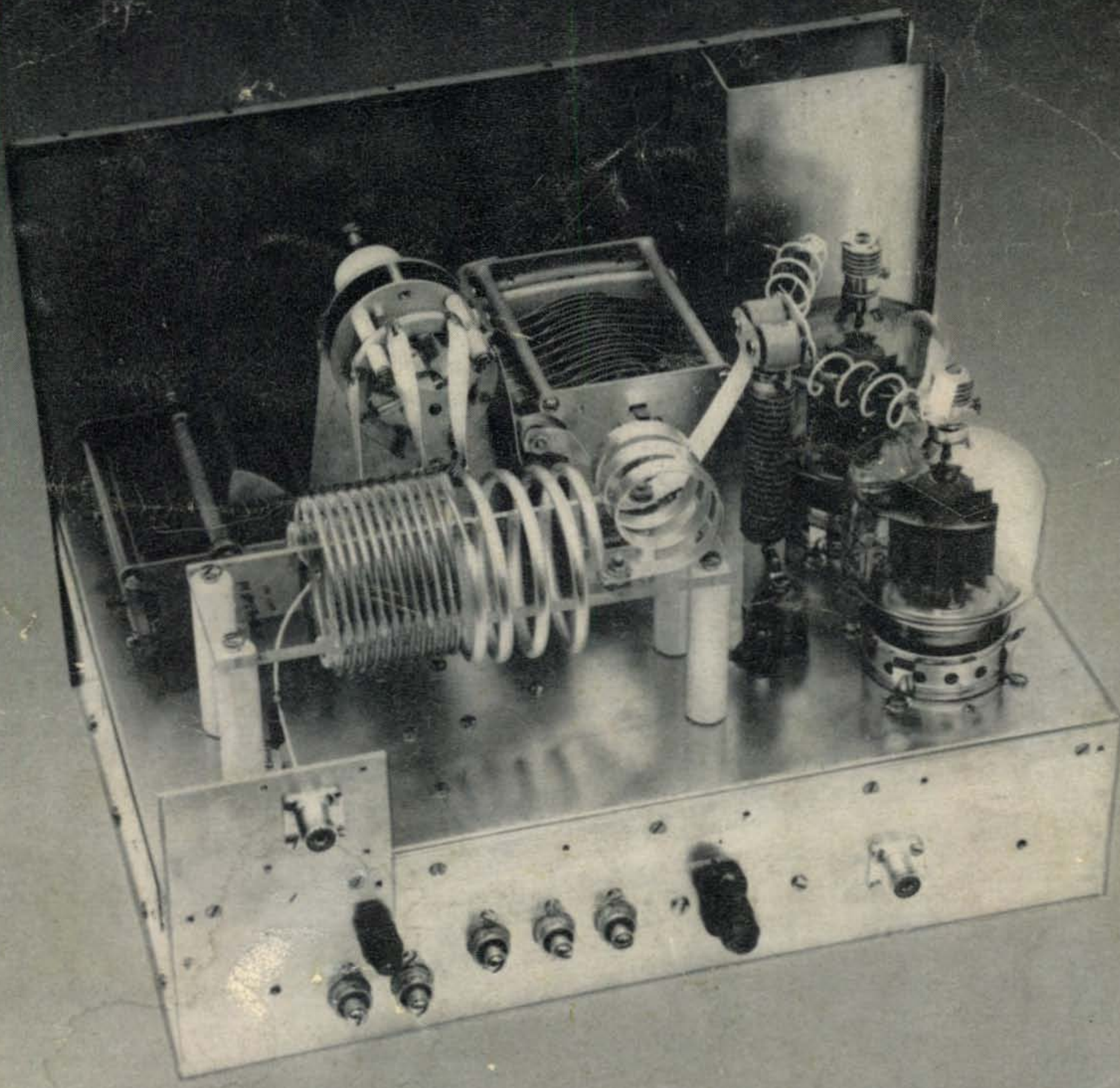
CQ

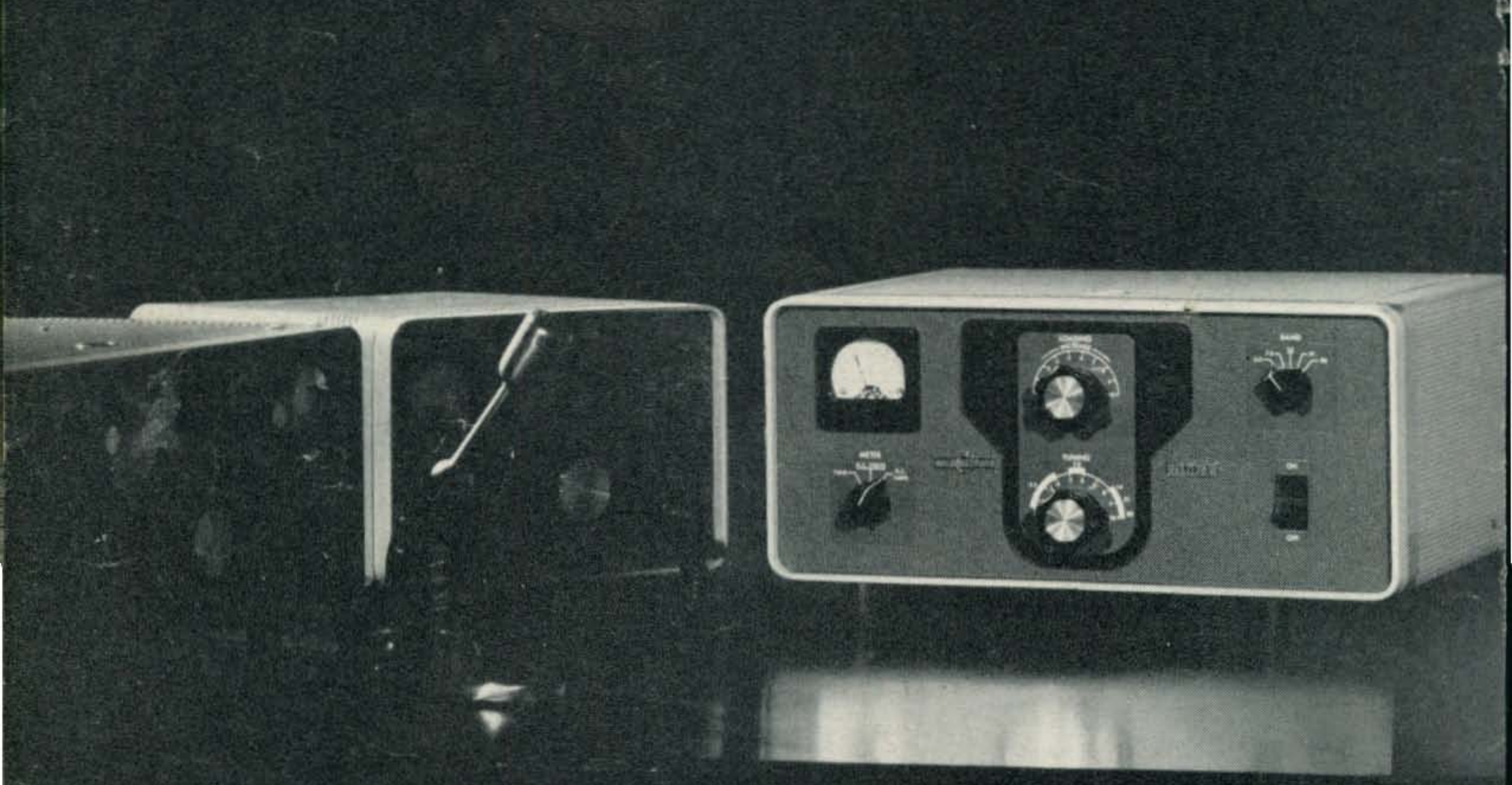
July 1961

50¢



The Radio Amateur's Journal

highlight your station with the 30L-1 linear



Desktop kilowatt amplifier from COLLINS

The compact Collins 30L-1 Linear Amplifier provides for 1,000 watts PEP input on SSB and 1,000 watts average on CW. It is designed for use with the famous Collins KWM-2 or 32S-1, as well as with most other 70-100 watt CW/SSB exciters. □ Visit your Collins distributor for details, and see the quality line — the Collins line of amateur equipment. Order the 30L-1 now for early delivery! Only $520.00.

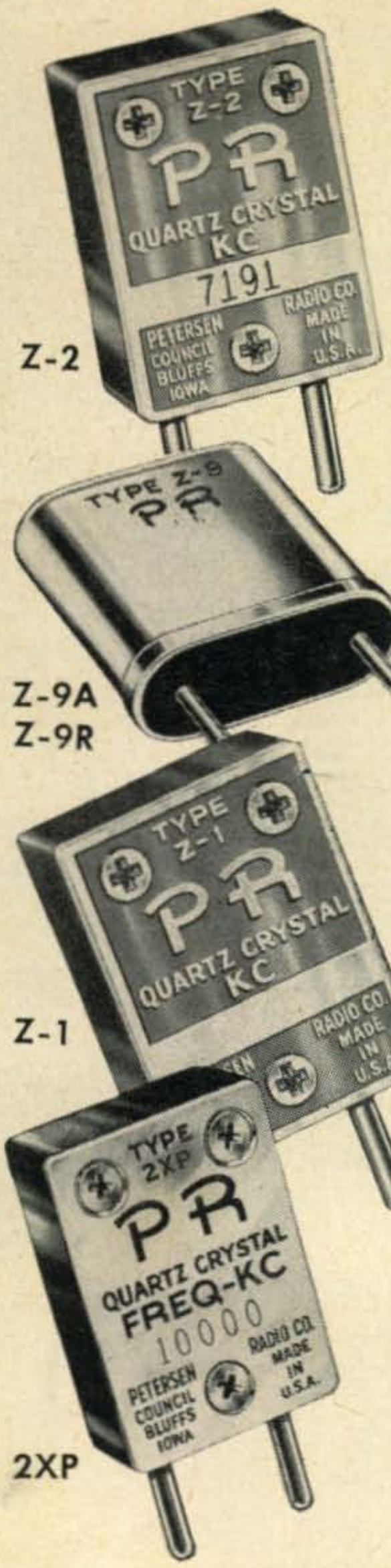
COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA • DALLAS, TEXAS • NEWPORT BEACH, CALIFORNIA

For further information, check number 1, on page 126

It pays to insist on PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934



Z-2

Z-9A
Z-9R

Z-1

2XP

AMATEUR TYPES

Fundamental, PR Type Z-2

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

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

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

Third Overtone, PR Type Z-9A

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

6 Meters, PR Type Z-9A

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

CITIZENS BAND CLASS "D"

Type Z-9R, Transmitter

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

CITIZENS BAND CLASS "D"

Type Z-9R, Receiver

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

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 and model number 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 126

Presenting—a new standard of performance for AM, CW, SSB reception

- Band-pass filter front end—equivalent of four tuned circuits preceding 1st mixer.
- Crystal-controlled high frequency oscillator.
- 5 steps of selectivity plus Hallicrafters' exclusive upper/lower sideband selection.
- Linear CTO, direct reading in kc.

SX-115
RECEIVER

The experienced amateur will immediately recognize in the SX-115 a first rate engineering triumph that creates an *entirely new class* of deluxe receiver.

Frequency coverage: Nine 500-kc segments covering 3.5–4.0 mc.; 7.0–7.5 mc.; 14.0–14.5 mc.; 21–21.5 mc.; 28.0–30.0 mc.; (4 segments); and WWV.

Additional features: Highest order of mechanical and electrical stability; linear tuning; constant tuning rate; separate noise limiters for SSB/CW and AM; dual loop AVC; spurious signal and image rejection better than 60 db. down; sensitivity less than one microvolt; perfect match for Hallicrafters HT-33 and HT-32 series exciters and transmitters.

The new ideas in communications are born at...

hallicrafters Chicago 24, Ill.

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

For further information, check number 4, on page 126

CQ The Radio Amateur's Journal

VOL. 17, No. 7 *JULY 1961*

OFFICES

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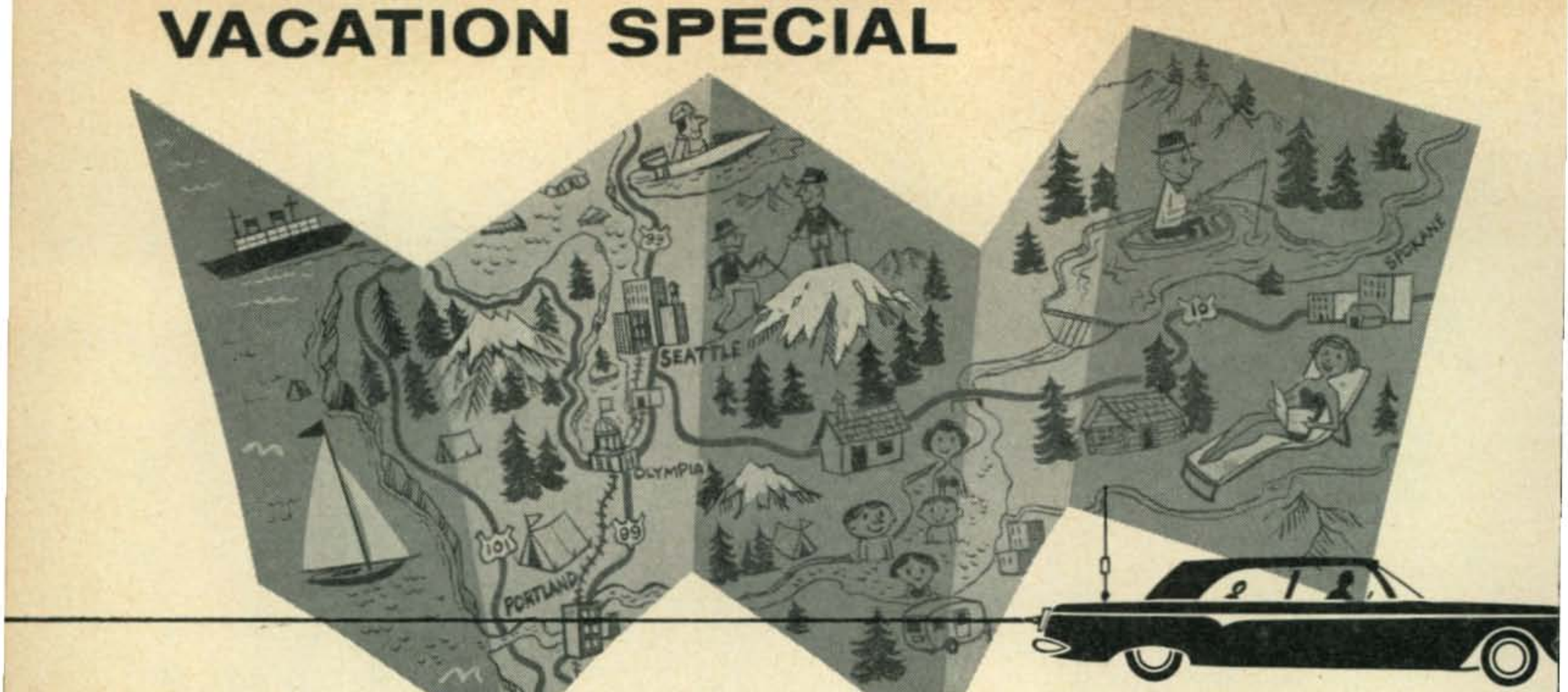
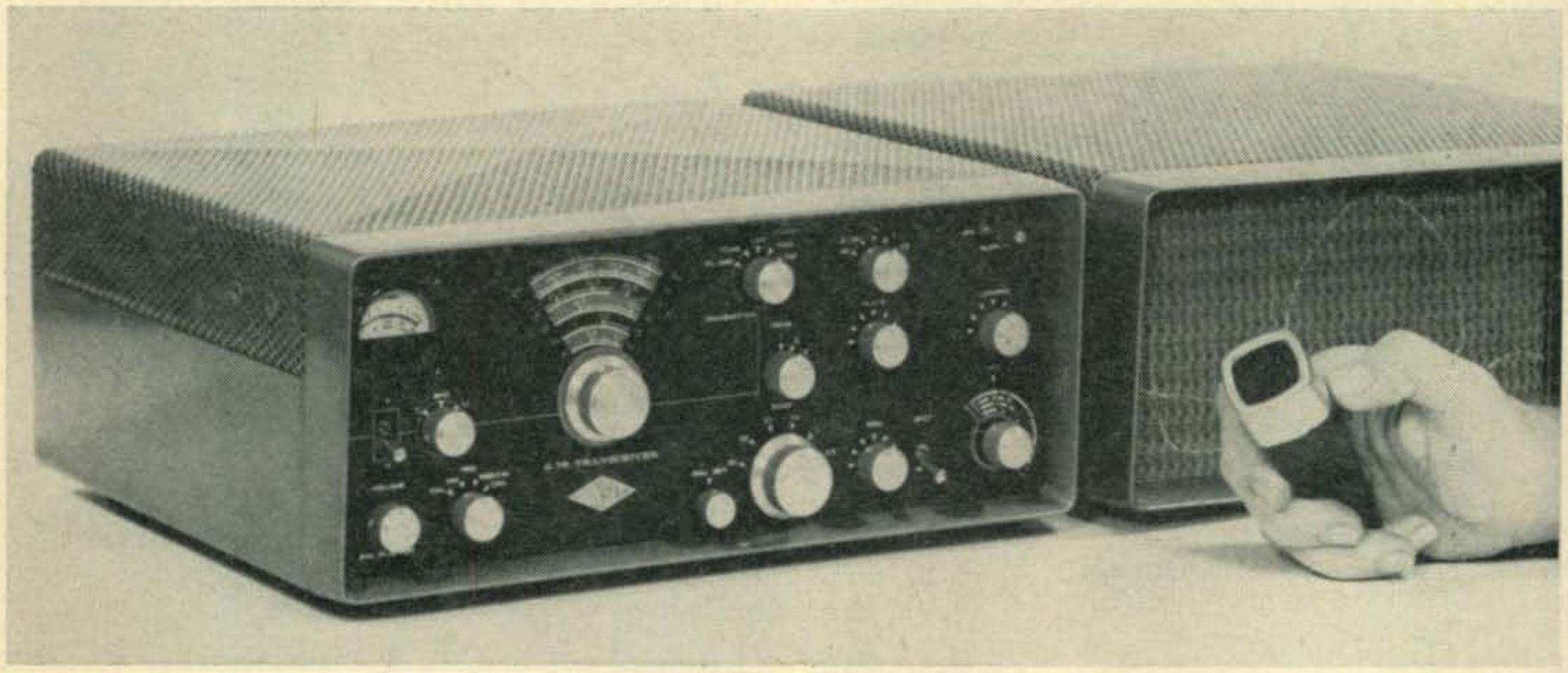
DEPARTMENTS

VACATION SPECIAL



The GONSET G-76 all-band 100 watt AM transceiver

goes where you go - performs anywhere - anytime



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

- ✱ G-76 is a fixed, mobile, or portable station . . . all in one package.
- ✱ G-76 gives an honest 100 watts input AM, 120 CW.
- ✱ G-76 operates on six amateur bands–6, 10, 15, 20, 40, and 80 meters.
- ✱ G-76 is only 12⅝" W, 5⅛" H, 11½" D, weighs less than 20 pounds. Will mount in any auto or boat.
- ✱ G-76 converts in 60 seconds from fixed to mobile. Compact, transistorized DC power supply available for auto. AC Power pack with built-in speaker unit available for home station use.

For further information, check number 5, on page 126

Amateur Net $399.50

Division of Young Spring & Wire Corporation

GONSET

801 S. Main Street, Burbank, Calif.

GONSET G-76 Vacation Special now on display at

"L. NORBERG, President of C & G Electronics invites you to see the G-76 at any of the locations listed"

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OLYMPIA, WASHINGTON
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Phone: FLeetwood 2-7593

CENTRALIA, WASHINGTON
217 So. Tower
Phone: PErshing 6-7707

ABERDEEN, WASHINGTON
510 West Wishkah
Phone: LEnox 2-3531

For further information, check number 6, on page 126

Hammarlund upgrades the "hot ones"

TOP VALUE HQ-100A

NOW—even better CW and SSB reception with the **new** HQ-100A! Keeping all of the advanced features of the famous HQ-100, Hammarlund engineers added extra convenience and performance by providing independently controlled, continuously variable BFO and Q-multiplier—permitting simultaneous use of both. Another added extra is the handy citizens band channel marking—usable at your option. **Plus Features** at no extra cost.

$189.00 Amateur Net

HQ-145X WITH NEW CRYSTAL CONTROLLED CHANNEL

Important new features have been added to the general coverage HQ-145 to make it the Hammarlund HQ-145X—**at no increase in price.** Provision for a crystal controlled channel has been included for use at any point within the entire frequency range of the instrument (540 KCS to 30 MCS). Highly desirable in net operations, citizens band, to obtain weather information, and to calibrate test equipment against WWV standard. Also features optional use of citizens band channel markings. (Crystal not supplied.)

$269.00 Amateur Net

and adds the "NEWEST OF THE NEW"

ALL NEW HQ-105TR CITIZEN-HAM BAND TRANSCEIVER

NOW—for the first time, a citizens band transceiver with built-in provision for ham band operation. The general coverage receiver is continuously tunable from 540 KCS to 30 MCS—transmitter has a 5 watt input and is 100% modulated. The Hammarlund HQ-105TR can be utilized for both CB and ham operation simply by retuning the transmitter. Ideal for the citizens band operator who entertains the possibility of being a licensed ham—and the amateur radio operator who would like to use a single unit for both business and hobby. **$219.50** Amateur Net

MR 50-X CRYSTAL-CONTROLLED MONITOR RECEIVER

The Hammarlund MR50-X Monitor Receiver is a true split channel instrument permitting clear, loud signals on the most congested communications bands. Crystal controlled to fixed predetermined channels within the frequency range of 147 MCS and 174 MCS, it provides a positive means for remote monitoring of two-way communications. Built-in whip antenna. Ideal for civil, industrial, or commercial use. **$199.50** Amateur Net

HAMMARLUND
MANUFACTURING COMPANY, INC.,
an affiliate of Telechrome
460 West 34th Street, New York 1, N.Y.
Established 1910

For further information, check number 15, on page 126

ZERO BIAS

SINCE the Sputniks started flying back in 1957, everyone has been aware of the need for more scientific and engineering personnel. Education has become a much talked about commodity, but like the weather, not too many people see fit to do anything about it.

We are indeed pleased to announce that amateur radio, in the form of a well-organized club is setting an example for all of us to follow.

The Foundation For Amateur Radio, Inc., comprising some 17 active amateur radio clubs from the Washington, D. C. area is now sponsoring a scholarship for either graduate or undergraduate work in electronics. The candidate, of course, must hold a valid FCC amateur license of a General level or higher.

The scholarship has been named after John W. Gore, W3PRL, who, up until last year, when he became a Silent Key, was President of the Foundation.

The Washington group have set aside a fund of $250.00 per year, collected from dues and various amateur activities, to help a needy amateur receive his education. Unfortunately, applications for this particular scholarship closed June 1st, 1961.

We present this to our readers, not only as a means of congratulating the Foundation for an excellent idea, but also as an enducement for other clubs to pool their resources, so that in a few years, many such programs may be under way.

Two hundred and fifty dollars certainly isn't too much for a club to afford and *CQ* feels that the multitude of hamfests produced each year would certainly cover the cost of quite a few amateur scholarships.

Congratulations once again to the Foundation For Amateur Radio and a hearty "Well Done!"

Postage Stamp

Rumors have been stirring lately regarding the proposed commemorative postage stamp which will honor the existence of the first 50 years of amateur radio. It seems that there is a difference of opinion as to just when fifty years of organized amateur radio will come about.

When the Department of Commerce started issuing calls in 1912 they were not only responsible for amateur stations but commercial as well, although the majority of radio licenses at that time were issued to amateurs. When it was realized that the radio service was growing like a well-watered weed the Federal Government realized the need for an agency that would handle matters pertaining only to the radio spectrum. In 1934 the Federal Communications Commission was organized and they have handled the entire operation ever since.

To honor either one of these dates [1912-1934] would certainly be a commendable gesture, but we feel that *organized* amateur radio, as we know it today, stems from the inception of the League in 1914.

CQ feels that in order to successfully bring about an event of this kind, every amateur should give his full support to this program so that we may expect to see a commemorative stamp issued in 1964.

OUR COVER

This month's cover illustrates a kw amplifier which will be described in the August issue of *CQ*. The r.f. amplifier uses a pair of 4-400 in parallel and the new 3-400Z will also be discussed as a possible substitute. The author calls this rig the "KW-2".

from Heathkit®

Special "Bonus" Offer

for Summer Buyers

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- **Eliminates note transferring**
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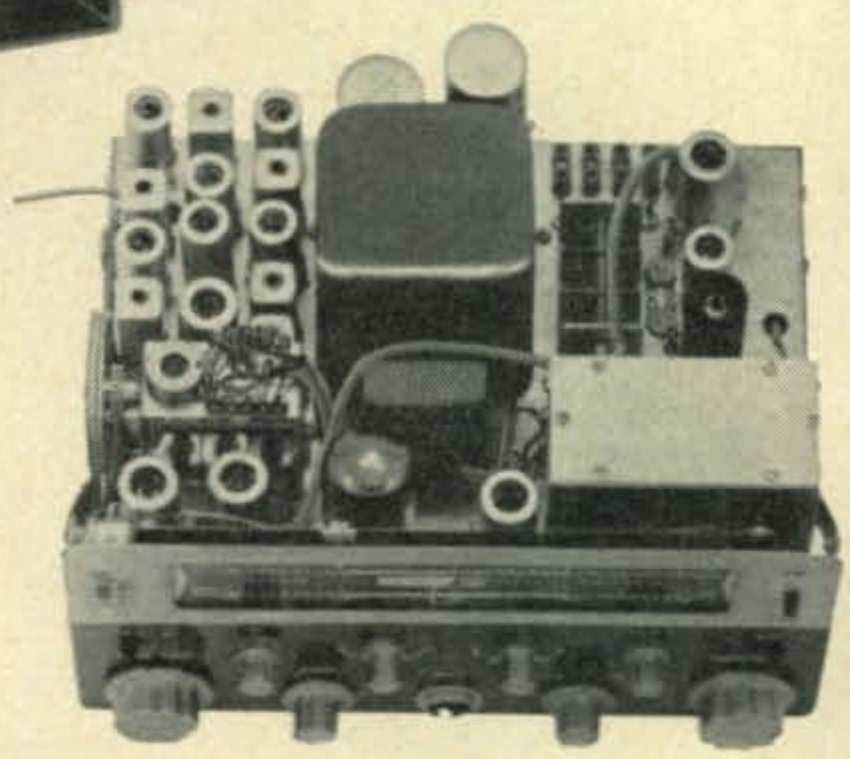

KIT HW-10 $199.95

Compare features, performance, and price...and you'll choose Heath's new VHF transceivers, "Pawnee" and "Shawnee"

• Output: 10 watts nominal CW, 8 watts nominal AM • Built-in VFO • Tracked exciter stages for single-knob tuning • 4 switch-selected crystal positions • "Spotting" switch • Built-in low pass filter • Built-in 3-way power supply, 117 vac, 6 or 12 vdc • Push-pull 6360 final rf amplifier • Dual-purpose modulator provides 10 watts for plate modulation or 15 watts for public address operation with external speaker • Push-to-talk microphone • Double conversion with first oscillator crystal controlled, first IF and second oscillator gang tuned • Voltage regulated oscillators • Illuminated slide-rule dial • Tuning meter automatically reads signal strength or relative power output • Squelch and noise limiter controls • Built-in speaker • Heavy-duty AC & DC power cables • Primary fused relay • Complete shielding • Compact, 6″ h x 12″ w x 10″ d • Recommended for the experienced ham kit builder; time approximately 70 hours.

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

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

Guarantees that you can build any Heathkit®!

- **Operates SSB, AM & CW on 80 through 10 meters**
- **Exclusive internal RF shielding for maximum TVI suppression**
- **Interlocked switching of HV for maximum protection**
- **Clean, functional styling—easy to build**

HERE'S THE RIG THAT'S WINNING PRAISES AROUND THE WORLD . . . THE NEW HEATHKIT "WARRIOR" G-G KW LINEAR

The HA-10 is a completely self-contained desk-top kilowatt linear, loaded with special features! • Amplifier and HV, filament and bias supplies are built in. • Drives with 50-75 watts, no matching or swamping network required. • Grounded grid circuit puts part of drive in output for up to 70% efficiency. • 4 paralleled 811A's, fan-cooled, and 2-866A's. • Oil-filled, 8 ufd 2 KV capacitor and 5-50 henry swinging choke for high peak power output with low distortion. • Neutralized, for high stability. • Best value in amateur gear. 100 lbs.

Kit HA-10...$23 dn., $20 mo.....**$229.95**
Assembled HAW-10...$33 dn., $28 mo.....**$329.95**

SPECIFICATIONS—Maximum power input: SSB-1000 watts P.E.P., CW-1000 watts, AM-400 watts (500 watts using controlled carrier modulation), RTTY-650 watts. **Output circuit:** Variable pi-network (50 to 75 ohms). **Driving power required:** 50 to 75 watts—depending on frequency. **Input circuit:** Broad banded—requires no tuning. **Input impedance:** 50 to 75 ohms. **Band coverage:** 80, 40, 20, 15, 10 meters. **Panel metering:** Switch-selected, grid current, plate current, high voltage and relative power output for ease of loading. **Tube complement:** 4-811A, 2-866A. **Size:** 19½" W. x 11⅜" H. x 16" D.

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For further information, check number 8, on page 126

Letters..... to the Editor

USA-CA

Editor, *CQ:*

Congratulations on your USA-CA program! This is just what the doctor ordered for the low Sunspot Cycle . . .

Mark Allen Rowland, W4UCZ
Box 1, McIntyre, Ga.

Editor, *CQ:*

The USA-CA announced in May 1961 ZERO BIAS, strikes me as a fine idea. I'm certain that it will contribute much to our hobby . . .

W. W. McGrannaham, KØORB
209 W. 47th St.
Kansas City 12, Missouri

Editor, *CQ:*

Congratulations on the announcement of the new USA-CA awards. It is indeed pleasant to see *CQ* take the initiative to promote these awards. Keep up the good work . . .

T. Richard Dunn, W1BPM
Old Blue Pt. Road
West Scarboro, Maine

Editor, *CQ:*

Have read with great interest your USA-CA program and regard it as a classic. Sincere congratulations! You may rest assured that I will participate in this program to its fullest extent.

The Directory of Post Offices as mentioned in ZERO BIAS has already been purchased . . .

Al Bellerose, W1IJB
Suncock, New Hampshire

Editor, *CQ:*

. . . As a CHC member, I am anxious to get started for these awards. Believe I can qualify at least through USA-1500 . . .

Norman L. Maguire, W5NXF
1420 Columbia Drive, N.E.
Alburquerque, New Mexico

Editor, *CQ:*

. . . Already made a check of my confirmations and since I have some 767 counties confirmed, with Alaska as yet uncounted, I am interested in securing one of the earliest possible numbered awards . . .

C. A. Rhines, W7VIV
Box 1025
Elko, Nevada

Editor, *CQ:*

Congratulations on your new award, the USA-CA. Though this award will keep many operators busy for some time, it will prove interesting and informative as to the geographical structure of the United States.

I am sure USA-CA will meet with a great deal of success. Living in a county populated with less than a five finger count of active hams, I am quite anxious to get underway . . .

Bev Cavender, W4CKB
P.O. Box 88, Lake Placid,
Florida, *(Highlands County; Rare for USA-CA)*

Editor, *CQ:*

Very pleased to read of the new USA-CA Awards program. I imagine you will have a lot of response, and I hope to be able to apply for the USA-500 award soon . . .

W. C. Morgan, KØDEQ
P.O. Box 163
Waynesville, Mo.

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

For further information, check number 10, on page 126

Record?

Editor, *CQ:*

We wondered if this may be a record of some sort. On Memorial Day one year ago, on 6 meters, we contacted K5YUG in Victoria, Texas and made a phone patch to his mother-in-law in Arlington Heights, Illinois. This contact lasted 20 minutes. This year on the same day and same band another phone patch was made for K5YUG to Arlington Heights. After some discussion, it was suggested that she come to our QTH in Des Plaines, which she did. This time the total contact lasted for 3 hours and 29 minutes. It would have lasted longer but the YL's ran out of steam. *That in itself is a record.*

Art Housholder, K9TRG
1774 Farwell
Des Plaines, Illinois

One Man's Family . . . .

Editor, *CQ:*

The writer is seldom moved to formally protest published articles dealing with any phase of our wonderful hobby, but Vic Clark's story "One Man's Family of Antennas" (*CQ* March '61) so moves me.

Just what does it prove or contribute to the art? Does the fact that one individual out of many thousands keenly interested in DX has obviously devoted every waking moment and many thousands of dollars to the establishment of a super DX factory, mean that we should all strive to emulate his example? I presume there is a school of thought who so advocate, since Vic mentions five who have done, or are doing so!

W3GRF's accomplishment in topping all U.S. entries in the 1959 *CQ* DX contest is cited as an outstanding accomplishment. Egads, if not an establishment of this magnitude, whom else? And, I am sure the comparison of W3GRF's score (and other national "highs") must be as odious to many others as it is to me. The two *'Big'* DX contests are billed each year as being competitive only between participants in the same general area, where propagation conditions and ability to work multipliers are comparable. Despite this billing, we are snowed each year with noxious accounts of astronomical scores by participants from the Midwest and Eastern seaboard who work Europe, where the bulk of multipliers lies, as easily as we on the western side of the divide work KH6! Set up a contest to see who can pile up the most contacts with VK, ZL, and JA, the only heavily populated (hamwise) countries available to us on an all-band, twenty-four hour a day basis, and see where the big scores come from!

You have undoubtedly drawn the conclusion that I am a jealous, envious or just plain garden variety of sorehead—who has never had access to more than a 50 × 100 foot city lot. Such is not the case. For several years I too was fortunate enough to have a dream location; thirty acres of hilltop, 800′ elevation overlooking San Francisco Bay in a 180° arc and a superlative shot to Europe, Africa and South America as well. It came equipped with four 125′ poles (unguyed being some 4′ base diameter and one foot at the top, no messy guys were needed!) Need more be said about antennae possibilities?

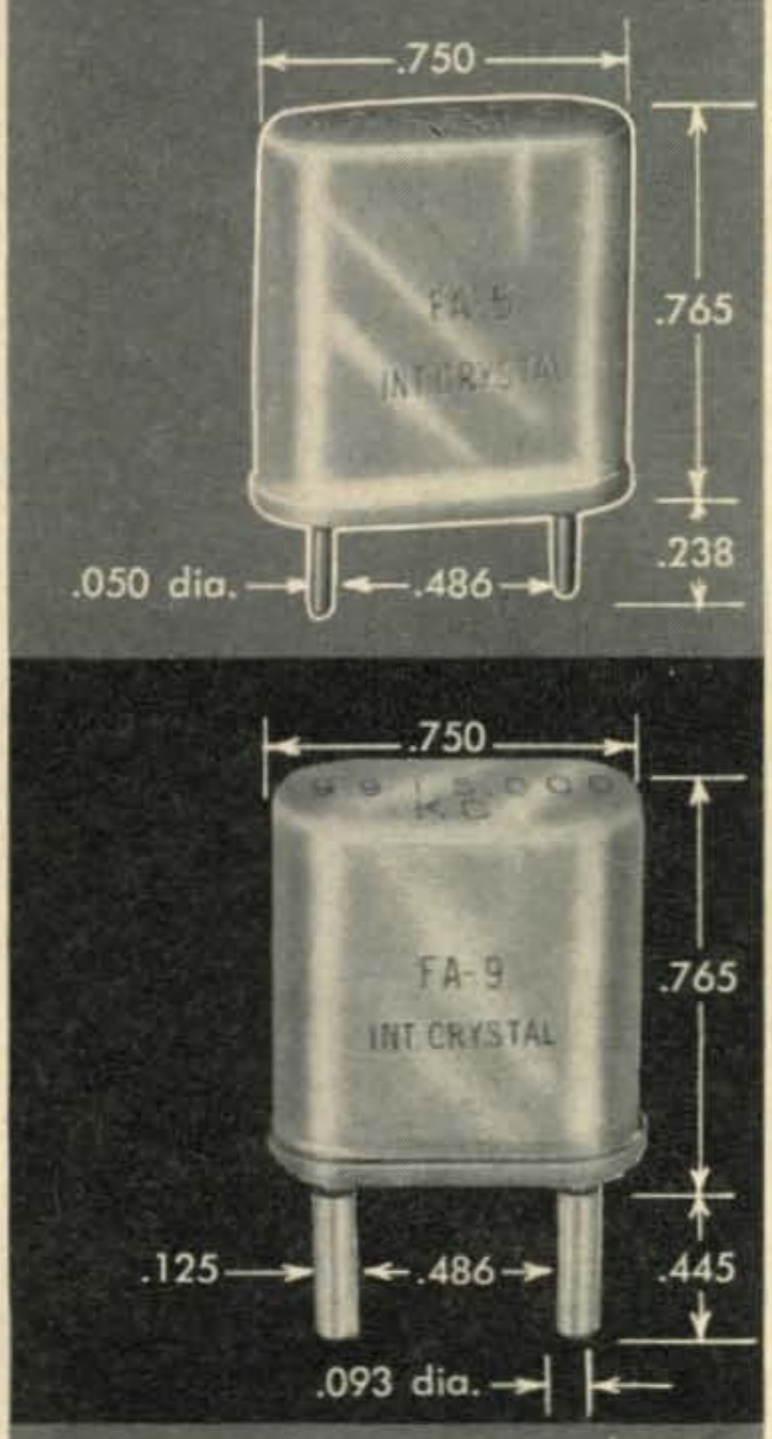
And, if we are to award recognition and acclaim in proportion to the size of antennae farm, I submit that Don Wallace, W6AM, should at least merit honorable mention for his purchase of a former commercial station site of approximately 100 acres, complete with a dozen (more or less) rhombics, sloping Vee's etc. in all directions. No trees to cut down, no road or bridges to build, no wells to dig, etc. etc.

An engineering axiom for our less fortunate brethren, for what little comfort it may afford: "Everything is relative."

Carroll Smith, W6RM
San Francisco 19, Calif.

Amateur Crystals

1000 KC to 137 MC - .01% TOLERANCE



New!
MINIATURIZED
FM-9 SERIES

Wire mounted, plated crystals for use by amateurs and experimenters where tolerances of .01% are permissible and wide-range temperatures are not encountered.

Just any crystal in any oscillator will NOT combine to produce spot frequencies. These crystals are designed to operate into a 32 mmf load on their fundamental between 1000 kc and 15000 kc. Overtone crystals operate at anti-resonance on 3rd mode and series resonance on 5th and 7th mode crystals.

- **HOLDERS:** Metal, hermetically sealed. FA-5 and FA-9 are HC/6U pin type while the FM-9 is an HC/18U pin type.
- **FREQUENCIES** (Specify crystal type and frequency when ordering.)

	FA-5 and FA-9	Price	FM-9	Price
Fundamental	1000 - 1499 kc	$ 5.75	Not available	
	1500 - 1799 kc	$ 4.95	Not available	
	1800 - 1999 kc	$ 4.40	Not available	
	2000 - 9999 kc	$ 3.30	8000 - 9999.999 kc	$ 5.00
	10000 - 14999 kc	$ 4.40	10000 - 15000 kc	$ 5.50
	15000 - 20000 kc	$ 5.50	15001 - 19999.999 kc	$ 6.50
Overtone (3rd)	10 - 14.99 mc	$ 4.40	Not available	
	15 - 29.99 mc	$ 3.30	20 - 39.99 mc	$ 5.00
	30 - 59.99 mc	$ 4.40	40 - 59.99 mc	$ 5.50
Overtone (5th)	60 - 75.99 mc	$ 4.95	60 - 89.99 mc	$ 6.50
	76 - 99.99 mc	$ 7.15	90 - 100 mc	$ 8.50
	Not available		101 - 110 mc	$10.00
Overtone (7th)	100 - 137 mc	$ 9.35	Not available	

Overtone crystals are calibrated on their overtone frequency. They are valuable for receiver-converter applications and are NORMALLY NOT UTILIZED IN TRANSMITTERS, since only a small amount of power is available under stable operating conditions.

- **CALIBRATION TOLERANCE:** ± .01% of nominal at 30° C.
- **TEMPERATURE RANGE:** —40° to + 70° C. ± .01% of frequency at 30° C.
- **DRIVE LEVEL:** Recommended, maximum 3 milliwatts for overtones; up to 80 milliwatts for fundamentals, depending on frequency.

ONE DAY PROCESSING . . .

Orders for less than five crystals will be processed and shipped in one day. Orders received on Monday through Thursdays will be shipped on the day following. Orders received on Friday will be shipped the following Monday.

WRITE FOR 1961 CATALOG FREE!

INTERNATIONAL
CRYSTAL MFG. CO., INC.

18 NORTH LEE • OKLAHOMA CITY, OKLA.

For further information, check number 11, on page 126

Code Practice

Editor, *CQ:*

I am a technician license holder who is trying to bring my code speed up to pass the General class exam. The only good source of c.w. I have are the regular transmissions of W1AW. However, the conduct of other c.w. operators on 80 meters dulls my enthusiasm. Is it necessary for the characters with the bugs, high power, and associated key-clicks to play around 3555 kc when there are plenty of "holes" all over the rest of the band?

Many times my code practice has been interrupted by v.f.o.'s rocking back and forth, some goof-ball sending a series of V's or calling *CQ* at about 50 w.p.m. Seems to me this is done deliberately, since I can usually tune over the rest of the band and find spaces with little activity.

It's almost enough to make me a confirmed v.h.f.'er, but I intend to "stick it out" and get my General ticket.

Charles A. Steinberger, W8LWX
Route 3, Box 299
Urbana, Ohio

National recognition will be given the genius who comes up with a solution to clear code practice frequencies of discourteous operations.—*Ed.*

Phone Patch

Editor, *CQ:*

With reference to my article which appeared in the October 1960 issue of *CQ* entitled "The Electronic Phone Patch". Some fellows have complained of not enough level from the phone line to operate the VOX on their transmitters. The way to cure this is to remove the d.c. blocking capacitors from the phone line, thus allowing the patch itself to hold in the relays at the control office. It is then possible to hang up the phone, thus greatly increasing the level on the phone line. Of course, the patch should be nulled with the phone hung up. This hint may help those who live in an area where phone lines are long and lossy. I am referring to the 0.1 mf capacitors in fig. 1., p. 48.

Cdr. Paul Lee, W3JHR
5209 Bangor Drive
Kensington, Md.

Sun-Spots!

Editor, *CQ:*

I was just looking at the May issue of *CQ*, which contained the fine story on Sunspots, when on page 31 I read "provided that a piece of smoked glass, negative film, or some other suitable ray filter is used to protect the eye from serious damage by the sun's rays."

Everybody in childhood goes through the stage of burning leaves, sticks, etc., by focussing the rays of the sun through a magnifying glass. The lens is efficient enough that it concentrates the sunlight into such a small spot that the temperature can be raised to kindling. This optical system is just like the one in your eye—it too has a lens, which focusses the incoming rays of light onto the retina, and when a small object is looked at, the focussing is done onto the part of the retina called the fovea, which area is reserved for the central, or most critical, vision. Now, when one looks at the sun *without adequate* protection, the sunlight too is focussed onto the fovea, and will generate enough heat to damage that part of the retina, and many times actually burns a tiny circular hole in the retina. If this hole was anyplace but centrally, it would be considerably less serious, and even non-consequential but by virtue of being right where the best vision is, it leaves a blank area in the central field of vision, which is permanent.

So—the public must constantly be warned about this danger. Perhaps it is because I just have taken my examination for my General license, and was struck anew by the number of young boys who were taking it. A lot of readers of *CQ* will have their interest stirred up by the Sun, and some are bound to try and see for themselves what Sunspots look like, and if they are not careful, some will end up with eye damage.

Bennett W. Muir, M.D., KØEZH
3705 E. Colfax Avenue
Denver 6, Colorado

NEW for Mobile...

autowhip TM-5

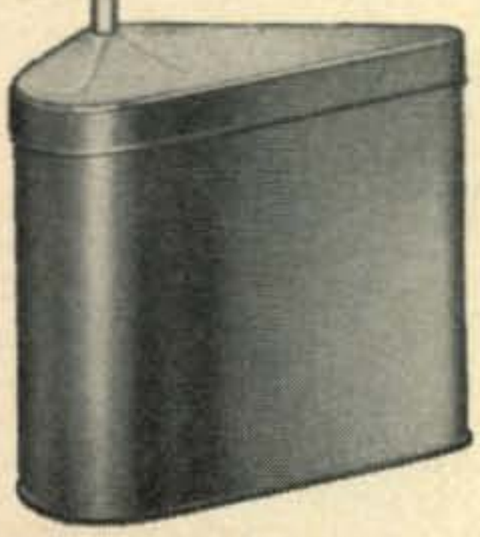
for 10·15·20·40·80

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

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

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

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



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

Amateur Net $69.95

Mosley Electronics, Inc.

4610 N. LINDBERGH BLVD. BRIDGETON, MISSOURI

WEST COAST BRANCH
1406-08 South Grand Avenue
Los Angeles 15, California

INTERNATIONAL DIVISION
15 Moore Street
New York 4, New York

For further information, check number 13, on page 126

Reward

W9KCB's mobile installation was sacked on May 1st and the following equipment was stolen: A Gonset Model 3136, CD 6 Meter Communicator; Astatic mike, M-101; an aluminum transmitter rack and various crystals. A reward is offered leading to the return of the equipment. W9KCB is Allan Lurie and the address is 605 E. Armstrong Ave., Peoria, Ill.

Mississippi

The Biloxi Amateur Radio Club Inc., at P.O. Box 1574, Biloxi, Mississippi will hold their 4th Annual Hamfest at the Beach Community House, July 1st and 2nd. There will be prizes and all the shrimp you can eat for $1.00. More details may be obtained by writing to the above address.

Kentucky

The Noble Park Community Center in Paducah, Kentucky will be the meeting place for the annual hamfest July 9th sponsored by the Paducah A.R.C. More information may be had by writing to P.O. Box 361, Paducah, Kentucky.

Wyoming Hamfest

The annual Wyoming Hamfest will be held Saturday and Sunday, July 22 and 23, in the Big Horn Mountains at Deer Haven Lodge, 40 miles East of Worland, Wyoming on U. S. Highway 16, sponsored by the hams of the Big Horn Basin. Plenty of cabins and campgrounds are available in the area. A full program of banquet, contests, transmitter hunts and prizes. An unexcelled opportunity to see deer, elk, bear and other wild life in their natural habitat. For further information contact the Hamfest Committee, 433 Arapahoe, Thermopolis, Wyo.

Oklahoma

The Third Annual Beaver's Bend Hamfest will be held at Beaver's Bend State Park, Okla. on August 19 and 20. Plenty of prizes and food. Call or write Charles Free, K5DLO for information and preregistration.

Illinois

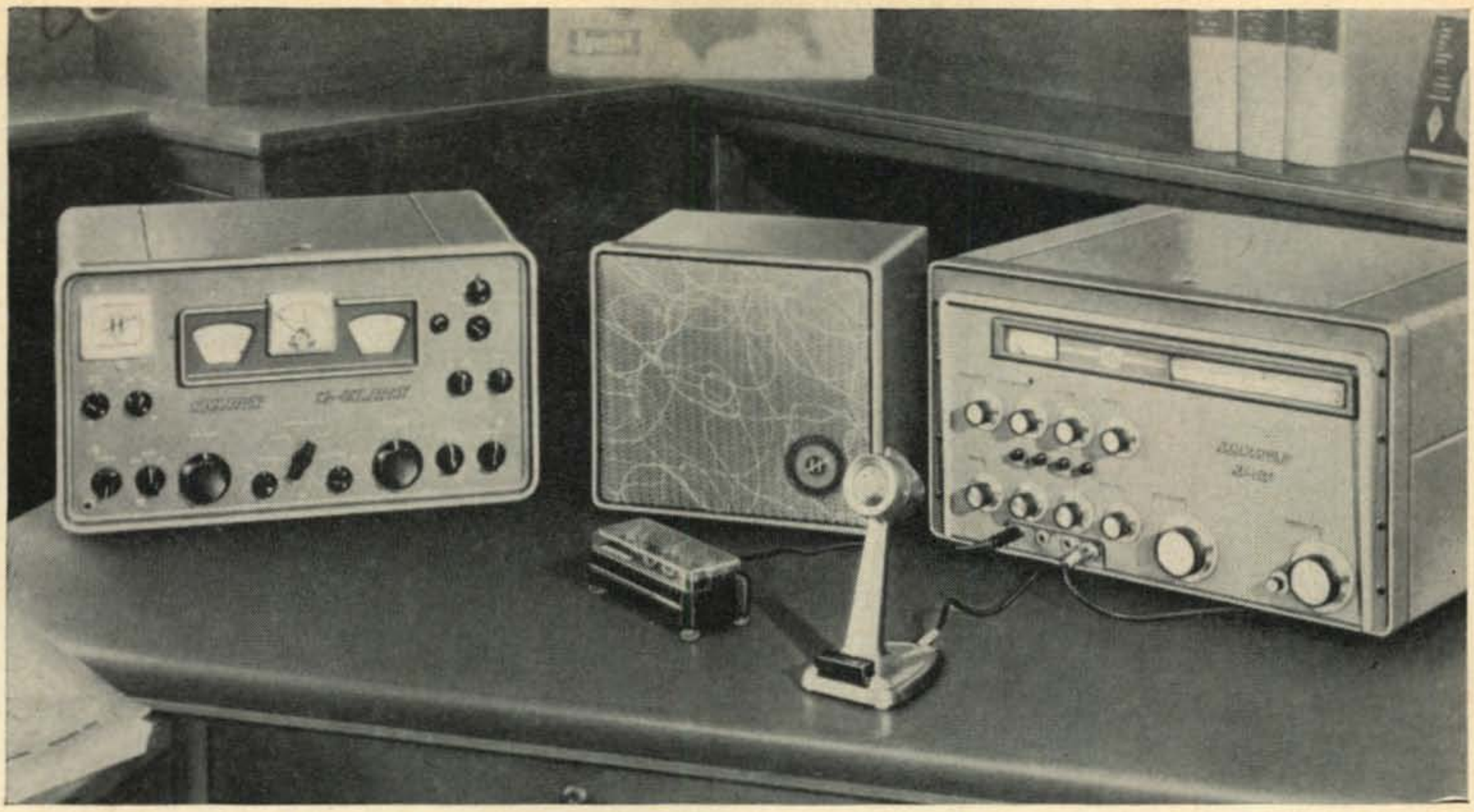
The Quad-Co Radio Club will sponsor the fourth annual hamfest of the Breakfast Club on Sunday, July 30, at Terry Park near Palmyra. The Illinois Emergency Net will hold a meeting, and all other groups are invited to meet at the hamfest, giving prior notice to the hamfest committee. Bring your own basket lunch. Sandwiches and soft drinks available on the grounds. Bring your swap gear. Registration is $1.00 in advance, or $1.50 at the gate. For tickets write to "Hamfest" c/o Bob Clark, K9BTL, 350 E. Prairie, Waverly, Illinois.

Indiana

The 13th Annual V.H.F. Picnic sponsored by the Wabash Valley Amateur Radio Association will be held on Sunday, July 30, 1961, at Turkey Run State Park, about 40 miles north of Terre Haute near Highway 41. This is an outdoor affair, and if you do not care to bring your own basket lunch, food is available at the Park Hotel and Restaurant. Further information is available from Ken Mier, K9EFO, 2446 Cleveland Avenue, Terre Haute, Indiana.

Joint W/K—VE

The 27th Annual Glacier Waterton International Peace Park Hamfest will take place at the Waterton Lakes National Park, Alberta, Canada on July 22 and 23. This year, the VE6's are handling the entire program. As an added incentive for both northwestern W and VE amateurs, the committee promises a special prize for the 1000th amateur that registers. Dave Forster, VE6FF is Secretary-Treasurer this year and will be pleased to send additional info. He can be found at P.O. Box 424, Lethbridge, Alberta, Canada.



HAMMARLUND SUMMER SPECIALS!

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

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

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

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

HX-500 SSB Transmitter .....reg. $695.00
HQ-180 General Coverage SSB Receiver .....reg. 429.00
S-200 Matched Speaker .....reg. 19.95

$1143.95 Value ONLY $999.50

SAVE $144.45

COOL DEALS

HX-500 SSB Transmitter .....reg. $695.00
HQ-170 Ham Band SSB Receiver .....reg. 359.00
S-200 Matched Speaker .....reg. 19.95

$1073.95 Value ONLY $965.00

SAVE $108.95

HAMMARLUND
MANUFACTURING COMPANY, INC.,
an affiliate of Telechrome
460 West 34th Street, New York 1, N.Y.

Established 1910

For further information, check number 7, on page 126

OOT

The Old Old Timers Club, founded in 1947 is now offering a certificate for working specified number of club members. Earl C. Williams, W2EG is secretary treasurer of the club and full information for the award may be obtained from him, or through the *Directory of Certificates* published by K6BX. Earl's address is 507 Wayside Rd., Neptune, New Jersey.

Maryland

The Amateur Radio Club Associated of the Greater Baltimore Area invites everyone to attend their Surfside Hamfest on July 8, starting at 10 A.M. The place is Kurty's Pleasure Beach, near Pasadena, Maryland. Activities will include, prizes, contests, auctions, swimming, softball, etc. Food will be available on the beach if you don't want to bring your own picnic. Complete details and tickets are available from K3IEV, 2300 Rockwell Avenue, Balt. 28, Maryland.

