-over-five array on a homebrew 50 ft. tower.



LU3DCA's 16 element 432 mc collinear array

Minden, Louisiana: Ernie Brown, W5FYZ, writes:

"A few notes from my 144 *mc* log—added W4AIB, South Carolina; W8PT, Michigan; and W9IXF, Wisconsin, via tropo earlier during the summer for states #16, 17, and 18. the biggest has been during the Perseids meteor shower August 9-15. Kept skeds with eleven stations per day and have confirmed, taped QSO's with W7LEE, Arizona; W7RUX, Arizona; WØMOX, Colorado; W2AZL, New Jersey; W3TDF, Pennsylvania; and W1REZ, Connecticut. The latter QSO is first Louisiana—Connecticut QSO on 144 *mc* as far as I know, and believe the same for WØMOX in Colorado. This brings states total up to 23 states, 9 call areas and maximum distance up to about 1250 miles. Am looking for skeds with new states during the December shower! Need several East Coast states: New York, Ohio, West Virginia, Indiana, Delaware, North Carolina, Iowa, and the Dakotas. Maybe some of the gang needs Louisiana too." *I know so, Ernie! Thanks for a very informative and newsy report. Let's hear from some of the other 2 meter men!*

Auburn, Maine: More words from Dick Huntress, K1CXX.

"We have received letters from fellows out of Maine asking about 220 *mc* activity. At present the only station really set up for that band is W1WAS in South Portland. We can't find anyone to test our gear with, and are quite disappointed with the whole thing at present. We have an 832 final at 20 watts with a homebrew 7 element beam. I believe the frequency I am on is about 20 *kc* from the low edge of the band. We have never had a two way QSO on 220 *mc* yet. Am still waiting for K1HAV to get an SCR-522 converted to the band but he keeps running into trouble.

"As usual on weekends we will be operating from our camp on Lake Maranacook in Winthrop, Maine. We will be using a homebrew 6146—6L6's modulating. This is a much quieter location (using 40 watts to 3 element beam) than in the city so we do all right out there. I built a c.w. monitor described in *The VHF Amateur* and has helped quite a bit on aurora.

"We work W1EXZ over in Danville, Vermont, on 6 meters a couple of times a week. This is a 100 mile obstacle gain path over Mt. Washington, New Hampshire. Signals are always S6-7 on phone. Bob has just gotten on 2 meters and is equipped for 220 *mc* also but he has the same trouble we have here; no one local to test with and stations to advise on ironing out the bugs. He has a 2E26 and an 11 element Cushcraft on 2 meters. He also has an 832 and homebrew beam on 220 *mc* and will be looking for stations during the next contest." *Thanks again, Dick, for news on the "unpenetrable Maine" activity. How about pushing those locals a little harder? They'll all give in sooner or later once they've given v.h.f. a half-way good chance!*

Lethbridge, Alberta, Canada: Another Lethbridgian, Dave Forster, VE6FF, writes . . .

"To add a few comments on last month's

[*Continued on page 161*]

Space Communications

GEORGE JACOBS, W3ASK
11307 CLARA STREET
SILVER SPRING, MARYLAND

Editor Speaks

I want to thank the many readers of this column who took the time to send me their comments concerning the initial Space Communications column which appeared in September's *CQ*. Many of the more than 100 cards and letters received contained valuable suggestions and ideas which will be reflected in future discussions in this column.

It is intended that this column serve as a focal point and as a forum for radio amateurs interested in the field of space communications. Readers are urged to participate by submitting news-worthy items, comments, suggestions, observations, etc. concerning space communications directly to W3ASK, the column Editor.

Amateur Space Project

One of the most interesting letters received came from nineteen year old Michael Beltran of Brooklyn, New York. Although not a radio amateur, Michael is an accomplished *amateur rocketeer*. He requests the assistance of radio amateurs in an amateur space project which would have been a good science fiction subject not too long ago, but is now within the realm of reality. Here are the details as Michael wrote them:

1133 East 35th Street
Brooklyn 10, N. Y.
'phone DE-8-3312

Dear Mr. Jacobs:

I am writing you about the firing of the world's largest amateur rocket, to set a new international amateur altitude record. To review my background, I have built 250 rockets since I was 10 years old, am President of the American Rocket Research Society, have received Army and Navy recognition of my work on high altitude research rockets, worked last summer with Dr. Wernher Von Braun at the Army's Redstone Arsenal in Huntsville, Alabama, and am presently a junior at the Polytechnic Institute of Brooklyn studying mechanical engineering.

At maximum altitude, the rocket will release a chemical contaminant (cesium or potassium, with a sodium dope) to form an artificial electron cloud. Not only will the artificial cloud be visible for several minutes, but it should be dense enough to reflect radio waves transmitted from two stations out of the line of sight. I would like to have amateur radio operators cooperate in a plan to transmit h.f. and v.h.f. radio waves up to distances of about 700 miles by bouncing them off the electron cloud. From the shape of the cloud, upper atmospheric wind velocity and cloud electron decay rate could also be determined.

My rocket, as presently envisioned, will be a solid propellant four stage vehicle, capable of attaining a 50 mile altitude. It will stand over 20 feet tall and weigh 1,200 pounds at launch. The proposed vehicle will probably be launched at one of the governmental missile ranges, perhaps Wallops Island, Virginia.

I have interested 24 magazines, 2 television stations, the Voice of America, U.S. Information Agency, United Press International, Associated Press, and the New York Times and Hearst News Papers in doing stories on the project. I also have Grumman Aircraft Engineering Corp., U.S. Army, Thompson Ramo Wooldridge, Lamtex Industries and Amrock Engineering Corporation acting as partial sponsors.

The Signal Corps at Ft. Monmouth is interested in cooperating, especially in the communications area. I would like to have *CQ* help in the communications experiments by contacting radio amateurs through your column. The project would require about a dozen transmitters on different h.f. and v.h.f. bands from 20 to 2 meters, and as many hams as possible to receive the reflected signals. The purpose of the project would be to determine the range of transmission possible and the signal characteristics. Since I know little about radio, any suggestions and help *CQ* readers could give me would be appreciated.

I am in the process of obtaining further sponsorship for this project and any way *CQ* readers could help along these lines would also be appreciated.

Thank you for your cooperation in this matter.

Sincerely,
Michael R. Beltran

Intriguing Project

Michael plans to complete his four stage rocket by early spring, 1961. By the time this appears in print he should have already test-fired the 14-foot first and second stage of the rocket at the Army's Fort A. P. Hill (Virginia) missile range.

Michael estimates the cost of the entire project at about $25,000. He has already received considerable monetary and material support from the sources mentioned in his letter, but more is needed. An assist from the amateur radio fraternity could go a long way towards the successful completion of this project.

Successful experimentation involving the reflection of radio waves from artificial electron clouds has very practical importance in the field of radio communications. Previous experiments of this kind sponsored by the Dept. of Defense (Project Smoke-Puff, in which dozens of amateurs in the southwestern part of the country participated) proved to be successful in establishing temporary v.h.f. communication well beyond ilne of sight. In addition, radio amateurs may be able to suggest other communication experiments for which Michael's rocket could be used. Valuable assistance could also be given Michael in designing electronic control and telemetering circuits.

There are many intriguing aspects to this project. Not too long ago a 50 mile high amateur built rocket and a man-made ionosphere would have been good subjects for science fiction. Today, by working together as a team, these accomplishments appear to be within the realm of reality for both the amateur rocketeer and the radio amateur. But perhaps most important of all, here is a marvelous opportunity for the radio amateur fraternity to exhibit some of that pioneering spirit so many of the "old-timers" fear no longer exists.

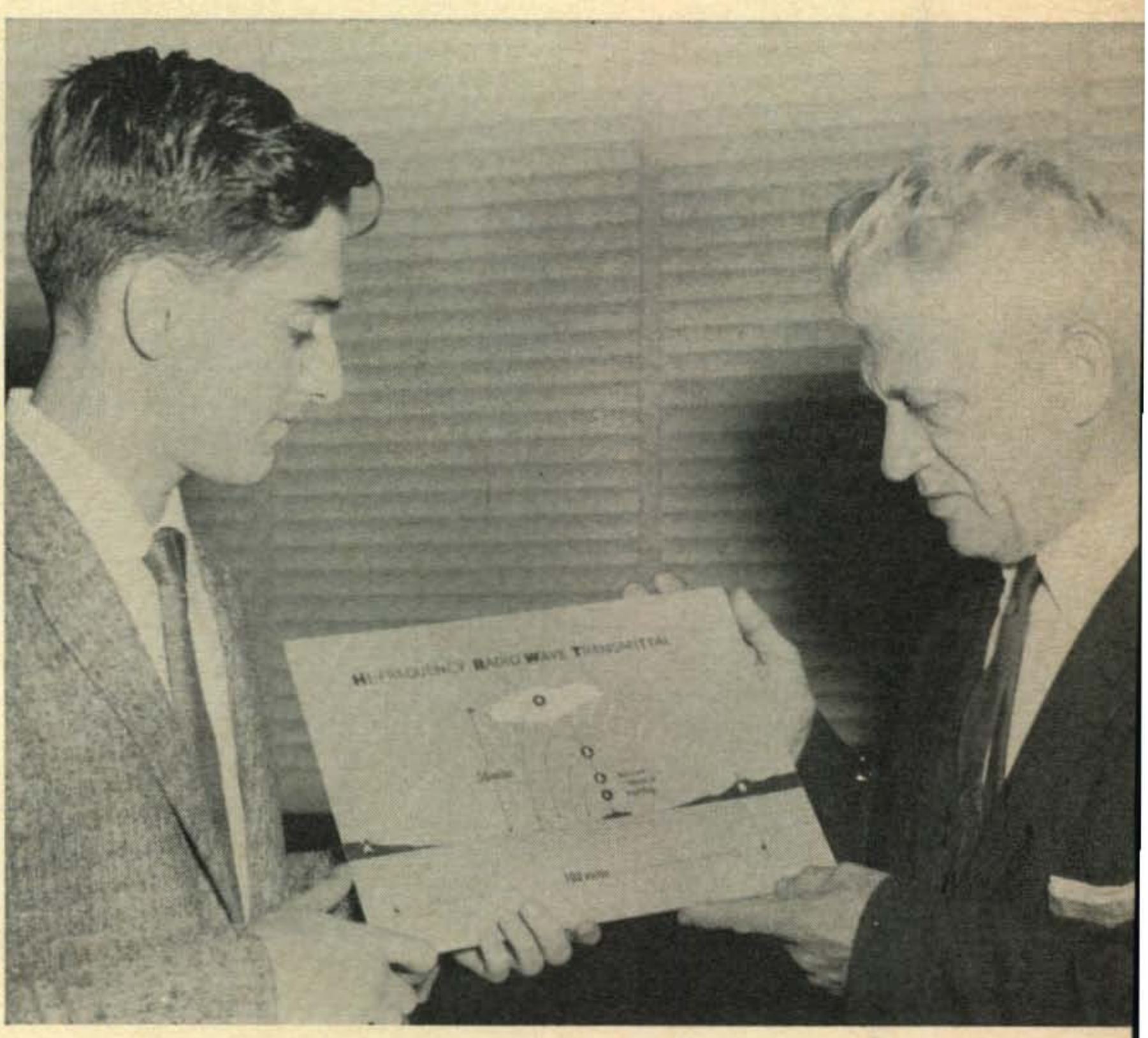
There will be more details about this project as it develops. Meanwhile those interested in assisting in the project can contact Michael Beltran directly at his home address, 1133 East 35th Street, Brooklyn 10, N. Y.

Project Echo

Echo, the 100 foot balloon satellite successfully launched by the National Aeronautics and Space Administration (NASA) on August 12th, made communications history. Designed largely to test the feasibility of u.h.f. radio telephone communication between the Bell Telephone Labs at Holmdel, New Jersey and NASA's Jet Propulsion Lab at Goldstone, California, the results achieved far exceeded expectations.

Using the 1000 mile high reflective coated balloon as a "radio mirror", the Bell Labs 960 megacycle signal was not only received regularly at Goldstone, but was also heard in England and France. Bell's 10 kw transmitter was fed into a 60 foot dish antenna. A new u.h.f. distance record was established on the 3700 mile circuit to France.

The successful launching of Echo caused considerable excitement among radio amateurs.



Michael Beltran, teen-age amateur rocket builder, shown with Dr. Harold A. Zahl, Director of Research at the U.S. Army Signal Corp's Ft. Monmouth N.J. Research and Development Laboratory. Michael and Dr. Zahl are seen discussing a proposed project for attempting VHF amateur radio communications by means of an artificially ionized cloud to be released from one of Michael's rockets.

Hams around the world attempted to bounce signals off Echo, with the hopes of establishing DX contacts on the v.h.f. bands usually limited to little more than line-of-sight openings. Coming less than three weeks after the first successful amateur moonbounce QSO on 1296 megacycles (between W6HB and W1BU), it was natural for amateurs to expect that by aiming their 2 and 6 meter beams at Echo it might be possible to establish DX communications.

Within two days after Echo's successful launching, the Editor of this column began receiving reports that amateur radio contact had been established by means of Echo reflection. In order to verify if in fact Echo was responsible for these contacts, the following had to be checked:

1. **Signal Characteristics;** Reception by means of reflection from the Echo satellite can usually be spotted by certain peculiar signal characteristics. Reception is generally preceded by a burst of noise, followed by very weak and shakey signal for a few seconds which suddenly builds up to a peak. The signal remains at peak level (which at best isn't very strong) from a few seconds to a few minutes depending on the location of the satellite in relation to the transmitting and receiving stations. When the signal begins to decline it drops very suddenly from the peak to a weak and shakey signal again. A few seconds later the signal disappears in a burst of noise, and then silence. Many of the reports received indicated very strong, solid signals for long periods of time. It is believed that such reception was probably due to intense sporadic-*E* propagation which occurred quite often during August, rather than Echo reflection.
2. **Echo Location;** Reception by means of Echo reflection can only take place when the satellite is within view of both the receiving and transmitting stations. Strongest reception is expected to occur when the satellite is approximately mid-way between both stations. For many of the reports received, Echo was hundreds and in some cases thousands of miles away from where it should have been for reception to take place. In these cases, communications may have resulted from meteor reflection since the Perseid Meteor shower peaked during mid-August. In some cases a signal reflected from a meteor trail may sound similar to an Echo reflected signal.
3. **Power and Antenna;** The Bell Telephone Labs and other experimental stations conducting communication experiments with the Echo satellite are using transmitter powers on the order of 10 kilowatts, and dish antennas having gains in excess of 30 decibels. In most cases the antennas are equipped with automatic tracking devices. Using an amateur station of optimum design (a kilowatt output, high gain antenna, low-noise receiver, etc.) communications by means of the Echo satellite might be possible on the 1215- 1300 megacycle band, with marginal results also possible on the 220- 225 megacycle band and on 2 meters. Communications of this type are less likely on 6 meters and probably not at all possible on the lower frequency bands. Many of the reports received reported using very low power (less than 50 watts) and simple antennas (dipoles). In all probability the openings reported were due to other causes (sporadic-E seems most likely) rather than Echo.

Checking the more than two dozen reports received against these three criteria, one-by-one the possibility of Echo reflection seemed to be eliminated . . . except for one case. At approximately 10:45 P.M. on August 18th, K3KPF in Philadelphia worked KØBWQ in Marshall, Missouri on 6 meters. The distance between both stations is about 1000 miles. The QSO lasted for little over a minute, and the signal characteristics reported correspond to the type that would be expected from an Echo reflection (although it could have also been meteor reflection). The position of Echo at the time of the QSO was just about perfect, being approximately mid-way between both stations, heading from the southwest towards the northeast. Criteria 1 and 2 check out FB. As far as criteria 3 goes, both stations were using far less power than would be required for even a marginal QSO (theoretically about 60 *db* less than the minimum power believed necessary). K3KPF was running 38 watts into a 3 element beam, while KØBWQ was using an 8 element beam being fed with 50 watts. However, it has already been shown with previous satellites that reception is often possible under conditions far poorer than the theoretical minimum values. For example, the low power (one watt) 40 megacycle transmitter on an early Sputnik was often well received on simple antennas, with average v.h.f. receiving equipment, and the low power transmitter on the Pioneer V space probe was received over distances hundreds of thousands of miles greater than expected theoretically. It's quite possible, therefore, that the K3KPF-KØBWQ QSO took place by means of reflection from the Echo satellite, although this cannot be proven conclusively because of the low power used.

Don't be discouraged at the apparent difficulties involved in working v.h.f. DX by means of Echo. This is only the beginning. Just as Echo portends that communications via space satellites will someday become an effective and commercially profitable technique, so will it stimulate that advances in the design of amateur VHF and UHF equipment that will someday result in its use as a means for DX communications on amateur bands now more or less limited to line-of-sight.

All About Missiles and Satellites

This is the name of a fine little book by David Marks. It does a wonderful job of introducing

Objects in Orbit

Object	*Name*	*Launched By*	*Launch Date*	*Period (Mins.)*	*Inclination*	*Apogee (statute miles)*	*Perigee (statute miles)*	*Transmitting freq. (MC/S)*
1960 THETA	Discoverer XIII	US	10 Aug 60	93.4	82.85	392	153	107.94
1960 IOTA 1	Echo I	US	12 Aug 60	118.2	47.20	1057	937	
1960 IOTA 2	Rocket Body	US	12 Aug 60	118	47.28	1031	950	
1960 IOTA 3	Metal Object	US	12 Aug 60	117.9	47.20	1034	941	
1960 IOTA 4	Metal Object	US	12 Aug 60	118.1	47.20	1043	943	
1960 IOTA 5	Metal Object	US	12 Aug 60	118.3	47.20	1056	945	
1960 KAPPA	Discoverer XIV	US	18 Aug 60	93.0	79.65	408	111	
1960 LAMBDA 2	Rocket Body	USSR	19 Aug 60	90.4	64.90	182	182	

Burned-Up Objects

Object	*Name*	*Launched By*	*Launch Date*	*Burn-Up Date*
1960 LAMBDA 1	Sputnik V	USSR	19 Aug 60	20 Aug 60 *

*USSR announced successful re-entry and recovery.

Additional launchings since the October, 1960, listing. The Midas II listing, in the October issue, was credited to the U.S.S.R. instead of the U.S.

the subject of missiles and satellites. Tracing the development of missiles from Chinese firecrackers to today's space launching giants, the book describes fundamental principles in clear, understandable language. The explanation of satellite orbiting begins with a comparison to a boy whirling a weight at the end of a piece of cord and ends with a step-by-step description of a Vanguard satellite being launched into orbit. Althought it may bore the space expert, beginners in the field should find "All About Missiles and Satellites" interesting, informative, and above all, easy to read. Copies are available at $1.50 each, postpaid, from Harold Weisner, WA2OBR, Cowan Publishing Corp. 300 West 43rd Street, N. Y. 36, N. Y.

Objects in Space

August was a very active month for space launchings with three successful orbitings chaulked-up by the USA and one by the USSR. The following report brings the table of "Objects In Orbit" contained in last month's column up to date as of September 12, 1960. This information has been supplied by NASA and is compiled by the National Space Surveillance Control Center, Bedford, Massachusetts.

On August 10th the USA successfully launched Discoverer XIII, officially labeled 1960 THETA. A capsule ejected from the vehicle was recovered from the Pacific Ocean, thus becoming the first reported space object to be successfully recovered after re-entering the earth's atmosphere.

On August 12th the USA successfully launched Echo I, officially called 1960 IOTA 1. Echo I is a 100 foot aluminized mylar covered balloon that is being used as an artificial reflector of u.h.f. radio signals. IOTA 2 is the body of the final stage rocket that launched Echo into space. The transmissions from IOTA 2 on 108.06 megacycles were last heard on August 16th at which time it is believed that the power supply failed. Also following Echo in space are IOTA 3 and IOTA 5, both of which are believed to be the halves of the sphere which contained the balloon prior to inflation. IOTA 4, also trailing Echo, is believed to be a small piece of excess aluminized mylar which ripped from the balloon covering, probably by collision with minute particles existing in space.

The Advanced Research Projects Agency (Dept. Of Defense) announced the successful launching of artificial earth satellite 1960 KAPPA/ Discoverer XIV on August 18th. On its 17th revolution, a re-entry capsule was successfully separated from the main vehicle and recovered (in mid air) over a predetermined impact point in the Pacific area!

The USSR announced the successful launching of artificial earth satellite 1960 LAMBDA/ Sputnik V on August 19th. There were two objects hauled into space with this launching; LAMBDA 1, a *five ton* space ship, and LAMBDA 2, the last stage rocket carrier. LAMBDA 1 was successfully de-orbited by the USSR during its 17th revolution on August 20th, and was brought back to a predetermined Soviet landing area with its animal cargo alive. LAMBDA 2 remains in orbit. While in orbit, LAMBDA 1's transmitter on 19,995 megacycles was received with exceptionally strong signals.

One failure was reported during August, by the USA. An attempt to launch the active communications repeater satellite Courier 1A, failed on August 18th. The failure was attributed to a malfunction in the first stage rocket. Unlike Echo, which is a passive reflector, Courier 1 A contained receiving and transmitting equipment for picking up and relaying u.h.f. signals from transmitters located on the ground. Another attempt to place a Courier satellite into orbit is planned for the near future.

73, George, W3ASK

by **DONALD L. STONER, W6TNS**
P.O. Box 137, Ontario, Calif.

semiconductors

Contrary to what you might think, one of the most difficult parts of writing the *Semiconductor Column* is the new products section. There is no shortage of information, however, for press releases cross my desk every day. The problem stems from the fact that the majority of these exotic devices are beyond the pocketbook of most amateurs and experimenters. It is often tempting to write an article using a $50.00 silicon transistor.

The situation was brought to a head recently when a ham told me of seeing 50 gallon drums in a metal scrap yard. The drums were overflowing with silicon mesa transistors! The junk dealer sold them for $1.00 a pound and 25% of the units were usable in amateur applications. Twelve and one-half gallons of transistors is certainly an impressive pile, particularly at $4.00 per pound.

It occured to me that if I could obtain such castoffs, they could be checked, sorted and graded into amateur application groups, and supplied to amateurs with data sheets. It would be quite possible to distribute the transistors to amateurs at even less than germanium prices.

I am sure many of the readers are employed in the transistor manufacturing industry and I am hoping some of them may be in a position to assist in obtaining these "culls" or rejects. If such is the case, please drop me a line. You will be doing me and several thousand hams a great service.

Puzzle

Ed Landefeld, W8DCC, and designer of the SSB transistor transceiver in the *SSB Handbook*, sent a real tough question which stumps me. Possibly someone else can supply an answer. A friend of Ed's bought a power transistor from Olson radio, Shield type 771, and connected it in an electronic ignition circuit. The device "went west", but in a very unusual manner. He increased the leakage current a great deal (180 *ma*) but appears to have increased the current gain to almost 1,000! The transistor was tried in two circuits (see fig. 1) to make sure it was not the method of connection. As Ed says "If he could reproduce this type of failure on a production basis, he could quit working". What happened inside the transistor?

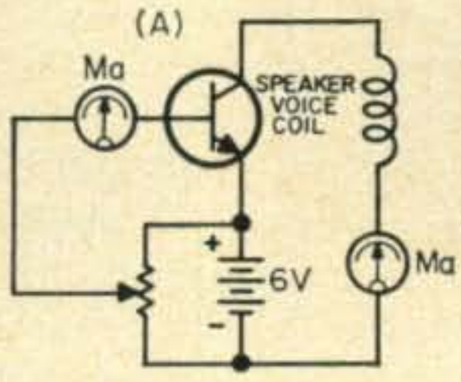
Batteries

Some time ago I introduced you to a new series of nickel cadmium rechargeable batteries. These "Ni-Cad" cells are just the ticket for transistor experimenters. I use a set of them connected to a step-switch for an adjustable voltage power supply. They can be easily be recharged overnight from a convenient power supply. The distribution of these cells has changed hands and they are now available from ABC Battery Company, Box 626, Richland, Washington. If you are planning a piece of portable equipment, or any transistor project for that matter, drop them a line for an interesting catalog and data sheet.

Literature

Bendix Red Bank, Semiconductor Products, 201 Westwood Ave., Long Branch, New Jersey, has two new application notes (#2 and 3) on "Transistor Power Derating and Thermal Resistance" and "Selecting Transistors and Drive for a DC-DC Converter". Drop a request to them if this type of data is useful to you.

Motorola, 5005 McDowell Rd., Phoenix, Arizona, has just generated a new handbook titled "Power Transistors". It is absolutely the last word on power applications and includes many working circuits such as a transistorized ignition system. The tariff is $2.00.

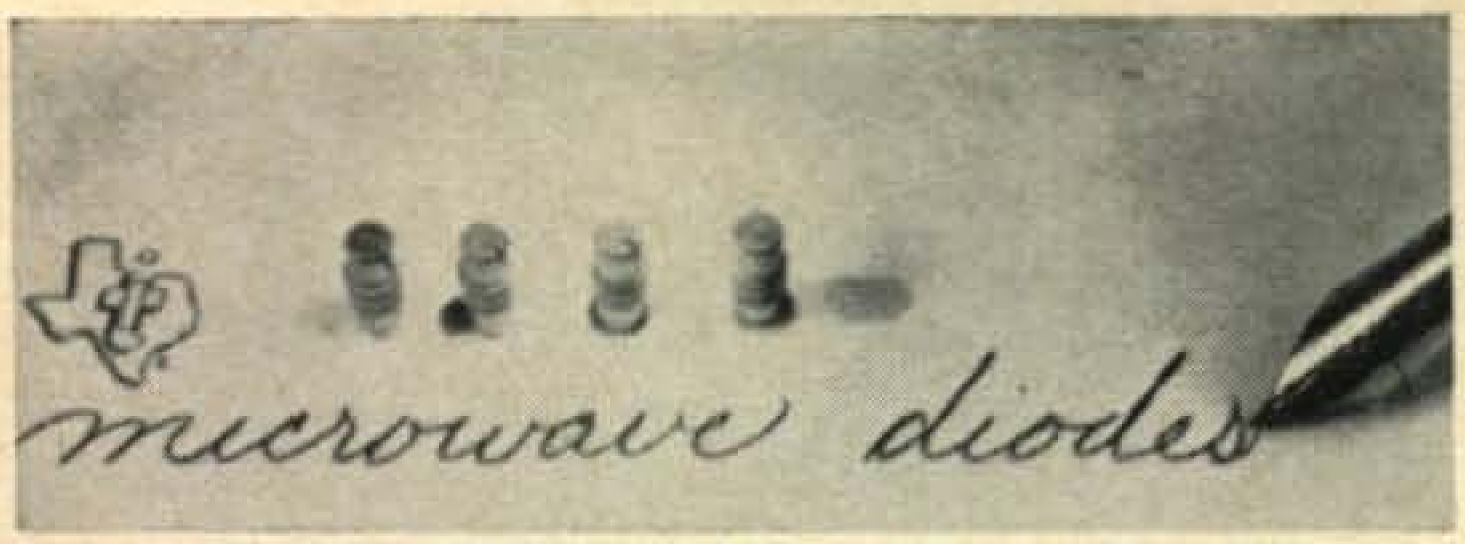


BASE I (Ma)	COLL. I (Ma)	VOLTS E-C
0.1	280	2.5
0.2	350	1.5
0.3	450	0.3

LEAKAGE IN EACH CIRCUIT 180Ma

BASE I (Ma)	COLL. I (Ma)	VOLTS E-C
0.05	250	2.4
0.1	285	1.9
0.2	350	1.2
0.3	440	0.3

Fig. 1—Two circuits tried in the "Puzzle" described in the text.



Varactor diodes made by Texas Instruments are capable of operation up to 144 *kmc*.

General Electric's new gallium arsenide tunnel diodes, types 1N3114 through 3120.

QRP News

Les Earnshaw, ZL1AAX, an 'ole timer at the QRP game has done it again. You may remember Les had a two way QSO from New Zealand to Kentucky on 20 sideband with a transistorized rig. The final, an RCA 2N247, ran 20 *mw* input and was coupled directly to the beam. Now Les is plinking away on c.w. with a tunnel diode transmitter. His best DX to date (shades of the Novice column) was with ZL1AOF, Jack King, located 160 miles away in Whakatane, N. Z. The power input to the crystal controlled tunnel diode oscillator was less than 1 *mw* and the power (?) output was in the microwatt region!

Bargains

Received the Olsen flier the other day and among the other bargains was a 3N25 Western Electric tetrode transistor for about $2.00. Now, as luck would have it, I can't find the catalog, the number, or the exact price. However, I did purchase several of them and they are not rejects but simply obsolete types, making them excellent bargains and worth dropping a line to Olsen for information.

Semiconductor News

Bendix Red Bank (address given earlier) is marketing a new line of Diffused Alloy Power (DAP) transistors. The 2N1651, 1652, and 1653, are intended for use in high frequency, high power switching equipment. Data sheets are available.

CBS Electronics, 100 Endicott St., Danvers, Mass., have revised and expanded their transistor home study course. For more information and group rates, write them at the above address.

General Electric has a new series of unijunction transistors priced between $3.00 and $4.00 in quantity. These silicon units may be used in solid state relay, triggering and switching applications. Here come the gallium arsenide tunnel diodes at low prices; GE's marketing department has just announced a price reduction of 93%! Originally priced at $55.00 and $85.00 they are now available in quantity for $4.50 and $6.00 each. They predict the price of tunnel diodes will drop to $1.00 by 1962. Also new from GE is a series of C11 Silicon Controlled Rectifiers, types are available for voltages between 25 and 400 volts and are priced between $4.50 and $35.50.

General Transistor Corporation, 91-27 138th Pl., Jamaica 35, N. Y., is now marketing tunnel diodes, their TD1, 2, and 3. The new units have a dissipation of 20 *mw*, a ratio between 3 and 7, and are made from germanium. No prices given.

The latest issue of Hoffman's publication *SPAN* has several interesting articles. The most notable is titled "Design Considerations of Photovoltaic Solar Energy Converters for Space Vehicles". If you do not receive this fabulous bulletin, drop a request to them (1001 Arden Drive, El Monte, Calif.) on your company letterhead.

Industro Transistor Corp., 35-10 36th Avenue, Long Island City 6, N. Y., has expanded their line to include a series of computer transistors and silicon diffused mesa types. They are also making an automatic transistor tester, called the ITVAC, which includes an elaborate computer section to evaluate the transistor and sort them to spec groups.

Motorola had a cute device going at the WESCON show. It was a mesa transistor transmitter operating in the citizens band. It was novel in that the transmitter sent the letters "mesa" in international code!

Pacific Semiconductors is working on a 1 *kmc*, 1 watt semiconductor device which was described in a WESCON paper. Currently available is their 2.5 watt device for 250 *mc*.

Philco Corporation, Lansdale, Pa., is now

[*Continued on page 161*]

TI's new v.h.f. mesa transistors will interest amateurs working on 144 and 220 *mc* equipment.

General Electric controlled rectifiers will find important applications in light dimming controls, speed control for motors, and as replacement for relays.

RTTY

Byron H. Kretzman, KØWMR
108 W. Teresa Drive
West St. Paul, Minn.

As the newcomer to this fascinating facet of amateur radio gets his feet wet, he discovers that those in the swim are using many strange, esoteric, words and equally strange pieces of equipment, equipment not usually found in an ordinary ham station. The word this month is "polar relay," and this piece of equipment is extremely useful in an amateur radioteletype station; and, as promised in last month's column, we herewith provide the "word" on this device.

The polar relay is basically a relay, as the name implies. It is a magnetic device, with the customary coils and contacts. As such it can be supplanted by an electronic keyer, either vacuum tube or solid state. "Then why use it", asks W6NRM. Well, for several reasons; most of all for the greater simplicity we realize in the "local loop" d.c. circuits required to interconnect our specialized items of RTTY gear within the shack. Secondly, there is a ready availability in surplus, MARS, etc. Thirdly, when used for receiving, a polar relay not only simplifies our converter (TU) circuitry but acts as a very fine low pass filter, passing only the keying spectrum and discriminating against the higher frequency noise pulses.

Polar Circuits

In the July 1960 RTTY column we discussed the typical "neutral" circuit. This is the type of circuit used in the local loop to key the receiving selector magnets in our machine. Note that there is current in the loop during the *mark* pulses and an absence of current during the *space* pulses of a character. Polar circuits differ from neutral circuits in that the current flow in the polar circuit is not interrupted in order to produce the *space* interval, but instead is made to flow in the opposite direction. Therefore, the signals in a polar circuit consist of pulses of current which change direction each time a change is made from *mark* to *space*.

Figure 1 shows a very simple polar type of telegraph or *Teletype* circuit. The "key," *K*, could be the sending contacts of a Model 14 tape transmitter-distributor. If you observe the polarity of the batteries, you can see that the polar relay at the receiving end has applied to it a voltage, from B-2, with one polarity during one condition (*mark*), and a voltage from B-1 of the opposite polarity is applied during the other condition (*space*). Figure 2 shows the ideal wave shape of the current in the line during the transmission of the letter Y.

Polar Relays

Most of the polar relays in ham hands these days are of the Western Electric 215A or 255A types. Mechanically, these two relays look quite similar except for the knurled tension nuts on the 255A. Electrically, they both have two coils; however, the 215A coils are 90 ohms each while the 255A coils are 136 ohms apiece. (By the way, some 255A polar relays with bakelite cases are marked D163119-A.) While both of these relays are similar, it should be noted that the 255A is built more accurately than the 215A and as the result it is easier to adjust. Also, when working with small current differentials, the more sensitive 255A is suggested.

When the normal 60 *ma* local loop is used with a 215A or 255A polar relay, the loop current is put through the upper or "operating" winding. Since these relays have no spring, a reversing or bias current must be continuously applied to the lower, or biasing, winding. Polarity of the current in each winding must be observed so that the armature is pulled in the proper direction. When the polar relay is connected in a polar circuit, both windings are usually connected in series, again observing proper polarity of the windings. Polar loop current is then set from 15 to 30 *ma* in each direction. The value of the current is not critical, but

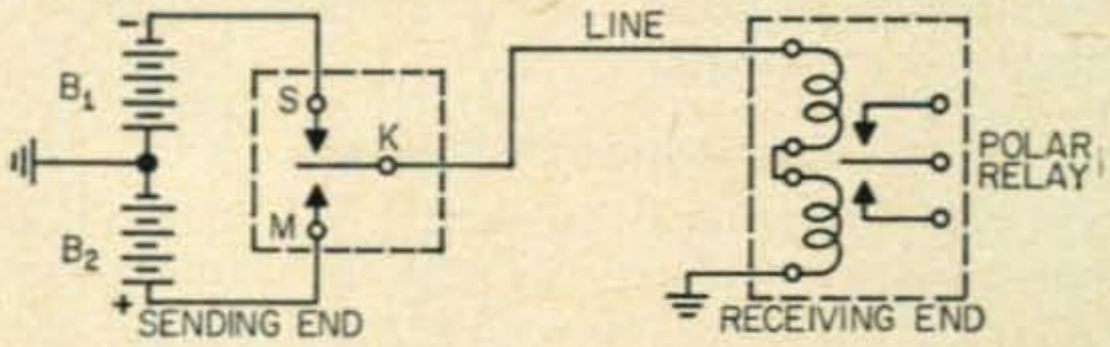
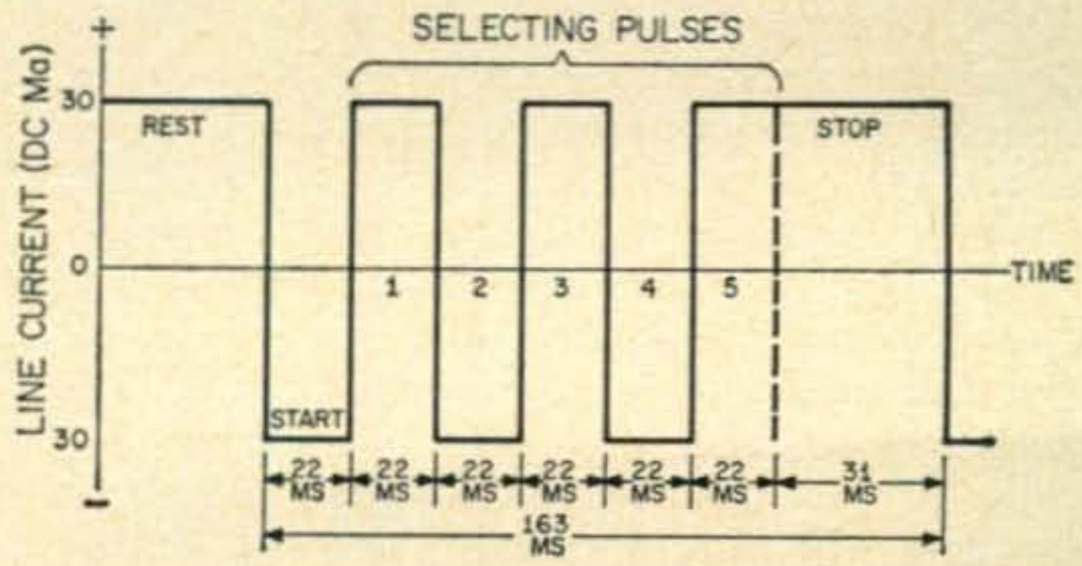


Fig. 1—Polar Telegraph/Teletype Circuit.

Fig. 2—Polar Line Current for Letter Y.



the currents in each direction must be equal. Otherwise the armature will spend more time on one contact than the other, giving the signal "bias distortion," which increases the possibility of errors.

Bias

From the above, it can be seen that bias distortion could just as easily result if the polar relay was not in correct adjustment. In other words, it must operate equally, in time, to the *mark* and to the *space* contact when equal pulses are received. Now, if a surplus I-193-A Test Set for polar relays can be found, perhaps through MARS, your adjustment problems are over as this test set permits setting the internal bias of a polar relay to zero, and in addition, at the correct sensitivity.

Since, in our usual application, sensitivity is considerably less important than bias, we can *build* a very simple test set which can permit us to accurately set the mechanical bias to zero. Figure 3 is the schematic diagram of this test set. The meter is the military IS-180, from the surplus BD-77A "Line Unit," found with the TG-7B, the military version of the Model 15. The circuit causes the relay to vibrate at approximately 22 c.p.s. and the meter simply measures the ratio of the armature dwell on each contact. The test set is powered from the station's 115 volt d.c. local loop power supply.

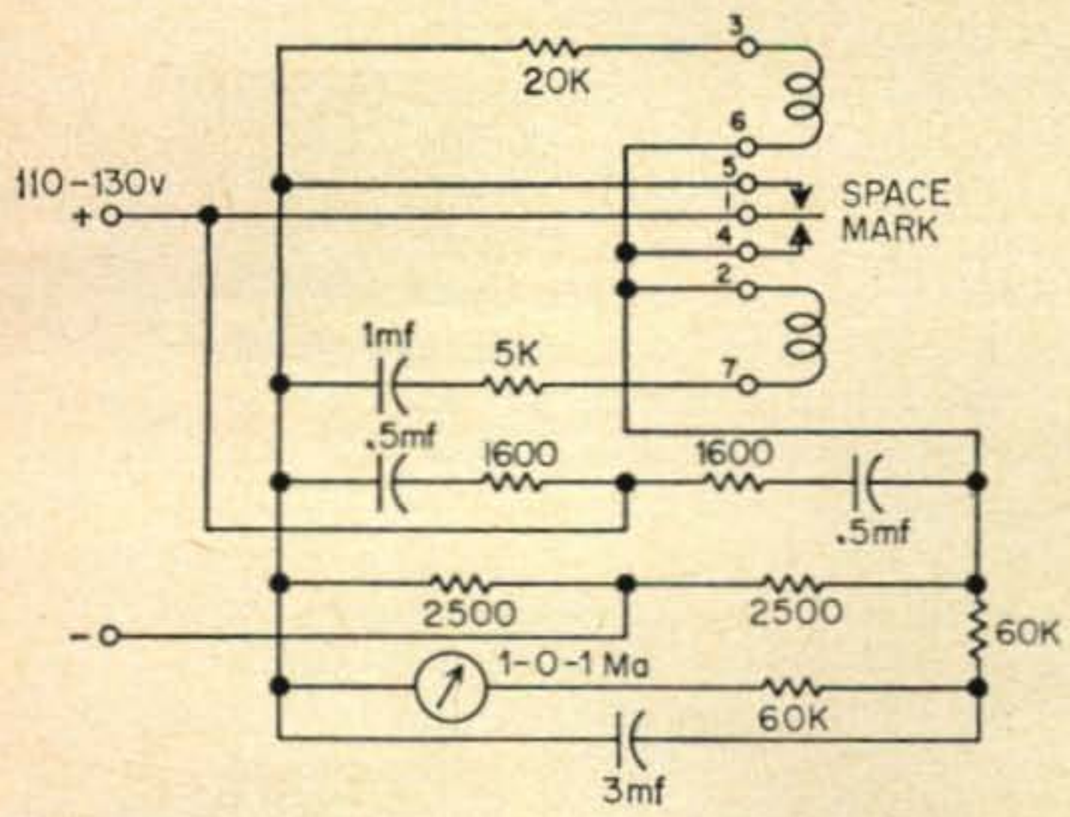
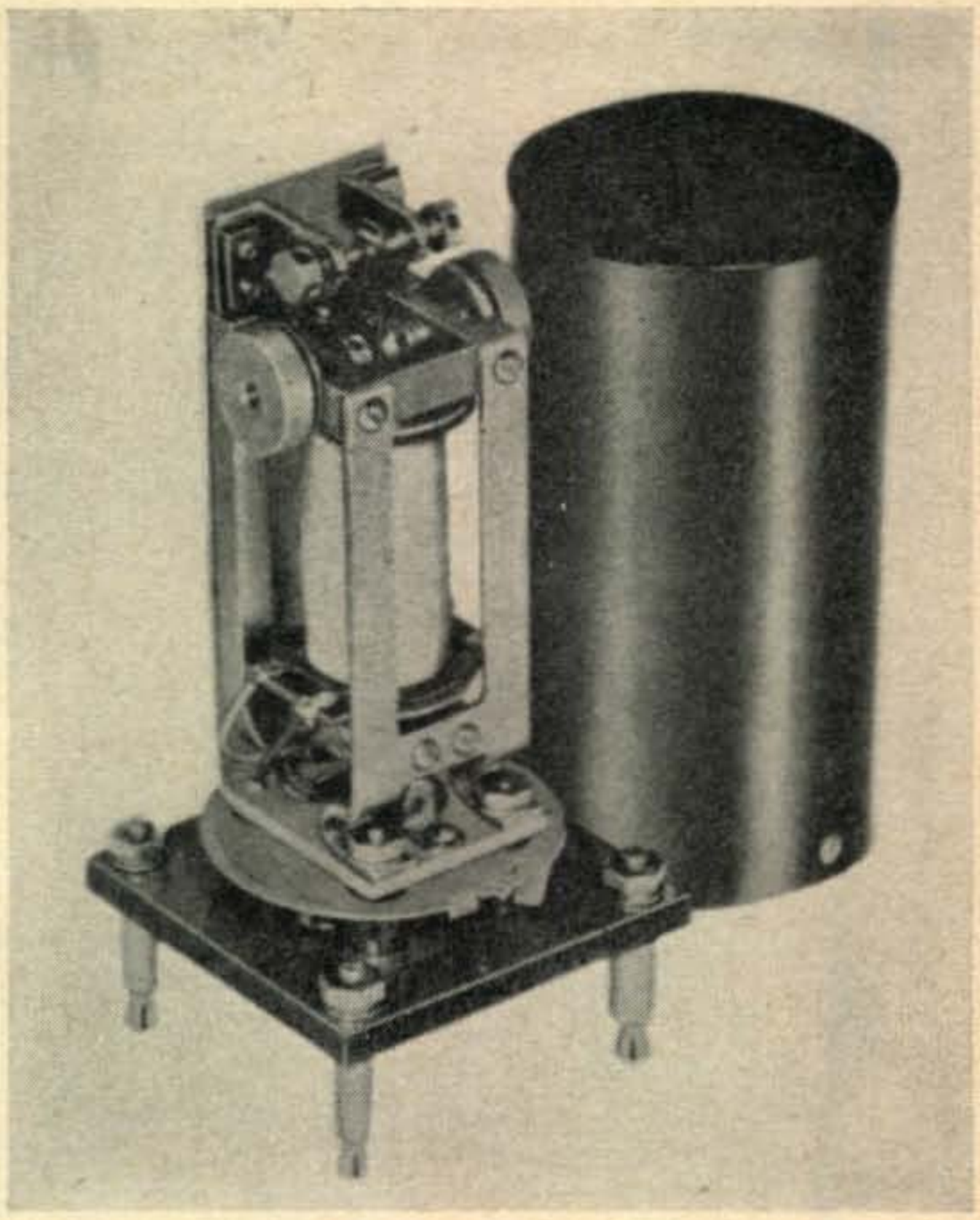


Fig. 3—Polar Relay Test Set schematic.