California Certificate

The Porterville, California Amateur Radio Club has come up with an unusual type of contest, designed to help the city publicize its Centennial Celebration. The members of the P.A.R.C. are QSL-ing 100% during the Centennial Celebration, which began February 4, 1961, and which will continue through November 11, 1961. A special Centennial QSL card has been printed for use by all members of the club. It will have the call letters of the individual amateur in a box in the center of the card. Any amateur who works three members of the P.A.R.C., or two members and the club station, during the duration of the Centennial will be issued a special Porterville Centennial Certificate if he sends in three QSL cards (either Centennial or regular type) to WA6EKP, Porterville Amateur Radio Club, 601 North Main Street, Porterville, California.

Maryland

The Maryland Emergency Phone Net will hold its annual picnic at Braddock Heights, Maryland on July 23rd. Braddock Heights is located approximately four miles west of Frederick, Md. on Alt. US 40. The registration fee will be $1.00, which includes soft drink tickets for the family. The Picnic portable station will be on 3820 kc along with 2 and 6 meters for the benefit of mobiles.

Kentucky

The Louisville Area Radio Council will hold their Hamfest and Picnic/Auction, Sunday, August 6th, starting at 9 A.M. at Cherokee Park, in Louisville. Good fun is expected by all. Lew Lingham, Route 3, Box 451, Anchorage, Kentucky will fill you in on particulars.

Warren, Ohio

The Fourth Annual Hamfest and family picnic of the Warren A.R.A., will be held on Saturday, August 26, at Main Shelterhouse Packard Park, Warren, Ohio. Many fine prizes, auctions and "talk-in stations" will be available for mobileers. Registration is $1.50 and Imogene Kalman, KN8VIQ will be happy to handle the tickets. The QTH is 112 Shirley Lane, N.W., Warren, Ohio.

WIMU

The Wyoming-Idaho-Montana-Utah 29th Annual Hamfest will take place August 4-5-6 at Macks Inn, Idaho. Many events of interest for OM's YL's and XYL's will be on the program. Lodging and camp grounds are available. John Swenson, W7VNO of Logan, Utah is Secretary of the club and will fill in all the incidentals.

Corrections

The diagrams of fig. 1 and 2 were inadvertently interchanged in the article "Improving The Heath AR-3" which appeared on page 41 of the June issue of *CQ*. Our apologies.

W6BLZ's article, "Another Keying System" indicated three footnotes. These footnotes were omitted and are as follows:

[1] Marriner, E. H., "6AS7 Vacuum Tube Keyer," *CQ*, May, 1949, p. 40.

[2] Marriner, E. H., "Semi-sequential V.T. Keying With One Power Supply," *CQ*, June, 1958, p. 48.

[3] Marriner, E. H., "Semi-Break-In With Vacuum Tube Keying," *CQ*, Nov., 1959, p. 78.

MASTER MOBILE-TOPS IN QUALITY & PERFORMANCE

NEW DELUXE HI-"Q" COILS

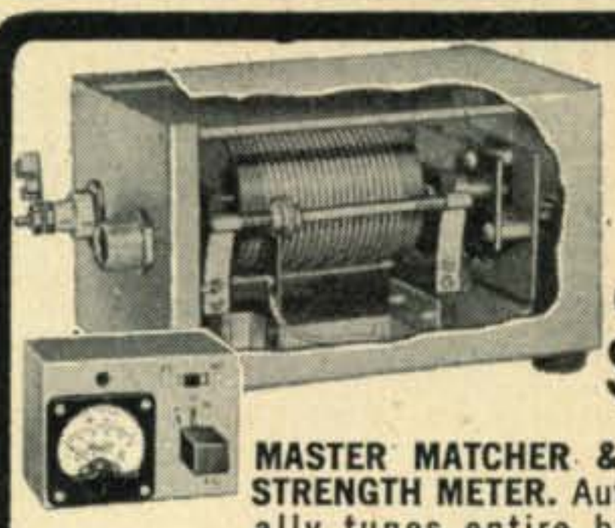
New wide space deluxe antenna coil. Greater efficiency on individ. bands. Easily handles 750 W. P.E.P. Lightest coil of its kind commercially available. Use with 36" base sect. 60" whip.

15M	$ 5.95
20M	6.95
40M	7.95
75M	9.95
160M	14.95

FIBRE-GLAS ANTENNA

The Feather-Weight with Spring-Steel Strength. Completely weatherproof. Fibre-glas covering, minimizes electrostatic noises generated by heat, moisture and foreign particles in the air.

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

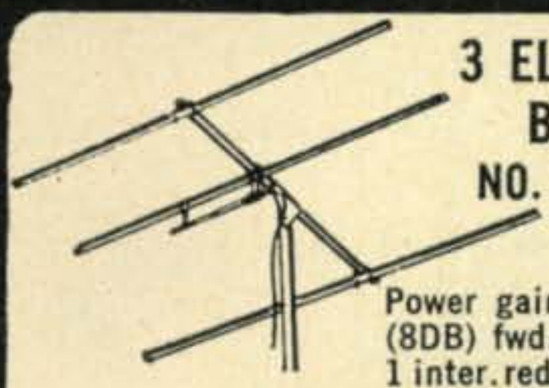


6 or 12 volt models

Complete $24.95

MASTER MATCHER & FIELD STRENGTH METER. Automatically tunes entire band by remote control.

3 ELEMENT BEAM NO. SR-500



Power gain app. 2½ (8DB) fwd. dir. 10 to 1 inter. red. from sides & rear VSWR-1 1-1 at band center when fed with 52 OHM coax.

SR-500-10 $24.95 SR-500-6 $12.95
SR-500-11 24.95 SR-500-2 10.95

MASTER-MAGIC TUNABLE WAND

New! easy-to-install, single band, top-loaded, plastic covered fiber-glas antenna. Maximum performance on the desired band.

10 Met.- 5 Ft. L $8.95
11 Met.- 5 Ft. L. 8.95
15 Met.- 5 Ft. L. 8.95
20 Met.- 5 Ft. L. 8.95
40 Met.- 6 Ft. L. 9.95
80 Met.- 6 Ft. L. 9.95

MULTI-BAND COILS

New plug-in type, operates with std. 3' base, 5' whip. Q of 525. 500 W input. Oper. with 52 ohm cable. Factory pre-tuned.

No. 900-10,15,20,40,75M
No. 999-10,15,20M
No. SSB-156-40, 75M

YOUR CHOICE $14.95

NEW! SLIM-JIM

ALL-BAND BASE LOADING ANTENNA COIL

96" WHIP

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

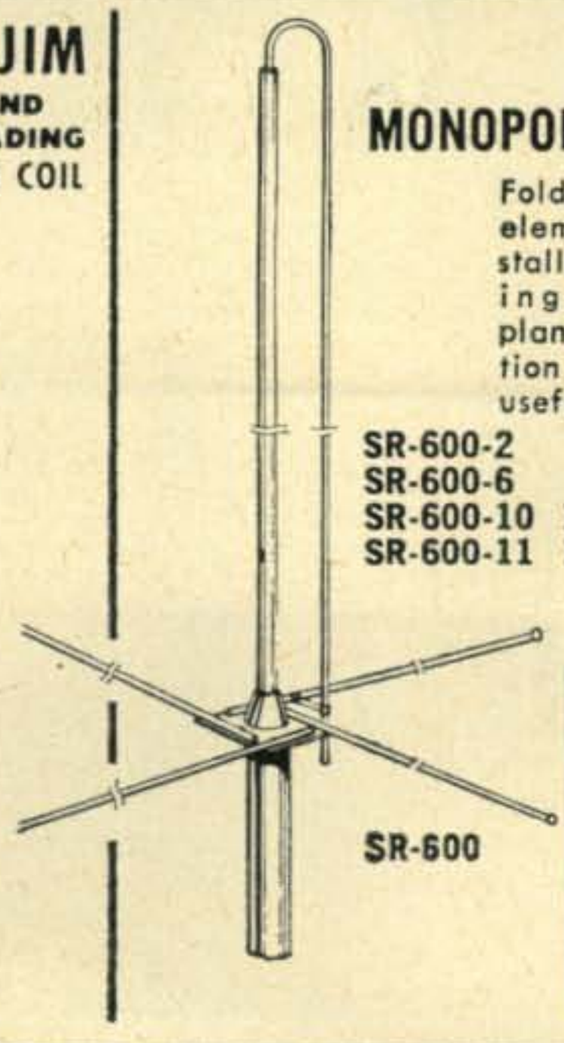
SIZE 1⅜" x 19"

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

NO. B-1080

$17.95

MONOPOLE ANTENNA



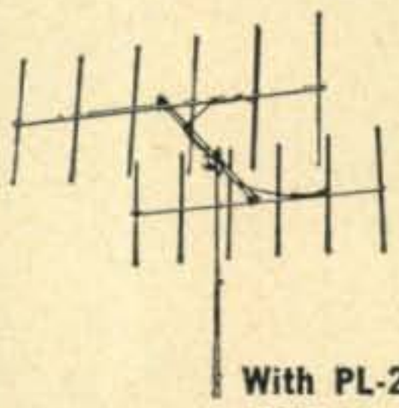
Folded radiating element for installation requiring a ground plane configuration and a wider useful range.

SR-600-2	2 Met.	$14.95
SR-600-6	6 Met.	16.95
SR-600-10	10 Met.	24.50
SR-600-11	11 Met.	24.50

SR-600

WRITE FOR FREE CATALOG

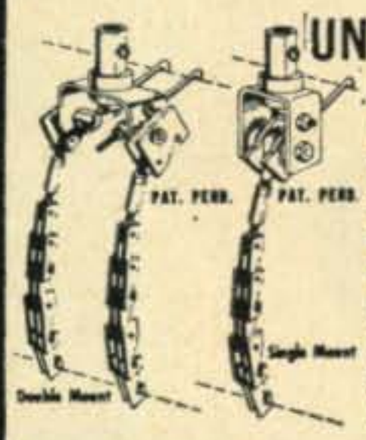
TWIN 6 - 2 METER BEAM



May be rotated by TV rotor. Complete with baluns, match. harness to 52 ohm. Vertical or horiz. pol. Trem. forward gain. Excell. front to back ratio. Lightweight, sturdy.

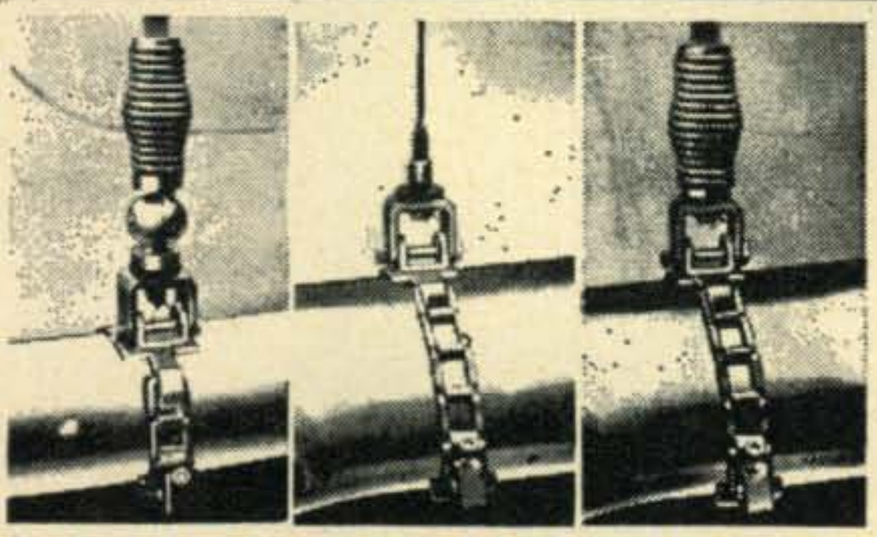
With PL-259 COAX $16.95

UNIVERSAL MOUNTS



Heavy duty comm. ant. mts. Can be attached through opening as small as 3/16". For spring or whip. Pheno insulators. ⅜"-24 th.

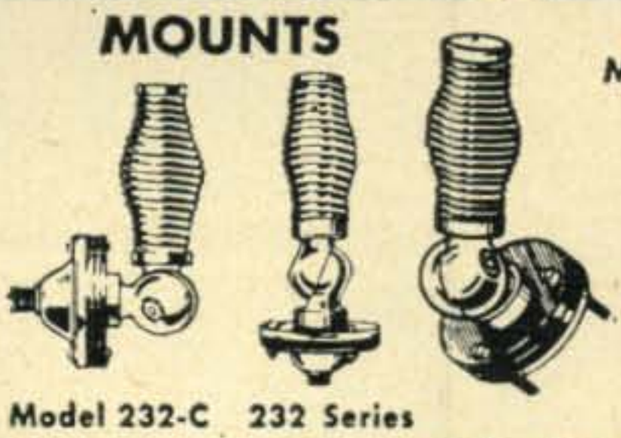
530 Double SS. $21.95
531 Single SS. 11.95
520 Db. S-Cad. Pl. 7.95
519 Sl. S-Cad. Pl. 4.95



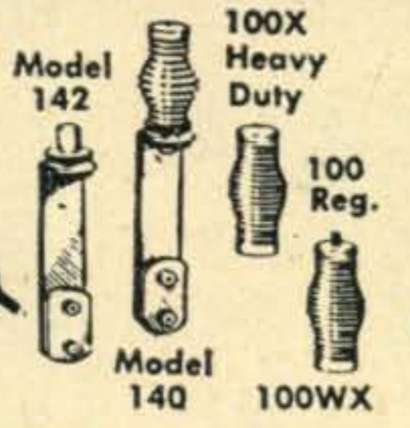
No.444 $17.80 No.445 $7.95 No.446 $13.45

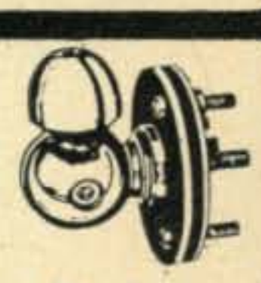
Adjustable to any bumper. No holes to drill.

MOUNTS



Model 232-C 232 Series





No. J-11 Swivel Mount Fits all antennas ⅜"-24th. $2.95

232X	Base Mount—H.D.—Dble. Tpred. Spring—Swivel Base	$ 9.85
232XC	Base Mount—H.D.—Dble. Tpred. Spring—Coax, Conn.....	9.85
232XSSC	Base Mount—H.D.—D. Tpd. Sg.—Sp. Sless—Coax Conn.	14.95
232XSS	Base Mount—H.D.—Dble. Tpd. Spg.—Spec. Stainless....	14.95
321 or 321C	Base Mount—Where no spg. des.—w. sp. rig. type ball jt.	7.95

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

EIA ELECTRONIC INDUSTRIES ASSOCIATION EST 1924

Master Mobile Mounts, Inc.

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

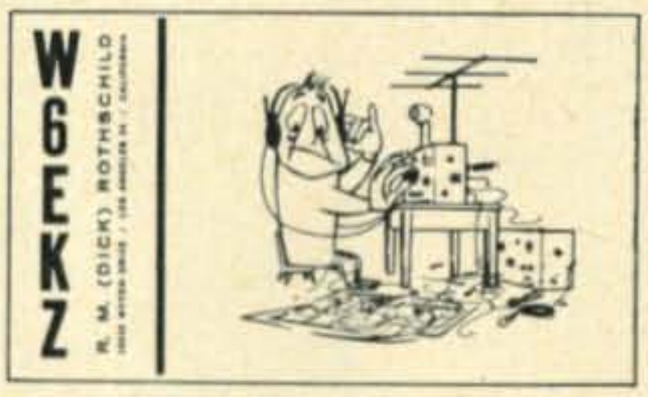
AT LEADING RADIO JOBBERS EVERYWHERE

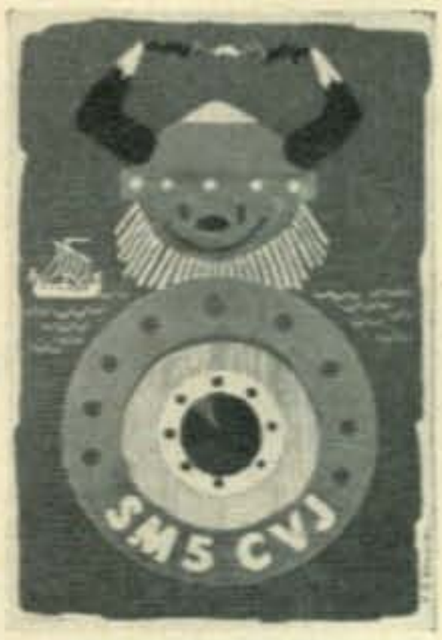
For further information, check number 17, on page 126

QSL contest

The winning QSL for July comes from the "Mummy Mountain Boys" at K7LJA. The card is a beautiful full color affair of very generous proportions (6" × 9") showing the special building, operating positions and antenna farm of the "Mummy Mountain Radio Club" of Scottsdale, Arizona. A free years sub to the boys at K7 *Little Johnny Appleseed*.

Runners Up





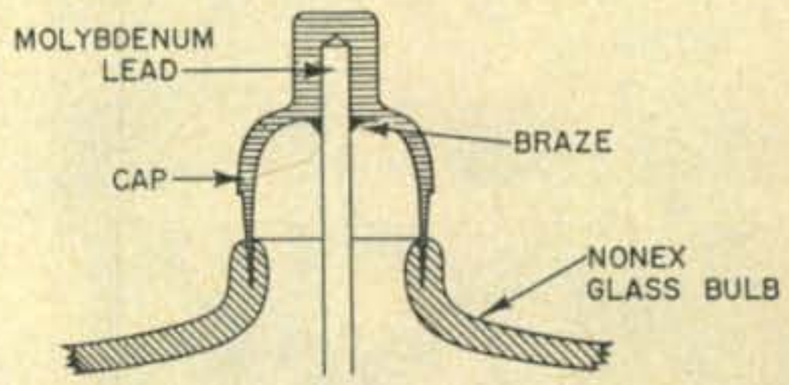
Made For Each Other . . .
Rugged Penta Power Triodes and Grounded-Grid Operation !

Here are two Penta power triodes designed specifically for grounded-grid operation. No more makeshifts! These long-lasting tubes will make a kilowatt rig out of a 100-watt-class exciter. Perfect for both SSB and CW. Superior design eliminates the need for neutralization!

PL-6569 – 250-watts plate dissipation, high mu (45). With a power gain of 10 or more, this tube gives you more than 800 watts output with only 75 watts drive. Low plate-to-filament capacitance (0.10uuf) gives you high stability.

PL-6580 – 400-watts plate dissipation, high mu (45). More conservative than the PL-6569. Useful in linear amplification of AM signals where carrier efficiency is low, and extra plate dissipation is needed.

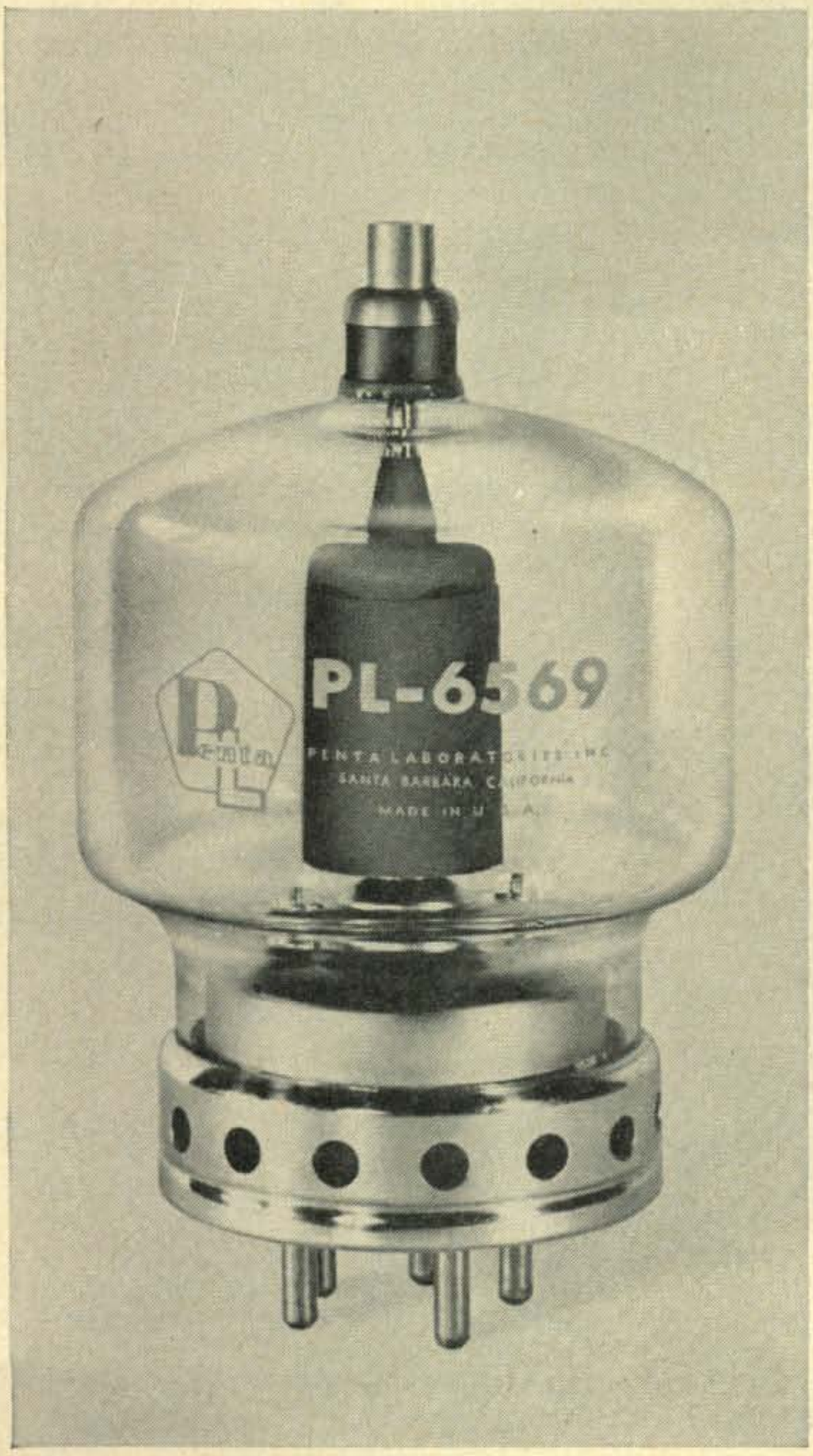
WRITE FOR TECHNICAL DATA – Literature gives ratings, operating conditions, suggested circuits and SSB data.

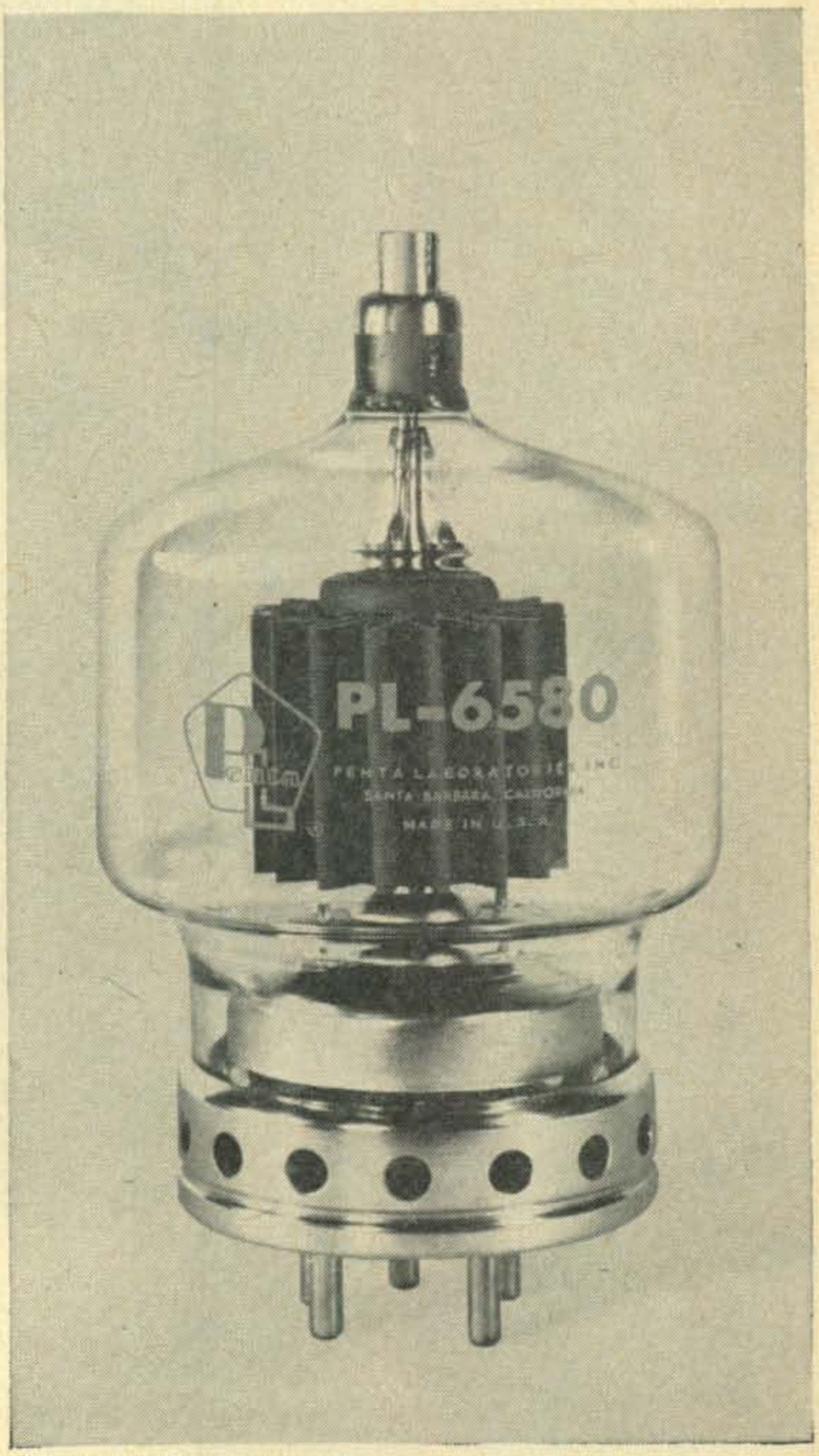


EXTRA-RUGGED PLATE CAP – Penta has designed both these tubes with a one-piece low-loss plate cap and seal which can't break off. There are no set screws or separate pieces to become loose.

PENTA LABORATORIES, INC.
312 North Nopal St., Santa Barbara, California

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





For further information, check number 19, on page 126

"INVADER"

EXTENSIVELY FIELD

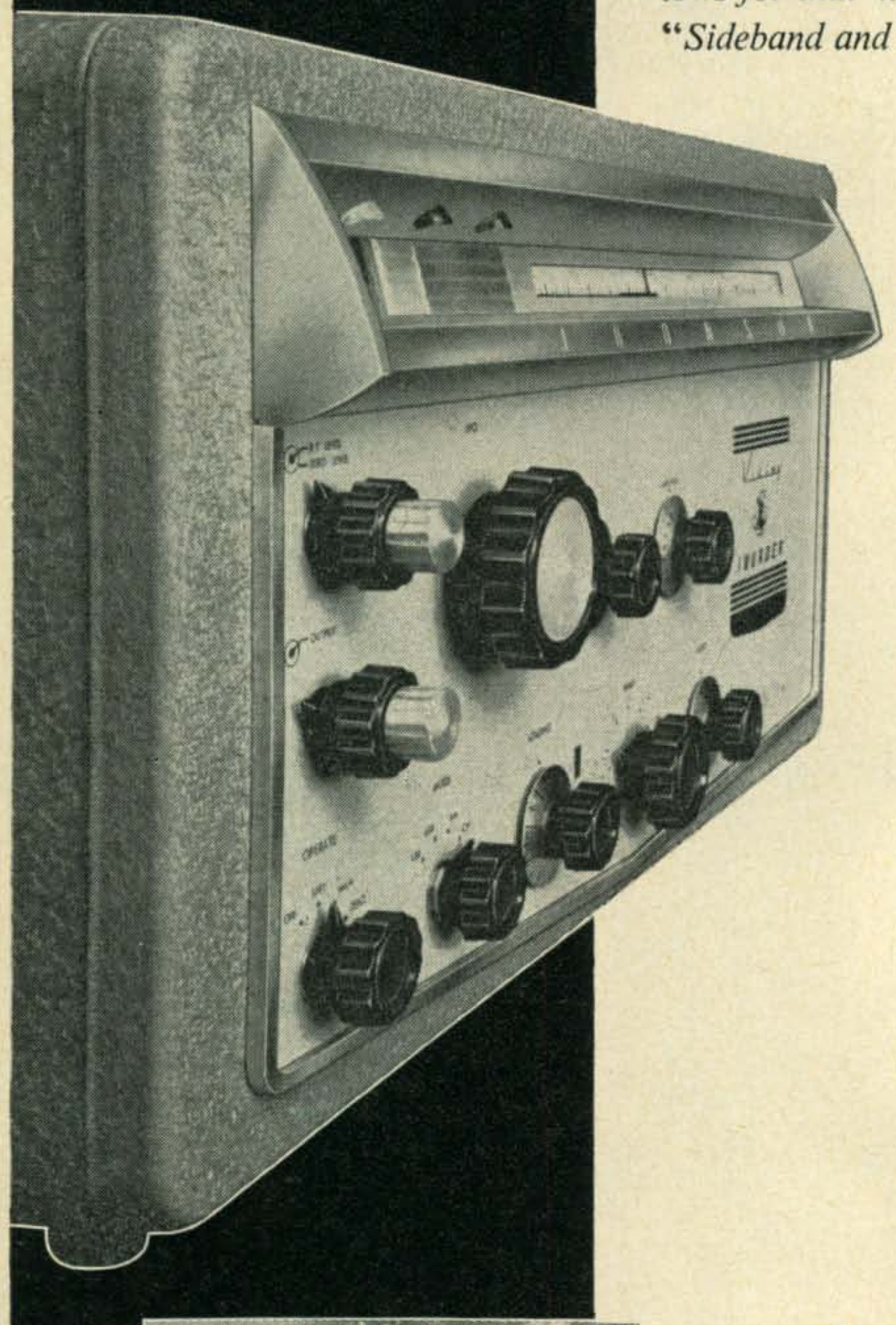
here are typical reports:

"Sideband never sounded so good!"

"Excellent penetration and an outstanding signal!"

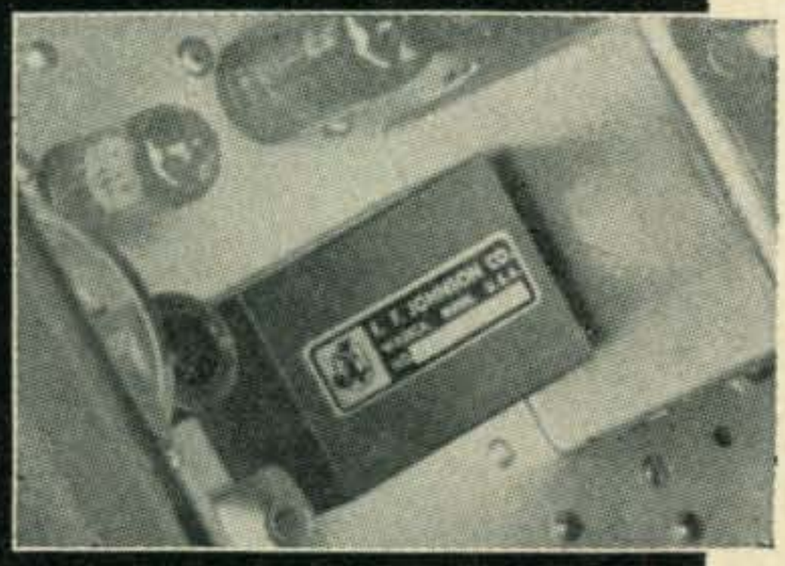
"Full-fidelity voice reproduction—picks up the lows for that 'natural' sound for the first time!"

"Sideband and carrier suppression is tops!"



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

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



superior to phasing-type units . . . obsoletes all other filter types!

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

the finest SSB signal on the air!

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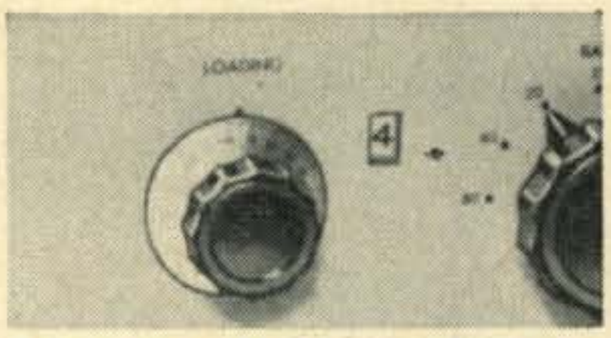

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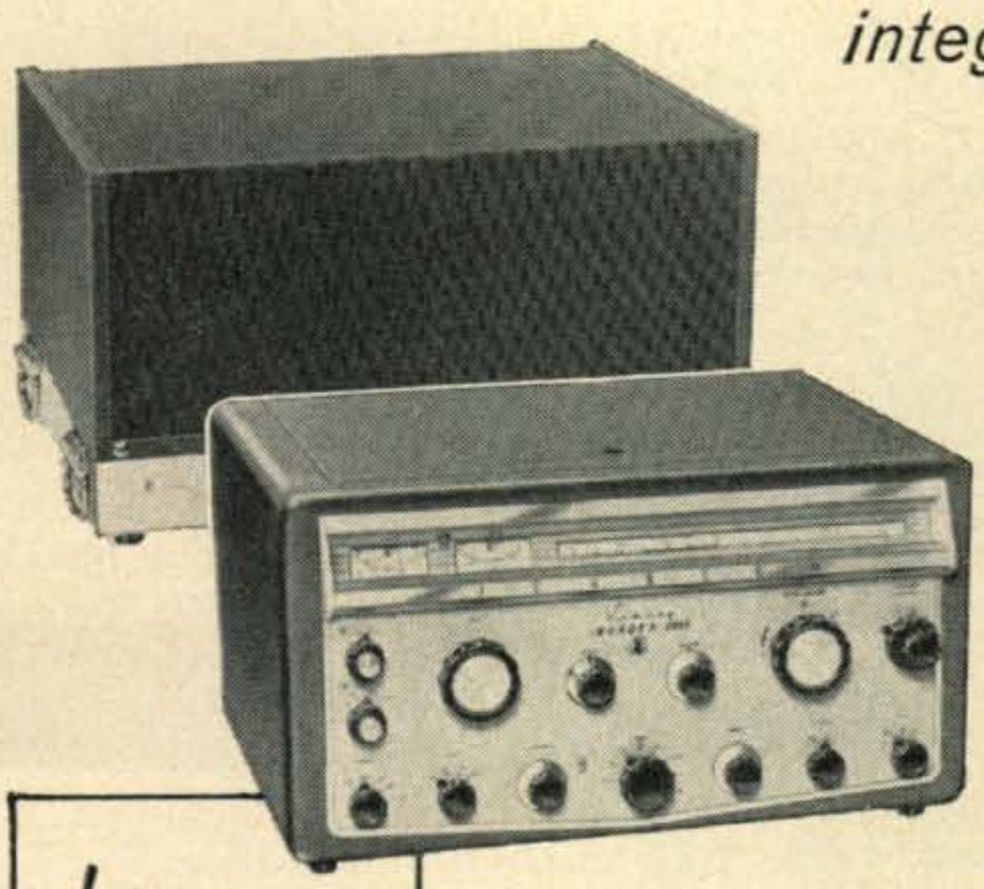

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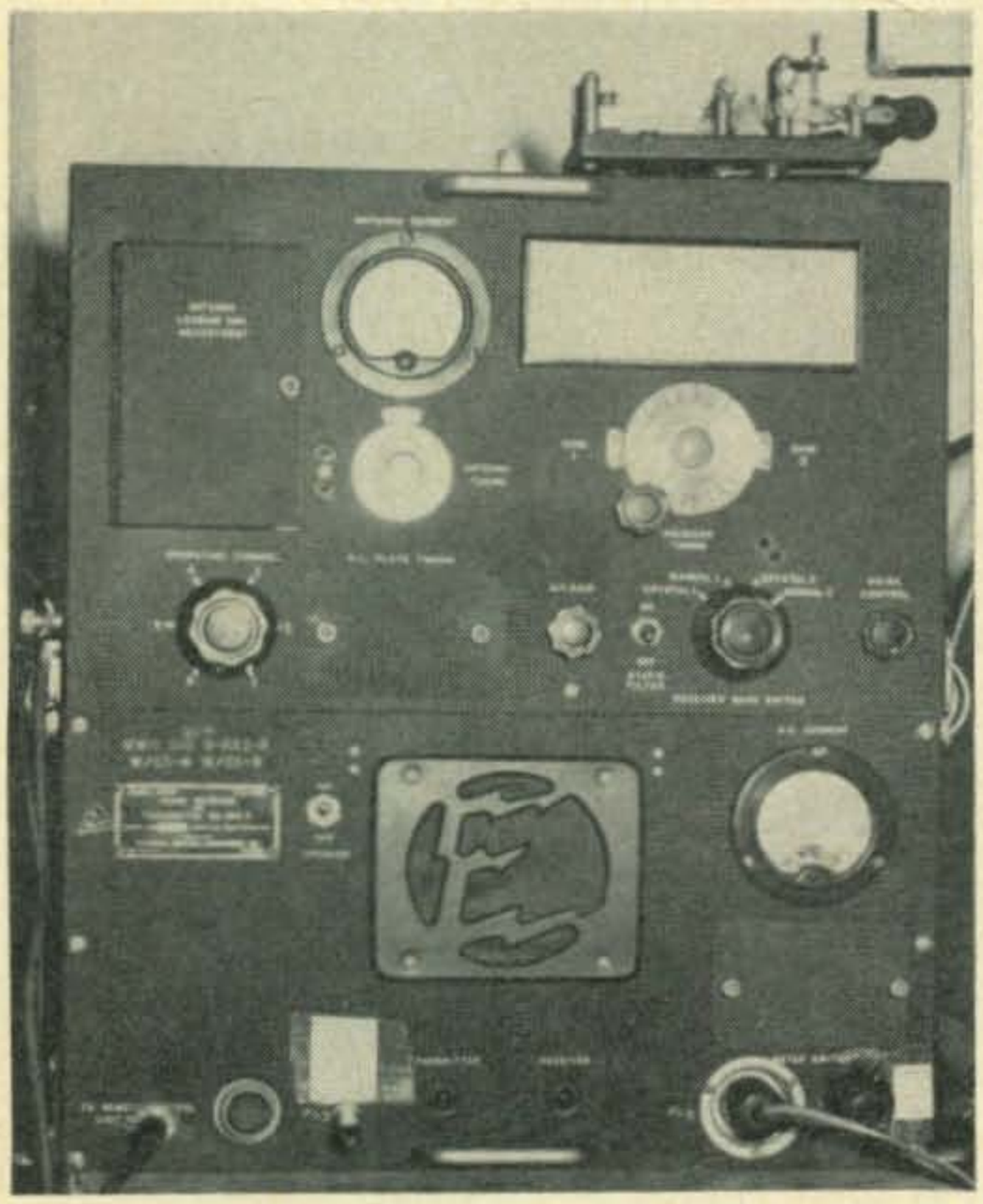
OPERATION REBUILD:

THE BC-669

Frank A. Mohler, W2IAZ
187 Broad Street
Eatontown, New Jersey

A complete course in radio fundamentals should include lessons on antennas, receivers, transmitters, and power supplies. In "Operation Rebuild", Novice operator WV2FDZ, in preparation for his General exam, takes a "blitz" course in radio fundamentals in the process of rebuilding a BC-669, to provide snappy break-in c.w. operation, ultra-smooth QSY, and single-control push-to-talk phone operation.

IF Shakespeare had been a radio amateur, he might have originated the oft' heard expression, "To build, or not to build . . . that is the question." To the Novice, or other amateur who is faced with the problem of building or buying his station equipment, this question may seem as though it has no completely satisfactory answer. After listening to the pros and cons on this argument, the average ham will probably agree that there are as many good reasons for building as there are for buying. Whatever choice he makes will depend upon how much he is influenced by such factors as economy, pride in appearance, operating convenience, pride in accomplishment, and superior design.



Front view of the BC-669. The upper deck contains the transmitter and receiver and the lower deck houses the modulator and speaker. An outboard power supply, described on page 28, must be added.

As a compromise solution to obtain station equipment which offers most of these advantages, I suggest *rebuilding* surplus gear similar to the BC-669. The BC-669 is a well-designed Marine/Mobile radiotelephone Transmitter/Receiver which can be obtained for less than $30. In my opinion, this is one of the best buys that has come over the surplus horizon since surplus sales became a national pastime. With a minimum of effort on the part of the rebuilder, the BC-669 will provide operating convenience which is almost impossible to beat; namely, single control push-to-talk phone operation, the snappiest break-in c.w. operation you'll ever see, and instantaneous QSY to any one of six pretuned frequencies.

In spite of its low price (I think somebody goofed), the BC-669 is a man-sized hunk of gear. It comes equipped with handles so that two men and a boy (the boy is needed for carrying the separate power supply) can move this versatile station outdoors for operation from a field day location, boat, or summer patio. Because the transmitter is crystal controlled and can be

operated at a cool 75 watts input, the rig makes an ideal Novice station. For hams other than Novices, the BC-669 can be operated at 100 watts input and makes a dandy second station for net operation or local round-table ragchews when higher power is a dead waste. In an emergency, when your full, or half-gallon rig springs a leak, you can still cover several hundred miles with this rig which runs at 1/10th of a gallon. Pretty good mileage, wot?

Evaluation Check

When the BC-669 was unpacked and set up on the work bench, an evaluation check was made to determine what it was designed to do, what was needed to make it do it, and what could be done to improve it. Here's the list:

1. It can receive and transmit phone signals only.
2. The operating frequency range is 1600-4500 kc.
3. It permits instantaneous QSY to any of six pretuned crystal frequencies.
4. The receiver may be either crystal controlled or continuously tuned over 2 bands.
5. It needs a power supply, a carbon microphone, and a whip antenna to bring it to life.
6. It can be improved by modifying the:
   a. *antenna system* to allow use of more efficient antenna.
   b. *receiver* to permit reception of c.w. and s.s.b.
   c. *transmitter* to provide a choice of c.w. or phone.
   d. *modulator* to permit use of a dynamic or crystal mike.

The discerning reader will note that all the major components of practically every radio station are listed here for construction or modification. This fact gave the OM an idea. Why not let the junior operator, WV2FDZ, who was studying for his General license exam, do the actual rebuilding and let experience do the teaching? And so "Operation Rebuild" was born.

Plan of Attack

The OM and the JO (junior operator) held a briefing in the war room (basement workshop), and it was agreed that Phase I, the construction of the power supply, would be the first step in our plan of attack. The other phases, involving improvements to the antenna, modulator, receiver, and transmitter could be accomplished in any order. These phases, like mopping-up operations, would depend upon the successful completion of Phase I. After completing Phase I and applying power to the set, the need for the other phases would be more apparent.

Detailed plans for each phase of "Operation Rebuild" were laid out by the OM. The actual rebuilding was performed by the 16 year-old JO. Because the JO was studying radio theory in preparation for his General license exam, practical experience in circuit tracing and rebuilding was combined with a course on radio theory fundamentals. During each phase of operations, the JO was encouraged to ask questions whenever some point was not understood. Some of the more significant questions which were asked are sprinkled throughout this article in bold-face type. For those of you who may be studying for your General class license exam, or could use a refresher course in radio theory fundamentals, the answers are listed at the end of this article.

Description of the BC-669

In any military operation, it's standard operating procedure to become familiar with the features of the terrain before mounting an attack. In the same way, before assaulting the BC-669 with flame thrower and machine gun, oops, I mean, soldering gun and drill, it's a good idea to become familiar with the arrangement and location of the various components.

The entire unit, with the exception of the power supply, is contained within a sturdy metal cabinet measuring 1¾' by 1½' by 1'. This is about the same size as two HQ-170's stacked one on top of the other. The power supply is constructed on a separate chassis and delivers the required voltages through a six-conductor power cable. After the power supply is hooked up to the unit, the BC-669 is ready to go on radiotelephone by merely plugging in a push-to-talk carbon mike and connecting a short wire to the antenna binding post.

A pair of snap clamps on each side of the cabinet permit the upper half of the cabinet to be separated from the lower half. This double deck arrangement greatly facilitates the rebuilding operations. The oscillator and power amplifier stages of the transmitter and the seven-tube superheterodyne receiver occupy the upper deck and the speech amplifier, modulator, and loudspeaker are mounted on the lower deck. As shown in the block diagram, fig. 1, the receiver

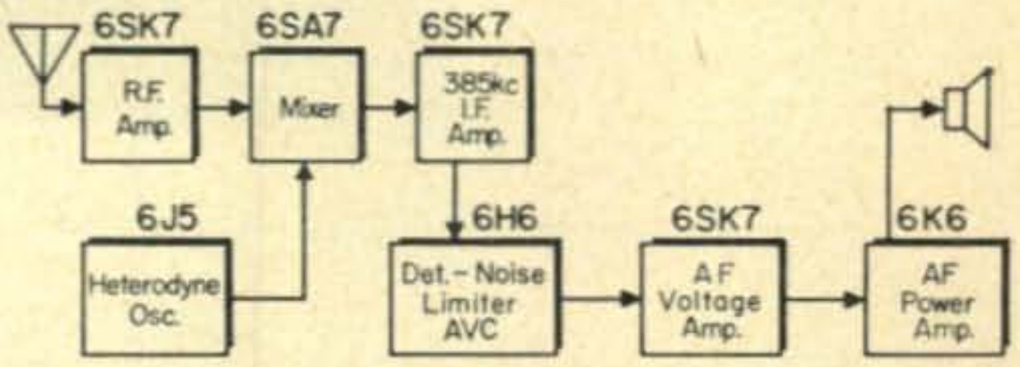


Fig. 1—Block diagram of the receiver portion of the BC-669.

incorporates one stage of r.f. amplification, a separate mixer and high frequency oscillator, one stage of 385 kc i.f. amplification, a noise limiter, and a diode detector followed by two stages of audio amplification.

The local oscillator of the receiver may be tuned continuously over 2 bands or crystal controlled on one of 6 frequencies. (Controlled by the transmitter frequency selector switch) The receiver bandswitch therefore has 4 positions, Crystal 1, Manual 1, Crystal 2, Manual 2.

The transmitter, fig. 2 uses a 6L6 Pierce oscillator circuit which incorporates a six-position crystal selector switch. The oscillator drives the final stage consisting of parallel 807's. The

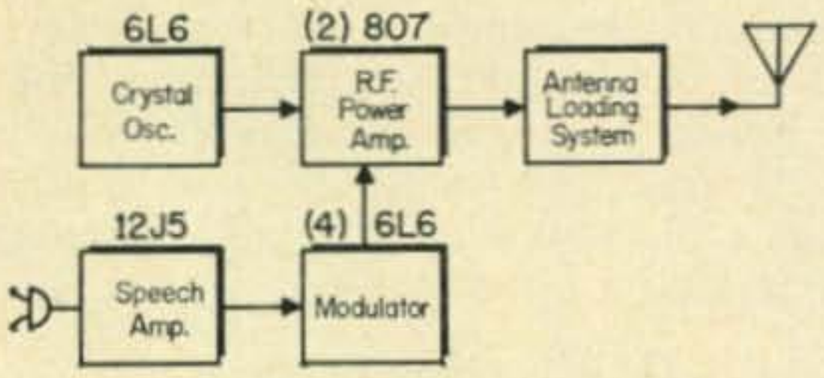


Fig. 2—Block diagram of the transmitter section of the BC-669.

transmitter output circuit is designed to feed a whip or short wire antenna. Pretuned adjustments are provided to permit split-second QSY to any one of six crystal-controlled frequencies by merely flipping an OPERATION CHANNEL switch.

A carbon mike feeds a 12J5 speech amplifier, which in turn drives the four 6L6 modulator tubes hooked up in push-pull parallel.

1. ***Question:*** **What is the difference between a volume control and a gain control, or are they just different names for the same thing?**

[*Answers to Questions on page 33*]

Power Supply

The BC-699 will operate from any power supply which can deliver the following voltages: 12.6 volts at 5 amperes for the tube filaments, 250 volts d.c. at 100 ma for the receiver plate supply, 400 to 500 volts d.c. at 300 ma for the transmitter plate supply, and 115 volts a.c. for the TRANSMIT-RECEIVE relay.

2. ***Question:*** **Why is the filament voltage called the "A" supply?**

The power supply which supplies all of the needed voltages was constructed on a metal chassis measuring about 12" by 8" by 2". Actually two separate power supplies were built on the same chassis; a low voltage unit for the receiver, and a high voltage unit for the transmitter. The schematic diagram of this dual power supply is shown in fig. 3.

3. ***Question:*** **Why is polarity important when wiring in the electrolytic capacitors but is not important when using oil filled capacitors?**

Conventional circuitry found in any handbook is used, including capacitive input filtering, to provide adequate elimination of hum in both receiver and transmitter power supply units.

4. ***Question:*** **Since most of the tubes are 6 volt type, why must the power supply deliver 12.6 volts for the filaments?**

Control Circuits

The ON-OFF switch on the power supply chassis turns the receiver on and applies filament voltage to the transmitter. The STANDBY-ON switch on the power supply permits the transmitter high voltage to be turned off during prolonged listening periods, or when making adjustments inside the transmitter. This STANDBY-ON switch can be used as a manual TRANSMIT-RECEIVE (T-R) control during phone operation if the microphone is not equipped with a push-to-talk (p.t.t.) switch. Normally, automatic T-R control is performed by the p.t.t. microphone switch. Closing the microphone switch energizes the d.c. relay RY_2. When energized, relay RY_2 applies 115 volts a.c. to the T-R relay RY_1 which then performs three functions: the antenna is automatically switched from the receiver to the transmitter, the transmitter is activated by the closing of the r.f. cathode line, and the receiver is instantly desensitized.

During p.t.t. phone operation, the high voltage is applied to the modulator tubes through a set of relay contacts on relay RY_2. These contacts were originally used to control the sidetone circuit but since sidetone is about as useful as an 8 handled broom, the removal of this feature introduced no hardship. Simply disconnect the blue lead and the green (shielded) lead on relay RY_2 and connect a pair of leads from these relay contacts to pin 7 of the power input socket and the high voltage line which normally would be connected to pin 7. Figure 4 shows the connec-

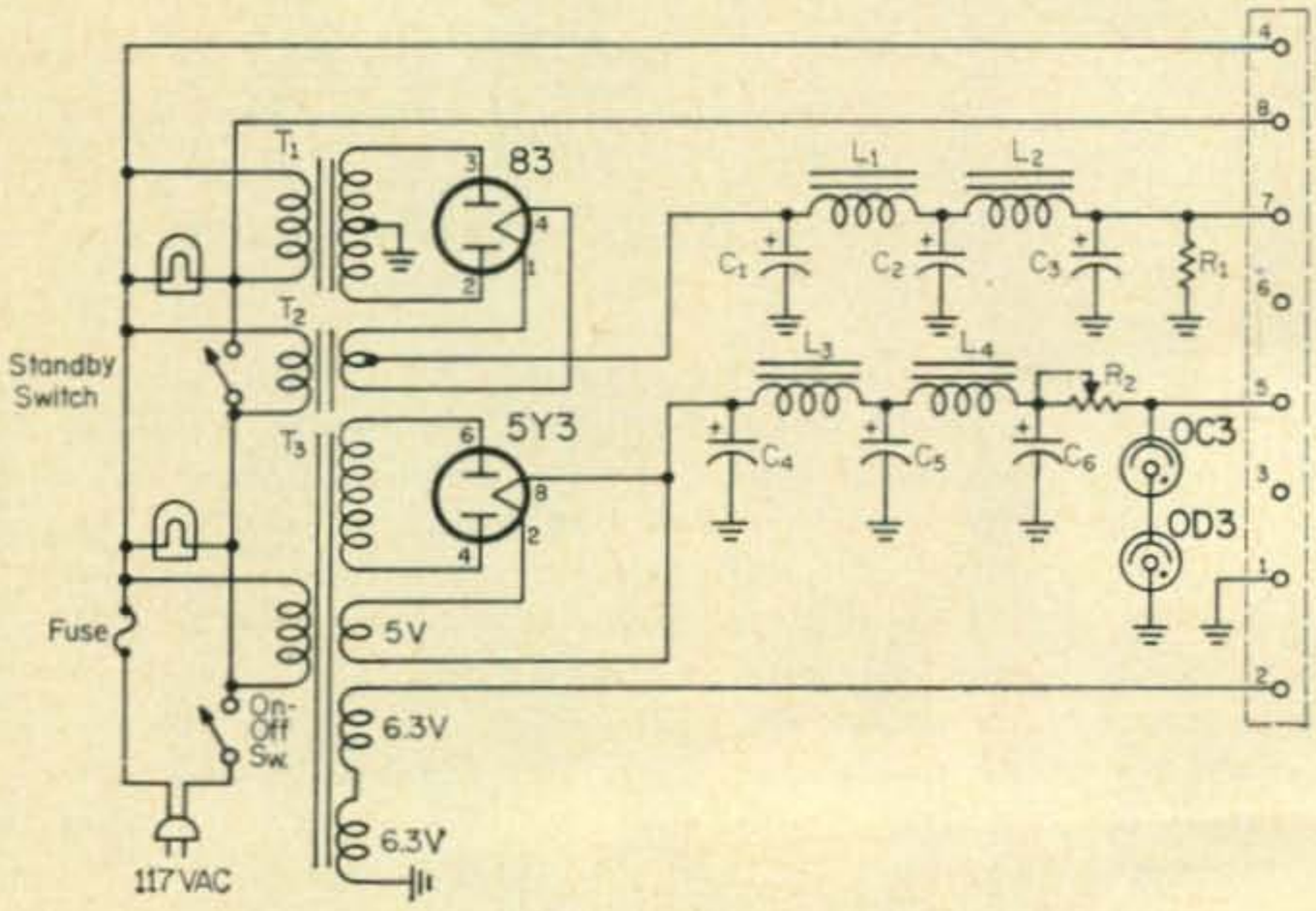


Fig. 3—Diagram of a suitable power supply to be used with the BC-669. The original unit was used as a marine/mobile installation and was powered by a dynamotor.

C_1—2 mf, 1,000 v.
C_2—4 mf, 1,000 v.
C_3—4 mf, 1,000 v.
C_4, C_5, C_6—10 mf, 450 v.
L_1—5/25 h, 300 ma.
L_2—8 h, 300 ma.
L_3—15 h, 100 ma.
L_4—15 h, 100 ma.

tions to relay RY_2. When relay RY_2 is de-energized by releasing the push-to-talk mike switch, the modulator high voltage is automatically removed.

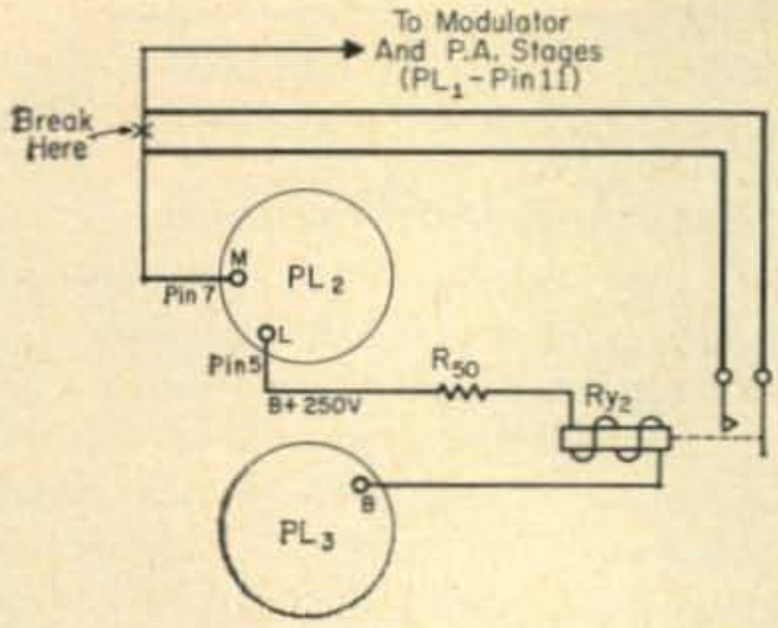


Fig. 4—Connections made to provide push-to-talk operation. The first set of wires on R_2, (sidetone) are removed and a new set of wires are inserted in series with the +B line. See fig. 5 for socket connections.

Power Cable Connections

To connect the voltages to the unit, it was first necessary to remove the odd-ball multi-pin power input socket (lower right corner of panel) and replace it with a common octal socket. The octal socket and the associated power cable were then wired as shown in fig. 5. If your BC-669 is

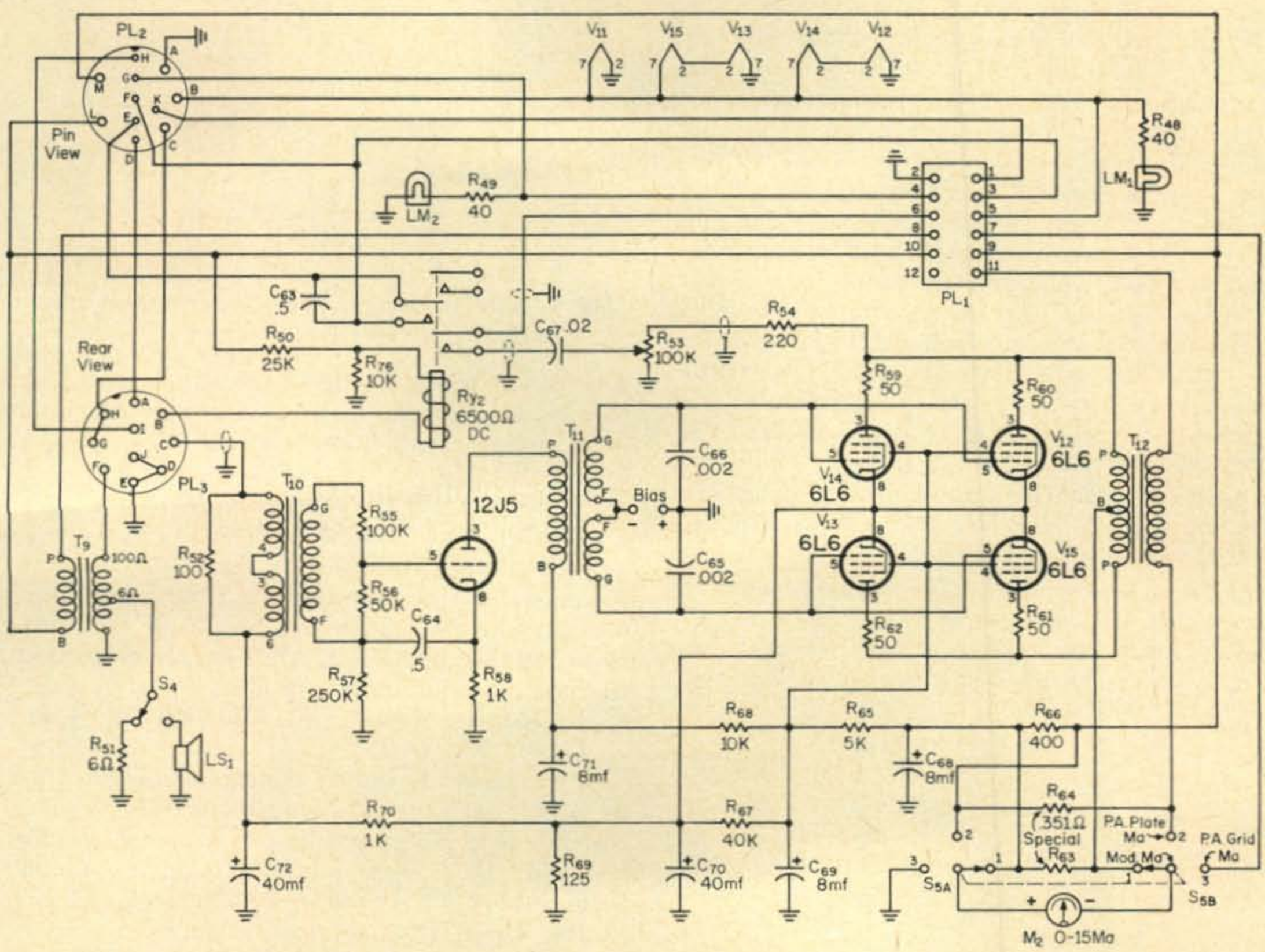
	⏚	12V AC	NC	115V AC	250V DC	NC	500V DC	115V AC
Octal Socket	1	2	3	4	5	6	7	8
Original PL-2 Socket	A	B+G	—	E	L	—	M	K

Fig. 5—The original input power connector is removed and replaced with an octal socket. The connection interchange is shown in the chart above.

"bugfree," that is, no defective tubes or components, the receiver should come to life as soon as the power cable is connected and the ON-OFF switch turned on.

Temporary Carbon Microphone Connections

To save time in testing out transmitter operation, an ordinary carbon mike jack (ring-tip-sleeve) was temporarily installed on the lower left corner of the panel. Short jumper wires were used to connect the ring, tip, and sleeve terminals of the microphone jack to the appropriate B(red), C(shielded), and D(black) leads on the multi-pin socket PL_3 located about one inch away. These jumpered connections are shown in fig. 6. When you are ready to make the change from carbon mike to dynamic or crystal mike, the carbon mike jack can be removed and a mike jack to fit your favorite microphone can be mounted in the same spot.



Modulator circuit prior to modification. A speech amplifier (fig. 7) is added to permit the use of a low level microphone.

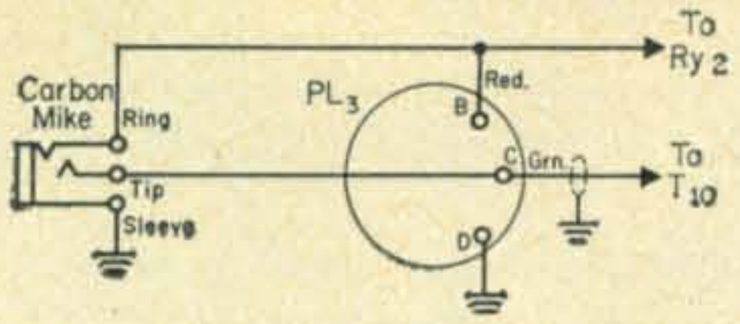


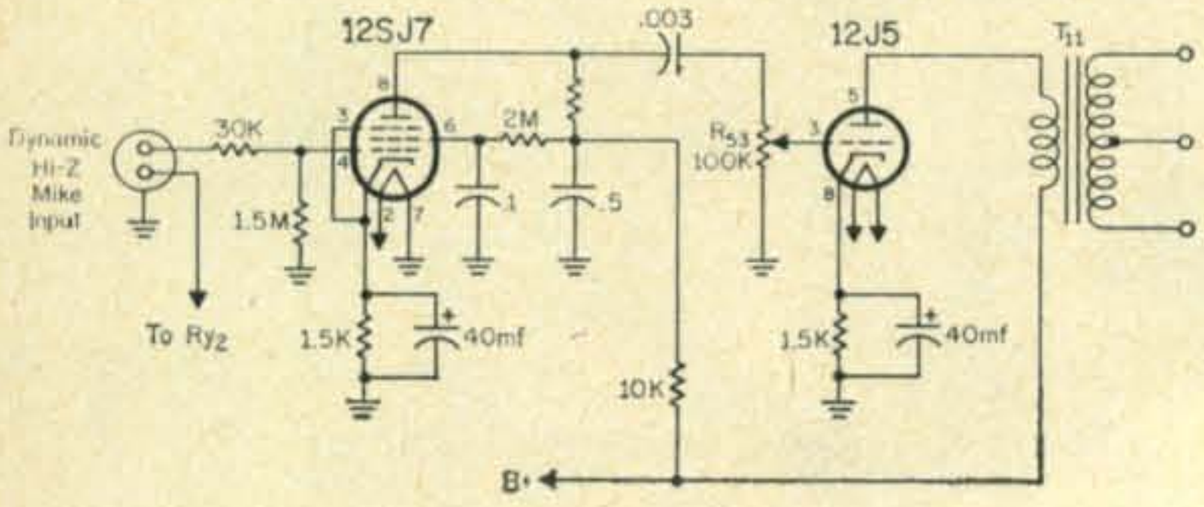
Fig. 6—To temporarily test the unit with a carbon mike a three circuit jack is installed and wired as shown.

Modulator and Speech Amplifier Improvements

When the power was first applied to the transmitter, the static modulator plate current zoomed up past the 300 ma mark on the meter. To reduce this heavy drain on the power supply, which was groaning under the load like a cub scout with his overnight camping gear, a 22.5 volt bias battery was inserted in the grid circuit of the modulator stage. This was accomplished by opening the lead connecting the center-tap of the driver transformer T_{11} to ground. A black insulated wire from C minus of the bias battery, was connected to the center-tap and a red insulated lead from C plus of the battery was connected to the chassis ground connection. With this fixed bias class AB system, static modulator current stays around 10 ma and shoots up to 150 ma on voice peaks for 100 percent modulation. To achieve 100 percent modulation it was necessary to increase the screen voltage on the modulator tubes to 250 volts by shunting the screen resistor with a 10K 5 watt resistor.

The above rearrangements upset the rather complicated system used to derive the carbon mike voltage. Since it was necessary to modify the mike circuit anyway, the entire speech amplifier circuit was rewired to include a resistance coupled 12SJ7. The circuit is shown in fig. 7 and provides plenty of gain for either crystal or high impedance dynamic microphone. The socket for the spare filter unit (located on the lower deck next to the SIDETONE VOLUME control) was removed and replaced by an octal socket. The 12J5 tube was plugged into this socket and wired up as the intermediate audio amplifier stage. The sidetone volume control, R_{53} was rewired to

Fig. 7—Speech amplifier added to the existing 6L6 modulator. The sidetone pot., R_{53}, is used as the volume control for the speech amplifier. See text for full modification.



operate in the grid circuit of the 12J5 where it controls the volume of the speech amplifier. The 12SJ7 preamplifier tube was then plugged into the socket originally used by the 12J5, and the socket wiring was changed accordingly. The carbon mike jack was removed and a shielded 2-pin type mike jack was installed in its place.

Antenna Modifications

The BC-669 incorporates an adjustable antenna loading coil which is designed to load up any random length of wire less than a quarter wavelength. This is fine for mobile or marine use where the antenna length must, for practical purposes, be short. For more efficient operation, a regular doublet antenna using coaxial cable transmission line can be used. To simplify connection to the coax transmission line, a regular SO-239 coax fitting was installed at the top center of the transmitter in place of the original antenna binding post.

The loading coil L_4 was entirely shorted out of the circuit by placing the sliding taps (one for each of the six pretuned channels) as far up on the coil as they can be pushed. These sliding taps on the loading coil are accessible through the door on the upper left of the panel. The sliding taps on the lower end of the plate coil L_3 were used to match the low impedance of the coaxial line. For 50-ohm coaxial line, the proper impedance tap for the 75 meter band was found to be about the second turn from the grounded end.

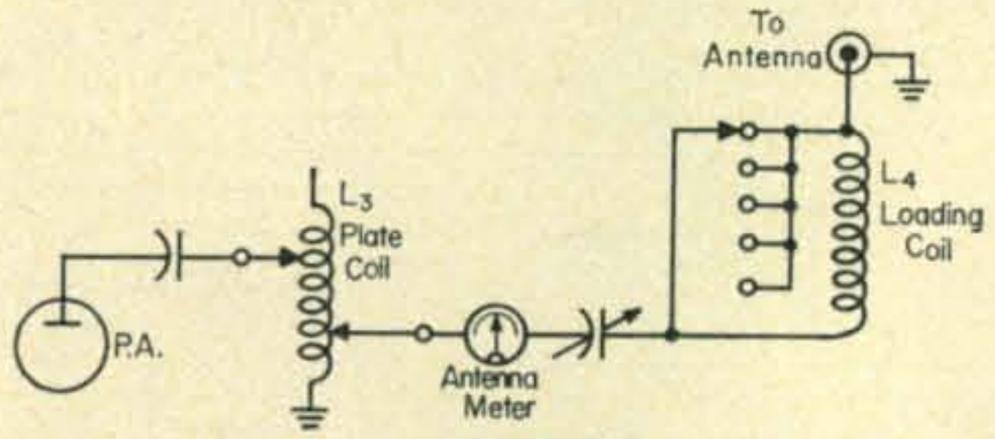


Fig. 8—Antenna loading modifications made to the BC-669 using 50 ohm coaxial transmission line.

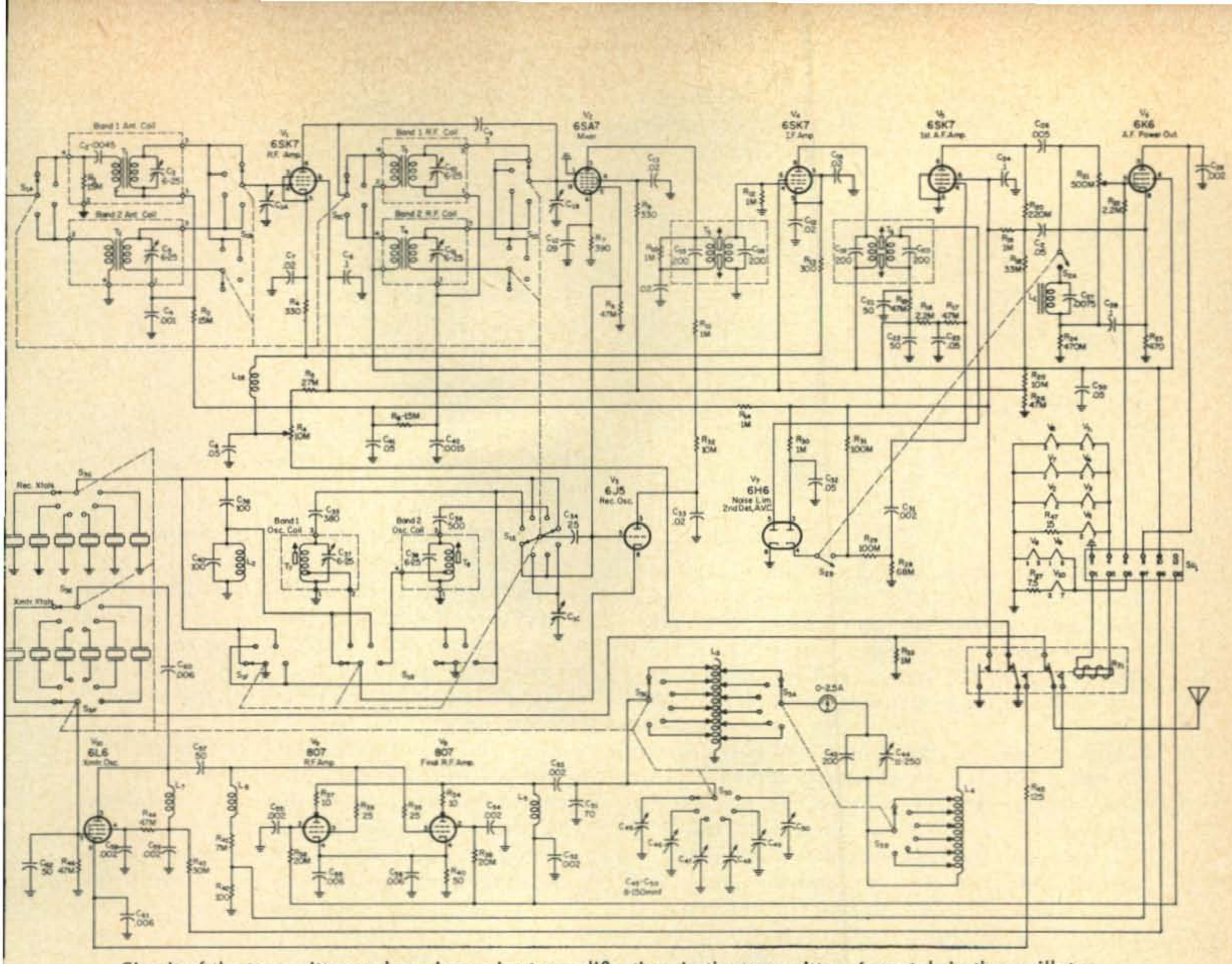
The sketch in fig. 8 shows the arrangement to modify the antenna loading system for coupling to a coaxial transmission line.

Modifying the Receiver for c.w. Reception

Because my model of the BC-669 was designed for radiotelephone use only, both the receiver and the transmitter had to be modified to permit c.w. operation. All the receiver needed was the installation of a b.f.o.

5. *Question:* What's this Bee-Eff-Oh Jazz, Dad?

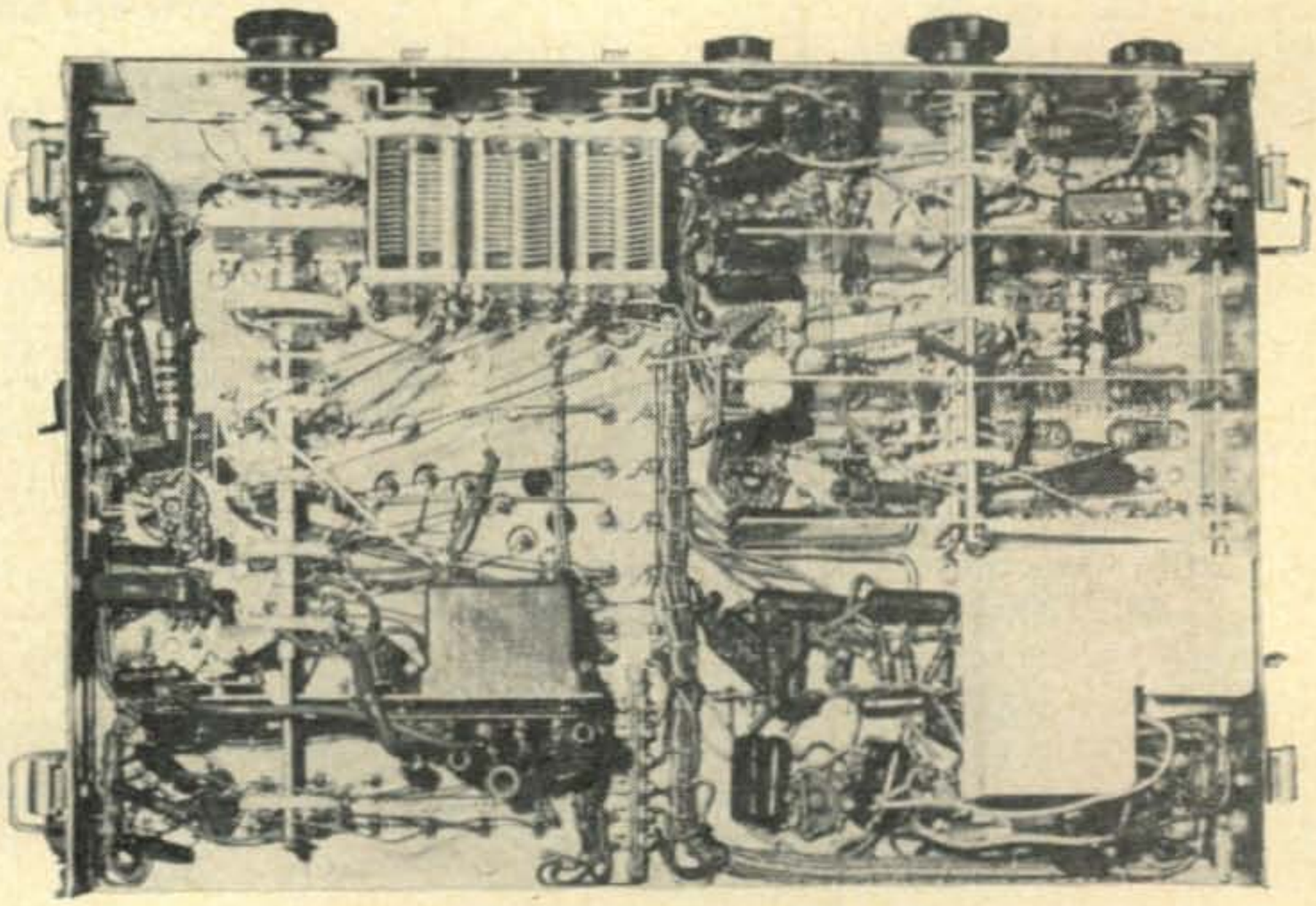
A surplus b.f.o. unit designed for use with the BC-342 receiver was obtained. This b.f.o. unit consists of a 455 kc oscillator circuit compactly installed (6C5 tube and all) in an aluminum L-shaped box measuring approximately $2 \times 2 \times 3$ inches. The external controls on the b.f.o. consist of an ON-OFF toggle switch, PITCH control knob, and screwdriver-adjusted tuning capacitor. To get the b.f.o. percolating requires only the appli-



Circuit of the transmitter and receiver prior to modification. In the transmitter, 6 crystals in the oscillator permit instant QSY. The final and antenna tuning circuits are pretuned and selected by the same switch. The receiver is a 2 band job of conventional design with no provisions for c.w. reception. The receiver may also be crystal controlled as explained in the text.

cation of B plus (150 to 200 volts) and filament voltage (6.3 volts). Because of its size and shape, the b.f.o. unit could not be conveniently located with its controls on the front panel of the BC-669. Instead, the unit was installed below the receiver chassis close to the 6H6 (det) and 6K6 (a.f. amp) tube sockets to which the b.f.o. wiring leads are connected.

Before installing the b.f.o. unit, the 455 kc oscillator frequency was reduced to 385 kc by connecting a 100 mmf postage stamp-type mica capacitor across the adjustable tuning capacitor in the b.f.o. After making this change, the b.f.o. variable capacitor tuned to 385 kc at about half of maximum capacity. The installation of the b.f.o. unit as described, places the C.W., ON-OFF and PITCH controls on the right side panel of the BC-669.



Underchassis view of the BC-699 showing the position of the L shaped chassis housing the b.f.o. Because of its configuration the controls had to be mounted on the side of the cabinet.

The wiring connections to the b.f.o. involve five leads as shown in fig. 9. Be sure to scrape the fungus-proofing varnish from the terminals and tube socket pins to which the b.f.o. leads are connected. The B minus lead is connected to a

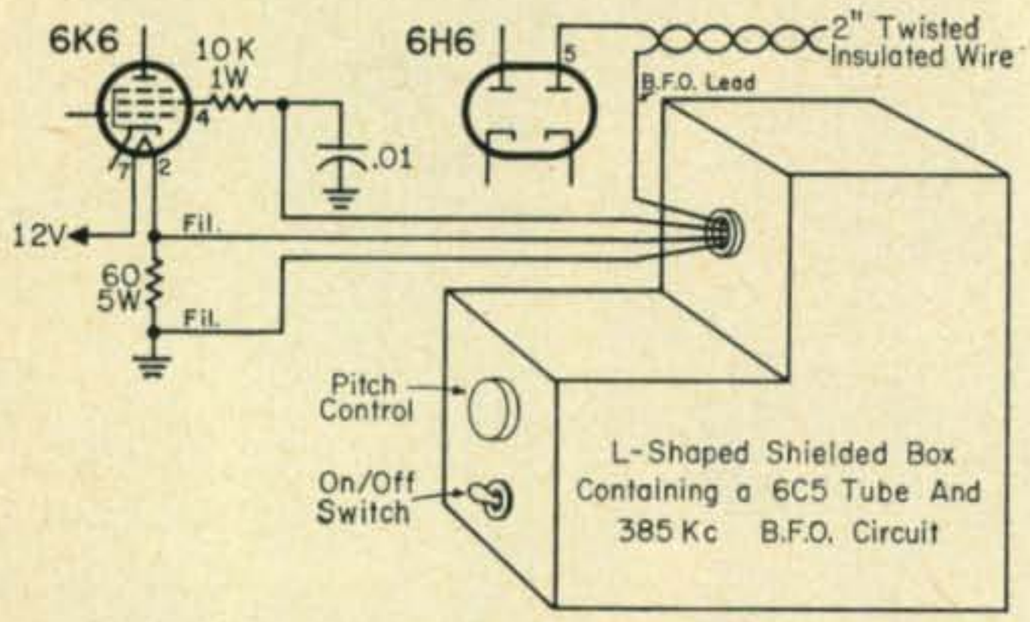


Fig. 9—The addition of a b.f.o. was required to copy c.w. A salvaged b.f.o. from a BC-342 was used here and is connected with only 4 wires. The BC-342 b.f.o. frequency was changed from 455 kc to the BC-669's i.f. of 385 kc by paralleling a 100 mmf capacitor with the b.f.o. tuning capacitor. See text.

chassis ground lug, the B plus lead is connected through a 10K, 1 watt voltage dropping resistor to pin 4 of the 6K6 tube socket. To provide the required 300 ma filament current to the 6C5 b.f.o. tube and the necessary 400 ma filament to the 6K6 tube, the 15 ohm resistor (R_{47}) was removed and replaced with a 60 ohm wire wound resistor. The filament leads of the 6C5 b.f.o. tube were then connected across this 60 ohm shunt resistor.

6. *Question:* Why is a shunt resistor used across one of the tube filaments wired in series?

Removing A.V.C. During C.W. Reception

When the b.f.o. is turned on, it is necessary to short out the a.v.c. circuit. Otherwise, the b.f.o. signal being inserted into the diode detector, will develop a high a.v.c. voltage which noticeably reduces the sensitivity of the receiver.

An a.v.c. ON-OFF toggle switch (s.p.s.t. type) was installed on the right side panel of the set next to the b.f.o. ON-OFF switch. One terminal of the a.v.c. switch was connected to chassis ground, the other terminal was connected to the junction of capacitor C_{41} and resistor R_{14}. These circuit components are in the a.v.c. line and are located on the terminal strip about one inch from the edge of the b.f.o. shielded box.

Modifying the Transmitter for C.W. Operation

Two changes were made to modify the transmitter for c.w. operation. A PHONE-C.W. switch was installed and a couple of keying jacks were mounted on the set. Why two keying jacks? Well, it won't help you to send twice as fast but there is a good reason as you will learn.

The PHONE-C.W. switch is a d.p.d.t. type which is installed at the lower right corner of the unit just below the meter switch. When the PHONE-C.W. switch is in the c.w. position, the B plus lead to the modulator is opened and deactivates this stage. At the same time, other contacts on the

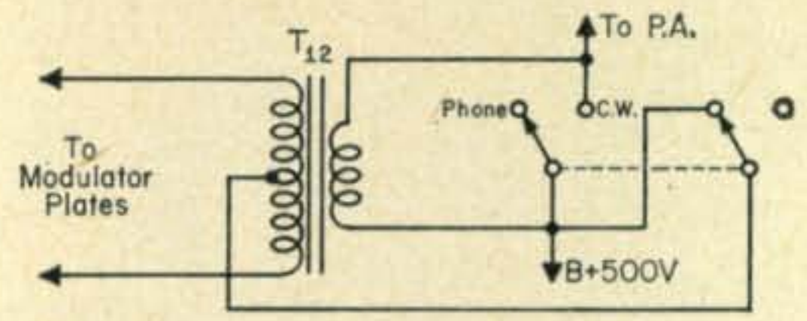


Fig. 10—The addition of a PHONE/CW switch.

switch short circuit the modulator transformer secondary. Figure 10 shows the arrangement of this switch.

Break-in Keying Connections

One of the two keying jacks is located at the lower left corner of the front panel. This jack is an open-circuit type with one terminal grounded to the front panel. The ungrounded terminal of this jack is connected by means of a short jumper wire to the ring-terminal of the microphone jack which is only a few inches away.

When this break-in keying jack is used, closing the key will automatically switch the antenna from the receiver to the transmitter, and desensitize the receiver so that it will be instantly activated when the key is opened. Superior c.w. break-in operation is achieved and recovery time of the receiver is so good that you will hear the

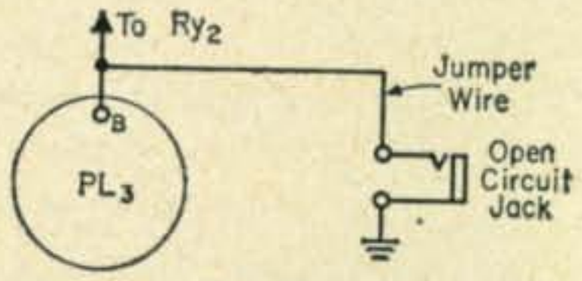


Fig. 11—Break-in key jack.

other station between your own dots and dashes. Figure 11 shows the simple jumpered connection for the break-in keying jack.

Silent Keying

And now we come to the reason for the second keying jack. When using the break-in keying jack, you and other members of the household will be impressed with the resounding clacks of the transmit-receive relay which accompanies the keying. Although it is difficult to believe, there are some people who will not appreciate the strangely beautiful cacaphony of sound and fury produced by the BC-669 relays when clacking along at a mere 15 w.p.m. So if you want to enjoy a late late QSO while the rest of the family is asleep, the silent-keying jack is used. Although this silent-keying jack does not provide automatic break-in operation, your c.w. keying will be as soundless as a mouse drooling on a blotter.

The silent-keying jack is a closed-circuit type mounted on the left side panel of the unit. A micarta strip about one inch wide is used to insulate the key jack from the metal cabinet of the set. The location of the jack on the side panel facilitates the job of wiring the jack in series

with the r.f. cathode line which is grounded by the transmit-receive relay. To permit simultaneous keying of the oscillator and p.a. stages and avoid the need for safety bias, the cathodes of the 807's (which are directly grounded to the chassis in most models) were removed from the ground connection and connected to the 6L6 oscillator cathode line.

When using the silent-keying jack, a shorted plug is inserted partway into the break-in jack to act as the manually-operated transmit-receive switch. Pushing the shorted plug into the break-in jack, energizes the relays that automatically prepare all the necessary circuits for transmission. Retracting this shorted plug, de-energizes the relays and restores receiving operation.

Test for Harmonics

Experience has shown that two-stage transmitters such as the BC-669 are prone to harmonic radiation unless reasonable precautions are taken. After completing the modifications described in this article, the rig was checked out for harmonics. To give it the acid test, the transmitter was connected to a multi-band antenna system. Paul, K2PDF, two miles away, and George W2FWE, six miles away, listening for harmonics reported the c.w. signal to be as clean as a whistle. (Hmmm. Wonder what they meant?) Subsequent checks have supported these original findings by Paul and George.

Retrospect

During the past few months after "Operation Rebuild" was completed, the modified BC-669 has been providing double duty for the JO on the Novice band and the OM on both phone and c.w. operation. In fact, the snappy c.w. operation so impressed the OM that it reawakened his interest to the point that he uses c.w. about 40 percent of the time. During a recent two week camping tour up Cape Cod way, the OM thoroughly enjoyed hour-long scheduled QSO's with the JO who used the BC-669 at the home QTH in New Jersey. Considering the rat race conditions on the 80 meter Novice band, maintaining hour long schedules speaks well of the BC-669 ability to push out a consistent walloping signal.

For anyone looking around for station equipment that considers economy—appearance—reliability—operating convenience, maybe "Operation Rebuild" is just the thing for you. ■

Questions and Answers

1. What is the difference between a volume *control and a gain control* or are they just different names for the same thing?

The controls operate differently although each results in controlling the strength of the signal in the loudspeaker. Volume controls are usually associated with the audio part of the receiver while gain controls are used with r.f. sections of the receiver. Volume controls usually consist of a potentiometer which permits a desired amount of available audio voltage to be amplified by the a.f. amplifier stages. Gain controls are a little more subtle in operation. They usually consist of variable resistors which vary the amount of grid bias voltage applied to r.f. and i.f. amplifier tubes. When the bias voltage is increased, the ability of the tube to amplify (gain) is decreased, and vice versa.

2. Why is the filament voltage called the "A" supply?

As you know, a "B" voltage is used with the tube plate, and a "C" voltage is used with the grid of a tube. Since the elements within the tube (filament, plate, and grid) were invented several years apart from each other, the chronological order of development no doubt influenced the alphabetical order in naming the different voltage sources.

3. Why is polarity important when wiring in the electrolytic capacitors but is not important when using oil-filled capacitors?

All capacitors have an insulating material called dielectric between the two conducting surfaces. In electrolytic capacitors, this dielectric is formed by an electroplating process which requires a particular polarity of voltage at each plate. If the polarity of the electrolytic capacitor is not observed, the dielectric layer will not be developed and the capacitor will act as a short circuit. The dielectric in oil filled capacitors is not dependent upon electrolytic action and thus no polarity need be observed.

4. Since most of the tubes are 6-volt type, why must the power supply deliver 12 volts?

Ohm's Law will prove that when a voltage is applied across two equal resistors connected in series, half of the applied voltage will be developed across each resistor. In the BC-669, pairs of 6-volt tubes have been wired with their filaments in series. Since the filament is actually a resistor, each filament will have half of the applied 12 volts and thus operate with the required amount of voltage.

5. What's this Bee-Eff-Oh jazz, Dad?

The letters in b.f.o. stand for beat frequency oscillator. The b.f.o., like all oscillators, generates a signal. This signal is used to permit the reception of a c.w. signal which otherwise would be inaudible. Here's how it works: the b.f.o. signal frequency is adjusted to approximately the same frequency as the i.f. signal being processed through the receiver. When the b.f.o. signal is mixed with the i.f. signal, a new frequency called the beat frequency is developed. This process is called heterodyning. The beat frequency is always the difference between the frequency of the b.f.o. and the i.f. signal. Therefore, when the b.f.o. frequency is varied by the PITCH control so that the b.f.o. frequency is 1000 c.p.s. different from that of the i.f., an audible note of 1000 c.p.s. will be heard in the loudspeaker.

6. Why is a shunt resistor used across one of

[*Continued on page 125*]

A 6580 Grounded Grid Kilowatt

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Not just another p.a. with a different component arrangement, but some really novel ideas and components are featured in this kilowatt amplifier. It operates from 10 to 80 meters and is built especially for the new high power triodes which are designed specifically for grounded grid operation.

MANY of the present day manufactured s.b. exciters and exciter kits have a power output capability of between 75 and 150 watts. A power amplifier for such exciters can have an untuned grid circuit or be cathode driven with the grid or grids grounded. In designing a kilowatt amplifier for my 75 watt exciter, many designs and circuits were investigated. The type of tube or tubes to be used also received careful review.

The final decision was for a grounded grid, cathode driven, pi-network output circuit. Neutralization is unnecessary, and most of the driven power appears in the output.

The tube selected was a Penta 6580, a high mu triode with a 400 watt plate dissipation, designed specifically for grounded grid operation. The 6580 is rated for 1000 watts input at 3000 volts, in AB1 operation, and that's the legal power input. The use of tetrodes was considered but ruled out since, in addition to costing more, they would require a stabilized screen supply. Operating them as triodes would require considerably more driver power than I have available. There is also the danger of exceeding the control grid dissipation unless the driving power is properly divided between the grid and screen.

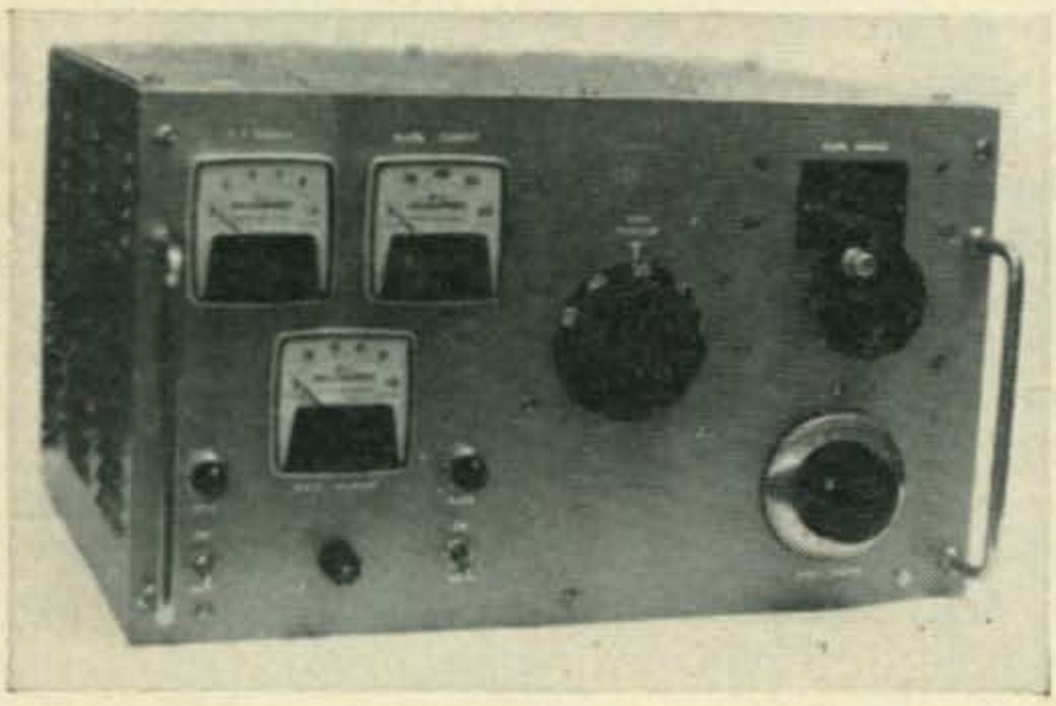
Amplifier

This amplifier was to be a "DeLuxe" job and to that end the components selected were conservatively rated and of the best quality. The bandswitch is insulated for 10 kv, and the plate tuning capacitor, a vacuum job, is rated for 7.5 kv. Its very low minimum capacity of 5 mmf, permits efficient operation up to 29.7 mc. The tuning coil uses a separate winding of ¼" tubing for the ten meter band and for the main inductance, a manufactured air-wound coil of #10 wire is used that is widely spaced for the 15 and 20 meter bands and closer spaced for 40 and 80.

The antenna coupling capacitor has a large enough range for 80 meters without requiring additional fixed shunt capacitors. A counter dial is used for the vacuum capacitor and a vernier dial for the coupling capacitor.

Three meters are used, a 0-100 ma for observing the grid current a 0-500 ma for plate current and a 0-1 ma, which is used to indicate the relative r.f. output. Meters cannot ordinarily be grouped close together or mounted in an r.f. field without affecting their accuracy. These new G.E. meters, however, have the moving coil mounted inside of a cup shaped magnet that effectively shields them from magnetic and r.f. fields. The 0-1 ma output meter is energized by rectifying a small amount of r.f. that is picked up by a 'gimmick,' a few turns of insulated wire wound around the antenna output lead.

The values of the plate tuning and antenna coupling capacitors were calculated for a circuit *Q* of 12 on all bands. The coil clips were set at arbitrary positions on the coil and during tune-up tests, were varied until resonance in the center of each band was obtained at the desired



Transmitter panel has the meters clustered in one corner. The upper left meter is the relative r.f. output and the adjacent unit measures plate current. The G.E. meters do not interact because of their shielded construction. The upper right dial drives the vacuum variable; the lower dial the loading capacitor.

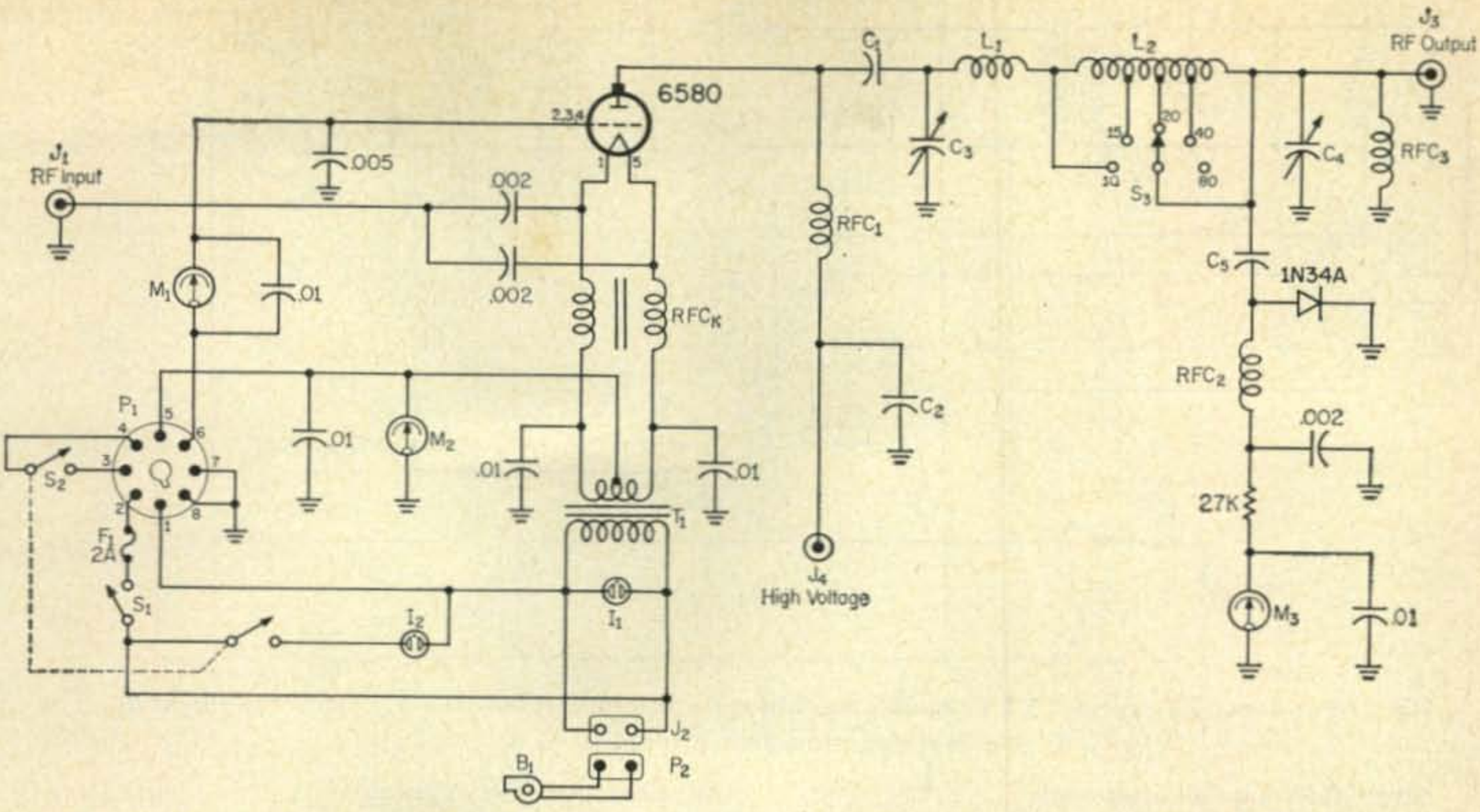


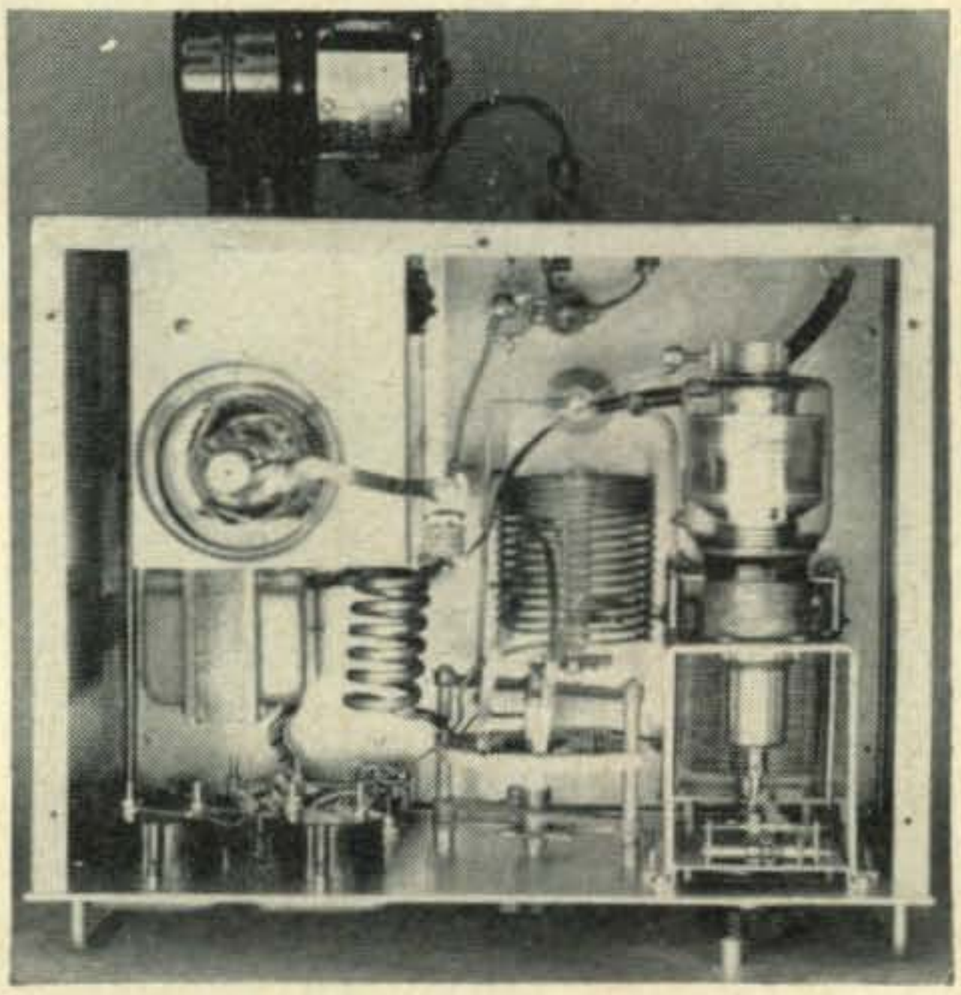
Fig. 1—Circuit of a grounded grid kilowatt AB1 final requiring 75 to 125 watts of drive to a Penta 6580.

B_1—Blower, Dayton IC180 (W. W. Grainger Co.)
C_1—.001 mf 5 kv, Centralab 858S—1000
C_2—500 mmf, 20 kv, TV "Doorknob" type
C_3—5-200 mmf, Jennings Vacuum Variable UCS-5-200 7.5 kv
C_4—50-1500 mmf Cardwell PL8013
C_5—Gimmick—See Text
I_1, I_2—NE-51A and holder with 100 K resistor built in. E. F. Johnson 147-1143
J_1-J_3—Amphenol 83-1R
J_2—A. c. receptacle female
J_4—High voltage terminal Millen 37001
L_1—6 turns, ¼" copper tubing, 1½" o.d.
L_2—17 turns, Illumitronix 240804 with excess trimmed from close spaced end
15M—2 turns wide end; 20M—5 turns; 40M—10 turns; 80M—Full coil
M_1—0-100 ma General Electric AW91-513X44
M_2—0-500 ma General Electric AW91-513X54
M_3—0-1 ma General Electric AW91-513X22
P_1—Male octal, chassis mount
RFC_1—National R 175A
RFC_2, RFC_3—2.5 mh @ 100 ma.
RFC_k—Cathode coil see text
S_1—S.p.s.t. toggle, 3a
S_2—D.p.d.t. toggle, 3a
S_3—S.p. 5 position—high voltage (Communication Products Co.)
T_1—5 volts @ 15 a. Triad F9A

tuning capacity value. Figure 1 lists the number of turns used for each band.

Cathode R.F. Choke

The cathode r.f. choke coils used are "home brew." An air core coil was tried first which was a bifilar winding on a one inch phenolic form with 6½ inches of #14 enamelled wire. Using a 5 volt filament transformer, the filament voltage at the tube socket was down to 4.4 volts. A 6.3 volt filament transformer gave too high a filament voltage and required an adjustable primary voltage control. Rewinding this coil with #12 wire did not make an appreciable improvement. A manufactured cathode coil was tried and the voltage drop was only 0.2 volt. A 12 turn bifilar wound coil using #12 enamelled wire was wound on half of a ferrite core of a "burnt out" TV horizontal output transformer. The voltage drop across this coil was only 0.16 volts. The exciter output was kept at a constant level and the amplifier grid current was noted while the various cathode coils were tested. The induct-



Top view of the transmitter. The Penta 6580 in the upper left is surrounded by the glass chimney with the blower coupled to the sub chassis forcing air up.