A reasonably good job of adjusting a polar relay can be done by a nail and a simple feeler gauge, but if possible beg, borrow, etc., *Teletype* tools. The gauge is a 74-D, and the "nail" is a No. 340 Tool or adjusting key. Also useful are the KS-2662 file and the No. 265-C contact burnisher.

Carefully inspect the relay visually to make sure that the contacts are unpitted and clean, that the surfaces of the flexible contact springs that bear against each other are clean and in contact with each other for at least 25% of their width, and that the armature swings freely inside the spool. Check, too, all slotted head screws for tightness.

Begin adjustment by backing off the contact screws and pole pieces with the 340 tool to find



Polar Relay made by Kurman Electric Co.

the natural mechanical position of the armature. You might find it necessary to center the armature horizontally by loosening the screws holding the front and rear spool heads to the base; then move the coil to the left or right to bring the armature into the center of the spool slot.

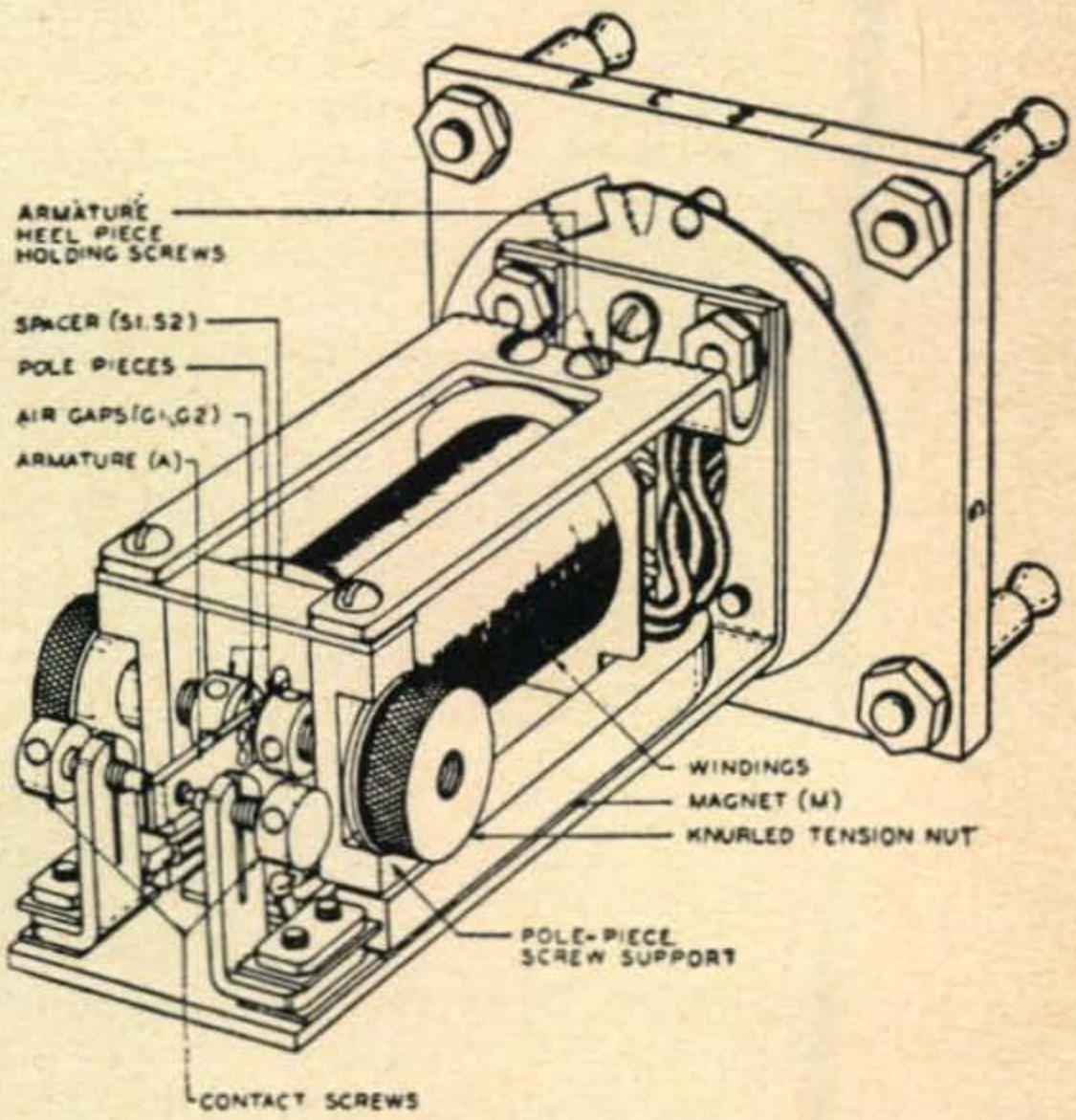


Fig. 4—255A Polar Relay, Cover Removed

Should it be necessary to center the armature vertically, loosen the heel piece holding screws; then adjust the armature vertically until the contacts are correctly aligned. Check for clearance between the armature and the slot in the spool at both top and bottom; then make doubly sure that all screws are tight.

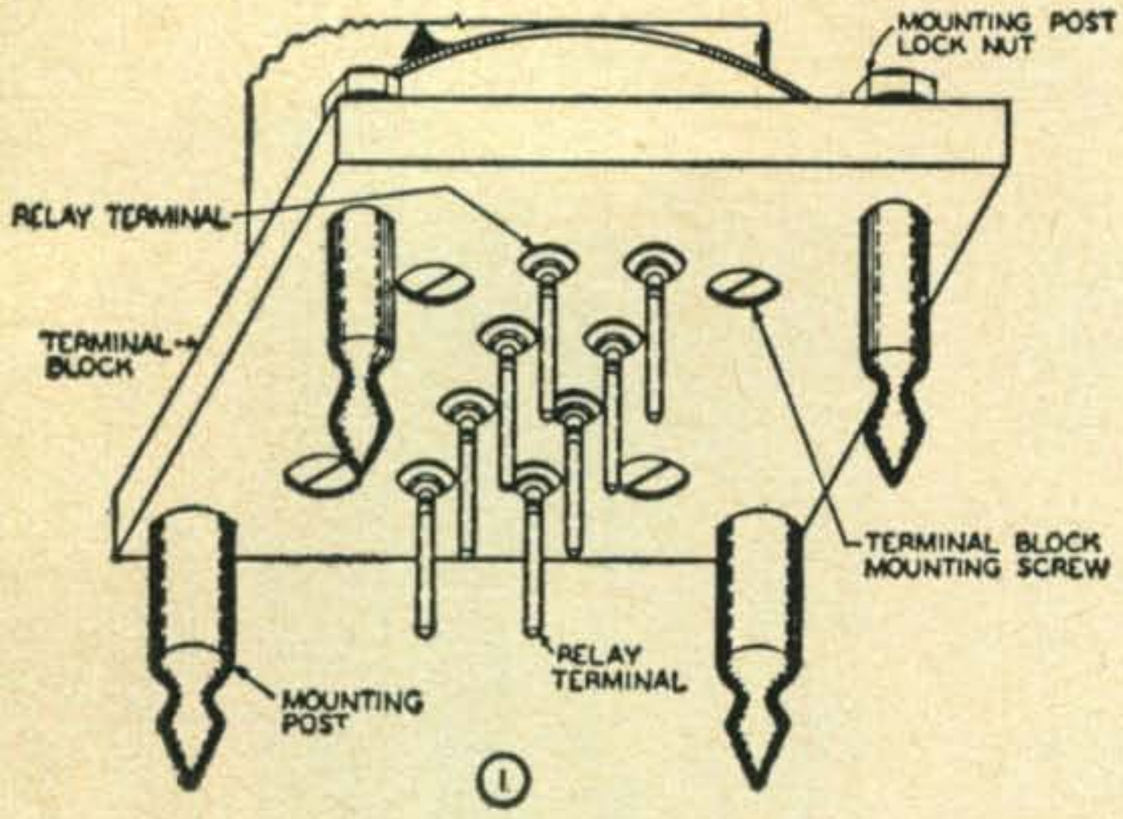


Fig. 5—255A Polar Relay Connections.

To set the contacts, begin this phase of the adjustment with both pole pieces backed off and the armature in its natural position. Using the relay test set, or at least an ohmmeter, turn in one contact screw until it just touches the armature, then back it off .002-inch, using the feeler gauge. (One-twelfth of a turn of the contact screw is close to .002-inch.) Go through the same procedure for the other contact, then check, with the feeler gauge, the total contact travel, which, of course, should be .004-inch.

The next step is the pole piece adjustment. This is begun by turning in one pole piece until the armature just rests against the opposite contact screw, as indicated by electrical contact. Then back off the pole piece screw slightly less than one half turn and tighten the tension nut to hold it there. Now, turn in the other pole piece until the gaps on each side are as equal as can be judged by the eye and tighten the tension nut. If necessary, readjust the second pole piece until the armature either stands midway between contacts or flips to either contact when moved by hand. Sensitivity is increased, up to a point, by moving the pole pieces away from the armature. So far this has been a "by hand and by eye" adjustment. Now plug the relay into a test set and do the fine adjustment for zero bias by moving one or the other of the pole pieces. It should take only a few degrees of movement to set the relay at zero bias. Go very slow at this point or you will find yourself starting the whole procedure over, right from the beginning.

Column Pattern

As you know, since the June (1960) issue, we have been taking you, the newcomer to RTTY, through the complete gamut of amateur radioteletype. This is because you requested it, by your letters. As we have been writing this column for over 5 years, it naturally has been necessary to repeat ourselves occasionally, and we do get called on it, invariably by a sharp eyed reader quite used to doing research-looking up back issues! So bear with us; the newcomer seldom has access to issues of *CQ* that go very far back, so we must serve him.

Following the pattern outlined above, next month we will describe in detail the interconnections, including a local loop with polar relays, that will permit the very efficient control and operation of an RTTY station. Future additions, such as tape gear, will be readily possible, with no modifications required. This so many of you have requested for so long. Watch for it.

Across the Nation

W1ZXA has left Rhode Island permanently and is now operating as K2SKK from Livingston, New Jersey. *This leaves Rhode Island without an RTTY station, doesn't it?!* K3IUV is using AFSK with his Model 19 on 6 with 100 watts and on 2 with 15 watts, with a 100 watt amplifier in the making. Bert reports increasing v.h.f. activity in the Philadelphia area. W3FAW is on 40 from Harrisburg, Pa.

In late August, W6CG, DX Editor of *RTTY*, and his XYL, K6OWQ, put on a "wing-ding" for about 20 hams and their XYL's which included an RTTY demonstration that astounded all. They managed a five-way QSO with VK3KF, ZL1WB, ZL3HJ, and ZK1BS on 21,085 *kc* from 0300 to 0600 G.M.T. with solid copy on all ends. W6AEE, W6NRM, and W6TPJ assisted at the keyboard. Many "non-believers" were converted, says Bud.

W8TIF is QRP on 40 with his 26 and PAT TU. A driver final with a pair of 4-65A's is being built, as well as a W2JAV TU. W9FJI has a TG26-TT, which is a military combination of a Model 14 Typing Reperforator with keyboard and a Model 14 TD. Fred would like to get a copy of the *military* manual on this gear. (*So would I, Fred!*) W9RDJ now has his Model 19 on the air. K9DAS has his 14 and 15 combinations on 40 with 750 watts to a pair of 813's, as well as on AFSK on 2-meter f.m.

WØKKB, Topeka, Kansas, has been sending taped ARRL and RTTY bulletins on 40, Mondays, Wednesdays and Saturdays at 2200 hours C.S.T. Look around 7140 *kc*. KØAKG was chairman of the RTTY Forum at the Dakota Division Mid-American Convention in Minneapolis September 17th.

Comments

When you write, please enclose a stamped and self addressed envelope. It greatly speeds up your reply. If you would like an extra speedy answer, also enclose a glossy photo of your RTTY ham shack. This we would appreciate even if you don't want an answer!

73, Byron, W2JTP, KØWMR

PROPAGATION

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

General Forecast

This month's column contains DX Propagation Charts for November and December, 1960. Short-Skip Propagation Charts for November appeared last month.

Ionization of the earth's upper atmosphere is more *intense* during the daytime hours of the winter months, and weaker during the nighttime hours, than during any other season of the year. This is expected to result in a general improvement in DX propagation conditions on all amateur bands between 160 and 10 meters.

Fair to good 10 meter openings are forecast to most areas of the world between post sunrise and early evening hours. Because of declining solar activity, however, 10 meter openings this winter are not expected to occur as often as they did during the previous three winter seasons when solar activity was considerably higher.

Fifteen meters is forecast to open to almost all areas of the world during the daytime hours and to some areas of the world during the evening hours. The reception peak on 15 meters will generally occur about an hour or two after conditions peak on 10 meters.

Atmospheric noise levels (static) and ionospheric absorption usually decrease considerably during the winter months, often resulting in much improved signal-to-noise ratios. This improvement is expected to be most noticeable on 40 and 80 meters. The 40 meter band is forecast to open for DX as early as the late afternoon hours, and is expected to remain open through the hours of darkness and the sunrise period. During the hours of darkness, signals may often reach very strong levels.

Fair DX propagation conditions are predicted for 80 meters during the hours of darkness. On some openings, signals may also reach strong levels.

Twenty meter propagation conditions undergo a considerable change during the winter months. As a result of seasonally weaker nighttime ionization, openings during these hours are expected to be fewer and conditions considerably poorer, than during other seasons. On the other hand, the expected improvement in signal-to-noise levels should result in *stronger* 20 meter openings to many areas of the world during the dawn, daytime and early evening periods.

LAST MINUTE FORECAST

The forecast indices for the month of November, shown in Propagation Charts by parentheses following the time of openings, are expected to be related to day-to-day propagation conditions in the following manner:

Forecast Indices	Above Normal Nov. 12-15	Normal Nov. 3-5, 8-11, 16-17 21-22, 30	Below Normal Nov. 1-2, 6-7, 26-29	Disturbed Nov. 18-20, 23-25
(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, strong steady signals.
B—Good circuit, moderately strong signals, some fading and noise.
C—Fair circuit, moderately strong to weak signals, moderate fading and noise.
D—Poor circuit, weak signals, considerable fading and very high noise level.
E—Circuit out.

Conditions during the c.w. period of the *CQ* DX Contest are expected to be below normal.

CQ's Propagation Editor, W3ASK, shown at the 1960 Dayton Hamvention with K4IOF (left). The declining sunspot cycle and its probable impact on amateur radio during the next five years, one of the topics discussed by W3ASK at the Hamvention, is the subject of a special report soon to appear in CQ. (Photo by W8UON)

NOVEMBER-DECEMBER, 1960

TIME ZONE: EST

EASTERN USA TO:

	10/6* Meters	15 Meters	20 Meters	40/80** Meters
Western Europe	9 A - 12N (1)* 8 A - 9 A (2) 9 A - 12N (3) 12N - 2 P (2) 2 P - 3 P (1)	7 A - 8 A (2) 8 A - 12N (3) 12N - 1 P (4) 1 P - 3 P (3) 3 P - 5 P (1)	5 A - 9 A (3) 9 A - 12N (2) 12N - 2 P (3) 2 P - 4 P (4) 4 P - 7 P (3) 7 P - 11P (2) 11P - 5 A (1)	3 P - 6 P (2) 6 P - 12M (4) 12M - 4 A (2) 7 P - 10P (2)** 10P - 1 A (1)** 1 A - 3 A (2)**
Eastern Europe	8 A - 11A (2) 11A - 1 P (1)	7 A - 8 A (1) 8 A - 11A (3) 11A - 1 P (2) 1 P - 3 P (1)	10P - 7 A (1) 7 A - 11A (2) 11A - 3 P (1) 3 P - 10P (2)	8 P - 12M (1) 9 P - 11P (1)**
North Africa	9 A - 12N (1)* 7 A - 10A (2) 10A - 12N (3) 12N - 2 P (2) 2 P - 4 P (1)	6 A - 11A (2) 11A - 1 P (3) 1 P - 2 P (4) 2 P - 3 P (3) 3 P - 4 P (2) 4 P - 6 P (1)	1 P - 3 P (2) 3 P - 4 P (4) 4 P - 8 P (3) 8 P - 11P (2) 11P - 6 A (1) 6 A - 8 A (2) 8 A - 1 P (1)	4 P - 6 P (1) 6 P - 1 A (3) 1 A - 3 A (1) 6 P - 1 A (2)**
South Africa	6 A - 10A (1) 10A - 12N (2) 12N - 3 P (4) 3 P - 4 P (3) 4 P - 5 P (2) 5 P - 7 P (1)	6 A - 10A (1) 10A - 2 P (2) 2 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	2 P - 5 P (1) 5 P - 8 P (3) 8 P - 10P (2) 10P - 3 A (1)	4 P - 6 P (1) 6 P - 10P (2) 6 P - 9 P (1)**
Eastern Mediterranean	8 A - 10A (2) 10A - 12N (1)	7 A - 10A (2) 10A - 11A (3) 11A - 12N (2) 12N - 2 P (1)	8 A - 10A (1) 10A - 1 P (2) 1 P - 2 P (3) 2 P - 6 P (2) 6 P - 10P (1) 1 A - 3 A (1)	6 P - 12M (1) 8 P - 11P (1)**
Central Asia	8 A - 10A (1) 5 P - 7 P (1)	8 A - 11A (2) 11A - 5 P (1) 5 P - 8 P (2) 8 P - 9 P (1)	7 A - 9 A (2) 9 A - 12N (1) 5 P - 7 P (1) 7 P - 11P (2) 11P - 1 A (1)	5 P - 9 P (1) 5 A - 7 A (1)
Southeast Asia	11A - 2 P (1) 6 P - 8 P (1)	10A - 12N (2) 12N - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (1)	7 A - 9 A (2) 9 A - 12N (1) 5 P - 7 P (1)	NIL
Far East	5 P - 6 P (1) 6 P - 7 P (2) 7 P - 8 P (1)	5 P - 6 P (1) 6 P - 8 P (3) 8 P - 9 P (2) 9 P - 10P (1) 8 A - 10A (1)	9 A - 6 P (1) 6 P - 9 P (2) 9 P - 11P (3) 11P - 4 A (2) 4 A - 7 A (1) 7 A - 9 A (2)	12M - 7 A (1)
Pacific Islands	7 A - 12N (1) 12N - 5 P (2) 5 P - 7 P (3) 7 P - 8 P (2) 8 P - 9 P (1)	9 A - 1 P (2) 1 P - 4 P (1) 4 P - 6 P (2) 6 P - 8 P (3) 8 P - 10P (2) 10P - 12M (1)	11A - 8 P (1) 8 P - 10P (2) 10P - 11P (4) 11P - 1 A (3) 1 A - 7 A (2) 7 A - 9 A (3) 9 A - 11A (2)	1 A - 6 A (2) 6 A - 8 A (1) 3 A - 7 A (2)**
Australia	9 A - 11A (2) 11A - 2 P (1) 2 P - 5 P (2) 5 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	9 A - 12N (2) 12N - 5 P (1) 5 P - 7 P (3) 7 P - 10P (2) 10P - 12M (1)	11A - 11P (1) 11P - 2 A (2) 2 A - 4 A (3) 4 A - 7 A (2) 7 A - 9 A (3) 9 A - 11A (2)	4 A - 6 A (2) 6 A - 8 A (1) 5 A - 7 A (1)**
New Zealand	1 P - 4 P (1) 4 P - 7 P (2) 7 P - 10P (1)	8 A - 11A (1) 11A - 1 P (2) 1 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (3) 9 P - 11P (2) 11P - 12M (1)	10A - 10P (1) 10P - 12M (2) 12M - 2 A (3) 2 A - 5 A (2) 5 A - 7 A (1) 7 A - 9 A (3) 9 A - 10A (2)	3 A - 6 A (2) 6 A - 8 A (1) 4 A - 7 A (1)**
South America	8 A - 11A (1)* 4 P - 7 P (1)* 7 A - 8 A (2) 8 A - 2 P (3) 2 P - 5 P (4) 5 P - 6 P (3) 6 P - 8 P (2) 8 P - 10P (1)	6 A - 7 A (2) 7 A - 9 A (3) 9 A - 2 P (2) 2 P - 5 P (3) 5 P - 8 P (4) 8 P - 9 P (3) 9 P - 12M (2) 12M - 2 A (1)	6 A - 4 P (1) 4 P - 6 P (2) 6 P - 12M (4) 12M - 2 A (3) 2 A - 6 A (2)	6 P - 8 P (1) 8 P - 2 A (3) 2 A - 5 A (1) 8 P - 2 A (2)**
McMurdo Sound	6 A - 9 A (1) 8 P - 11P (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 6 P (1) 6 P - 9 P (2) 9 P - 10P (3) 10P - 12M (2) 12M - 2 A (1)	9 A - 7 P (1) 7 P - 10P (2) 10P - 2 A (3) 2 A - 4 A (2) 4 A - 7 A (1) 7 A - 9 A (2)	10P - 6 A (1)

TIME ZONES: CST & MST

CENTRAL USA TO:

	10/6* Meters	15 Meters	20 Meters	40/80** Meters
Western Europe	8 A - 9 A (1) 9 A - 11 A (3) 11A - 12N (2) 12N - 2 P (1)	7 A - 10A (2) 10A - 1 P (3) 1 P - 2 P (2) 2 P - 4 P (1)	6 A - 1 P (2) 1 P - 3 P (3) 3 P - 7 P (2) 7 P - 11P (1)	6 P - 10P (1) 10P - 1 A (2) 1 A - 2 A (1) 9 P - 1 A (1)**
Eastern Europe	8 A - 11A (1)	8 A - 11A (2) 11A - 12N (1)	7 A - 10A (2) 10A - 4 P (1) 4 P - 9 P (2) 9 P - 12M (1)	7 P - 1 A (1)

TIME ZONES: CST & MST, Con't.

CENTRAL USA TO:

	10/6* Meters	15 Meters	20 Meters	40/80** Meters
North Africa	9 A - 11A (1)* 8 A - 9 A (2) 9 A - 11A (3) 11A - 12N (2) 12N - 1 P (1)	7 A - 11A (2) 11A - 1 P (3) 1 P - 3 P (2) 3 P - 5 P (1)	7 A - 9 A (2) 9 A - 11A (1) 11A - 2 P (2) 2 P - 7 P (3) 7 P - 10P (2) 10P - 12M (1)	4 P - 6 P (1) 6 P - 1 A (2) 1 A - 2 A (1) 6 P - 12M (1)**
Central Africa	9 A - 2 P (1)* 7 A - 11A (2) 11A - 1 P (3) 1 P - 4 P (4) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 7 P (1)	7 A - 10A (1) 10A - 1 P (2) 1 P - 3 P (3) 3 P - 6 P (4) 6 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	10A - 12N (1) 12N - 3 P (2) 3 P - 5 P (3) 5 P - 8 P (4) 8 P - 11P (3) 11P - 1 A (2) 1 A - 3 A (1)	5 P - 7 P (1) 7 P - 10P (2) 6 P - 9 P (1)**
Eastern Mediterranean	8 A - 11A (1)	7 A - 11A (2) 11A - 1 P (1)	7 A - 9 A (1) 9 A - 11A (2) 11A - 4 P (1) 4 P - 7 P (2) 7 P - 11P (1) 11P - 2 A (2) 2 A - 4 A (1)	5 P - 10P (1)
Central Asia	7 A - 10A (1) 7 P - 9 P (1)	7 A - 10A (1) 7 P - 9 P (2) 9 P - 10P (1)	7 A - 9 A (2) 9 A - 11A (1) 6 P - 9 P (2) 9 P - 5 A (1)	4 P - 7 P (1) 4 A - 7 A (1)
Southeast Asia	11A - 2 P (1) 5 P - 7 P (1)	9 A - 12N (2) 12N - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (1)	7 A - 9 A (2) 9 A - 1 P (1) 5 P - 7 P (1)	4 A - 7 A (1)
Far East	3 P - 4 P (2) 4 P - 7 P (3) 7 P - 8 P (2) 8 P - 9 P (1)	9 A - 11A (1) 3 P - 4 P (1) 4 P - 6 P (2) 6 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	7 A - 9 A (2) 9 A - 11A (1) 7 P - 9 P (2) 9 P - 11P (1)	2 A - 7 A (1)
Pacific Islands	10A - 11A (2) 11A - 12N (3) 12N - 5 P (2) 5 P - 8 P (3) 8 P - 9 P (2) 9 P - 10P (1)	9 A - 1 P (2) 1 P - 4 P (1) 4 P - 6 P (2) 6 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	11A - 7 P (1) 7 P - 9 P (2) 9 P - 12M (4) 12M - 2 A (3) 2 A - 4 A (2) 4 A - 7 A (1) 7 A - 9 A (3) 9 A - 11A (2)	12M - 7 A (3) 7 A - 9 A (2) 1 A - 7 A (2)**
Australia	8 A - 11A (2) 11A - 1 P (1) 1 P - 4 P (2) 4 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	7 A - 9 A (2) 9 A - 12N (3) 12N - 3 P (2) 3 P - 6 P (1) 6 P - 9 P (2) 9 P - 11P (1)	11A - 11P (1) 11P - 5 A (2) 5 A - 7 A (1) 7 A - 9 A (3) 9 A - 11A (2)	3 A - 6 A (2) 6 A - 8 A (1) 4 A - 7 A (1)**
New Zealand	11A - 4 P (2) 4 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	7 A - 9 A (1) 9 A - 1 P (2) 1 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	11A - 8 P (1) 8 P - 10P (2) 10P - 11P (3) 11P - 1 A (4) 1 A - 3 A (3) 3 A - 5 A (2) 5 A - 7 A (1) 7 A - 9 A (3) 9 A - 11A (2)	1 A - 6 A (2) 6 A - 7 A (1) 2 A - 6 A (1)**
South America	7 A - 10A (1)* 2 P - 7 P (1)* 6 A - 8 A (2) 8 A - 10A (3) 10A - 1 P (2) 1 P - 3 P (3) 3 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	5 A - 7 A (2) 7 A - 8 A (3) 8 A - 1 P (2) 1 P - 4 P (3) 4 P - 7 P (4) 7 P - 9 P (3) 9 P - 11P (2) 11P - 2 A (1)	2 P - 4 P (2) 4 P - 6 P (3) 6 P - 11P (4) 11P - 3 A (3) 3 A - 5 A (2) 5 A - 7 A (3) 7 A - 8 A (2) 8 A - 2 P (1)	6 P - 8 P (1) 8 P - 3 A (2) 3 A - 5 A (1) 6 P - 4 A (2)**
McMurdo Sound	6 A - 9 A (1) 7 P - 10P (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 5 P (1) 5 P - 7 P (2) 7 P - 10P (3) 10P - 11P (2) 11P - 2 A (1)	8 A - 6 P (1) 6 P - 8 P (2) 8 P - 2 A (3) 2 A - 3 A (2) 3 A - 6 A (1) 6 A - 8 A (2)	10P - 7 A (1)

TIME ZONE: PST

WESTERN USA TO:

	10/6* Meters	15 Meters	20 Meters	40/80** Meters
Western Europe	7 A - 8 A (1) 8 A - 11A (2) 11A - 12N (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 11A (3) 11A - 12N (2) 12N - 1 P (1)	6 A - 7 A (2) 7 A - 9 A (3) 9 A - 12N (2) 12N - 2 P (1) 2 P - 7 P (2) 7 P - 12M (1) 12M - 2 A (2) 2 A - 6 A (1)	5 P - 2 A (1) 7 P - 12M (1)**
Eastern Europe	7 A - 10A (1)	6 A - 7 A (1) 7 A - 9 A (2) 9 A - 11A (1)	7 A - 9 A (3) 9 A - 10A (2) 10A - 2 P (1) 2 P - 7 P (2) 7 P - 12M (1) 12M - 2 A (2) 2 A - 7 A (1)	6 P - 2 A (1) 7 P - 12M (1)**
North Africa	7 A - 8 A (2) 8 A - 10A (3) 10A - 11A (2)	6 A - 9 A (2) 9 A - 11A (3) 11A - 12N (2)	6 A - 7 A (2) 7 A - 10A (1) 10A - 11A (2)	5 P - 7 P (1) 7 P - 10P (2) 10P - 1 A (1)

TIME ZONE: PST, Con't.

WESTERN USA TO:

	10/6* Meters	15 Meters	20 Meters	40/80** Meters
North Africa (con't)	11A - 12N (1)	12N - 2 P (1)	11A - 1 P (3) 1 P - 5 P (2) 5 P - 12M (1) 12M - 2 A (2) 2 A - 6 A (1)	6 P - 10P (1)**
South Africa	6 A - 8 A (1) 8 A - 11A (2) 11A - 2 P (3) 2 P - 3 P (2) 3 P - 5 P (1)	5 A - 9 A (1) 9 A - 11A (2) 11A - 1 P (3) 1 P - 3 P (4) 3 P - 5 P (3) 5 P - 6 P (2) 6 P - 8 P (1)	10A - 12N (1) 12N - 3 P (2) 3 P - 5 P (3) 5 P - 7 P (4) 7 P - 9 P (3) 9 P - 11P (2) 11P - 2 A (1)	5 P - 8 P (1) 6 P - 8 P (1)**
Eastern Mediterranena	7A -10A (1)	7 A - 8 A (1) 8 A - 10A (2) 10A - 11A (1)	6 A - 7 A (1) 7 A - 10A (2) 10A - 5 P (1)	5 P - 9 P (1)
Central Asia	6 A - 9 A (1) 5 P - 6 P (1) 6 P - 7 P (2) 7 P - 8 P (1)	6 A - 9 A (1) 4 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (1)	7 A - 9 A (2) 9 A - 5 P (1) 5 P - 7 P (2) 7 P - 10P (1)	NIL
Southeast Asia	3 P - 6 P (1)* 8 A - 9 A (1) 9 A - 11A (3) 11A - 12N (2) 12N - 3 P (1) 3 P - 4 P (2) 4 P - 5 P (3) 5 P - 7 P (2) 7 P - 9 P (1)	8 A - 9 A (2) 9 A - 11A (3) 11A - 1 P (2) 1 P - 3 P (1) 3 P - 7 P (2) 7 P - 9 P (1)	2 A - 8 A (1) 8 A -10A (2) 10A - 2 P (1) 9 P - 12M (1)	4 A - 7 A (1) 4 A - 6 A (1)**
Far East	3 P - 5 P (1)* 1 P - 2 P (1) 2 P - 3 P (2) 3 P - 4 P (3) 4 P - 5 P (4) 5 P - 6 P (3) 6 P - 7 P (2) 7 P - 9 P (1)	12N - 1 P (1) 1 P - 2 P (2) 2 P - 6 P (3) 6 P - 7 P (4) 7 P - 8 P (3) 8 P - 9 P (2) 9 P - 10P (1)	8 A - 10A (2) 10A - 12N (1) 12N - 2 P (2) 2 P - 5 P (1) 5 P - 7 P (2) 7 P - 9 P (3) 9 P - 10P (2) 10P - 12M (1)	11P - 1 A (2) 1 A - 7 A (3) 7 A - 9 A (1) 1 A - 6 A (2)**
Pacific Islands	8 A - 9 A (1) 9 A - 1 P (3) 1 P - 5 P (2) 5 P - 7 P (4) 7 P - 8 P (2) 8 P - 10P (1)	7 A - 8 A (1) 8 A - 12N (3) 12N - 4 P (2) 4 P - 6 P (3) 6 P - 9 P (4) 9 P - 11P (2) 11P - 2 A (1)	12N - 6 P (1) 6 P - 7 P (2) 7 P - 9 P (3) 9 P - 1 A (4) 1 A - 2 A (3) 2 A - 3 A (2) 3 A - 6 A (1) 6 A - 7 A (2) 7 A - 9 A (4) 9 A - 12N (2)	10P - 7 A (3) 11P - 6 A (2)**
Australia	4 P - 7 P (1)* 8 A - 11A (1) 11A - 1 P (2) 1 P - 3 P (4) 3 P - 5 P (3) 5 P - 6 P (4) 6 P - 7 P (3) 7 P - 8 P (2) 8 P - 10P (1)	8 A - 9 A (2) 9 A - 11A (3) 11A - 2 P (2) 2 P - 5 P (1) 5 P - 6 P (2) 6 P - 8 P (3) 8 P - 9 P (2) 9 P - 11P (1)	1 P - 7 P (1) 7 P - 10P (2) 10P - 12M (3) 12M - 3 A (2) 3 A - 7 A (1) 7 A - 8 A (2) 8 A - 10A (3) 10A - 1 P (2)	2 A - 6 A (3) 6 A - 8 A (1) 4 A - 6 A (2)** 12M - 3 A (2)
New Zealand	3 P - 6 P (1)* 7 A - 9 A (1) 9 A - 11A (2) 11A - 5 P (3) 5 P - 7 P (4) 7 P - 8 P (3) 8 P - 9 P (2) 9 P - 10P (1)	7 A - 9 A (2) 9 A - 12N (3) 12N - 4 P (2) 4 P - 7 P (3) 7 P - 9 P (4) 9 P - 11P (3) 11P - 1 A (2) 1 A - 2 A (1)	12N - 5 P (1) 5 P - 8 P (2) 8 P - 10P (3) 10P - 1 A (4) 1 A - 3 A (2) 3 A - 6 A (1) 6 A - 7 A (2) 7 A - 9 A (3) 9 A - 12N (2)	11P - 6 A (3) 12M - 5 A (2)**
South America	9 A - 2 P (1)* 4 P - 6 P (1)* 6 A - 7 A (2) 7 A - 11A (3) 11A - 2 P (4) 2 P - 4 P (3) 4 P - 7 P (2) 7 P - 9 P (1)	5 A - 7 A (3) 7 A - 11A (2) 11A - 3 P (3) 3 P - 6 P (4) 6 P - 8 P (3) 8 P - 10P (2) 10P - 12M (1)	2 P - 4 P (2) 4 P - 6 P (3) 6 P - 9 P (4) 9 P - 11P (3) 11P - 2 A (2) 2 A - 5 A (1) 5 A - 7 A (2) 7 A - 2 P (1)	6 P - 8 P (2) 8 P - 1 A (3) 1 A - 2 A (1) 8 P - 12M (2)**
McMurdo Sound	7 A - 8 A (1) 8 A - 9 A (2) 9 A - 10A (1) 7 P - 10P (1)	7 A - 10A (2) 10A - 4 P (1) 4 P - 7 P (2) 7 P - 10P (3) 10P - 12M (2) 12M - 2 A (1)	4 P - 6 P (1) 6 P - 8 P (2) 8 P - 2 A (3) 2 A - 4 A (2) 4 A - 6 A (1) 6 A - 8 A (2) 8 A - 11A (1)	11P - 6 A (1)

FORECAST INDICES

Circuits forecast to be 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.

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

See "Last Minute Forecast" in text for the relationship between the Forecast Indices and the day-to-day propagation conditions expected during the month.

* Indicates expected 6-meter openings.

** Indicates expected 80-meter openings. On nights when atmospheric noise conditions are exceptionally quiet, 160-meter openings are likely to occur on circuits where 80-meter openings are rated (2) or higher.

The CQ DX Propagation Charts are based upon a CW effective radiated power of 150 watts at radiation angles less than theiry degrees, and are centered on the Eastern, Central and Western areas of the USA. The DX Charts are valid through December 31, 1960. See text for further details concerning the use of these Charts. Propagation forecasts contained in these Charts are based upon basic ionospheric data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

6 And 160 Meters

The gradual reduction in solar activity is expected to have a marked influence on both 6 and 160 meters. During the past three winter seasons, frequent 6 meter openings were reported during the daylight hours to almost all areas of the world. Solar activity has now declined to a point where very few 6 meter openings are forecast for the present winter season. While some infrequent 6 meter openings are shown in the November-December Propagation Charts, they will be few and far between. In all probability, this winter season will see the last of the 6 meter DX openings to most parts of the world until some future solar cycle rises to peak intensity. Based on present solar predictions, such an event is not likely to take place again for many, many years.

As the solar cycle declines, propagation conditions at the other extreme of the spectrum, 160 meters, tend to improve. W1BB, an "old standby" on 160 meters, already reports a considerable improvement in reception on this band, with U.S. to New Zealand signals peaking 567 on c.w. and 55 on phone during the past summer! The 160 meter band is expected to come to life during the nighttime hours of the winter months, and DX openings to some areas of the world should be possible. Signals peak on this band during local sunset and sunrise hours.

Contest Special

The c.w. section of *CQ's* DX Contest will be held from 0200 GMT November 26th to 0200 GMT November 28th. The Propagation Charts appearing in this month's column can serve as a valuable guide during the Contest period. The Charts are based on the three main geographical areas of the continental United States, and contain propagation predictions to 13 different key areas throughout the world, including most of the choice DX locations.

The Eastern U.S.A. Chart, centered on Washington, D.C., can be used in the following call areas: W1, 2, 3, 4 and 8.

The Central USA Chart, centered on Denver, Colorado, can be used in the W5, 9 and Ø call areas.

The Western USA Chart, centered on Sacramento, California, can be used in the W6 and 7 areas.

The DX Charts are based on an *effective radiated* power of 150 watts c.w. Propagation calculations have been made assuming a dipole antenna a half wavelength above ground (for each band) as a reference. The effective radiated power of your station is equal to the c.w. power that you are feeding into your antenna system, multiplied by the gain of the antenna that you are using, over that of the reference dipole. For each 9 *db* difference (equivalent to a power ratio of 8) between your effective radiated power level and the reference level upon which the Propagation Charts are based, the

[*Continued on page 163*]

SURPLUS

by **KEN GRAYSON, W2HDM**
Care of CQ 300 West 43rd Street,
N. Y. C. 36, N. Y.

When Lew Cates of Rex Radio, 88 Cortlandt St. New York City, cornered me last week, I knew something was up. "Tell me," he said, "is the BC-604 an orphan? No one seems to want to run a conversion on it." Our first impulse was to say yes, it is an orphan, but I decided to look into the set and see what I could come up with. This seems to be a good buy (about ten dollars new) and loaded with fine parts. Within two days I had a conversion that could be done by anyone with very little outlay of cash, and the result is a fifteen or ten meter transmitter in the thirty watt class.

BC-604 Description

The BC-604 is a transmitter for mobile use in the thirty watt output class for operation on twelve or twenty four volts d.c. I receive mine with a DM-35 dynamotor which puts it on twelve volts with little strain. (Twenty four volts requires a DM-37). It covers the frequency range of 20 to 27.9 *mc*, making it a natural for the bands mentioned. A companion receiver is the BC-684, which covers 27.0 to 38.9 *mc*. Note now, and please understand this clearly. This transmitter is not capable of conversion to the Citizen's Band without violating the law, and no correspondence will be answered about any conversion to non-amateur applications. (See "Surplus" Sept. 1960, page 82 for reasons.)