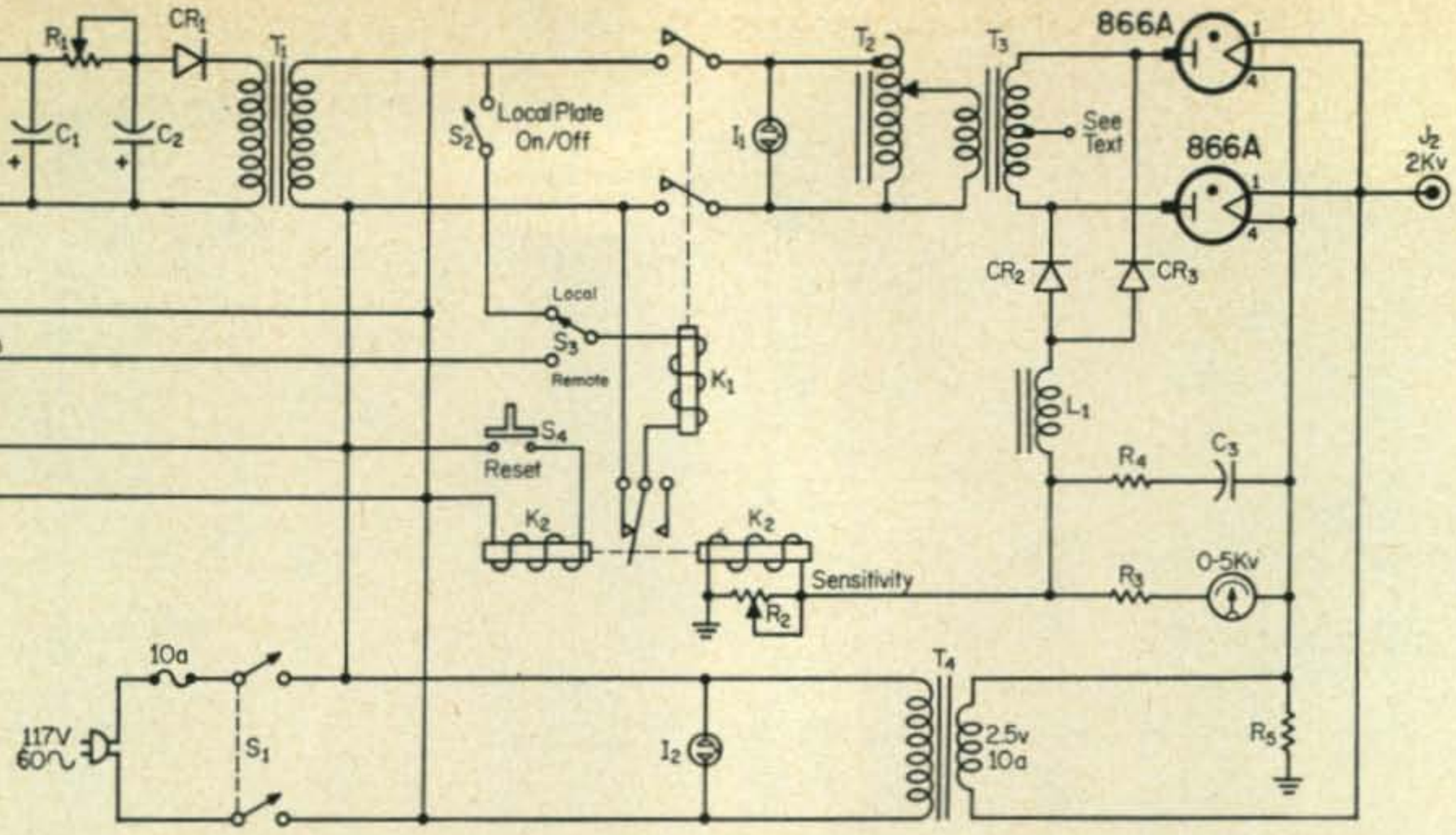
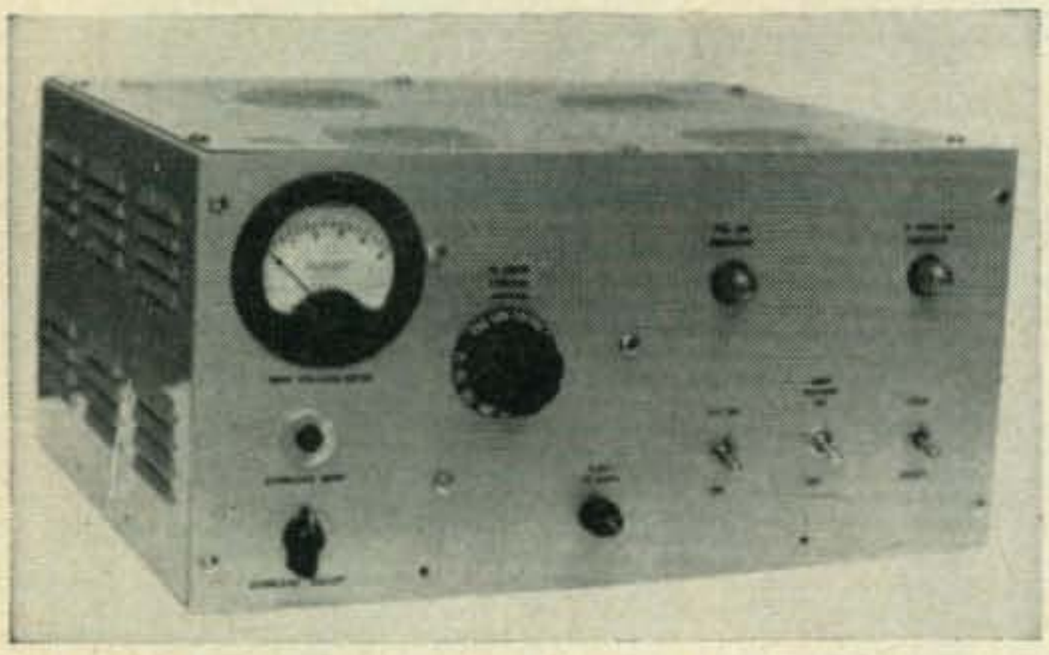


Fig. 2—Power supply provides 3.5 kv at 300 ma through a bridge rectifier. The h.v. output is varied by T_2 and overload protection is supplied by K_2.

C_1—20 mf 450V tubular, electrolytic
C_2—40 mf 150V tubular, electrolytic
C_3—4 mf 3kv
CR_1—IN1763
CR_2, CR_3—S-5033, Sarkes Tarzian
I_1, I_2—NE-51A and holder with 100K resistor built in. E. F. Johnson 147-1143
J_2—High voltage terminal; Millen 37001
J_1—Octal socket
K_1—D.p.s.t. 115 V 60 cycles Potter Brumfield PR11AY
K_2—Overload relay—0.5 to 1A. Advance OF/2B
L_1—4-20 hy, 30-300 ma swinging choke. Stancor C-2307
R_1—3000 ohm 10W adjustable
R_2—50 ohms 2W pot
R_3—5 one megohm 2W resistors in series
R_4—100 ohms 10W
R_5—6 180K 2W resistors in series
S_1—D.p.s.t. toggle switch, 10a
S_2—S.p.s.t. toggle switch, 3a
S_3—S.p.d.t. toggle switch, 3a
S_4—S.p.s.t. Normally open push button switch, 3a, overload reset
T_1—117V to 125V @ 50 ma, Stancor PA-8421
T_2—Variable autoformer, 7.5 amp. Superior 116U
T_3—2500-0-2500, 300 ma, UTC S-49
T_4—2.5v @ 10 a. Stancor P-6454

ance values of the various coils were also noted. It was determined that the ferrite core coil had the least voltage drop and resulted in slightly more grid current that any of the other coils tried.

For those who would prefer to roll their own, the following information should be of help. Horizontal output transformers are a common casualty of TV receivers. To obtain the high Q necessary for their operation, they have a ferrite core. Any local TV repair shop will be glad to give you one. Disassemble the transformer and pull the core apart. The el sections should be carefully ground off on an emery wheel until you have a straight section of core. Wrap masking tape over the core. Cut two 3 foot lengths of #12 enamelled wire and clamp the wire ends in a vise. Keep wires taut and parallel and start winding by rotating the core until you run out of winding room. Trim and tin the ends and use as is or mount on a phenolic board.



Front view of power supply presents a neat appearance. The overload reset button and sensitivity control are below the high voltage meter, and the voltage control, T_2, is to the right of the meter.

Power Supply

To obtain 3000 volts of d.c., with the transformer available, bridge rectification was used. The use of silicon rectifiers throughout was contemplated but I wanted to use a 2.5 volt 10 ampere transformer and a pair of 866A's also on hand and so they were used in one side of the bridge. To avoid buying two other filament transformers and another pair of rectifier tubes, two silicon rectifiers were used. They are the type used as 866A replacements (fig. 2).

The 115 volt a.c. line is fused and for d.c. overloads, a circuit breaker is included in the negative high voltage return to ground. The overload trip current is adjusted by a panel control and an overload causes the relay coil to open up the circuit to the primary relay coil. The circuit remains open until the reset coil is operated by a panel push button. Neon type indicator

lights are used on the power supply panel for line ON switch and high voltage ON. I had available an adjustable line autoformer which is used in this power supply and the output voltage can be varied from 0 to 3.5 kv. The 0 to 5 kilovoltmeter is made by re-marking the dial of a 0 to 1 d.c. milliammeter. The 5 megohm multiplier is made up by connecting five 1 megohm 2 watt resistors in series, mounted on a small phenolic panel which is mounted directly on the voltmeter terminals.

A one megohm resistor group is connected across the filter capacitor to discharge it. It is made up of six 180K 2 watt resistors connected in series and mounted on a phenolic panel. The 5 megohm meter multiplier will also discharge the capacitor in the event the 1 megohm bleeder opens.

A small bias rectifier is mounted on the inside rear of the cabinet above the filter reactor. It is assembled on a small chassis and uses a silicon rectifier in a half wave circuit with an 0A3 as a voltage stabilizer.

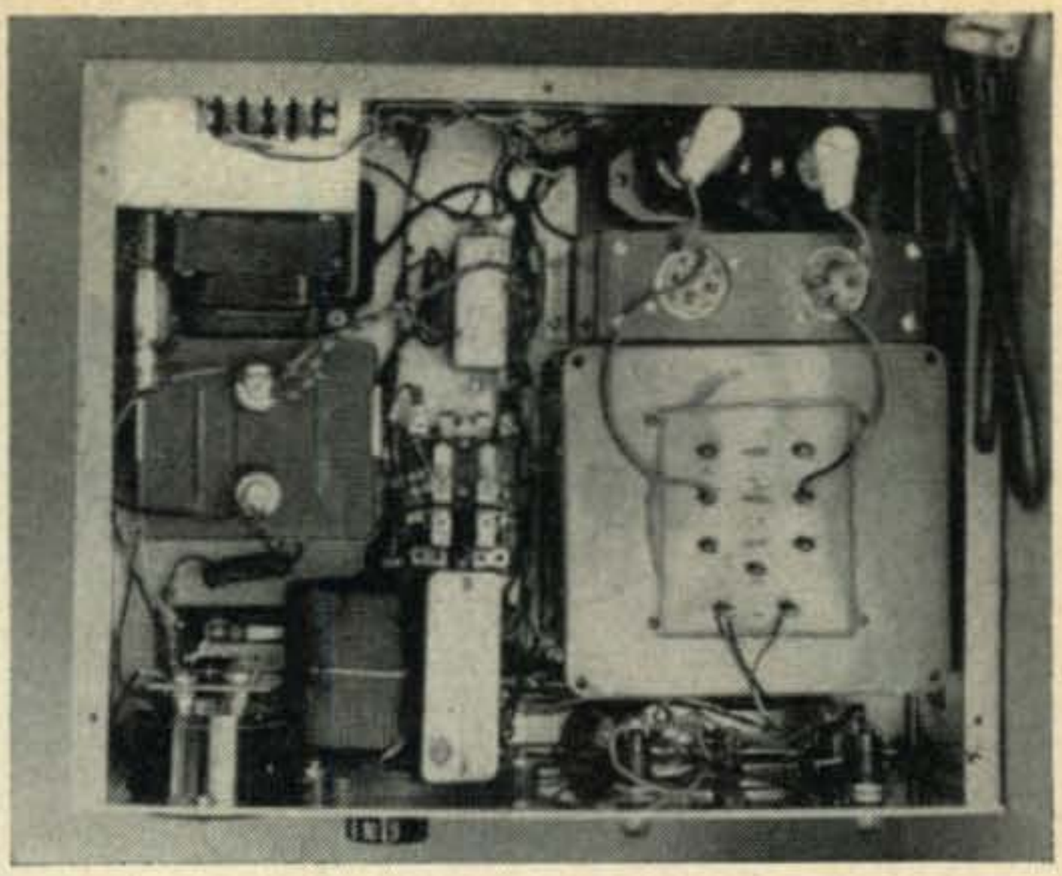
To initiate operation, the power supply line ON-OFF switch must be ON. The LOCAL-REMOTE switch must be in REMOTE position and the a.c. plug which is part of the power cable to the amplifier is connected in parallel to the a.c. receptacle of the exciter that operates the coaxial antenna transmit-receive relay. When VOX (voice control) operation is used, the a.c. plug is connected to any line receptacle.

Construction

Both amplifiers and the power unit are of identical size, 8¾ × 16½ × 13 inches. An 8 foot, 7 wire cable connects both units. A separate high voltage lead is used. The power supply components are fastened to a base plate and the wiring to the panel controls are made with the panel removed from the cabinet and lying flat.

In the power amplifier, the bandswitch, pi-network capacitors, switches and meters are fastened to the panel. A cable connects the meters and switches to a 5 × 7 × 3 inch chassis which houses the tube socket. The filament transformer is mounted in front of this chassis. The rear of the chassis has the octal power receptacle, r.f. input coax connector and an opening for a blower which is mounted on the rear of the cabinet. An a.c. receptacle on the rear of the cabinet provides power for the blower, a 60 c.f.m. unit which delivers more air than is required for the 6580 tube. A tube chimney is used in conjunction with an air system socket, providing efficient base anode seal and envelope tube cooling. A smaller blower would, of course, be quite satisfactory. The blower is easily removable and does double duty here at W6HHN. It is used to hasten the barbecue fire which is usually started 15 minutes before dinner is ready to be served.

The cabinets are of steel with the top plate, sides and rear louvered for good ventilation. The two sides and rear section are in one piece



Top view of the power supply. The plate transformer, T_3, is located in the lower right. Just above T_3 are the bridge rectifiers with the selenium units just adjacent to the transformer. The bias supply, built on a subchassis, is to the left of the rectifiers. The variac, T_2, is mounted on the left side of the front panel.

with half inch bends for the flat top and bottom plates and the panel to screw fasten to. The cabinet and panel were painted a silver hammertone gray finish with a spray can. Decals were generously used to give the amplifier and power supply a professional look. As the photographs show, there is no crowding of components and every part of the amplifier is easily accessible.

The amplifier panel has the power control switches in the lower left side of the panel. The STANDBY switch applies the line voltage to the filament transformer and the blower. The OPERATE switch energizes the plate transformer primary relay. A panel fuse protects the filament transformer line. There are indicator lights of the neon type that light up when either of the switches are in ON position. The grid current meter is above the control switches and the R.F. OUTPUT and PLATE CURRENT meters are above it. The bandswitch is in the center of the panel and the plate tuning and antenna loading capacitor dials are on the right of the panel. Mounting of the vacuum capacitor, if one is used, requires a special bracket to hold it off the panel. The r.f. output indicator rectifier is assembled on a 4 point-tie terminal with one of the terminals grounded. The assembly is mounted directly on the ground terminal of the plate current meter, and an insulated pickup wire makes a three turn wrap around the amplifier output lead. A short length of RG-8/U connects from the end of the tuning coil to the u.h.f. r.f. output receptacle on the rear of the cabinet.

Tuning Up

The tuneup on the amplifier is done at one half plate voltage. The silicon rectifiers in the bridge rectifier should be removed and the plate transformer secondary center-tap used as the negative high voltage return by grounding it.

[*Continued on page 124*]

A 9 Mc. Filter S.S.B. Generator

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Since the introduction of the RCA 7360, interest has run high for its use in s.s.b. equipment. Here is an application, using this versatile tube, in combination with the McCoy crystal lattice filter.

ORDINARILY a ham who builds his first single sideband generator chooses a phasing generator such as the W2EWL[1]. Phasing generators are normally cheaper than filter exciters unless the builder constructs his own filter. There are disadvantages to high frequency phasing rigs as far as complexity, stability of adjustments, and suppression are concerned. The last two difficulties can be minimized by selection of precision heat-cycled components and careful construction, but then complexity and price usually will be increased. Using average components and a commercial audio phase shift networks, 30-35 db of unwanted sideband suppression is about the maximum attainable, and as components age, suppression will gradually decrease. The carrier can usually be suppressed well enough with homebrew phasing generators, but the suppression will change as tubes and components warm, with the result that the carrier may have to be renulled during an evening's operation.

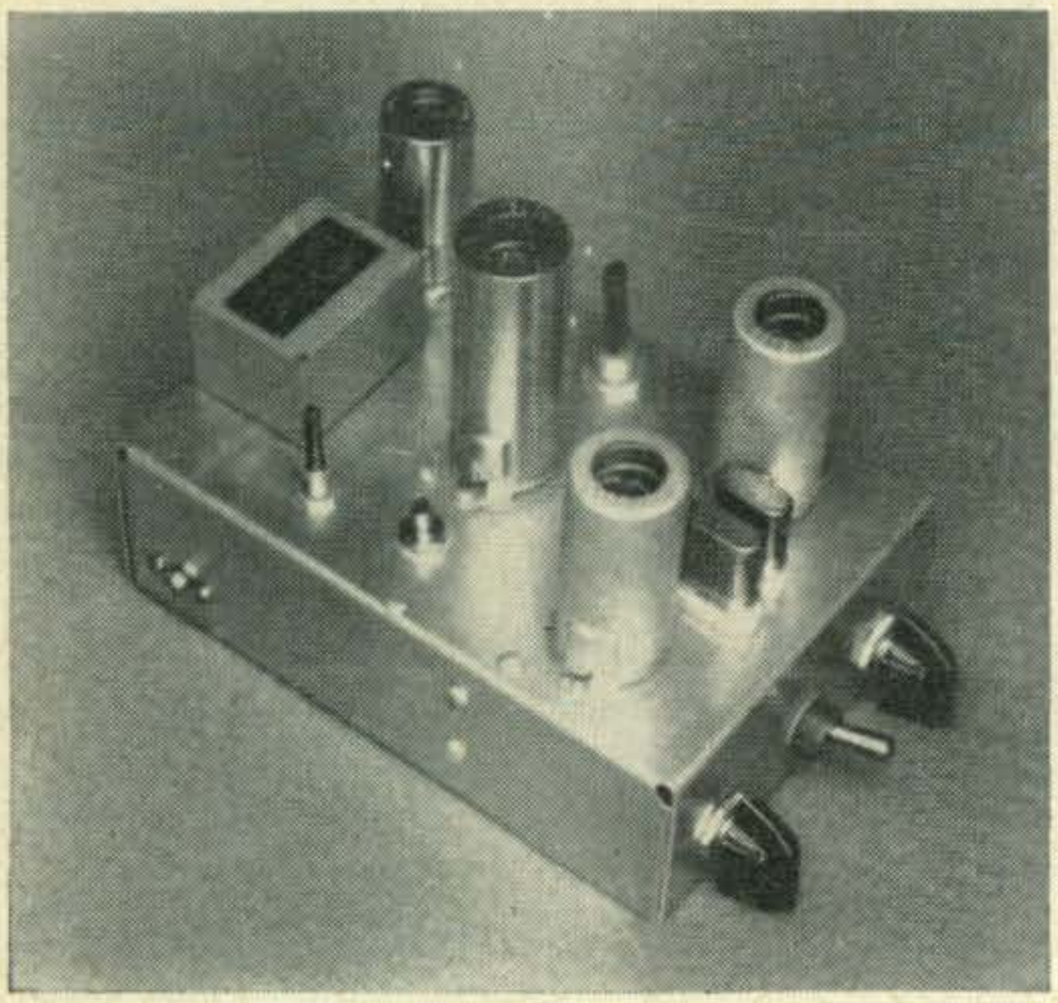
If a sidebander with a 9 mc phasing exciter desires to have a sharper signal, without the need of continual readjustments, or if one decides to build a filter rig, the filter generator described here should be considered. The small dimensions of this generator allows it to be easily mounted within the exciter. It also makes an excellent basis for a homebrew exciter. It is a simple matter to find circuitry for a 9 mc s.s.b. exciter, and the portion of the transmitter following the input to the first mixer can be used in conjunction with this generator. Nine mc has become very popular for homebrew and commercial phasing exciters. A commercial mobile transceiver is now available which uses a 9 mc crystal filter for sideband elimination.

Circuit Description

The unit utilizes four tubes for complete audio and s.s.b. generation. Tube V_1 is the carrier generator and amplifier for carrier insertion and V_2 is the audio amplifier which also supplies a feedpoint for VOX. Tube V_3 is the new RCA 7360 balanced modulator tube which is described on page 33 of the March 1960 issue of *QST*[2]. The balanced modulator circuitry is taken from this article. This tube is an ideal balanced modulator, for it is a high impedance device and requires only single-ended audio and carrier inputs. Tube V_4 amplifies the single sideband

[1]Vitale, A., "Cheap and Easy S.S.B.", *QST*, March, 1956, p. 16

[2]Vance, H. C., "S.S.B. Exciter Circuits Using a New Beam-Deflection Tube", *QST*, March 1960, p. 33



Top view of the 9 mc s.s.b. generator built on a 3×4×6" chassis. Front panel controls are, from left to right; carrier level, sideband selection, and audio gain. The two tubes flanking the crystals are; the 12AT7 carrier oscillator, in the foreground and the 12AX7, audio amplifier at the rear. Behind the McCoy filter is the 6C4, s.s.b. amplifier. The larger tube in the center is the 7360. The current equalizing potentiometer, R_1, is mounted behind the 7360 and the differential capacitor C_9 is mounted in front. To the left of C_9 is L_1.

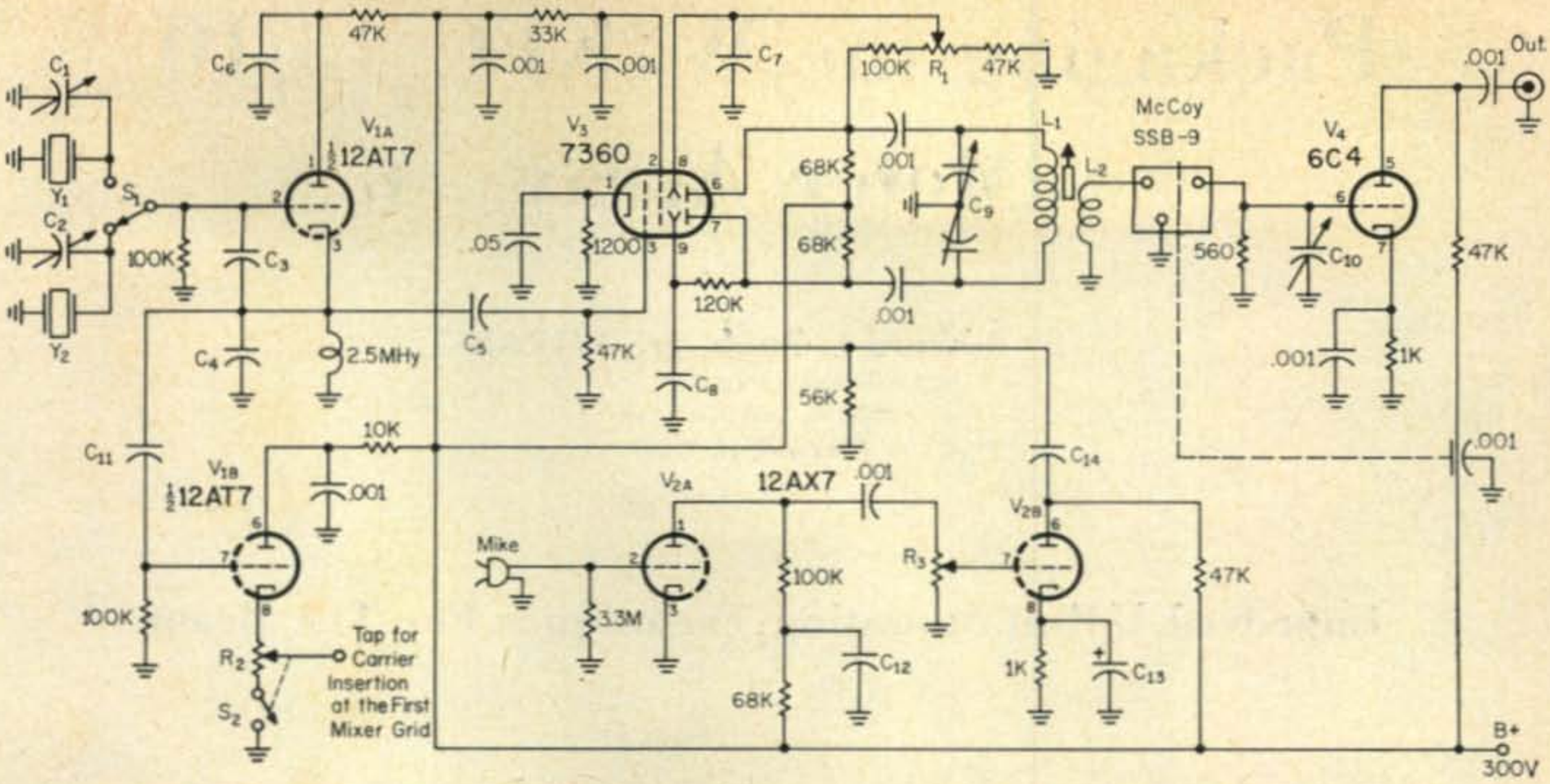


Fig. 1—Schematic of the 9 mc filter s.s.b. generator. The 9 mc carrier output from R_2 is used to provide carrier injection at the first mixer (not included in this unit) without unbalancing potentiometer R_1.

C_1, C_2—25 mmf trimmers
C_3—30 mmf silver mica
C_4—75 mmf silver mica
C_5—220 mmf ceramic
C_6—500 mmf ceramic
C_7, C_8—.005 mf ceramic
C_9—19.6 mmf differential cap. Johnson 160-311
C_{10}—50 mmf variable capacitor. Hammarlund MAPC-50
C_{11}—10 mmf ceramic
C_{12}—10 mf, 450 v electrolytic
C_{13}—10 mf, 25 v electrolytic
C_{14}—.2 mf paper
L_1—14.8 to 31 μh, Miller, 4407
L_2—See text
R_1—25K, Centralab, Q11-120
R_2—2K, Centralab, Q11-110
R_3—5 Meg, Centralab, Q13-141
S_1—S.p.d.t. toggle switch
S_2—Centralab 76-1 mounted on R_2

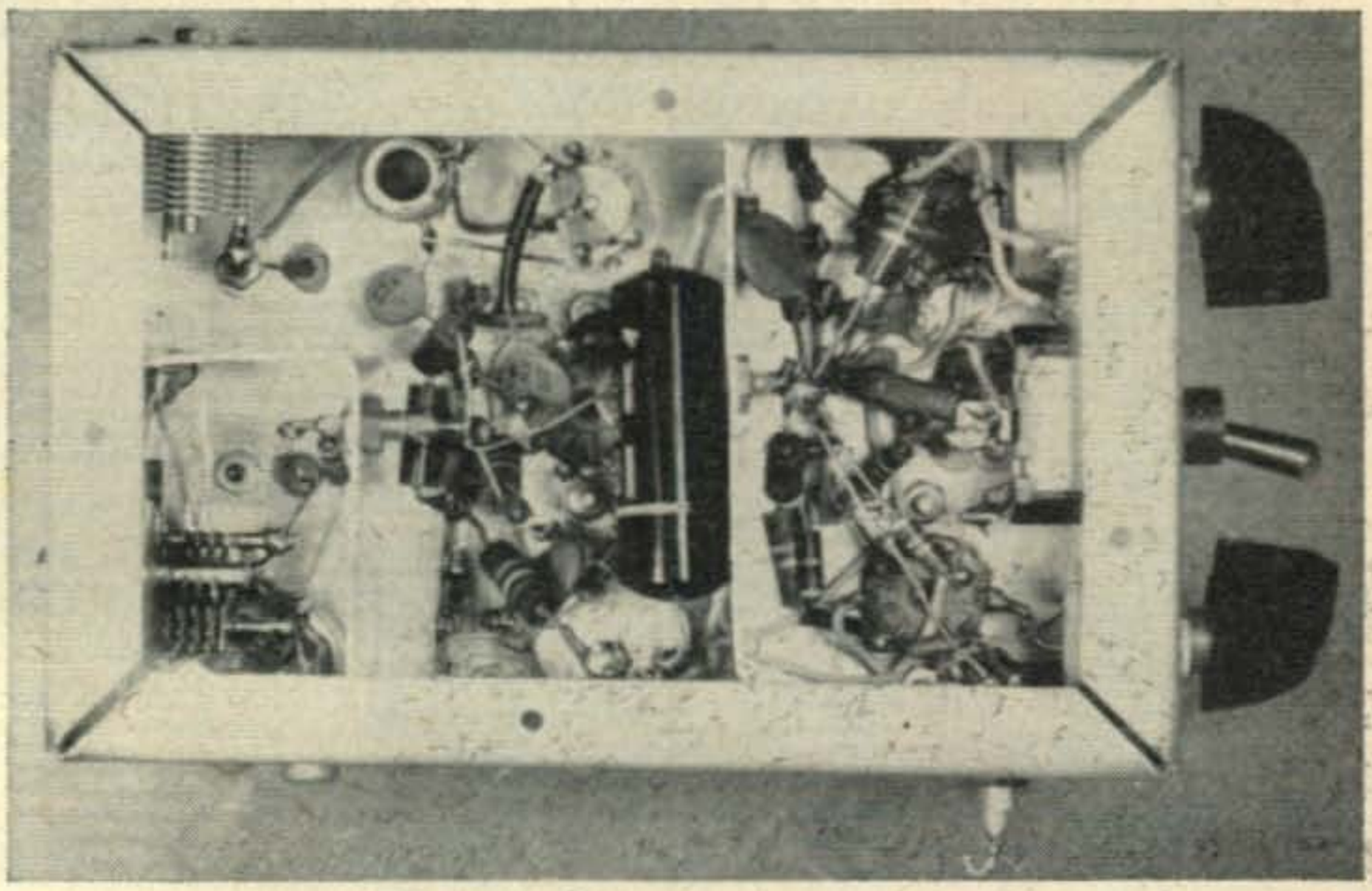
signal and feeds it into the first mixer stage. The filter is a McCoy SSB-9, which is small in size and has sharp skirts. It is 2.8 kc wide at 6 db down and 4.3 kc wide at 50 db down. A complete description of this crystal filter is given in the March 1960 issue of *CQ*[3]. Crystals Y_1 and Y_2 are included in the McCoy SSB-9 filter package. If carefully constructed and well shielded, 50 db of unwanted sideband and 50-60 db of carrier suppression can be obtained. If L_1 is bifilar wound, up to 70 db of carrier suppression is possible with the 7360 and this filter.

[3]Stoner, D. L., "Nine Mc. Crystal Filter Exciter", *CQ*, March 1960, p. 44

Construction

The unit is constructed on a 3×4×6" aluminum chassis. This size chassis results in a compact, yet uncrowded unit. Construction is straightforward and if the unit is assembled as shown in the photographs, one should have no difficulties. This layout was chosen so as to put all controls at one end and to simplify shielding difficulties. Care must be taken to keep L_1 and C_9 away from the input of the balanced modulator and away from other components which would lower the Q of L_1. The two shields shown must

[*Continued on page 118*]



Bottom view of the sideband generator. The major vertical shield separates the carrier oscillator and audio amplifier on the right, from the balanced modulator at the left. The 6C4 amplifier and its components are located in the shield at the lower left. Feedthrough capacitors are mounted on the shield and insure good isolation between stages. *(Photos by Dick Jeckel—KØCEI)*

Packaging the W4KFC 15/10 Meter Array

By Edward L. Raub, Jr., W1RAN
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1000 N. Division St.
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Improved U-Bolt Mounting Techniques For The Beam

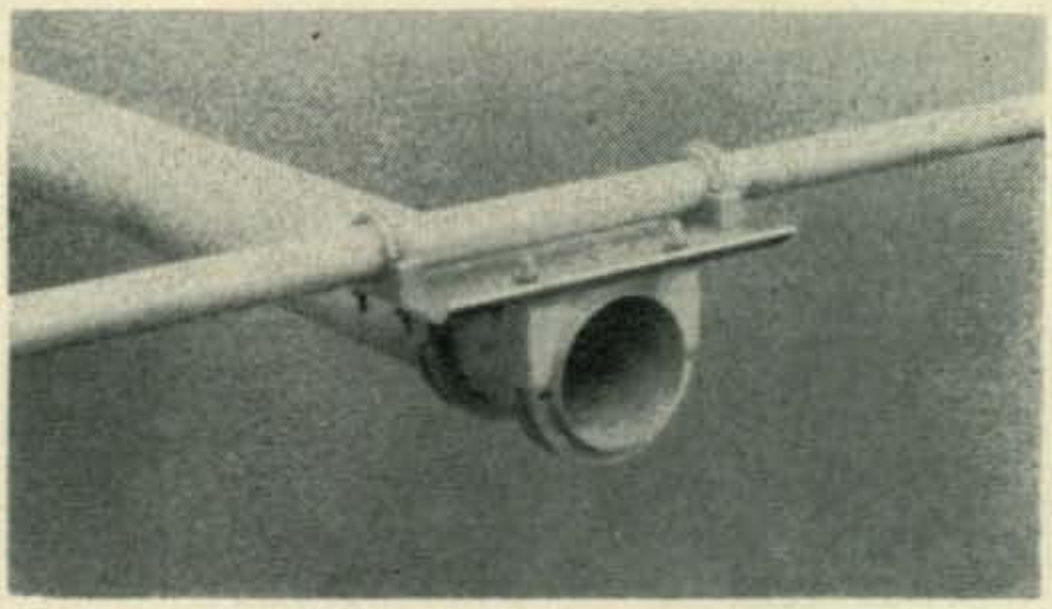
CQ for July 1958 carried a description of a superior two-band beam by Vic Clark, W4KFC.[1] The five-element array had two elements on each band in-line, with a shared parasite between them. His DX-test proof-of-the-pudding scores made the beam more than a little attractive. Additionally, others —notably W3GRF—have similarly employed the in-line arrangement with outstanding results. Apparently, the 'floating' elements for the band not in use complement the driven portion to give over-all performance exceeding that of 3 elements per band.

Three summers ago I had the privilege of viewing the antenna firsthand. In a word, it was impressive. The Vesto tower and fabricated 20-foot boom evinced a feeling of heft and permanence. Duplication seemed out of question, for a similar supporting structure was not possible on our city lot.

Casting about for a physically smaller design left us with the feeling that a 20-foot boom might still be possible if the problems of weight and wind area could be reduced. This quest led to Bill Orr's *Beam Antenna Handbook*. Subsequent sessions with several serious DXer's brought to light the fact that the recommended cast-aluminum irrigation-pipe fittings often failed after some months of use. (It appears W6SAI recognizes this defect, as they are not mentioned in later articles by him.)

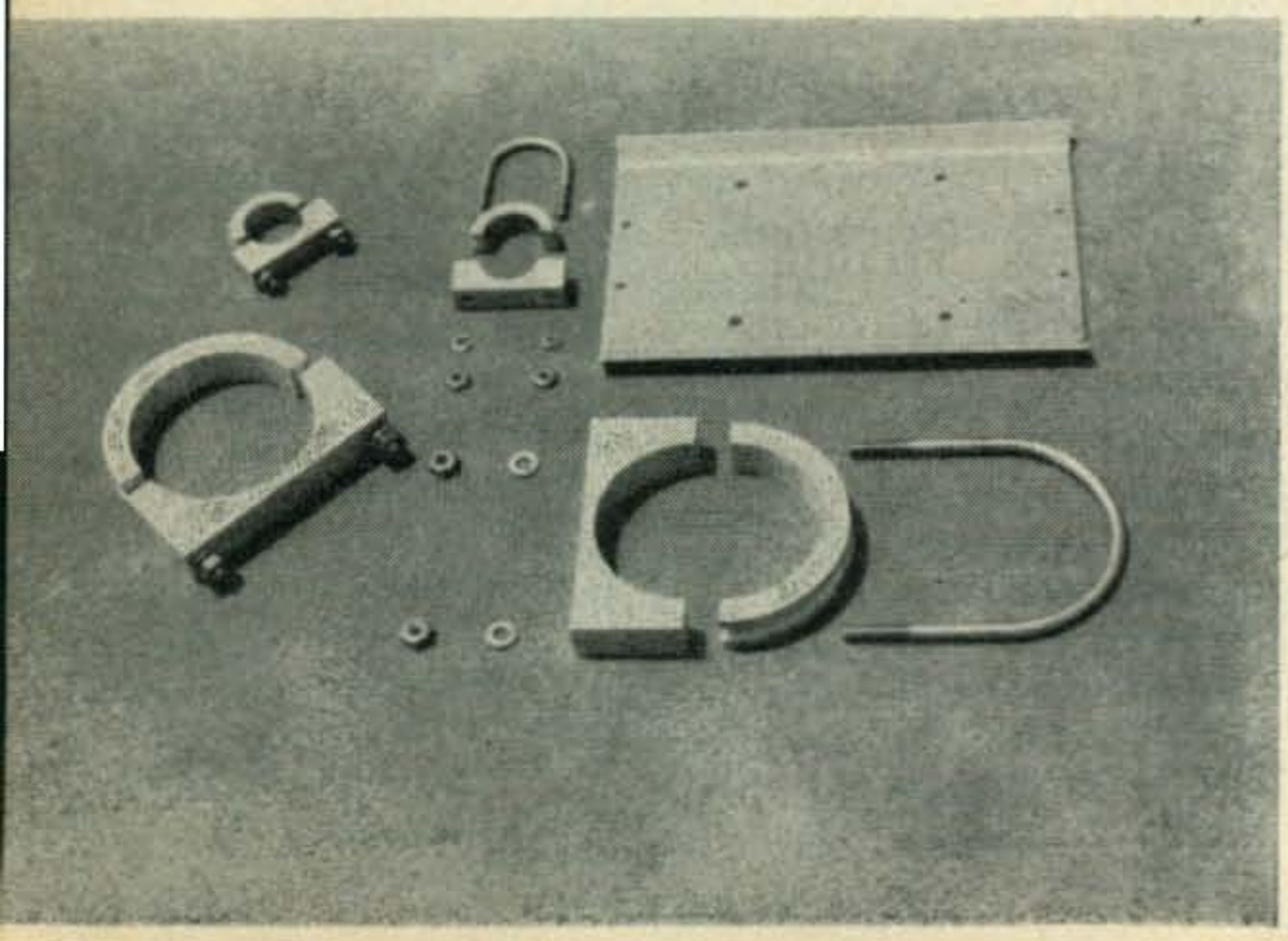
Over the years the skewing of elements on booms and booms twisting in yokes has been a problem. TV fittings with their line contact and vulnerability to corrosion have proved utterly useless. Living on the coast is great propagation-wise, but the hydrochloric atmosphere is death on all but the best of materials.

It did seem though that if the alternate combination of muffler clamps and mounting plates could be improved, we might have the solution. Patterns were made; aluminum was cast, precision bored, grooved, and split; stainless rod was

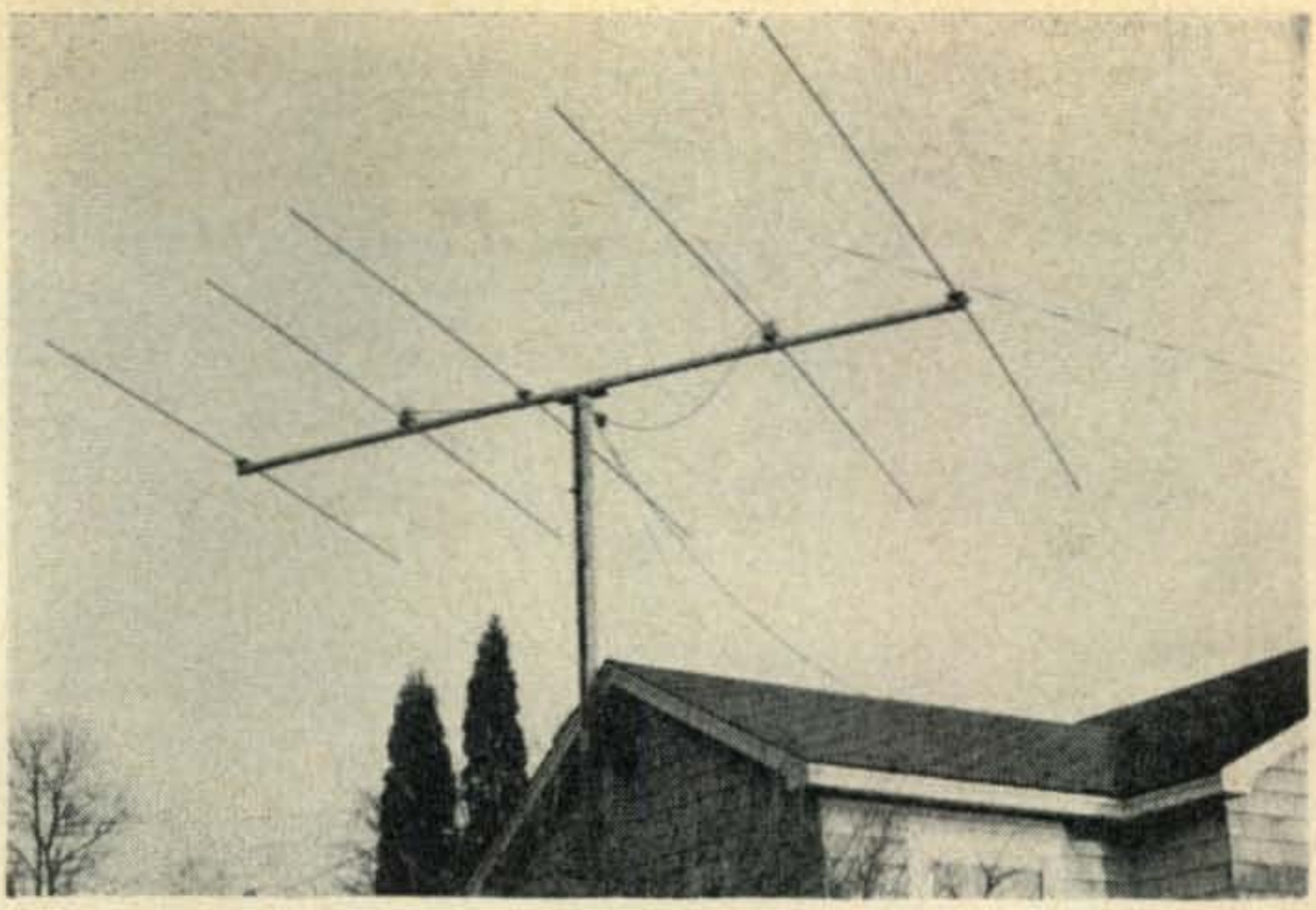


Mounting plate and U-bolts demonstrate the neat appearace of the boom-to-element connection. No holes are made in either the boom or the element and beam dimensions are easily changed.

[1]Clark, V. C., "One Boom Two Band Beam at W4KFC", *CQ*, July 1958, p. 32.



Materials used by the author to mechanically secure the elements to the boom. The large clamps are 3 inches in diameter and the small clamps have a diameter of one inch. The threaded rods are stainless steel. Materials are available from the Precision Tool Company of New London, Inc. Box 617, New London, Connecticut.



Overall view of the 5 element 2 band array. Both 10 and 15 meter gamma matches are visible in this view.

threaded and formed into U-bolts.

The 9½ square inches of surface-to-surface contact afforded by the castings, when backed up by the superior strength of stainless steel, gave a grip that won't quit. The first sample assembled on a 3-inch irrigation pipe easily withstood 500 pound-feet of torque. (Know of any commercial fittings you'd care to try that on?)

Perhaps the biggest bonus in this method is the total absence of holes in either tubing or boom. This means a beam can be put together with just two nutdrivers. The elements are not weakened in any way and are totally reuseable. Spacings are very easily changed, and even conversion to another band is a "snap."

In order to reduce sail area the element diameters were reduced to one inch. This brings down the bandwidth a little and requires slightly longer elements. Total weight above rotator is 32 pounds.

An afternoon spent 20 feet above ground with a half wave of coax between feedpoint and s.w.r. bridge produced ratios unreadable on the meter, i.e., apparently better than 1.05 to 1.00 at the resonant points, 21.1 and 28.2 mc.

The over-all results of this project have proven one thing. The expense in beam construction should go into the mechanics of holding the array together. There are plenty of good electrical designs in amateur literature "fer free." If big league performance is your aim, this would seem the sanest approach. ■

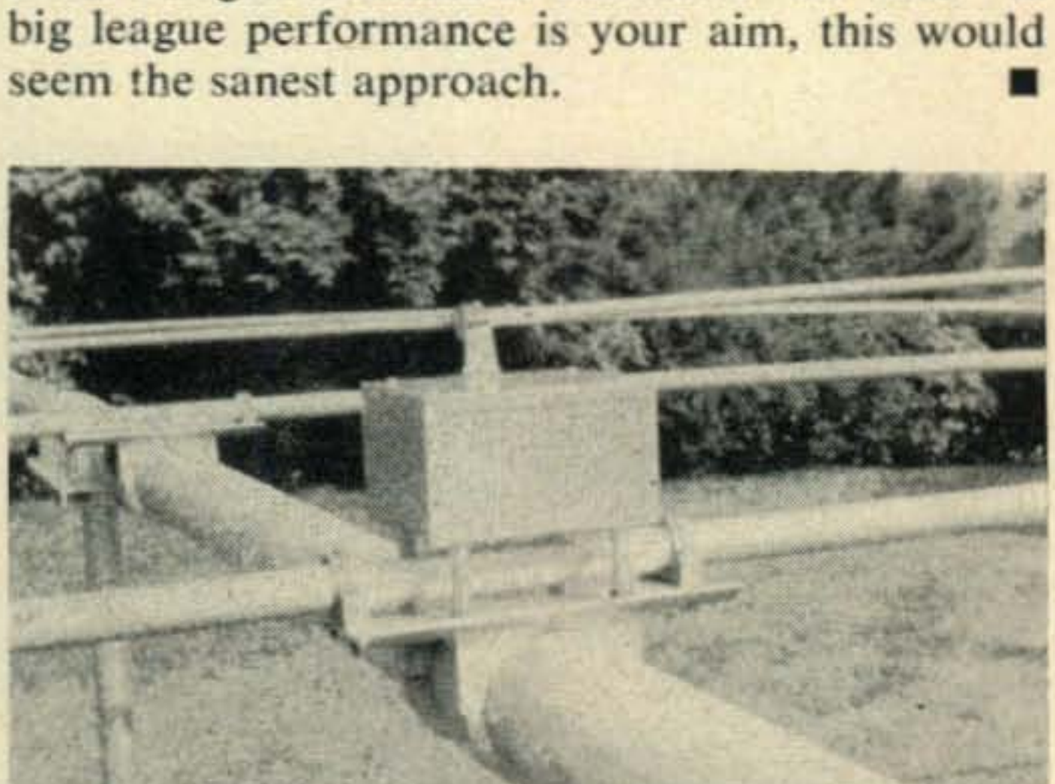
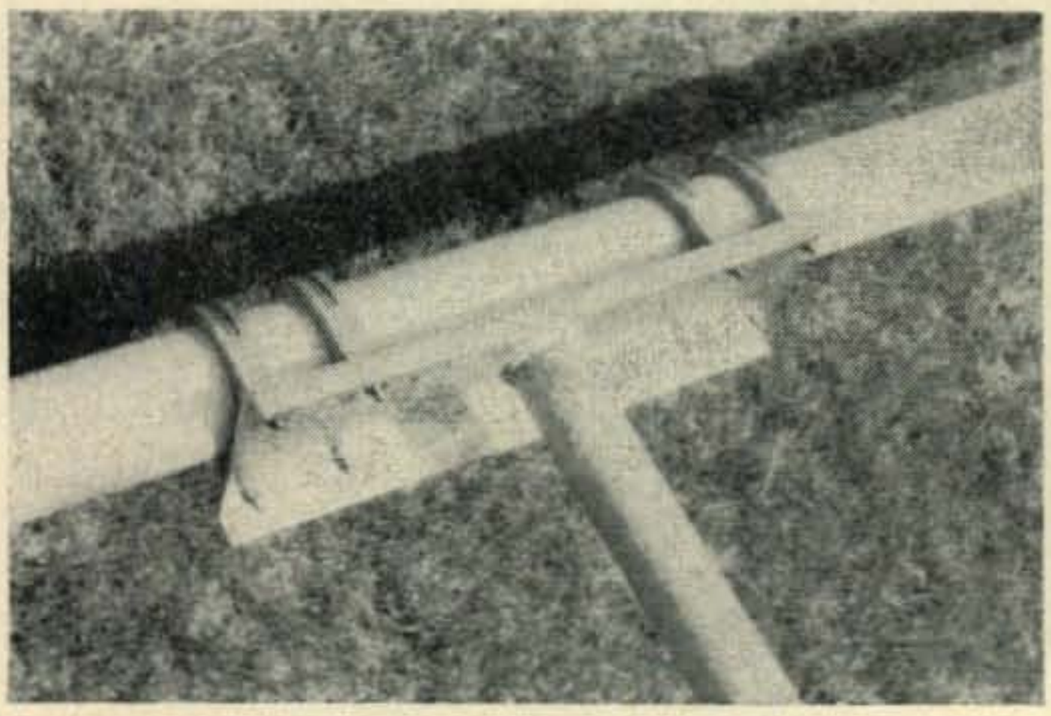


Fig. 1—Diagram illustrating the most efficient way to cut the aluminum tubing for the correct element length. Aluminum used for W1RAN installation was 6061-T6 alloy (aircraft grade), center sections: 1" O.D., 0.049" wall thickness; end sections: ⅞" O.D., 0.035" wall thickness. Note the combinations which total one standard 12-foot length of tubing: 7+5; 6+6; 3¼+3¼+2¾+2¾.



Four clamps provide sufficient support for the yoke section.

The gamma match housing mounts on the four studs available from the U-bolt clamps, via short spacers.

Running The S-Line Mobile

Jack D. Bruce, W4CHM/6
Box 259 Route 3
Carmel, California

INSTALLATION of radio equipment in an automobile is usually not much of a chore, especially if the equipment is specifically designed for mobile installation. The difficulty lies in latching on to enough cash to finance such an installation.

For the ordinary sedentary amateur a vacation trip once each year, plus an occasional week-end make up the bulk of his mobile program. This, of course, makes hamming about as expensive as using the telephone. The following installation can be had for about $110.00 and a handful of skinned knuckles. I backed into the project accidentally; most amateurs can attack squarely and not have half the trouble.

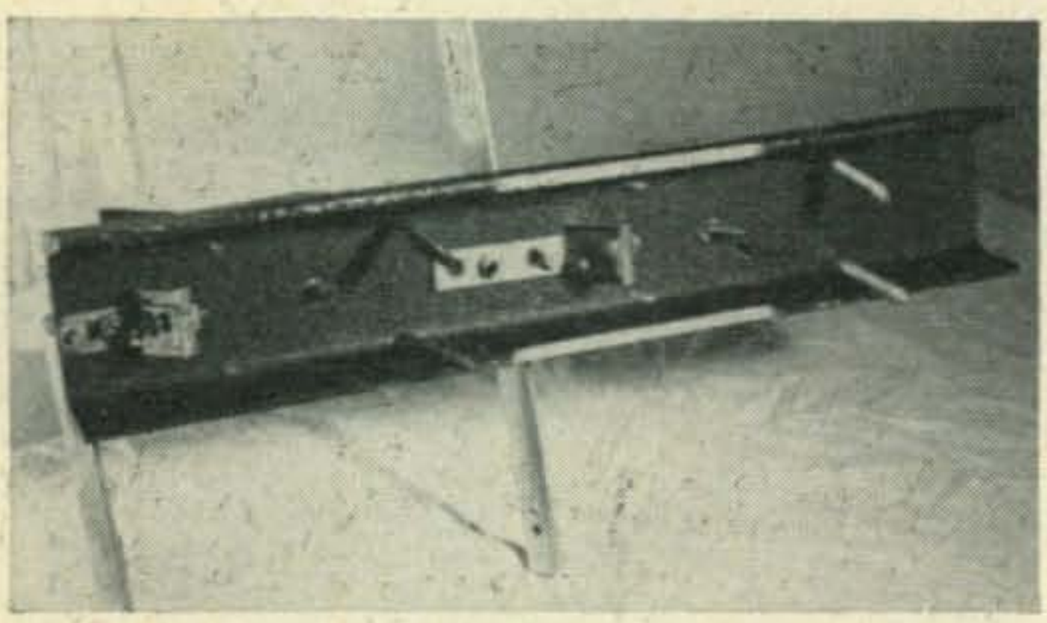
Just before our recent move to the West Coast, I decided to install the "S" Line in the family bus, a venerable '53 Cadillac.

At first I intended simply to make a dummy installation of the equipment, safe transportation being the only objective. I decided later to hook up the receiver since this seemed to be a smallish matter. Well, of course, any dyed-in-the-wool amateur could have predicted what would happen; I went "whole hog" for a complete station! What else?

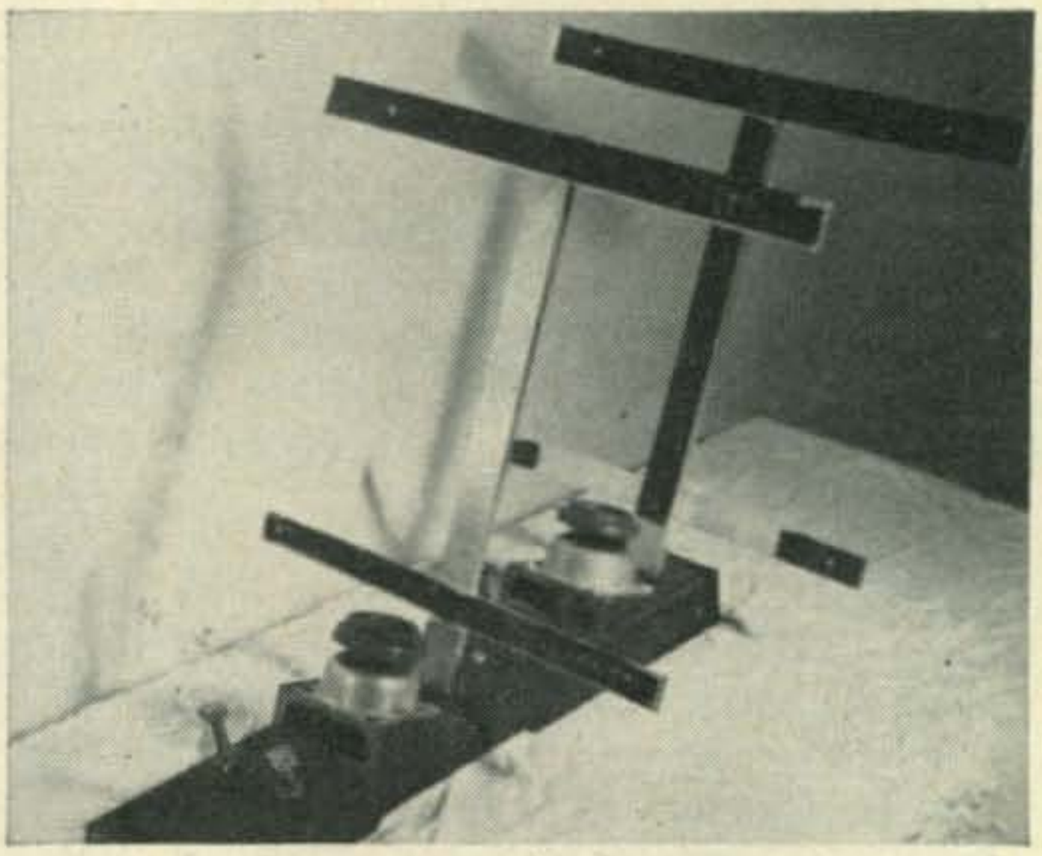
Mounting Assembly

At the start of the project I was primarily interested in getting the gear cross country in the best possible condition, so I decided I would construct my own mounting assembly.