The 604 originally operated on any ten of 120 crystal controlled channels spaced 120 *kc*. The transmitter is *Frequency Modulated* and used a deviation of plus or minus 40 *kc*. The crystals used were in the 375 to 540 *kc* band and I multiplied 72 times to get to the actual transmitted frequency. The final amplifier is very similar to an 807, while the other tubes are similar to a 6L6. The only problem with these tubes is, that they are directly heated filament types and are wired in a series-parallel string to get the necessary filament voltages. The first thing to do when converting equipment is to get

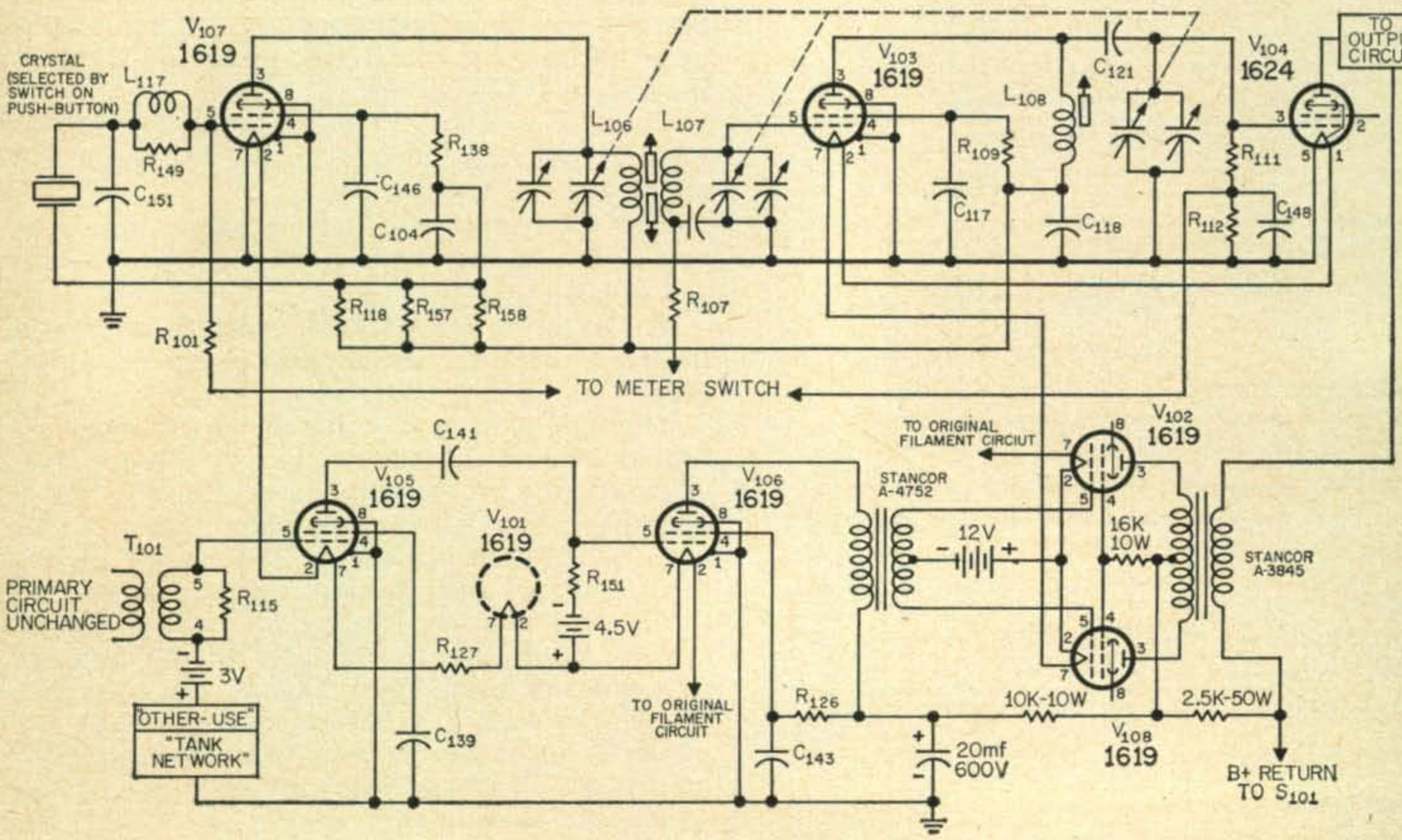


Fig. 1—Modified circuit of the BC-604.

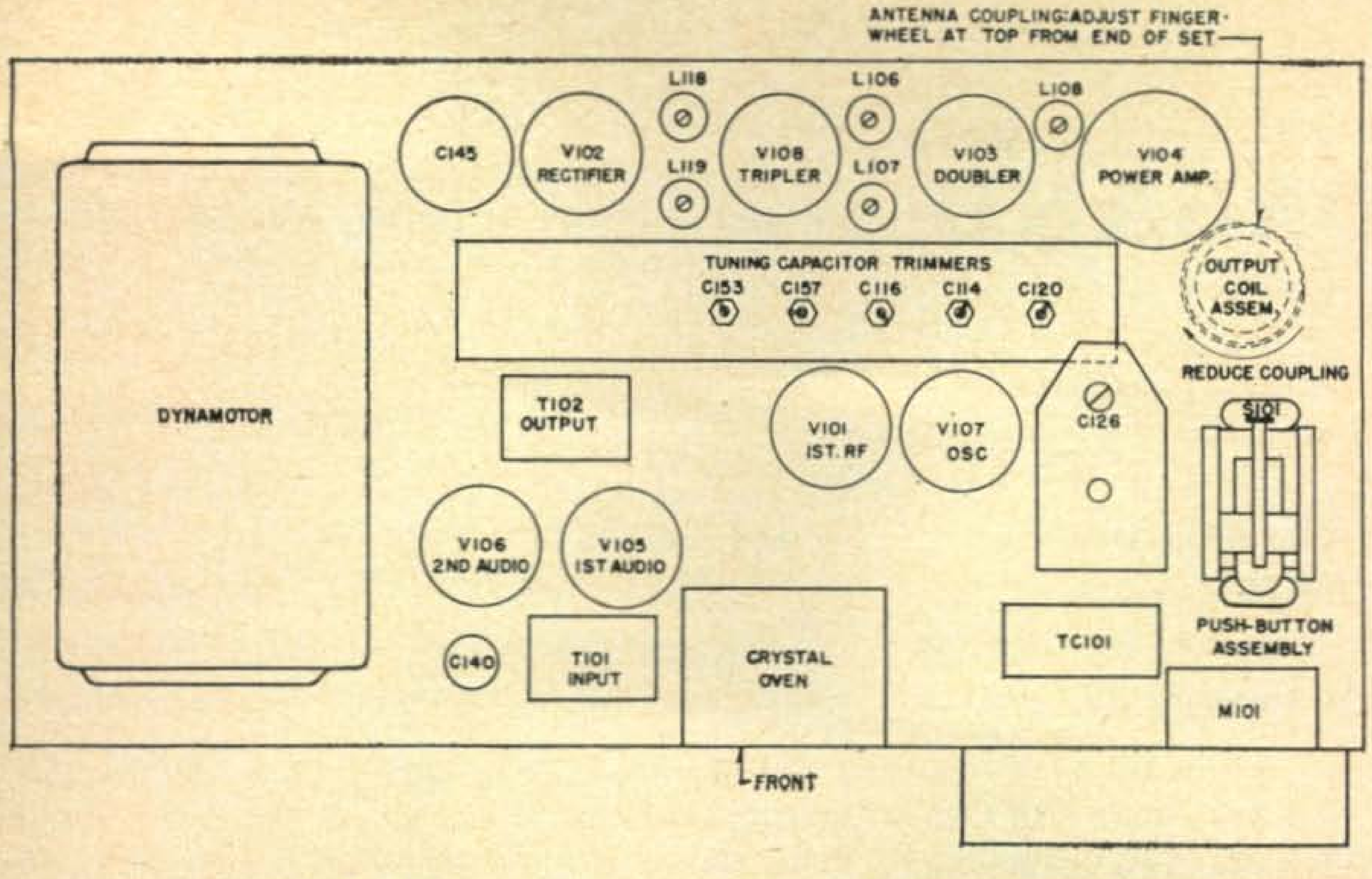


Fig. 2—Top view of the BC-604.

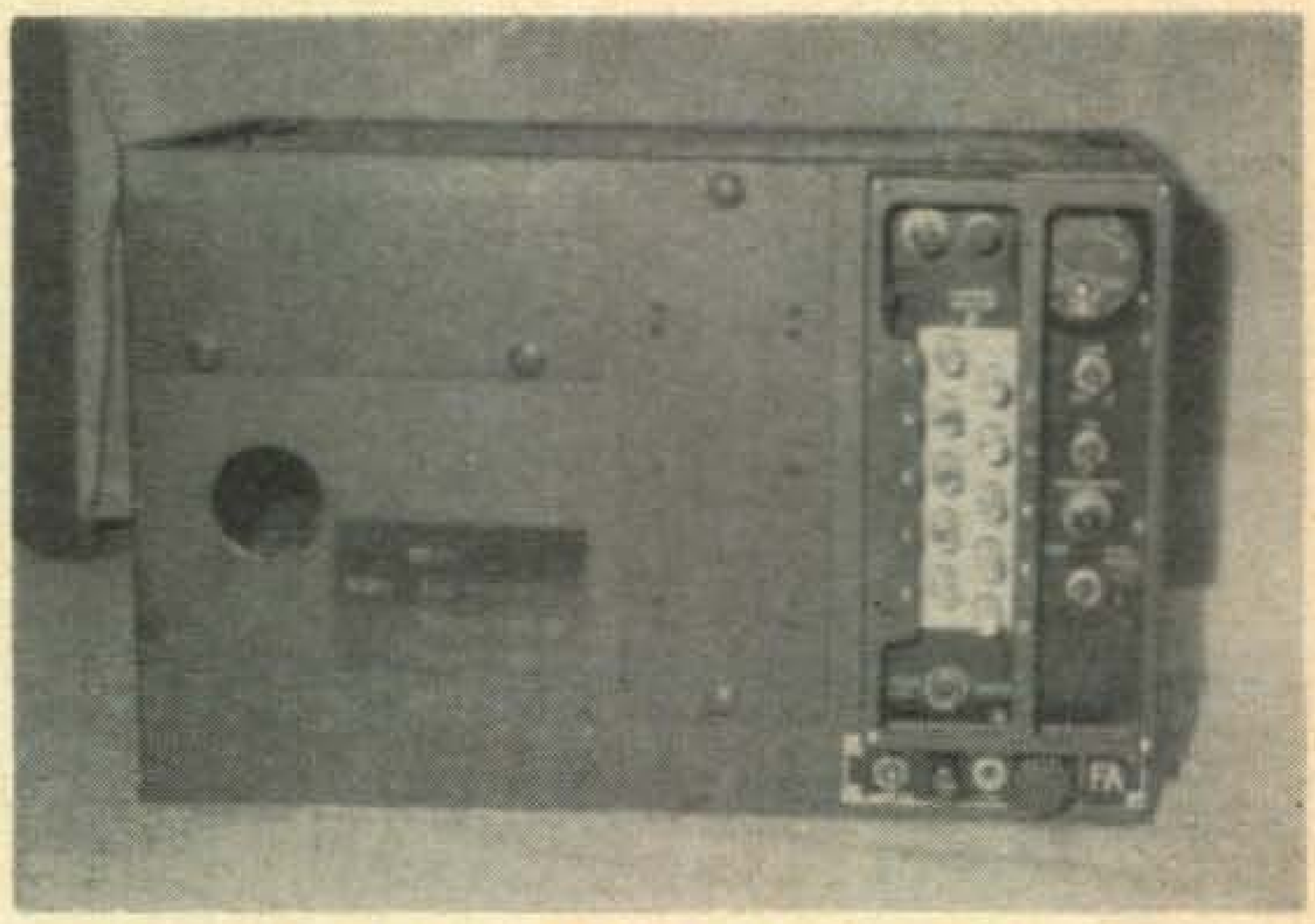
a working model. In this case don't get talked into taking the crystals with the unit unless you are planning to get a single sideband filter out of the deal, since that is about all the crystals are good for. Usually the dynamotor is obtained separately. Also, since the unit weighs about seventy pounds, be careful; the shipping charges are counted in the price.

Fortunately, for our purposes, the FT-241 cillator, rewire this section to use the 7 *mc* crystals as far as sockets are concerned, so those surplus and new crystals will work OK in this unit. You will have to rewire the oscillator and make use of the f.m. circuitry for the a.m. modulator.

Conversion

The actual conversion begins by locating the various parts within the transmitter. This is done by removing all of the quick disconnect panels which have quarter-turn type fasteners. This will expose the circuits and it will be necessary to locate the tubes as well as the various sections of the variable capacitors. Starting with the oscillator, rewire this section to use the 7 *mc* crystals needed for the ten and fifteen meter bands. Remove the wire going to L_{102} from pin 3 of V_{107} at the lug of L_{102} and reconnect this to the free lug on C_{114} variable capacitor (second from the end) near V_{107}. Remove the wire going from pin 3 of V_{108} to L_{106}. Remove exactly 16 turns each from L_{106} and L_{107}. Remove the 100K resistor going fro mpin 4 of V_{108} to B plus. This modifies the transmitter so that the oscillator now works at 7 *mc*, while the plate is tuned to 14 *mc*. The tripler circuit now operates as a doubler to 28 *mc* and we are now ready to align the r.f. sections. With the tuning capacitor open completely, adjust C_{120} so that the coil L_{108} is resonant at about 30 *mc*. It will be necessary to use a grid dip oscillator for this operation. Likewise set L_{106} and L_{107} to resonate at 15 *mc* by adjusting C_{114} and C_{116} respectively. Now close the capacitor by means of one of the push but-

[*Continued on page 162*]



Front view of the BC-604 showing push button arrangement and control functions. The round plastic window on the left indicates the line voltage in use when the dynamotor is installed. The spare crystal draw is the horizontal panel shown on the left. Active crystals are located behind the vertical plate.

Top view of the unit with the cover removed showing r.f. components on the right and top of the crystal draw on the left. The small holes on the side of the cabinet are individual channel antenna loading capacitor adjustments. The large square hole on the side of the cabinet is the final amplifier tank trimmer.

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street, Lynbrook, New York

FIFTH ANNUAL CQ WORLD-WIDE SSB CONTEST

1500 GMT, Saturday, January 28, 1961 to 2100 GMT, Sunday, January 29, 1961

The Fifth Annual *CQ* World-Wide SSB Contest will take place the last weekend in January, 1961 from 1500 GMT, Saturday, January 28, 1961 to 2100 GMT, Sunday, January 29, 1961, **with only 24 hours of operating permitted.**

The object of the contest is to work as many stations and as many different prefixes on SSB in the world as possible. (A "prefix" is considered the two or three letter/numeral combination which forms the first part of any amateur call. The following would all be considered *different* prefixes: W2, K2, WA2, WA6, 5A1, 5A2, DJ1, DJ2, etc.)

The contest is open to all sidebanders in all parts of the world and all authorized frequencies may be used.

Only one contact with a station may be counted and no multipliers are allowed for multi-band operation.

Only one transmitter may be in operation from any station at any one time and *only the licensee of the station may operate*, (except at a club station where one duly-designated club member may operate).

A major change in this year's contest is that it covers a 30 hour period but a participant must not operate for more than 24 hours. (This, of course, is to allow contestants to compete for the full contest period and still get some sleep.) 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 *clearly designated* in the contest log. Contestants may, of course, operate less than the maximum of 24 hours. Logs not indicating a 6-hour silence period will be disqualified.

Scoring: Each station must exchange the usual Q and S report followed by the number of their own contact. For example, the first contact would be 59001; the 67th contact would be 57067. All times **MUST** be entered in GMT.

Final scores are determined by multiplying the number of different stations contacted by the number of different prefixes worked.

The operator's name, address, rig set-up, number of stations contacted, number of prefixes worked and the final score MUST be indicated on a *separate sheet* attached to the front of the log.

AWARDS: The K2HEA-K2MGE TROPHY will be awarded to the highest scoring operator in the Contest.

Certificates will be awarded to the highest scoring contestants in each of the U.S., Canadian, and Australian call areas as well as in all other countries from which log returns indicate a minimum of three participating stations.

Log forms may be obtained from the *CQ* Sideband Editors, 12 Elm Street, Lynbrook, New York. When requesting log forms, be sure to provide a large envelope, self-addressed and stamped with return postage.

To be eligible for mention, logs must be returned DIRECTLY to the Editors at the same address as above no later than March 30, 1961.

The *CQ* World-Wide SSB Contest has become one of the most popular contests in amateur radio competition. Each year has seen an enormous increase in the number of participating stations and, of course, in the size of the final score. Last year's winner, Jack, CN8JF, made 751 contacts and worked 116 prefixes for a grand total of 87,116 points, topping the score of his predecessor, Peter HB9IE, by 30,000 points. With the greater number of sidebanders and the longer list of countries now represented on sideband, we are certain that this year's winner will top 100,000 points!

To the W/K stations who are out to win this contest, remember that each station contacted counts for one point so be sure to make use of all the available frequencies in order to increase your score. In the past, too many of the W/K boys have concentrated on working new countries only and, by comparison with the number of sidebanders operating, there just aren't that many new countries. To our DX friends, we hope that last year's confusion over what constitutes a prefix has now been eliminated and we expect to hear you in there working each other and us with reckless abandon!

This year, as many DX operators as possible will be informed of the rules by mail so that they will know well in advance of the contest. However, we would appreciate the cooperation of all sidebanders in publicizing this contest so that all sidebanders everywhere will go all out on January 28 at 1500 GMT to make this the biggest and best *CQ* World-Wide SSB Contest ever!

Who Me? Yes, You!!

We are both still fascinated by s.s.b.; properly used it is the hope for phone operation in the future. But we note with alarm that there is a growing disenchantment among some sideband ers who were its earliest proponents and practitioners. It doesn't take much effort to learn why they have disappeared from the bands, making an occasional appearance to talk with old friends and depriving the new crop of sidebanders of their sage advice on the technicalities of the art. Of course, if you never had the pleasure of their company, you'll be quick to say, "So what?"; but believe us, we are the losers!

Sideband, of course, was too good to keep for only a few and it spread like wildfire, as it should, among the phone operators and some c.w. men too. With this tremendous influx of operators, it is inevitable that some should bring with them all the bad habits that distinguished them in other modes of operation. But on sideband, where a signal must be technically good and operating a bit more careful, they really stand out! In the past several months we have had the pleasure of roaming the bands from 75 up to 10 meters—let's stop kidding—it was far from a pleasure! We don't consider ourselves "old timers" nor do we look down our noses at the "newcomers" to sideband, but we do have a real affection for s.s.b. and it bothers us no end to hear what is happening to s.s.b. operation as it is practised on every band.

From one end of the band to the other, we hear sloppily operated rigs and worse yet, sloppily oriented operators. We all goof at one time or another, but the good operators among us attempt to set things right. The sloppy operator, of whom there are too many, is inclined to say, "Yes, I know my signal is lousy. One of these days I'm going to do something about it. When I get the chance." Put a couple dozen such operators on any one band and you can imagine what it sounds like!

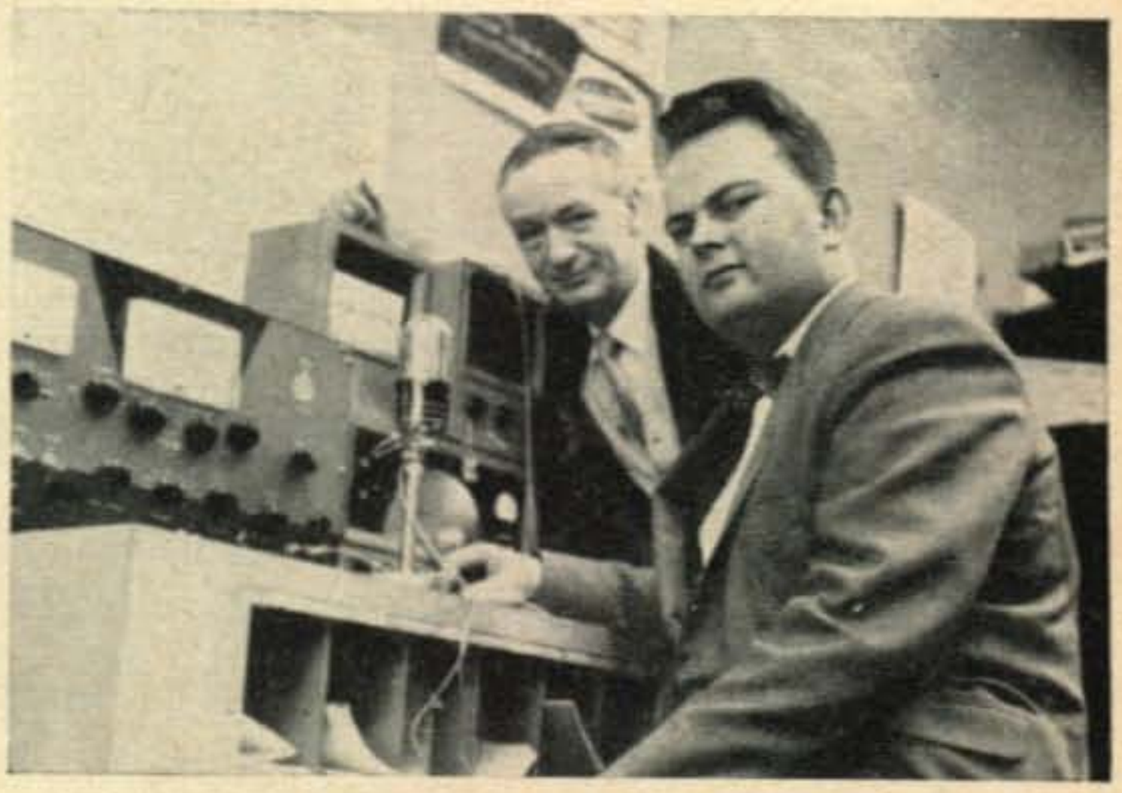
Some of us are willing to put up with a certain amount of this operating but there is a reasonable limit to this sort of garbage! The "old timers" have given up and gone elsewhere; some of us are trying to fight back as best we can, but until all of us insist upon improvement on the part of these "lid" operators who are cheating the majority of sidebanders of the operating pleasures of s.s.b., we can foresee the day when the s.s.b. portion of the phone bands will sound worse than the squealing mass of hetrodynes we can still hear on a.m.

Now if this is what you as an individual want, if this is what you think side band should be allowed to degenerate into, just keep on ignoring the rules of the road; ignoring the guy at the other end of the line who may offer words of opinion from time to time about the sound of your rig; who may suggest that you read the instruction manual and who may, in the last analysis, make s.s.b. more enjoyable for you — TOO!

A great group of the west coast sidebanders; l. to r. standing, W6ZPX, K6QBN, W6GT, W6NZW, K6HZP, K6ZXW, K6VNU, l. to r. kneeling, W6BAF, W6WMD, W6RKP, W6JFW

AL, K1IXG

Jack, W2GDG



Reg, W3HQO and Ian, MP4BBW

Sid, G3NUY
Photo Courtesy of W2GDG

SSB Certificates

Nine more sidebanders were made happy this month by the receipt of certificates and stickers awarded for their skill in not only working new countries on s.s.b. but, more important, in getting the confirmations. Sid, G3NUY, a comparative newcomer to sideband, received the "Worked 50" Certificate as did VE3CIO, W6-DLY, K9MGF, and DL6VM, Ella—the first YL in Europe to earn a *CQ* SSB award. K2PIC was the lone candidate for the "Worked 75" Certificate but the "Worked 100" Certificate had five claimants: W3KT, W3HQO, VE3BKL, W7-DLR, and K4TJL who also hit the jackpot by earning the "Worked 125" and "Worked 150" stickers to add to his certificate. DL4AS, now K4LYG/7, made the final pitch for credit for countries worked under his DX call and received the "Worked 125" sticker, while W1OOS climbed up the list by earning the "Worked 150" sticker. Our congratulations to one and all and keep the confirmations coming—we love to see the totals increase!

It Ain't New

Looking backwards is not a very good idea as a general rule, but sometimes it is necessary to gain the proper perspective. To most of us, s.s.b. is something brand new in the way of communication, both to the hams and to commercial users. This is hardly the case however, since the first patent for a method of generating carrierless signals was issued to John Carson in 1923. The fact that intelligence contained in but one sideband was all that was needed for communication was established as far back as 1915 by H. D. Arnold at the Navy Radio Station, NAA, when he tuned the transmitting antenna to resonate the lower sideband frequency attenuating the carrier and upper sideband. Then, as sometimes happens even now, the arguments went back and forth as to the existence of sidebands!! Some contended that they were a mathematical fiction! However, John Carson continued with further tests and came up with two very important theorems that form the basis for today's sideband; both sidebands contain identical information and that the greatest amount of power expended goes into the useless carrier. The carrier did nothing other than act as a reference for the sidebands. He pointed out that for the same input power, the effective power output could be doubled by eliminating the carrier!

In 1923, an s.s.b. signal with a pilot carrier at the frequency of 57 *kc* was used in the first trans-Atlantic radiotelephone demonstration. By 1927, trans-Atlantic s.s.b. radiotelephony was open for public service!! However, s.s.b. development did not permit practical s.s.b. transmission in the frequency range of 3-30 *mc* until recently. Our old friend, a.m., with its carrier and duplicating sidebands, was more in keeping with the methods readily available and while far from satisfactory, it served a purpose. With the development of more sophisticated techniques, in frequency stability, filter selectivity and low distortion linear amplifiers, s.s.b. has come into its own as a superior method of voice communication. We are all aware of the tremendous strides that s.s.b. has taken in the past ten or so years and as hams we can take pride in our contribution to its development.

Ella, DL6VM

It all goes to prove that there is nothing new under the sun; but if there is, the hams will be improving on it!

The SSBARA WAS Contest

That was quite a weekend the sidebanders had —the weekend of Sept. 10-11—when the SSBARA WAS Contest was accompanied by another contest—man vs. nature—as hurricane Donna made a most unexpected and unwelcome appearance. It was unfortunate that the Contest took place during a period of emergency and that a few unthinking operators placed the importance of getting contacts by breaking into emergency nets over the importance of letting the traffic get through unhampered. The emergency traffic handlers once again lived up to the highest traditions of amateur radio by providing the only communications available from some of the stricken areas while the WAS Contest participants, for the most part, frequented limited sections of the band, leaving plenty of space for ragchewers and emergency nets.

Propagation was better than could be expected for that time of the year. Twenty meters remained open for the entire contest period; 15 provided plenty of contacts with the more elusive states; 40 meters had greatly increased activity over that of last year's contest; and 75 again provided contestants with many opportunities to log in one station after another from the more local states.

The extension of the 20 meter band thinned out the QRM between contest and non-contest operators. With all the frequencies now available, the upper part of 20 provided an excellent area for contest activity while the frequencies below 14.300 were mainly occupied by normal weekend activity. Forty meters was the big surprise of the weekend—much, much more activity was evident this year than ever before which will, no doubt, be reflected in the Contest scores.

The biggest disappointment was the lack of activity in Nevada and Vermont. Even our ace contest operator, W2SKE, fell short of WAS through not being able to contact a Nevada station. (Next year, we're going on a WAS DXpedition to Vermont; who'll take Nevada?) Others were a bit luckier than Bill was, however, and among those who hit the magic number of 50—states, that is—were K9EAB, W5KFT, K4TJL, W6ONP, and KØLUX. There will probably be more once the logs are checked but a little on-the-air snooping revealed the success of these five operators.

The cooperation and courtesy displayed by members of round tables on the various bands in providing contacts should not go unnoticed. Without fail, the reception to the frenzied contestant breaking in for quick contacts was good-humored and understanding and we salute the Knights of the Round Tables for being such good sports.

We think you'll agree with us that the carefully thought out contest rules formulated by W2SKE proved their worth under fire. It was most refreshing to be able to grab at least a six hour snooze; the necessity for exchanging names put the whole Contest on a much more friendly

Bob, G3KGC (Photo Courtesy of W2GDG)

basis; and the practice of giving times in GMT proved invaluable for those amateurs who normally think only in terms of their local times.

A word of apology must be offered to the DX stations who were invited to participate in the Contest. With most W/K beams turned inland, our brethren out of the country didn't stand much of a chance to make WAS but, nevertheless, some of them made a good attempt and, we hope, enjoyed the activity.

All in all, the SSBARA WAS Contest gave the Stateside stations a unique chance to meet each other and to engage in a little friendly rivalry and a good time was had by all.

Sideband Around The World

Can anyone help Humberto, TI2HP, locate a Bob who was the operator at CT2RN during March, 1959? Humberto worked the station—the only one on sideband in the Azores—but never got a confirmation nor a specific QTH from the operator. . . . Pete, ZD2PJB, wrote that he had moved to Nigeria from Bahrain and expected to be fairly active on SSB for the next six months or so. . . . After a year of trying, Syd, (W8UTQ/3V8) finally was assigned the 3V8-CA call. W4YWX is his QSL manager for all W/K contacts. Syd uses a 32S-1 and HQ180 with dipoles on 7, 14, and 21 *mc* but was hoping to have a beam up before long. He enthused that he was able to work every DX station heard, was getting fantastic results, and credited his location which is 250 feet up on a hill overlooking the sea and harbor to Tunis and almost a clear shot in all directions . . . Jo, CR6CA, delighted some of the boys with a contact on 40 meters, some of the lucky ones being K4TJL, PZ1AX, W9SFR, W4BOC, and W4TO. . . . Floyd, VR6AC, will probably never forget this year's visit to the States. He walked off with top prize, an HT-37, at the Western SSB Convention so here's hoping Pitcairn Island will soon be on sideband regularly. . . . VS1JV is using Harold, W6BAF, as his QSL manager. W6BAF is now on a mission to Southern Rhodesia and visited Peter, ZE5JJ, but should be returning shortly to issue those rare QSLs so eargerly awaited by VS1JV's contacts. . . . And speaking of issuing QSLs, we must ask your patience regarding cards for FF8AK. Claude must have enjoyed his vacation in Paris so much that he clean forgot to contact us and furnish reports for those stations needing his card. However, soon as we hear Claude again, we'll try to get the cards to you as quickly as possible. . . . Olliver, ZS5JY, had such a busy schedule during his October round-the-world trade mission jaunt that he had to pass up many invitations from his Stateside friends. We hope his next visit will be more leisurely. . . . Some of the most fantastic pile-ups ever heard are those occurring when Mike, VR1D, opens up on 20 meters. When will the DX chasers learn that Mike cannot hear them calling him while he is transmitting???? . . . Ralph, DL4PI, was flabbergasted to discover that his two-way discussion with W3AST about the Olympics soon widened into a roundtable including sidebanders in Italy, Lebanon, Bahrein, Formosa, the Virgin Islands, Brazil, Libya, Surinam, Argentina, Denmark and New York (Anita, WA2BEI) . . . all these over a 3 hour period and just a station from Oceania would have made it a WAC roundtable!

[*Continued on page 167*]

Norry, F7GZ (Photo courtesy of W2GDG)

Novice

by **DONALD L. STONER, W6TNS**
P.O. Box 137, Ontario, Calif.

A full wave rectifier is a device which has two or more anodes so arranged that the output current (rectified energy) always flows in the same direction even though the half-cycles of the alternating current supply are both positive and negative.

A full wave rectifier may be made by connecting two diodes as shown in fig. 1. The cathodes of the two diodes are tied together and the junction is tied to one end of the load resistance. The other end of the load resistor is tied to the center tap "C" of the transformer secondary through the common ground connection. The two halves of the secondary winding may be a center-tapped winding as shown, or may be separate windings.

The center-tapped secondary winding may be considered the source of voltage. It supplied an alternating current waveform which is also shown in fig. 1. This voltage is impressed on the tube V_1 and the resistance of the load in series. During the first half cycle, the plate of V_1 is positive relative to the cathode. Therefore, an electron current flows in the load resistance (direction is shown by arrow). This current causes a voltage drop across the load resistor such that the upper end of R_1 is more positive than the lower end. During this same half cycle the voltage across the other half of the transformer makes the plate of V_2 negative, relative to its cathode and this tube does not conduct. A half-cycle later the voltages on the plates of the two tubes are reversed, V_2 now is conducting, and V_1 nonconducting. The electron current which passes through V_2 flows in the load resistor in the same direction as before. This current also produces a positive pulse of voltage across the load resistor.

Thus only one tube conducts at a time. Since there are two pulsations of current in the output for each cycle of the applied alternating current, the fullwave rectifier is more efficient than the half wave rectifier, has less ripple effect, and may be used for a much wider variety of applications.

Bridge Rectifier

If four rectifiers are connected as shown in fig. 2, the circuit is called a bridge rectifier. The input to such a circuit is applied to diagonally opposite corners of the network, and the output is taken from the remaining two corners.

During one half-cycle of the applied alternating voltage the top end of the transformer "A" becomes positive with respect to the bottom by the amount of the voltage induced in the secondary of the transformer. The secondary voltage will cause a current to flow through the load resistance, V_4 and V_1 in series. The voltage applied across these tubes makes their plates more positive than their cathodes, and current flows in the path indicated by the dotted arrows. The waveform is also shown in fig. 2. One half-cycle later, V_4 and V_1 are nonconducting, but an electron current flows through tubes V_3 and V_2, and the load resistor, in the direction indicated by the solid arrows. The current through the external load is *always in the same direction*, as in the full wave rectifier. The bridge rectifier is actually a full wave rectifier

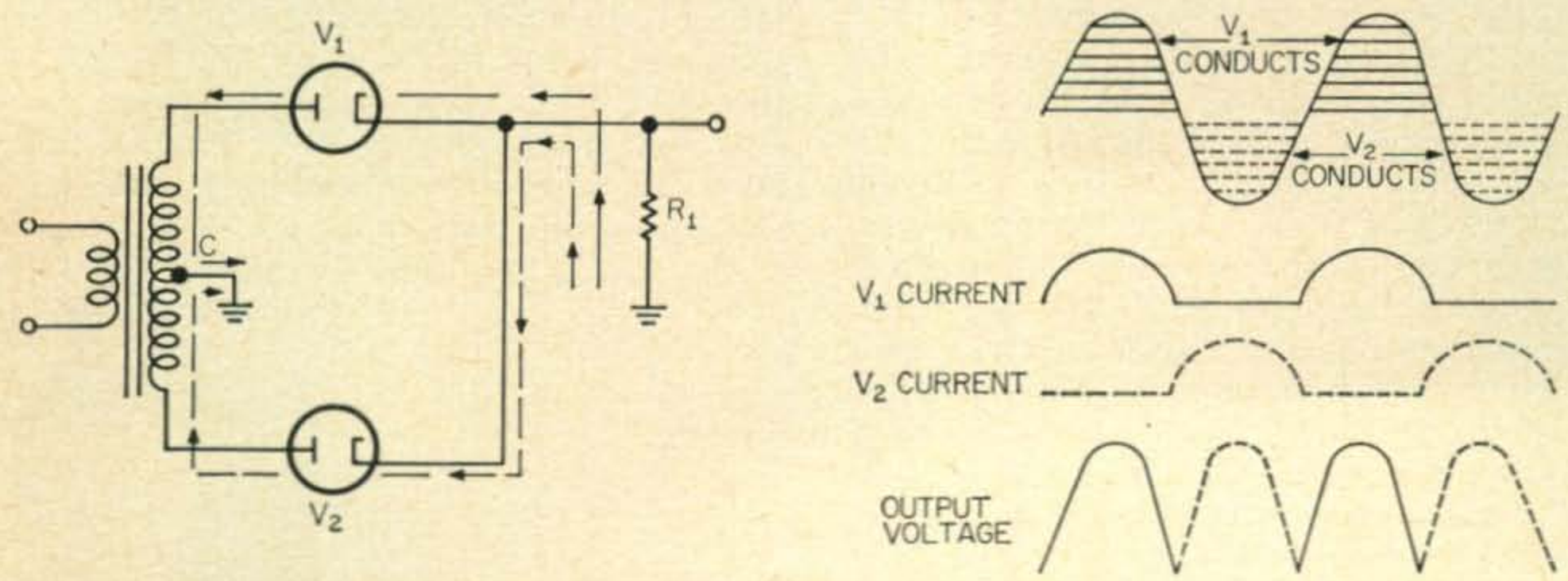


Fig. 1—The full wave rectifier uses both halves of the impressed a.c. Note that the current always flows in one direction through the load.

since current flows in the load during both halves of the cycle.

One advantage of a bridge rectifier over a conventional full wave rectifier is that with a given transformer the bridge circuit produces a voltage output nearly twice that of the full wave circuit.

A second advantage of the bridge circuit is that the inverse voltage across a tube is half of the inverse voltage impressed on a tube in a conventional full wave rectifier which is designed for the same output voltage.

Vacuum tubes are not used as widely in bridge rectifier circuit as they are in other types of rectifier circuits because of the greater number of tubes required and because three separate filament transformer windings are needed. This is because the filaments of V_4 and V_3 are at the same potential, but the filament of V_2 is at a different potential from either V_1 or V_3. The three filament transformers must be well insulated from each other and from ground because of the high potentials to which they are subjected.

Who's DX?

As this is being written, we are in the middle of the summer slump. Signals on 15 meters are few and far between. Even so, our overseas DX reporters are dredging the QRM and QRN and find quite a few Novice "peanut whistles" spanning the oceans.

The following Novices were received by Don Kirkman, WA6ENG/JA1, 405 Kikuna Cho, Kohoku-ku, Yokohama, Japan, during the month of July: 7/2- WV6LKC. 7/3- KN4PNM/KL7, WV6KDO, KN7LPA, MEF (?), KST. 7/6- KN4WZM. 7/7- WH6DRB, WV6IEO/KL7, KSG, LJN, MAW. 7/9- KN5CRT (?), KN5CXT (?), WV6IEO/KL7, JCF, KOB, KYT, KJR, 7/10- WH6DRT, DSF, WV6-JFX, KN7KCQ, LGZ. 7/11- KN4KIP (?), WH6DRB, WV6MAX, KNØZRT. 7/12- WH6-DNO, DRB, WV6IEO/KL7, HCA, MAZ, KN7 MHA/7. 7/13- KN4PNM/KL7, WH6-DRB, DSH, WV6IEG, KOB. 7/19- WH6 DSZ, KN7LIJ (or LIO. Don advises us that these signals were received on 40 meters. He took a run down to 80 meters when the band

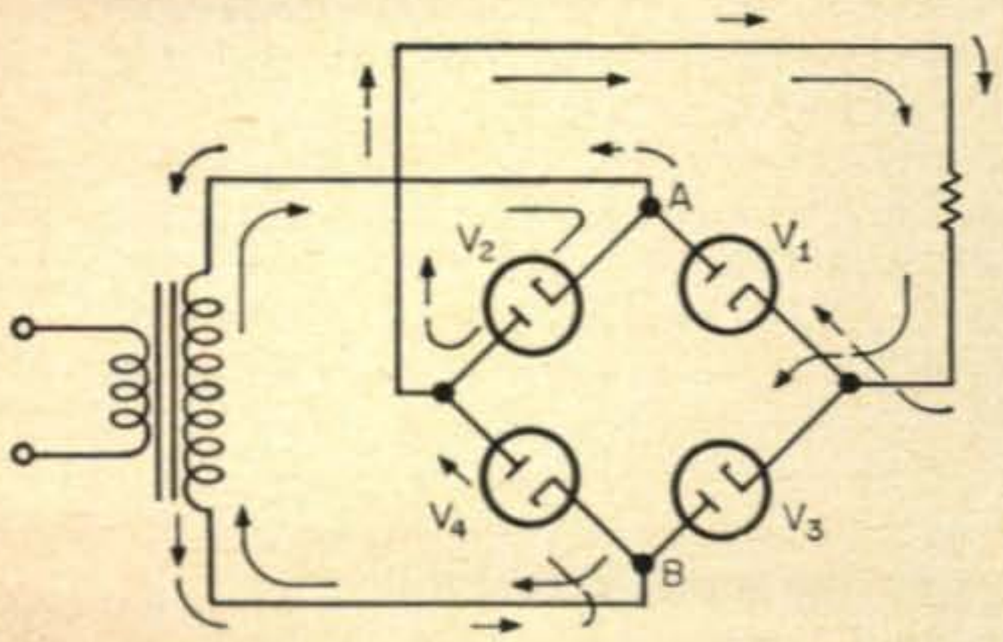


Fig. 2—The bridge rectifier system is convenient when using transformers that have no center tap. It rectifies the full end to end voltage.

Meet pretty Carol Ann Bernier, KN1NVG, 43 West St., Easthampton, Mass. Carol operates evenings and Mondays (her day off work), but don't look for her on Saturday nite-hi.

It's no wonder Ford Toomans, K8PVU, 4776 Slade Dr., Hamilton, Ohio, is all smiles. You should see his impressive list of DX worked. Ford will sked anyone needing Ohio.

Where the heck is JT1? So says Mike Sealfon, WV2OCG, 107 Stony Ridge Dr., Hillsdale, New Jersey. Hidden behind Mike is his DX-40.

Dick Gordon, KNØWNZ, 545 South Monroe St., Lebanon, Missouri, operates from this neat station and has piled up 198 contacts with 36 states confirmed. The small meter near the center of the picture is Dick's home-brew fields strength meter.

On June 29, 1960, Bill Lovett, KN7LHT, won the Aberdeen Washington Soap Box Derby and went on to race at the National Derby at Akron, Ohio, on August 14th. Bill has been racing for over 4 years, starting when he was only ten. By the time you read this Bill will probably have received his General ticket. Bill's proud parents (his dad is W7GEK) and sis' stand by.

Bill, KN7LHT, logs that rare one in front of his HRO and Viking Adventurer.

was particularly hot but only heard one Novice. It was a KN7 something, "W", something. At one time it sounded like Blank WP and later he thought it was JWX. The signal was copied at 1140 GMT on the 10th of July. Check your logs, maybe it was you. If any of the above stations would like to have their RST in Japan, I will copy it from Don's letter to your self addressed postal card.

Hawaii isn't DX to a lot of hams, but to many Novices it is. John ("Monte") Montague, K6-PXQ/KH6, 1108 Kakila Pl., Honolulu 18, Hawaii, has offered to make skeds with Novices desiring the 50th state. Figure 5 days for air mail, and give him at least two weeks advance notice before a sked date. In addition, you should list several alternate frequencies. Monte reports hearing the following Novices on 80 meters between July 19 and July 23: WV6JTZ, JUA, KEV, KN7KNY, KPC, LMC, LXA, MCA, MPD, MPF, MPX, MQP, KNØZNV. The signal of KN7MCA is outstanding and was received on 3 separate evenings with 589 sigs!

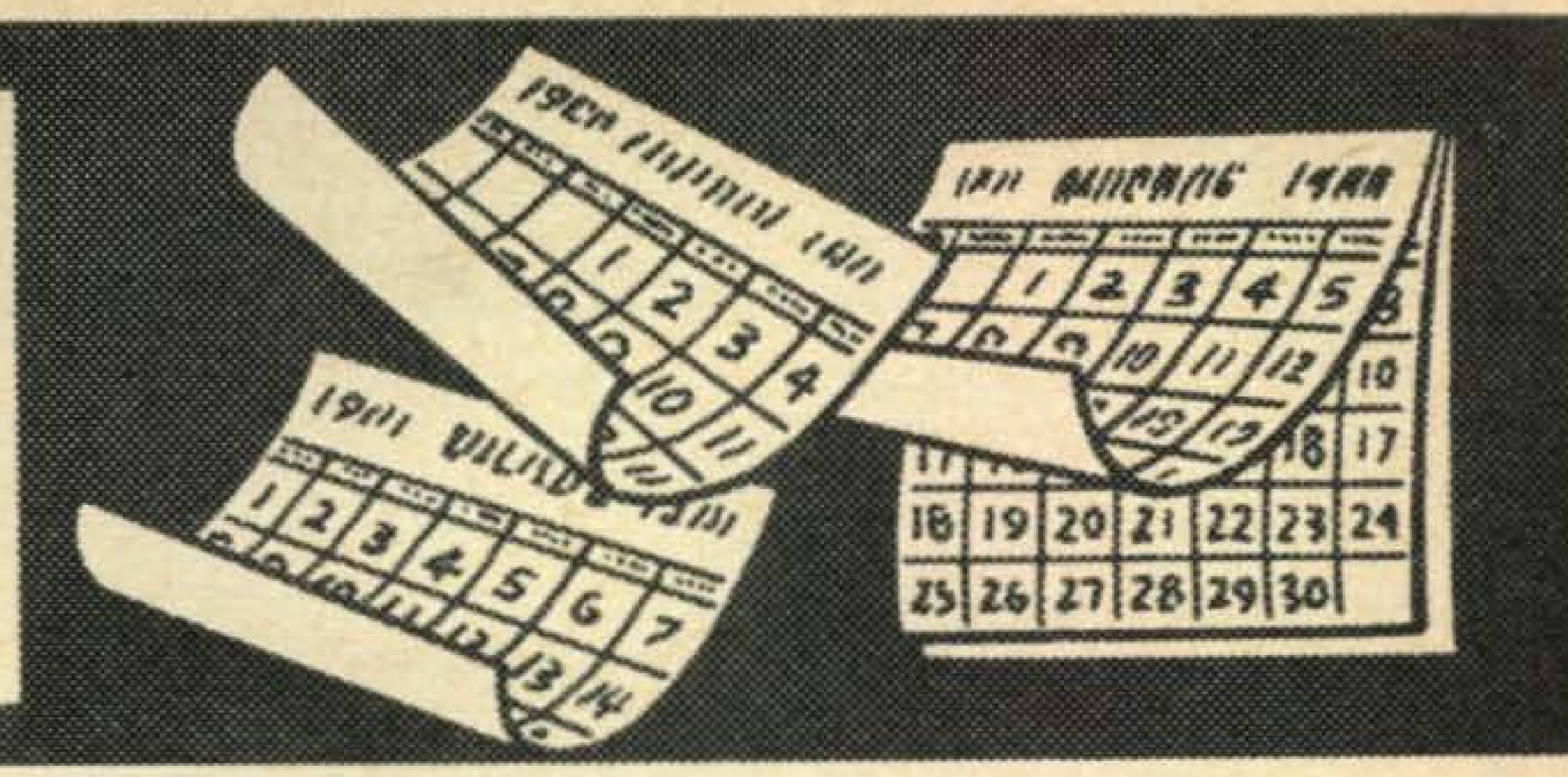
From the land "down under", our faithful correspondent Ivor Stafford, VK2XB, 16 Byron St., Box Hill South, E. 11, Victoria, Australia, writes to bring us up to date. Ivor has worked Novices in all the states except Utah, New Hampshire, and North Dakota, and would like skeds with these states very much for his Novice WAS. If you live in one of these spots, drop him a line for a 40 meter sked. Ivor has called or worked (italics) the following stations in the period between April 22 and August 4: KN1-*LEP*, *LOM*, LTP, LYS, LUI, LXA, MBF, MBK, MGC, MNI, MTD, MXR, NJV, NLN, *NTD*, NUD, OED, OJI, OLP, OQY, VCK. WV2CVM, FVD, GRW, *GWM*, GZC, *HGH*, IMS, JBG, JHX, JKX, JZM, KAR, KBF, KDR, LMW, LZA, MER/5, MFA, NAU. KN3JGJ, *JLG*, *JMC*, JOT, KSW, *KHK*, KIX, *KTU*, KWX, LBR, LBX, LGS, LJP. KN4JWQ, LHD, PEO, PLD, PMH, *RHK*, RIF/4, RSQ, SUN, *TBB*, UNL, UPP, WHD, WIG, WIP, WMY, WOF, YLX. KN5AAM, AAZ, ARE, BFQ, BSL, CGI, CGS, CGU, CGZ, CQW, CXT, VWA, WEO, WWM, WVH, YKV, YMU, ZCJ, ZUX. WH6DIB, DJV, DLW, DPI, DRT, DSF, JGF. WV6DNV, FID, GEZ, *GWM*, HND, *HZB*, IEO/KL7, *ILP*, IQC, JAD, JJD, JJP, JQR, JWA, KBN, KDQ, KOB, KRY, KYK, LBB, *LKC*, KN7DNF, IUR, JGB, JLM, JRE, KPP, KHP, KJS, KST, KTC, KXP, KWP, LAE, LAN, LES, LDS, LFD, *LGU*, LPF, LPY, LSM, LSO, LVE, LVL, LXG, MDK, MGQ, MTG. WL7DJN, DJU. KN8ENZ, PMQ, QFJ, *SBU*, SDK, SKA, SQE, SRP, STG, TFM, TGW, THH,TSR. KN9*SXV*, TKE, VDD, VGC, VOC, VPS, VWH, VZO, WWS, WXH, YKF, YEI, YMI. KNØUTJ, UZM, VCQ/6, VGD, WNU, WPK, WRP, WUX, YET, YLV, YPY, YVY, ZIU/Ø, ZNT.

European conditions have been very poor. Tima Popovic, YU1RS, Banat Novo Selo, Yugoslavia, says; "Band conditions have been very bad for quite a few months now and no Novices are coming through at all. I kept waiting until conditions change for the better but they never did". Tima did manage to snag a few stations during the spring season, however. They are: April 27, 1927-1935 GMT: KN1LEP, NKQ, WV2LZA, KN3IZK, KN4RTF. May 15, 2039-2057 GMT: KN1OAZ, KN3KRF, KN4PZR, QOL, TZU. May 23, 1952-2144 GMT: KN1-LFS, LZE/1 MBO, NCP, WV2FCV, IHC, KKAE, KBC, LLT, KN3KLE, KRF, LSS, WP4AUT, KN5YMO, ZUY. May 25 at 1923 GMT: WA2JGK (just to prove that Generals can get through too-hi). June 12, 2000-2124; KN1MWF, NWF, WV2GDQ, GRE, HRZ, JTC, KAE, KIP, KTF, LTK, LZA, KN3JAW, JOT, KHK, KLT, KST, LPX, KN4KVP, KZV, PYU, SUD, WHD, WOB, KN7KDK, KN8-RCD, SHT, KN9VQK, KNØYRG. July 17, at 1812 GMT WV6KOJ (he was answered by G3IGD, but he failed to hear it). So ends Tima's report. Let's hope band conditions pick up like 'ole times. According to George Jacobs, our propagation editor, the outlook for DX in the future is not too good.

[*Continued on page 168*]

CONTEST CALENDAR

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



October	29-31	*CQ* WW DX Phone
November	2-3	YLRL Phone
November	12-13	ARRL SS
November	19-20	ARRL SS
November	26-28	*CQ* WW DX CW
December	3-4	RSGB 21/28 Phone
January	14-15	DARC WAEDC
January	14-15	New Mexico QSO
January	28-29	*CQ* WW DX SSB
January	28-29	Kansas QSO Party

CQ WORLD WIDE DX CONTEST

Phone

GMT 02:00 Saturday, October 29th to 02:00 Monday, October 31st.
EST 9:00 PM Friday, October 28th to 9:00 PM Sunday, October 30th.

CW

GMT 02:00 Saturday, November 26th to 02:00 Monday, November 28th.
EST 9:00 PM Friday, November 25th to 9:00 PM Sunday, November 27th.

Special Awards for the 1960 World Wide DX Contest

Phone

The K2IEG, Barry Briskman Trophy, for the world highest score by a Single Operator on a Single Band.

The W2SKE, Bill Leonard Trophy, for the world highest score by a Single Operator on All Bands.

The K2AAA, Don Merten Trophy, for the world highest score by a Multi-Operator station in the Single Transmitter division.

The W6AM, Don Wallace Trophy, for the worl dhighest score by a Multi-Operator station in the Multi-Transmitter division.

C W

The W7KVU. John D. Ryan Trophy, for the world highest score by a Single operator on a Single Band.

The W9IOP, Larry LeKashman Trophy, for the world highest score by a Single Operator on All Bands.

The W3AOH, Tony Susen Trophy, for the world highest score by a Multi-Operator station in the Single Transmitter division.

The K2GL, "Buzz" Reeves Trophy, for the world highest score by a Multi-Operator station in the Multi-Transmitter division.

The *CQ* Plaque, given to the DX Club submitting the highest aggregate score of the scores submitted by its members. These scores will be taken from all sections and divisions in the contest.

The above array of awards certainly is tops for any DX contest in the world. The fact that in last year's contest only one trophy was won by a station in the United States, should be proof positive that this indeed is a World Wide DX Contest.

Once again let us reiterate that the *CQ* Plaque will only be awarded to affiliated DX Clubs that have submitted a list of its participating members along with their claimed scores, signed by an authorized officer of the club. At their request, club members will have their scores credited to their club, but the club will not be eligible for an award unless Rule XI—#7a is observed.

Don't be confused by the 12 hour operating time required to be eligible for an award. Your score will be listed regardless of how much time you put in the contest. The mailing deadline is also made flexible for stations located in isolated areas. Therefore, by all means, be sure to send us your reports.

YLRL

Phone

Starts: 12:00 Noon EST Wednesday, November 2nd.
Ends: 6:00 PM EST Thursday, November 3rd.

The YLs kept their 21st Anniversary Party a secret so its too late to announce the CW section held last month. However Louisa Sando, W5RZJ

[*Continued on page 171*]

Members of the U.P.Y.L. Net met in person for the first time at the 12th annual Hamfest of the Upper Peninsula of Michigan at Sault Ste. Marie on Aug. 7-8, 1960. W8HAV, Zelma, was elected Net Coordinator and NCS will rotate among the members on a monthly basis. L. to r., front row: K8DWA, K8KIT, K8TGX, K8SUP, W8HAV, K8ILN. Standing: W8MMB, K8OMH, K8SRO, K8DTD, W8JXJ, K8PNA. (K8TGX and K8SUP are twins.) The UPYL Net was organized on the air in June of this year. It meets each Monday at 0800 EST on 3920 *kc*. While it is primarily a gab-fest net, anyone with traffic is welcome to break in and will receive all assistance possible.

YL

by Louisa B. Sando, W5RZJ
212 Sombrio Drive, Santa Fe, N.M.

New YLRL Officers

Once again it is time to offer congratulations to those YLs who have been elected as officers and District Chairmen for YLRL for the coming year, 1961. An outstanding slate was nominated, and these are the winners: President, K5BNQ, Doris Anderson; V.P., W1ZEN, Leonice ("Onie") Woodward; secretary, K1IZT, Blanche Randles; treasurer, K6OQD, Jean Kincheloe.

These YLs will be serving YLRL as District Chairmen: W1HOY, Helen Harris; WA2DBG, Helen Yankaskas; W3CDQ, Elizabeth Zandonini; W4EER, Betty Dennison; W5WXY, Bernice Jack; K6ZCR, Claire Hogeweide; W7GGV, Helen Maillot; K8DTD, Maxine Hill; K9EMS, Evelyn Cudia; KØEPE, Martha Wessell; KH6-AFL, Louise Bostwick; W4VCB/KL7, Evelyn Wikoff; VE3DTW, Ethel Williamson.

Also serving YLRL in the positions listed (each a big job) are the following: Membership chairmen: Western, K6BUS, Midge Rommell; Eastern, W8OTK, Alice Geib. Correspondents: International, W4HLF, Arlie Hager; Novice, W7DVH, Alice Sturdevant. Certificate Custodians: WAS/YL, W9GME, Grace Ryden; WAC/YL, K5YIB, Barbie Houston; DX/YL, W6-UHA, Maxine Willis; YLCC, W4SGD, Katherine Johnson. Continuous Membership Chairman, K7BED, Bettie Mayer. Librarian, W6-CEE, Vada Letcher.

YLRL invites licensed Young Lady Hams to

join its International organization. Write to either of the membership chairmen listed above, or to the District Chairman for your call area. You will find a warm welcome in YLRL, now entering its 22nd year of existence.

K5BNQ

Our new president, K5BNQ, Doris Anderson, of Broken Arrow, Okla., though licensed only five years ago, is one of the best known YLs in W-K land. K5BNQ is consistently active on 10, 15, 20, 40 and 75, phone and c.w. She loves rag-chewing, emergency work, contests, chasing YLs and certificates. Doris is a member of AREC and she and her OM, Andy, W5IWL, are assistant EC's for Tulsa Co. They have been very active during tornado emergencies. She checks into many of the YL nets, but her favorite is TYLRUN, of which she is a past president and NCS. Doris was 5th D/C in 1958 and nominating chairman. Among her over 50 certificates are WAS/YL and YLCC (#75) with 600 YLs confirmed. She is the first winner of the Corcoran Plaque for combined phone-c.w. high score in the 1959 YLRL A.P. She won the gold cup for highest phone score in this same contest. Doris also has placed regularly in the top three in the YL-OM Contests. For several years she has been Oklahoma Editor for *The Monitor*, and she holds an OPS appointment. Doris and Andy are the parents of three teenage jr. ops and both are very active in church and summer camp work. They share another hobby, photography, and you will often note K5IWL's by-line on photos in this column.

W1ZEN

Leonice ("Onie") Woodward, W1ZEN, of Marlboro, Mass., YRL's new V.P., is known to many of us as one of the very capable co-chairmen of the highly successful 3rd International YLRL Convention held at Cambridge in June. Onie started with a Novice ticket in '53, progressed to Technician and got her General in Oct. '54. You can find her on 10, 15, 20, 75 and on 6 and 2, the latter especially during VHF contests. She checks into the YL nets on all bands whenever possible. A charter member of WRONE, she is also a past president of the club and chairman of the Exec. Committee in 1958-59. A member of YLRL since '56, she served as 1st D/C in '59. She holds WAC, YLCC (350), DX/YL, Maritime Mobile, and many club certificates. Onie works as a substitute school teacher. Her OM is W1RCJ, Woody, and they have a teenage daughter, Ann. Onie also enjoys handcrafts—she made the lace afghan raffled at the YLRL Convention.

K1IZT

YLRL's secretary for 1961, K1IZT, Blanche Randles, of Framingham, Mass. also is well known from her active part in the 3rd YLRL Convention, as co-chairman of the favors and decorations committee. Blanche received her General in June '54 as W4GXZ and after several

W1ZEN, "Onie" Woodward, 1961 YLRL V.P.

K1IZT, Blanche Randles, secretary of YLRL for '61.

K5BNQ, Doris Anderson, YLRL's president for 1961.

moves landed in Mass. and received the call K1IZT in '58. She was a charter member and first secy-treas. of the Floridora YLs. Since living in Mass. she has been active in WRONE and is custodian of the club's certificate. So many moves made it hard to complete certificates, but she holds YLCC with three endorsements and many other YL certificates. She meets all YL nets if she is not working, and operates all bands 6 through 80. Blanche's OM is K1HTK, Wes, and they have a teenage daughter. Blanche also

[*Continued on page 172*]

BE APPRECIATED!

YOU probably have several very near and dear friends who are also Hams . . .

for whom expensive and elaborate Christmas gifts this year are out of the question.

IF SO, you're not alone! Thousands of Christmas shoppers face the problem of what to get these friends . . . while holding expenses within their budgets.

A SUBSCRIPTION to CQ will be appreciated by anyone who receives it and each month will be a reminder of your thoughtfulness.

SAVE MONEY on your subscription as well as your gifts.

CHECK our Subscription envelope and rates on the opposite page.

Special Distributor's Index

One problem that faces the amateur when he reads about something that interests him is, "Where Do I Get It?" This can be pretty frustrating at times. The handy lists on the following pages will tell you where you can buy what you want.

Industry Interview

THIS is an interview between a member of *CQ's* Marketing Staff and the Sales Manager of a leading amateur radio equipment manufacturer. The purpose of this interview is to ascertain the importance that distributors have played toward the dynamic expansion of the amateur radio hobby.

Question: To what extent has the distributor contributed toward the growth of the amateur radio industry?

Answer: We feel, and we believe that other manufacturers also will agree, that the distributor has been a major factor in the growth of amateur radio. This has resulted in hams being key customers throughout the world for those distributors who have geared their efforts in this direction.

As you know, in past years there were relatively few amateurs on the air and the majority of these built their own equipment. For this reason, distributors were primarily interested in supplying parts to hams rather than factory-built gear. In more recent years, however, this trend has changed somewhat, with many amateurs concentrating more on operating rather than on building, and as a result the distributor's sales of factory-wired equipment have increased notably with a decline to some extent on component sales. There are several reasons for these changes —in part, the tremendous expansion of the amateur ranks, technical progress in the industry, and a notably increasing interest in amateur radio by non-technically inclined persons who originally couldn't be induced toward our hobby. In many instances, these persons are professional people, doctors, lawyers, etc. who haven't the time to build the equipment but nevertheless find operating on the ham bands a pleasant form of relaxation.

Many key distributors have relied heavily upon advertising toward establishing the scope of their ham equipment sales, providing information to the public as to the availability of any products and his own interest in backing up these products with service and delivery. Many distributors rely on mail order as a heavy portion of their amateur equipment sales and such mail order buying has become heavily increased through advertising in amateur publications such as *CQ*. In establishing a relationship with his customers, the distributor now has an opportunity to display an abundance of services, which in turn will lead to future inquiries from the customer to that distributor who has satisfactorily served him in past transactions. Direct correspondence, therefore, with established customers has become an important fact in distributors strengthening their relationship with their customers. You must realize, of course, that handling trades on used equipment through the mail is an intricate and involved process and these same distributors have become experts in this direction providing the amateur ranks with a vital flow of both used and new equipments to meet the demands of our growing hobby.

Question: Who do you consider some of the major ham distributors today?

Answer: This, of course, is a tricky question to answer, since some distributors specialize in direct mail, others in local traffic only, and some in a combination of the two. During the past few years, five distributors stand out in front as doing the heaviest amateur radio business in total dollar volume. These five are Allied Radio, World Radio Labs, Henry Radio, Radio Shack Corp. and Harrison Radio. You will note, of course, that these distributors fall into the category of doing both direct mail and local business. Other well known distributors, however, must not be overlooked as having contributed greatly through the years to the expansion of our hobby. Notable names that come to mind are Harvey Radio, Burstein-Applebee, Adirondack Radio, Evans Radio, Fort Orange, Burghardt, Lafayette, Arrow, C&G, Almo, and many others. One can't help noticing that certain new names have become prominent in the field in recent months. The Lew Bonn Co. in Minneapolis would be a noticeable example of a distributor who is devoting much of his efforts toward stimulating amateur activity. Some of these distributors have been serving amateurs faithfully for 20 or 30 years and can truly be called pioneers in the development of this vastly expanding hobby.

Question: To what extent, in your opinion, have amateur radio code classes that have been instituted by some of the distributors contributed toward the expansion of ham radio?

Answer: You must understand that relatively speaking, code classes are a new thing with most distributors, but they are certainly a valuable tool in furthering the interest of prospective amateurs and in further strengthening the distributor-customer relationship already mentioned. The two largest ham distributors, for instance, Allied and World, were two of the first to initiate code classes and this has been an obvious factor in the position they hold today. You realize, of course, that these code classes and also technical theory classes are primarily intended to help the non-technically inclined people who are finding amateur radio a most attractive hobby once they get over the initial feat of technical terms. Many amateurs today wouldn't have their calls if it hadn't been for the patient and cooperative assistance of distributors throughout the country in answering the questions and helping them for the amateur examination.

Question: What is your opinion about amateur radio conventions?

Answer: Conventions have existed just about as far back as amateur radio itself, and will probably continue as long as the hobby exists. As has already been mentioned, in the past, relatively few distributors concerned themselves with amateur radio equipment sales and for that reason, hamfests or hamventions of any real size were relatively few because it was difficult to entice a large gathering. One of the major factors in increasing interest in this direction has been the large increase in door prizes contributed both by manufacturers and distributors and it is quite noticeable that in recent years distributors have been taking a much more active part in these conventions resulting in bigger and better hamfests in all areas of the United States. At these conventions, the local distributors become the major factor, with the mail order houses playing a much smaller part because of the extreme distances between their operation and the conventions. To our way of thinking, the local distributors have done an outstanding job in this particular direction. Offhand, we think of the Radio Shack Corp., in Boston, Custom Electronics in Dayton, Crabtree Electronics in Dallas, Pioneer Electronic Supply in Cleveland and Walter Ashe in St. Louis as typical distributors who have done outstanding jobs in convention growth.

Question: What are distributors doing today to further stimulate the growth of amateur radio and to educate the public on a hobby that was once relatively unknown by the masses of our population?

Answer: This is, of course, a question that could be answered with volumes, but to be brief, distributors, in our opinion, have primarily contributed in this direction by their participation in local club meetings, hamfests, newspaper items, and other efforts to further publicize the hobby. Many of the distributors to whom we owe our thanks for the growth of amateur radio have further strengthened the hobby by their participation in NEDA, the National Electronic Distributors Association, an organization which concentrates its efforts on increasing distributor sales and strengthening manufacturer-distributor-customer relationships.

Interviewer: Many thanks for your comments on this very complex subject. We are quite certain that other leading manufacturers feel as you do and we look with great interest to the future and what it holds for amateurs and for distributors as the bond of mutual interest seems to be continuously growing.

***Note: The views expressed above are not necessarily those of the publisher, but are the opinions of the manufacturer interviewed. This manufacturer is a major producer of amateur radio equipment and well qualified to voice the opinions of the industry.**

Alphabetical

List of Distributors

1 Adirondack Radio Supply
185-191 W. Main St.
Amsterdam, N. Y.

2 Allied Radio Corp.
100 No. Western Ave.
Chicago 80, Illinois

3 Arrow Electronics Inc.
525 Jerico Turnpike
Mineola L. I., N. Y.

4 Arrow Electronics Inc.
65 Cortlandt Street
New York 7, N. Y.

5 Geo. D. Barbey Co., Inc.
622 Columbia Avenue
Lancaster, Pa.

6 Geo. D. Barbey Co., Inc.
821 Quentin Road,
Lebanon, Pa.

7 Geo. D. Barbey Co., Inc.
157 N. York St.
Pottstown, Pa.

8 Geo. D. Barbey Co., Inc.
157 Penn Street
Reading, Pa.

9 Barry Electronics Corp.
512 Broadway
New York 12, N. Y.

10 The Lew Bonn Company
1211 LaSalle
Minneapolis 3, Minn.

11 Brown Electronics Inc.
1032 Broadway
Fort Wayne, Indiana

12 Burghardt Radio Supply
Box 97
Aberdeen, So. Dakota

13 Burghardt Radio Supply
P. O. Box 309
Rapid City, S. D.

14 Burghardt Radio Supply
P. O. Box 139
Sioux Falls, S. D.

15 Burghardt Radio Supply
P. O. Box 746
Watertown, South Dakota

16 Burnstein-Applebee Co
305 East 55th
Kansas City, Missouri

17 Burnstein-Applebee Co
1012-14 McGee Street
Kansas City, Missouri

18 James W. Clary Co.
1713 - 2nd Avenue, South
Birmingham, Alabama

19 Communications Equipment Co.
518 State Street
La Crosse, Wisconsin

20 Crescent Electronic Supply, Inc.
1509 22nd Avenue
Gulfport, Mississippi

21 Crescent Electronic Supply, Inc.
910 Barrow Street
Houma, Louisiana

22 Crescent Electronic Supply Inc.
3215 Metairie Road
Metairie, Louisiana

23 Crescent Electronic Supply, Inc.
537 S. Claiborne Avenue
New Orleans, Louisiana

24 Electric City Radio Supply
2815 Tenth Ave. South
Great Falls, Montana

25 Electronic Distributors Inc.
1845 Peck Street
Muskegon, Michigan

26 Electronic Supply
1301 Hibiscus Blvd.
Melbourne, Fla.

27 Electronic Supply
61 N. E. 9th St.
Miami 32, Florida

28 Elliott Electronics Inc.
418 N. 4th Avenue
Tucson, Arizona

29 Elmar Electronics
140 - 11th St. at Madison
Oakland 7, California

30 Evans Radio Inc.
P. O. Box 312
Concord, N. H.

31 Fort Orange Radio Dist.
904 Broadway
Albany, N. Y.

32 George's Electronic Supplies
320 West Superior Street
Kokomo, Indiana

33 Graham Company
505 Main Street
Reading, Mass.

34 Graham Electronics Supply
122 South Senate
Indianapolis, Ind.

35 H & H Electronics Supply Inc.
506-510 Kishwaukee Street
Rockford, Illinois

36 Harrison Radio
225 Greenwich St.
New York 7, N. Y.

37 Harrison Radio
144-24 Hillside Avenue
Jamaica 35, N. Y.

38 Harvey Radio Co., Inc.
103 W. 43rd Street
New York 36, New York

39 Henry Radio
931 N. Euclid Avenue
Anaheim, Calif.

40 Henry Radio
Butler, Missouri

41 Henry Radio
11240 W. Olympic Blvd.
Los Angeles 64, Calif.

42 Iowa Radio Supply Co. Inc.
719 Center Point Road N.E.
Cedar Rapids, Iowa

43 Key Electronics
100 S. Wayne St.
Arlington 4, Va.

44 Key Electronics
11254 Triangle Lane
Wheaton, Maryland

45 Klaus Radio & Electric Co.
1055 First St.
La Salle, Illinois

46 Klaus Radio & Electric Co.
403 E. Lake St.
Peoria, Illinois

47 Knox Electronic Supply Inc.
67 N. Cherry Street
Galesburg, Illinois

48 Ladd Electronics Company
111 North 41st Street
Omaha 31, Nebraska

49 Lafayette Radio
165-08 Liberty Ave.
Jamaica 33, N. Y.

50 Lafayette Radio
100 Sixth Avenue
New York 13, N. Y.

51 Lafayette Radio
542 E. Fordham Road
Bronx 58, N. Y.

52 Lafayette Radio
110 Federal Street
Boston 10, Mass.

53 Lafayette Radio
24 Central Avenue
Newark 2, N. J.

54 Lafayette Radio
139 W. Second St.
Plainfield, N. J.

55 Lafayette Radio
182 Route 17
Paramus, N. J.

56 Lavender Radio & TV Supply Inc.
520 East Fourth
Texarkana, Arkansas

57 Lavender Radio & TV Supply Inc.
503 E. Oakwood
Tyler, Texas

58 Melvin Electronics Inc.
541 Madison St.
Oak Park, Illinois

59 Mission Ham Supplies
5474 Mission Bl.
Riverside, Calif.

60 Oregon Ham Sales
409 West First Avenue
Albany, Oregon

61 Payette Radio Limited
730 St. James West
Montreal 3, Canada

62 Peard Electronic Supply
535 Washington Street
Jacksonville, Fla.

63 Pioneer Electronic Supply Co.
2103 East 21 Street
Cleveland 15, Ohio

64 Priest Electronics, Inc.
6431 Tidewater Drive
Norfolk 9, Virginia

65 Radio Products Sales Inc.
1501 So. Hill St.
Los Angeles 15, Calif.

66 Radio Shack Corp.
730 Commonwealth Avenue
Boston, Mass.

67 Reno Radio Company
1314 Broadway
Detroit 26, Michigan

68 Scott Radio Supply Inc.
266 Alamitos
Long Beach, California

69 Gil Severns Amateur Distributors
1340 E. Florida
Hemet, California

70 Smalley's Radio Ltd.
1105 7th Ave. S.W.
Calgary, Alberta, Canada

71 Spera Electronics
37-10 33rd Street
Long Island City 1, N. Y.

72 Tydings Company
933 Liberty Avenue
Pittsburgh 22, Pa.

73 United Radio Supply, Inc.
22 N. W. 9th
Portland, Oregon

74 Valley Engineering Inc.
804 East Main
Farmington, New Mexico

75 Valley Engineering, Inc.
601 Cedar Street
Los Alamos, New Mexico

76 Valley Engineering, Inc.
241 West Alameda
Santa Fe, New Mexico

77 Van Sickle Radio Supply Co.
4131 N. Keystone Avenue
Indianapolis 5, Indiana

78 Verl G. Walker Co.
P. O. Box 1586
Medford, Oregon

79 Eugene G. Wile
218 South 11th St.
Philadelphia 7, Penna.

80 World Radio Laboratories
3415-27 W. Broadway
Council Bluffs, Iowa

Random Thoughts — — — —

From the Boys in the Back Room

Watch CQ in the months ahead—

—big things are happening

Geographical

List of Distributors

James W. Clary Company 18
1713 - 2nd Avenue, South
Birmingham, Alabama

Elliott Electronics Inc. 28
418 North 4th Avenue
Tucson, Arizona

Lavender Radio & TV Supply, Inc. 56
520 East Fourth,
Texarkana,
Arkansas

Henry Radio 39
931 N. Euclid Avenue
Anaheim, California

Gil Severns 69
Amateur Distributors
1340 E. Florida
Hemet, California

Scott Radio Supply Inc. 68
266 Alamitos
Long Beach, California

Radio Products Sales Inc. 65
1501 So. Hill St.
Los Angeles 15, California

Henry Radio 41
11240 Olympic Blvd.
Los Angeles 64, California

Elmar Electronics 29
140 - 11th St. at Madison
Oakland 7, California

Mission Ham Supplies 59
5474 Mission Bl.
Riverside, California

Peard Electronic Supply Co. 62
535 Washington Street
Jacksonville, Florida

Electronic Supply 27
61 N. E. 9th Street
Miami 32, Florida

Electronic Supply 26
1301 Hibiscus Blvd.
Milbourne, Florida

Allied Radio Corp. 2
100 N. Western Ave.
Chicago 80, Illinois

Knox Electronic Supply Inc. 47
67 N. Cherry Street
Galesburg, Illinois

Klaus Radio & Electric Co. 45
1055 First St.
La Salle, Illinois

Melvin Electronics, Inc. 58
541 Madison Street
Oak Park, Illinois

Klaus Radio & Electric Co. 46
403 E. Lake St.
Peoria, Illinois

H & H Electronic Supply, Inc. 35
506-510 Kishwaukee St.
Rockford, Illinois

Brown Electronics Inc. 11
1032 Broadway
Fort Wayne, Indiana

Graham Electronics Supply 34
122 South Senate
Indianapolis, Indiana

Van Sickle Radio Supply Co. 77
4131 N. Keystone Avenue
Indianapolis 5, Indiana

George's Electronic Supplies 32
320 West Superior Street
Kokomo, Indiana

Iowa Radio Supply Co. Inc. 42
719 Center Point Road N.E.
Cedar Rapids, Iowa

World Radio Laboratories 80
3415-27 W. Broadway
Council Bluffs, Iowa

Crescent Electronic Supply, Inc. 21
910 N. Barrow Street
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3215 Metairia Road
Metairie, Louisiana

Crescent Electronic Supply, Inc. 23
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Key Electronics 44
11254 Triangle Lane
Wheaton, Maryland

Radio Shack Corp. 66
730 Commonwealth Avenue
Boston, Massachusetts

Lafayette Radio 52
110 Federal Street
Boston 10, Massachusetts

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505 Main Street
Reading, Massachusetts

Reno Radio Company 67
1314 Broadway
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Minneapolis 3, Minnesota

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Butler, Missouri

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Lafayette Radio 53
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Lafayette Radio 55
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Paramus, New Jersey

Lafayette Radio 54
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Valley Engineering Inc. 74
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Bronx 58, New York

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Harrison Radio 37
144-24 Hillside Ave.
Jamaica 35, New York

Spera Electronics 71
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Long Island City 1, New York

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525 Jerico Turnpike
Mineola L. I., New York

Arrow Electronics Inc. 4
65 Cortlandt Street
New York 7, New York

Harrison Radio 36
225 Greenwich Street
New York 7, New York

Barry Electronics Corp. 9
512 Broadway
New York 12, New York

Lafayette Radio 50
100 Sixth Avenue
New York 13, New York

Harvey Radio Co., Inc. 38
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New York 36, New York

Pioneer Electronic Supply Co. 63
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Cleveland 15, Ohio

Oregon Ham Sales 60
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Albany, Oregon

Veri G. Walker Co. 78
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Medford, Oregon

United Radio Supply, Inc. 73
22 N. W. 9th
Portland, Oregon

George D. Barbey Co. Inc. 5
622 Columbia Avenue
Lancaster, Pennsylvania

Geo. D. Barbey Co. 6
821 Quentin Road
Lebanon, Pennsylvania

Eugene G. Wile 79
218 S. 11th St.
Philadelphia 7, Pennsylvania

Tydings Company 72
933 Liberty Avenue
Pittsburgh 22, Pennsylvania

Geo. D. Barbey Co. Inc. 7
157 N. York St.
Pottstown, Pennsylvania

Geo. D. Barbey Co. Inc. 8
157 Penn St.
Reading, Pennsylvania

Burghardt Radio Supply 12
Box 97
Aberdeen, South Dakota

Burghardt Radio Supply 13
P. O. Box 309
Rapid City, South Dakota

Burghardt Radio Supply 14
P. O. Box 139
Sioux Falls, South Dakota

Burghardt Radio Supply 15
P. O. Box 746
Waterto n, South Dakota

Lavender Radio & TV Supply Inc. 57
503 E. Oakwood
Tyler, Texas

Key Electronics 43
100 S. Wayne St.
Arlington 4, Virginia

Priest Electronics, Inc. 64
6431 Tidewater Drive
Norfolk 9, Virginia

Communications Equipment Co. 19
518 State Street
La Crosse, Wisconsin

Smalley's Radio Ltd. 70
1105 7th Ave. S. W.
Calgary, Alberta, Canada

Payette Radio Limited 61
730 St. James West
Montreal 3, Canada

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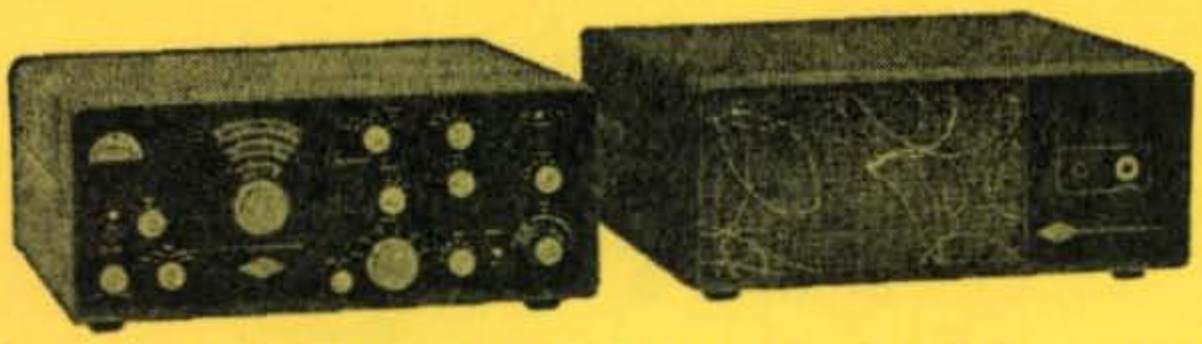

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AM Transceiver

For 6-band operation . . .

Now your mobile operation will be more enjoyable with G-76 . . . a powerful 100-watt AM transmitter and a sensitive, dual-conversion receiver. First, excellent 2-way communication on any of 6 amateur bands — 80, 40, 20, 15, 10 and 6 meters! Performance has of course been the foremost design objective but flexibility and operating convenience has not been overlooked. Receiver tuning dial . . . "S" meter . . . any element that occasionally requires a quick glance while driving is fully visible. And because the entire front panel is only 5" high and 12½" wide, every control — including transmitter VFO and Band switch — is conveniently at the driver's fingertips . . . designed to be just right in size and shape for easy installation in your car.

Use G-76 both in your car and home station. Simple to do. Transistorized 12 volt DC supply remains in car. 117V AC supply with speaker is optionally available for home use.

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Mobile Sideband Communicator Transceiver

Compact . . . mounts readily under dash . . . complements any modern car or fits on any well-appointed operating desk.

Highly stable . . . non-critical with single knob VFO tuning both transmitter and receiver . . . with quartz crystal filter to eliminate unwanted sideband.

Has 125 watts P.E.P. input . . . upper and lower sideband and CW . . . all band operation, 10 through 80 meters . . . high stability VFO . . . VOX . . . push-to-talk and phone-patch provisions.

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OUR 34TH YEAR

hrc HARVEY RADIO CO., INC.

103 West 43rd Street, New York 36, N. Y./JUdson 2-1500

For further information, check number 29, on page 182

Alphabetical list of Manufacturers

KEY NUMBERS INDICATE DISTRIBUTORS HANDLING THEIR PRODUCTS

AMERICAN GELOSO ELECTRONICS, INC.

312 Seventh Avenue
New York 1, New York

Receivers, Transmitters

2, 3, 4, 9, 11, 12, 13, 14, 15, 18, 26, 27, 42, 43, 44, 60, 63, 66, 68, 69, 70, 73, 78, 80.

ANTENNA SPECIALISTS CO.

12437 Euclid Avenue
Cleveland 6, Ohio

Mobile Communication Antennas

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 71, 72, 73, 77, 80.

ASTATIC CORP.

Conneaut, Ohio

Microphones

1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 70, 72, 73, 78, 79, 80.

AUTOMATION ELECTRONICS, INC.

1500 W. Verdugo Avenue
Burbank, California

Mobile Communications Receivers

2, 3, 4, 36, 37, 39, 40, 41, 65, 66, 68, 71.

BARKER & WILLIAMSON, INC.

Canal Street & Beaver Dam Road
Bristol, Pennsylvania

Transmitter, Amplifiers, Baluns, & Components

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 77, 78, 79, 80.

CAMBRIDGE THERMIONIC CORPORATION

451 Concord Avenue
Cambridge 38, Masachusetts

Coil Forms, Connectors, Chokes, Terminals, Battery Holders, & Other Components.

2, 3, 4, 11, 16, 17, 18, 26, 27, 29, 30, 31, 38, 45, 46, 49, 50, 51, 52, 53, 54, 55, 62, 63, 64, 66, 73, 80.

CENTRAL ELECTRONICS, INC.

1247 W. Belmont Avenue
Chicago 13, Illinois

Transmitters, Amplifiers, and Test Equipment

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 25, 26, 27, 28, 29, 30, 31, 33, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 56, 57, 59, 62, 63, 64, 65, 66, 67, 68, 69, 70, 73, 77, 80.

[*Continued on page 138*]

OPEN NOW THE 3rd HENRY RADIO STORE 931 N. Euclid Ave., Anaheim, Calif.

"CALL ME for Personal Service"

"CALL ME for Personal Service"

Bob Henry
WØARA
Butler, Mo.
ORchard 9-3127

ON

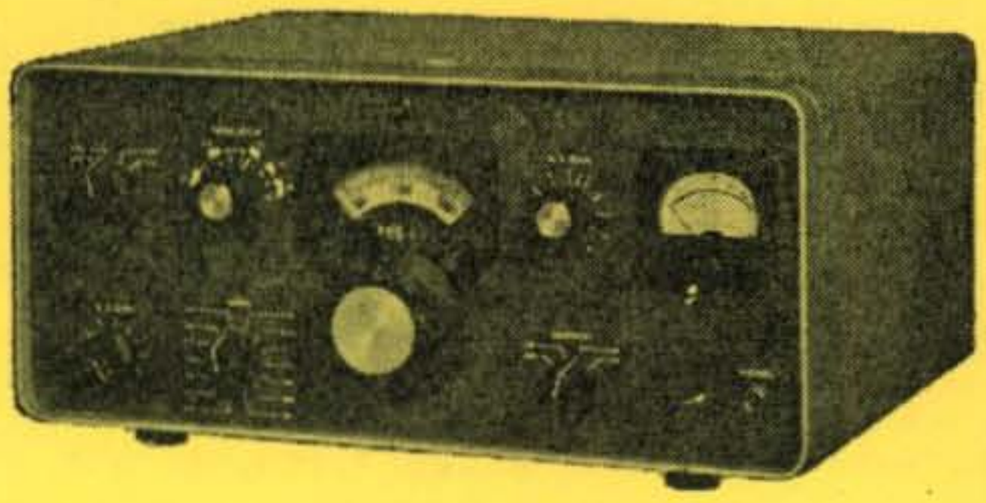
Ted Henry
W6UOU
Los Angeles
GRanite 7-6701

WORLD'S BEST TERMS

Because we finance our own terms...

- Only 6% a year finance cost
- 20 months or longer to pay
- Only 10% down (or your trade-in as down payment)
- No finance charges if paid within 90 days
- Reduced charges if paid off ahead of time
- You get more flexibility of financing in the future (such as re-financing) because we handle our own financing

Collins S/LINE



KWM-2 Transceiver	$1150.00
32S-1 Transmitter	666.00
516F-2 AC Power Supply	115.00
516E-1 12 V DC Power Supply	270.00
75S-1 Receiver	520.00
312B-3 Speaker	29.00
312B-4 Speaker Console	195.00
30S-1 Linear Amplifier	1556.00

Write, phone or visit either store today! Inquiries & orders from military men and others outside USA wanted.