A piece of magnesium material shaped in the form of a long narrow box provided a take-off point. I cut off a piece 17" long and mounted it with four, 2¾" long self threading bolts, along the top of the transmission bulge to form a base for the transmitter and receiver. I mounted two pieces of strap aluminum (Reynolds' do-it-yourself) protruding from this base in a nearly vertical position, from each of which two cross pieces were positioned, secured and drilled to mate with the feet mounting holes of the receiver and transmitter.



Completed unit sitting on the workbench waiting for installation. The material for the verticals and the top crosspieces is 1" × ¼" aluminum strap. The bottom crosspieces are ¾" × ⅛" aluminum.



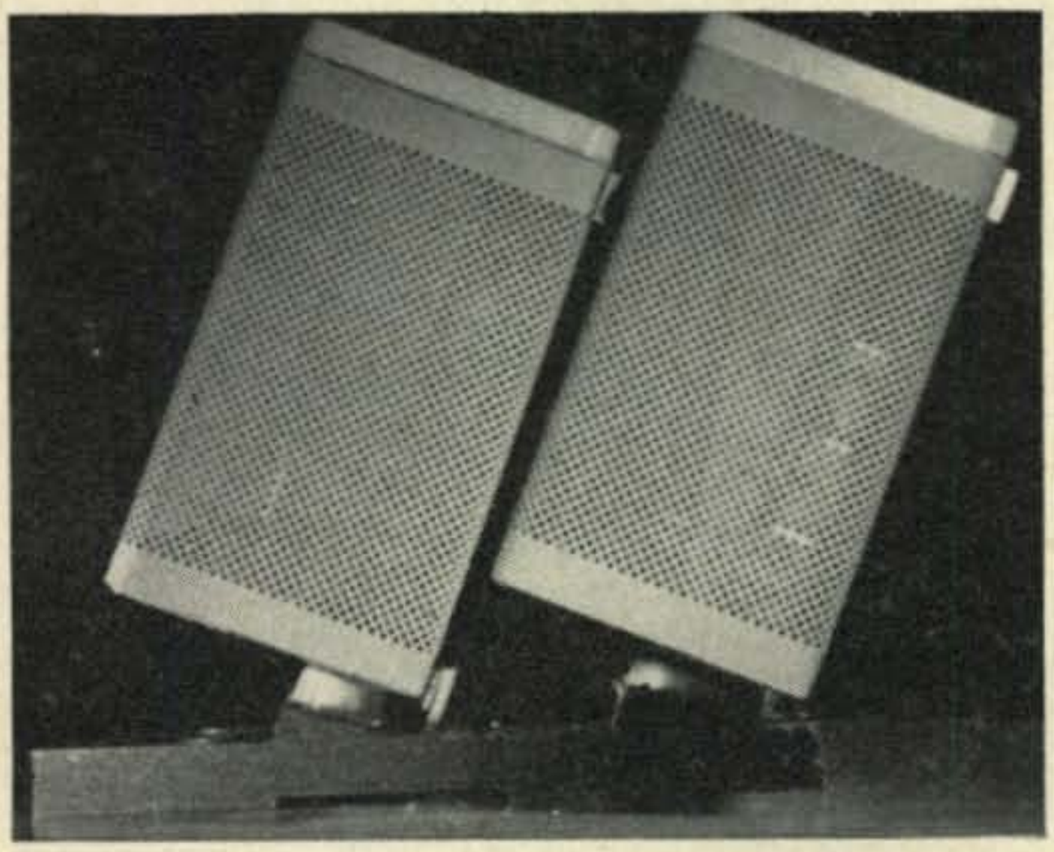
Shows details of anchoring the uprights. There isn't a great deal of room to mount the rear strap if the topography of your car is similar to mine ('53 Cad. Cpe.). Incidentally, the cutouts along both edges of the base plate were made necessary because of an awkward weld on the transmission bulge.

The rectangular holes for the vertical arms are cut by drilling and filing. The verticals are secured to the base by two common hardware angle straps as shown in the photo. Be sure the angle is correct.

I then mounted two rubber snubbers on top of each unit to form a flexible bond between the two units and between the top unit and the dash panel. By moving the seat forward against the after vertical upright I could cramp the two units together and against the dash panel to form a firm flexible unit. One other feature which I incorporated in my assembly (but which I doubt is absolutely necessary) was shock mounts between the rear faces of the transmitter and receiver and the base mounting platform. By using these I was able to mount each of the units onto the crossarms under positive stress, thus relieving some of the strain that might otherwise be taken by the crossarm when operating over bumpy roads.

Mechanical Construction

Unlike most "do-it-yourself" articles, the exact physical dimensions of the mechanical installation can't be given, unless, that is, your car is identical to mine. Most people will have to tailor dimensions to fit individual cars. The length of the mounting base is not important; just make sure it will fit along the top of the transmission bulge between the seat in its most forward position (after installation of the units) and the raised forward portion of the floor.



Side view of the two units mounted in the assembly and sitting on the workbench. Receiver is the rear unit.

To determine how your bracket should be tailored, place the base piece along the transmission bulge. Cut two cardboard silhouette shapes of the transmitter and receiver and physically place them in the approximate position the radio equipment will occupy. Now, by moving the cutouts about, a determination can be quickly made as to the correct position your radio gear will occupy. Mark and carry on. Don't worry too much about exact measurements. Quite a large amount of tolerance can be allowed.

To prevent chaffing, procure some adhesive felt material from the dime store and apply along the front and back of the assembly mount wherever the mount comes in contact with the radio gear.

After examining the transmission bulge for welds, trap doors, seams, etc., drill four holes in the respective corners of the base piece, making sure such holes will miss any of the aforementioned welds and seams when the assembly is in position.

If your car has about an inch thick floor mat you may well conclude as I did that the thing is hardly worth all the bother. Marking and drilling those holes into that curving transmission bulge is no easy matter. I used an ice pick to mark the spots for drilling and then pulled up the mat and drilled them. Sounds easy but it wasn't for me. Use your own judgement in picking the length and diameter of the four self-threading bolts to be employed in securing the assembly to the car. I used two bolts 5/16" x 2¾" and two others ¼" x 2¾"; I happened to have them on hand.

This is how it looks when all's said and done. The seat is snugged up against the back of the receiver. If you look closely enough you may be able to see the rubber bumpers between the two units and between the front unit and the dash panel.

Remember these bolts do not support the entire installation. All rotational forces are controlled by cramping the two units between seat and dash panel.

Selecting The Power Supplies

The S line requires 150 volts for the receiver and 800 volts at 250 ma for the final. A Kupfrian transistorized unit CA-1231-10 was selected for the low voltage supply but the final p.a. presented a problem. The highest output available was 600 volts. I finally decided to buy the 600 volt unit and attempt to place it in series with the 150 supply for a 750 volt output.

A Heathkit MP-1 was selected and rapidly built although the newer HP-10 would be even better due to the built-in bias supply. I soon learned that I couldn't saddle one of the supplies on top of the other. As soon as their outputs were placed in series they both stopped oscillating.

For a bias supply, I foraged through the junk box and picked up a surplus unit delivering 150 volts plus or minus depending on the position of the synchronous vibrator. This completed the power supplies; now to marry them into an operating unit.

Power Supply and Control Circuit

The block diagram and control function of the installation is shown in fig. 1. While the control panel and meter connections are shown in fig. 2.

Switch S_6 is contained in the MP-1 and controls an internal relay. The line (marked 12 volts) parallels this switch through pin 6 of the transmitter where it grounds on VOX action. In theory it should have worked but didn't because the MP-1 was too slow to start. Most of the time I turned it on and off by hand.

The value of R_5 might be open to question. I used 150 ohms here because it seemed about right to me and because I happened to have that value on hand. However, I'm sure those engineering types among you can prove quite handily that an entirely different value is called for.

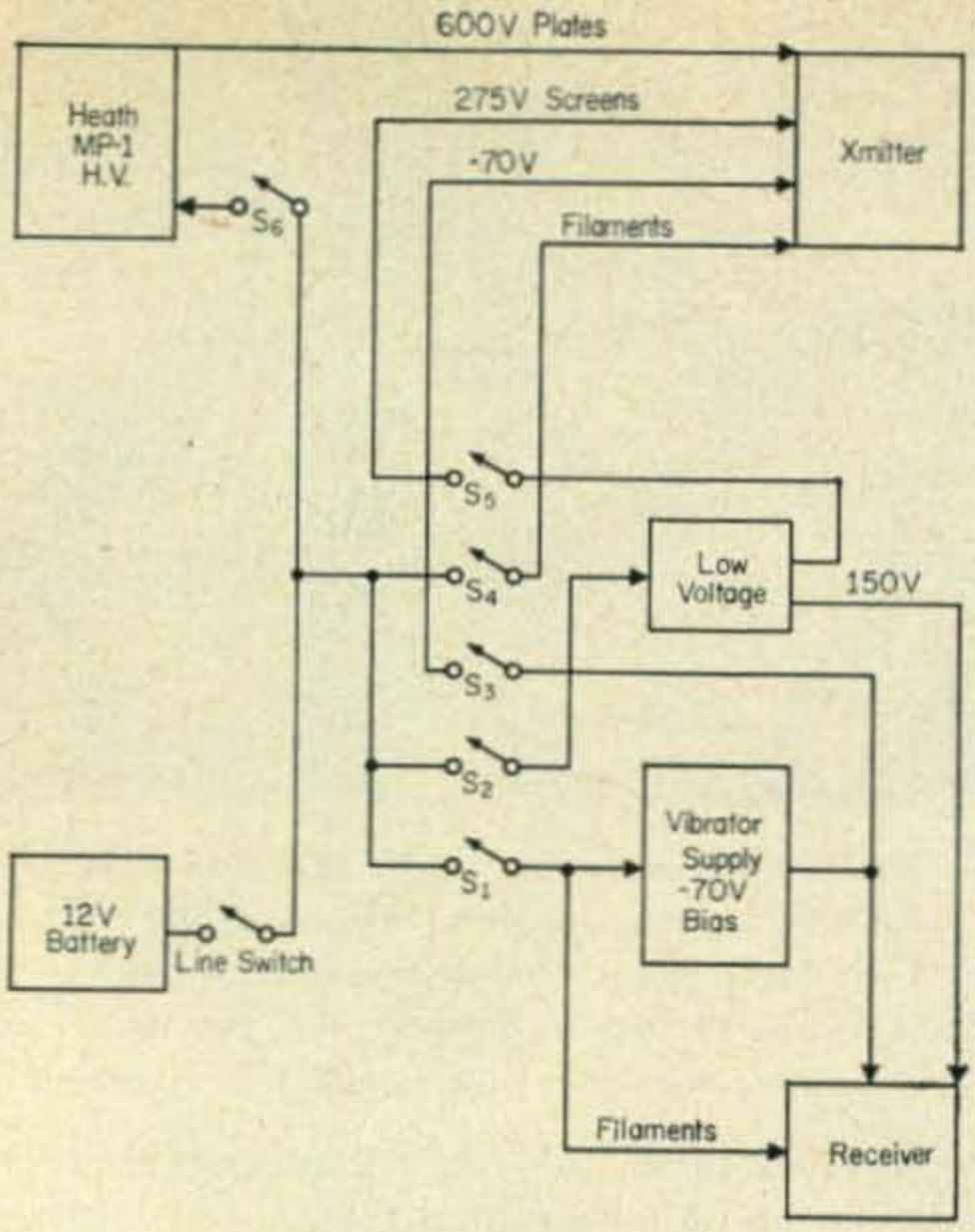


Fig. 1—Block diagram of the power supply system.. The line switch cuts all power to every unit and should be mounted in a hidden protected place. Mine was placed behind the car dash to the left of the wheel. Switches 1 to 5 are mounted on a control panel and placed in a position convenient to the operator. The control functions are: S_1, Bias and receiver filaments; S_2, LV power supply; S_3, Transmitter Bias; S_4, Transmitter filaments; S_5, Transmitter low level stages; S_6, Transmitter high level stages.

Choke L_2 is simply a filter choke for the bias supply. Since only about 10 ma is being demanded most anything will do. I liberated mine from an unidentifiable organ of surplus. The heft and feel were about right so I used it.

Two 11-pin octal female plugs are needed to fit the male plugs on the receiver and transmitter. I used two sets of Cinch-Jones series 300 plugs and sockets for the distribution box connections although here again just about anything with the proper number of pins will do. For the cables from the distribution box to the radios I used coax braid as a sheath and as a ground wire.

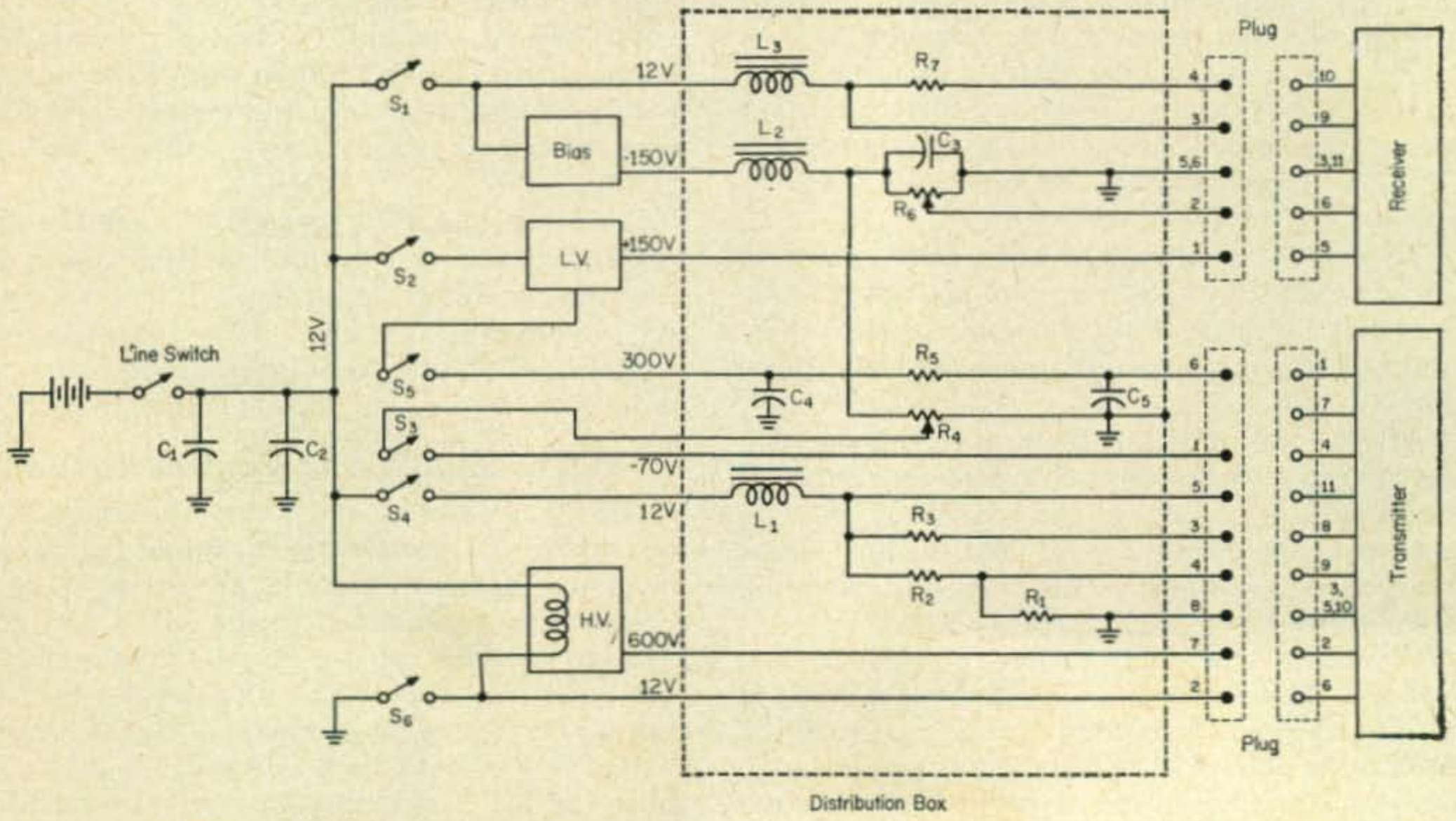
Although not shown, be sure to lace a nice big ground wire from battery negative to all important connections. Size 8 or 10 wire will do.

Mounting The Power Supplies

Place the power supplies and the distribution box where you like but two considerations are paramount. First, the power units should be close to the battery because as they say not many ohms here make a very huge dozen. Think what the power loss will be with 20 amps trafficking through 1/10 ohms. So either get the thing close to the battery or make the primary supply wire very large. I mounted the high voltage supply just under the car radio, forming a shelf from aluminum straps secured to the bottom of the dash panel and to the mounting bolts of the car radio. I mounted the low voltage supply on the bottom of the glove compartment principally be-

[*Continued on page 116*]

Fig. 2—Circuit of the control panel and junction box. The junction box components are not too critical as may be seen from the parts list and text descriptions.



C_1—2500 mf @ 25 V. Make it big but less will do.
C_2—.001 mf
C_3—50 mf @ 150 V. electrolytic
$C_{4,5}$—20/450 electrolytic
R_1—27 ohm 2W
R_2—33 ohm 2W
R_3—22 ohm 2W
R_4, R_6—1 megohm, screwdriver adjust pot. Bias adjust. Not critical.
R_5—150 ohms 10W (See Text)
R_7—47 ohms 2W
L_1, L_3—"A" chokes. Precautionary; may be omitted if desired
L_2—See Text.

Rx For Clock Watchers

E. S. Teutschbein, W4LAV
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Arlington 7, Virginia

A minor addition to a popular station accessory provides 10 minute warning signals for lengthy s.s.b. roundtable. Use as a Conelrad alarm is also mentioned.

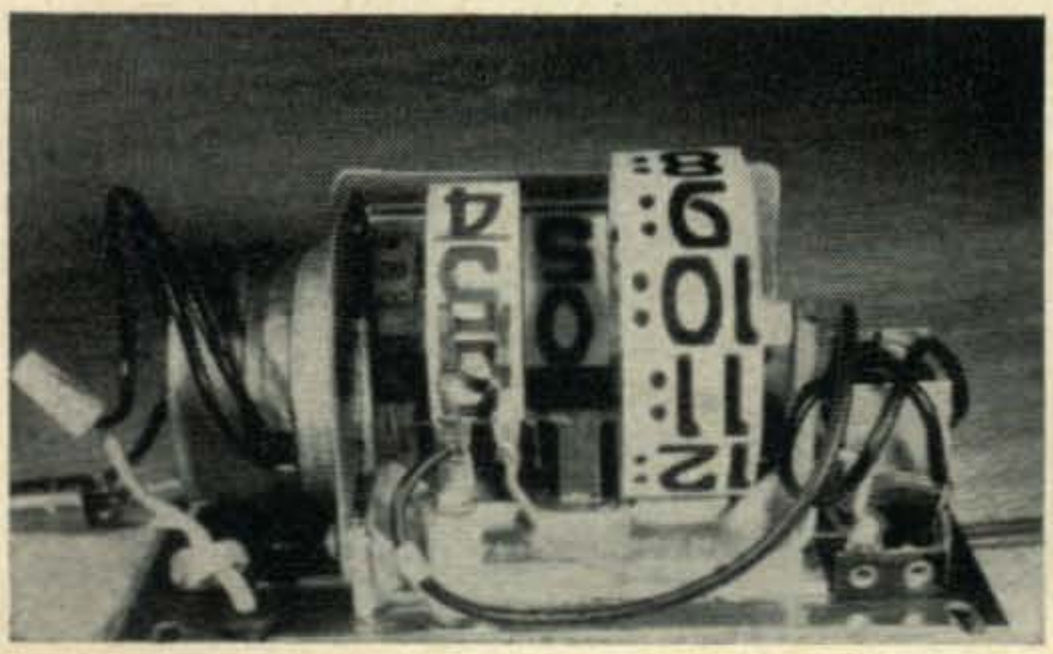
IF YOU are one of those many lucky owners of a numeral clock, similar to the one shown in the photograph, you can benefit from this article. Some newly introduced models have a ten-minute timer and buzzer built in; but for the thousands of owners who do not have this feature, why not incorporate an alarm at a very modest cost?

Modification

Since the minute wheel makes one revolution every ten minutes, we shall deal exclusively with this portion of the clock. Using a good clear glue (I used an epoxy resin to be safe), cement a ½" piece of about #16 piano or bare copper wire exactly on the highest point between any two numbers. Solder a narrow piece of phosphor bronze or brass shim stock to each terminal of a 2-terminal tie strip, approximately 9/16" long, and of a thickness which will allow a light spring return action. I used the phosphor bronze armature springs from a discarded relay.

Set this aside for the moment and mount the buzzer on a metal stand-off on the clock base. The photo shows the approximate location. Now mount the terminal strip on a ¾" stand-off insulator, and mount the stand-off on the clock base using fiber washers on each end of the stand-off. When the glue has hardened, adjust the contacts so that they rest evenly, and not too firmly on the piano or copper wire as it passes by, making certain they clear the plastic dial during the remainder of the dial's rotation. Make sure the contacted surface of the wire is clean and free from glue.

Rear view of the clock with the cover removed. The shorting bar can be seen between the 4 and 5 minute mark. A porcelain standoff supports the two lug terminal strip holding leads x and y in fig. 1.



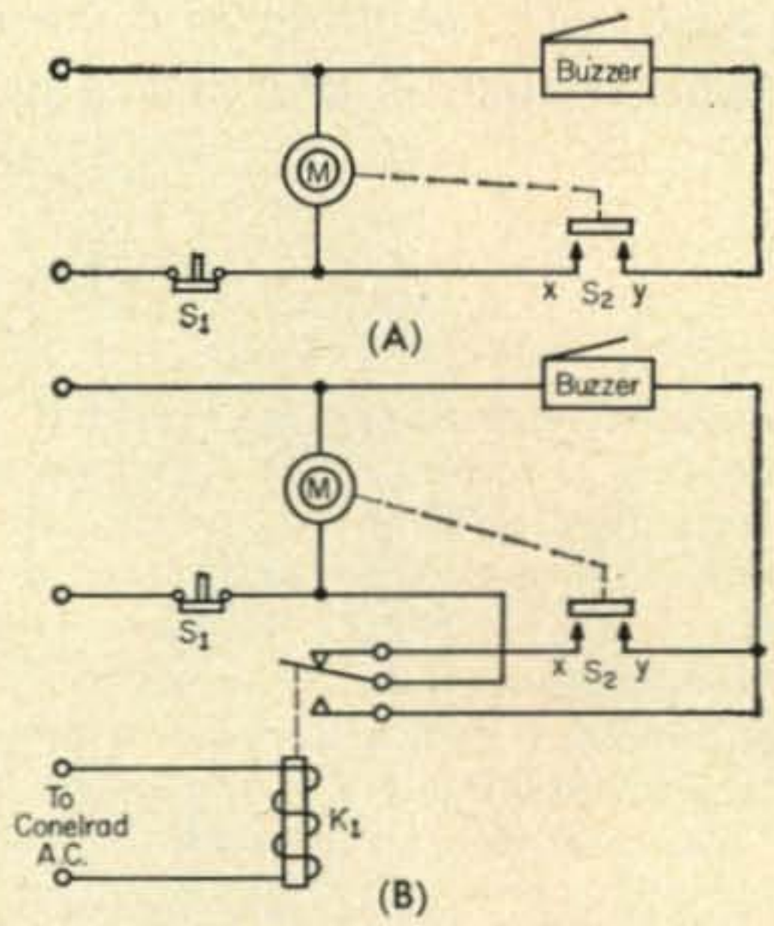
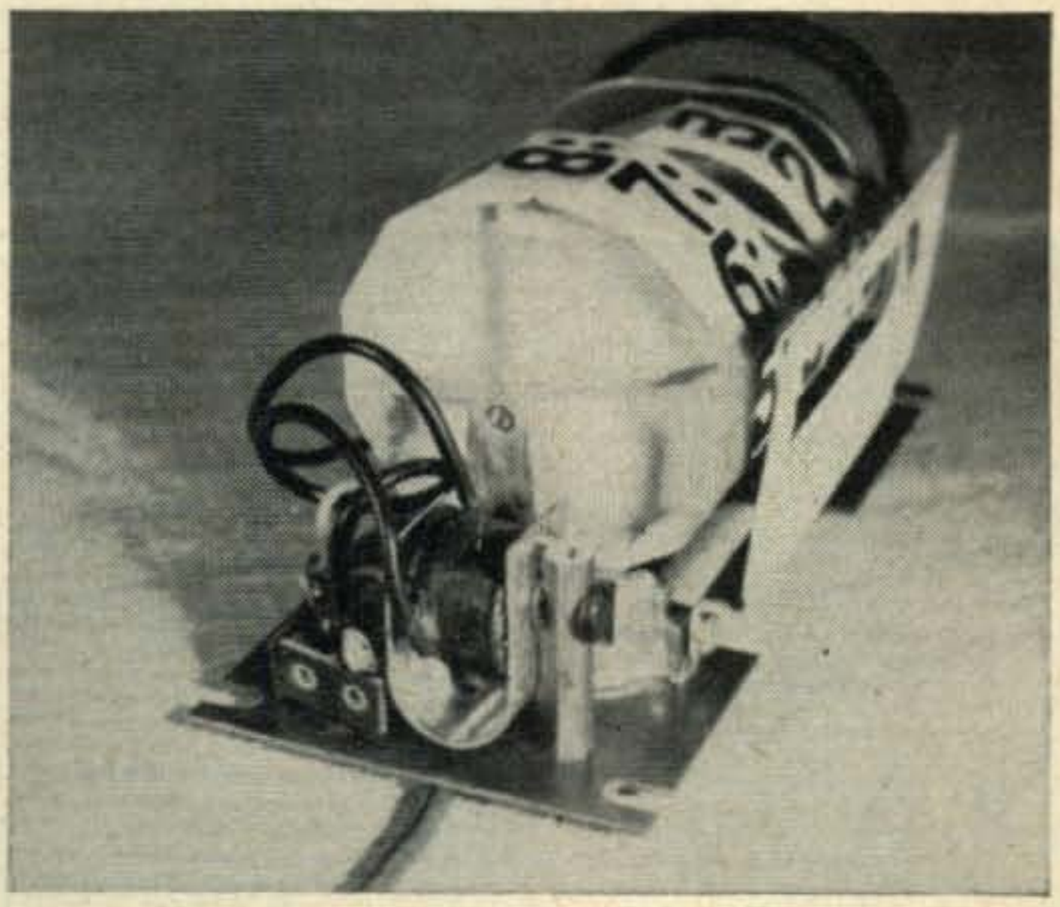


Fig. 1—In A), S_1 is used to interrupt the a.c. supply to the motor to accurately calibrate the clock with WWV. Switch S_2 is the piano wire bar on the minute drum as shown in the photograph. In B) a relay is wired in to permit the use of the buzzer as a Conelrad alarm.

All that remains is to wire the unit as in fig. 1a. Alligator clips, temporarily clamped to the terminals while soldering the leads will dissipate the heat from the contacts.

My shack has a master a.c. switch which turns everything on at one time. It is this switched a.c. that I use to feed the buzzer circuit. I might add

[*Continued on page 115*]



Side view showing mounting of buzzer. A single metal stand-off does the whole job.

A 50 Mc S.S.B. Converter-Transmitter

Utilizing 14 mc S.S.B. Output for 100 Watts p.e.p. on 6

by J. F. Sterner, W2GQK

End of Florence Avenue,
Pitman, New Jersey

This article describes a relatively simple, moderately priced mixer and amplifier scheme, utilizing readily available 14 mc s.s.b. r.f., resulting in 6 meter s.s.b. output. Excellent linearity and reduction of TVI are just two of the many advantages of this unit.

THIS converter-transmitter is designed to provide s.s.b., c.w. and a.m. 6 meter operation when used with any of the presently popular 100 watt output s.s.b. transmitters, such as Hallicrafters HT-32, HT-37, Gonset's GSB-100, etc. Modification of the s.s.b. transmitter itself is not necessary, since a resistive power reducing network (output pad) is inserted between the converter-transmitter and the s.s.b. transmitter.

The converter-transmitter described here is driven by the 14.0 mc to 14.5 mc output of an HT-37, providing operation in the 50.0 mc to 50.5 mc range of the 6 meter band.

Circuit Description

In the r.f. portion of the unit, the triode section of a 6EA8 is used in a 36 mc crystal controlled oscillator circuit. The pentode section of the tube is connected in a buffer amplifier/phase splitter circuit and drives a pair of 5763's utilized as balanced modulators. A part of the 14.0—14.5 mc output from the HT-37 is coupled to the cathodes of the two 5763's. The plates of these tubes are then applied to a push-pull tank circuit tuned to the 6 meter band. The 5763 tank circuit is then closely coupled to the push-pull grid circuit of two 6146's. The plate circuit of the 6146's is of the conventional push-pull type.

The antenna link, L_3, is closely coupled to the center of the plate coil, L_2, and includes an APC type air trimmer capacitor for adjustment of the 6146 plate loading to a coaxial type transmission line.

Metering is provided only for the output voltage to the antenna transmission line, since this system is used very satisfactorily in the author's HT-37 s.s.b. transmitter. If the initial adjustments are made to the converter transmitter under "bench" conditions, this type of metering is more desirable than an elaborate circuit switching arrangement or a grouping of several meters for different circuits.

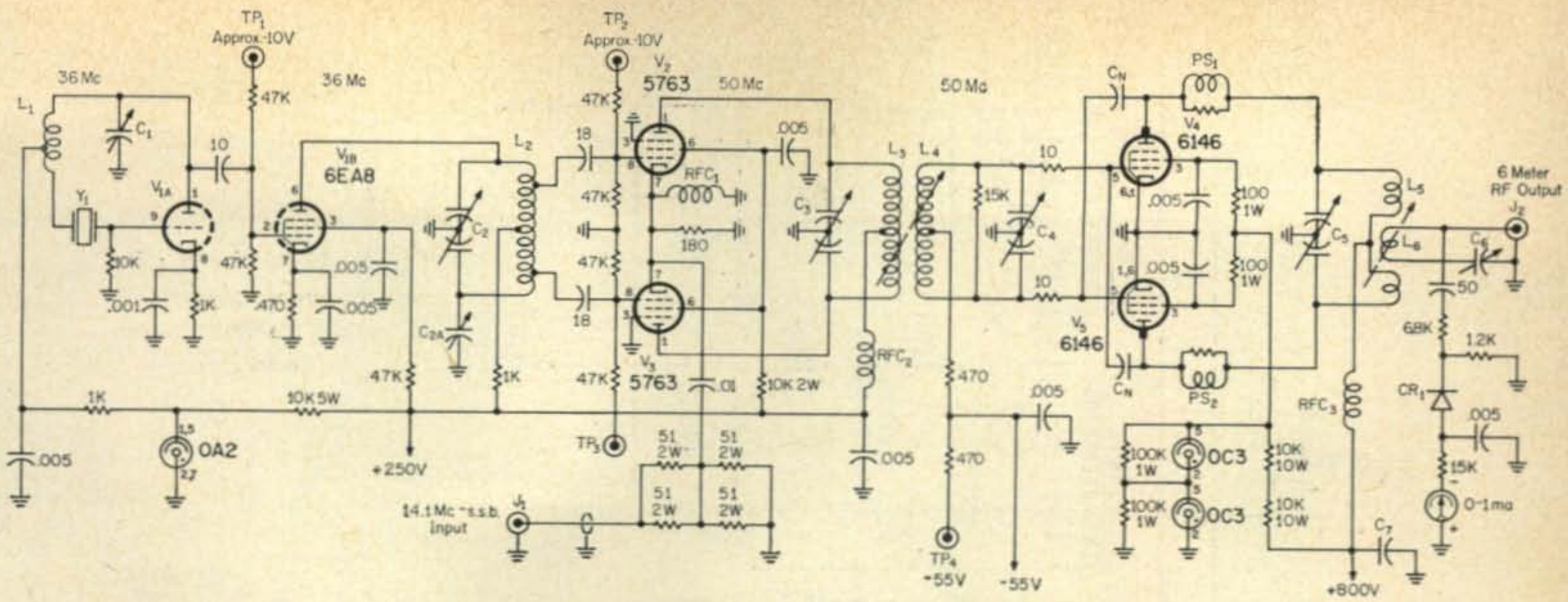
Power Supply

The power supply section delivers +800 volts at approximately 250 ma for the 6146 tubes, a bias voltage for the 6146 grid circuit (adjusted to —55 volts) and a low voltage supply for the 6EA8 and 5763 tubes. An 0A2 tube is used to regulate the voltage for the crystal oscillator section of the 6EA8. Screen voltage regulation for the 6146 tubes is provided by two VR-150/0C3 tubes connected in series.

Output Pad

The "output pad" inserted between the s.s.b. transmitter and the converter-transmitter, is built

The low voltage power supply components are at the rear left and the high voltage components are to the rear right. The tube lineup from l. to r.; 6EA8, 36 mc oscillator/buffer amplifier; two 5763 balanced modulators feeding two 6146's in push-pull. The 0A2 regulator is directly behind the 6EA8 and the ceramic trimmer, C_1, in front of the 6EA8 tunes the crystal oscillator.



C_1—7-45 mmf ceramic trimmer, Centralab 822-BN or equivalent

C_2—Split stator, 30 mmf per section

C_{2a}—1-8 mmf piston capacitor, Erie 532-10 or equivalent

C_3—Split stator, 30 mmf per section

C_4—Split stator, 50 mmf per section, Hammarlund HFD-50

C_5—Split stator, 50 mmf per section, Hammarlund HFD-30X

C_6—10-100 mmf, Hammarlund APC-100

C_7—.01 1600 volt disc ceramic

C_n—Neutralizing gimmick wires

CR_1—1N34A

L_1—9t #16 tinned, close wound ¾" long, wound on a 7/16" dia. coil form.

L_2—11t #16 tinned, air wound ⅞", long, ½" i.d. Taps 1 and 3 are placed ½ turn from each end. Tap 2 is connected to the center-tap.

L_3, L_4—8t #16 tinned, air wound, ⅞" long, ½" i.d. center tapped.

L_5—6t #12 tinned, air wound, 1½" long, 1 3/16" i.d. (3 turns per pi).

L_6—2t #12 tinned, air wound, covered with insulating sleeving, 1 3/16" i.d.

PS_1, PS_2—2½t #16 tinned, wound on a 39 ohm, 1w carbon resistor.

RFC_1—36 μhy (TV peaking coil)

RFC_2, RFC_3—1.2 μhy

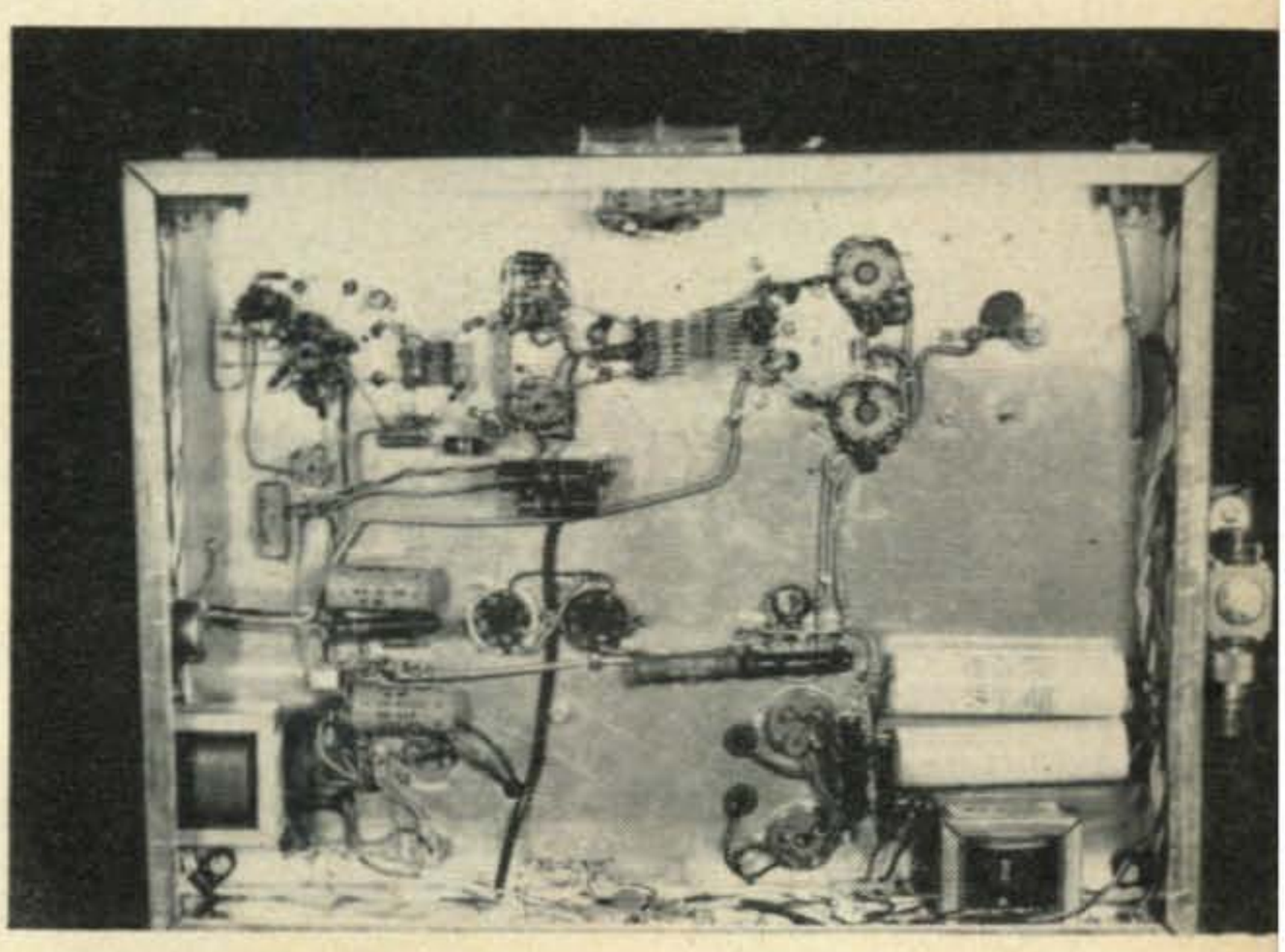
Y_1—36 mc crystal (third overtone) mounted in an FT-32 holder. Hunt Corp., Carlisle, Pa.

Fig. 1—Diagram of a converter-transmitter capable of 100 watts p.e.p.; 100 watts c.w. and 25 watts a.m. All resistors are ½ watt unless otherwise specified. Decimal value capacitors are disc ceramic. All others are in mmf unless otherwise indicated.

into a separate 3" × 4" × 5" aluminum Bud "Mini-Box". Twelve 51 ohm, 2 watt carbon resistors are connected in a series-parallel arrangement as shown in fig. 3. Four more of these same type of resistors are also connected in series—parallel, but are installed in the converter-transmitter itself. This pad then provides a good 51 ohm, 32 watt resistive load for the s.s.b. transmitter output. The 32 watt capacity of this system is more than adequate to handle the 100 watts peak output of the transmitter, since the average power of the voice s.s.b. peak 100 watt signal is less than 30%. The author has another 3" × 4" × 5" box bolted to the output pad box. This is to house a 2 position, 3 circuit switch for selection of drive for either the converter-transmitter or for a Central Electronics 600L Linear Amplifier, used on the lower bands. Of course this may be omitted, depending on the operator's requirements.

Construction

The converter-transmitter, including the power supply, was built on a 13" × 17" × 3" aluminum chassis. It is definitely recommended that an aluminum chassis be used to minimize coil losses



Under chassis view of the 6 meter converter-transmitter. R.f. components are at the top and the power supply components are on the bottom. Inductors L_3 and L_4 can be seen just below the meter. Inductance L_2 is mounted to the left of the two 5763 tube sockets and L_1 is adjacent to the crystal socket at the left. Part of the r.f. attenuater pad can be seen below the 5763 socket. Potentiometer R_1 is mounted on the left apron.

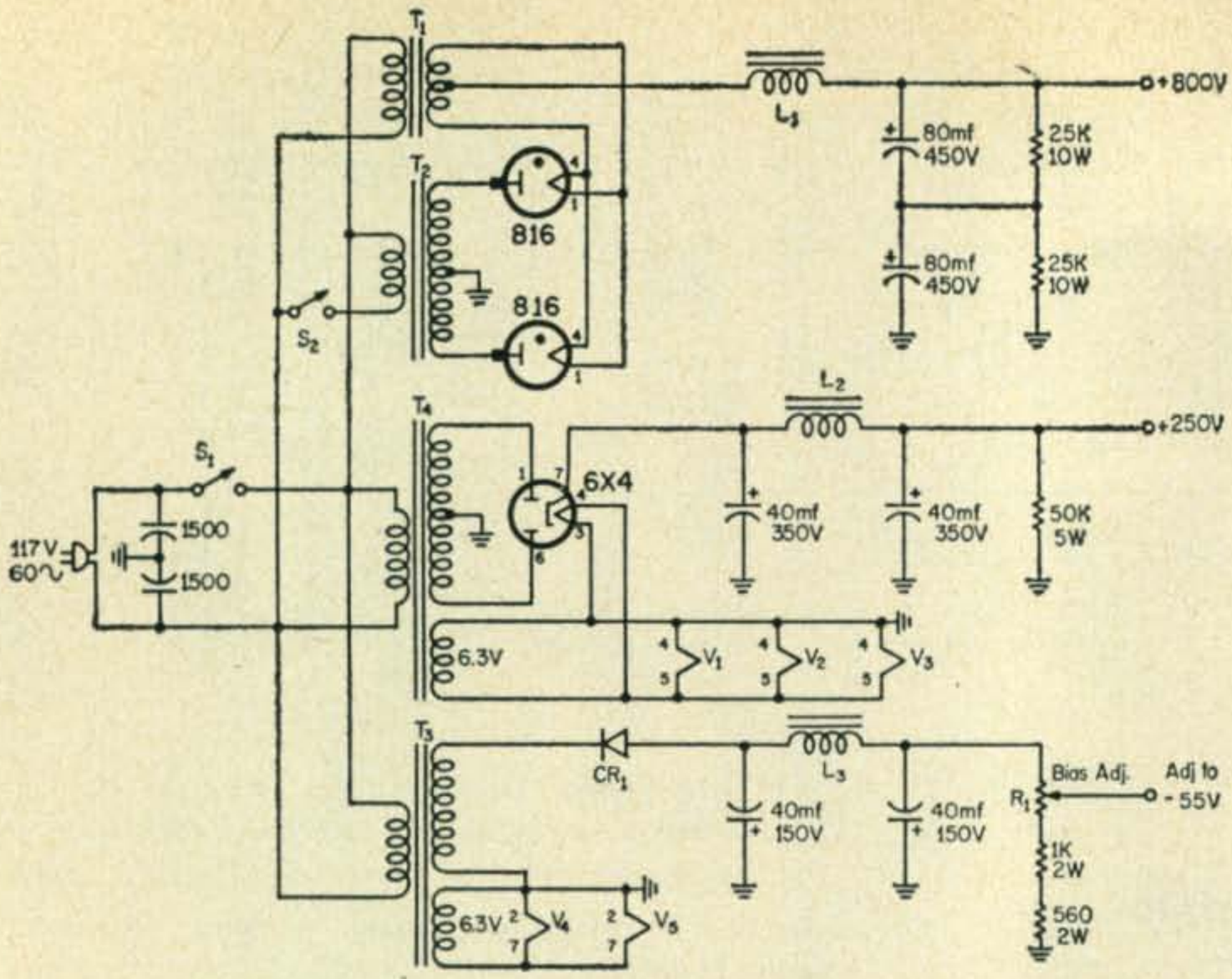


Fig. 2—Circuit for a suitable power supply for the 6 meter transmitter-converter.

CR_1—Silicon rectifier 150 ma, 200 p.i.v.
L_1—5-25 hy, 200 ma, Stancor, C-1721 or equivalent
L_2—16 hy, 50 ma, Stancor, C-1003 or equivalent
L_3—12 hy, 80 ma, Thordarson, 20C53 or equivalent
R_1—1k 2w potentiometer, linear taper
T_1—2.5v., 5 amps, Merit P-2939 or equivalent
T_2—920-0-920v. r.m.s., 250 ma, Stancor PC-8305 or equivalent. One end bell is removed and a hole drilled at the top to pass the two leads for the 816 plates.
T_3—55v. 100 ma, 6.3v. 4 amps—Similar to Heath replacement transformer for their a.m.-f.m. tuner, A-10. The original end bell is removed and the transformer is strap mounted vertically.

and provide better heat dissipation. A small metal shield is mounted between the 6146's and C_4, the 6146 grid tuning capacitor. Note the two gimmick wires, C_n that pass through the shield to the outside area of the 6146's. These may be adjusted for neutralization as found in most Handbooks. No shield cover was made for this unit, and no TVI is present in the house TV set, nor has there been any reported from neighbors.

If components similar to those described in the parts listed are used, and the layout shown in the photographs is followed closely, no particular problems should be encountered in duplicating this rig.

Initial Checkout

The tune-up procedure is quite simple and may be done after initial voltage checks are made.

1—Turn S_1, ON, (fig. 2) but leave S_2 in the OFF position. Connect a v.t.v.m. to test point TP_1, shown in fig. 1. Adjust C_1 so that approximately —10 volts is measured. The crystal will "plop" in when C_1 is rotated in one direction, and at this point the meter will read about —14 volts. Back down on C_1 until the voltage is —10 volts.

2—Connect the voltmeter to TP_2 and adjust C_2 for maximum output on the voltmeter. Connect the voltmeter to TP_3 and note the reading. If it is not the same as TP_2, alternately readjust C_2 and C_{2A} until the voltage at TP_2 and TP_3 is the same.

3—Tune the s.s.b. transmitter to 14.250 mc. Switch to the CW or DSB position and adjust the transmitter so that 10% to 15% of its output is delivered to the converter-transmitter. Tune your 6 meter receiver to 50.250 mc and adjust C_3 for maximum output as indicated on the receiver S-meter.

The following adjustments are made with the high voltage power applied to the 6146's. It is suggested at this point that you use an insulated adjustment tool, and keep the hand you're not using deep in your pants pocket.

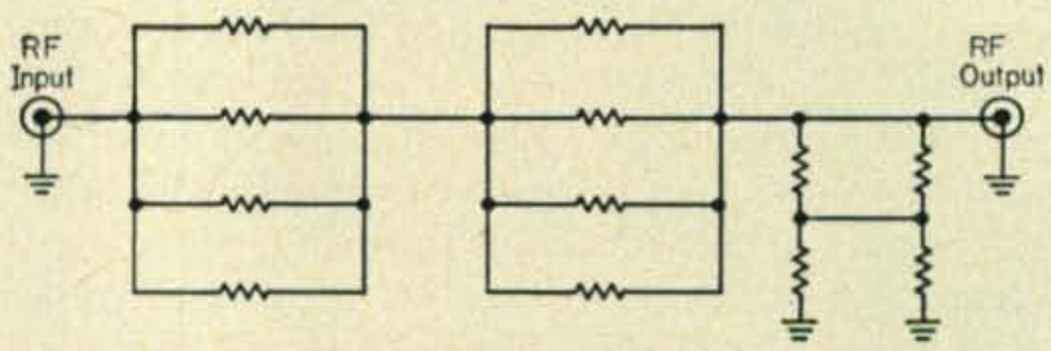


Fig. 3—Diagram of a suitable power attenuator network used by the author to couple a commercially available 20 meter rig to the transmitter described here. All resistors are 51 ohm 2 watt carbon.

4—Connect a 100 watt, dummy load to the antenna connector, J_2. Switch on S_1 and recheck the 50.250 mc signal on your receiver. Connect the voltmeter to TP_4. Adjust the 1K, 2 watt potentiometer so that the bias voltage is —55 volts. Reduce the drive from the s.s.b. transmitter to minimum. Turn on the B+ switch, S_2. Advance the output power control of the s.s.b. transmitter (RF LEVEL on HT-37) again to about 10% of its maximum output.

Tune p.a. grid capacitor, C_4, and p.a. plate capacitor, C_5, for maximum output as indicated on the converter-transmitter meter, M_1. Adjust C_6 for maximum output on M_1 and retune C_5. With an insulated screwdriver, carefully push L_3 and L_4 away from, or closer to each other, in whichever direction provides the maximum output as indicated on M_1. It will be necessary to retune C_3 and C_4 each time these coil positions are adjusted. Note the position of these coils in the under-chassis view.

Final Adjustments

When the above adjustments are completed, increase the output of your s.s.b. transmitter and notice the increase in the reading of M_1. Connect a 6 meter antenna to the converter-transmitter, using a 50 ohm coaxial transmission line. Retune C_5 and C_6 so that maximum voltage is indicated on M_1. The meter indication will kick up to 0.80 ma to 0.85 ma on speech peaks, corresponding to approximately 100 watts p.e.p. output. You are now ready to go on the air with s.s.b. on 6 meters.

For a.m. service, tune your s.s.b. transmitter to the DSB mode and reduce the drive until M_1 reads about 0.30 ma. Modulate your s.s.b. rig and note that the flicker of the meters on both the s.s.b. transmitter and the converter-transmitter coincide. If the converter-transmitter meter flickers downward, reduce the output of the s.s.b. transmitter slightly so that both meters flicker similarly.

The results on a.m., s.s.b., and c.w. have been quite gratifying. Needless to say, the s.s.b. signal is most effective under adverse conditions, and second only to c.w.

Many thanks to W2OQW for his assistance in preparing the photography and to the other local amateurs for their constructive comments during this project. ■

A Combination Cell Holder and Tester

by George P. Pearce
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Albuquerque, New Mexico

For experimental and research work where a low d.c. voltage is required, the following article describes a very handy cell holder which will take almost any small flashlight cell such as the N, NE, A, AA, AAA, B, C, and D sizes, for it is of the vertical clamp style as shown in the photographs. This particular holder, however, has a valuable addition which consists of a small push button which, when pressed, places a 4.7 ohm, 1% precision resistance across the cell terminals. This will give complete data regarding the condition of the cell by simply reading the open circuit and under-load cell voltages. For this purpose, use a high resistance voltmeter, one of at least one thousand ohms per volt sensitivity.

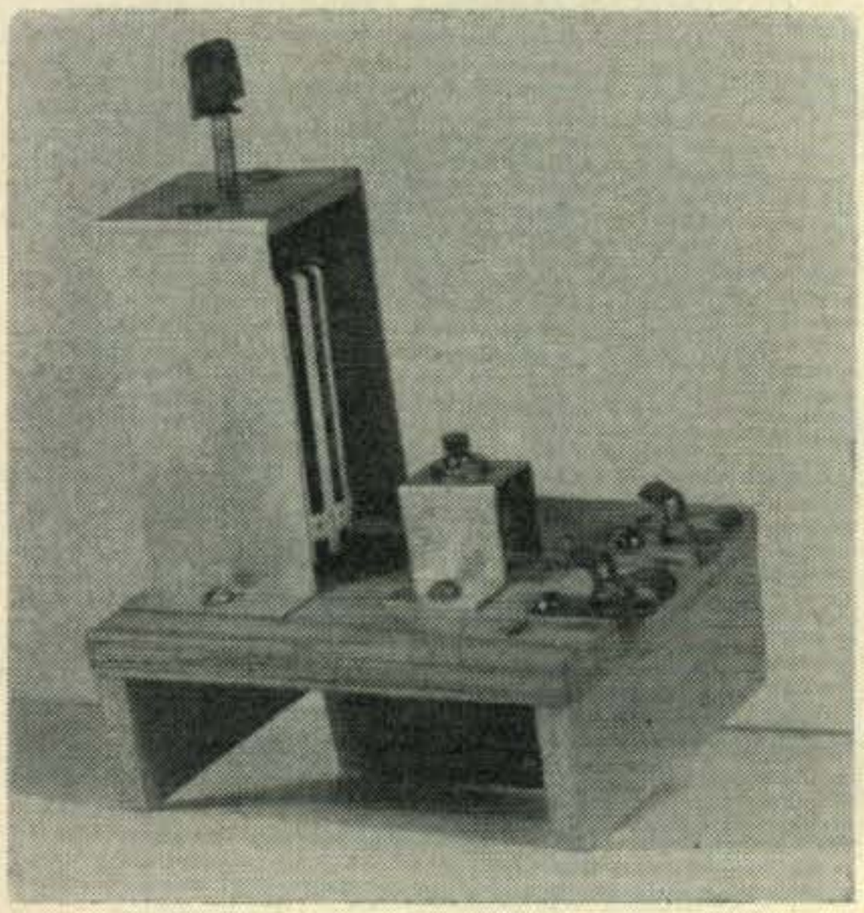


Photo showing simplicity of cell holder and tester. The 4.7 ohm resistor is mounted underneath, out of view. The Fahnstock clips connect to the voltmeter.

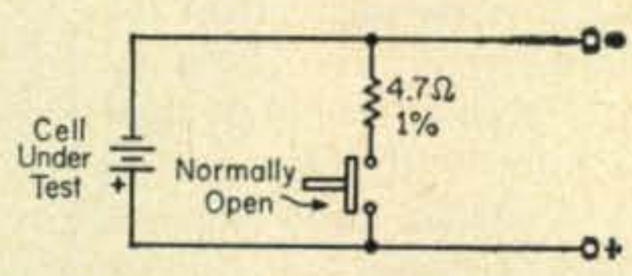


Fig. 1—Diagram of a simple device used to determine the internal resistance of a dry cell.

Call the open circuit reading E, the load reading —when the button is pressed—V, this will be lower than E, and the external resistance or load R_e. This information is all that is necessary to determine the internal resistance of the cell called R_i. Now using the formula:

$$Ri = \frac{E - V}{V} \times 4.7$$

Let us take the actual readings of a cell that has been partially used up. E=1.55 volts, V= 1.10 volts; thus:

$$Ri = \frac{1.55 - 1.10}{1.10} \times 4.7$$

which equals 1.921 ohms. This is the internal resistance of that particular cell at the time of test, and if used, will add 1.921 ohms to the circuit. The cell is pretty well used up, for a new cell generally runs around 0.3 ohms.