A-1 Reconditioned Apparatus

Nearly all makes and models. Big savings! Ten day trial—90 day warranty. 90 day full trade back on new apparatus. Write for bulletin.

Butler 1, Missouri
ORchard 9-3127

Henry Radio Stores

11240 West Olympic Blvd.
Los Angeles 64 Ph. GRanite 7-6701

BIG TRADE-INS

World's Largest Distributors of Short Wave Receivers

For further information, check number 30, on page 182

For further information, check number 31 on page 182

[*Continued from page 136*]

CENTRALAB
900 E. Keefe Avenue
Milwaukee 1, Wisconsin
Switches, Components, Transistors, Amplifiers

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 16, 17, 18, 20, 21, 22, 23, 25, 26, 27, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 61, 62, 63, 65, 66, 67, 68, 70, 72, 73, 74, 75, 76, 79, 80.

COLLINS RADIO CO.
Cedar Rapids, Iowa
Receivers, Transmitters

1, 2, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 24, 26, 27, 28, 29, 30, 31, 34, 35, 36, 37, 38, 39, 40, 41, 45, 46, 47, 56, 57, 62, 63, 65, 66, 80.

COLUMBIA PRODUCTS CO.
RFD #3
Columbia, South Carolina
Mobile Antennas

3, 4, 16, 17, 24, 26, 27, 28, 31, 33, 36, 37, 43, 44, 47, 65, 66, 68, 69, 71, 80.

COMMUNICATIONS CO., INC.
Coral Gables
Miami 34, Florida
Transmitters & Receivers

26, 27, 36, 37, 43, 44, 47, 71, 80.

COMMUNICATIONS PRODUCTS CO., INC.
Marlboro, New Jersey
Communications Mobile Antennas, Bay Station Antennas, etc.

10, 36, 37, 38, 45, 46, 47, 62, 63, 71.

CONTINENTAL ELECTRONICS & SOUND CO. (CESCO)
711 Liscum Drive
Dayton 7, Ohio
Antenna Hardware, Accessories and Phone Patches

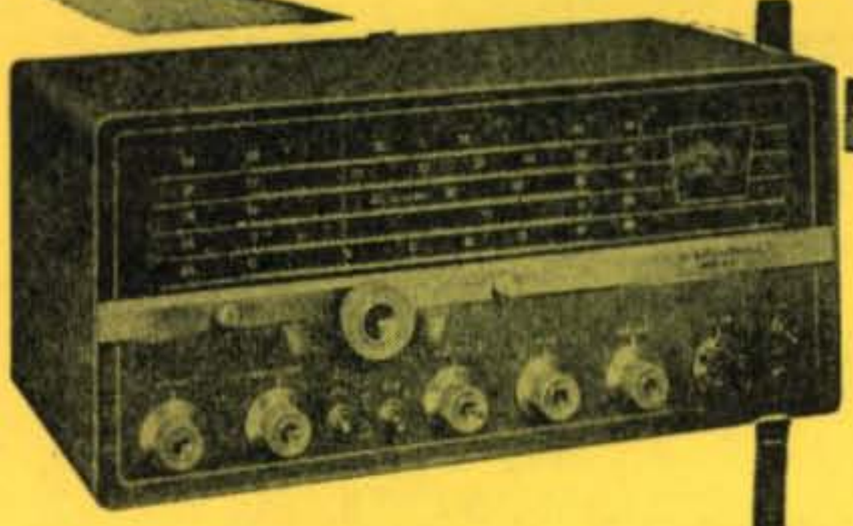
1, 2, 3, 4, 10, 12, 13, 14, 15, 19, 26, 27, 29, 30, 31, 35, 36, 37, 38, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 59, 62, 63, 64, 65, 66, 68, 69, 70, 72, 77, 78, 80.

CORNELL-DUBLIER ELECTRONIC CORP.
S. Plainfield, New Jersey
Rotators, Power Supplies and Components

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80

[*Continued on page 140*]

NOW AT RADIO SHACK!
NEW LOW DOWN PAYMENTS
ON HALLICRAFTERS



$10 DOWN AT RADIO SHACK

HALLICRAFTERS SX-111 RECEIVER
$17 monthly

$249.50

No cash needed!

$10 DOWN AT RADIO SHACK

HALLICRAFTERS SX-101A RECEIVER
$25 monthly

$399.50

Use Trade-in as Down Payment!

$10 DOWN AT RADIO SHACK

HALLICRAFTERS NEW HT-37 TRANSMITTER
$29 monthly

$450.00

Low monthly payments!

$15 DOWN AT RADIO SHACK

HALLICRAFTERS HT-32A TRANSMITTER
$34 monthly

$695.00

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- ☐ Money Order
- ☐ C.O.D.

Name _____

Address _____

City _____ Zone _____ State _____

For further information, check number 32, on page 182

[*Continued from page 138*]

COSMOS INDUSTRIES, INC.
3128 Queens Boulevard
Long Island City, New York
Transceivers

3, 4, 10, 26, 27, 30, 36 ,37, 38, 65, 66, 69.

CUSH CRAFT
621 Hayward Street
Manchester, New Hampshire
Antennas

2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 25, 26, 27, 28, 30, 31, 33, 35, 36, 37, 38, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 59, 62, 65, 66, 68, 69, 70.

DOW KEY CO., INC.
S. E. Highway 59
Thief River Falls, Minnesota
Keys, Coaxial Relays, Switches and Connectors

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

E-Z WAY TOWERS, INC.
5901 East Broadway
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Towers

1, 2, 3, 4, 10, 12, 13, 14, 15, 18, 24, 26, 27, 31, 36, 37, 38, 43, 44, 45, 46, 63, 64, 65, 66, 67, 68, 72, 77, 80.

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1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

EITEL-McCULLOUGH, INC.
798 San Mateo Avenue
San Bruno, California
Electron Tubes

2, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 26, 27, 29, 30, 31, 34, 36, 37, 38, 39, 40, 41, 42, 45, 46, 47, 56, 57, 61, 63, 64, 65, 66, 69, 71, 73, 74, 75, 76, 77, 78, 80.

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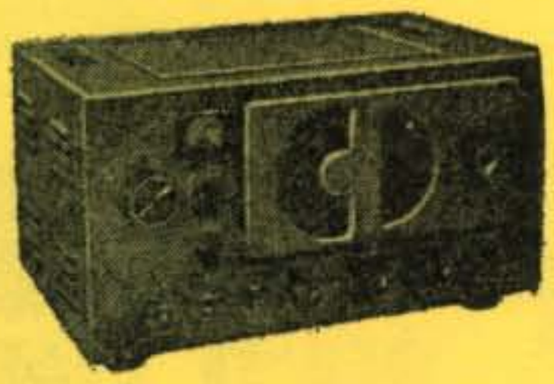

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- Band Spread 80 to 10 Meters
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For further information, check number 36, on page 182

For further information, check number 35, on page 182

[*Continued from page 140*]

GENERAL ELECTRIC CO.
(Electronics Components Div.)
Owensboro, Kentucky
Electron Tubes

1, 2, 3, 4, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 26, 27, 29, 30, 31, 32, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 58, 61, 63, 65, 66, 70, 72, 73, 74, 75, 76, 77, 78, 80.

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Transmission Line, Guy Line, Insulators

1, 3, 4, 5, 6, 7, 8, 9, 11, 25, 26, 27, 31, 36, 37, 39, 40, 41, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 59, 60, 63, 67, 68, 77, 78.

GLOBE ELECTRONICS, INC.
(Formerly WRL)
3417 West Broadway
Council Bluffs, Iowa
Transceivers, Transmitters, Amplifiers, and Test Equipment

1, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 77, 80.

GLOBE INDUSTRIES, INC.
(Electronics Division)
525 Main Street
Belleville, New Jersey
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1, 36, 37.

GONSET COMPANY
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Burbank, California
Receivers, Transmitters, Amplifiers, Antennas and Accessories

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 77, 78, 80.

GREENLEE TOOL CO.
1708 Columbia Avenue
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1, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 25, 26, 27, 29, 30, 31, 32, 35, 36, 37, 38, 42, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 63, 64, 66, 67, 70, 72, 77, 79, 80.

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65B	59.00
90	39.00
680	69.00
680A	79.00
CB100 Citizen's Bander	79.00
DSB-100	99.00
LA-1	89.00
GONSET 6 Meter Commun III	199.00
G-28 10 Meter	209.00
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HT-32	439.00
HT-33	395.00
HT-33A	569.00
HEATH DX-20	33.50
DX-35	49.50
DX-40	57.50
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Adventurer	36.50
Challenger	109.00
KW, w/Desk	949.00
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Navigator	139.00
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Ranger	199.00
Thunderbolt	429.00
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Viking II	159.00
6N2	99.00
500	545.00

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75A4	495.00
75S-1	409.00
DRAKE 1-A	199.00
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S-38D	34.00
S-38E	39.00
S-76	109.00
S-85	79.50
S-86	79.50
S-102	34.00
SX-62	209.00
SX-71	139.00
SX-96	139.00
SX-99	109.00
SX-100	209.00
SX-101	239.00
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HQ-100	129.00
HQ-110	174.50
HQ-120	99.00
HQ-129X	129.00
HQ-140X	169.00
HQ-145	199.00
HQ-150	199.00
SP-400X	279.00
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HRO-50T	229.00
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NC-125	119.00
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G-66B w/ps	159.00
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A-54	59.00
A-54H	64.00
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[LONG ISLAND—144-24 HILLSIDE, JAMAICA]

[*Continued from page 142*]

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4401 W. 5th Avenue

Chicago 24, Illinois

Receivers, Transmitters and Amplifiers

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77, 78, 80.

HAMMARLUND MFG. CO., INC.

460 West 34th Street

New York 1, New York

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Receivers and Components Parts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 77, 78, 80.

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Transmitters, Receivers and Accessories

3, 4, 5, 6, 7, 8, 10, 18, 20, 21, 22, 23, 31, 34, 35, 36, 37, 38, 43, 44, 63, 78.

HY-GAIN ANTENNA PRODUCTS CO.

1135 No. 22nd

Lincoln, Nebraska

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1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 80.

INTERNATIONAL CRYSTAL MFG. CO., INC.

18 North Lee Street

Oklahoma City 2, Oklahoma

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Printed Circuit Amplifiers,

Test Equipment

29, 38, 48, 49, 50, 51, 52, 53, 54, 55, 63, 65, 68, 69, 71.

JOHNSON, E. F. CO.

Weseca, Minnesota

Transmitters, Amplifiers, Antennas

Rotators and Components

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76, 77, 78, 79.

[*Continued on page 146*]

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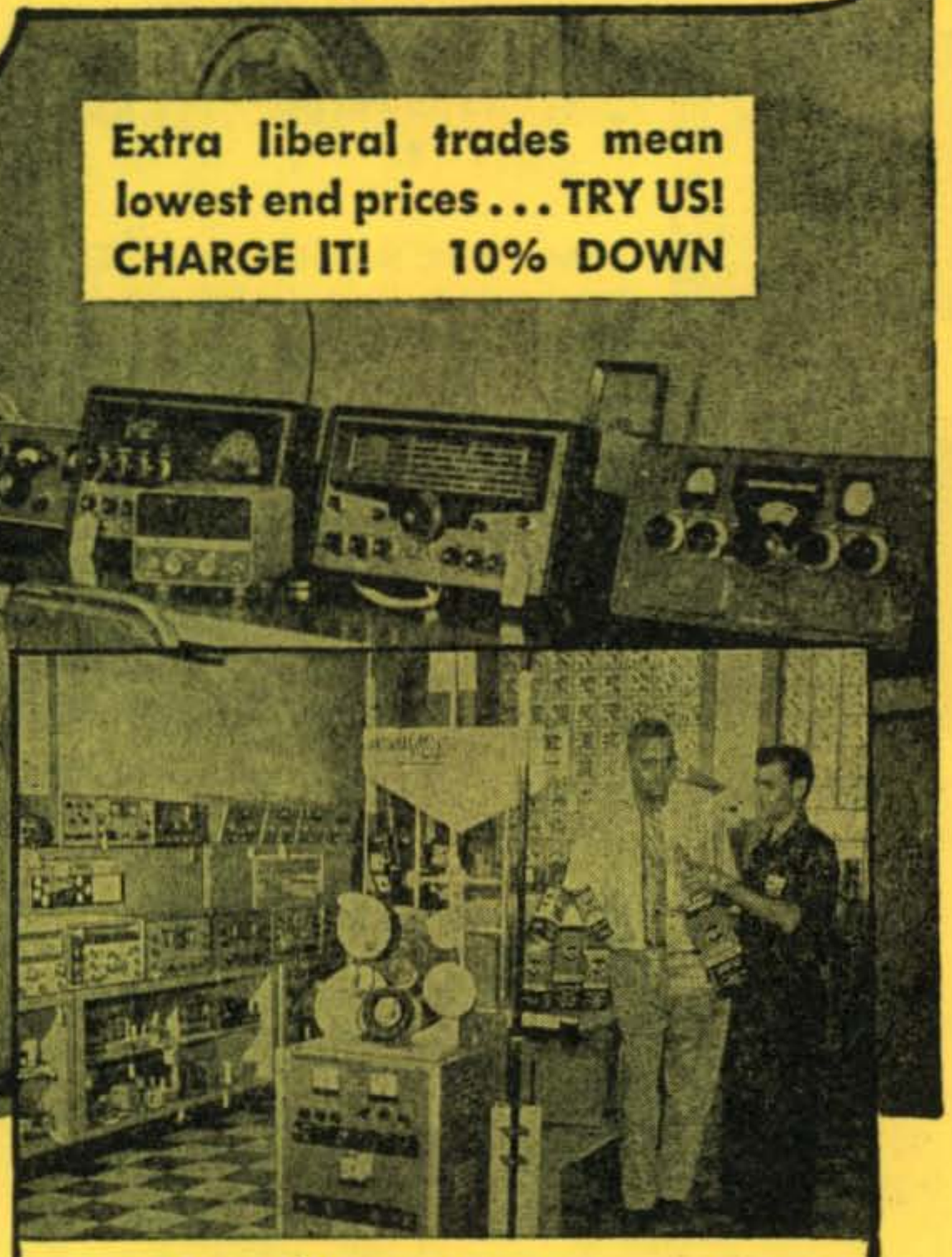

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RCA

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[*Continued from page 144*]

LAKESHORE INDUSTRIES
P. O. Box 163
Manitowoc, Wisconsin
Transmitters, Amplifiers

1, 2, 3, 4, 10, 12, 13, 14, 15, 16, 17, 18, 26, 27, 29, 31, 35, 36, 37, 38, 48, 63, 66, 80.

MARK MOBILE, INC.
6416 W. Lincoln Avenue
Morton Grove, Illinois
Mobile Antennas

1, 2, 3, 4, 10, 12, 13, 14, 15, 16, 17, 25, 26, 27, 29, 30, 31, 33, 36, 37, 38, 39, 40, 41, 45, 46, 48, 63, 65, 66, 69, 72, 74, 75, 76, 80.

MASTER MOBILE MOUNTS, INC.
4125 W. Jefferson Blvd.
Los Angeles 15, California
Mobile Antennas, Mounts, and Coils, Field Strength Meters, Crystals

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 65, 66, 67, 68, 69, 70, 73, 74, 75, 76, 77, 78, 80

MILLEN MFG. CO., INC., JAMES
Malden 48, Massachusetts
Transmitters, Amplifiers, Power Supplies Component Parts, Test Equipment

2, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 25, 28, 30, 31, 34, 36, 37, 38, 39, 40, 41, 45, 46, 47, 59, 61, 65, 66, 68, 71, 73, 80.

MOSLEY ELECTRONICS, INC.
8622 St. Charles Rock Road
St. Louis 14, Missouri
Antennas and Accessories

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

MULTI-PRODUCTS CO.
21470 Coolidge Highway
Oak Park 37, Michigan
Citizen Band Transceivers

1, 2, 3, 4, 10. 11, 12, 13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 29 30, 31, 33, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 48, 56, 57, 59, 60, 61, 63, 64, 65, 66, 67, 68, 69, 71, 72, 73, 74, 75, 76, 78, 80.

[*Continued on page 148*]

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The UM-1 Universal Modulator is a Class A or AB-2 modulator, driver for higher power modulator or PA amplifier. Matches output impedances 500-20,000 ohms. Uses carbon or crystal mike. Supplies up to 40w audio with proper tubes. Can add external meter for monitoring modulator cathode currents. Wired, **$45.95**, with tubes. Kit **$34.95**, less tubes.

The new Globe Chief Deluxe is a self-contained 90w transmitter for CW, bandswitching 10-80M. 75w meter indication for Novice use. Modified grid block keying or cathode keying with VFO. Provision for plate or screen modulator by simple plug in. Built-in power supply. Standard coax antenna fittings. 3-color kit diagrams. Prepunched chassis, all parts and tubes included in kit. Rotary switches throughout.

wired $79.95. kit $59.95

The 6PMC Series Converter has a new improved circuit for higher gain, greater signal/noise ratio. Printed circuit for ease in kit assembly. Models for fixed or mobile stations 6/12 volt filaments. Highly stable, completely shielded, crystal controlled, complete with tubes, crystal, cable, wired, **$29.95** Kit, **$21.95.**

Globe Scout Deluxe, Model SD-75A, is a modern new bandswitching 6-80M transmitter for 90w CW, 75w phone input power with relay controlled circuitry. Final amplifier works straight through on all bands, panel control for antenna loading on all bands, high level plate modulation, pi-net output on 10-80M — tuned link on 6M, matching into low impedance beams, built-in power supply for 115 VAC. Extensive TVI precautions including separate shielding of final amplifier and meter. Convenient rotary switches. Functional design. 15¼x6¼x1¼". Wired **$159.95.**

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The Globe 6-2 VFO is ideal for driving 6 & 2 meter transmitters. Perfect zero beat. Built-in power supply with voltage regulation. Temperature compensated. Approx. 50 RF volts output in 8-9mc range. 13:1 tuning ratio. Wired, **$59.95. Kit, $49.95.**

Globe Patcher PH-1 mounts anywhere — a phone patch operating VOX on SB, push-to-talk on AM. Switchable selection 500-8 or 3.2 ohm speaker. Completely shielded. Standby switch. Wired, complete, **$29.95.**

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TRENTON, N. J. 201 Calhoun St. LY 9-2522	ATLANTIC CITY 4401 Ventnor Ave. AT 2-7181	VINELAND, N.J. 219 Landis Ave. OX 1-6965	WILM., DEL. 1133 French St. OL 6-9467	SALISBURY, MD. 317 Park Heights Ave. PI 2-1393

For further information, check number 43, on page 182

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NATIONAL CO., INC.

Malden, Massachusetts

Receivers, Component Parts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

NEIL COMPANY (THE)

1336 Calkins Road
Pittsford, New York

VHF Transmitters

1, 3, 4, 11, 49, 50, 51, 52, 53, 54, 55, 73, 80.

NORTHEAST TELECOMMUNICATIONS, INC.

Transcon Division
Plantsville, Connecticut

Transmitter Converter, Power Supply, Vox Box.

2, 3, 4, 10, 29, 38, 49, 50, 51, 52, 53, 54, 55, 63, 68, 69, 71, 80.

P & H ELECTRONICS, INC.

424 Columbia
Lafayette, Indiana

Transmitters, Amplifiers, Test Equipment

1, 2, 3, 4, 10, 11, 12, 13, 14, 15, 26, 27, 29, 31, 35, 36, 37, 38, 43, 44, 45, 46, 47, 48, 63, 69, 77, 80.

PENNWOOD NUMECHRON CO.

7249 Frankstown Avenue
Pittsburgh 8, Pennsylvania

24 Hr. Numerical Clocks—Timing Devices

1, 2, 3, 4, 10, 12, 13, 14, 15, 16, 17, 18, 26, 27, 29, 30, 31, 33, 35, 36, 37, 38, 39, 40, 41, 43, 44, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 62, 63, 65, 66, 67, 68, 69, 71, 72, 77, 80.

PETERSON RADIO COMPANY, INC.

2800 West Broadway
Council Bluffs, Iowa

Crystals

3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 35, 36, 37, 38, 43, 44, 45, 46, 47, 48, 56, 57, 62, 63, 65, 66, 67, 68, 71, 73, 79, 80.

RCA ELECTRON TUBE DIV.
415 So. Fifth
Harrison, New Jersey
Electron Tubes

1, 2, 3, 4, 5, 6, 7, 8, 10, 16, 17, 18, 25, 26, 27, 29, 34, 36, 37, 38, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 61, 62, 64, 65, 66, 67, 69, 73, 79, 80.

REGENCY DIV. OF IDEA, INC.
7900 Pendleton Pike
Indianapolis 26, Indiana
Receivers and Converters

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 59, 63, 64, 66, 67, 68, 69, 71, 72, 77, 78, 80.

RIDER PUBLISHING, INC., JOHN F.
116 W. 14th Street
New York 11, New York
Books

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 29, 31, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 61, 62, 63, 64, 65, 66, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80.

ROHN MFG. COMPANY
116 Limestone
Bellevue, Peoria 5, Illinois
Towers and Accessories

2, 3, 4, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 29, 30, 31, 32, 33, 35, 36, 37, 42, 45, 46, 47, 48, 56, 57, 58, 62, 63, 64, 67, 70, 72, 73, 74, 75, 76, 77, 80.

SHURE BROTHERS, INC.
222 Hartrey Avenue
Evanston, Illinois
Microphones

1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 45, 46, 47, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 65, 66, 68, 70, 71, 72, 73, 74, 75, 76, 78, 79, 80.

TAPETONE, INC.
10 Ardlock Place
Webster, Massachusetts
Transmitters and Converters

5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 25, 26, 27, 28, 29, 30, 31, 33, 36, 37, 38, 43, 44, 45, 46, 48, 63, 65, 66, 68, 69, 72, 77, 80.

[*Continued on next page*]

[*Continued from page 149*]

TELEX, INC.

1633 Eustis Street

St. Paul 1, Minnesota

Head Sets

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 61, 62, 63, 64, 65, 66, 67, 68, 69, 72, 73, 77, 78, 79, 80.

TELREX, INC.

Box 879

Asbury Park 2, New Jersey

Antennas, Rotators and Accessories

1, 2, 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 15, 24, 26, 27, 28, 29, 30, 31, 33, 36, 37, 38, 39, 40, 41, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 59, 63, 64, 66, 67, 69, 72, 77, 80.

TRIAD TRANSFORMER CORP.

4055 Redwood Avenue

Venice, California

Transformers and Chokes

2, 10, 16, 17, 18, 26, 27, 29, 30, 34, 38, 43, 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 61, 63, 65, 66, 70, 74, 75, 76, 77, 78.

TRI-EX TOWER CORP.

127 E. Inyo Street

Tulare, California

Towers and Acessories

3, 4, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 36, 37, 39, 40, 41, 45, 46, 48, 59, 62, 63, 64, 65, 66, 68, 69, 73, 78, 80.

TURNER MICROPHONE COMPANY

925 17 Street, NE

Cedar Rapids, Iowa

Microphones

1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 16, 17, 18, 20, 21, 22, 23, 24, 26, 27, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 60, 63, 65, 66, 67, 68, 69, 70, 72, 73, 77, 80.

VIBROPLEX CO., INC., THE

833 Broadway

New York 3, New York

Keys

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 25, 26, 27, 28, 29, 30, 31, 34, 36, 37, 38, 39, 40, 41, 43, 44, 45, 46, 49, 50, 51, 52, 53, 54, 55, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 70, 72, 73, 77, 78, 80.

ONLY SERVICE SOLD HERE

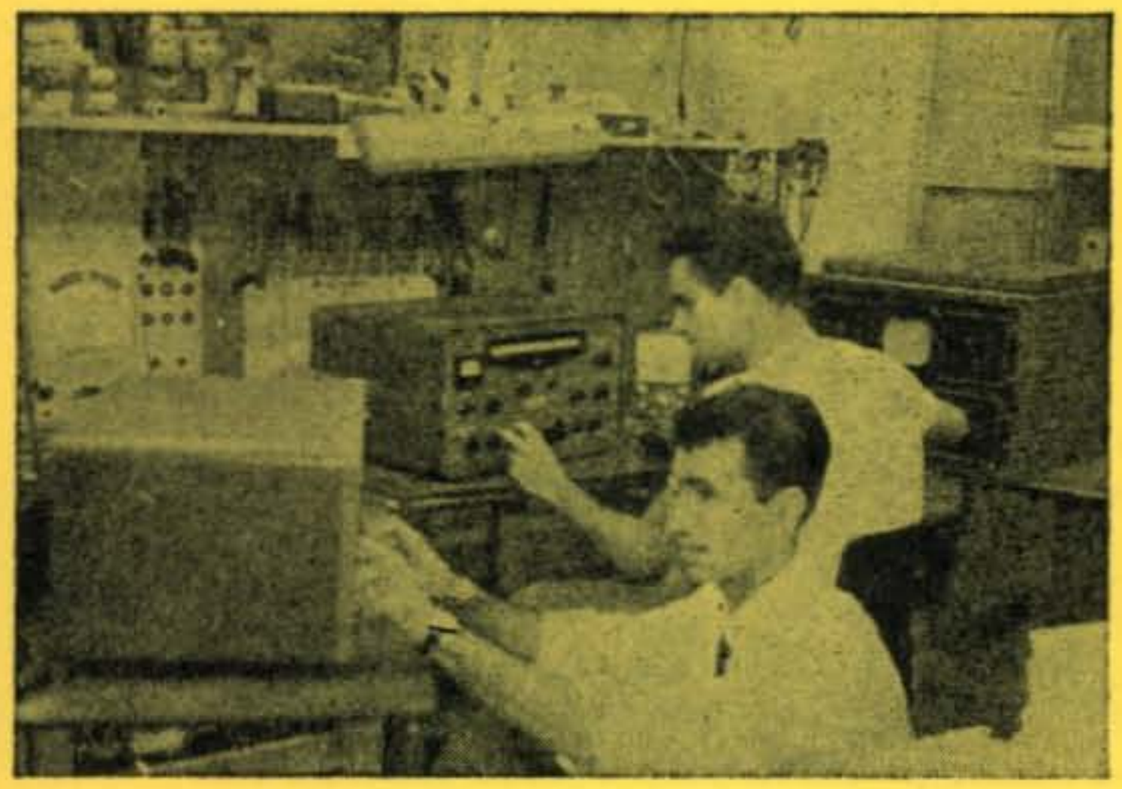
Behind this unassuming storefront is a beehive of activity. This is the home of Empire State Electronics.

At long last there's a service firm specializing in repair, maintenance or wiring of amateur radio equipment. In operation for the past six months, Empire State Electronics, 139-40 Hillside Ave., Jamaica, New York, has already been appointed the official warranty service station for many leading manufacturers of ham equipment including Heath, Gonset, Hallicrafters, Hammarlund, Globe, International Crystal, and Central Electronics. The firm sells *no equipment* other than replacement parts for a service job which they handle.

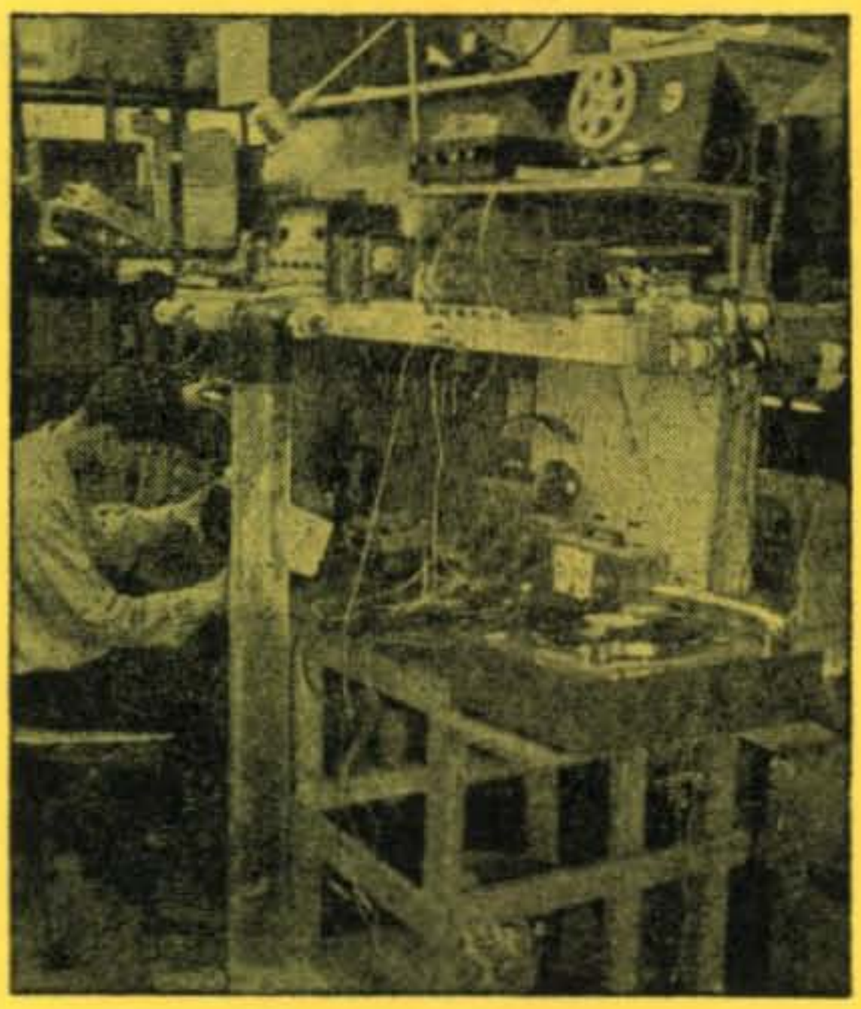
The need for a service organization of this sort has been long recognized. Not only does Empire State provide a necessary service to hams who haven't the time or patience to troubleshoot their own gear, but it has available many vital test instruments which the average ham wouldn't happen to have in the shack.

One of the unique features at Empire State is the fact that it's run entirely by hams. The technical service problems are supervised most ably by Russ, K2RLY and John, WA2CGX. Phil, K2VFW runs the business end of the operation, while Selma, K2ZKD handles traffic and correspondence. Other hams on the staff are Dan, K2YYH, Chuck, WA2NMI, and Ed, WA2ONA. The shop is often open late into the evening for local hams who can't leave the salt mine during the day to bring in their pet problem.

Another interesting sidelight on this growing firm is that they have the technical knowhow and facilities to service hi fi, test instruments, and industrial equipment as well as ham gear. So whatever your problems, give Empire State a call. We think you'll be well pleased with their performance.



↑ Russ, K2RLY and John, WA2CGX at work on typical service jobs for ham customers. An important asset to getting the job done promptly and properly is a complete line of tools, test instruments, and exact replacement components.



In case you're wondering, the long glass vertical tube in the forefront is a cylinder for testing depth-finding equipment. This typifies the unusual equipment that Empire State keeps on hand to solve customers' problems with a minimum of time. ←

CELEBRATES 25th ANNIVERSARY

in amateur radio

The publishers wish to congratulate Leo I. Meyerson, WØGFQ, President of World Radio Laboratories, on his 25th anniversary of serving hams throughout the world. A native of Omaha, Nebraska, Leo received his early training in the Council Bluffs' schools and attended the University of Nebraska. In 1936, WØGFQ made his first entry into the wholesale radio business as a result of his hobby which was begun in 1928. During World War II, the business was converted to the manufacture of quartz crystals for military purposes and in 1946 World Radio Laboratories was reactivated as a major "ham distributing business" to become a leading distributor of amateur radio equipment throughout the world.

Besides his interest in amateur radio—and amateurs around the world are quite familiar with the call, WØGFQ—Leo Meyerson is active in Kiwanis, Elks, Shriners, Boy Scouts and other community affairs. He is former president of the United Fund, past board member of the Chamber of Commerce, Handicapped Center, YMCA, Mercy Hospital, Kiwanis and was vice president of NEDA, the National Electronics Distributors Organization.

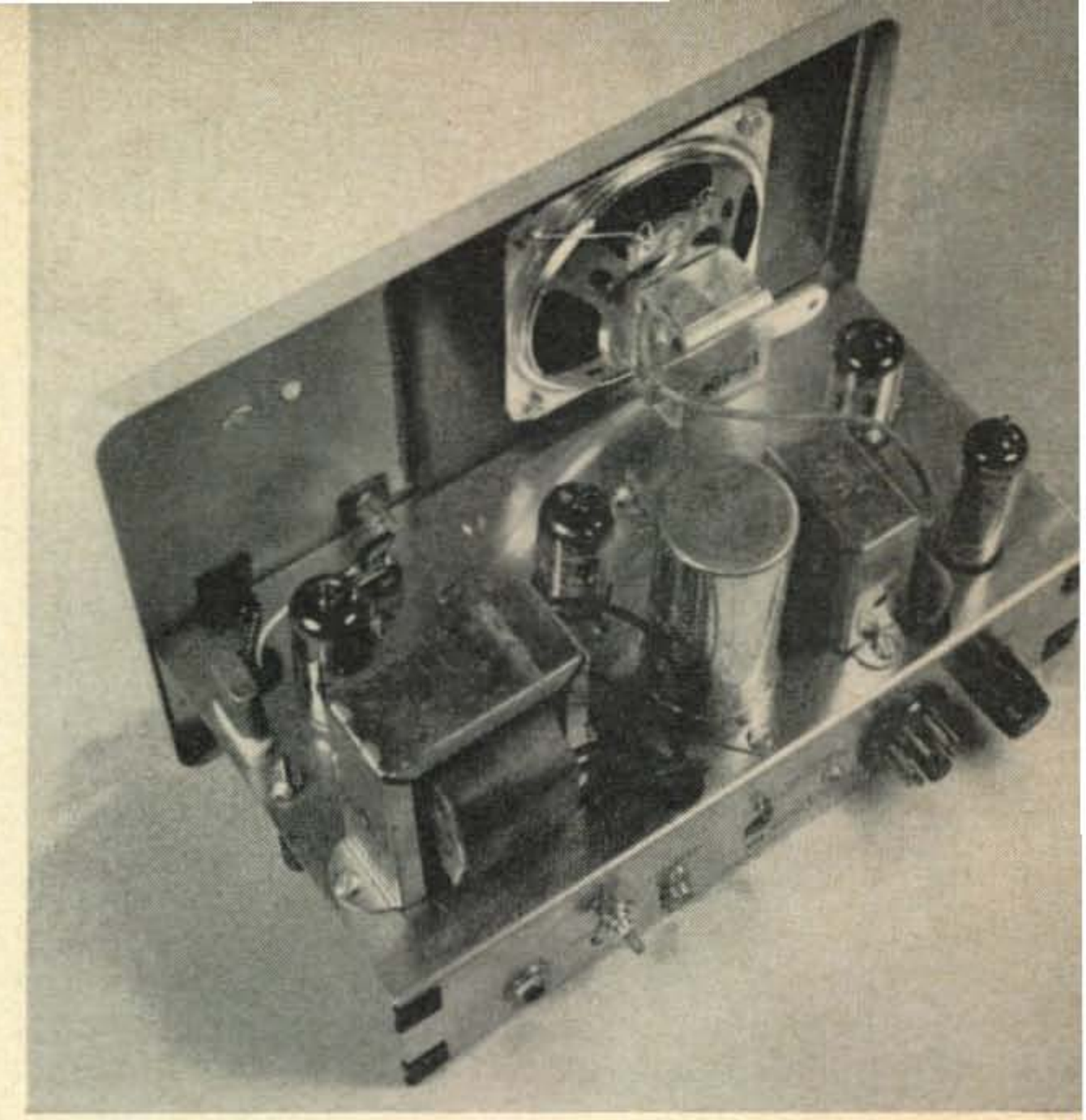
Leo is married and has two children, Larry, also an amateur, WØWOX, and Darlyn. His wife, Helen, is also quite active in civic affairs.

So, to you Leo, we at *CQ* wish heartiest congratulations on your 25th anniversary and our sincerest hopes for continued prosperity and continuation of your service to the amateur radio field.

CQ Reviews:

Heath Sixer And Tener

Lee Aurick, W2QEX,
Technical Editor; CQ



Both the 10 meter and 6 meter rigs use a 6AU8 triode-pentode. That's it. This one tube *is* the transmitter. The triode unit functions as the oscillator with the plate tank circuit tuned to the operating frequency. The original instructions for the "Sixer" called for a fifth-overtone crystal, but the manufacturer now recommends the third-overton type for both units. Incidentally, during the testing of the "Tener", 14 *mc* rocks were tried. Oscillator tuning was not as critical as with the third-overtone crystals, but a significant drop in power was noticed. The pentode section is the final amplifier and it runs about five watts input. The audio output transformer doubles as the modulation transformer with both the plate and the screen-grid voltages of the final amplifier modulated by the audio signal. The *rf* output, as well as the modulation level is indicated by a red-capsuled neon indicator on the front panel. The "Tener" has an adjustable trap in the antenna circuit to reduce second harmonic output. This trap *really* works and permits operation directly alongside the family TV set.

Receiver Section

The receiver section employs the pentode section of a 6AN8 as a broad-tuned *rf* amplifier. The amplified *rf* signal is fed to the triode superregenerative detector.

Last November your reviewer discussed the Heath CB-1 and mentioned a successful 10-meter conversion and possible 6-meter conversion of this compact transceiver. No sooner the word than the deed—Heath recently announced two similar units, the HW-19, 10-meter transceiver, and the HW-29, 6-meter transceiver.

The power supply used in both units is a self contained 105-125 volt, 50-60 cycle supply utilizing a pair of silicon diodes in a full-wave doubler circuit. The use of an octal plug as a power connector on the rear of the chassis makes it convenient also to connect 6 or 12 volt mobile supplies. These units may be purchased separately.

The audio section consists of two tubes; a 12AX7 and a 6AQ5. In receiving, the detected audio signal is applied across the volume control. The setting of this control determines the portion of the signal applied to the grid of one-half of the 12AX7 and then to the 6AQ5 audio output stage. When transmitting, both triode sections of the 12AX7 are used as speech amplifier and driver stage, respectively, for the 6AQ5 modulator. The volume control and the speaker are switched out of the circuit during transmission.

A regeneration control is located on the chassis rear apron. Once adjusted, this control may be disregarded.

For operating convenience, a push-to-talk switch is also included with the normal transmit switch. This spring-return switch is handy for rapid-break, net-type QSOs.

The "Tener" was constructed first and took about twenty hours. The "Sixer" took somewhat less time, about 18 hours, undoubtedly due to the experience gained with the "Tener." It's obvious that a great deal of time and thought went into the design of these units. Mechanically, everything fits, and except for the 6AU8 transmitter stage, where things get a bit cramped, all parts are readily accessible. However, the 6AU8 stage will present no problem if the assembly instructions are carefully followed.

The performance of both units has been highly satisfactory. A ten-meter ground plane connected to the "Tener" brought in both short-skip and local stations as soon as it was turned on. Though no skip contacts have been made to-date, numerous local contacts were quickly and easily logged.

The "Sixer" has been used both fixed and mobile, and locals come pounding in. Reports on the signal quality of both units have been excellent.

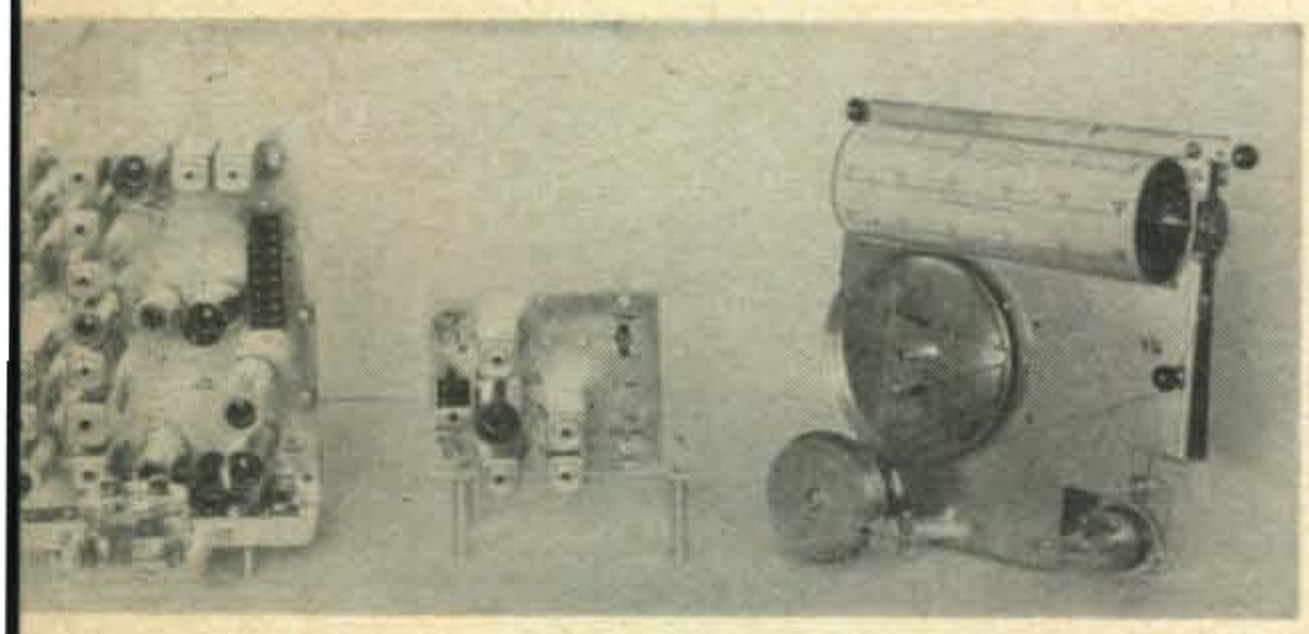
These units are not fancy; no S meters, *avc* and the like, and like all superregens they tune broadly, but for their size and price they make a nice package for local nets or ragchews. ■

CQ Reviews:

The Hammarlund HX-500 Transmitter

Herbert Greenberg, W2EEJ
821 Rutgers Road
Franklin Square, New York

The Hammarlund HX-500 Transmitter-Exciter is a handsomely packaged, well finished, Sideband, a.m., c.w., f.m., or f.s.k. generator with self contained power supply. It needs only connection to an antenna and an a.c. outlet to place it in operation. The instruction manual is clearly and simply written, with only the first few pages telling all that is necessary for interconnection with the station receiver and routine operation. The balance of the manual concerns itself with the theory of operation and alignment data for the technically minded.



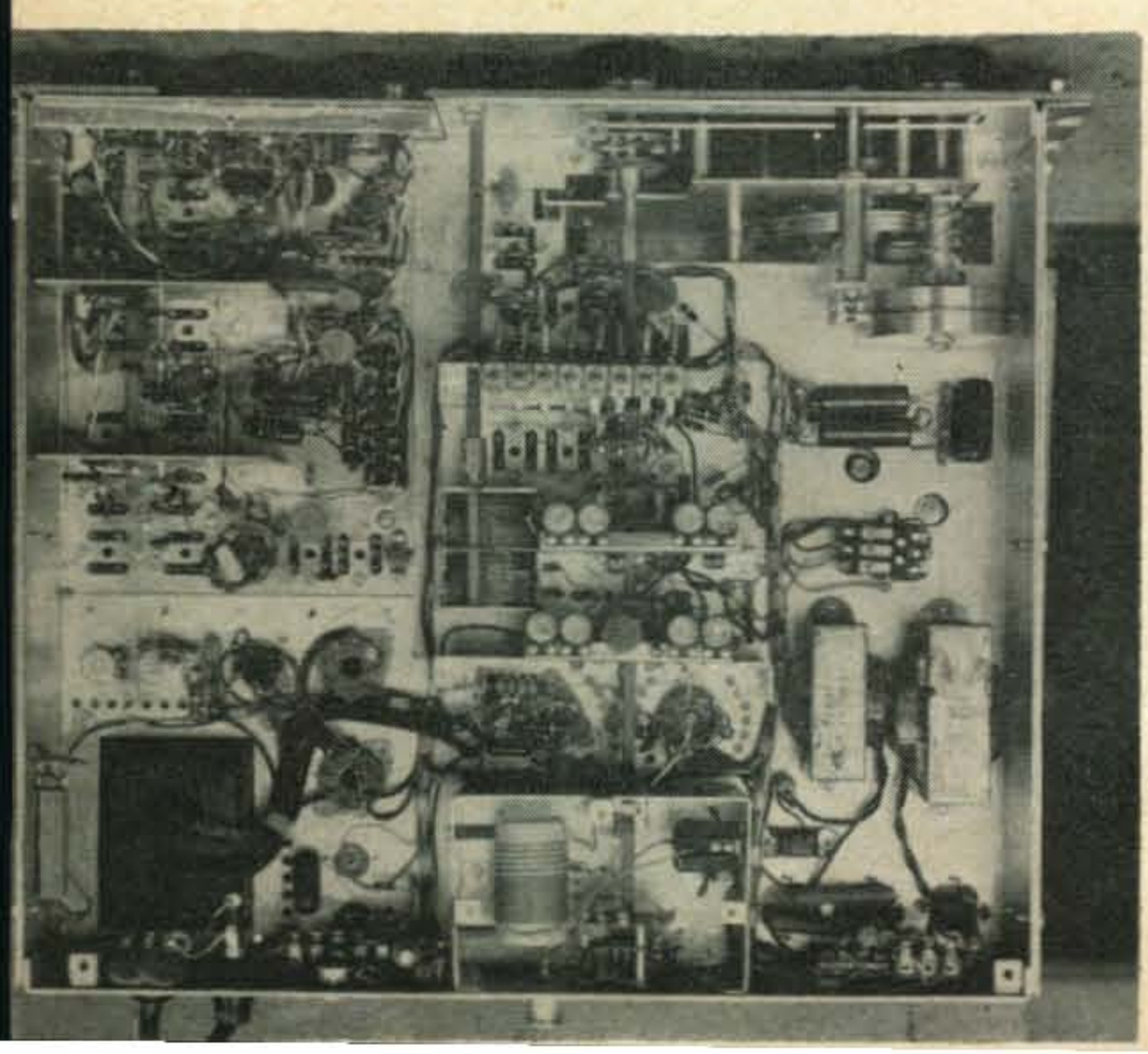
Exciter assembly sub-chassis, v.f.o. assembly sub-chassis and dial assembly.

Little time was needed to actually set up and integrate the transmitter with the station receiver. While the antenna changeover relay and receiver muting is integral, a plug is provided for the leads and provides a convenient means for interconnecting. Hammarlund though might also provide an *RCA* type phono plug for those who might not have one handy, as well as a short piece of thin coax, for the receiver input. Amateurs in remote areas might appreciate not having to delay operating their new piece of equipment because of lack of this inexpensive plug.

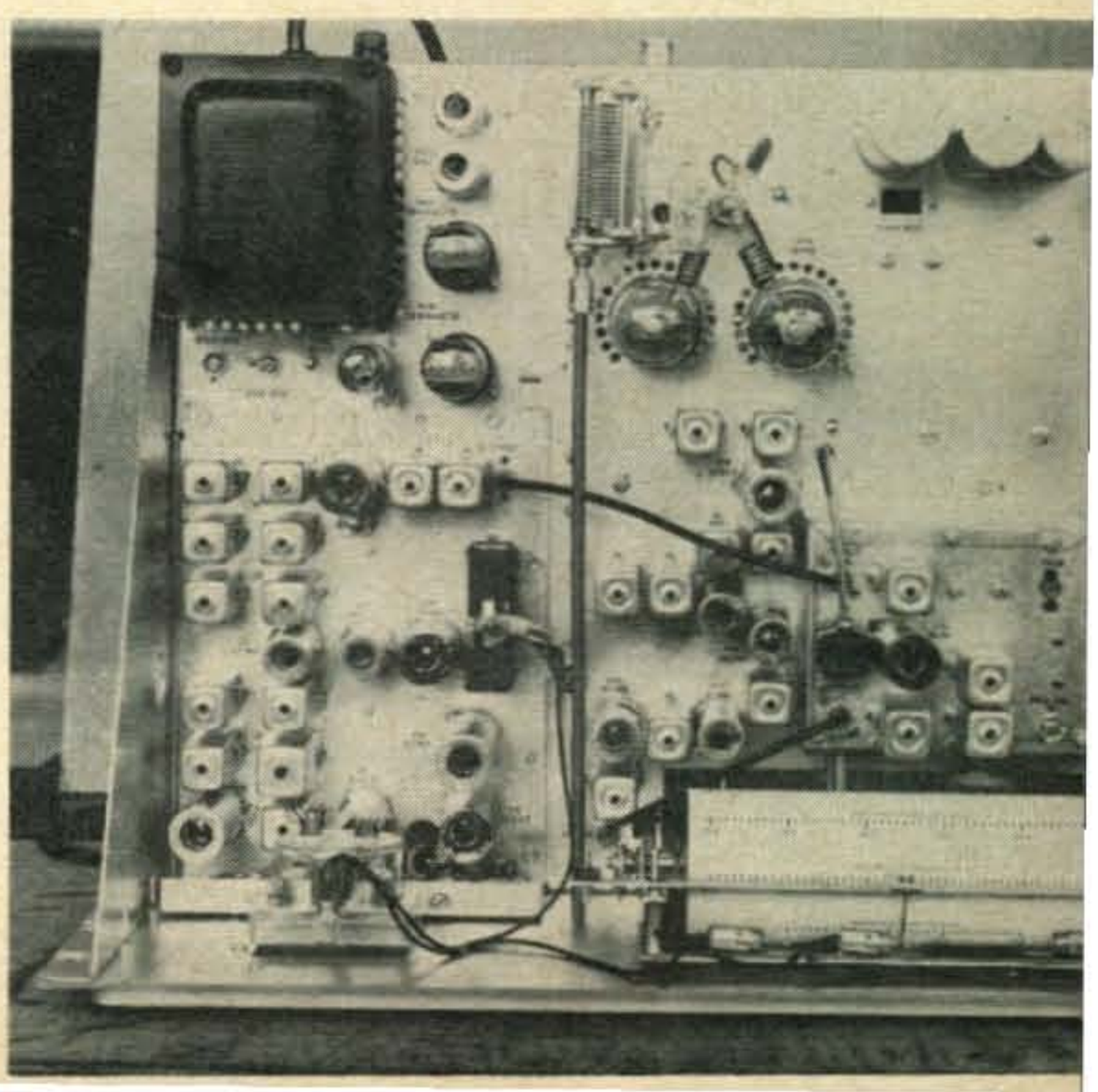
The first on air s.s.b. contacts were quickly and easily made. However, a dummy load was first attached and used to become familiar with the controls and tuning, as well as adjusting the vox and anti-trip without cluttering the airwaves. Reports were flattering, and solicitation of critical reports resulted in no negative comments. Operation was "barefoot", without any linear amplifier (which might distort the final r.f. output) in order to obtain true checks on the unit itself. However the HX-500 should drive any linear amplifier within the legal limits. The other modes of transmission were also checked and proved to be very good. "Shaping" is used for clean keying and yields a T9X note that is easy and pleasant to copy.

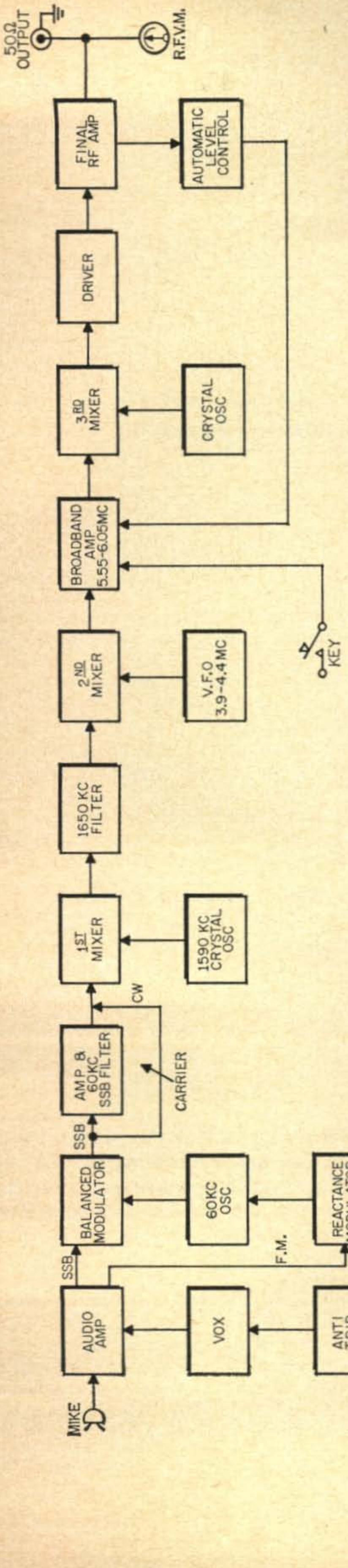
The transmitter covers the full 80 through 10

Bottom view with shield plates removed. Crystals for heterodyning to ham bands are visible in the top center, just above the trimmers.



The screen cage surrounding the final has been removed to show the 6146's. The cooling fan is mounted on the cover and is not visible.





meter amateur bands with 100 watts P.E.P. on c.w., f.m., or f.s.k. operation. Double sideband is available as well as 25 watts of a.m. output. Pi network coupling is used in the final with fixed output capacitors chosen to match a 50 ohm output load on all bands. Part of the output is rectified and used for a.l.c. (automatic level control) to prevent overdriving and splatter.

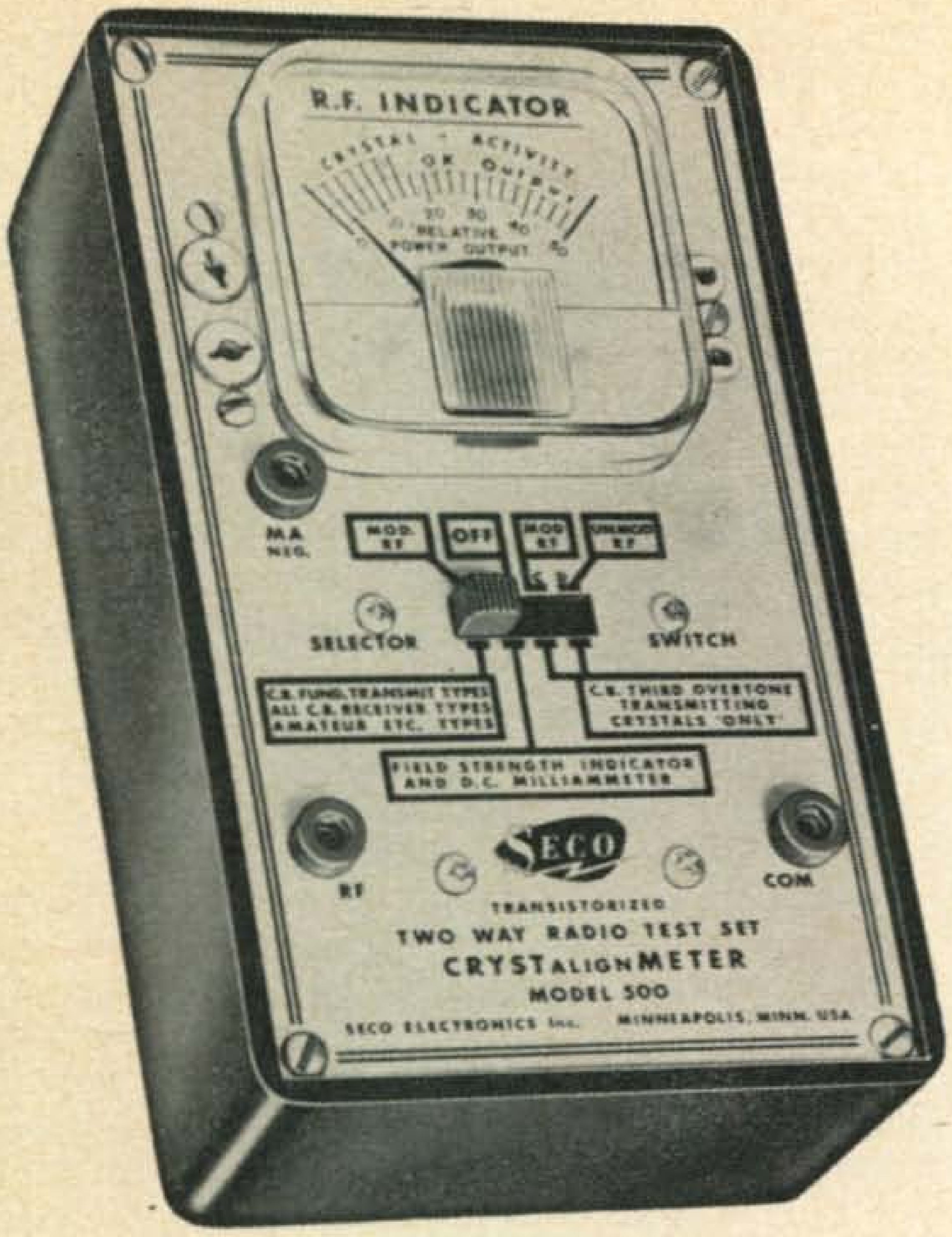
Each dial scale is calibrated in a 500 *kc* full range. This is adequate for all bands except 10 meters and four ranges are used to completely cover this band. There is plenty of bandspread and the dial and knob arrangement provides a very easily read frequency calibration. Stability is excellent and in keeping with present standards. Although the MARS frequencies are not covered, substitution of a heterodyning crystal should enable the operator to tune near ham band channels with little difficulty.

Checking the block diagram will show the interesting method used to place a signal in the amateur bands while using a stable and easily filtered 60 *kc* oscillator for a starter, followed by a balanced modulator using special diodes with The 60 *kc* oscillator is reactance tube modulated audio fed in parallel and the r.f. in push pull. for f.m. or f.s.k. For a.m., one of the diodes is rendered inactive and the carrier is not balanced out.

For sideband operation, the 60 *kc* is filtered through a series of inductively tuned overcoupled and undercoupled filter sections to provide rejection of the undesired sideband and the remaining sideband is amplified to compensate for the filter losses. For other than sideband operation, the basic 60 *kc* is switched around the filter and amplifier and directed to the first mixer, a heterodyne crystal controlled oscillator operating on 1590 *kc*. Here it beats with the 60 *kc*, resulting in an output of 1650 *kc*. It is then fed to the second mixer where it is mixed with the v.f.o. output which is variable over a range of 3.9 to 4.4 *mc*. The resultant of the 1650 and the v.f.o. is a 5.55 to 6.05 signal which is passed through a broadband amplifier biased to prevent passage except when desired. This amplifier is controlled either by keying or the vox in the course of normal voice operation. The gain of this stage can be varied to provide for output control.

Finally the 5.55 to 6.05 mixes in the last heterodyne stage with a crystal controlled oscillator resulting in an amateur band signal. A selector switch places the correct crystal and proper tuned circuit in operation. A linear driver stage excites the parallel 6146 final amplifier, which is cooled by a small fan. An output meter to indicate the relative output is used rather than a plate milliameter, and is far more convenient and accurate. Provision is made for connecting an external plate milliameter if desired.

With the HX-500, Hammarlund has entered a strong contender in the field of modern transmitters which merits serious consideration by those who prefer to buy and use commercial equipment. ■



CQ Reviews:

Seco Model 500 Test Set

Lee Aurick, W2QEX,
Technical Editor; CQ

Straight from the field of commercial two-way radio comes this very handy radio test set. It's the kind of gadget that you wonder how you ever did without. Furthermore, its complete portability extends its usefulness beyond the shack and into every amateur mobile and portable application.

Some idea of the usefulness of the Seco 500 may be obtained from the impressive list of things that it can do for you. It functions as: *crystal checker, signal generator, rf field strength meter, plate current milliammeter,* and may be used as a *beat frequency demodulator,* as well as to check *transmitter modulated output.*

The circuitry consists of two transistorized oscillators and a germanium diode which functions as a mixer-modulator as well as the meter rectifier. One oscillator generates approximately a 1000 cycle tone. This tone may be used to modulate the crystal controlled *rf* oscillator. A four position slide switch selects the type of crystal to be checked as well as a choice of modulated or unmodulated output.

Crystal Checker

In position A, the oscillator output circuit is untuned, and *rf* output is tone modulated. Its useful frequency range is from about 1 *mc* to well over 20 *mc*. Output is determined to a degree by the frequency as well as the crystal size and type of cut. Nearly all good crystals should check beyond the "?" mark.

In position D, the oscillator functions in a third-overtone circuit very similar to tube-type oscillators found in many amateur and commercial equipments. This circuit is loaded so that the indicated output on the meter is proportional to the Q of the crystal under test. The higher the reading the more active the crystal. Low meter readings identify crystals of low *rf* output and those that will be generally poor in starting. Average good crystals will read about half scale. Very active ones will read near full scale and marginal ones at the "?" mark. In this position the tank circuit is broadly tuned in the 26 to 28 *mc* range. However, crystals either side of this range, by a considerable margin, have given reliable response when tested. Position C applies the tone-modulated signal to this circuit.

Signal Generator

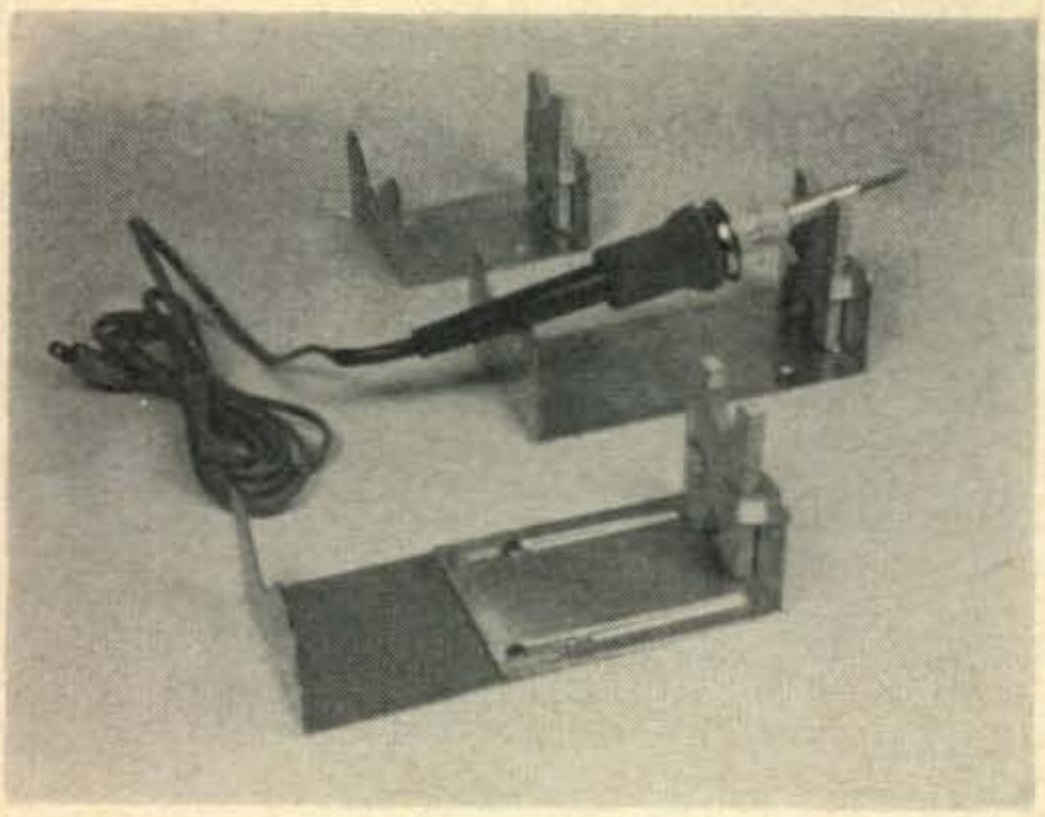
While serving as a crystal checker the 500 is also a low power crystal controlled transmitter. An external audio tone, or voice, may be applied to the *rf* output. By inserting a transmitter crystal a useful signal is obtained for peaking antenna coupling or *rf* tuning circuits in receivers. Precise frequency measurement cannot be assured without correlation between the test and transmitter oscillators.

RF Field Strength Meter and Plate Current Milliammeter

In position B, the test set functions as a field strength meter or as a *dc* milliammeter. The 500 has a built in pick-up loop located in the center of the back of the unit. However, the 500 need not be located adjacent to the antenna. A special set of test leads are provided so that the test set may be located where tuning adjustments are being made, and the leads run to the antenna. This arrangement is particularly useful in mobile installations. Headphones may be connected to obtain a check on modulated output.

[*Continued on page 159*]

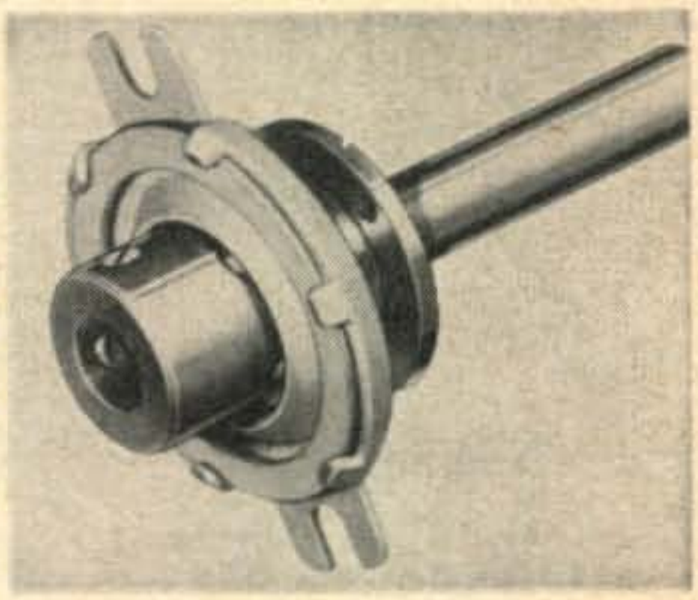
New Amateur Products



Soldering Iron Saddle

PRODUCTION of a lightweight metal holder for hand soldering irons, designed to be permanently mounted in place on the work bench or for use as a moveable cradle has been announced by Falls Laboratories, Inc., 2219 Nottingham Way, Trenton, New Jersey. A novel feature of the Saddle is the removable asbestos rest, notched with a "V" at one end and a semi-circle at the other. Three models are available, all constructed of 18 gauge steel. A 3 inch model and 5 inch model can be used if only one soldering iron happens to be around the shack. If various soldering operations are anticipated and more than one iron is required, an adjustable Saddle is available which, when closed, measures 4 inches long and when wide open, measures 6 inches. For more information, circle A on page 182.

6:1 Planetary Drive



JACKSON Bros. (London) Ltd. of Kings Way, Waddon Surrey, England has been exporting, along with their regular line of variable capacitors, a planetary friction drive designated 4511/DAF. Ball bearings compressed between two steel races transfer the shaft rotation at a ratio of six turns to one. This drive is handsomely made of machined brass and features a front collar to which a pointer may be attached. Turning action is extremely smooth and backlash is held to a minimum. Two set screws are provided to insure proper locking on the mating shaft. A ¾ inch diameter panel hole is required to mount the unit. Shaft diameter is .250".

M. Swedgal Electronics of 258 Broadway, N.Y. 7, N.Y. is the sole distributor in the U.S.A. for Jackson Products. More information may be conveniently received by circling B on page 182.

Shielded R. F. Inductors

NORTH Hills Electronics, located at Alexander Place, Glen Cove, L. I., New York has announced a new series of slug-tuned, shielded r.f. inductors designed for chassis or panel mounting. The new series, designated 900, covers a range of inductances from 0.5 *μh* to 100 *μh* in 10 steps and are most useful from 500 *kc* to 60 *mc*. The average Q is 70.

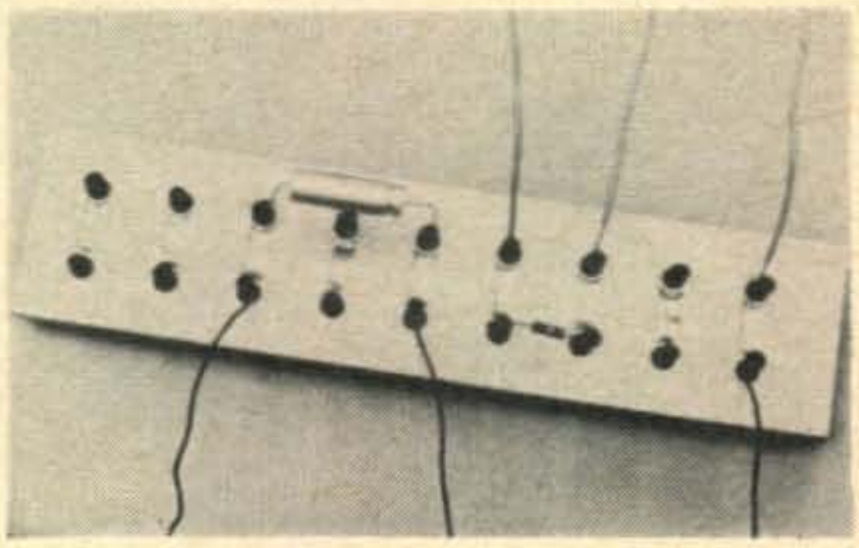
The assembly consists of powdered iron cups and core mounted in a plated brass case. Leads are securely mounted on feed-through solder lugs brought out the rear of the case. A built-in tension device locks the slug in place after the tuning operation has been performed. These units should render excellent stability in i.f. and r.f. circuitry in mobile rigs as well as equipment subject to severe environmental conditions. The unit has an outside diameter of 7/16" and a single ¼-28 bushing for a sturdy mounting. More information may be obtained by circling C on page 182.

Circuit Mock-Up

A NEW device has been developed by Plastic Associates, 2900 S. Coast Blvd., Laguna Beach, California for establishing temporary connections between electronic or electrical circuits.

The Inter-Connek consists of 20 rubber core Junction Cells arranged in two parallel rows, with copper foil connecting each pair of cells. Wires are inserted by first pulling up on the flexible rubber core at the center of each cell. When the core is released, the rubber expands, gripping the wire. Circuit elements such as resistors, capacitors, and diodes may be inserted between cell units. These units provide significant advantages over the usual terminal strips using screw connections or clips.

Clips, screw terminals and other usual methods of making temporary connections have the common fault of utilizing two opposing metal surfaces to grip and make contact with the wire leads. The Junction Cells employed here, on the other hand, grip the wires between rubber and metal, automatically adjusting to various sized diameter wires. There is no chance that a large diameter wire will "spring open" the connection. Circle D on page 182 for more information.



LETTERS TO THE EDITOR [*from page 18*]

giving some consideration to the Extra class license. For me, higher code speed for the Extra class will be awfully hard, but it will be worth it, if you get some advantages for your trouble, (such as increased power).

I also believe there should be more motivation for Extra class hams, but I do believe the General license should be renewable.

Melvin Berman, K4TXP

P. E. P.

Editor, *CQ:*

Re: Letters for Sept. '60 *CQ*, Sgt. Schweitzer seems to be misinformed and insults the intelligence of the engineering staffs of your various advertisers marketing r.f. amplifiers and your authors of the same subject.

Peak ratings are not new but were discovered along with the theory of modulation. One example (a.m!): a 1 *kw* carrier modulated 100% produces 4 *kw* on peaks. The F.C.C. regulations for amateur transmitter rating calculates the input voltage and current for the stage or stages contributing power to the antenna with meters of a prescribed time constant and makes no reference to the wave form (peaks).

Fifty or 150 watts may or may not provide a useable circuit depending on the conditions that prevail at the time of a given contact. There are plenty of times when an extra 1.0 *db* of signal makes the difference. The boys should be governed by another F.C.C. regulation that says only enough power to maintain contact should be used, rather than trying to change these regulations.

Wayne W. Cooper, K4ZZV, ex HR2WC
9302 N. W. 2nd Place
Miami 50, Florida

Impressions

Editor, *CQ:*

As an American ham who has had an opportunity to work as a DX station, 5A2TC, I thought I might give a few impressions of operating here. First, the QSL problem. Although I am not destitute yet, I would be if I answered every request for a QSL card. So, being a relatively rare DX station (15 active stations out of about 50 total) I have had to go to the policy of QSLing on receipt of the other fellows card. It cut down my bill to an average of three to four hundred cards in a two month period. It also helps to pry cards out of some of the more difficult states. This is the biggest gripe of a DX station. If you want a card from "6L6GT" at least send him a card. Next on the line is return postage. If you do desire to send return postage and you cannot get the stamps of the country in question send an IRC. Above all, do not send U.S. stamps. They are just no good except when mailed from an American post office. A friend of mine has a stack of stamped self addressed envelopes a foot high that are about as useful as an 813 with an open filament. Third, make sure you are registered with your call area QSL bureau. The vast majority of DX stations send cards via the bureau. The bureaus in Europe are very well organized. You will usually get a card just by sending one of yours, but you will get one direct only by sending return postage.

I would also like to add that if I owe anybody cards to drop me a line, I have my logs and some cards left over. No return postage necessary.

1/Lt. John McCarthy, K5TDF/5A2TC
513th FIS, Box A-18
APO 115, New York, N. Y.

CLASS B LINEAR EFFICIENCY CALCULATIONS [*from page 84*]

Let's substitute some more values in our equation

$$\text{Efficiency (in percent)} = \frac{\pi}{4}\left(1 - \frac{0.6}{1}\right) 100$$

$$= (0.785)(0.4)(100)$$

$$= 31.4$$

where 0.6 is the half value between the full plate voltage as signified by 1.0 and the practical limit of 0.2 as previously mentioned.

This, then is the approximate value for efficiency when you calculate the maximum input to a class B tube.

Let's look at the characteristic curves as published in the tube manuals and see how these all correlate with what has just been said. A typical beam power tube such as an 807 has the following operating conditions as stated in the tube manual. Plate voltage 750 volts, grid bias minus 40 volts, grid drive plus 35 volts peak. If we have 35 volts *ac* peak drive and 40 volts *dc* bias we have, therefore, a net bias of minus 5 volts at the peak of the excitation drive cycle. This, by the way, is operating with no grid current, which is not especially unusual for a final class B stage. The explanation is, however, as valid without grid current as it is with. With these figures in mind let's look at the characteristic curves for an 807 with a screen voltage of 300 volts. Using the curves for plate voltage vs plate current place a rule on the 750 volt point on the voltage coordinate (the bottom, or base, line of the graphs) and, using this as a pivot point, see how low on the plate current coordinate (left hand vertical) you can place it and still cross the minus 5 volt bias curve before it bends sharply downward. You will find you can lower the rule to approximately the 180 *ma* point on the left hand coordinate. If you then go directly down from the point where the rule crosses the minus 5 volt bias curve line you will read approximately 75 volts *dc* as the instantaneous plate voltage at that particular operating point. This means that under these conditions our load to the tube will be approximately 4400 ohms (170 *ma* at 750 volts) and as the grid swings from cutoff to minus 5 volts the plate voltage will swing between 750 and 75 volts. If we then substitute these figures in our equation we have

$$\text{Efficiency (in percent)} = \frac{\pi}{4}\left(1 - \frac{75}{750}\right) 100$$

$$= (0.785)(0.9)(100)$$

$$= 70.7$$

Let's look briefly at another beam tube, the 813. We have here a plate voltage of 2000 volts, grid bias of minus 60 volts and a peak grid drive of 70 volts which gives us a net figure of plus 10 volts on the grid at the peak of the drive cycle. Using this technique we find we can get an

efficiency of 68.3% under those conditions.

All this shows how you can calculate efficiencies for your class B linear, plus the fact it shows the importance of operating with correct loading and correct grid drive. With heavier loading for instance your rule will rise on the left hand scale and limit the low figure for plate voltage minimum. This, in turn, will raise the value of the E_m in the equation and decrease the efficiency.

If this indicates to you that you must know what you're doing when you put a class B linear into operation, you're right. It also should indicate that a flat figure of 30 percent for the efficiency of an amplifier of this type should not be unqualifiedly given. ■

SECO TEST SET [*from page 156*]

The basic meter movement is 0 to 1 milliampere. Internal circuitry makes this a 0 to 5 volt voltmeter. When the test leads are placed across a 100 ohm external resistor, in series with the plate current, the meter then becomes a 0 to 50 milliammeter.

Beat Frequency Demodulator

When it is desirable to precisely align two transmitters to a particular frequency, a small amount of *rf* from each transmitter may be coupled to the test set and the beat note monitored in the headphones. The frequency of one of the transmitters may then be adjusted for zero beat.

Power

The two flashlight cells which power the Seco the unit as a signal generator. It is even possible 500 should last their normal shelf life since they are only used when checking crystals or using to check their voltage without removing them.

Don't throw out that scope and VTVM *yet,* but it would be difficult to imagine a more useful piece of gear, for a variety of checking purposes, around the shack or in the mobile, than the Seco 500 transistorized test set. ■

COLLINS KWM-2 TRANSCEIVER [*from page 81*]

ence product of this combination is then applied through a variable i.f. transformer to the second mixer, V_{17_B}. The v.f.o. injection signal is fed to the cathode of this tube and the 455-*kc* difference product present at the plate of V_{17_B} is then coupled to the mechanical filter, FL_1.

Filter output is applied to the grid of the first i.f. amplifier, V_{1_B}. Following amplification by V_{3_B}, the signal proceeds to the a.v.c. rectifier, V_{15_A}, and to the grid of the product detector, V_{15_B}. Injection from the b.f.o. is applied to the cathode of this tube and the result is the detected audio signal. The a.v.c. output controls the two receiver i.f. amplifiers as well as the common transmitter/receiver r.f. amplifier.

Perhaps something of a record in amateur gear, the KWM-2 contains five oscillators; the b.f.o., the tone generator, the v.f.o., the high frequency crystal oscillator and the crystal calibrator. There is no reason for going into the operation of these units as their operation is either as previously discussed or in keeping with customary practice.

VOX and Anti VOX

Audio output voltage from V_{11_B}, the second microphone amplifier, is coupled through a gain control to vox amplifier V_{14_C} and from there to the vox rectifier V_{14_B}. The positive d.c. output drives the grid of V_{4_B} which actuates vox relay, K_2. This little operation causes a multitude of things to happen. This relay switches the antenna to the transmitter, the -70 volt *d.c.* muting and bias voltage, and relays K_3 and K_4. These relays in turn switch the metering circuits to transmit, the low plate voltages to the transmit tubes, and the a.v.c. and ALC circuits.

The anti vox arrangement rectifies some of the receiver audio so that speaker output will not trip relay K_2. Speech delivered into the microphone by the operator, however, will cause the positive vox voltage to overcome this negative anti vox voltage and close K_2, thereby disabling the receiver and turning the transmitter on.

It was with the vox circuit, however, that your reviewer came to grips with the KWM-2. A reputation for fast talking, acquired over many years, was unequal to the task of keeping the vox relay closed. It required a bit of getting-used-to. On c.w., an estimated operating speed in excess of 20 w.p.m. was required to keep the vox relay closed between words. Perhaps we may look forward to further refinement of this fine piece of equipment to include a variable delay control applied to the vox circuit. Such a circuit would certainly win the additional praise of clipped-speech Yankees as well as re-tread c.w. slow-timers. ■

WEAK SIGNAL DETECTION [*from page 78*]

the high frequency response. Capacitor C_5 is the audio coupling for the next stage. R_2 is the cathode bias resistor and determines the minimum Eg-Ip operating characteristics of the detector. R_3 in combination with C_1 is a decoupling and screen grid voltage dropping net work. Capacitor C_3 is a blocking capacitor which prevents the *bfo* plate voltage from appearing on the suppressor grid. By using the suppressor grid as an injection grid the 6BA7 characteristics are changed from a pentode to a screen grid tube. A suitable audio choke for

the plate of the detector was not available. It should have an inductance between 100-400 henries, however, an interstage audio transformer designed for a 6SJ7 with a primary impedance of 42,000 ohms was available in the junk box and it worked very well.

Construction

Due to the high gain of this stage it was found necessary to connect all ground return points to a common junction. The ground side of R_2 was used for this purpose. No trace of instability was noted. The detector should be mounted as close to the last *if* stage as practicable. The important thing is to keep all leads as short as possible. In some receivers it may also be necessary to shield adjacent filament leads. In my particular receiver I removed the diode detector and *avc* rectifier completely and installed a 9 pin socket for the 6BA7. The *avc* circuit shown in fig. 1 was used. A 1N54 or equivalent germanium diode may be utilized as the *avc* rectifier. The high back resistance of the diode serves as the load resistance for this circuit. It has a wide operating range and the time constant determined by C_6 works well. Capacitor C_6 can be changed to suit individual requirements, if desired. No problems were encountered. Incidentally by obtaining the *avc* voltage from the plate of the last *if* amplifier, *avc* can be used with SSB or CW signals quite well. The value of C4 in fig. 1 determines the amount of high frequency cutoff and can be varied to suit the builder. It was not found necessary to shield the 6BA7. A measurement was made of all voltages and currents and the detector stage was operating well within the characteristics listed for the tube.

Adjustments

After the wiring has been completed and the circuit checked for shorts, turn the receiver on and tune in a signal. The *avc* should be on and while observing the S-meter (or output meter) peak the primary and secondary of the last *if* transformer. Lacking a signal generator, I used a local broadcast station as a steady signal source. Be certain to swing through the peaks several times to insure that you are "on-the-nose" of the *if*. A noticeable increase in the S meter reading should be evident. Next, with the *rf* sensitivity control at maximum, *avc* and *bfo* on, and a steady signal source (at any frequency), set the audio control to a comfortable level. Adjust C_2 until the signal sounds clean and crisp. This setting corresponds to the maximum signal level which the detector will handle without overloading. This setting of C_2 does not necessarily correspond to the maximum S-meter reading, however, greater output can be obtained if the *rf* gain control is decreased slightly and the capacity of C_2 increased. Some distortion will occur especially on 100% modulated AM signals. I do not recommend this increased sensitivity since the maximum overall gain of most communications receivers is more than adequate, especially so with this sensitive detector.

A final word; the values of the parts used are not at all critical. Don't be afraid to substitute. That's what junk boxes were made for. Good luck and good listening pleasure. ■

HAM CLINIC [*from page* 97]

address envelope stamped with 8¢), there you will find *many* construction articles on the type of transmitter you'd like to build. Sorry.

Quad vs GP—"If you had a choice, which antenna would you choose for 15 and 20 meter operation, a quad or a ground plane?"

Depends on the location. I'm partial to the quad.

Non-Technical Department

"I want to become a ham in the worst way and have been studying real hard. But my father won't let me put up an antenna. He says it will attract lightning and this is the reason he won't put up an outside TV antenna; our set uses rabbit ears. How can I convince my dad that ham radio is a fine hobby and that there is no real danger (as least as bad as he imagines) with an outside antenna?"

Some people do not like cats; some do not like lightning. Phobias are strange things. But if your dad would realize that the chance that lightning striking his "antenna" is *less* than his having an auto accident or falling out of bed, he would be better off. What makes him think he is safe with rabbit ears? Because they are in the house? Bosh! An antenna that is properly installed and lightning protected *actually protects* a house. I'm sure your father has heard of lightning rods used on barns, tall buildings, trees, power lines ad infinitum!

Another thing: it is better that you have a rewarding hobby like ham radio that will keep you at home doing something worthwhile, rather than away from home in some possible mischief. Tell your dad to look around the block and see the antennas in sight—maybe this will convince him that he should let you go ahead. Be sure and tell him that you'll obtain good advice and technical assistance in putting up your antenna; and if need be, have it inspected by the local electrical inspector.

On the other hand, if your father is a little "tight" with his money and doesn't want to see his son take up a hobby that could lead to a mighty rewarding career in electronics or some allied field, then son, you're in a tough fix!

XYL Trouble

"My old man (yes old, he's near 60) seems to look only for contacts with lady radio operators and I'm getting mighty sick of his cooing. Do

you have any suggestions to keep him from harassing me with his sugar and spice contacts?"

Lady, you ever heard the expression, "it is better that one get their appetite outside and eat at home"? Well, I'd let the old duffer amuse himself. Maybe he thinks he is making a hit with the lady radio operators, but that is *his opinion.* As long as some of these sweet-voiced lady hams don't start coming around to take a look at his station, you have little to worry about. The next time he makes contact with some OM, you just bust right in there and start pitching a little woo yourself. Maybe you can make it sound silly enough so that your Romeo will realize how silly he must sound. On, the other hand, some of these OMs may take you seriously and when they come around they won't be looking for any ham radio station!