The importance of using a high resistance voltmeter can readily be seen by taking the open circuit cell readings (E) with various voltmeters: One "D" cell when tested with a voltmeter of 20,000 ohms per volt gave 1.32 volts; a 1,000 ohms per volt gave 1.31 volts and a small pocket tester of 12.5 volts per ohm gave only 1.0 volt, which obviously would result in very misleading figures. ■

Contact Print Your Own Dials

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

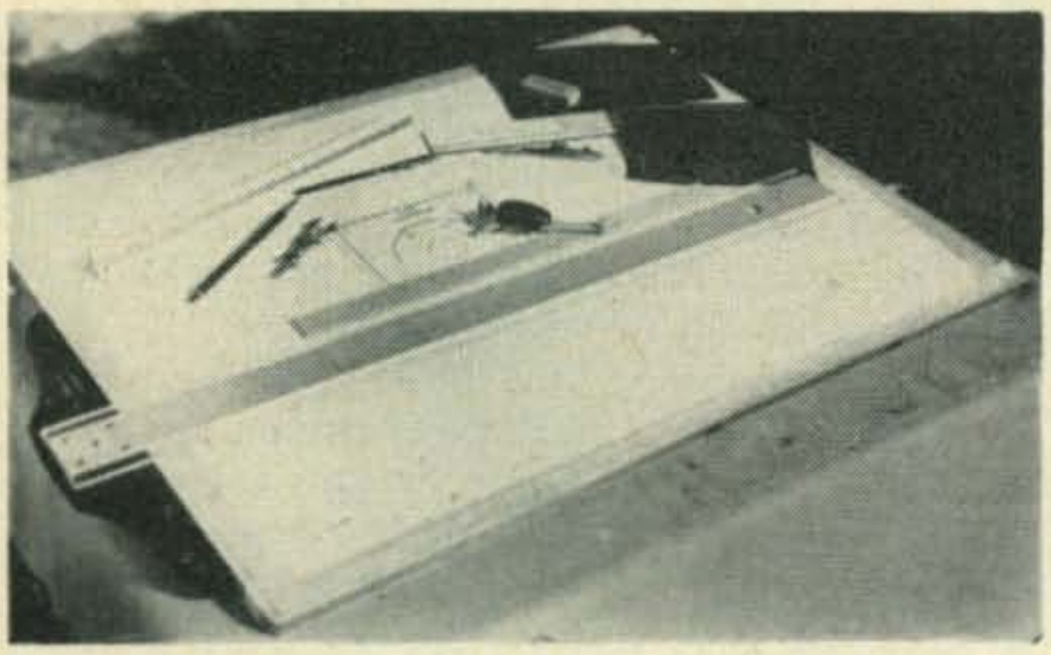
Adding a Professional Touch to Your Home-Brew Equipment

YOUR home-brew equipment can be considerably dressed up by using a glossy contact print for the dial on your rig. Covered with a sheet of lucite, the equipment will have an extra sparkle needed to make it look professional. A negative is also available, in case anyone else might want to duplicate a particularly difficult dial calibration simply by making a contact print, using your negative.

The negative for a dial is easy to make in your own kitchen laboratory, with equipment and material that can be purchased locally. No difficult-to-obtain material is used in this process.

First, get a pad of Keuffel and Esser Transparent Sketching Pad, Number 355-11. Lay a piece of this paper on your equipment and draw the calibration lines in pencil. Next cover the pencil lines with India ink. A few drafting tools are handy for doing this work, such as a straight inking pen, ink compass and a Speedball lettering pen. Better yet, if you intend to make a lot of dials, buy a new K&E *Doric* lettering set #8935. It will do a mechanically perfect job and is less expensive than the *LeRoy* lettering sets.

We are now ready to make a high contrast negative from the tracing. Place the tracing face down on a piece of glass and cover it with a sheet of Ansco Reprolith Film. This must be done in a dark room because the film is very sensitive to light. The film will have a dull side and glossy side which can be felt in the dark. Place the dull side next to the paper.



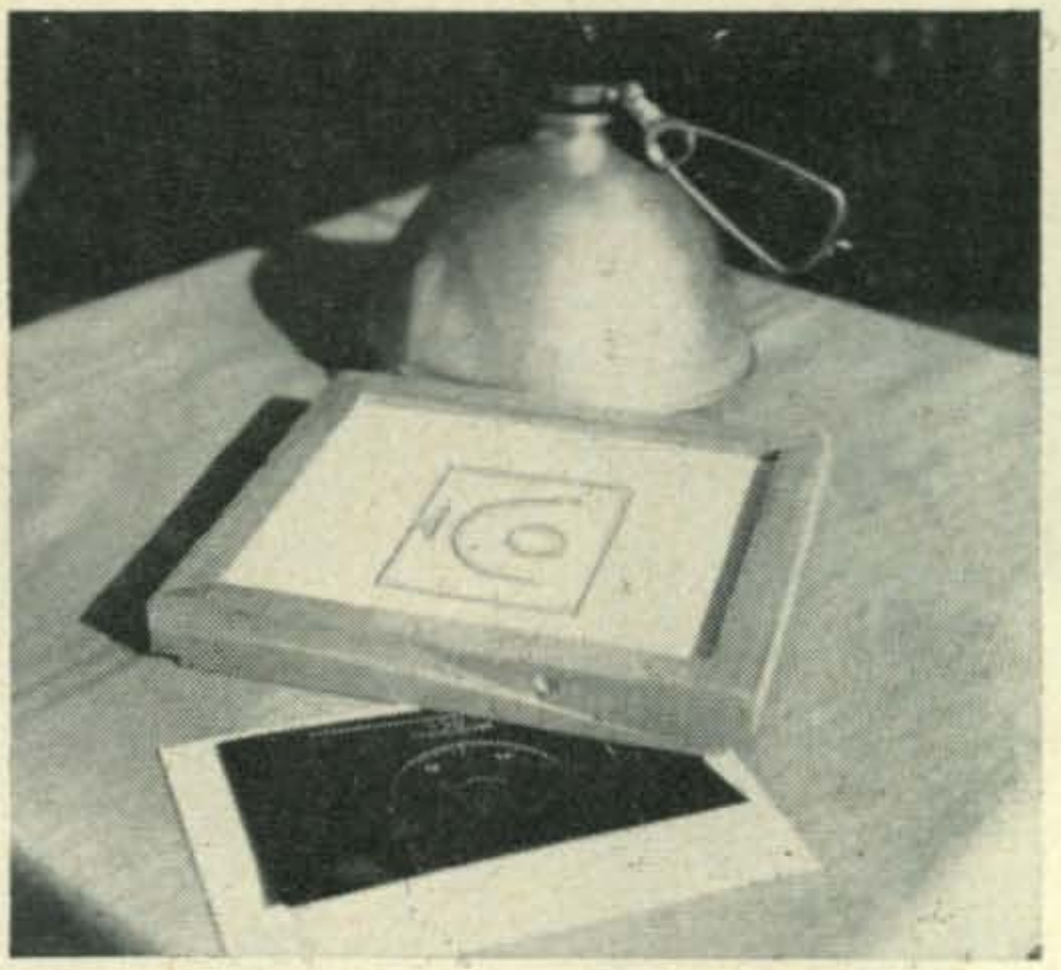
Draw dial calibration in pencil, go over it with India ink. When dry, erase pencil lines with soft eraser.

You are now ready to expose the film. Hold a 40 watt bulb a distance of about two feet and expose for approximately a half a second. When the film is developed and the negative turns out darker than required, reduce the exposure.

To develop the film, place it in a pan of Kodalith[1] high contrast developer for about one minute. Rinse with clean water, preferably distilled, and add a few drops of stop bath. Next, place the film in a hypo solution, following the instructions on the package. Leave the film in the fixer for fifteen minutes and again wash the film for about fifteen minutes.

After the negative has been dried overnight, take it to a local photo shop and have a glossy white contact print made. If you are a photo enthusiast, you may have the materials in the dark room to do this yourself. Place the print on your panel and cover it with a sheet of lucite, you will be surprised how much nicer your equipment will now look. ■

[1]Use only Kodalith, ordinary developer will produce a grey negative.



After the lamp has been held over the film for about half a second, the film is developed and a contact print is made. Shown here is the original artwork mounted in the frame. The negative is in the foreground.

A 220 mc Transistorized Oscillator

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Salina Star Route
Boulder, Colorado

A simple circuit suitable for local oscillator work at the very high frequencies.

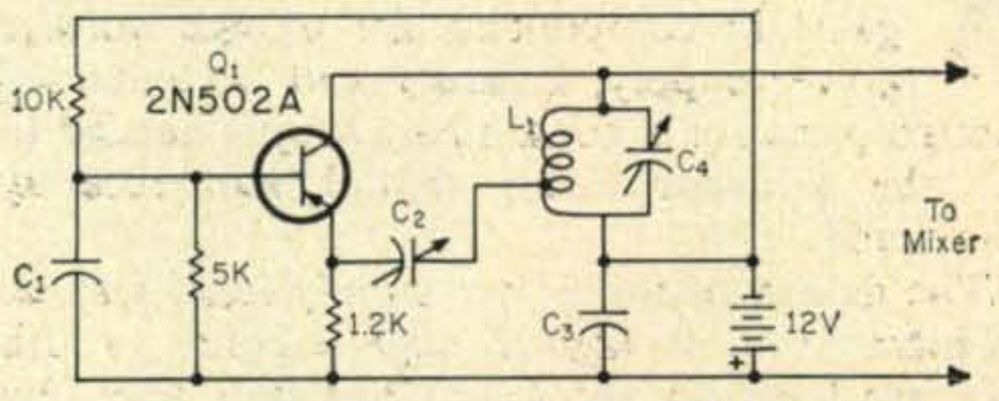
Due to the recent reduction in price of the v.h.f. transistors, it is becoming economically feasible for the amateur to build transistorized v.h.f. receivers. This article describes a local oscillator circuit using the Philco 2N502A transistor which recently had its price reduced to $4.65.

Printed Board

The oscillator uses a grounded base circuit with feedback to the emitter. It is mounted on a printed circuit type board to make it small and light but still have a good ground surface. The components, excluding resistors, are mounted on the bakelite side as shown in the photo. The feedthrough and tuning capacitors are brought through the board and soldered to the foil side.

A disc of foil is cut away where the feedback capacitor is mounted so that this point, which is where the emitter is connected, will not be grounded. Two lugs are placed on the feedback capacitor on either side of the board. The lugs must be small to keep the emitter to ground capacitance small. One lug is soldered to the emitter and the other to the 1.2K emitter resistor.

The transistor base and cold coil lead are soldered to the feed-through capacitors, the others ends of which are soldered to the 5K-10K junction point and —12V respectively. The collector and hot coil lead are joined at the tab on the tuning capacitor. The tab on the feedback



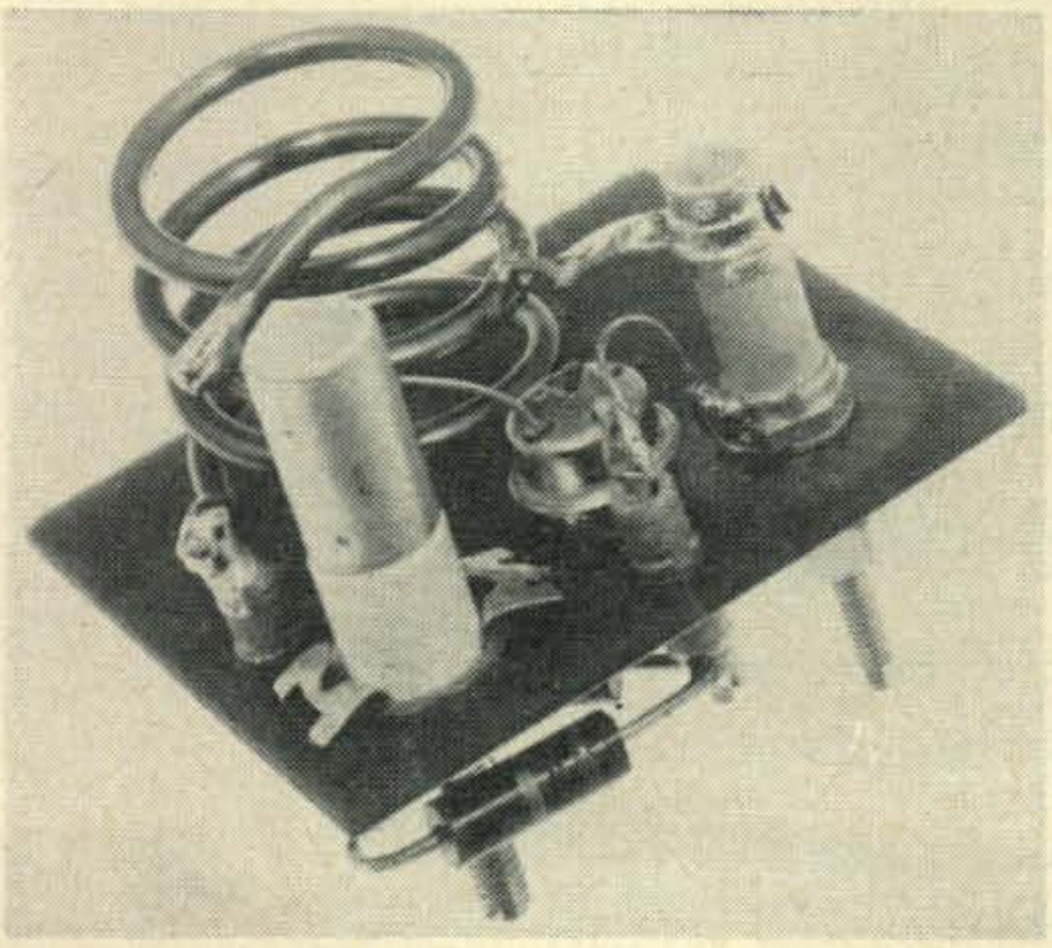
$C_{1, 3}$—.001 mfd. feedthrough. Centralab MFT 1000.
C_2—1.5-12 mmf. Cambridge Thermionic CST50.
C_4—.5-5 mmf. Erie 532A.
L_1—220 mc; 4t #12, 5/8" diam. 3/4" long tapped 1.5 turns up from the cold end.
200 mc; 4t #12, 3/4" diam. 3/4" long tapped 1.7 turns up from the cold end.

Fig. 1—Circuit of a transistorized oscillator that may be operated in the 220 mc area.

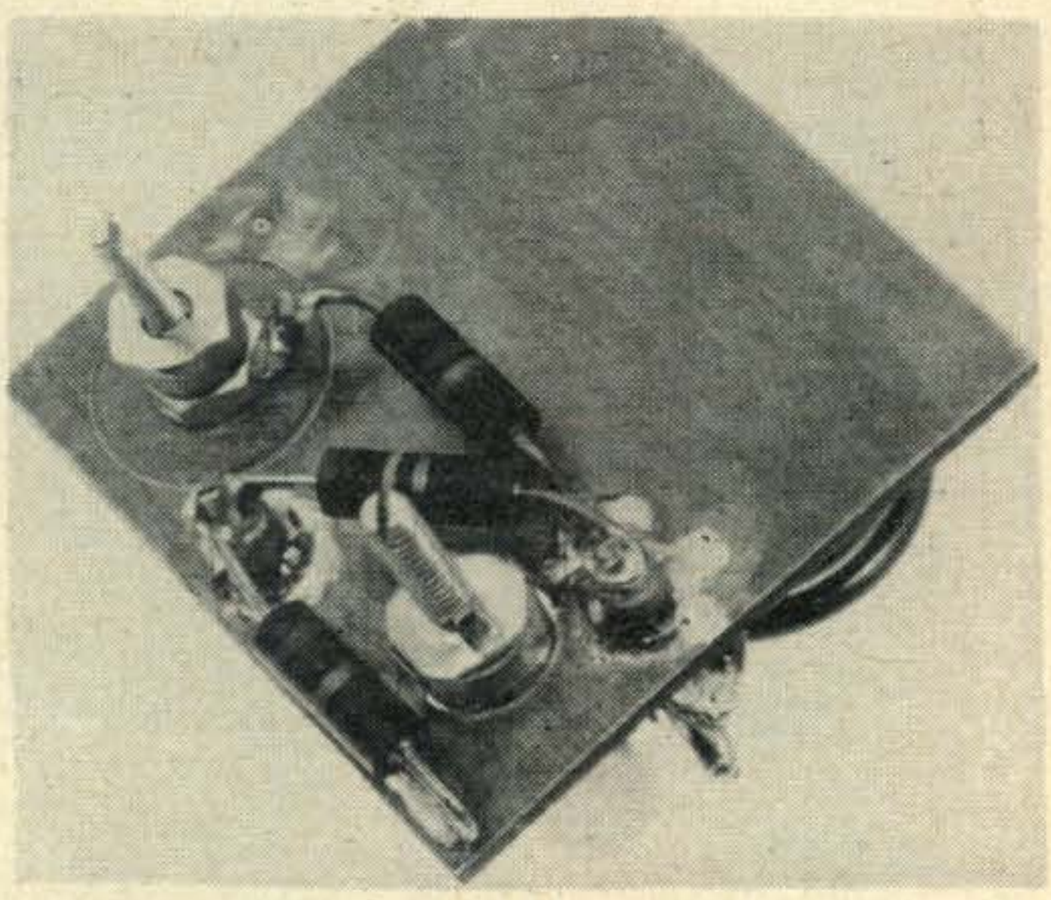
capacitor is joined to the coil tap by a short length of tinned wire. The output is connected to the collector.

The output is fed to the mixer circuit by a very small capacitor made by wrapping a few turns #22 wire around a plastic covered lead from the oscillator. One end of the #22 wire is joined to

[*Continued on page 114*]



Component side of the board showing tank circuit (left), transistor and feedback capacitor (right).



View of foil side of the board showing bias resistors and tuning adjustments.

A Control Panel For The High Voltage Power Supply

Jack Falkenhof, W8GHE
293 Hawthorne
Elyria, Ohio

A versatile method of B-plus control, filament control and high voltage overload protection is provided here, using variable voltage transformers, a time delay relay and an industrial-type push button on-off switching system.

After scrounging the surplus market for bargains in components for a high voltage power supply, I finally had accumulated enough parts for a good husky supply needed to jolt the kilowatt linear that I had recently completed.

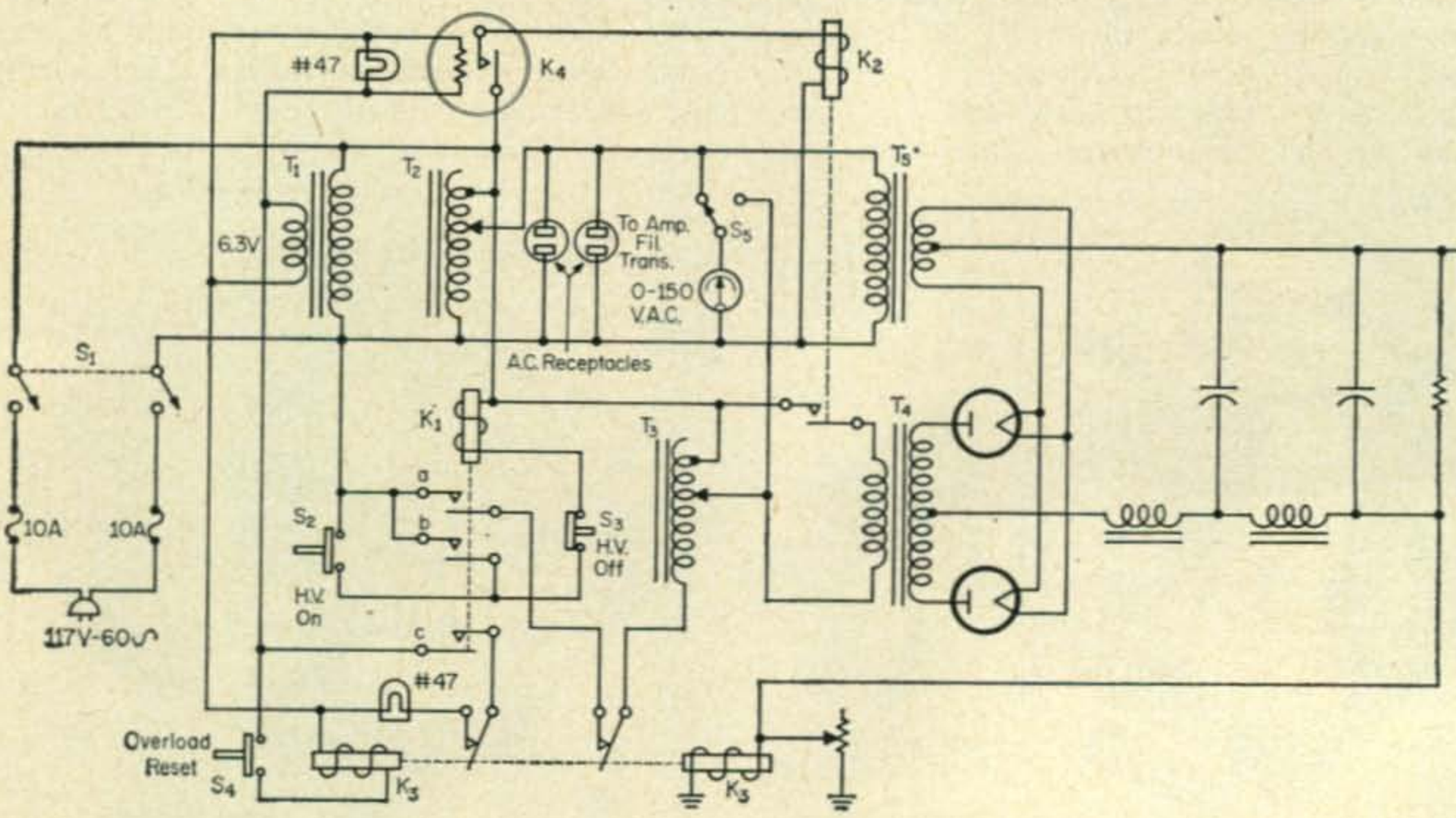
The design of the power supply itself was no problem as most high voltage supplies of this type are basically the same. The only way that my supply differed from those that I had seen in various articles was that it was built telephone rack style without any chassis. I'm just not clever enough to figure out how to mount a hundred pound power transformer on a chassis and have room for anything else.

My big problem was how to design a control panel that would be fairly simple yet flexible enough so that it could be mounted on my six foot rack cabinet or changed over to the operating position at the desk in a few minutes if I so desired.

At this point I dug through all of the radio magazines and handbooks accumulated in the last ten years with no success.

My old friend Vic, who is also my chief trouble shooter and heckler, stopped over soon after to see what progress was being made on the monster. After hearing the tale of woe, he proceeded to interrogate me in his own inimitable style. After finding out just what I had in the way of switches, relays, variacs, etc., he sharpened up his pencil and in a few minutes came up with a working diagram which met all my requirements and then some.

Fig. 1—Circuit of a high voltage power supply control unit featuring push button control, variable output voltages and overload protection.



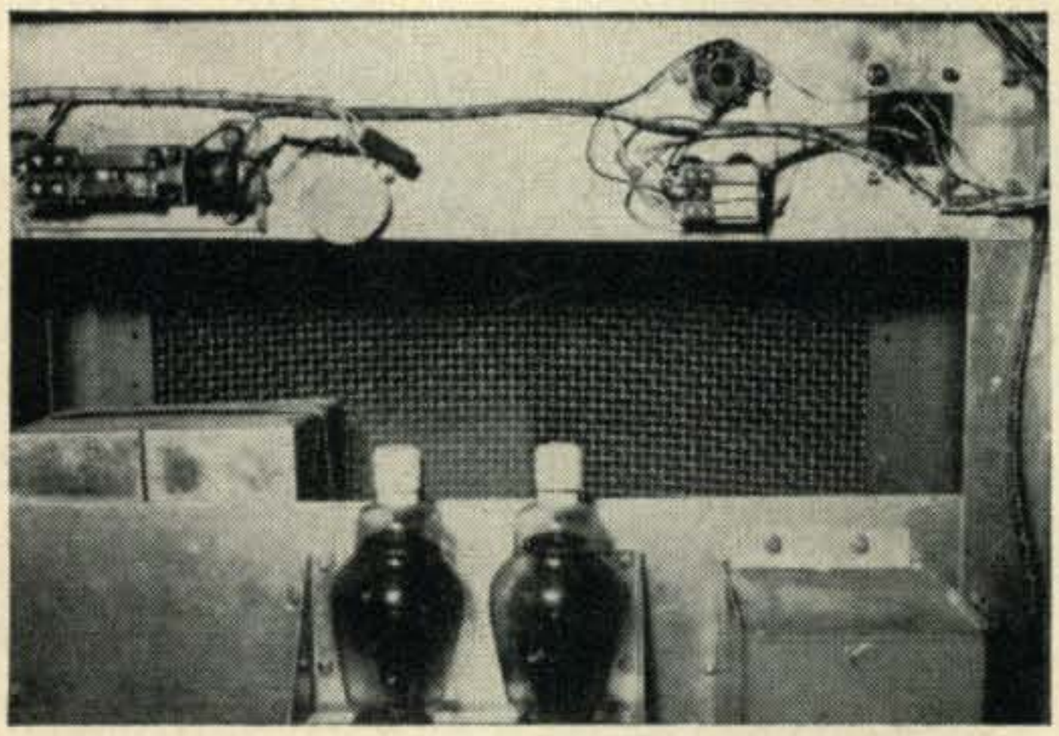
K_1—P & B MR14A 3 p.s.t. relay, 115 v. field
K_2—Guardian IR-500-A115 s.p.s.t. relay, 115 v. field
K_3—Guardian X 300 ER overload relay
K_4—Amperite 6NO60 time delay relay
T_1—6.3 v.a.c. 0.9 amp fil. trans.
T_2—1.5a. 115v. Variac
T_3—7.5a. 115v. Variac

Circuit Operation

The circuit design Vic came up with is shown in fig. 1. Aside from the usual control and safety features, "push button" on-off control of the high voltage is included.

Two variacs are used, one to control the high voltage output and the other to adjust the transmitter filament voltage. The single a.c. meter used is switched to either of these circuits for measuring variac output.

Some might question the use of the a.c. meter for monitoring the filament and high voltage d.c. I feel that the filament voltage should be metered at the tube socket and since I was unable to do



Relay control panel located above the power supply. The overload relay and adjustment pot are on the left and the t.d. relay is plugged into the octal socket above K_2.

this I used the a.c. meter to check the primary voltage delivered to the filament transformers from the variac. I used a test meter at the amplifier filaments initially and made note of the input voltage that gave the required output so that I could easily reset the variac if the line voltage fluctuated. I did the same thing with the high voltage d.c. by checking the reading with a d.c. voltmeter against the a.c. meter on the panel and noting the a.c. readings for every 500 volts d.c. I was able to calibrate to 3,000 volts. I also meter d.c. voltage at the amplifier, so I have a double check.

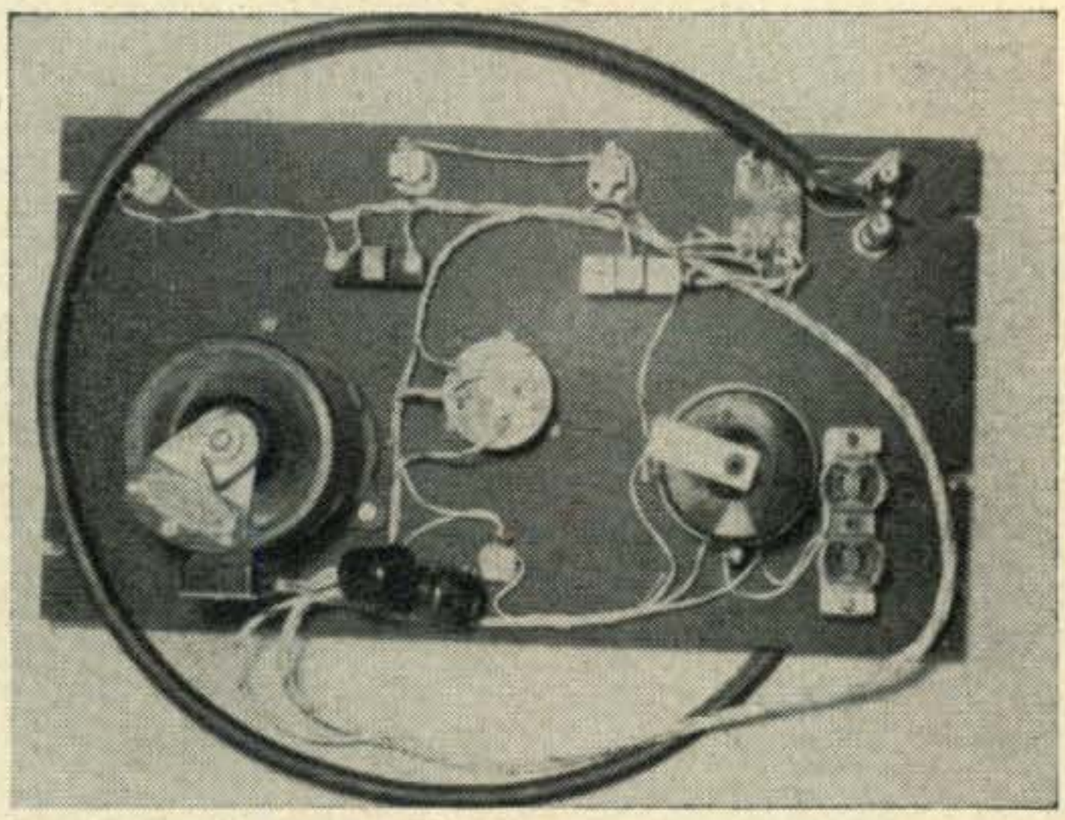
A thermal time delay relay is used to prevent the plate voltage from being applied before the filaments have been on for at least 60 seconds. The time delay relay, K_4, energizes K_2 to complete the circuit between T_3 and T_4.

In the push button ON-OFF control system, S_2 and S_3 control K_1. When S_2 is depressed, K_1 is energized and contact K_{1b} shorts out S_2 so that it may be released. Contact K_{1a} has also closed the feed to T_3 to provide high voltage. To shut off the high voltage, S_3 breaks the a.c. to K_1 thus unshorting S_2.

Construction

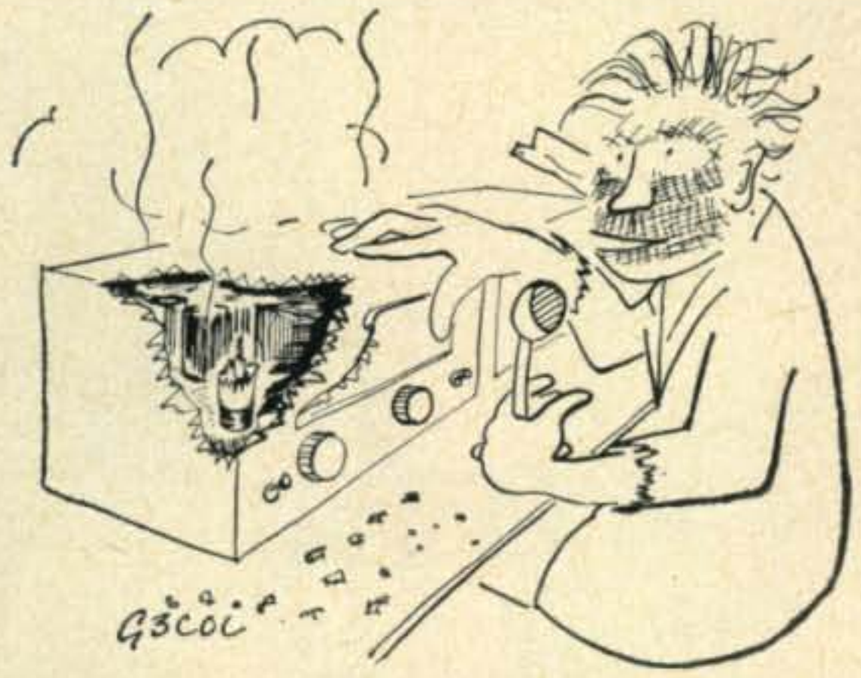
The construction is divided into 3 areas. First the control panel (10" × 19") is assembled, containing the two variacs, the meter and the necessary switches and fuses. For the high voltage control the big industrial type push button switches would have been nice but were too costly for my budget. I used small microswitches connected either normally-on or normally-off and they did the same job as the industrial switches. The second section contains the control relays K_1 to K_4 and is mounted on a panel 4" × 19" located directly above the power supply

Front and rear views of the control panel. Rear view shows the #14 line cord that plugs into a receptacle in the rear of the rack. The amplifier and rectifier filament transformers plug into the duplex outlet alongside the 1 ampere variac. The laced cable with the two plugs connects to the relay panel at the power supply.



in the rack. The third section, of course, is the power supply itself and this area is determined by your needs alone.

The control panel has been in use here for about six months now and I'm unable to think of any changes that would add to its flexibility. ■



"—I don't know what you did at your end, but your signal came up quite a bit on that transmission."

Project "SPACE"

West to East By Sunlight

Richard L. Molay, WA6KGS/AD6KGS
Hoffman Electronics Corporation
3761 S. Hill Street
Los Angeles 7, Calif.

Some background data on the project "SPACE," Solar Powered Amateur Communications Experiment which resulted in the first known instance in which amateur radio signals were exchanged between East and West coast U. S. A., using power derived from conversion of solar radiation directly into electrical energy via silicon solar energy conversion cells.

Last April, 1960, Richard Zucker, WA6JBO, a senior engineer at the Hoffman Electronics Semiconductor Division, and the author were invited to participate in an experiment which might accomplish the objective of long-range radio communications using solar energy as a power source.

We were informed by Marvin Whitney, Vice President, Operations, of Hoffman Electronics Corporation's Semiconductor Division, El Monte, that the United States Army Signal Corps was planning a pageant to celebrate its 100th year of service, to be held during the fourth week in June. As a part of that celebration, a solar power supply was being shipped from Hoffman to Ft. Monmouth, New Jersey, where the Signal Corps laboratory personnel would incorporate it into a display.

Mr. Whitney asked us if we would like to carry on some communications experiments using whatever facilities the plant could provide on an extra-curricular and voluntary basis. Naturally, we jumped at the opportunity.

June 23, 1960. Sheldon Stern, K2QKL, establishes contact with Fort Monmouth, New Jersey. Note the Hallicrafters FPM-200 transceiver and the nickel cadmium battery setup. As far as is known this was the first instance of a solar powered two way amateur contact between the East and West Coast.

However, wishing to conform to the spirit as well as the letter of the FCC regulations, Mr. Whitney placed the following restrictions on our activities:

A. No amateur activities could take place during regular working hours.
B. We would realize no payment of any kind for time or effort spent on the project.
C. At no time would we refer to our company while we were on the air other than as an answer to a direct question as to location.
D. We were forbidden to enlist the help of other company personnel while they were on company time.

By adhering to these strict rules, Mr. Whitney, himself an ex-ham, created an atmosphere of true amateur experimentation.

Dick Zucker and I learned that the solar panel we [Hoffman,] were constructing for Ft. Monmouth was very much similar to some of the "Paddle Wheels" which had been built for orbiting satellites in outer space. In fact, we named the project "SPACE", a shortened form of "Solar Powered Amateur Communications Experiment".

Our first step in the project was to send a letter of inquiry to George Jacobs, W3ASK, who is the Propagation Editor of *CQ*. George responded by return mail, giving us the probable best frequencies for communications between El Monte, California and Ft. Monmouth, New Jersey during the latter part of June. In fact, George's close cooperation with us was a major factor in our enthusiasm and began a pleasant correspondence between us.

We determined that the 15 meter band would be good during those hours when sunlight would be available at both ends.

At this point it would be wise to mention the power source in El Monte. When the Semiconductor plant was dedicated in 1959, Hoffman installed a solar power panel on the roof, which has been used to operate some displays in the

reception lobby. During peak sunlight hours it delivers about 75 watts.

We erected a 20 meter dipole antenna on the roof of the El Monte plant, oriented it for maximum lobe towards Ft. Monmouth, and began test transmissions between El Monte and Ft. Monmouth. These tests, powered by conventional power, used a Viking II transmitter and both an HRO-50T and new HQ-180 receivers at the El Monte end. Ft. Monmouth station K2USA used their kilowatt transmitters, beam antennas, and Collins receivers. Needless to say, we hooked up.

We also gained valuable information on the hour-to-hour propagation characteristics of 15 and 20 meters.

Meanwhile, our MARS/ARMY tickets came through, and Hallicrafters Company entered the scene. Fritz Francke of Hallicrafters brought us a new FPM-200 mobile SSB transceiver, all transistor except for the 6146 finals. It was a honey of a rig, and performed well. During the first days of June, we erected a rhombic antenna, and contacted many hams around the country using the Hallicrafters FPM-200 unit. Fritz told us we were using a pilot production model, a faithful prediction of the forthcoming production models.

Finally we were ready for the big day. With the following set up:

Ft. Monmouth, New Jersey K2USA/AA2-USA—180 watt solar panel, hooked to an FPM-200, using a beam antenna.

El Monte, California WA6KGS/AD6KGS—75 watt solar panel, "floated" across nickel cadmium battery, hooked to an FPM-200, using a directed rhombic antenna.

On June 23, 1960, at approximately 1:30 P.M. Pacific Daylight Time, Sheldon Stern, K2QKL, an employee of the Army Signal Corps, was at the mike in El Monte when contact was established with AA2USA on a MARS frequency of 14.375 mc. Power at both ends was sunlight, and history was made. ■

Project "SPACE"
East to West

Howard M. Russell, K2ABH
83 Richmond Ave.
Deal, N. J.

Melvin Cannon, W2OAI
8 Calvert Ave.
Long Branch, N. J.

W2OAI and K2ABH describe their experiences on the Eastern end of the first solar powered QSO.

THE project started, late in May 1960, with a phone call from Colonel Leon J. D. Rouge, WV2MMT, of the U.S. Army Signal Research and Development Laboratory. He suggested the use of a solar array to power a rig on the ham bands during the Signal Corps Centennial celebration at Fort Monmouth and for use in the 1960 Field Day operation.

With the Centennial week starting 20 June and Field Day 25-26 June, time for preparation was limited. After a series of hurried conferences and phone calls it was decided it could and would be done. It was known that certain difficulties would be encountered; first, the solar array, and second, a suitable rig for this experiment.

Arrangements were made with the Hoffman Corp. of El Monte, California, for the use of a solar array consisting of 7800 silicon photovoltaic solar cells, each cell being 1 × 2 cm. The cells were arranged in a series parallel arrangement to produce 14 volts d.c. at 100 watts output power. A similar array which was installed at the Hoffman plant near Los Angeles would be used for powering the other end of the circuit thereby effecting transcontinental 2-way communication by solar power. These two 20 square foot arrays convert the sunlight directly into usable electrical energy, and are believed to be the most powerful arrays ever assembled for ground applications. Each panel can provide up to 100 watts

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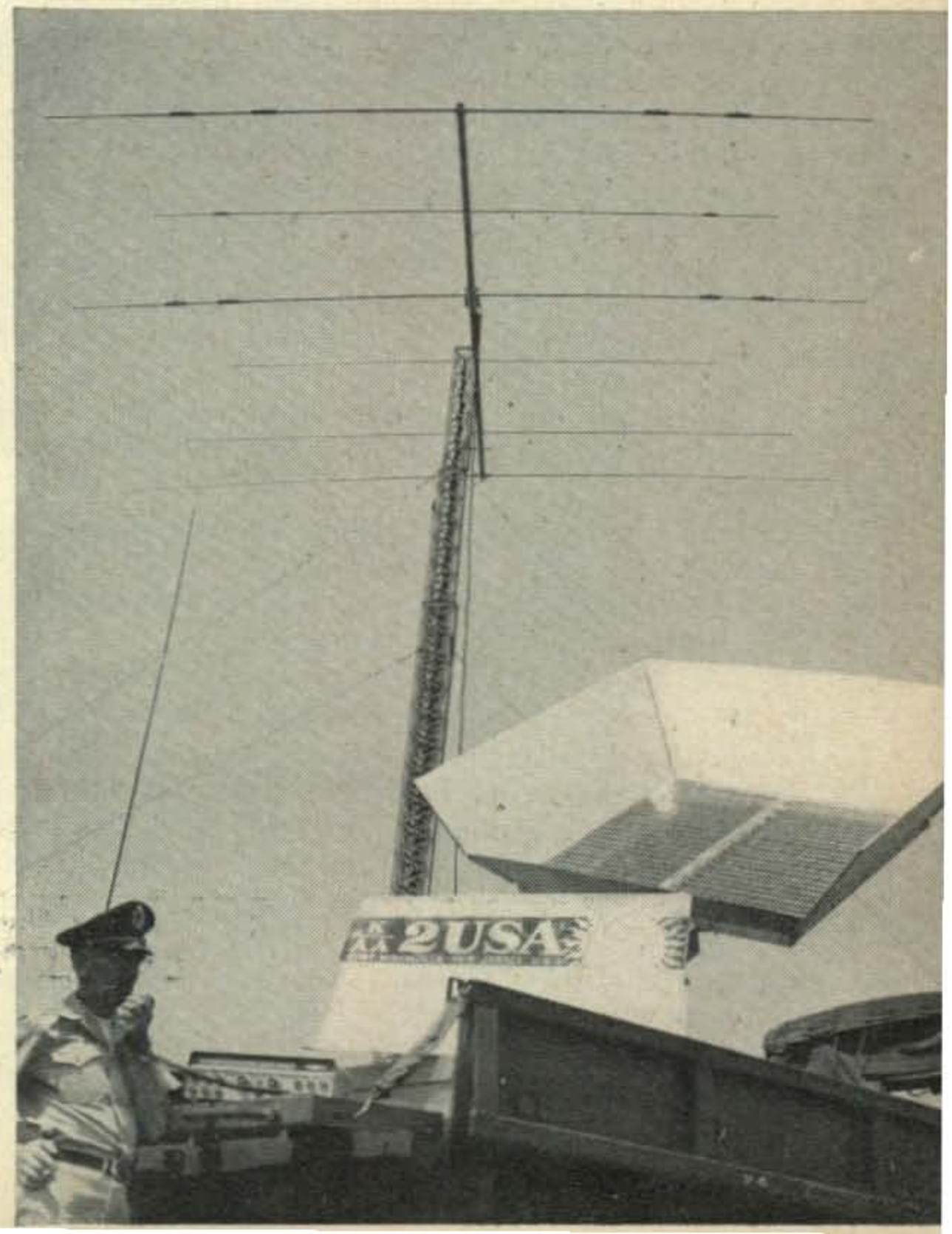


Solar cells and Telrex array used at AA2USA in the first transcontinental solar powered QSO.

Evolution Of A **Bold-Face** Listing

Terry Murray[1], KH6DXG, ex KL7CDQ
P.O. Box 1558
Honolulu, Hawaii

The plight confronting many DX stations regarding QSL cards emanating from the U.S.A. is the result of using non-standard systems of keeping time. Here is an account of a non-QSL collector and the results the author obtained using a bold-face listing in the Call Book.

BACK in the days when the ink was still damp on my Novice ticket I was pretty naive about this QSL thing. Someone had misled me and I was pretty well convinced that all the more gentlemenly amateurs QSLed. So when my victims allowed as how they'd like a card I promptly sat down and wrote one out. Of course these same guys always promised on their mother's picture to do likewise.

But one day when the band was dead except for the usual commercial harmonics, fundamentals, etc., I tallied up. It came as an awful blow, but I was forced to conclude that some of the brethren just plain weren't honest, or gentlemen, or either.

I was sending out about three times as many QSLs as I was receiving; apparently this is about par for the course!

At first I thought it might just be a foulup in the Post Office, but then I recalled Uncle Sam always seemed to be able to find me along about bill time every month, no matter how I dodged.

I realized some of the boys (and girls) honestly needed my cards as they were genuinely working for an operating award of one kind or another, but it was pretty obvious some of 'em didn't want their cards very bad.

It seemed to me that one of their cards would be fair exchange for one of mine, and a *quid pro quo* would pretty well weed out the jokers that just ran out of something to say, or whose c.w. ability was limited and so put in a "PSE QSL OM" automatically, or as a substitute for "HW CPI OM?"

So I had a bold-face listing inserted in the *Call Book*. It read:

KL7CDQ Terry Murray, Anchorage, Alaska. Via Bureau. All QSLs Answered.

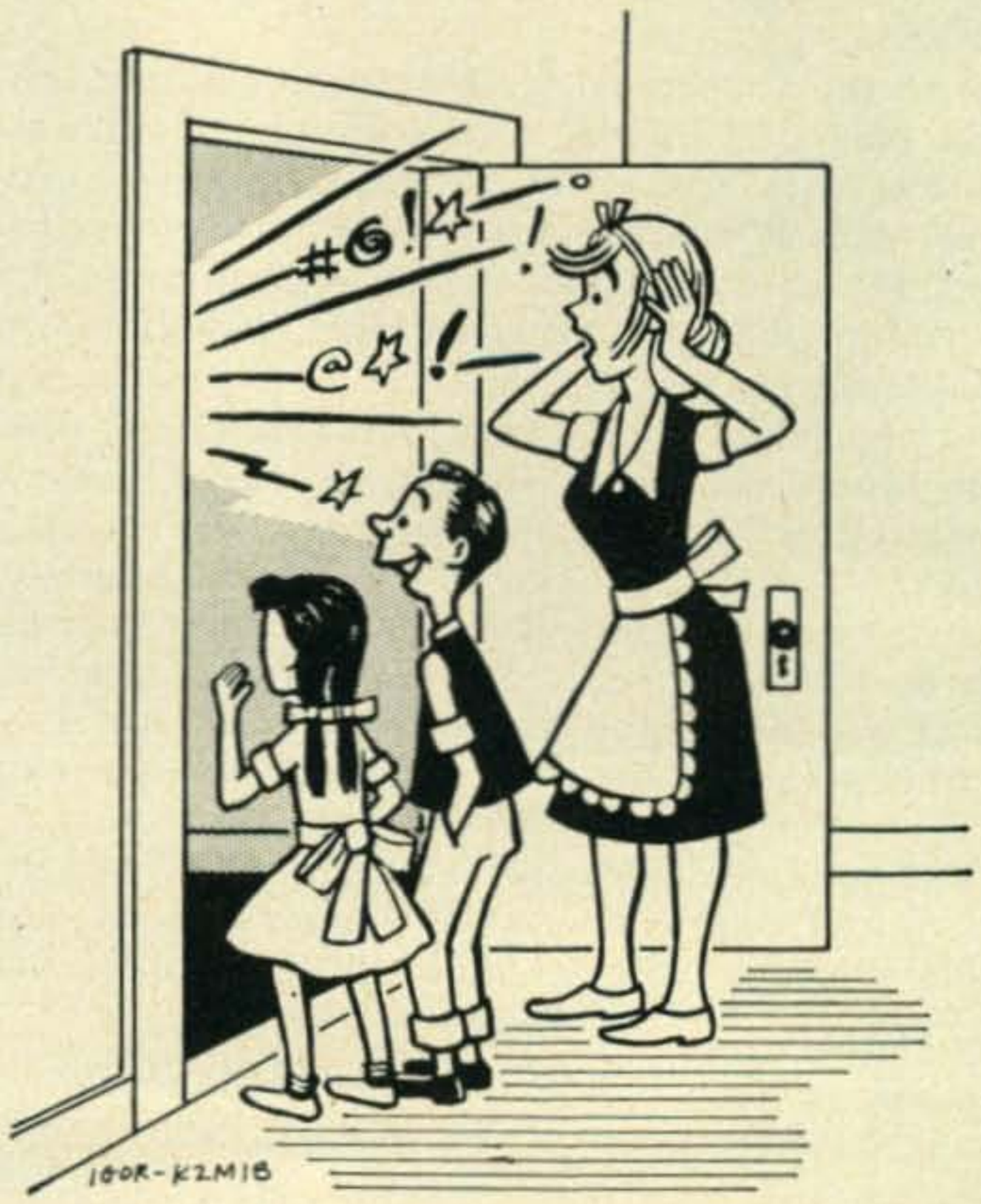
It appeared about the time I dropped the WL7, and I thought I had the problem beat. I shoulda known better!

As a matter of fact, for about six months I *did* have the problem thoroughly beat, but then my favorite band, forty meters, got a little too noisy for comfortable communication, and so I switched to fifteen c.w. for the simple reason my forty meter vertical loaded on fifteen too, but didn't do as good on other bands.

Fifteen treated me well; I worked lots and lots of nice people, and oodles of them sent cards.

Right away I noticed there seemed to be a lot more characters around who only knew enough c.w. to qualify as a minimum-by-the-rules-contact—guys who couldn't even answer a simple query about the local status of TVI or the price of hootch, but who sure were experts at the old "PSE QSL OM" dodge!

About this time the XYL took pity on me and offered to let me go up and ham while she filled out the replies. I like to believe it was an offer prompted by her sweet and loving nature, but secretly I suspect it was simply because she didn't like the language the harmonics were picking up while I sat at the kitchen table filling out cards.

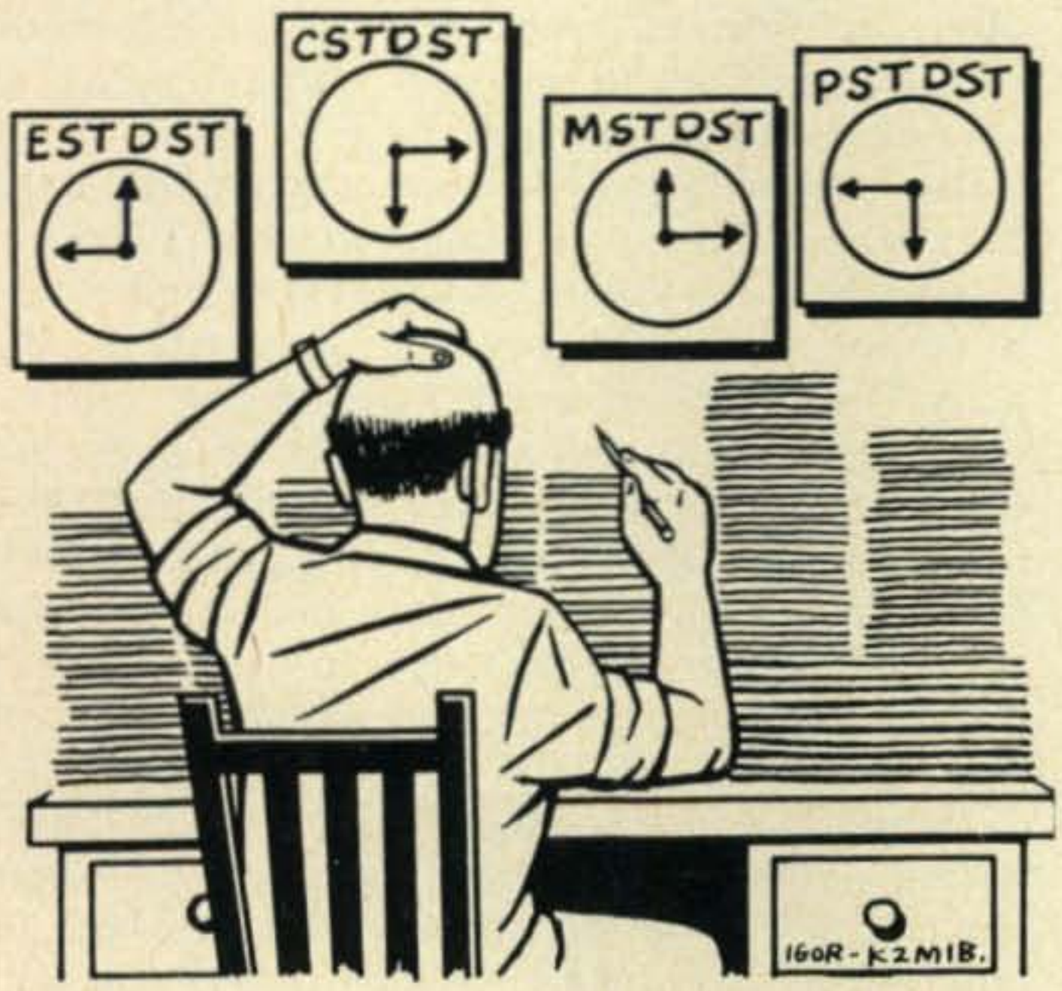


[1] This article was written by KL7CDQ prior to his taking up residence in Honolulu as KH6DXG. All correspondence with the author should, of course, be carried on through his Honolulu address.

But it hit the fan pronto. After filling out about 50 cards, she was fit to be tied (and hasn't said anything about my language since, so maybe something was gained after all).

"Say, Curley," she growled. "I thought you told me Greenwich Time was so practical, but these cards have every sort of time on 'em! Here is one in 'ESTDST'—whatever the heck *that* is. Here are three cards from three towns in the same state, and one uses Z time, and one uses CST, and the last one uses something abbreviated 'CSTDST.' I quit!"

As most of you know, good-hearted people who fill out your QSLs are hard to catch—and even harder to hold—so I quick came up with my next bold-face listing: **KL7CDQ Terry Murray, Anchorage, Alaska. Only QSLs showing GMT answered.**



This time I was positive I had a good grip on a piece of the answer; only thing is, I figured, without taking into consideration the innate bull-headedness of hams in general. After all, if ESTDST is OK for making a date with the gal up the pike, why ain't it good enough for some joker way the heck up in Alaska who only has four or five local time zones of his own to contend with?

But the QSL problem still hadn't reached the acute stage. I seldom received over 50 cards at a crack, and I managed to get them answered somewhow without perforating my ulcer.

Then came the deluge. Alaska became a State —yea, and a country, too, just for good measure.

Apparently KL7s who would deign to work W/K stations on fifteen c.w. were *rara avis,* indeed, for seldom did a QSO wind up without a poignant plea for a card, and I invariably advised my contact to "CK CL BUK PSE." By golly, they did check the *Call Book* all right, but most of 'em sure didn't read very carefully. They all seemed to get as far as the address and then get high-centered. Naturally the bulk of 'em continued to use local times.

Maybe I seem to put too much importance on this business of time, but after filling out a couple of hundred cards, some afternoons it gets to be one heck of a chore just thumbing through the log, and anything slowing down the routine tends to become more and more irritating, akin to the Chinese Water Torture.

But, though I'm not a DXer or a Wallpaper Collector myself, I was still fairly sympathetic to the average ham's burning desire for QSL cards.

Right here I think I'll let slip a Lodge secret: I don't really believe there is an operator anywhere on earth who waits with bated breath for a W/K card. Personally, I only get cards from the Bureau about three times a year, or even less. When I get them I immediately answer them, spending as many evenings as necessary to get them out. The thoughtful individuals who had the courtesy to enclose envelopes or stamps naturally get their cards mailed first. the hoi polloi get 'em all at once, when I've filled out the last reply.

I enjoyed—and still enjoy—receiving novel, original, decorative and polite cards. The catch is, I seem to attract so many of the other kind!

I suppose the equipment manufacturers and dealers may think they're generating good will by supplying cheap QSLs to the multitudes, but I don't agree. Seems to me, if a guy can afford an expensive commercial station, he ought to be able to ante up with the slight additional cost of getting his own QSL cards designed, printed and (even) copyrighted. Anything—but anything—beats sending out cards just like those used by 11,000 others.

If he just plain ain't original, a ham can simply have a good photograph taken and go from there.

To me, at least, nothing is more of a deadly burdensome chore than sitting down and facing a pile of cards belt-high, about half of which I know in advance will be stock cards with just about as much interest, imagination or originality as a Detroit automobile.

I mentioned 'polite' somewhere in the foregoing.

Along this line the last batch of cards I received from the Bureau contained some real duzies, superb examples of how to lose friends and irritate people.

Some were real gems . . .

One brilliant ham sent me a QSL, a tracer QSL, two letters, and to really put the egg in the beer, a prolix, handwritten letter to the QSL Manager imploring that busy and overburdened individual to use his influence toward getting an answer to his stock card! Of course, this whole *olla podrida* arrived the same day.

And as always there were the three or four comedians who sent me cards by surface mail and then a tracer by air telling me my ad in the *Call Book* is a lie because I hadn't replied to their QSL!

I answered 'em all, though, even up to and including the very, very rare s.w.l. who sent in a competant report. Only cards I skipped were the ones claiming to have worked me on fone—I don't even own a mike!

[*Continued on page 104*]

Some Hints On Technical Writing

John Britson, KØZAL
623 East 8th Street
Newton, Iowa

Most of the articles printed in *CQ* are written by amateurs, and are packed solid with good practical information. However, quite often the articles ignore most or all of the basic rules of journalism. As a result the information is not always as clear and precise as it could be. The purpose here is to point out the most frequent errors and how to avoid them when you send in your next article. Here are the most common voids as viewed by the writer:

1. What is it all about? The first paragraph should be explicit as to the exact purpose of the article. A good percentage of readers are newcomers. Some are not licensed and are in the first stage of interest. Unfamiliar technical terms and abbreviations must be avoided or explained. Remember that your readers may not be as familiar with such words as "Pan-adapter" and "VOX" as you are.

2. Now that the reader knows what you are writing about, do not keep him in the dark as to why the article is being written. Do you want your readers to try out a new antenna? Is it your purpose to explain how a certain circuit works. Whatever your motive may be let the reader in on it early.

3. The where and when are not always important in technical writing, but if they do apply you should not omit them. For example, an artic-le on antenna performance or band propagation should always give full details on places and times. Do not fail to use these tools whenever possible because they add a personal touch and will draw reader interest.

4. Illustrations (pictures, diagrams, and sketches) play a very important role in technical writing. Of all the shortcomings in amateur writing, this is by far the weakest area. There is a good reason for this. Most amateurs are not artists and do not have a staff of illustrators on call. But in order to put your message across to amateurs like myself you have to show me as well as tell me. I want to know exactly where the coax is connected—from what to what. I want to know where the inner conductor goes and where the outer conductor goes. You must tell me exactly where to attach my wire on that vertical antenna. To tell me to feed the base is not enough. Where on the base? How far up? How is it fastened? Don't worry, you can't make it too simple. Many times I have had my enthusiasm built up for a project only to discover I still didn't have complete information and could not make the hook-up.

Many books have been written on technical writing and no one expects amateurs to be expert journalists. But if the above points are kept in mind when you write your next article you will get by. Who knows, it just might mean an acceptance instead of a rejection slip. ■

Can anyone beat this one for a late QSL? Paul Tierney, KØGZP, ex-9BZK recently received this card from WØEQD. The date; February 12, 1925! Paul informs us that he was using a single 202 with a chemical rectifier. Receiver; UV 200 regen plus UV 201 audio amplifier. All districts were worked and he was heard in England on 80 with 5 watts.

The Veterans Administration Headquarters in Washington, D. C. now has its own station in operation. K3NEU is operated by club members, numbering nearly 30. Code and theory classes are currently being held. Members present are, standing, KN3NXC, KN3OJP, and K4HIA. Seated are K4EUY and at the model 14, W4TMJ.

Results of the February *CQ* W.W. V.H.F. Contest

Bob Brown, K2ZSQ
V.H.F. Editor, CQ

HERE at long last are the scores and results of our first really *new* v.h.f. contest! Next month we'll have another . . . but before we get into that, let's see how contestants did in the February contest.

V.H.F. Contest Results

Gold Plaque Winners

W2UUN 3,072,000
K9GXI 3,030,720

Results—6 Meters

California
K6UEY/6 (multi-op) 739,200
K6EJX/6 (multi-op) 364,500
K6KLY 223,100
K6TWF (multi-op) 100,800
WA6BYA 28,800
K6QEZ/6 10,080
K6WGN/6 8

Colorado
KØTSD 117,600
K1KNQ/Ø (multi-op) 101,520
KØBCW 94,080
WØWYX 47,328
KØWFT 25,200

Illinois
W9BBF (multi-op) 762,000
W9EET 255,000
K9QEY 114,380
K9TGT 3000
K9DWR 2560

Indiana
K9GXI 3,030,720
W9PMZ (multi-op) 556,800

Iowa
KØSVH (multi-op) 414,000
WØBXR (multi-op) 376,640
KØMST 367,080
KØLDN 76,032
KØZMU 21,120

Kansas
KØGTK 160

Kentucky
K4HOY 1400

Louisiana
W5DNL 18,368

Michigan
K8PEJ 1,166,400
K8PEO 135,300

Minnesota
KØINX 25,208

Missouri
WØWKG (multi-op) 73,500
WØEEE 7,776

Massachusetts
K1IEB/1 387,200
K1DIT 111,540
K1HCC 132,600
K1QXV 30,240 (multi-op)

Nebraska
KØTVD 50,400

New Hampshire
W1YQH/1 233,640

New Jersey
W2UUN 3,072,000
K2OWR 506,880
WA2CWA 8,640

New York
*WA2LRO (multi-op) 1,313,760
W2KVA 930,240
K2TMB (multi-op) 91,390
K2GTC 74,880

High Scores		
6 Meters	W2UUN	3,072,000
2 Meters	W3AEQ	124,200
Multi-band	KØGIC	2,244

Ohio
W8KKF 204,000
K8OBN 101,556
K8PBE 52,800
K8GVK/8 39,200
K8QND 28,770
K8SUJ 5250

Pennsylvania
K3IPM 1,249,000
K3HNP 686,400
W3HZU/3 (multi-op) 663,040
K3JTH 633,600
W3AEQ/3 (multi-op) 466,440
W3JUZ 398,040
K3HGA 177,408
K3KEL 25,300
K3LNM 360
3AKR 144

Rhode Island
K1KPB 126,720

Tennessee
K4YOF 121,600
K4VKJ 80,640

Texas
W5BDF 522,720
†K5TXX 414,720
†K5RBN 339,280
†W5HXW 319,200
†K5ZMS 260,600
†K5YKX 87,360
†K5VQJ 37,200
†K5BDL 36,000
†K5PTP 29,000
†K5ASP 20,680
†K5KVE 16,200
†K5YOS 15,050
†K5SXU 11,200
K5MTK 8,580
†W5DXQ 6,912
†K5GHR 4,000
†W5FEG 1,920
†W5AQS 868
K5WQZ 740
†K5YSW 720
†K5YST 640
†K5KWB 540
†K5UIA 400
†K5VRY 168

Argentina
LU3DCA 2880

Brazil
PY5GK 1,764

Canada
VE3CIK 52,500
VE3APF 1,536

**signifies W A2LRO is a member of the CQ staff, and thereby not officially a competing contestant.*
†members of the 6 Meter Club of Dallas

Results—2 Meters

California
WA6CFA/6 975,360
WA6LYF 636,480
WA6EOB 180,320
K6WGM/6 128

Connecticut
KN1PKQ/1 190,400
KN1PUG/1 640

Illinois
K9WFY 255,360
W9TOY 185,250
KN9ZWU 125,400
W9MYC 98,000
W9UNN 61,600
KN9BBN 36,400
W9OTW 23,040

Nationwide winner. Winner of the 6 meter New Jersey award and gold plaque for acquiring over 3 million points and winner of the entire contest with his 3,072,000 points, is Bert Simon, W2UUN, pictured above with his recently acquired XYL, Jeanne, at their Oak Ridge, New Jersey, QTH.

High atop Holland Mountain in Oak Ridge, New Jersey, is W2UUN's home and tower. The big beams are not visible in this photo.

New York Winners. For the 2 meter contest, the award went to the MARS station at Steward AFB, K2FCO. Operators during the contest were (left to right) Bill Williams, WA2FJF, Dan Ortone, WA2ESR, and Bill Brack, K6IHO/2.

Iowa
KØSVZ 118,800
KØSVH 39,000

Indiana
W9OVL 40,920

Louisiana
K6HNP/5 160

Massachusetts
W1NQQ 123,480
K1IOE 52,800
K1MNO 4,800

Michigan
K8PCU 213,180
K8BGZ 21,528
W8ZGW 18,700
K8RFN 7,000

Missouri
KØSBJ 107,100

North Carolina
K4MHS 9,900

New Jersey
WV2NMX 120,900
K2PBP 360

New York
K2FCO 191,520
WA2IMG 141,900
K2GSF 94,640
K2CXP/2 86,184
WV2OYV 59,400
WA2HAQ 7,200
K2LRI 360

Ohio
K8RXD 1080

Pennsylvania
W3AEQ 124,200
K3GGZ 55,000
K3CNN 3,920

Rhode Island
W1FEO 270

Wisconsin
W9JOT 500

Canada
VE3CUY 96,000
VE3EPI 77,700
VE3AAH 24,000

Estonia, U.S.S.R.
UR2BU 360
UR2RDE 60
UR2CQ 40

Results—Multi-Band

California
W6YX 4,140

Illinois
W9DJ 516

Kansas
KØGIC 2,244
KØGIA 60

Massachusetts
K1AII 550

213,180 points went to this boy to take the state of Michigan in the 2 meter contest! Who? None other than Carson, K8PCU, at the operating position pictured above. Carson, age 18, has since joined the Navy.

Worldwide Winner

High Honors go to **Bert Simon, W2UUN,** of Holland Mt., Oak Ridge, New Jersey. Bert operated six meters exclusively during the contest and came out with a final score of 3,072,000 just barely passing K9GXI's 3,030,000 points. Bert also was top scorer for the New Jersey sector and qualifies for the engraved gol dplaque awarded to those few who top the three million point mark!

For the run-down at W2UUN, let's hear a few comments from him. . .

"The contest station at W2UUN consisted of an 11 element Telrex Spiral Array, a Tecraft converter, 1,300 foot elevation and a Seneca transmitter with the screen voltage removed from one 6146 and the screen voltage to the other 6146 tied down with an 8000 ohm resistor. In this manner we were able to run about five watts input with no modulation and about 24 watts with. The power was measured by providing an audio tone and reducing the screen voltage until the 25 watt power input was achieved. I feel

At the Davenport, Iowa 2 meter operating position is Bob Ward, KØSVZ. Bob made 118,800 points in the February contest. His 15 year old son, Bob, Jr., KØSRL, is also quite active.

certain, however, that a hi-level plate modulated conventional Class C amplifier would have provided the greatest efficiency for the contest."

Band Conditions in General

Propagationwise, that week-end of February 25-26 was nil all across these United States, with little good "ground wave" to speak of and no Sporadic E band openings (except one five-minute affair here in W2-land in the wee hours of Sunday morning). I, however, am to blame. Should have contacted our Propagation Editor W3ASK several months in advance and gotten a good forecast predicted ahead of time.

Propagational conditions were not the only deterent. Many operators in the mid-West were the victims of high winds and low antennas. The state of Wisconsin, for example, was completely wiped out 6 meterwise and W9JOT was the only 2 meter entree out of countless v.h.f. men. High winds had blown down all antennas of any decent size. Wisconsin wasn't *the only one* to suffer. Many W9's, and W8's had similar problems.

The California Story—K6UEY/6

Many clubs participated in this recent contest, and among them was the Southern Peninsula Amateur Radio Club, K6UEY/6. Check the top California winner for 6 meters—that's right: K6UEY/6! From the pen of the chief op ('6UEY) comes. . .

"K6UEY/6 operated from Black Mountain, approximately 2500 feet above the floor of the beautiful Santa Clara Valley.

"Black Mountain, located south of Palo Alto, is a site operated by Philco Western Defense Laboratories.

"Contest participation was carried on by W.S. Dixon, WA6MLY, Mountain View, C.S. Smallhouse, WA6MGZ, Mountain View, and O.J. Dalton, K6UEY, of San Jose. Each contributing his share in facing the elements of a wintry week-end on a mountain in supposedly sunny, warm California.

"Despite the cold and the wind, which made the writer wonder at times if it was worth it, a very good time was had by all.

"Installation began the afternoon of the 25th by erecting the 5 element Hy-Gain beam atop a 40 foot high open structure located at the site. For a while it looked as though yours truly would remain atop the structure, after reaching the top and looking down. The other fellows on the ground assured me it was the same distance from the top to the ground as it was from the ground to the top.

"Once the antenna and the rotator were in place the next thing was to assemble the station.

"A converted Heath DX-40 was used for the transmitter. It required an additional switch position for 6 meters and replacing the 6146 with a 2E26 and a few other minor circuit changes, to enable us to load to 23 watts input.

"Mobility around the band was accomplished via a converted Heath VF-1 v.f.o.

"The 'hearing aid' was a Heath XC-6 ahead of a Hammarlund HQ-100.

"As the hours drew longer and actions and reactions slower toward the end of the contest,

Here's the operating position of WV2NMX, of Norwood, New Jersey. Ed was winner for New Jersey, 2 meter-wise.

Ohio Winner. To Harry, W8KKF, goes top Ohio honors for 6 meter work with his 204,000 points!

one of the operators was found trying to modulate a cold 807 can instead of the mike."—*Ahem!*

"Many otherwise unheard stations were worked from our drafty perch. We would like to thank all the stations worked for their participation and sincerely hope that they had as much fun and enjoyed the contest as much as we did."

The Russian Point of View—UR2BU

For several weeks after the contest was over, your columnist was deluged with logs after logs . . after . . logs . . . after logs! You can probably realize the pleasant surprise of receiving one a wee bit of the ordinary—from Karl Kalleman, UR2BU, of Tartu, Estonia, U.S.S.R. Along with his log were a few comments . . .

"Well, Bob, we sure have more v.h.f. folk here, but unfortunately the fellows are really active only during the National or All Union Field Days.

"I am sorry that I was not able to hear more than my old QSO-partner OH2HK in Helsinki, Finland, and two local fellows. The last ones were good enough to write logs out to you to enable me to get the certificate.

"That's the simple story. On the other hand, though, I shall do all I can to secure many time more participation next August. This time we heard too late about the contest to do any goodly amount of publicizing.

"I have worked Estonia and Finland and some stations in Latvia and some 20 in Sweden. The real DX has been via aurora. I read very carefully all I can get my hands on regarding v.h.f. and am quite enthused about it."

Summing Up

All in all, I think we'll all agree we had a good time . . . And that includes me! My score isn't submitted for print as it was so low that I was ashamed to enter it. Usually the 'ole K2ZSP-K2ZSQ team go all out for contests, but this time we went to the East Coast V.H.F. Society dinner and hamfest on Saturday night. By the time we got home (2:30 AM) it was a bit too late to go competing . . . Truth of the matter is that while I was representing *CQ* at the dinner, Ye Honorable Editors, K2MGA and

[*Continued on page 104*]

DX DX DX DX DX DX DX DX

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

The following certificates were issued between the period from April 12th, 1961 and May 12th, 1961:—

WAZ

1525	K6SXA	James R. Herndon
1526	W9ESQ	Louis Welsh
1527	DJ1VP	Herbert Schulze
1528	DL4BS	Russ L. Lawson
1529	G6VC	V. H. Curling
1530	W6YMV	Paul E. Friebertshauser
1531	K6IEC	Norman Borchert
1532	W8JRG	Richard C. Littler
1533	DJ2YA	Ulrich Weiss
1534	K6VVA	Rick Hilding
1535	DL2YU	D. H. Willoughby
1536	W3PN	Henry R. Pemberton
1537	W9SWR	Frank E. Kamplain
1538	VE7PV	Ian MacArthur
1539	W7PQE	Paul Bowden
1540	W6DQH	Rev. Gene Emmet Clark

TWO-WAY SSB WAZ

1	UA3CR	Leonid M. Labutin

ALL-PHONE WAZ

70	JA6CY	Michio Ieiri
71	VE7ZM	W. D. Wadsworth
72	W9JJF	Walter F. Cuga
73	W3LMA	Edward Dillmeier

CW WPX

169	ST2AR	Eric Dowdeswell
170	K4SXR	Emmett O. Herman, Jr.
171	K4TEA	Ken Byers
172	DL1YA	Hans Schleifenbaum
173	F3DM	Antoine Mercader
174	W6WWQ	Bill Mauzey
175	K5ESW	Paul Ferguson
176	W4RVW	W. W. Baldwin
177	W2QHH	H. S. Bradley
178	OY7ML	Martin Haasen
179	W2DEO	Jim Dupont

PHONE WPX

27	SM3EP	Gosta I. Westerlund
28	W8UMR	John M. Sulak

SSB WPX

60	OY7ML	Martin Haasen

I would like to offer special congratulations to Leo, UA3CR, on being the first station in the world who qualified for the WAZ certificate on two-way single sideband.

Michio Ieiri, JA6CY, also deserves special credit for his phone WAZ, as all stations were worked on 28 mc during 1960.

Bits and Pieces

FH8 Comoro Islands: FB8CE will soon be going to the Comoros and will have good equipment with him. The new FH8 prefix for Comoros will be used for the first time. (Tnx *DXer*)

HZ1 Saudia Arabia: The gang at HZ1AB will be pulling up stakes around the end of the year so best make hay while the sun shines.

KC6 Western Carolines: License has just been issued to KC6SP on Anguar Island, W. Carolines. They have a little more work to do on the xmtr., but may be in operation soon. This is a Loran installation and the personnel will be looking for s.s.b. fone patches. QTH: Coast Guard Depot, Navy 926, FPO Box 1, San Francisco, Calif. (Tnx WGDXC)

KG6I Iwo Jima: KG6IJ is active most weekends. Often in company of KG6AJB. Look for him Sundays at 12-15 GMT 14300 SSB. (Tnx NCDXC)

PY7 Fernando de Noronha: Latest word from Alvaro, PY7LF sez that if he is not transferred back to Rio de Janeiro this month (May) he will be on F. de N. until next October. (Tnx WGDXC)

ST2 Sudan: Due to licensing difficulties, ST2AR, is QRT at present but Eric hopes to be back on the air shortly.

VK9 Nauru Island: VK9DJ is now active from this spot on c.w. and a.m. A VK doctor is to settle on Nauru within a short time. He will have s.s.b. equipment. (Tnx WGDXC)

VP9 Bermuda: The following letter and information from Bill, K4JQV, should be of interest to anyone needing or going to VP9 land on a visit.

"K4JQV/VP9 will be on the air here from May until November on 7007 kc, 7025 kc, 7075 kc, 7100 kc, 7175 kc, 7200 kc, 7275 kc, and multiples thereof as well as 3748 kc, with a power of 90 watts c.w., 35 fone.

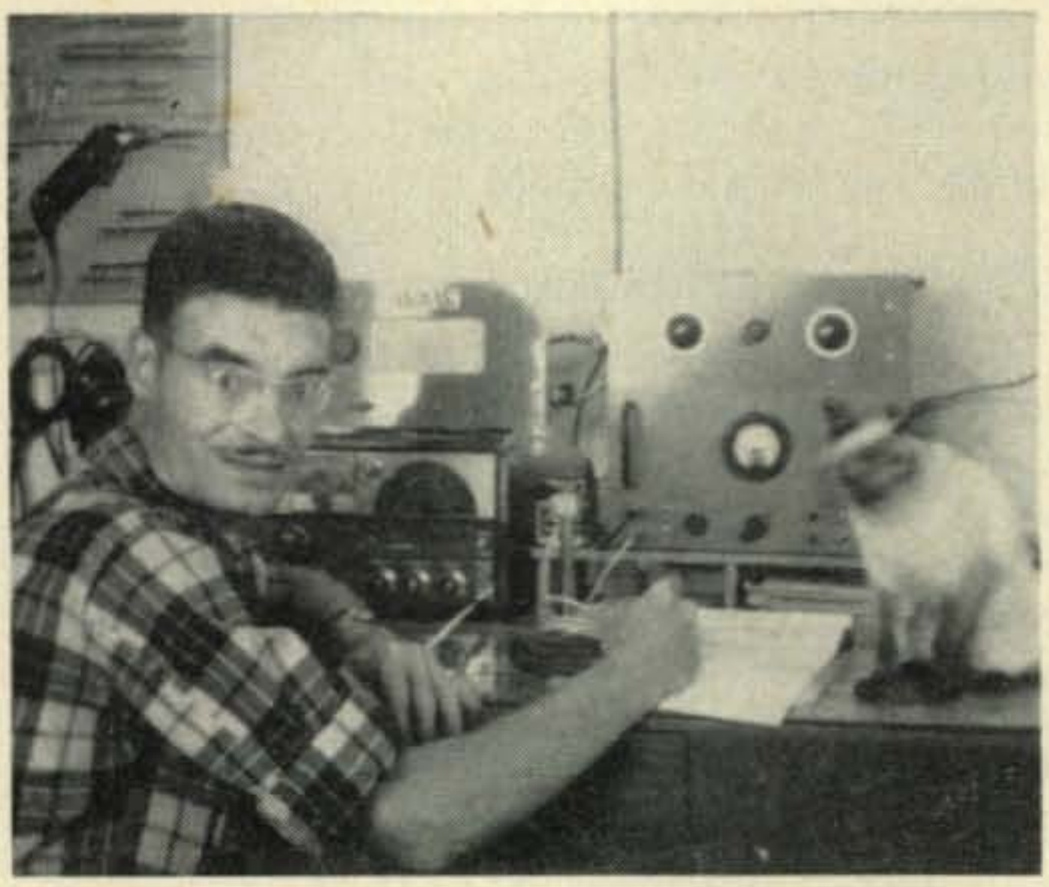
SP7HX needs no introduction as he is very active in DX circles as may be seen by his impressive display of wallpaper. Roman is the Dean of the Lodz Music Academy. *(Tnx K2UKQ)*

"Bermuda will no longer issue VP9 licenses to visitors here. On examination of your General or better ticket and receipt of £3 ($8.46), you will be issued a permit to operate with your own call letter/VP9.

"Power limit is 150 watts and 80,40,20, 15 and 10 meter frequencies correspond to ours, except phone is permitted over the entire range of the band. Third party traffic is still illegal. One record of not longer than 10 minutes may be played over the air per day.

"TVI or BCI may result in loss of operating privileges at the request of the Colonial Governor or any commercial radio or TV station.

"QSLs for K4JQV/VP9 may be sent via Bill Watts, ET2, USN, Lorac Support Team #3, c/o Fleet Post Office, New York, N. Y. or via K4JQV's home address."



Claude, ex XW8AK, shown in his operating position when he was in Vientiane. Although Claude stopped operating as XW8AK in June 1959 he has received many QSL's for QSO's after this date. He has QSL'd 100% but anyone who has not received a card may reach him at his present QTH which is Claude Roussey 42 rue Caulain Court, Paris 18, France. A one year tour with the army in FA-land caused a delay with QSL's.

VQ8 St. Brandon: VQ8AP is planning on going back to St. Brandon on August 1, 1961. He will be using the call VQ8APB.

VR6 Pitcairn Island: VR6AC is active on 14250 kc s.s.b. usually operating from 0500 to 0700 GMT on Tuesday, Wednesdays, and Thursdays. This from W6RCD, his QSL manager, who should certainly know.

VS9 Maldives: VS9MB will make skeds with any station interested. Write them a letter setting the time and date at least 21 days in advance. Five IRCs are required for air mail return on a QSL. (Tnx WGDXC)

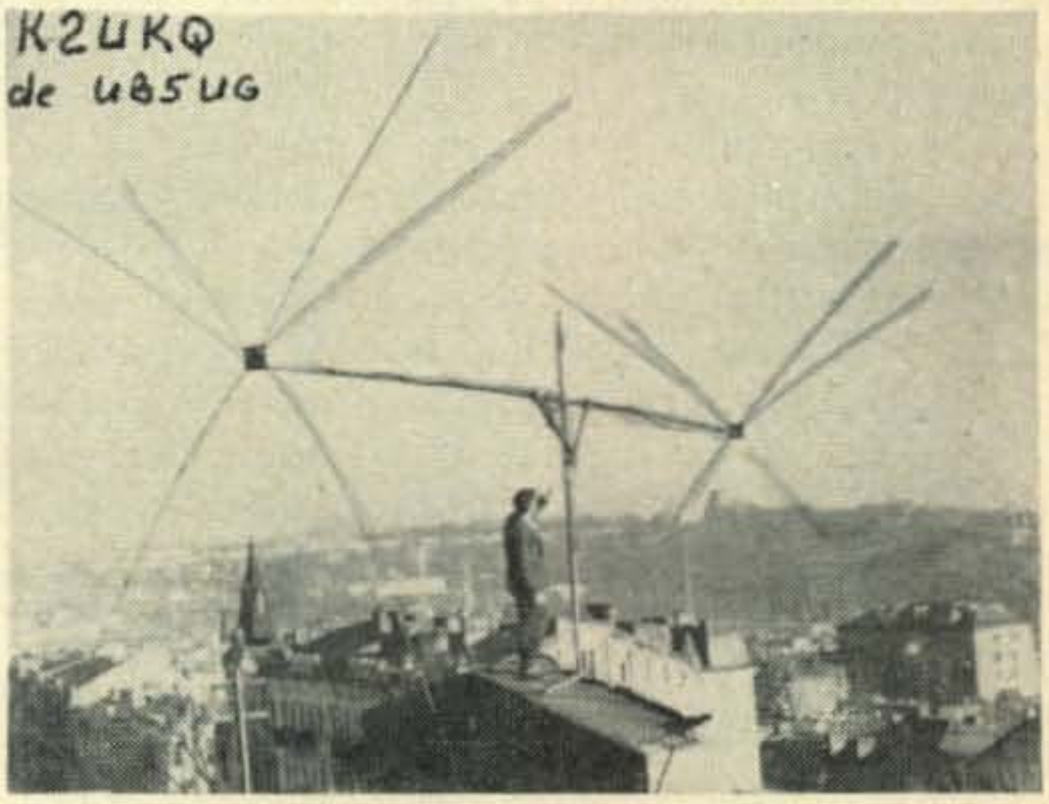
ZA Albania: During the summer of 1960 DM2ALN visited Albania and looked into the hamming situation. There are two legitimate stations active at present, ZA2BAK and ZA2BOR. Both are club stations; have operators named "Spiro", Hiqmet, and "Ahmet". There are a couple of other operators learning c.w. There probably will be other stations in Albania. The rig at ZA2BAK uses 60 watts input to a long wire. QRI is T6-7 with chirp. ZA2BAK and ZA2BOR are active almost every Monday and Tuesday from 1500-1800 GMT on 14 mc for the most part, although there is some 7 mc operation. The big drawback is the lack of electronic equipment in Albania. DM2ALN mentions that there is a possibility of a DXpedition to Albania by some DMs this summer, but it is too early to say for certain. (K2UYG via WGDXC).

ZD7 St. Helena: ZD7SE has been somewhat active around 2100 GMT on 14 mc c.w. ZD7SA also shows up around the same time but rather infrequently.

5U7 Niger Republic: 5U7AC is on almost every afternoon (U.S. time). He calls CQ on 14085 kc and when the pileup gets too big, he will QSY to 14025 kc. Watch both frequencies as he sometimes QSY's back and forth several times before going QRT. 5U7AH is also active on 21 mc a.m. phone. He is ex-FE8AH. (Tnx NEDXA)

Here and There

Postage: Effective July: Rates for regular and airmail letters and post cards to Canada and Mexico will remain unchanged. Ordinary surface mail to all other countries will be increased from 8 to 11 cents for the first ounce. Regular mail post cards to other countries will be hiked from 5 to 7 cents. The 15 cent airmail rate for Europe will remain unchanged. Air mail letters going to South American countries will be increased from 10 to 15 cents per half ounce. Three cents will be added for Caribbean countries and Central America. Air mail letters to the Soviet Union will be increased from 15 to 25 cents per half ounce. There will be no change in the 25 cent rate for Asian, So. African and Pacific nations. (WGDXC) . . . VS1HU, ex G3JFF will be making the following trip with a survey group; should be operating now as VR2MA. Approximately August, arrive Gilbert and Ellice and operate as VR1M from November thru January and they will refit in ZL land; February ('62) return to VR1M; April arrive in the Solomons;



Yuri, UB5UG, on his roof overlooking Kiev. Although the antenna looks like a quad it is a multiband broadside. *(Tnx K2UKQ)*

The "Abstainers", W8WZ, W8ZY, W8KIA, W8-NBK, W8UPN, W8CQ.

No one else worked him; just us!" W9YFV, W8DUY.

June, arrive in Singapore and home to G3JFF. Mike will also operate /MM from ship, (Tnx NCDXC)

New Prefixes: TL8 Central African Republic; TN8 Congo Republic; TT8 Tchad Republic; TU2 Ivory Coast.

Certificates

The FEARL (M) advises that the WSKAD (Worked Seven KA Districts) award will continue to be issued as long as the supply of blank awards lasts. This award cannot now be worked as there are only five active districts, namely KA2, KA5, KA7, KA8 and KA9. But those stations who have previously worked and received cards from districts KA3, KA4 or KAØ can obtain this award if they work and obtain QSL cards from the presently active districts.

Applications for the awards and endorsements may be sent to FEARL(M), attention Awards Manager.

The BV Award—This very attractive award is being issued by the Taiwan American Radio Club and the rules are as follows:

1. Asian stations must contact four separate BV stations. Non-Asian stations must contact two separate BV stations.

2. Contacts after 1 January 1961 only will be valid for the award.

3. All contacts for the basic certificate must be of the same emission type. Any authorized amateur band may be used. Cross-band contacts are not valid. Additional endorsements will be given for contacts made using other modes of emission.

4. Endorsement of the award to cover other types of emission will be governed by the same rules as outlined for the original award.

5. QSLs need not be submitted. Submit only an extract of the station log showing appropriate entries and certified as being correct by a club official, or, in the case of those applicants not belonging to a club, a public official together with his seal of office.

6. Applicants who are applying for the basic certificate must clearly indicate this fact in the application, otherwise, only an endorsement seal will be issued.

7. It is requested that sufficient postage (8¢ U.S. or 3 IRC) be included to cover the cost of mailing.

8. Submit applications to Secretary, Taiwan American Radio Club, Box 24, USTDC, APO 63, San Francisco, California, U.S.A.

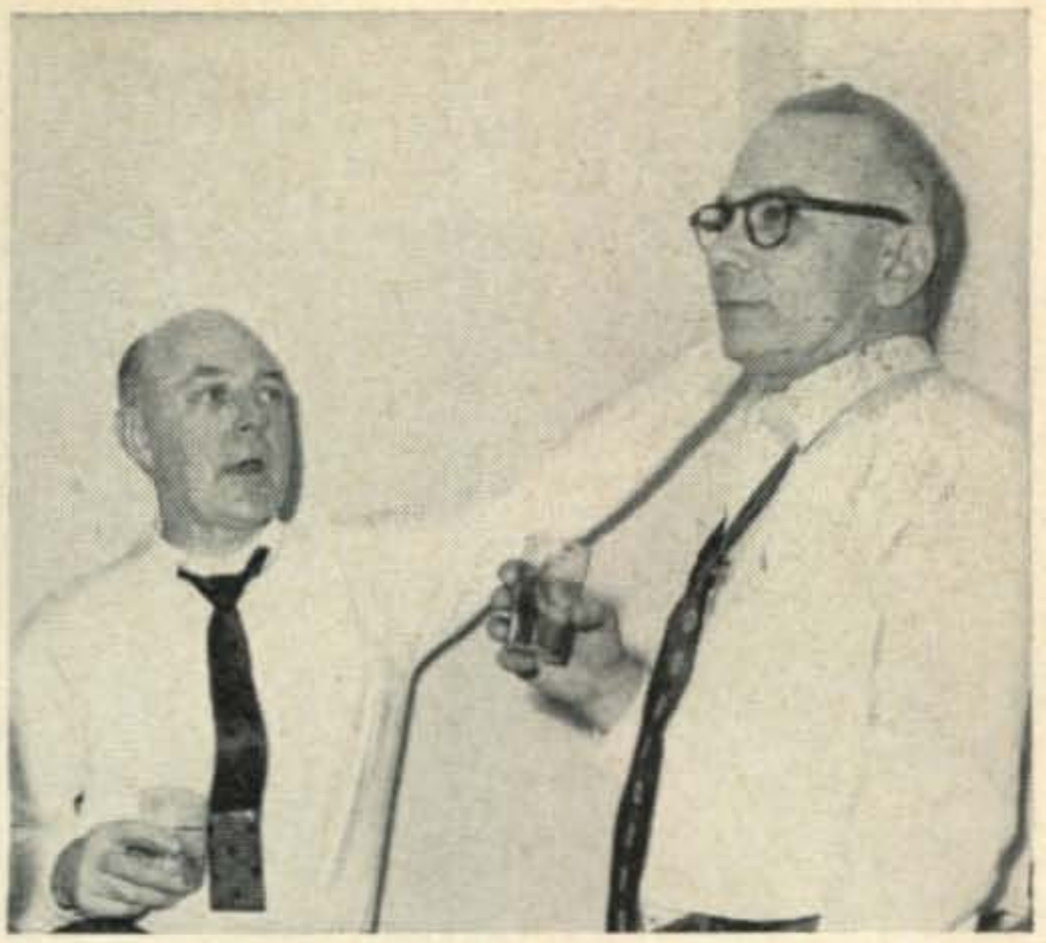
The Peoria Area Amateur Radio Club is issuing the Illinois Counties Certificate (I.C.C.) and Cliff, K9EAB, the award custodian, will supply you with the details.

Dayton Hamvention

On April 28th, the Dayton Hamvention was held again in the Dayton Biltmore and, as usual, was an overwhelming success. The time and effort that the Committee puts into this affair is almost unbelievable. The way the Convention has grown year after year is proof that their work has borne fruit. This year, the total registration was just over 2700 and there were 875 at the banquet. Dana, W1HKK, was the main speaker at the banquest and gave a very interesting talk on his trip to the U.S.S.R.

The DX forum was held on Saturday morning and I had the honor of being moderator at the forum. The list of DXers in attendance read like a Who's Who in the DX world. There were 18 DXers with over 300 countries confirmed and 12 honor roll members at the forum. They included W7PHO, W4DQH, W8PQQ, W8UAS, W4BPD, W8DMD, W8BF, W2AGW, W3GHD, W8BKP, W3JNN, W2JT, W8GZ, W8JIN, W8KIA and W8BRA. The speakers included Glen, 9N1GW, who talked on his experiences in Nepal; MP4BBW, and Gus, W4BPD, who had the gang in stiches with his narration of his expedition to 3A2, M1, FL9, VQ1, MP4, OK, etc. Gus is getting ready to go on another trip and I'll keep you posted on the developments. Arne, W2DTJ, the Editor of this fair magazine presented W8JIN with a plaque for being the first station in the world to earn 200 certificates. Sax, W2SAW, gave a very interesting talk on the art of certificate chasing. Last on the program was MAC, W9EVI, who narrated movies on the HKØTU DXpedition. Anyone thinking it would be nice going on a DXpedition should see the HKØTU films before making up his mind. This one is by far the roughest place to land and operate of any I have seen. The side of the island is almost a sheer cliff. I think the films will be available for club use, and if so, I *highly* recommend them.

"That's an easy one to work." W3BSF, W8UPN."



"Don't tell me I can't work DX!" W2SAW, W2AGW.
(Pictures and captions by W8OCT)

One of the highlights of the DX forum is the DX quiz, which I'm reproducing below. W2AGW walked off with top honors and a Jennings Vacuum Variable, with a score of 75. Let me know if you do better.

It is really wonderful getting together with the DX gang at Dayton and I wouldn't miss it for the world. The North Jersey DX Association always has a hospitality suite for the DX gang and this year we played to an overflow crowd; it got so bad that we had to go visiting to make room for the visitors, hi. DX there, in addition to 9N1GW and MP4BBW, included ZL1AAX and Bob, W5EHM, chief operator of the KG6ICD, Marcus Island DXpedition. There were DXers from every call area. If you can possibly make it the last week end in April next year, come and have the time of your life, *but come early*. The Convention itself doesn't start until Saturday morning, however, the DX gang starts gathering Friday afternoon. Of course, if you can't make it on Friday, you will have your compensations, as I understand there is very little W-QRM that weekend.

Again, our thanks to Bill, W8OCT, for the wonderful pictures which we'll be running for the next few months.

1961 DAYTON HAMVENTION

DX Quiz

FOR the first four questions, the April 1961 QST will be used as an answer guide.

1. The number-one station on the DXCC Honor Roll is _____,
2. The number of countries separating the top and bottom of the Honor Roll is _____,
3. There are two call areas that have six Honor Roll members. They are:
   (a)....6 and 8
   (b)....2 and 8
   (c)....6 and 9
   (d)....None of the above.
4. The only call area without an Honor Roll member is _____,
5. 5U7AC is:
   (a)....A Pirate
   (b)....Located in the Niger Republic.
   (c)....Located in the Upper Volta Republic.
   (d)....Located in the Mali Republic.
6. W2CTN is NOT QSL Manager for:
   (a)....ZD9AM
   (b)....KW6CU
   (c)....FM7WU
   (d)....TI2WD
7. Pakistan does not border on:
   (a)....XZ2
   (b)....YA
   (c)....YI
   (d)....EP
8. Going from west to east you would cross British Guinana, French Guinana, and Surinam in which order?
   (a)....VP3, PZ1, FY7
   (b)....PZ1, FY7, VP3
   (c)....VP3, FY7, PZ1
   (d)....FY7, PZ1, VP3
9. The Equator does not pass through
   (a)....Gabon
   (b)....Columbia
   (c)....Congo (9Q5)
   (d)....Ghana
10. The QSL Manager for FF4AL is _____.
11. How many countries may be worked that use the VP2 prefix?_____.
12. Bumthang is the capital of _____.
13. The QSL Manager for VQ9 is _____.
14. The Malagasy Republic was previously known as _____.
15. When it is midnight (E.S.T.) in New York City it is _____(I.S.T.) in Bombay.
16. The first station to earn WAZ Post War was _____.
17. 5N2 is to ZD2 as 6W8 is to _____.
18. The operator of ZM7DA was _____.
19. How many Zones may be worked using only prefixes that begin with U (UA, UB, etc.)____.
20. The name of the country the prefix of which is UI8 is _____.

Honor Roll and QSL Managers follow on next page.

WPX HONOR ROLL

CW WPX

W2HMJ	605	W1IUU	313
W8KPL	534	SM5WI	312
W6KG	528	SM5AHK	311
W9YSX	527	W5BRR	311
W5KC	516	W8RQ	311
K6CQM	500	OH3TH	310
W1NLM	491	PAØLY	310
W1EQ	482	SM7TQ	310
K2UKQ	467	W3GHD	310
W3OCU	466	W9BPW	310
W2EQS	464	W9UX	310
W4OPM	464	W3AYD	309
W8LY	456	DJ3BB	308
W9UXO	453	SM5AHJ	308
K6SXA	452	SM5BCE	308
K9EAB	451	WØAUB	308
W2MUM	450	DU7SV	307
W8JIN	449	W9YNB	307
W3BQA	437	K4IEX	306
K5LIA	428	OK3DG	306
OK1MB	428	UA9DN	306
WØPGI	420	W2SAW	306
W2HO	418	W8RSW	306
W8PQQ	418	K4HXF	305
W5AWT	412	VE3BWY	305
W2PTD	411	W2TP	305
K9AGB	409	WA2DIG	305
W6WO	409	W4SHX	305
K4JVE	407	W5AZB	305
W5AFX	407	W8ONA	305
K2ZKU	405	WØGUV	305
W2NUT	403	K4DRO	304
PY4OD	402	K8GHG	304
W5LGG	401	K5JZY	304
W9GFF	401	K6RTK	304
VK3KB	400	OK1AEH	304
W9SFR	400	SM5CCE	304
WØQYE	377	W1BFT	304
IT1AGA	374	W1EIO	304
W5BUK	369	W1FZ	304
W9DYG	367	W6NWI	304
G2GM	365	W6RLP	304
W4AZK	365	K8IKB	303
W9QGR	361	OK3EA	303
W9WIO	360	W7ABO	303
SM5AJU	359	W8UMR	303
UC2AA	357	W9VIN	303
VE3DIF	357	VE3HB	303
WØMCX	357	ZL2GS	303
DL7CS	356	OY7ML	303
KL7MF	356	K2CPR	302
W5OLG	356	K9CLO	302
W2GVZ	355	OK1KKJ	302
VE3JZ	354	W1HGT	302
DL1YA	354	W3DBX	302
K4GSS	353	WØDMA	302
W4DKP	353	JA2JW	301
K2PFC	352	JA3FT	301
W9WCE	352	LU5AQ	301
HB9TT	351	OK1CX	301
W5DA	351	W2DGW	301
F3DM	351	W4IMI	301
W6UNP	350	W8IBX	301
W1IJB	349	W8TTN	301
W3GAU	349	ZL4CK	301
W9IU	344	DL9KP	300
W6YY	330	K4KOY	300
DL1QT	328	K9KDI	300
K2QXG	327	PAØZL	300
SM7CNA	327	SM5BPJ	300
WØSNL	327	PY4AO	300
LU8EN	326	SM2BCS	300
DL3RK	324	SP6FZ	300
F9IL	322	VE3CIO	300
W2KIR	320	W1HWH	300
UC2AR	319	W2FXA	300
EA4CR	318	W3BCY	300
G3EYN	318	W3LMA	300
LA6CF	318	W3SOH	300
SM7EH	318	W7TPE	300
DJ1VS	316	W4GXB	300
VK6WT	316	W4RVW	300
W2GT	316	W2DEO	300
F9MS	315	WØDVZ	300
PAØVB	315	W6WWQ	300
PAØVO	315	ST2AR	300
W2BYP	315	K4TEA	300
W1NHJ	314	K5ESW	300
		W2QHH	300

PHONE WPX

W8WT	516	SP7HX	323
G3DO	476	W3AYD	314
CT1PK	449	I1CBZ	312
W9YSQ	436	W3DJZ	306
W9WHM	367	ZP5CF	306
PAØHBO	363	SM3BIZ	304
SM3EP	361	VK6KW	303
W5ERY	358	W8UMR	303
W9UZC	356	F8PI	302
DL3TJ	354	PY1NC	302
PY2CK	354	EI3R	302
5A5TO	353	W9PQA	301
W8PQQ	327	K9EAB	300
VE1ADE	325	XE1AE	300

SSB WPX

TI2HP	328	VE3BKL	163
HB9TL	315	YV5FK	162
K9EAB	301	TG9AD	160
MP4BBW	300	W8YIN	157
W4OPM	284	K1IXG	155
K2MGE	263	W1TYQ	155
W8PQQ	250	GW2DUR	154
W1GR	246	W2HXG	154
W3MAC	235	W9WIO	154
HB9TL	221	K2QXG	153
WØCVU	218	W2OTZ	153
W1EQ	213	W2TP	153
DL4AS	208	W2VZV	153
W2YBO	207	K2JFV	152
K2JXY	206	VE3BWY	152
W5RHW	203	W6VUW	152
OY7ML	203	W8JIN	152
W3VSU	200	W8JXY	152
XE1AE	197	W8YBZ	152
EI8P	191	K2TDI	151
PZ1AX	189	W2BLP	151
K2HEA	181	W2GNQ	151
VE3BQP	181	W9YHE	151
W6BAF	170	WØFUH	151
WØKFA	168	K6HZO	150
W8BKO	166	LA3SG	150
K4PUS	166	W2FXN	150
UA3CR	165	W5DA	150
VE6TF	165	W5PQA	150
VE3MR	164	W6TNS	150

QTH's and QSL Managers

AC5PN	**via W8PQQ**
AP2R	**via G3CJQ**
HC1LE	**via W2MUM**
HK2YO	**Box 1041, Cucuta, Columbia**
HM1AP	**via K6QPG**
HV1CN	**via W2BIB**
KC4AAC	**via K4MRT**
KC6SP	**Coast Guard Depot, Navy 926, FPO Box 1, San Francisco, Calif.**
KZ5MQ	**via K5VTA**
OA4M	**Box 538 Lima, Peru**
TG9BJ	**U.S. Embassy, Guatemala City, Guatemala**
TI2PT	**APDD 1209, San Jose, Costa Rica**
TI2WA	**via K9TZH**
VK9GK	**via W2CTN**
VKØVK	**via K2QXG**
VP2GAQ	**via K9UTI**
VP5BL	**via W3AYD**
VP6CD	**via KP4 Bureau**
VP6ZX	**via W9JFY**
VP7 QSL Bureau	**Donald Thompson, VP7NS, P.O. Box 48 Nassau, Bahamas**
VP7NY	**Lowell Albury, P.O. Box 1007, Nassau, Bahamas**
VQ2WM	**via W2CTN**
VQ8AM	**via W8EWB**
VR4BC	**Box 53, Honeara, Guadalcanal, Solomon Islands**
VR6AC	**via W6RCD**
VS9MB	**Royal Air Force, Gan, BFPO #180, London, England**
ZD3P	**via W7VEU**
5A5TZ	**Major L. Beaumont, R. Signals, Army Apprentice School, Harrogate Yorks, England**
5N2RJD	**N. Region Development Corp. Kaduna, Nigeria**
9M2GV	**P.O. Box 5000, Muar, Federation of Malaya**
9N1MM	**Box 50, Kathmandu, Nepal**
9U5D5	**Box 1186, Usumbura, Ruanda-Urundi, Africa**
9U5MC (new)	**Box 78, Usumbura, Ruanda-Urandi, Africa**

73 for now, and have a good summer.

Urb, W2DEC

by DONALD L. STONER, W6TNS
P.O. Box 137, Ontario, Calif.

semiconductors

One Watt Transistor Transmitter

Several years ago I earned my c.w. WAC certificate by working the five major continents with an 80 milliwatt QRP transistor rig. These contacts provided more enjoyment than working any rare DX station with a full gallon.

The QRP experiments were of no practical value, other than to show it could be done, since the contacts were made in liaison with higher powered initial contacts. However, since that time, transistor technology has improved to the point where higher powered, inexpensive transistor rigs are quite practical. No longer is it necessary to contact a station and have him listen for your transistor rig, or call CQ-TR for hours on end.

The transistor transmitter to be described is capable of one-watt r.f. *output* on the 20, 15 and 10 meter bands. Although primarily designed for c.w. operation, it can be easily modulated by a single class A stage. The circuit evolved from the common Citizens Band transmitters for 27 mc, with an added silicon stage for high power output. The transmitter is optimized for 10 meters and is padded down to the 15 and 20 meter bands by shunting capacitors across the interstage inductances. It should be pointed out, in all fairness to the reader, that many of the details were arrived at empirically (particularly the coil taps) and possibly more power output could be obtained with further experimentation. The power output is limited *only* by the driving power available to the final amplifier stage. Any adjustments which increase the drive will also increase the power output. The common base configuration was used for several reasons. Since the transistors are slightly regenerative in this configuration, the power gain appears to be somewhat higher. The common base configuration also permits a higher modulation potential to be used since the collector-to-base breakdown potential is always higher than the collector-to-emitter rating. However, the main reason for using this configuration is its similarity to the grounded grid r.f. amplifier and the attendant advantages. The transmitter shows that a considerable portion of the driving power is delivered to the load, for the final efficiency *appears* to be about 92%.

Circuit Description

The schematic for the one watt c.w. transmitter appears in fig. 1. The oscillator, which uses a Texas Instruments R-425, is similar to the common base circuit. Imagine for a moment that the base is bypassed and grounded for r.f. Since the emitter is only partially bypassed (50 mmf) feedback can occur through the transistor junction capacity between collector and emitter and oscillate at a frequency determined

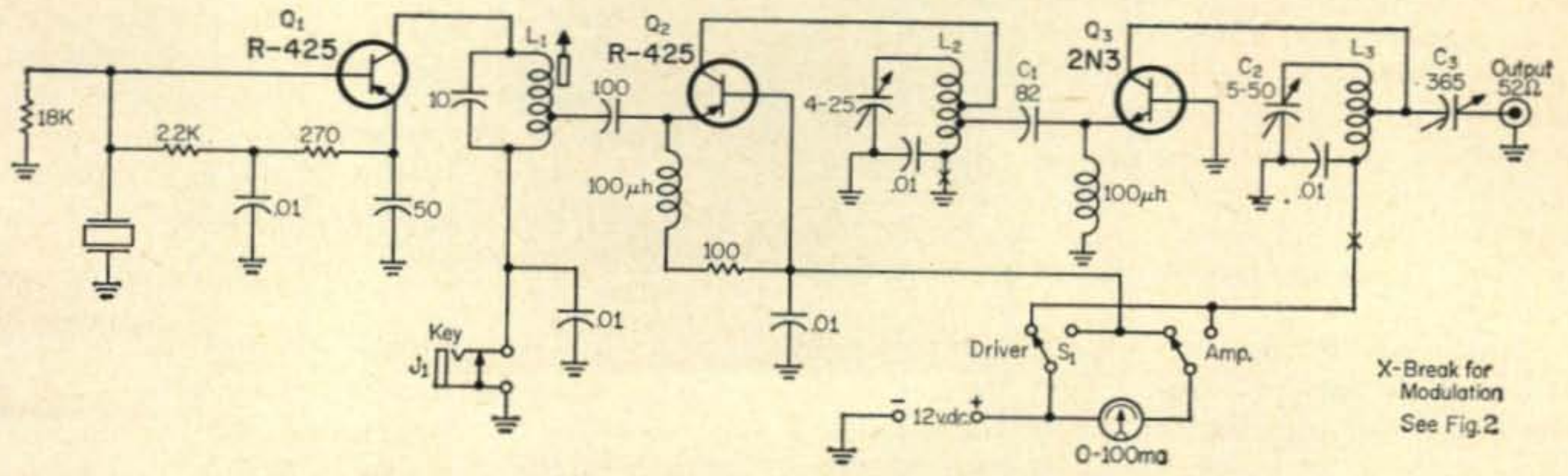


Fig. 1—Schematic diagram for the one-watt c.w. transistor transmitter.

C_1—see text.

C_2—50 mmf variable capacitor (E. F. Johnson 50S8 with shaft).

C_3—365 mmf broadcast type variable capacitor (J. W. Miller type #2111).

J_1—Closed circuit key jack.

L_1—15¾ turns, #24 closewound on 5/16" p.c. slug tuned form, tap at 3¼ turns.

L_2—17 turns, #24 spaced diameter of wire, ½" i.d. (Air Dux #416) collector tap at 8½ turns base tap at 2½ turns from cold end.

L_3—14 turns #24 spaced diameter of wire, ½" i.d. (Air Dux #416) collector-antenna tap at 3 turns from cold end.

S_1—Double pole double throw rotary switch.

Note—the 100 μh coils are simply d.c. return paths and are not critical. Any similar inductance, such as a television peaking coil (J. W. Miller 72F104AP) is suitable.

by the collector inductance L_1. However, the base is not bypassed by a capacitor but with a quartz crystal. The crystal operates in series resonance and therefore is a low impedance at that one frequency. Thus, in effect, the base is only bypassed at the crystal frequency which closely maintains the frequency of oscillation. R.f. energy appears across the tank (L_1) and is coupled to the buffer/driver. A jack in series with the collector current path is used to key the stage. The 2.2K and 18K resistors form the forward bias divider. A 270 ohm resistor is used to stabilize the stage and prevent thermal runaway.

It is only necessary to key the oscillator stage, for the buffer and final derive their forward conduction bias by signal rectification. In the absence of signal, these stages do not conduct.

The buffer/amplifier, another R-425, increases the drive level to approximately 100 mw, and also operates in the common base configuration. A 100 ohm resistor in the emitter current path is necessary to stabilize the stage. Note that the collector is tapped down the coil to prevent excessive loading and maintain a high Q. R.f. drive from this stage is coupled to the power amplifier through an 82 mmf capacitor which, in conjunction with the transistor base-emitter capacity, forms a voltage and impedance divider to correctly match the two stages.