Magazines for Friendship

I still have the names of many foreign hams who would like to receive your "cast-off" technical magazines. If you would like to help one of them out, send HAM CLINIC your name and QTH. For *Callbooks,* Clif Evans, PO Box 385, Bonita, California is the man who is and has been handling this particular program splendidly. Any names received by this columnist offering to send *Callbooks* will be passed on to Clif. He tells me that he has about 900 names (at this writing) of foreign hams who want callbooks. (Foreign ham magazines please copy!)

Thirty

This is the time of the year when a ham's thoughts turn to turkey, cranberry sauce, big red apples and pumpkin pie; and it is also the time of the year when DX activity is high. But the ham is balanced—right after he finishes his big commemorative dinner, he'll head for the shack and send out his Thanksgiving greetings. Let us hope that he won't forget to be thankful for being able to operate in a free country.

So Seasons greetings to all HAM CLINIC readers. "See" you right here next month and perhaps on the air—give a listen.

73 and 75 Chuck (and 72 to my DX friends)

SEMICONDUCTORS [*from page 109*]

making gallium arsenide tunnel diodes in the TO-18 package. Also new is their 3,000 *mc* plus coaxial transistor for use in cavity circuits. At 200 *mc* the gain is 22 *db* with a 3.8 noise figure. By the way, the T1693, T1694, T1695, and T1696 used in recent *CQ* articles by the author and Specialny have been superceded by improved cadmium types T1858, T1832, T1859, and T1833 respectively. The T1832 is particularly interesting for it has and F_{max} of 1300 *mc* and a 4.5 *db* noise figure at 2 meters.

Looking for toroidal iron core forms? Radio Cores, Inc., 9540 Tulley Ave., Oak Lawn, Illinois, have an extensive line of just about any size you might require. For an informative catalog drop them a line. They have a $5.00 billing minimum.

RCA has been experimenting with obtaining high power from tunnel diode oscillators. Power outputs of 10 milliwatts have been obtained from these devices at 600 *mc*, 2 *mw*, at 1.6 *kmc*, 0.7 *mw* at 2.8 *kmc*, 0.2 *mw* at 5.5 *kmc*, and 0.01 *mw* at 7.1 *kmc*. That will give you something to shoot for-hi. Also new from RCA is the "fastest mesa in the world". It is capable of handling 100 million signals per second! The device designated a TA-1882 has a 500 *mc* gain-bandwidth product and a switching speed of 10 millimicroseconds. RCA has entered the medium power silicon rectifier market by introducing a family of 20 ampere solid state devices. The IN248B through 250B, and 1N1195A through 1198A are rated between 55 and 600 PIV. While on the subject of RCA we should mention their new computer tunnel diode series, capable of switchin gin the time it takes light to travel one inch. The devices are available for $5.60 to $22.00 in quantity.

Sylvania Electric has announced a new series of low cost PNP audio transistors designed to meet MIL-S-19500B specifications. The units are priced between $1.25 and $2.40.

Of particular interest to amateurs is TI's new mesa u.h.f. transistors. The 2N1405 series have low noise and f_{max} in excess of 1 *kmc*. Also new is a small signal silicon mesa group types 2N-734, 738, 1564, and 1572 for medium speed switch applications. Of particular interest to the VHF'ers is TI's new microwave varactor diodes. Types XD-500 through 503 are available for frequencies up to 144 *kmc*.

73 de Don, W6TNS

VHF [*from page 103*]

editorial, as an interested onlooker I am wondering why all the fuss about the new FCC appointed c.w. sub-band, 147.9 to 148.0 *mc?* Is this part of the band unusable for some reason? The only reason I can see is trouble with fourth harmonic on Channel 34 TV which is used in relatively few areas and in those areas I am sure the boys could rig up filters to kill their radiation. Maybe I am overlooking something which I don't know about and if so would be glad to receive comments. But, on the other hand, as you yourself have stated, there are certain commercial companies who are just itching to get the hams out of this part of the spectrum and if we aren't careful we are going to lose our frequencies. I don't know very much about the 144 *mc* band, but if it is anything like the 50 *mc* band, the top two-thirds of the band is seldom, if at all, used. This to me is an out and out invitation for the FCC and DOT to take them

away from us. What do you say we get busy and make use of these unused frequencies and go after more and keep up the old Ham Spirit of making use of the unusable and obtaining the unobtainable." *Well, Dave, agreed—you have a point . . . But in most sections of the country under FCC jurisdiction the top megacycle, at least, remains literally unused. I don't know many that would care one way or the other. The main reason is, that for a receiver to adequately cover a 4 mc segment of a band, tuning would be a five minute affair—At a sacrifice of selectivity and peaking on a certain section of the band (usually the low end). You would either have to have a broad tuned receiving set-up with an antenna cut for the center of the band, or have everyone move up to the high end of the band. The latter, the only answer, for all practical purposes, is easier said than done. For years and years the 2 meter DX men (c.w.) have been using the low edge simply because it's become an institution. There are so many on at the low end now, with antennas cut there, and with receivers and converters peaked for ultimate reception at those frequencies, it would be impossible and not beneficial to move, except to retain that top megacycle.*

"Enough of this guff except to add that I will write from time to time and give you any news from this area, and don't forget to turn your beams toward Alberta once in a while as we have already heard W2's and W4's and we are sure we can work you." *OK, Dave—Will Do. Keep those letters coming!*

Well, once again we've reached the bottom of the 'ole mailsack and must end the most widely read column in *CQ* (plug-plug) for another month. We can print all you send in. And I'm willing if you are. Send me your news, DX, pictures, and club news, certificates, etc. by the 5th of the month and we'll get it in. It's all up to you. 73, Bob, K2ZSQ

SURPLUS [*from page 117*]

tons or the stud knob near the right handle. The circuits should resonate at about 10.5 *mc* for the coils L_{106} and L_{107}, while L_{108} should be about 21 *mc*. If this is not obtainable, readjust the slugs within the coils to get the circuits to resonate where they should. A grid dipper is invaluable since it can tell you which way the coils have been adjusted as far as frequency is concerned, and this will enable you to do a faster job.

When this is completed, go to the top of the chassis and check the adjustment of C_{126} the same way C_{120} was adjusted. When transmitting it will be necessary to make additional adjustments which will be discussed later.

The modulator is built up, using the tubes we didn't use before. Twenty five watts of audio will be required, since the power input is in the order of about fifty watts. I used two 1619's in push pull for the modulator, and drove them with the original audio circuitry, making only a slight change. It will be necessary to remove T_{102} from the circuit (it can stay on the chassis if you want to leave it there). In its place connect a driver transformer for the audio power stages. This could be a Stancor type A-4752 or equivalent. It is not critical where it is mounted, and we found that it could easily be mounted on the bracket covering the transmitter trimmer adjustments. The modulation transformer was mounted on the back wall of the transmitter and is a Stancor type A-3845. The nearest ratio of transformer impedances we could find that worked best was the 10,000 to 8,000 ohms. Incidentally, some models have a switch marked, TANK-OTHER USE. This is used to make the carbon mike input less sensitive in a noisy location and thereby improve the transmission. Set it at OTHER USE if you have such a switch.

This equipment was originally used in vehicles with a negative ground. When used in a positive ground car, it will be necessary to provide some bias source such as a battery or dry cell to eliminate this problem. Figure 1 shows the circuit I finally ended up with, and since the battery is inserted properly, there will be no need to worry about how to set the battery. It will be necessary however to reverse the primary connection on the dynamotor for the positive ground cars.

When wiring the modulator, I made use of two tubes which were originally used in the f.m. circuit. The leads may be a little long, both from, and to, the transformers but this shouldn't matter much. If any r.f. is picked up, they could be shielded, but this is probably not necessary.

Power is applied by connecting 12 volts d.c. to pin 1 and the negative terminal (unless changed as mentioned above) to pin 2. The entire transmitter is operated by push to talk, with a dynamotor start relay and an antenna changeover relay all ready built in. A receiver disable relay is also provided.

Tuning Up

Once power has been provided it will only be necessary to press the mike button to get on the air. Tuning up is the next step and should be done as follows: Set a crystal in one position of the crystal socket. Rotate the small knob on the side, until the channel select locking screw is visible through the hole above the push buttons. Loosen this screw and then depress the push button corresponding to the crystal position you inserted the crystal. Put the transmitter ON-OFF switch into the ON position. Press the button on the mike and rotate the knob on the side (with the meter switch in position 1) until maximum current is read with the meter switch in TUNE. Put the meter switch into position 5, and read the grid current. This should be at a maximum value at the setting obtained for the previous

reading, (about 30 on the meter), when the side knob is rotated. If the setting is different, then the alignment is at fault and the trimmers and coil slugs will require additional adjustments until they track. Likewise, the reading for position six of the meter switch should also be set properly. This should be a minimum reading, since it is the plate current, and when tracking is proper, as it should be, it will be possible to increase the plate current by loading the transmitter. This is accomplished by setting the loading capacitors for each frequency. These are found on the right side of the unit. Likewise, L_{111}, which is accessible from the top side, is is adjusted for maximum r.f. current as is the general loading. This is done by merely flipping the switch on the front panel to read r.f. current. L_{110} is accessible from the bottom side just above the handle. This is the final amplifier tank coil and should be adjusted as part of the tracking, but may require adjustment as part of the loading.

Once the adjustments for a particular channel are determined, the next set of adjustments are made and the procedure followed again, and again, until all ten channels are preset. This may seem a little tedious, but it is actually a fast operation, since only the knob under the handle and the loading capacitor need be adjusted for each setting. The dial is locked in a manner reverse of that of loosening it, that is, by turning the side knob until the screw is visible within the front panel hole and then tightening it. Some doubt may appear regarding the changing of settings each time, but the push buttons lock the assembly except for the setting being adjusted so no change will occur in those not being adjusted.

It is a good idea not to keep the transmitter on in a transmit condition too long at any one time, since the tubes could easily over heat. The manual for the equipment recommends the use of the equipment only intermittently, which means about five minutes on, fifteen off. This is primarily to protect the dynamotor, and should extend the life of the unit greatly. This need not be followed if the side plates are removed and proper ventillation is provided.

The crystals used should be one fourth of the frequency of the output. For fifteen meters, a 5.25 *mc* crystal will provide an output of 21 *mc*, while 7.3 *mc* crystals will be 29.2 *mc* and so forth.

This equipment was designed for use with a whip antenna of about one quarter wave length long. Coaxial connectors of an odd and difficult to get type, plus a terminal, are provided for the transmitter. The receiver coaxial connector is used for the relay circuit and may be changed without too much effort.

Mail

Those requesting a free listing for a manual or handbook may do so by dropping a postcard to the editor, listing the manuals desired. Publication is approximately two months from date of receipt. No commercial listing may be published, and no assistance will be given regarding conversion information for commercial applications, including citizens, aircraft or marine usage.

Harry McGaughy, 303 W. Bay Drive, Olympia, Washington is looking for any information on the TS-306/ARW. Gary Householder, 306 22nd Street, Dunbar, West Virginia needs a manual for the BC-224E. James Hardy, North Georgia College, Box 5604, Dahlonega, Georgia wants a handbook or info on the BC-1267A. Alvin Goolsby, 398 E. Gilbert St. San Bernadino, Cal. is looking for information on the BC-1248. Irv Kelly, 116 Wiltshire Blvd., Biloxi, Miss. is in need of an RDZ handbook.

M. Jannine, c/o Del Padre Supply, 12 East Worcester St., Worcester 8, Mass. wants a book on the RCK, W. Smyth, 17125 W. 9th St. Oklahoma City 8, Okla. is looking for any information on an unusual transmitter, Navy type YR. Danny Pridgen, 307 Hillcrest Drive, Greenville, N.C. wants any data and handbooks on the TCM, TCN, TCU Navy equipment.

Mike Lebert, Route 3, Anderson, S. C. wants information on a Mackay Shipboard transmitter type 156-A. George Leonard, R-2, Delton, Michigan needs a manual for the ART-13. From England, R. V. Wright, 4A, Nepal Ave., Atherton, Nr; Manchester, Lancaster asks for help in locating the following manuals: R-390/URR, R-105/ARR, APN-9A, TM-11-687 (AN/TRC-24), RT-196/PRC-6, and would like to contact RTTY people regarding some RTTY gear he has. Ray Robertson, PFC, Co. "D", 32nd Sig Bat (Corps) APO-175, NYC, NY needs conversion info on a BC-610 plus some info on souping it up.

73, Ken, W2HDM

PROPAGATION [*from page 115*]

Quality Figures shown in the "Last Minute Forecast" should be adjusted by one letter. For example, a Quality Figure of C should be raised to B for an increase in effective radiated power of 9 *db*, and reduced to D for a 9 *db* decrease.

The "Last Minute Forecast" appears elsewhere in this column.

Sunspot Cycle

The Zurich Solar Observatory reports a monthly mean spot number of 131 for August, 1960. This results in a 12 month running smoothed sunspot number (upon which the sunspot cycle is based) of 124 centered on February, 1960. *CQ* forecasts a smoothed sunspot number of 99 for November, 1960, as the present cycle continues to decline gradually.

For those "old-timers" who can remember conditions during previous cycles, the present level of solar activity is about the same as during the winters of 1937, 1938 and 1949.

73, George, W3ASK

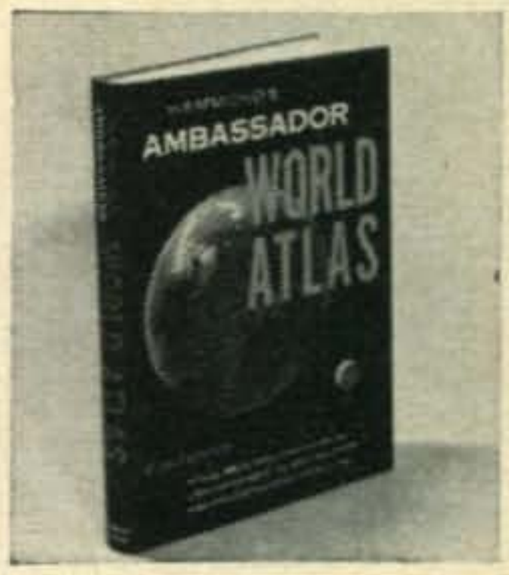
THE CQ HAM MART

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

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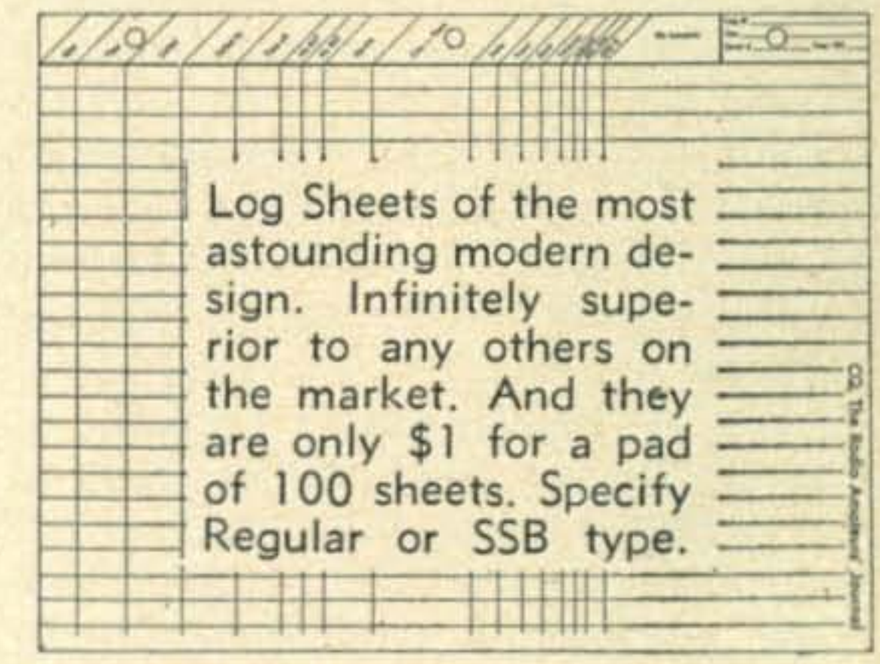

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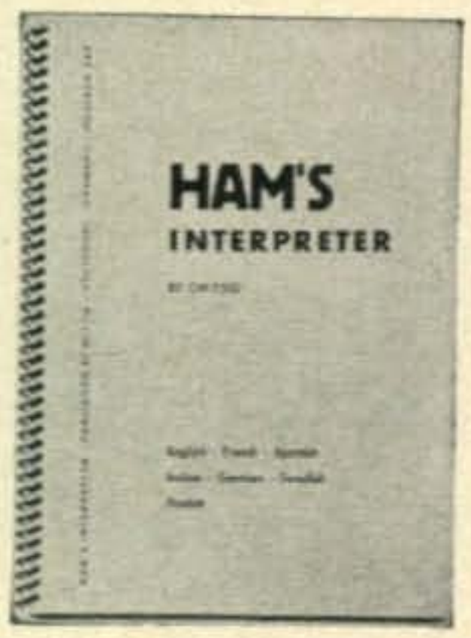

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W1DBM's newly written TVI book (2nd edition) covers all aspects of curing TVI from both the Ham's viewpoint and that of the TV viewer or the TV serviceman. It includes 2- and 6-meter TVI as well as Citizen's Band, Industrial, Medical and Utility TVI. Profusely illustrated with diagrams, photos, charts, tables and FCC regulations pertaining to radio and television interference. Price $1.75 postpaid, USA, $2.00 Foreign.

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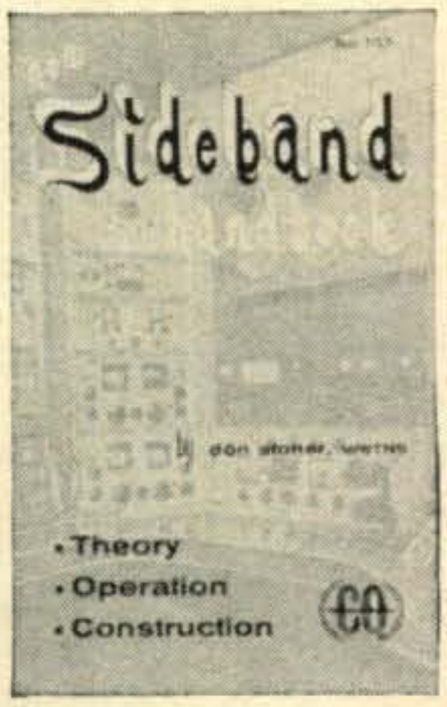

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Written by Don Stoner, W6TNS, was almost one full year in the preparation of this terrific volume. This is not a *technical* book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers. Price, only $3.00.

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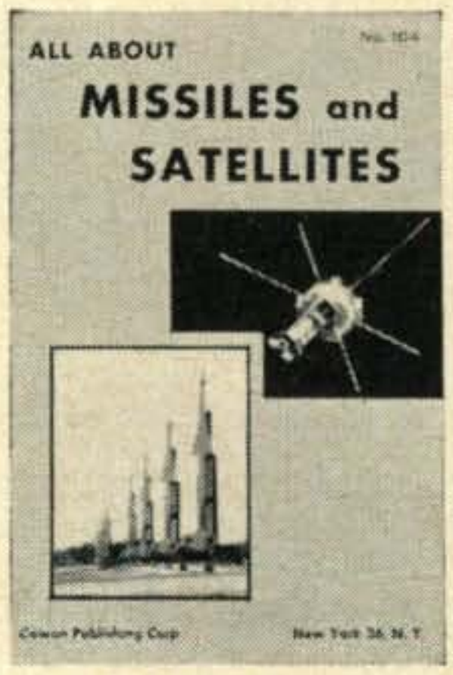

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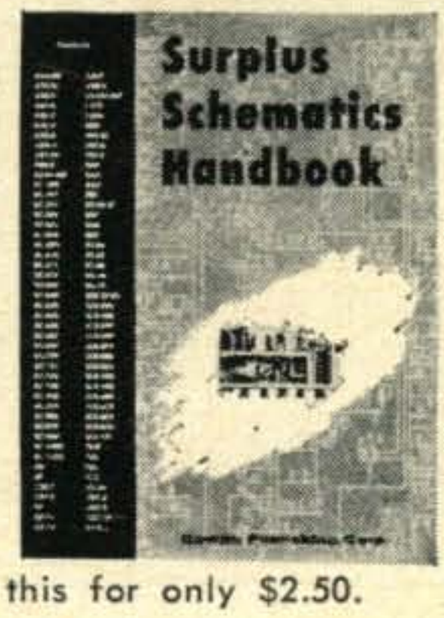

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SIDEBAND [*from page 121*]

yet. . . . Robby VQ4ERR, was really a busy man during June, July and August, playing host to Jane, OQ5IE and Paul, OQ5GU and their 3 children before the Hiernaux's embarked for Europe; setting up in a new shop in Nairobi, and trying to shake off a case of flu following (and we hope not caused by) a visit from Gene, W6HYG. By now, Robby should be back in full swing in the DX race.

Band Hopping

Wallace, K4TJL, had his special wish granted —his "Worked 100" Certificate was dated September 3, 1960, marking his second anniversary date on s.s.b. . . . A low bow must go in the direction of Gil, K2YFQ, who, after four years of studying and attending night classes, received his Master's Degree in Economics and Finance from Columbia University at the age of 42! . . . Looks like Martin, VE3MR, owes his cousin, Bob, W2MTL, a goodly sum of money. The two had a bet on as to which one would wed first. Bob says Martin lost the bet but we say that Martin's a cagy one and he obviously was the winner. . . . Gordon, W1VWP/VO2 was looking forward to a contact with Jack, W8UWT, ex-CN8JF, to reminisce about the good times they shared when Gordon was also based in Morocco. We're also looking for Jack to explain that the Cup he won in last year's SSB DX Contest was ready in June but has since been returned to the engraver twice for larger lettering! . . . Harriett, K5BJU, and Dean, W5LAJ, were two key figures in a real-life drama in August, involving saving the life of a critically ill Peruvian gentleman. Through amateur radio, arrangements were made to fly him and his personal physician to Houston for an urgent operation. Last we heard, the gentleman from Peru was progressing nicely, (despite the subsequent necessity for three operations in 10 days) and was recuperating at the home of Harriett and

OM Kirby, W5VWF, where he and his wife were invited houseguests. Such hospitality indicates why hams are the nicest people in the world. . . . And similar consideration was shown Richard, G3WW, by Bob, K2GMO, who drove a round trip of 287 miles in one evening to bring Richard to and from the NJDX meeting during G3WW's visit to the States in September. . . . Cliff, K9-EAB, has, as he says "been raising cain calling 'CQ New York for the Empire Award' " but it did pay off. We heard Cliff telling Jack, K2-JDV/M, that, just minutes before their contact, Cliff had worked his last N.Y. county. This makes Cliff the first to qualify for the Rye Neck Radio Club's Empire Award-Class I. At the rate that Cliff has been earning certificates, his folks will never need commercial wallpaper for their home! . . . Ed, W8OVG, hastens to correct us—the next Dayton Hamvention will not be April 21-22 as announced but rather April 28-29 and, for the first time, Ed is going to "attend" this great event. He's not even taking a post on a committee, certain as he is that there are many willing to take over the chores so ably handled by W8OVG for lo! these many years . . . Forty meters has been real fine from this area of late (especially now that we can be heard running a little more power!) and we have been enjoying some wonderful rag chews on the low end of the band nightly. One of the best parts of rag chewing is being able to learn about other people and what they do aside from hamming. For instance, how else could we have found out all about the conveying business from Dick, W8WNH; or what makes a Phys. Ed. Director at the YMCA from Jim, K8JPD? Jim was operating the station owned by Sandy, K8ORI, and was being introduced to SSB the hard way—in a six-way roundtable! . . . 40 also provided us with a most pleasant half hour spent with Con, K4BE, down Winston-Salem way, discussing a hobby dear to both our hearts—color photography. . . . According to Johnny, W8LMW, there's more to 40 than meets the ear. It's Johnny's contention that if more stations used beams on 40, it could be an excellent DX band similar to 20. Well, Johnny, you'll probably be proved right; with more and more stations crowding 20 meter SSB, something has got to give and maybe the swing will be towards 40. . . . QRM notwithstanding, we have much to be thankful for this November ham-wise—the visionary SSB manufacturers who constantly provide us with new and better equipment; propagation which has been better than was expected; and most important of all, the many dear and true friends brought to us by this wonderful hobby who fill our leisure hours with the treasure of good comradeship.

73, Irv and Dorothy

NOVICE [*from page 124*]

Help Wanted

The following persons have written request-

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To the scientist interested in a challenging nonmilitary technical assignment affording outstanding potential for significant scientific accomplishment we can offer a dynamic program and complete facilities in a stimulating professional climate. While specific related experience is desirable, we would also be interested in talking to a person who has complete formal training in chemistry, and has some familiarity with electronic components and circuitry.

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600 vct/350 mils, 12.6 v/11 amps, potted	18#	$4.29
Auto, 115 to 230 volts, 90 watts, potted	7#	$2.29
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ing help with their Novice examinations. Will you take the time to give them a helping hand?

W1- Tom Duignan, 45 Chelsea St., Fairfield, Conn. (CL-91444)

W2- John J. Miller, 184 Fairfield Ave., Mineola, N. Y. (PI-24824)

W6- John V. Grey, 511 So. Union Avenue, Los Angeles 17 Calif.

W7- Ed Alexander, Box 194, Chino Valley, Arizona

W9- Tom Orzech, 6929 S. Washtenaw, Chicago 29, Ill.

WØ- Bill Topper, 181½ Edlum Dr., Grand Junction, Colorado (WA-57241)

Letters

Let's have the distaff side lead off this month! Carol Ann Bernier, KN1NVG, 43 West St., Easthampton, Mass., has been on the air since July 2nd, and has picked up a WAS of 10/9 on 40 meters. Carol operates in the evening and QSL's 100%.

Ed St. John, WA2BOY, 122 Queens Ave., Elmont, L. I., N. Y., wonders if any of the novices have an idea for a latching relay for switching between his 6 and 2 meter beams.

Ronnie, KN1NJV, 142 Willow Rd., Nohant, Mass., hams it up with a DX-40 and NC-303 into a Hy-Gain 14AV vertical antenna. Ron offers to help any Novices in his area and can be contacted by calling Juno 1-1725.

Hi Don, says Mike Sealfon, WV2OCG, 107 Stony Ridge Dr., Hillsdale, New Jersey. Mike managed to pick up a WAS of 20/10 in 2½ weeks of operating with his DX-40 and SX-110 connected to either a homebrew beam or 126′ wire. Only one DX contact but it was DL1FF and the sigs were 589! Mike would like contacts with W6's, 9's and Ø's.

Bob Albrant, Box 18, Oakridge, Ore., holds call letters KN7MDS. He started his career in ham radio with an ARC-5 running about 7 watts. However with the new EICO 720 he has a WAS of 22/16 including contacts into Georgia (599) and the new states. Bob would like skeds with Wyoming.

A double header comes from Bill Nordman, KN7MHA, 826 Blacklidge, and Dave Cockrum, KN7KYR, 2760 Cerrito Cr. both of Tucson, Arizona. Both boys want to offer their services in making skeds with Arizona. You should be able to work them on 40 or 15 with their Adventurer and RME 45 or DX-40 and NC 98 respectively.

Doug Heimsted, KN7LEL, 13th F.I.S. Glasgow A.F.B., Montana, puts himself on the block as being available for Montana skeds or RCC. Doug will have no trouble getting out with his SX-100 DX-40, and *two* vertical antennas.

Vic Shields, P. O. Box 106, Shannon, Illinois, is KN9UIY and he warms the airways up with antenna. The WAS smoke has settled at 42/37 a Globe Chief 90A, SX-99 and Hy-Gain 12AV and DX includes F2, KZ5, WP4, VK3 (Ivor?) and many VE's. Vic would like skeds with KL7,

KH6, Mont., Wyo., W. Va., Ky., S. Dak., and N. Mexico.

Paul McGurn, K6VWJ, 110 Palisades, Santa Barbara, Calif., mention his QRP work. Paul runs a Heath VF-1 VFO "barefoot" to about 4 watts and has worked 25 stations including K7BCD in Phoenix, XEØBMP in San Felipe, and a station in Idaho. Just goes to show, it doesn't take high power.

Frank Cahoy, KNØBLT, Box 429, Butte, Neb., hammers aways with a HQ-160 and Globe Chief into a Hornet beam and has a WAS of 44/39 plus KV4, WP4, LU8, PY4, XE1, F8, and numerous VE's. Frank will be happy to

That flattens our final for another month fel- make skeds with anyone needing Nebraska.
lows. Be sure to keep those letters and pictures flowing this way. CUL.

73, Don, W6TNS

CONTEST CALENDER [*from page 125*]

will probably fill you in on the details in her YL Column.

ARRL

Regardless of how you feel about the "Sweepstakes" there is no doubt about its popularity. Now in its 27th year it seems to grow in stature. Last year over 1500 logs were received, making it just about the most active amateur radio activity in the world .So who are we to argue about its merits. This month's issue of that other magazine will give you all the information, as if you didn't know.

RSGB 21/28

Starts: 07.00 GMT Saturday, December 3rd.
Ends: 19.00 GMT Sunday, December 4th.

Strictly a phone contest on the two high frequency bands, with the boys of the British Isles working all comers. If 10 and 15 are open this could prove to be a very interesting week-end.

There are contact points and bonus points so its advisable to check last month's Calendar for a complete run-down on the rules.

Your log must be postmarked not later than December 19th and sent to: The R.S.G.B. Contest Committee, New Ruskin House, Little Russell Street, London, W.C.1, England.

New Mexico

Starts: 8:00 AM MST Saturday, January 14th.

Ends: 8:00 PM MST Sunday, January 15th.

The Sandia Base Radio Club of Albuquerque announces its Second New Mexico QSO Party and invites all amateurs to participate. New Mexico hams will try to work as many out of state and out of country stations as possible. This offers an excellent opportunity for those interested in earning credit toward their WAS.

Certificates will also be awarded to the highest scoring station in each state and in each country.

Full details next month.

WAEDC

Starts: 05.00 GMT Saturday, January 14th.
Ends: 23.00 GMT Sunday, January 15th.

This popular European contest sponsored by the DARC, has been wisely cut down to one week-end. Rudi Hammer, DL7AA also advised us that all future contests will be held the third week-end in January. (Also another good idea) Rules in detail next month.

CQ WW SSB

Starts: 15.00 GMT Saturday, January 28th.
Ends: 21.00 GMT Sunday, January 29th.

With the ever increasing popularity of s.s.b. and the success of this contest the past few years, it looks like this one will be an annual affair the last week-end of January each year.

Besides the usual certificates there is also a Cup to the "Top Banana" in the contest. It would be wise therefore, to check the Sideband Column this month. Irv and Dorothy will tell you all about it.

Ed. Note

The Quarter Century Wireless Association is planning another QSO Party on the week-end of February 11/12 and *CQ* will again repeat the highly successful 160 Meter Contest on February 25/26th. More details next month.

Now, I hope George Jacobs, W3ASK has good news for us for this week-end and again in November. Please George?

73, Frank, W1WY

YL [*from page 127*]

enjoys sewing and handcrafts and young peoples groups.

K6OQD

Jean Kincheloe, K6OQD, of Glendora, Calif. has been re-elected as YLRL treasurer for 1961. A photo and write-up on Jean appeared in this column for Jan. 1960. Look for her on 2 through 80 meters, and in *Western Radio Amateur* magazine, for which she is YL editor.

K6ENK

YLRL's faithful editor for the last two years, K6ENK, Wanda Gluck, resigned following publication of July-August *YL Harmonics*, so that post remains to be filled. Wanda has done a tremendous job on our League magazine. When you consider that most issues have run about 60 pages, and each page has to be run off close to a thousand times, then assembled, stapled and addressed, to say nothing of all the preliminary work of editing, typing, and retyping for the stencils, plus all the correspondence involved, you can see why her doctor has told Wanda to "slow down"—it's just too much for any one gal, even with a helpful family. We all are grateful

to you, Wanda, for the fine issues of *YL Harmonics!*

Here and There

New officers for PARKA for 1960-61 are: President, KL7DLA, Grace; V.P., KL7BJD, Mary; secy, KL7CHV, Evelyn; treas., KL7BLL, Margie.

Second two YLs to achieve the Certificate Hunters' Club (founded by K6BX) award are K4RNS, Marge, and KØGIC, Dot.

Remember the Phone Section of YLRL's 21st Anniversary Party will be held Nov. 2-3; complete rules in Oct. CQ.

CQ YL

Summer activities over, jr. ops back in school —now is the time to catch up on your reading and learn more about the YLs you meet on the air and about the International YLRL. Get your copy of "CQ YL," one and only book about the YLs, 18 chapters covering every phase of their Ham operating, over 500 photos. Order from W5RZJ (address at head of column), $3.00, postpaid.

33—W5RZJ.

ARMED FORCES DAY [*from page 67*]

W7UQI, W7VPH, W7VZX.

W8CLX, W8CRY, W8CUY, K8ERL, W8FLA, W8GIG, W8HMM, W8HTU, W8HYG, W8IJV, W8JGI, W8JGI, K8JIB, K8KLC, W8KPT, K8KTK, W8LEX, W8MBB, K8OGV, W8PHG, W8QNW, W8RTZ, W8SKY, K8SOG, W8SUW, K8SUX, K8SUX, W8WUD, W8ZYW.

K9AIW, W9AKM, W9AOV, K9BHD, K9BRL, W9CDW, W9COW, K9CTL, W9CWH, K9DAS, W9DJE, W9DRY, K9EHP, AFA9ESP, AFA9ESP, K9EYY, AF9FEM, W9GLR, W9GRW, W9GVN, K9IBT, W9IOG, AFA9JSF, K9JVZ, W9JZV, AFA9KCQ, K9KGJ, AF9KHS, K9KKF, W9LKK, W9LOT, K9NBI, K9OJV, W9ONM, W9OPI, K9OVQ/6, K9POU, W9PUU, W9QBJ, W9QKE, W9QVQ, AFA9SJF, W9TQ, K9USG, W9VMG, W9WBE, W9WKM.

KØAFL, KØAKG, WØBDZ, KØBFS, KØBJB, KØBJB, KØBRS, WØCGO, KØCST, WØDEL, WØDQN, WØEKJ, KØEMF, WØFQW, WØGUP, WØHAT, KØHLC, WØIFS, KØIIE, WØITX, WØJHS, WØJRQ, WØJRQ, WØJWS, KØLPK, WØLQV, AFAØLTJ, KØLTP, WØMDL, WØMXI, KØPFU, WØQHB, WØQLU, WØQRP, WØRCY, WØRWG, WØRWH, AFØSBO, WØSBY, WØTBL, KØTNP, KØUDG, AFØWYK.

Abel, A. F.; Amateur Radio Station & Signal Platoon (Area Spt) Ft. Clayton, C. Z.; Ames, Michael; Brennon, James S.; Brock, Charles R.; Brown Jr., Leo O.; Brummet, Robert K.; Caster, Kenneth P.; Crooks, A. Boyd; Danell, Dennis L.; Elgan, Harold C.; Frisby, Charles E.; Golinski,

Ronald G.; Goodman, David J.; Guldman, Leonard H.; Holstein, Everett G.; Holtz, William J.; Hopper, G. E.; Jugenaeimer, Robert L.; Kaczmarczyk, C. M.; Kniskern, K. L.; Llewellyn, Robert R.; Miller, Frank; Mobley, Carl; Murrill, Charles C.; Myres, R. R.; Nickolson, Richard M.; Radio PLT, 8th Comm. Br.; Sack, Edward J.; Saldivar, Edmund S.; Schafer, Tommy; Scott, Howard F.; Sides, W. H.; Sutton, Billy G.; Thompkins, Richard; Tidrington, Dennis F.; Tolbord, Raie E.; U.S. Naval & Marine Corps; U.S. Naval Reserve; Watt, Cecil C.; Wilson, Wade; Zuelke, Harris W. ■

IF NOISE LIMITER [*from page 70*]

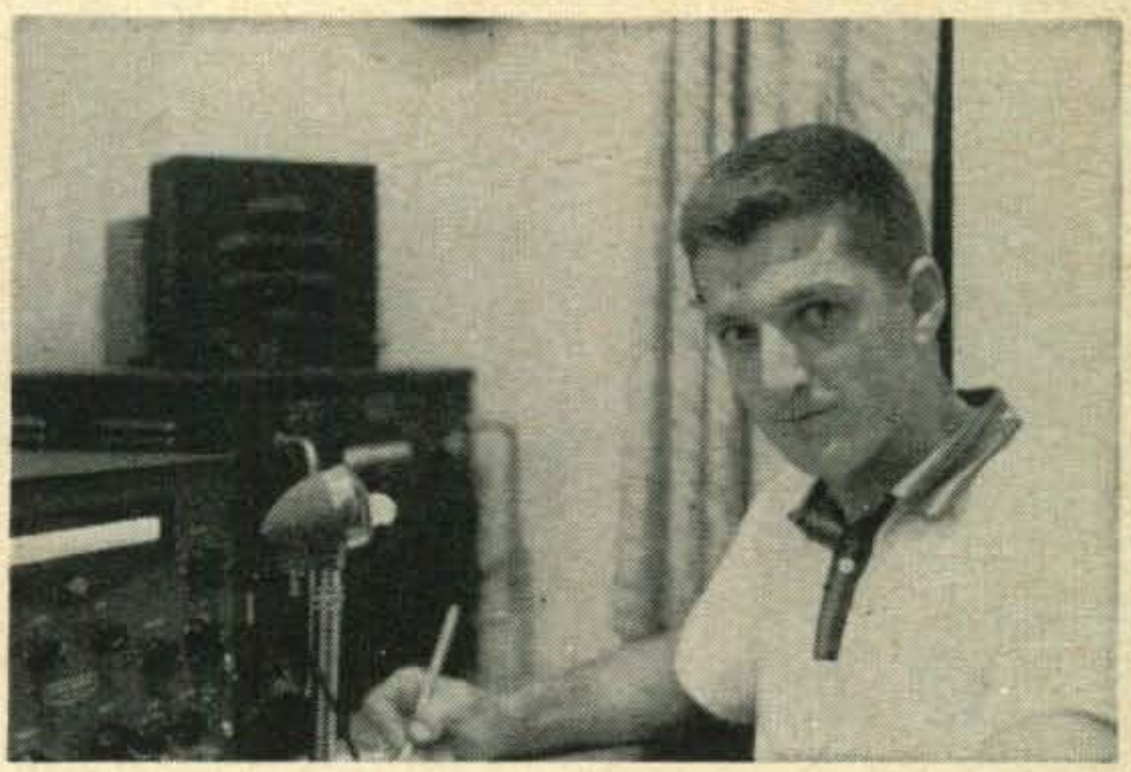
For the c.w. man, the use of the auxiliary 500 cycle filter and its associated crystal for b.f.o. frequency, which gives an 800 cycle note instead of the 1350 cycle note, is a must. C.w. operation can be made a pleasure by adding a pair of IN34-A diodes connected in opposite directions right across the phone jack. Then run the audio gain at maximum, adjust r.f. gain for best reception of those weak DX signals. The loud locals do not pump the a.v.c. when right next to the wanted station, and the clipper holds these loud ones to a comfortable earphone level as you are tuning around the band. ■

KEYER [*from page 61*]

controls are R_3 and R_4 both of which are coarse speed controls for the "on" time and "off" time.

In constructing the unit there are no special precautions that need mention other than reasonable care in wiring and in metal work. Since there is no r.f. involved, placement of parts can be left to your own discretion. No special mention has been made regarding the audio oscillator and audio amplifier since they are straightforward. ■

DXOSIS [*from page 59*]



Ed Jones, KA2ED, puts a good signal into W land and is an avid SSBer.

band again when DXCC arrived, the Quad stayed down. This ol' disease just won't quit

Bill, KA2BF sit comfortably in front of his BC-610. A consistent signal on 14 mc, Bill will soon be on 21 and 28 *mc*.

though and in a few days a 14 *mc* dipole went 10 feet up. More thrills, rag chewing on 14 c.w. and reeling off the Ws.

As I sit here in a far off land, I am spent from DXosis. I vow to put up a 75 meter antenna when I return to Shaw AFB, South Carolina in September and solder in a crystal. But, alas, I know this vow will not be kept. A thirty foot tower, tri-band beam, IRCs, night and mornings at the rigs, meals in the shack and shouts at the kids are a part of me, for that incurable disease, DXosis, has conquered another, in the most unusual and rewarding hobby in the World. ■

145 MC CONVERTER [*from page 42*]

tors have often been described in American literature[5]. All these descriptions are marked by one basic trouble. Diodes, intended for use in noise generators, e.g. 5722, are subject to reactance. The plate filament capacity, resulting in a fairly low capacitance on 145 *mc,* must be compensated by an added inductance. A coil is placed across anode and ground and tuned to 145 *mc* before inserting the resistor. The tuning can be easily done by means of a grid-dip oscillator.

Using a compensated noise generator, home built but checked against a commercial one, a noise factor of 3 *db* (equivalent to a noise figure of 2) has been measured with the converter, described here. This noise factor can be reached easily by touching up the coils of the cascode stages. It will be seen that neutralization and the pi filter produce the most marked influence on the noise factor without regard to the antenna tap of the grid coil (L_1). The antenna must be coupled very tightly.

I hope that this article will be of interest to all American and Canadian amateurs and will stimulate more converter projects. We all need up-to-date converters not only for the present but also for the years to come. The day will soon be here when Europe and America will be joined by the waves of our 2 meter band. ■

[5]Tilton, E. P., "Noise-Generator Techniques for the V.H.F. Man", *QST* August 1949, p. 20.

Classified Ads

RATES: 25¢ per word per insertion for commercial business organizations.
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CLOSING DATE: 20th of the 2nd month preceding date of issue.

MAIL: Your typewritten copy with full remittance should be sent to CQ Magazine, 300 West 43rd Street, New York 36, N. Y.
Attention: Classified Ad Dept.

NOTE: The products and services advertised in this section are not guaranteed by the publisher of CQ. Telephone orders not accepted.

FOR SALE

CALL-PERSONALIZED items advertised Page 106, October CQ. Write for reprint. Chuck, K9TVA, 6429J Glenwood, Chicago 26.

FOR SALE: Eldico SSB 100A $325.00; Collins 75A-1 with speaker and vernier dial, $235.00, Eldico EE-3 Electronic Key, $45.00; Collins mech. plug-in filter 6KC $45.00. All items in excellent condition. K2HFX, 152 Tulip Ave., Floral Park, L.I., N.Y. Telephone GE 7-0460.

FACSIMILE—For sale two TT-1C/TXC-1 facsimile transceivers complete with manual, one ream Teledeltos paper, requires no darkroom processing. Also one additional transceiver minus motor, clutch and power supply—use for spare parts. All three machines for $600.00. Prefer not to ship—W9WKC.

GREAT SURPLUS VALUES!! BC-603 Receiver New $23.00—BC-683 New $37.00—R-26/ARC 5 Rec. 3-6 mc New $15.00—R-27/ARC 5 Rec 6-9 mc New $15.00, used exc $9 95 — BC-659 Transceiver with PE-120 $19.95 — T-47/ART-13 Transmitters $39.00—BC-603 AC—Supply $9.95—Synchroscopes Model TS-34/AP $49.00—Sound-Powered Dynamic Phones PR. $4.75—Rec. Microwave R-111/APR 5 $49.00—Collins Mod. Xformer 100 watt 811-PP to 813 final $3.95—RA-62-C Power Supply A-C for SCR-522 VHF 110/60 cyc. New $59.50—Kits only for above, $17.00—Ground-plane VHF antennas 30-200 MC New $9.95—T-19/ARC-5 Transmitters 3-4 mc $9.50 used—T20/ARC-5 New 4-5.3 $10.00—BC-485 5.3-7 mc New $10.00—BC-459 7-9.1 mc New $12.00. Hi-Mu Electronic Sales, 133 Hamilton Street, New Haven 11, Connecticut.

FREE HI-PASS FILTERS—almost every TV manufacturer gives out FREE Drake TV-300-HP filters to those receiving TVI. If you'd like this list and some forms, send 25¢ in coin to cover printing, envelopes, stamps, etc. and you'll get them. . . . Bob Brown, K2ZSQ, 67 Russell, Rahway, New Jersey.

For Sale: TV Cameras, Teletype, Panadaptors, Transmitting Tubes, Transistors, SSB gear. Write for list. Spera Electronic, 37-10 33 Street, L.I.C., N.Y. STillwell 6-2199.

COLLINS STATION: 30S-1, $1200; 75S-1 with noise blanker, $490; 32S-1, $500; 516F-2 AC supply, $90; 312B-4 console speaker; $150; Central Electronics, MM-2 scope, $100; Telrex 'Monarch' tri bander TBS 626. $205; HAM-M rotor, $85; Johnson TR switch, $20; Johnson 52 ohm low pass filter, $10; Astatic 10D with G stand, $27. All prices F.O.B. Phoenix, Arizona, K7EPD 3850 E. Elm. CR 9-2824. All above equipment in perfect condition. On the air less than 50 hours.

COLLINS KWM-2 and "S" line IN STOCK at—Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor, Mich. Ph. NO 8-8696.

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 for each item that you want preserved. 24-hour service. Send to C. Lee P. O. Box 395, Times Square Station, New York 36, N.Y.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 PP. DePaul, 309 South Ashton, Millbrae, Calif.

ANTENNA TROUBLES? Watch Laurel & Hardy erect a roof antenna amid hilarious antics Kraus and Yagi never dreamed of. Low front to back ratio, but loads of laffs for all ages . . . especially the Jr. Ops. 200 ft. 8 mm film. $5.50 postpaid, Please allow 4 weeks delivery. Send check or M.O. (no cash or COD) to JAGFILMS, 1738-201 St., Bayside 60, N.Y.

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ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog. Fabulous bargains. Meshna, Malden 48, Mass.

COLLINS 51J-2 $495. 51J-3 $675. Both reconditioned. HRO-60, $325. HQ-160, $275. Teletype printers & receiving converters. Valiant $319., Ranger $198. Panadapter $89., R-390A/URR, R-274 $245. NC-183D $199. Tom W1AFN, Alltronics-Howard Co. Box 19, Boston 1, Mass. (Richmond 2-0048)

BEGINNERS: Code bothering you? Now learned in one hour. New Method. Quick approach towards your ham ticket. Used in Armed Services, Ham Radio, Scouting. Ketchum's One Hour Code Course $1.00 postpaid. MONEY BACK GUARANTEED—O. Ketchum, 10125 Flora Vista, Bellflower, California.

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Amazing low prices on radio gear and Parts FREE LIST Martin Brothers 1420 South 10½ St. Springfield, Illinois. "Unusual Surplus Bargains—⅝" Chassis Punch Telephone Dial, $1.00 ea. Free Flyer, MDC 944 W. Tioga Street, Phila. 40, PA."

Collins 32S1 Transmitter, $480, 75S1, $390, 75A4 with 800 and 3.1 filters, speaker and Vernier knob, $485. All equipment in "as new" condition. Reason, buying KWM2. Chet Kucyn W2BTP, 34 Dumbarton Drive, Huntington, N. Y.

THREE BAND QUAD ANTENNA. Why pay more for less? $49.50. Communications Accessories Co. Box 642, Cedar Rapids, Iowa.

FOR SALE—Complete set Electronics, RCA Review, Control Engineering, QST (less 10 issues), IRE Proceedings since 1928. Also runs of Tele-Tech, Radio News, Radio-Electronics, Popular Electronics, many others. Stamp for list. Wanted: Used KWM-2 W4NYF, 405 NW 30th Terrace, Ft. Lauderdale, Fla.

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TOROIDS: 34 mhy, uncased, 40¢ each, three for dollar, include sufficient postage. Electronics Unlimited, 2627 Randolph, Lincoln, Nebraska.

For further information, check number 55, on page 182

FOR SALE (Cont'd)

SX43 Receiver. Excellent. $125. W8VDA/5, 203 Harding Street, Big Spring, Texas.

SELL Eldico SSB 1000 kilowatt linear. Perfect condition, gray cabinet, half original price $385. K2CIV Tom Patterson, 50 Crescent Lane, Roslyn Heights, LI, N.Y.

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200 watt amplifier for 220MC. Excellent condition. $39 including 4X250M tube. WA6LEN, Box 602, Cardiff, Calif. 200 watt transmit SX 20 Rcvr. Contact after 7 P.M. Herbert Rosenzweig K2KLY, 901 Ave. H. Bkyn. GE 4-2803.

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WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft, Box 399, Mount Kisco, N.Y.

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ANY TUBES commercial test equipment, broadcasting equipment, any quantity. Diamond, 749 W. End Avenue, New York City.

WANTED: Surplus Measurement Model 78 or 80 Signal Generators. Also Federal 804 or I-122 or Used Motorola two-way equipment. State quantity, price, and condition. Communications Service, Inc., 3209 Canton Street, Dallas, Texas.

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Would like to swap TV Repair equipment and tubes as part payment for receiver and transmitter. Box 9358, Akron, Ohio.

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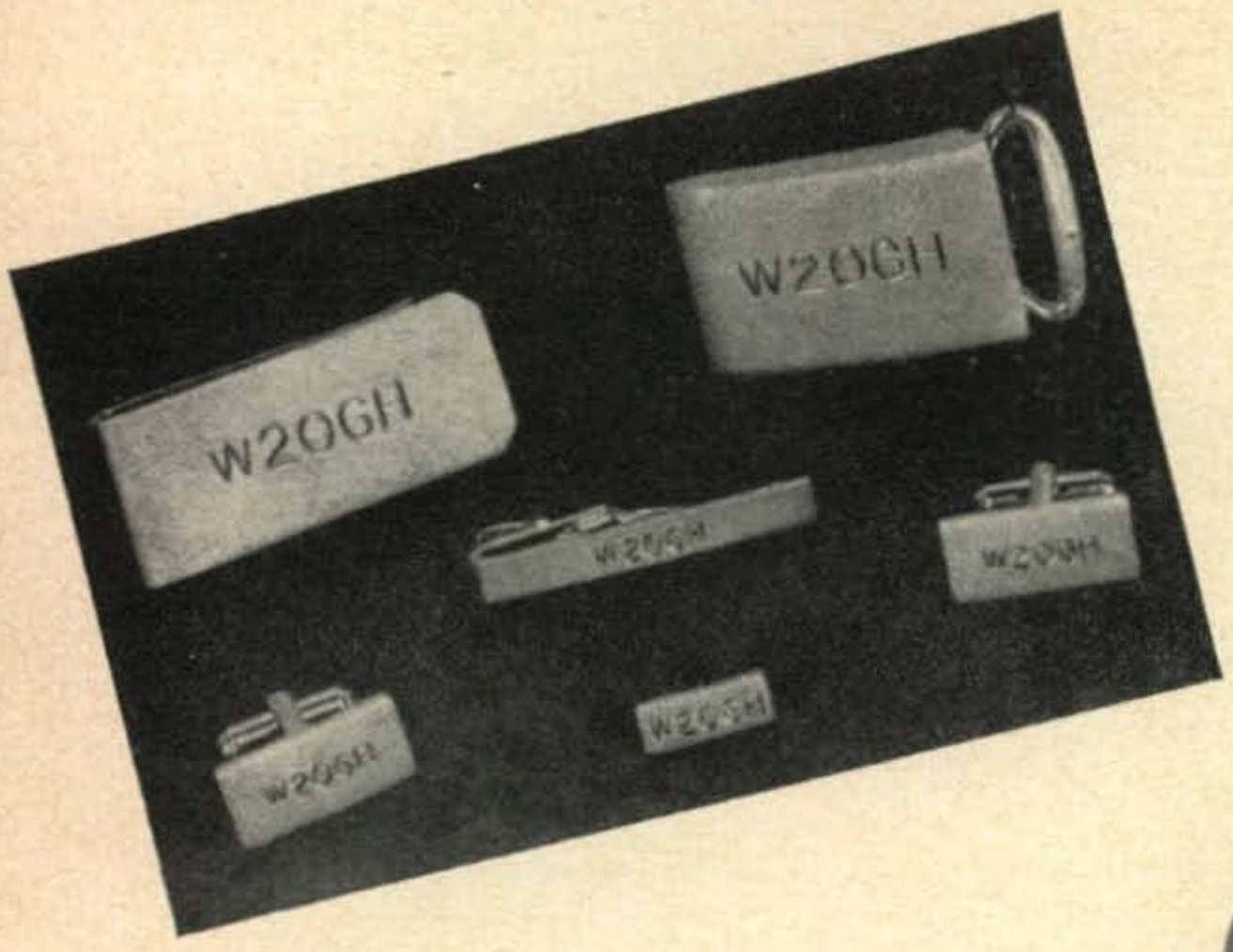

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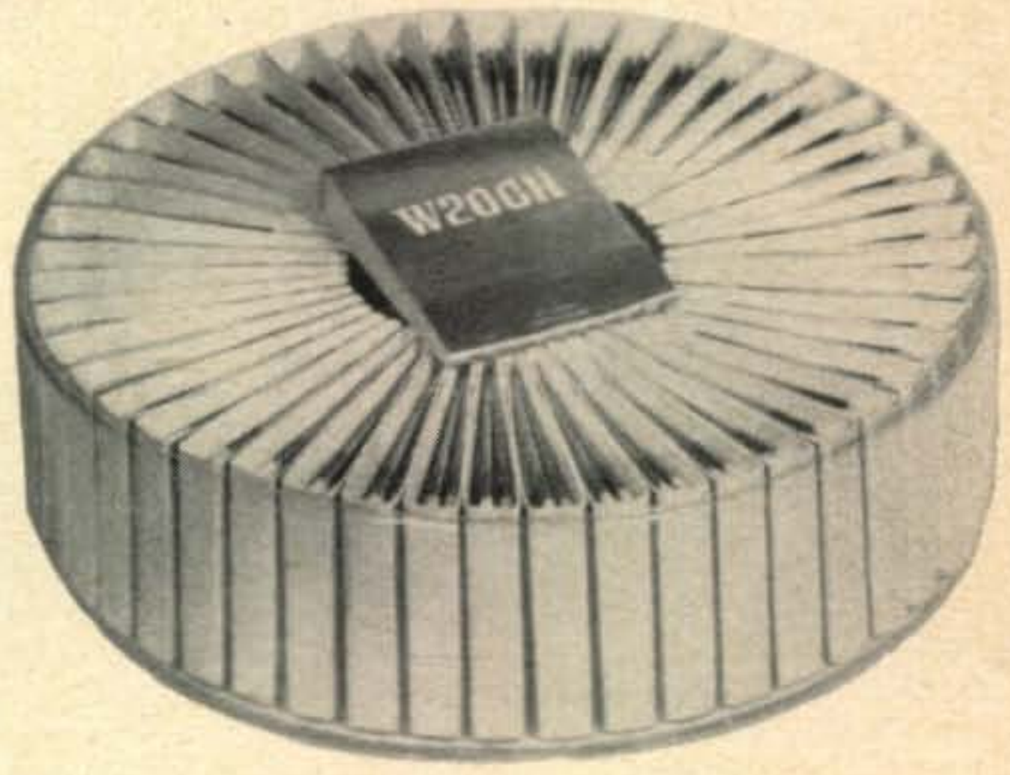

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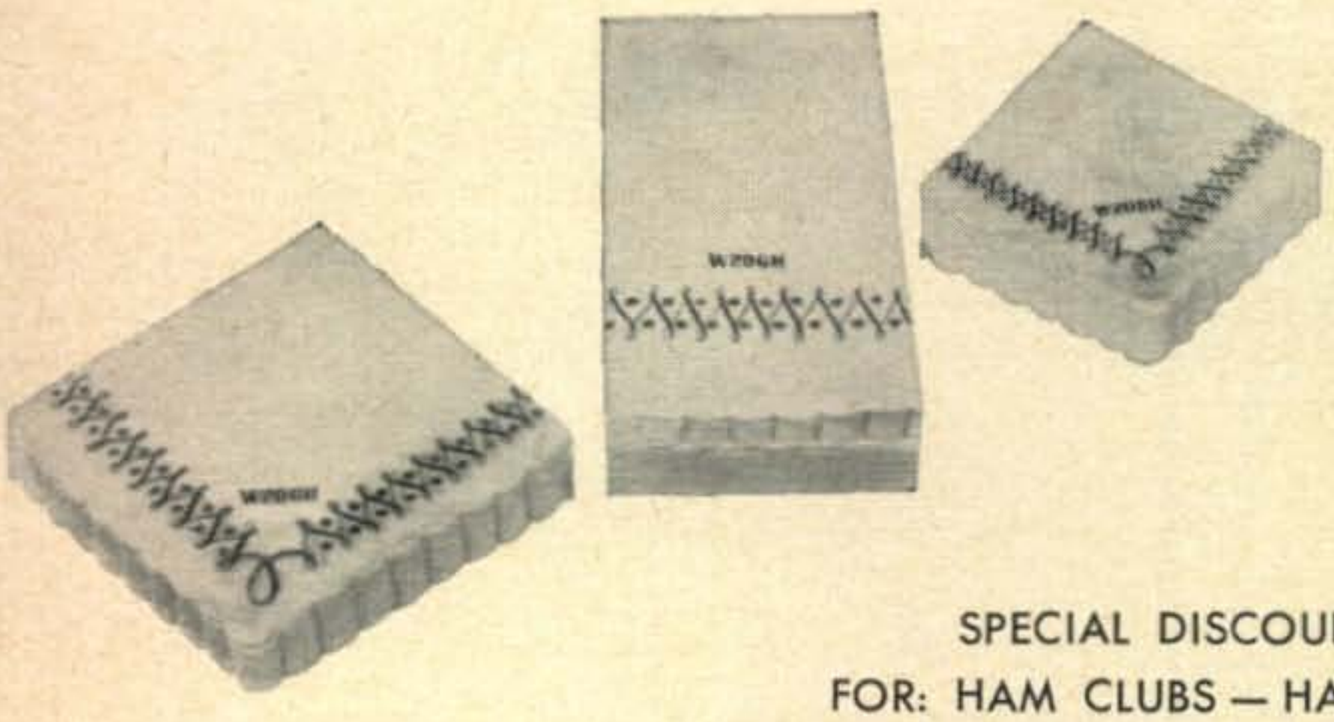

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rms/piv	**rms/piv**	**rms/piv**	**rms/piv**
280/400 50¢	350/500 62¢	420/600 80¢	490/700 95¢
rms/piv	**rms/piv**	**rms/piv**	**rms/piv**
560/800 $1.05	630/900 $1.25	700/1000 $1.70	770/1100 $2.00

Use in Bridge or C.T. up to 1 Amp DC

"TAB" Special General Purpose Silicons
400 PIV @ 300Ma 39¢@, 25 for $8.00
*Derate 20% for Capacitive input

HDQTRS. TRANSISTORS & ACCESSORIES

2N441/$3; 2N442/$4.50; 2N277/$4; 2N278/$5; 2N155/$1.39; 2N176/$1.80; 2N177/$1; 2N178/$1.75; 2N247/$1.50; 2N255/$1.20; 2N270/.95; 2N274/$1.25; 2N408/.80; 2N554/$1.20; 2N578/$1.80; 2N579/$2.20.

DIAMOND BASED MICA MTG KIT.....30
DELCO ROUND BASED MICA KIT.....30
DELCO POWER HEAT SINK.....$1.00

Wanted 304TL Tubes & ALL TYPES!!!

"VACDAC"® SILICON TUBE REPLACEMENTS

WITH BUILT IN RF SURGE & SERIES BALANCING PROTECTION

TYPE	VRMS/PIV	AMPS	PRICE
ST866	5000/10400	0.3	$20.00
ST816	5000/7000	0.3	$16.00
ST5R4	1900/2800	0.5	$15.00
ST5U4	1120/1600	0.6	$ 8.00

SELENIUM F.W. BRIDGE RECTIFIERS

	DC AMP	18VAC 14VDC	36VAC 28VDC	72VAC 54VDC	130VAC 100VDC
One Year Gtd!	½	$1.00	$1.90	$3.85	$5.00
	1	1.30	2.00	4.90	8.15
	2	2.15	3.00	6.25	11.10
	3	2.90	4.00	8.60	13.45
	6	4.15	8.00	18.75	31.90
	10	6.10	12.15	26.30	41.60
	12	7.75	14.90	30.95	43.45
	20	12.85	24.60		
	24	15.00	29.45		

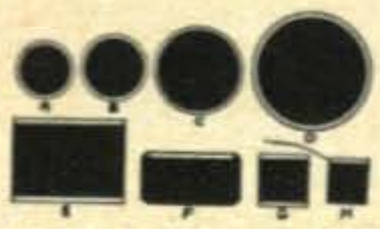
New "TABTRAN" Rectifier Xfmrs

Sec'd Volts (DUAL†) 0-9-15-18-&-0-9-15-18. Series Sec'ds 0-3-6-9-12-15-18-21-24-27-30-33-36 Volts.

Write for Rectifier Catalog

TR4001 @ 1 Amp† ea/sec/winding $5.15
TR4002 @ 2 Amp† ea/sec/winding.....$7.15
TR4003 @ 5 Amp† ea/sec/winding..9.90
†Wndgs in Series at Ratings shown: Parallel 2X Current. Voltage output. 0-9-15-18

"SUNTAB"® SELENIUM PHOTOCELL



5AP	ROUND 1⅛" Dia.—250ua	$1.00
10AP	ROUND 1½" Dia.—360ua	$1.75
15AP	ROUND 2" Dia.—750ua	$3.00
2BP	RECT ⅜ x 7/16—75ua	.70
5BP	RECT—200ua	$1.35
10BP	RECT 1-11/16 x ⅜—360ua	$1.80
KIT ALL SIX ONE EACH		$7.00

This Item Shipped Postpaid $5 up.

AC POWER SUPPLY FOR ART13 — "TABPAK" DELIVERS 1250VDC, 500VDC & 28VDC AT 10 AMPS. ALL FILTERED. USES SILICON H'SEALED DIODES. "TABPAK"® PS/ART13....$125

SELENIUM RECTIFIERS 130/RMS HALF WAVE

75Ma 49c, 5 for $2; 100Ma 59c, 6 for $3
150Ma 70c, 8 for $5; 250Ma 79c, 6 for $4
300Ma 88c, 5 for $4; 350Ma $1.00, 8 for $7
500Ma $1.35, 5 for $5
This Item P.Pd. 48 states orders $10.

Leece Neville Charger Systems
"SILTAB" Silicon Rectifier Replacement
Non-Aging Hermetically Sealed
FOR 6 or 12VDC @ 100A, Type YJ9 $24

WE BUY! SELL & TRADE
Send 25¢ for Bonus Catalog!

"TAB" THAT'S A BUY

"TAB" Tubes Tested, Inspected, Boxed
Six Months Guaranteed! No Rejects!
GOVT & MFGRS Surplus! New & Used

0A2	.70	6BZ7	1.25	*We Buy & Sell*	
0A3	.80	6C4	.45	43	.75
0B2	.65	6C5	.69	45	.49
0C3	.70	6C6	1.08	50L6	.69
0D3	.50	6C8	1.08	RK59	1.39
0Z4	.60	*We Trade!*		RK60	1.17
1A7	.90	6CB6	.89	HY69	2.20
1B3	.78	6CD6	1.49	75	.81
1L4	.82	6CF6	.85	HY75	5.00
1R4	5/$1	6CL6	1.40	83V	.95

We Swap Tubes! What Do/U Have?

1R5	.78	6CB6	.89	4PR60A	37.50
1S4	.78	6CG8	1.12	4-125A	27.50
1S5	.68	6CM6	.79	4X150G	15.00
1T4	.85	6CS6	.70	4X250B	41.00
1T5	.95	6CU6	1.29	4-400A	41.75
1U4	6/$1	6D6	.99	4E27A	39.00
1U5	.75	6E5	.79	250TL	19.45
1X2	.99	6F4	2.49	307A	2/$1
2C39A	9.00	6F5	.63	316A	5/$1
2C40	5.50	6F6	.99	VR92	5/$1

Send 25¢ for Catalog!

2C43	6.50	6F7	.99	388A	3/$1
2C51	2.00	6F8	1.39	350A	2.45
2D21	.65	6H6	.59	350B	1.75
2E22	1.75	6J4	1.72	371B	.95
2E24	1.90	6J5	.59	5146	3.90
2E25	2.50	6J6	.59	416B	16.00
2E26	2.75	6J7	.99	450TH	43.00
2E30	1.70	6J8	1.39	450TL	43.00
2E35	1.60	6K6	.59	460	11.50
2K25	9.75	6K7	.79		

All Tubes Stocked at Low Prices!

2K26	34.00	6K8	.99	703A	2.00
2K28	30.00	6L6	1.19	707B	3.50
2V3	2/$1	6SN7	.72	715C	10.90
2X2	.48	6T8	.98	717A	5/$1
3A4	.70	6V6GT	.90	723AB	5.00
3A5	1.00	6X5	.49	725A	2.75
3API	5.95	12AT6	.59	803	3.50
3BPI	3.99	12AT7	.89	804	8.85
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69	*We Trade!*	
We Buy!		*We Sell!*			
3E29	6.00	12AX7	.79	807	1.10
3Q4	.68	12AY7	1.29	5/$5. 10/$12	
3Q5	.86	12B4	.95		
4-65A	13.50	12BA6	.65	811	3.45
4-125A	27.50	12BA7	.99	811A	4.41
4-250A	34.00	12BD6	.59	812	3.30
4X150A	7.00	12BE6	.59	813	8.00
4X250	36.00	12BH6	.79	815	1.75
4X500	37.00	12BH7	.99	826	.59
5API	2.95	12BY7	1.00		

Wanted Test Sets and Equipment

5BPI	5.02	12BZ7	.99	828	9.00
5BP4	5.00	12H6	.75	829B	8.00
5CPI	4.99	12J5	.69	832A	6.00
5CP7	9.00	12J7	.69	833A	36.00
5R4	1.00	12J8	1.35	837	2/$2
5T4	.90	12K8	.89	866A	2.45
5U4	.99	12SA7	.69	954	10/$1
5V4	.89	12SC7	.89	955	3/$1
5Y3	.60	12SF5	.69	957	3/$1
5Z3	.89	12SG7	.89	958A	2/$1

Send 25¢ for Catalog!

15GP22	89.00	12SH7	.89	991	5/$1
6A7	1.00	12SJ7	.75	1614	2.75
6A8	.99	12SK7	.75	1619	5/$1
6AB4	.59	12SL7	.79	1620	2.00
6AC7	.72	12SN7	.69	1625	3/$1
6AG5	.65	12SQ7	.69	1626	5/$1
6AG7	.75	12SR7	.69	1629	4/$1
6AK5	.69	15E	1.19	2050	1.25
6AL5	.59	15R	4/$1	5517	1.25
6AQ5	.66	FG17	3.49	5608	3.95

Top $$$ Paid for 304TL, 726B Tubes

6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.69	5725	1.95

Top $$$ Paid for XMTTR Tubes!

6BK7	.99	FG27	8.28	5732	2.00
6BL7	1.35	HV27	19.39	5736	85.00
6BN4	.69	28D7	.89	5749	1.95
6BN6	1.08	FG33	15.00	5750	2.75
6BN7	1.99	EL34	3.49	5751	1.25
6BQ6	1.19	35A5	.69	5814	1.20
6BQ7	.99	35L6	.59	5879	1.20
6BX7	1.11	35T	4.49	5894	$12.00
6BY5	1.19	35Z5	.89		
6BZ6	.91	RK39	2.99	No See—Write!	

"TAB" TERMS: Min Order $3—25% with order F.O.B. New York. Ten day guarantee, price of mdse. only. Our 15th year.
Prices shown are subject to change.
111CW Liberty St., N. Y. 6, N. Y. RE 2-6245

NEW POWER CONVERTER 12VDC to 500VDC up to 200MA 100 Watts; Tap at 250VDC Type C1250E $35

Hi efficiency, low ripple, low idle current-Silicon rectifiers! Toroidial HiEff! Mag-metal tape wound transformer, fused & short circuit proof, small in size! Quiet! Light weight! C1250EE built, ready to go. Conservatively Rated. Delco Transistors Heavy Duty Finned Delco Heatsinks.

12VDC to 250VDC up to 150MA Type C1225E $30

"TAB"—THAT'S A BUY!—BARGAINS!!

IRISH/MYLAR Tape 2400 ft .....3/$12
CONDSR Oil/W.E. 2mfd@600WVDC 6/$1
SNOOPERSCOPE TUBE 2".....$5@, 2/$9
MINI-FAN 6 or 12VAC/60 Cys $2 @ 3/$5
NEW PRINT CKT-PANEL, 11x12x.062" $2
IRISH TAPE 1200' HiQlty, ...3 for $5

BANDPASS 60 or 90 or 150 Cys ..each $2
1N34A 45¢@, 15/$5; 1N35 $1; IN38 70¢@;
XTAL OVEN—115V&Thermostat $2
Blower 24VDC/100CFM $3.98
Blower AC/Miniature 6&12VAC $1.00
Xmitting Mica's .006 @ 2500V, 5 for $1.00

Miller 2.5MH/2.5&5Mtr Chokes ....8/$1.00
Vibrators 6 or 12VDC $1.49@; 4/.... $5.00
New Variacs/or equiv 0-135V/7.5A $15.30
New Variacs/or equiv 0-135V/3 Amp $10.65
New Variacs/or equiv 0-132V/1.25A $7.25

RF-MTG GE/475 Ma & 5 Amp $4@, 2/$7
DC-METER Dejur 800 Ma/3½" $3@, 2/$5
DC-METER One Ma/4" Rd. $5@, 2/$8
RF-HTR Weston 750Ma/TC....$4@, 2/$6
DC MTR 100Ma/2½".....$3@, 2/$5

AN-ARR2/RCVR less tubes A-1 cndtn $1.95
829B Socket 85¢, 183 Socket..... $1
4x150 Ceramic/LOKTAL ..... 2 for $1.00

NEW BATTERY CHARGER BC6-12V FOR 6V OR 12 VOLT BATTERIES, TRICKLE & FULL CHARGE up to 4 AMP

Charges 6 & 12 volt batteries.

Built BC6-12V $10.00

If U Don't See It Write

"TAB" FOR THE BEST KITS!

KITS! *Each "TAB" Kit Contains The Finest Selection!!!!*

99c

Kit 100 Self/Tap Screws
Kit 4 Selenium "Suncells"
Kit Adj Wire Striper & Cut
Kit 5 pcs Wrench Set
Kit 8 pcs Nut Driver Set
Kit Hi Gain Xtal Mike
Kit 6 ea Phonoplugs & Jacks
Kit 25 ft Lo-Cap Mike Cable
Kit 20 ft RG59U Coax Cable
Kit 15 ft RG11U Coax Cable
Kit 2 pair SO239 & PL59
Kit 12 Binding Posts Asstd
Kit 5 Phone Jacks Asstd
Kit 3 Phone Plugs Asstd
Kit Long Nose Plier
Kit Side Cutter Plier
Kit 2 Xmttr Variables

Kit 5 Myealex Glass/HF Strips
Kit 35 Precision Resistors
Kit 10 Switches
Kit 75 Resistors ½/1/2W
Kit 150 Carbon Resistors
Kit 12 Electrolytic Cond's
Kit 15 Volume Controls
Kit 56 Tube Sockets
Kit 65 Tubular Condensers
Kit 500 Lugs & Eyelets
Kit 10 Bathtub Oil Cond's
Kit 5 lbs. Surprise Package
Kit 10 Transmit Mica Cond's
Kit Glyptal & Cement
Kit 3 Phone/Patch Xfmrs
Kit 4 AN/Reflector Lites
Kit 6 Insltd Tuning Tools
Kit 4 "Suncells" Asstd.

Kit 3 AN Plugs & cnnctrs
Kit 5 Sub-Min Tubes
Kit 40 Standoff Insulators
Kit 35 Power Resistors
Kit 75 Mica Condensers
Kit 8 Crystal Diodes
Kit 200ft Hook Up Wire, 4 Rolls, 50ft/ea. Asstd. Color
Kit 100 Ceramic Condensers
Kit 5 FT243 Xtal Holders
Kit 5 Microswitches
Kit 10 Wheat Lamps
Kit 3 Transistor Xtmrs
Kit 8 Xtal Osc-Blanks
Kit 4 Asstd Rectifiers
Kit 12 Alligator Clips Astd
Kit 5 UG/Connectors

ONE EACH ABOVE KIT ONLY.....

Order Ten Kits We Ship Eleven!!!

Send 25¢ for Catalog

big ALLIED clearance sale of reconditioned equipment...

biggest trading in our history brings you top values like these...

ALL WITH 90-DAY NEW EQUIPMENT WARRANTY!

Barker & Williamson	
5100 Transmitter	$219.00
51SB Sideband Generator	139.00
Central Electronics	
20-A Sideband Exciter	164.50
600-L Linear Amplifier	279.00
10-B Sideband Exciter	99.00
10-A Sideband Exciter	79.00
GC-1 Gated Amplifier	29.00
Collins	
32 V1 Transmitter	225.00
32 V2 Transmitter	249.00
32 V3 Transmitter	329.00
KWM-1 with AC Supply	625.00
Elmac	
AF-67 Transmitter	109.00
A-54H Transmitter	65.00
PSR-6 Power Supply	15.00
PSA-500 Power Supply	29.95
1050 Power Supply	29.00
Globe	
680 A Transmitter	89.00
Chief 90 Transmitter	39.50
Champ 300 Transmitter	275.00
Scout 65 A Transmitter	65.00
Phone Patch	15.00
Gonset	
G-66 Receiver	135.00
G-66 Power Supply	17.50
Communicator III 6 meters	189.00
Communicator II 2 meters	149.00
6 Meter Linear Amplifier	79.95
2 Meter Linear Amplifier	79.95

Hallicrafters	
S-38 E Receiver	$ 42.50
S-40 Receiver	54.00
S-40 B Receiver	79.00
S-53 A Receiver	49.00
SX-71 Receiver	149.00
S-76 Receiver	89.00
SX-99 Receiver	114.00
SX-101 MK III Receiver	259.00
S-104 Receiver	69.95
S-107 Receiver	74.50
HT-30 Transmitter	249.00
HT-31 Amplifier	249.00
HT-32 Transmitter	429.00
HT-32 A Transmitter	479.00
HT-33 Linear Amplifier	385.00
HT-33 A Linear Amplifier	569.00
Hammarlund	
HQ-110C Receiver	189.00
HQ-140X Receiver	169.00
HQ-170C Receiver	269.00
Heath	
DX-35 Transmitter	48.00
DX-40 Transmitter	54.50
DX-100 Transmitter	159.00
VF-1 V.F.O.	15.00
QF-1 "Q" Multiplier	6.95
Harvey-Wells	
R-9A Receiver	79.00
T-90 Transmitter	79.00
TBS-50D Transmitter W/VFO	59.50
APS-50 Power Supply	15.00
APS-90 Power Supply	39.00

Johnson	
Pacemaker Exciter	$289.00
Thunderbolt Linear Amp	425.00
Viking II Transmitter	159.00
Knight	
R-100 Receivers	89.00
T-50 Transmitters	29.95
Morrow	
MB-565 Transmitter	179.00
MBR-5 Receiver	139.00
MB-560 A Transmitter	125.00
Falcon Receiver W/BC Band	139.00
National	
SW-54 Receiver	34.50
NC-60 Receiver	42.50
NC-66 Receiver	59.00
NC-88 Receiver	79.00
NC-173 Receiver	119.00
NC-183 D Receiver	229.00
HRO-60 Receiver	329.00
NC-303 Receiver	329.00
RME	
4350 A Receiver	159.00
VHF-126 Converter	189.00
DB-22 A Preselector	29.95
Tecraft	
6 Meter Converter	19.00
2 Meter Converter W/Supply	39.00
PTR-2 Power Supply	27.95
PS-1 Power Supply	15.00

EASIEST TERMS: Available on all orders over $20; only $2 down up to $50; $5 down from $51-200; only $10 down from $201 up. Up to 24 months to pay. Fast handling—no red tape.

15-DAY FREE TRIAL: Try any of this equipment under your own conditions; if in 15 days you're not completely satisfied, return it for full refund, less only transportation costs.

90-DAY WARRANTY: Allied Reconditioned equipment is covered by the same 90-day warranty against defects in material or workmanship which covers brand-new equipment.

SELECT YOUR NEW GEAR from our complete 444-page value-packed catalog. If you haven't a copy, write for it today.

IMPORTANT: Some items above are one of a kind...all items are subject to prior sale...send deposit to hold any item.

For reconditioned or new equipment, write to Jim Sommerville, W9WHB, c/o Allied, or stop in and meet Joe Huffman, W9BHD; Joe Gizzi, W9HLA, Burt Fischel, W9VOB; Jack Schneider, W8CZE.

ALLIED RADIO

100 N. Western Ave., Dept. 16-L
Chicago 80, Ill.

For further information, check number 60, on page 182

WITH BUILT IN PRODUCT DETECTOR

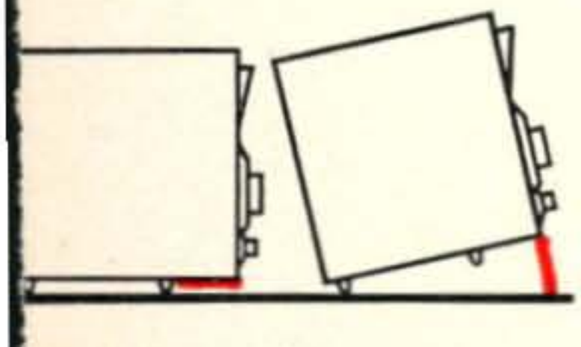
NC 270

Photographed in true color

THE "COSMIC BLUE" NATIONAL'S NEW HAMBAND RECEIVER

This newest and finest precision double conversion amateur receiver with 6 meter coverage, brings you an ease of sideband tuning previously available only in the most expensive equipment. The NC-270 features an exclusive "Ferrite Filter" for instant upper-lower SSB selection, and a degree of selectivity to conquer even the toughest AM and CW signal conditions. The solid 1/8" steel panel, ceramic coil forms, double-spaced tuning gang, and full ventilation cabinet combine to give mechanical and thermal stability that will surprise even the most critical operator. Even the color of the NC-270 is outstandingly different, National's new duo-tone "Cosmic Blue." Write for detailed specifications.

Only $24.99 down*



And National Radio's patented "Flip Foot" makes operating the NC-270 so easy.

Suggested cash price: $249.95. 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. ®

A WHOLLY OWNED SUBSIDIARY OF NATIONAL CO., INC.

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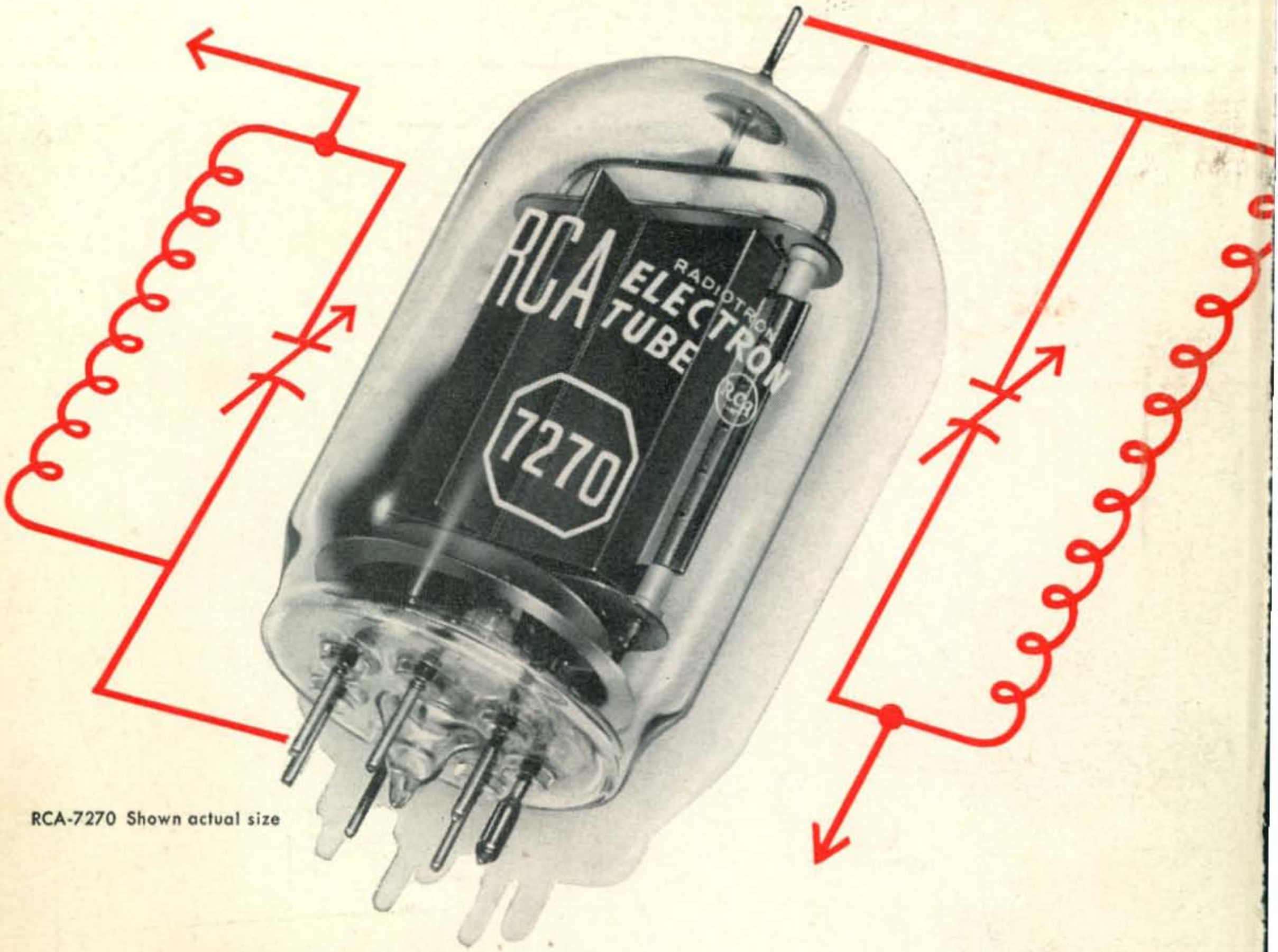
"FERRITE FILTER" PATENT PENDING

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

For further information, check number 2, on page 182



RCA-7270 Shown actual size

The FIRST High-Perveance "300-WATT" Input Beam Power Tube ...ever designed for Amateurs

- 315 watts CW input up to 60 Mc
- 235 watts CW input up to 175 Mc

Fix your eyes on this—one of the sweetest little beam power tubes ever designed and built for an amateur medium-power transmitter.

Here, in a compact unit no bigger than a child's fist, is an all-new tube that takes over *a quarter KW input to 2 meters*. High-perveance design—an original RCA development—enables you to get maximum power with a plate voltage of only 1350 volts. High power gain makes it easy to drive one RCA-7270 (or two in push-pull or parallel) with a single RCA-2E26 or -5763 through 10 meters—or a single 2E26 for 6- and 2-meter operation.

Check the chart for a quick appraisal of the RCA-7270's capabilities. For a complete technical bulletin on SSB, AM and CW use, qsl, RCA Commercial Engineering, Sec. K-15-M, Harrison, N. J.

Typical Operation in Amateur Service to 5

Type of Service	CW	AM	SS (AB
Heater Volts	6.3	6.3	
DC Plate Volts	1250	1000	12
DC Grid No. 2 Volts	300	400	
DC Grid No. 1 Volts	—80	—107	—
DC Plate Ma	250	190	1
Required Driver Power Output Watts (approx.)	4	4	
Useful Output Watts (approx.)●	225	130	

*Max. Signal Value ▲With Single-Tone Modulc
●Measured at load of output circuit having 9 efficiency

RCA® **RADIO CORPORATION OF AMERICA**

Electron Tube Division **Harrison, N. J.**

Another Example of RCA's Contribution to Amateur R