The final amplifier is a silicon mesa transistor with the following ratings: V_{cb}= 30 volts, V_{eb}= 2 volts, I_{co}= 1 microampere, hfe= 20, alpha cutoff 80 mc, C_{ob}= 35 mmf and dissipation= 2.0 watts with an infinite heat sink. The device is graded out of the 2N696 family and any similar device may be used. It is so rugged that only a minimum of heat sink is necessary—a one square inch piece of copper clipped to the case is more than adequate. Note also that no emitter resistor is required at this power level. The collector impedance is very close to a coaxial transmission line, and in fact could be directly coupled to the antenna. However, when this is done, efficiency is poor and harmonic suppression is nil. For this reason the tank circuit (L_3) is used and the collector is tapped well down the coil to provide a high loaded Q. The 365 mmf single-section broadcast tuning capacitor serves to match the collector impedance to the transmission line and its adjustment is quite critical if maximum transfer of power is to be obtained. Although not shown in the diagram, bandswitching is accomplished by padding coils L_1 and L_2 lower in frequency with trimmer capacitors as shown in the bottom view photograph. The final tank coil is not switched, for capacitor C_2 has sufficient range to tune from 12 to 35 mc.

Experimenting

Although the etched circuit board should greatly simplify the problem of duplicating the performance of the transmitter, the reader should be advised of several points which are critical. Coil L_1, its associated tap and the 100 mmf coupling capacitor do not seem to affect the performance particularly. The taps on L_2 do, however. If the collector tap is moved up, the output and harmonic suppression will be depreciated. If the tap is moved down the coil, the power output will fall off but harmonic suppression will improve. The location of the emitter tap for Q_3 reacts similarly. The collector/antenna tap for L_3 is also critical. If the tap is too high, the loaded Q falls and if too low, circulating currents cause excessive losses. The harmonic suppression, with the coils tapped as shown, is excellent and no TVI occurs on channel 2 due to second harmonics when operating on 10 meters.

One bug did crop up in the transmitter which was never completely solved. The value of C_1 is extremely critical (more so than its position on the coil) indicating that it may be series resonating the lead and transistor inductance. It can only be optimized on one band and as shown is correct for 10 meters. For 15 it should be 100 mmf and for 20 the correct value is 15 mmf. Unfortunately no provision was made for switching in other values of capacitors since the switch was installed before this problem came to light. If this value is not changed, the r.f. will fall off approximately 10% on 15 meters and 25% on 20 meters. In view of this, and since any bandswitching rig is a compromise (particularly transistor QRP equipment), I would recommend that the transmitter be built for one band only. It can then be changed to other bands by tacking in other capacitor values.

At this writing experiments are progressing on a six meter version of the rig. Preliminary work indicates that roughly one-half watt output can be obtained.

Modulation

Although the transmitter was designed primarily for c.w. operation, many readers will want to modulate it. A suitable circuit is shown in fig. 2. It is rather primitive and uses a carbon

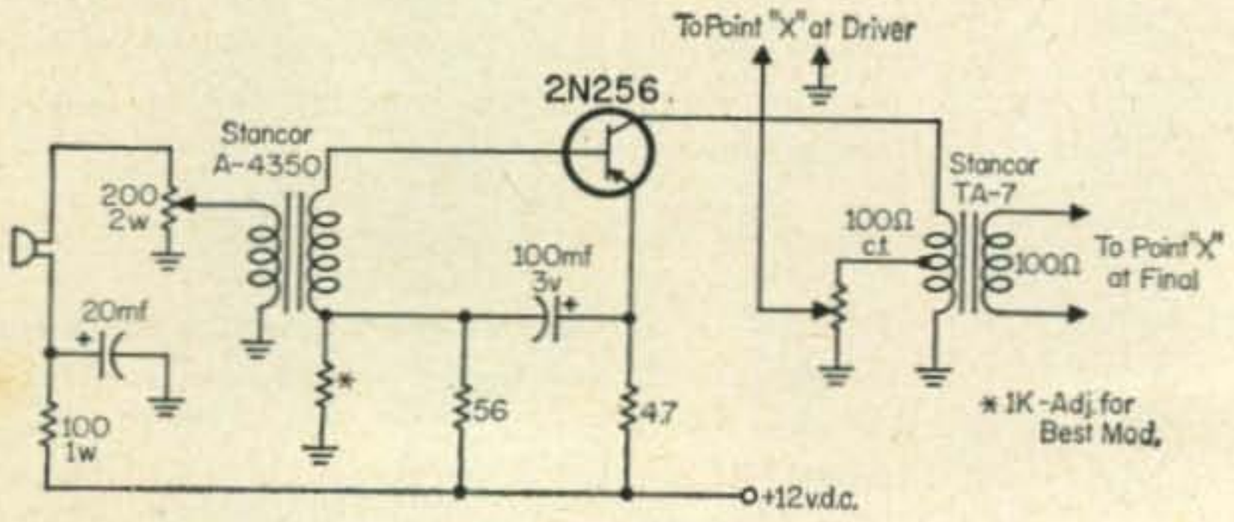
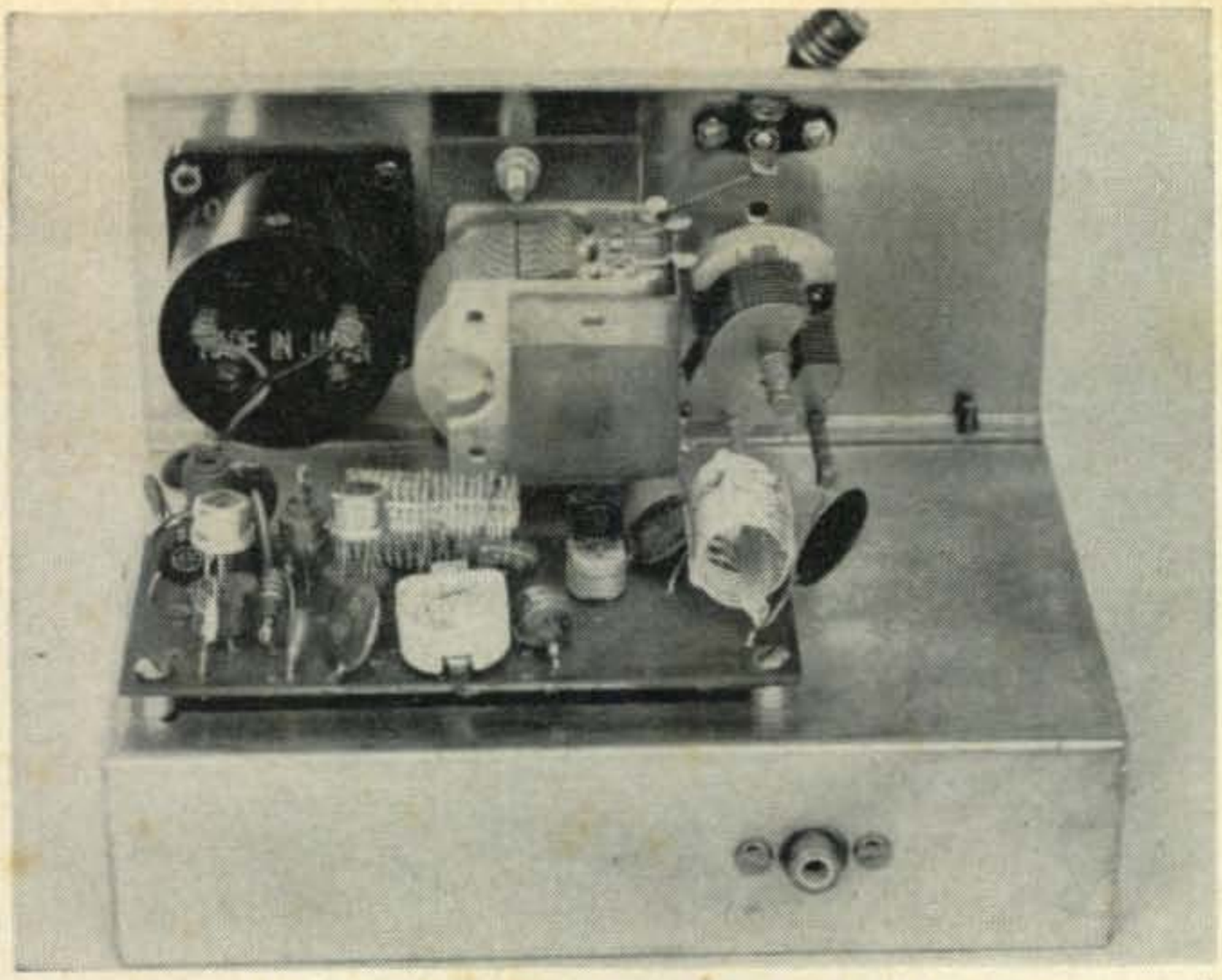


Fig. 2—Modulator suitable for the 1 watt c.w. transmitter. Note that the power transistor dissipates several watts and must be bolted to a heat sink.



Rear view showing power input connector (RCA jack) on rear apron. Construction is not critical and layout of components can be seen in photo.

microphone but should prove adequate. It should be mentioned that the modulation will only be about 80% if the driver is not modulated since both the driver and final must be modulated to reach 100%. Both PNP and NPN transistors are employed and this necessitates the use of a dual winding transformer to isolate the two windings. A system which should work is shown in fig. 2. One word of caution, however. Keep an oscilloscope on the modulated line to insure that the V_{eb} rating of the transistor is not exceeded.

Adjustment

The circuit for the probe (an r.f. voltmeter) in fig. 3 will be extremely useful for determining power output. Although it is a peak-reading device, the 39K resistor loads the d.c. output to approximately r.m.s. The load resistor, which is part of the probe, is connected to the transmitter r.f. output and the voltage developed is read on a multimeter (20,000 ohms per volt, or better). This figure is then squared and divided by the load resistor (51 ohms) to give the power output in watts. Naturally, all adjustments are peaked for a maximum reading on the voltmeter (which corresponds to maximum power out). When the transmitter is working properly the meter should read 7 to 8 volts, indicating one-watt or more output.

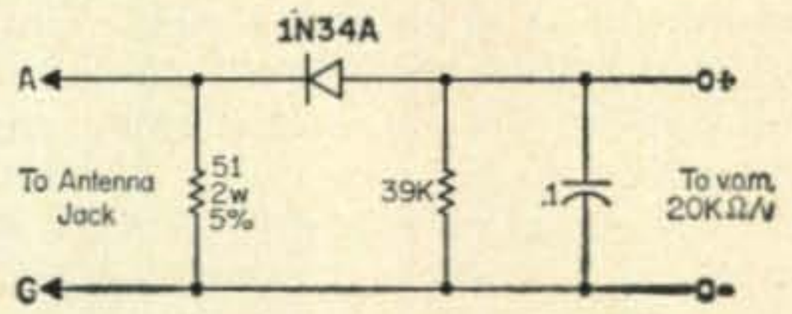
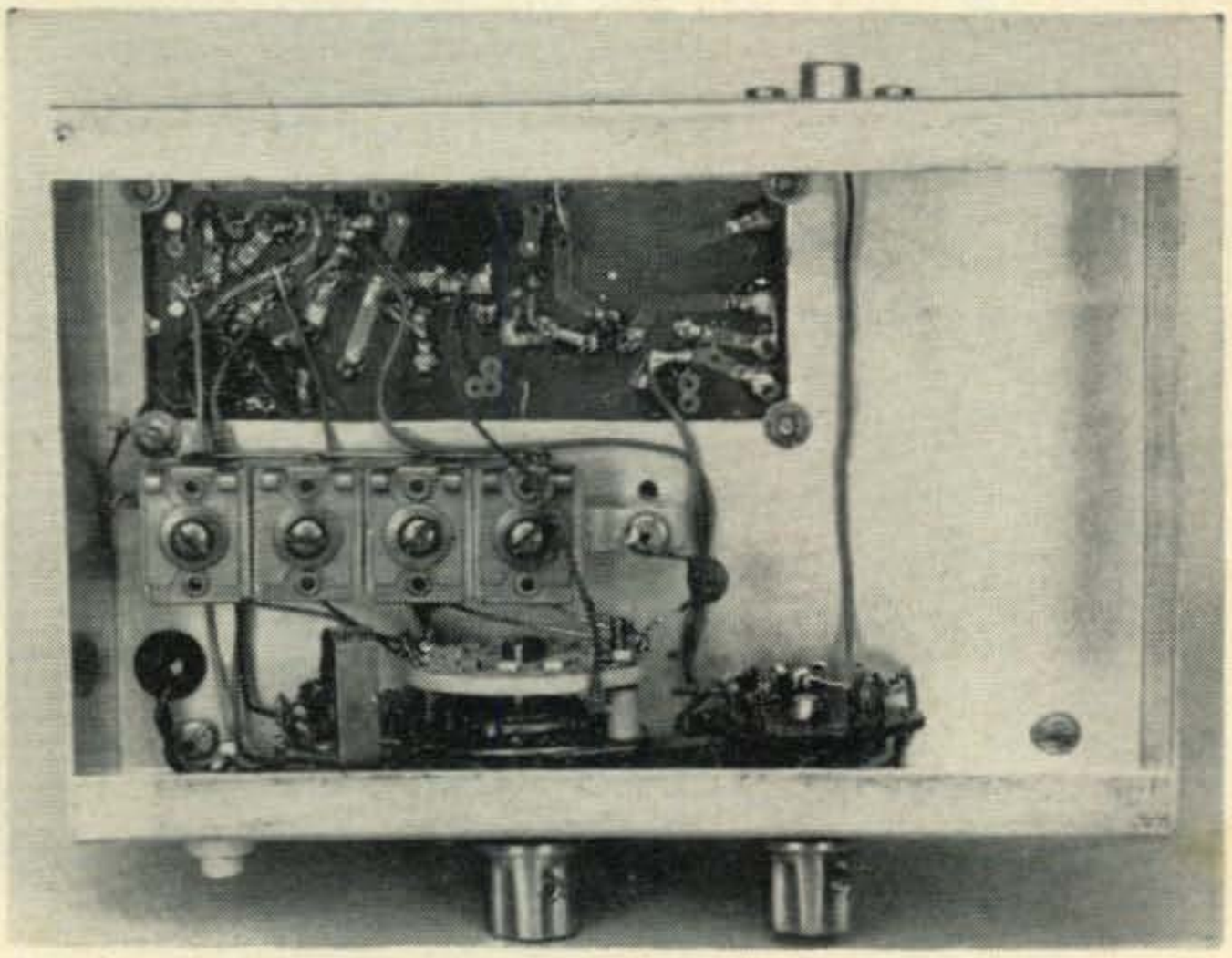


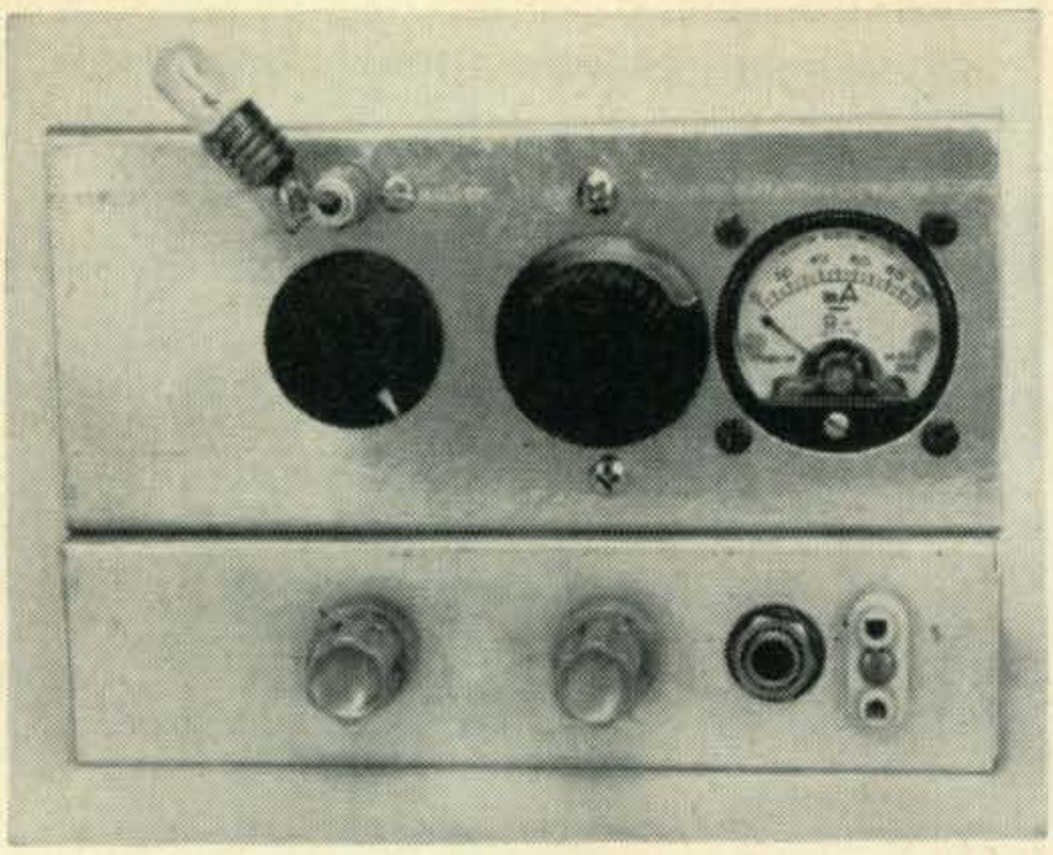
Fig. 3—An r.f. probe for power output measurements. For accurate readings the leads should be quite short.

20 Watt TI Transmitter

The circuit for the 2.18 mc marine transmitter, shown in the April 1961 issue of *CQ*, omitted several important details as pointed out by many readers contemplating building this unit. Although it does not particularly affect the construction of the transmitter, the impedance formula was shown incorrectly and the collector impedance is actually 3.5 ohms. It was also



Underside of 1 watt c.w. transmitter showing the compression trimmers used to pad L_1 and L_2 on 15 and 20 meters.



Front view of the 1 watt transistorized c.w. transmitter. Along the lower edge from left to right are the meter switch, band switch, key jack and crystal socket. At the top are the plate tuning, plate loading and 100 ma meter.

pointed out that the circuit was for positive ground, which was incompatible with our present automotive systems. However most marine installations still use a positive ground. The circuit can be changed simply by connecting all minus 12 volt lines to ground, and running grounded current points to the plus 12 volt source. No reason is given in the report for using a 30 watt modulator with a 40 watt input final amplifier. The class A driver transistor is a Texas Instruments 2N1038, transformer T_m is a Stancor A-4350 (Z_p= 200 ohms, Z_s= 125 ohms), T_1 is a Thordarson TR-65 (Z_p= 100 ohms, Z_s= 200 ohms c.t.) and T_2 is a Triad TY-67A (Z_p= 6 ohms c.t., Z_s= 4, 8 and 16 ohms). The final is connected to the 8 ohm secondary point. A crystal or ceramic microphone could be used with a suitable preamplifier section.

Standardization

Most of the circuits appearing in the SEMICONDUCTOR COLUMN have been rather haphazard regarding the polarity of the power source. Over the past few years most of them have been for a positive ground system. Although this makes the circuitry resemble vacuum tube configurations(with PNP transistors) and might make the circuits more readily understood, it is completely incompatible with the late automobiles. Therefore, your conductor is standardizing on all negative ground circuitry. Contributed circuits, which have positive grounds, will be redrawn before publication.

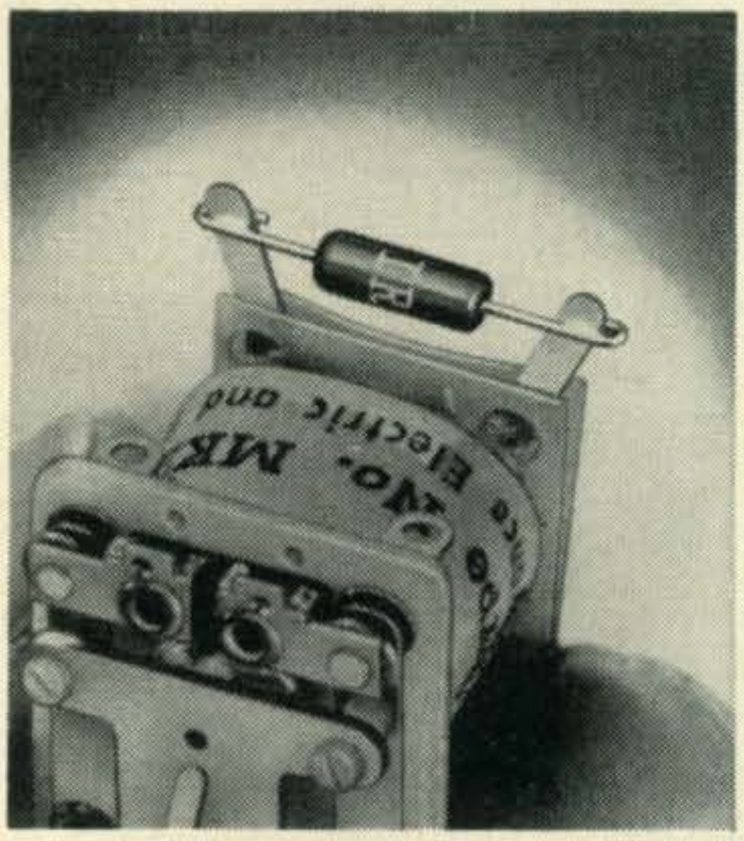
Semiconductor News

An interesting new development from the Hoffman Science Center in Santa Barbara is a tiny fuel cell described by their Dr. Smatko. The device is about the size of a flashlight cell but produces more power and is continuously recharged.

The latest copy of *CBS Tech-Tips* contains a discussion of zener diodes and circuit applications. For a copy write Engineering Information Services, 100 Endicott St., Danvers, Mass.

Always a source of superb publications, GE has done it again with their *Tunnel Diode Manual*. It is similar to their Transistor Manual but covers an area where less information is available. The new manual is available at most radio stores or by sending one dollar to General Electric, Kelley Building, Liverpool, N.Y. Also of interest is a new germanium alloy type 2N396, transistor. A six-page data sheet (25.24) is available from the above address.

International Rectifier Corporation, El Segundo, Calif., has introduced a new line of silicon mesa miniature glass diode for relay contact arc suppression. For detailed data, ask for bulletin XR-168. Also of interest is a line of 400 mw rated glass zener diodes featuring low voltage values, low impedance and low temperature coefficient. These devices are described in bulletin XSR-263.



International Rectifier silicon diode contact protectors.

Motorola Inc., 5005 McDowell Rd., Phoenix 10 Arizona, has converted their silicon mesa line to the epitaxial process. Eight of these high-speed devices are now available. The conversion has also been accompanied by large price reductions. Also of interest is the MR series press-fit silicon diodes which are said to have made the new alternators possible in 1960 and later cars. The 50 volt, 18 ampere rectifier is available in production quantities for 58 cents!

If you would like to learn more about the epitaxial semiconductor process, request a copy of *A Case History In Progress* from Sylvania, 1100 Main St., Buffalo 9, N.Y.

The latest issue of Texas Instruments (Box 5012, Dallas, Texas) *Application Notes* contains a description of germanium bilateral switching transistors. If you are working on transistor power converters or inverters, check into the new low-profile TO-36 industrial package. The 2N441, 442, and 443 types so popular for this service are available with 150 watt dissipation ratings. Useful for switching or r.f. applications is the new TI 2N1131 and 1132 designed to compliment the 2N696 and 2N697 silicon mesa NPN transistors.

For another month, 73, de Don, W6TNS

PROPAGATION

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

LAST MINUTE FORECAST

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

Forecast Indices	Above Normal Days July 12-15, 23-24	Normal Days July 1-4, 8-11, 16-22, 25, 28-31	Below Normal July 5-7, 26-27	Distributed Days None
(1)	C	D-E	E	E
(2)	B	C-D	E	E
(3)	A	B-C	D-E	E
(4)	A	A	B-C	C-D

Where:

A—Excellent circuit with strong steady signals.
B—Good circuit, moderately strong signals, with some fading and noise.
C—Fair circuit, signals fluctuating between moderately strong and weak, with moderate fading and noise.
D—Poor circuit, signals weak, with considerable fading and very high noise level.
E—Circuit not possible.

General Conditions

The combination of a seasonally weak ionosphere and steadily declining solar activity results in a great many NILS in this month's DX forecast for the 10 and 15 meter bands. Seasonally high levels of absorption and static are also expected to result in fewer, and somewhat poorer DX openings on the lower frequency bands.

Fifteen meters should be the best DX band to many areas of the world during the daylight hours, with 20 meters peaking during the late afternoon and early evening hours. During the hours of darkness, 40 meters is expected to be the best band for DX to many areas of the world.

The occurrence of sporadic-E propagation generally peaks during July, resulting in a great

JULY & AUGUST, 1961

TIME ZONE: EST

EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	NIL	12N - 2 P (1) 2 P - 6 P (2) 6 P - 8 P (1)	5 A - 7 A (2) 7 A - 2 P (1) 2 P - 4 P (2) 4 P - 5 P (3) 5 P - 8 P (4) 8 P - 9 P (3) 9 P - 10P (2) 10P - 12M(1)	7 P - 9 P (1) 9 P - 11P(3) 11P - 1 A(1) 8 P - 10P(1)* 10P - 11P(2)* 11P - 12M(1)*
Eastern Europe	NIL	2 P - 5 P (1)	6 P - 11P (1)	9 P - 11P (1)
Southern Europe & North Africa	NIL	12N - 2 P (1) 2 P - 4 P (2) 4 P - 5 P (3) 5 P - 6 P (2) 6 P - 9 P (1)	4 A - 7 A (1) 12N - 3 P (1) 3 P - 5 P (2) 5 P - 6 P (3) 6 P - 8 P (4) 8 P - 10P(3) 10P - 11P(2) 11P - 1 A(1)	8 P - 9 P (1) 9 P - 11P(3) 11P - 12M(2) 12M - 1 A (1) 9 P - 12M(1)*
South Africa	NIL	8 A - 11A (1) 11A - 1 P (2) 1 P - 3 P (1)	3 P - 5 P (1) 12M - 5 A(1)	8 P - 10P (1) 10P - 12M(2) 12M - 1 A (1) 10P - 12M(1)*
Eastern Mediterranean	NIL	3 P - 7 P (1)	5 P - 7 P (1) 7 P - 10P(2) 10P - 1 A(1)	7 P - 11P (1) 8 P - 10P (1)*
Central Asia	NIL	NIL	5 A - 8 A (1) 8 P - 11P (1)	NIL
Southeast Asia	NIL	NIL	6 A - 8 A (1) 12N - 5 P (1)	NIL
Far East	NIL	NIL	7 A - 11A (1) 9 P - 12M(1)	NIL
Pacific Islands	7 P - 9 P (1)	7 A - 12N (1) 12N - 2 P (2) 2 P - 6 P (1) 6 P - 8 P (2) 8 P - 9 P (3) 9 P - 10P (2) 10P - 1 A (1)	7 P - 9 P (1) 9 P - 11P (2) 11P - 3 A(3) 3 A - 7 A(1) 7 A - 8 A(3) 8 A - 9 A(2) 9 A - 12N(1)	1 A - 5 A (2) 5 A - 6 A (1) 2 A - 5 A (1)*
Australia	NIL	8 A - 10A (1) 8 P - 10P (2) 10P - 12M(1)	4 P - 12M (1) 12M - 3 A (2) 3 A - 7 A (1) 7 A - 8 A (2) 8 A - 11A (1)	2 A - 6 A (1) 3 A - 5 A (1)*
New Zealand	7 P - 9 P (1)	4 P - 7 P (1) 7 P - 10P(2) 10P - 12M(1)	7 P - 9 P (1) 9 P - 11P(2) 11P - 2 A (3) 2 A - 4 A (2) 4 A - 9 A (1)	12M - 2 A (1) 2 A - 4 A (2) 4 A - 5 A (1) 2 A - 4 A (1)*
South America	11A - 1 P (1) 1 P - 3 P (2) 3 P - 5 P (1)	6 A - 7 A (2) 7 A - 10A (3) 10A - 3 P (2) 3 P - 5 P (3) 5 P - 7 P (4) 7 P - 9 P (3) 9 P - 12M(2) 12M - 2 A (1)	5 A - 7 A (2) 7 A - 3 P (1) 3 P - 6 P (2) 6 P - 8 P (3) 8 P - 12M(4) 12M - 2 A (3) 2 A - 3 A (2) 3 A - 5 A (1)	7 P - 9 P (1) 9 P - 10P(2) 10P - 2 A (3) 2 A - 4 A (2) 4 A - 6 A (1) 9 P - 2 A (2)* 2 A - 4 A(1)*
McMurdo Sound, Antarctica	NIL	1 P - 4 P (1)	4 P - 6 P (1)	8 P - 10P (1) 6 A - 8 A (1)

TIME ZONES: CST & MST

CENTRAL USA TO:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Western Europe	NIL	12N - 7 P (1)	4 A - 7 A (1) 2 P - 4 P (1) 4 P - 8 P (2) 8 P - 10P (1)	9 P - 11P (1) 9 P - 11P (1)*
Eastern Europe	NIL	1 P - 3 P (1)	5 P - 11P (1)	NIL
Southern Europe & North Africa	NIL	1 P - 3 P (1) 3 P - 6 P (2) 6 P - 8 P (1)	5 A - 7 A (1) 1 P - 3 P (1) 3 P - 5 P (2) 5 P - 9 P (3) 9 P - 11P (2) 11P - 1 A (1)	8 P - 9 P (1) 9 P - 11P (2) 11P - 12M(1) 9 P - 11P (1)*
Central Africa	NIL	1 P - 3 P (1) 3 P - 6 P (2) 6 P - 8 P (1)	12N - 3 P (1) 3 P - 6 P (2) 6 P - 9 P (3) 9 P - 12M(2) 12M - 1 A (1)	8 P - 11P (1) 9 P - 10P (1)*
Eastern Mediterranean	NIL	2 P - 4 P (1)	5 P - 9 P (1)	NIL
Central Asia	NIL	5 P - 8 P (1)	A - 8 A (1) 2 P - 5 P (1)	NIL
Southeast Asia	NIL	8 P - 11P (1)	6 A - 10A (1) 12M - 2 A (1)	NIL
Far East	NIL	8 P - 12M (1)	12M - 6 A (1) 6 A - 8 A (2) 8 A - 4 P (1)	NIL
Pacific Islands	7 P - 9 P (1)	7 A - 11A (1) 11A - 1 P (2) 1 P - 5 P (1) 5 P - 6 P (2) 6 P - 10P (3) 10P - 11P (2) 11P - 12M(1)	6 P - 8 P (1) 8 P - 10P (2) 10P - 12M(4) 12M - 4 A (3) 4 A - 7 A (1) 7 A - 9 A(3) 9 A - 11A (2) 11A - 2 P (1)	12M - 2 A (1) 2 A - 5 A (3) 5 A - 6 A (2) 6 A - 7 A (1) 1 A - 4 A (2)* 4 A - 6 A (1)*
Australia	NIL	4 P - 8 P (1) 8 P - 11P (2) 11P - 12M(1)	3 P - 9 P (1) 9 P - 1 A(2) 1 A - 8 A(3) 8 A - 10A(2) 10A - 12N(1)	12M - 3 A (1) 3 A - 6 A (2) 6 A - 7 A (1) 3 A - 6 A (1)*
New Zealand	3 P - 8 P (1)	12N - 5 P (1) 5 P - 8 P (2) 8 P - 10P (3) 10P - 11P (2) 11P - 12M(1)	6 P - 8 P (1) 8 P - 10P (2) 10P - 12M(4) 12M - 4 A(3) 4 A - 8 A (2) 8 A - 1 P (1)	12M - 4 A (2) 4 A - 7 A (1) 1 A - 5 A (1)*
South America	12N - 1 P (1) 1 P - 4 P (2) 4 P - 5 P (1)	5 A - 7 A (1) 7 A - 9 A (3) 9 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)	9 A - 3 P (1) 3 P - 6 P (2) 6 P - 8 P(3) 8 P - 11P (4) 11P - 2 A(3) 2 A - 4 A(2) 4 A - 6 A(3) 6 A - 9 A(2)	8 P - 10P (2) 10P - 2 A(3) 2 A - 3 A(2) 3 A - 5 A(1) 10P - 2 A(2)* 2 A - 4 A (1)*
McMurdo Sound, Antarctica	NIL	12N - 1 P (1) 1 P - 3 P (2) 3 P - 5 P (1)	4 P - 7 P (1)	8 P - 11P (1) 6 A - 7 A (1)

TIME ZONE: PST

WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80* Meters
Northern & Central Europe	NIL	NIL	5 A - 7 A (1) 4 P - 9 P (1) 9 P - 10P (2) 10P - 12M(1)	7 P - 12M (1)
Eastern Europe	NIL	NIL	5 A - 7 A (1) 4 P - 11P (1)	NIL
Southern Europe & North Africa	NIL	2 P - 5 P (1)	5 A - 7 A (1) 12N - 2 P (1) 2 P - 4 P (2) 4 P - 7 P (3) 7 P - 10P (2) 10P - 12M(1)	7 P - 10P (1)
Eastern Mediterranean	NIL	NIL	5 A - 7 A (1) 12N - 3 P (1) 7 P - 10P (1)	NIL

TIME ZONE: PST , (Con't.)

WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80* Meters
South Africa	NIL	11A - 1 P (1)	12N - 3 P (1) 9 P - 10P (1) 10P - 11P (2) 11P - 12M(1)	7 P - 9 P (2) 7 P - 9 P (1)*
Central Asia	NIL	3 P - 5 P (1) 8 P - 10P (1)	10P - 1 A (1) 6 A - 9 A (1)	NIL
Southeast Asia	NIL	10A - 12N (1) 8 P - 11P (1)	11P - 1 A (1) 1 A - 3 A (2) 3 A - 6 A (1) 6 A - 8 A (2) 8 A - 1 P (1)	3 A - 5 A (1)
Far East	NIL	10A - 12N (1) 7 P - 9 P (1) 9 P - 10P (2) 10P - 11P (1)	3 A - 6 A (1) 6 A - 9 A (3) 9 A - 12N (2) 12N - 8 P (1) 8 P - 11P (2) 11P - 1 A (3) 1 A - 3 A (2)	2 A - 5 A (3) 5 A - 6 A (2) 6 A - 7 A (1) 3 A - 5 A (1)*
Pacific Islands	5 P - 9 P (1)	7 A - 10A (1) 10A - 4 P (2) 4 P - 6 P (3) 6 P - 8 P (4) 8 P - 9 P (3) 9 P - 11P (2) 11P - 3 A (1)	10A - 5 P (1) 5 P - 8 P (2) 8 P - 10P (3) 10P - 2 A(4) 2 A - 4 A(3) 4 A - 6 A(2) 6 A - 8 A (3) 8 A - 10A (2)	10P - 12M (2) 12M - 5 A (4) 5 A - 7 A (2) 7 A - 8 A (1) 11P - 12M (1)* 12M - 5 A (2)* 5 A - 7 A (1)*
New Zealand	1 P - 3 P (1) 3 P - 7 P (2) 7 P - 9 P (1)	11A - 1 P (2) 1 P - 4 P (1) 4 P - 6 P (2) 6 P - 9 P (4) 9 P - 10P (2) 10P - 3 A (1)	5 P - 7 P (1) 7 P - 9 P (2) 9 P - 12M(3) 12M - 3 A (4) 3 A - 6 A(2) 6 A - 8 A (1)	11P - 1 A (2) 1 A - 5 A (3) 5 A - 6 A (2) 6 A - 7 A (1) 12M - 4 A (2)* 4 A - 6 A (1)*
Australia	3 P - 8 P (1)	2 P - 7 P (1) 7 P - 10P (2) 10P - 1 A(1)	7 P - 9 P (1) 9 P - 11P (2) 11P - 2 A (3) 2 A - 8 A (2) 8 A - 1 P (1)	12M - 2 A (1) 2 A - 5 A (2) 5 A - 7 A (1) 1 A - 5 A (1)*
South America	11A - 1 P (1) 1 P - 3 P (2) 3 P - 5 P (1)	5 A - 7 A (1) 7 A - 9 A (2) 9 A - 12N(1) 12N - 3 P (2) 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 - 10P (4) 10P - 12M(3) 12M - 1 A(2) 1 A - 4 A(1) 4 A - 6 A (2) 6 A - 2 P (1)	7 P - 9 P (2) 9 P - 1 A(3) 1 A - 2 A(2) 2 A - 4 A(1) 9 P - 1 A(2)* 1 A - 3 A(1)*
McMurdo Sound, Antarctica	NIL	12N - 3 P (1) 3 P - 4 P (2) 4 P - 5 P (1)	4 P - 7 P (1)	7 P - 9 P (1) 2 A - 8 A(1)

FORECAST INDICES

Circuits Forecast To Open:

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

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

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

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

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

See the "Last Minute Forecast" appearing in the text for the relationship that is expected to exist between the Forecast Indices for each circuit and day-to-day propagation conditions during the month.

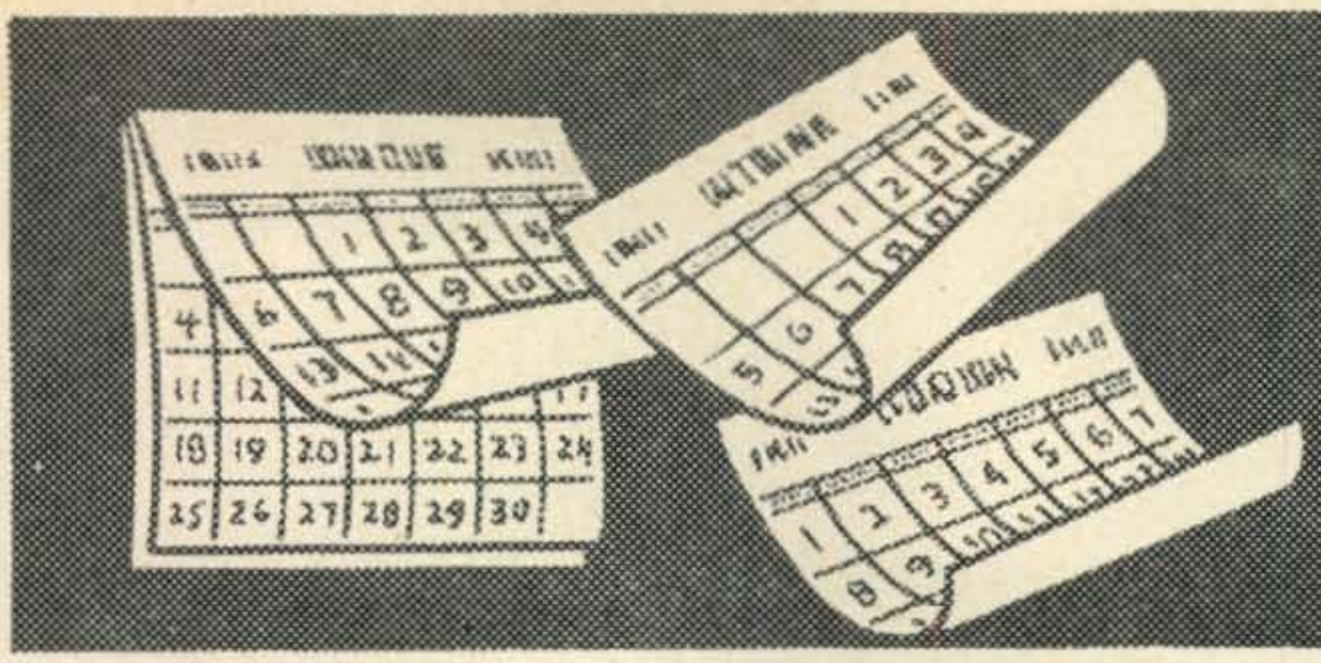
*Indicates expect 80 meter openings. On nights when atmospheric noise conditions are exceptionally quiet, 160 meter openings may occur on circuits during those times 80 meter openings are rated (2) or higher.

The CQ DX Propagation Charts are based upon a CW effective radiated power of 150 watts at radiation angles less than thirty degrees. The Eastern USA chart can be used in the W1, 2, 3, 4 and 8 areas; the Central USA chart in the W5, 9 and 0 areas, and the Western USA chart in the W6 and W7 areas. The charts are valid through August 31, 1961. Propagation forecasts contained in these charts are derived from basic ionospheric data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado.

number of short-skip openings, up to distances of about 1400 miles, on frequencies as high as 30 mc. On some occasions, 6 meter short-skip openings may also occur as a result of sporadic-E propagation. Short-skip propagation charts for July appeared in last month's column.

The Aquarids meteor shower is scheduled to take place between July 26 and 31. During this

[*Continued on page 104*]



CONTEST CALENDAR

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

Anticipated Calendar of Events

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

Events marked (*) denotes dates that have been officially announced. Others are based on last year's dates. It will be noted that with the exception of the SSBARA on Sept. 9/10, dates having two scheduled event are of different modes. Because of the crowded Sept. calendar the SSBARA conflict could not be avoided. Organizations planning contest activity can use the above as a guide.

JARL DX

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

This is the 2nd annual All Asian DX Contest held by the JARL.

The object of the contest is to increase Asian activity. Amateurs located in other continents are invited to work as many Asian stations as possible during the 30 hour contest period.

Its a c.w. contest only and you can use all bands, 3.5 thru 28 mc.

1. Type of competition:
   a. Single band, Single operator.
   b. Multi-band, Single operator.
   (No multi-operator category.)
2. Serial numbers:
   a. For OM stations. Five figures, RST report plus two figures denoting your age.
   b. For YL stations. Five figures, RST report plus the two figures 00. (Come on now, some of the OMs are sensitive about their age too.)
3. Points and multiplier:
   a. For non-Asian stations. One point per contact and a multiplier of one for each Asian country worked on each band.
   b. For Asian stations. One point per contact and a multiplier of one for each non-Asian country worked on each band. Use the DXCC and WAE country lists.
4. Scoring:
   a. Score for each single band is the country multiplier for that band multiplied by the total contact points on that band.
   b. The multi-band score is the sum of the country multipliers from all bands multiplied by the sum of contact points on all bands.
5. Awards:

Certificates will be awarded to the following in each country.

a. The highest scoring operator on each single band.

b. The three highest scoring operators on all bands. (I think that in large areas such as the USA, Canada and etc., awards should be made on the basis of call districts or at least Zones.)

6. Special Awards:

In addition, a special cup will be awarded to the highest scoring operator on multi-band in each continent. Your log must be postmarked no later than September 30, 1961 and sent to: The J.A.R.L., Att: Conest Committee, P.O. Box 377, Tokyo Central, Japan.

Included below is a listing, compiled by the ADXA, of all the Asiatic countries:

Aden, Afghanistan, Anderman and Nicobar Is., Asiatic Russian S.F.S.R., Azerbaijan, Bahrein I., Bhutan, Bonin and Volcano Is., Burma, Cambodia, Ceylon, China, Cyprus, Formosa, Georgia, Goa, Hongkong, India, Iran, Iraq, Israel, Japan (Japanese nationals only), Jordan, Kazakh, Kirghiz, Korea, Kuwait, Laccadive Is., Laos, Lebanon, Macau, Malaya, Maldive Is., Manchuria, Mongolia, Pakistan, Palestine, Qatar, Ryukyu Is., Saudi Arabia, Sikkim, Singapore, Sultanate of Oman, Syria, Tadzhik, Thailand, Tibet, Trucial Oman, Turkoman, Turkey (Asian Part), Uzebek, Viet Nam (ban for U.S.), Yemen.

SUMMARY OF 2ND ALL ASIAN DX CONTEST

CALL:..... ENTRY ☐ Multi Band ☐ Single Band

NAME:.....

ADDRESS:.....

BAND	QSOs	POINTS	MULTIPLIER	SCORE
3.5				
7				
14				
21				
28				
TOTAL				

Transmitter Description and Power.....

.....

Receiver.....

Remarks (Suggestions Criticisms and Comments).....

.....

.....

This is to certify that in this contest I have operated my transmitter within the limitations of my license and observed fully the rules and regulations of the contest.

DATE:..... SIGNATURE:.....

(Please write in English)

ADXA CONTEST LOG

CALL..... COUNTRY.....

LOG For..... Mc. Band ENTRY.....

(Use separate log for each band).

DATE	TIME (GMT)	STATION Worked	SERIAL NUMBERS		Name of Country	Points
			SENT	RECEIVED		

Sample JARL DX contest log.

First All Asian DX Contest Results

Continental Winners MultiBand

4X4JU.....55,000

UB5WF 5,846 K6EVR 2,774
ST2AR 4,446 KH6DLF 2,760
CE3AG.....1,666

North America

All Band

KL7DEM	**195**
VE7EH	**818**
VE7BBG	**135**
KZ5TD	**21**

14 mc

W6KMT/KL7	**348**
W4ARH/KL7	307
VE2BV	**18**

All Band

K6EVR	**2774**
K6CQM	**2,071**
W4KXV	**988**
K6HYO	776
W1BIH	742
W5KC	642
W6IPH	495
W6YC	450
W3DBX	432
WØBTD	418
K6CJF	392
WØBHM	369
W5BUK	342
W3KPI	261
K6IEC	252
W6RCV	203
W6EJA	80
K1MEM	50
K5UYF	30

21 mc

W1BPW	**10**

14 mc

W4KFC	**994**
W2AIW	605
W6AFI	530
KØRHO	324
W1GYE	189
WA6EYK	132
W5ARJ	128
W2EQS	96
W3KA	92
W6OMR	42
K7DVT	36
W8DWP	8

7 mc

K6JBP	**141**
W6PQW	126
WA6IVM	90
K6DV	27
W6WLV	7
W6FAR	5

(Winners Only)

Africa

All Band

ST2AR	4,446
5A2TZ	288
CR7LU	450

So. America

All Band

PY1ADA	200
PY4GA	168
CE3AG	1,666

21 mc

ZP5LS	96

14 mc

PY4OD	21
HK1FF	2
YV6BS	4

Asia

All Band

EP1AD	9,072
JA2JW	21,340
JA3AF	19,765
JA7AD	6,698
KR6JM	8,030
KR6LJ	6,880
KR6RU	6,583
MP4BCV	4,536
UA9AA	43,273
UA9FN	15,566
UA9FI	6,732
UD6KAB	147
UD6AM	44
UF6FB	50
UF6KPA	38
UL7FA	19,152
UL7KBK	3,692
VS6BJ	2,048
XZ2TH	10,244
ZC4AK	19,264
4X4JU	55,000
4X4FU	40,486

28 mc

JA1BK	960

21 Mc

JA8AQ	7,995

14 mc

HL9KT	476
HS1R	225
JA1AA	7,592
JT1KAC	30
OD5CT	3,744
UAØAG	5,280
VS1JW	378
VS9OA	2,875
VU2MSZ	1,064
4X4YL	12,420

7 mc

JA1BTG	1,022

Europe

All Band

DL1FF	4,060
DJ2IB	1,975
DM2ABL	1,311
F9MS	903
F9DW	45
F8TM	6
G4CP	1,100
G3AAE	1,026
G2DC	704
HA5KAG	1,353
HA5KFR	585
HA8KWG	582
HB9MO	1,083
HB9TT	512
HB9DX	192
I1SYU	2,010
IT1AGA	50
LA6U	104
LZ1KSZ	833
OH5QN	2,106
OH3TE	2,059
OH1TN	1,056
OK1MG	1,863
OK1SV	525
OK1LK	350
OZ9N	176
OZ7OF	28
PAØVB	450
PAØDVM	432
SM5LL	4,386
SM3VE	3,000
SM5BLA	2,212
SP8HU	1,403
SP9KJ	748
SP8HR	360
SVØWI	612
UA1DZ	5,508
UA3CR	4,620
UA3HK	435
UB5WF	5,846
UB5KAD	3,180
UB5KED	1,558
UR2BU	1,280
UR2KAE	858
YU1SF	429

21 mc

DL1NT	77
I1ZCN	153
OH8QD	297
OK3EA	98
SP9RF	390
SM5AJR	56

[*Continued on page 112*]

CHARLES J. SCHAUERS, W6QLV/4
CQ, 300 WEST 43RD ST., NEW YORK 36, N. Y.

ham clinic

Stubborn TVI

Evident from our mail is the fact that there are still many hams who are experiencing TVI troubles . . . of the stubborn variety. So this month we thought a discussion on the subject may help those who just do not seem to be able to solve their TVI problems.

TVI (television interference) emanating from amateur radio transmitting equipment may be so strong as to completely obliterate the picture and make sound reception impossible. On the other hand, there just may be a "trace" of interference to the next door neighbor's set which permits reception but nevertheless is downright annoying . . . most stubborn cases fall in this category.

Remember that TVI may be radiated directly from the ham's antenna, from certain stages in the transmitter itself, go to TV sets via the power lines, or even "snake" its way along hot air ducts, telephone lines or even the plumbing.

In fringe areas (where TV signals are relatively weak) TVI becomes a greater problem, because even the slightest amount of interference will interfere with weak signals.

Old TV receivers using 21 mc i.f. stages are still around and it is virtually impossible to operate on the 21 mc band near these sets. In fact, even if the receivers are located within a radius of about 3 miles from a ham station and the TV signal is relatively weak in the area, TV reception will be affected.

Before attempting to pin down TVI causes, the ham should begin with his own installation. Here are the questions he should ask himself: is my a.c. power input line filtered? Am I using the correct transmission line to the type of antenna I have? Is the line matched? (Note: always better to use coax cable when possible) Is my transmitter cabinet electrically "tight"? Are my meters shielded and by-passed? Is my ground system excellent, good or poor? Do I over-drive the final (too much grid current)? Am I operating my various stages with too much plate voltage? Are my connections (coax fittings) on the transmitter tight? Would a low-pass filter help? Have I by-passed *all* power leads in the set with good ceramic capacitors with very *short* leads? Have I checked the generation of harmonics (with a good grid-dip meter) in every stage? Is my final r.f. stage completely shielded? Have I checked all connections (especially in the case of a kit) to make certain they are electrically and mechanically stable? Do I have the proper size parasitic chokes installed in the high level stages? (Note: some parasitic chokes if not constructed properly will tend to accent certain frequencies which may fall in the TV band)

Remember that a piece of wire used to interconnect tuned circuits can become resonant at certain TV frequencies, so it is always a good practice to make interconnecting leads as short as possible. Where r.f. "runs" of over 4 inches must be made between stages, I advocate using small coax cable.

After you are certain that you have done everything that you can technically do, check the TV set installation. I suggest you do this along with a trained TV service technician and a member of your local TVI Committee (if there is one). *Never* touch a neighbor's set (unless you are an active TV technician-ham).

The mere addition of a good ground (not using the telephone or power company's ground) to the offended TV set may clear up all interference. The point here is, that you should look for the simplest causes of TVI *first*.

Check the TV antenna to make certain that the wind has not broken one side of the twin-lead, thus lowering the available signal. Check the routing on the twin-lead, is it near power or telephone lines? If it is, the TV technician should re-install it.

If the TV installation is okay, then a high-pass filter right at the TV antenna input terminals can be tried. With late sets there is little problem in this regard, for most of them do contain appropriate filters. If the set is relatively old, do try a high-pass filter (at the *owner's* expense).

In the event that interference is "selective," that is, is only found on one or two channels, you may have to "go back to the old drawing board" . . . your transmitter.

Found effective are parallel tuned traps (tuned to the TV frequency) placed in the output circuits of buffers, doublers etc. However, there is always a possibility that your power line filter is not "heavy" enough and you may have to use a line filter right at the TV set. You can check this with a grid-dip meter placed in the MONITOR position and set to the offending frequency, coupling it to the power line.

Switching from a vertical to a horizontal

antenna has been found effective in eliminating TVI in specific cases.

Remember that where a transmitter stage has a tendency toward parasitics, it more than likely will be a good source of TVI.

Now here are some specific tips on specific sets.

DX-40: Keep grid drive *below* 3 ma consistant with good output loading. If you use a v.f.o. with the set, make certain that the input cables are properly grounded. Make certain that the crystal compartment cover is tight. If you use an antenna relay, make sure it is shielded and that the coax plugs which go to its shield can are tight. In case of channel 2 interference try a larger (by 3 turns) parasitic choke in the 6146 final.

Apache: Do not overdrive the final. Use up to 5 ma and check for TVI. Where no TVI is experienced, use the rated 6 ma. Check the screw ground connection, a loose one will contribute to TVI. Make certain that the final shield cover is tied down with *all* screws supplied. Bypass the fan motor with two .001 mf ceramic capacitors in series (*across the motor*) center-tap to ground. Make sure that the rear chassis screws are seated properly and tight. If line conducted interference is experienced, try reversing the line plug *before* doing anything else. If you use an SB-10 with the Apache, make certain that all cables are properly connected and tight. (Note: you may have TVI on a.m. and/or c.w. and *none* on s.s.b. . . . another advantage for using it). Check all switch contacts for arcing . . . one case was traced to the final switch in the final stage compartment not making good contact. Check for proper neutralization too.

Viking Ranger: Most cases with this set were cleared by using a Johnson 250-20 low-pass filter (52 ohms) or 250-35 (72 ohms). Try a separate ground on this set. The remarks on over-driving which apply to the DX-40 apply to the Ranger.

Viking II: Don't overmodulate this fine transmitter! Keep your drive to the final down consistent with good loading. A low pass-filter is usually only required in the stubbornest case.

Collins 32V-3: This set will seldom give TVI unless the final is overdriven. However, its earlier brothers the 32V-1 and 32V-2 may require a good low-pass filter in the extremely difficult cases. Never try to use an 80 meter horizontal antenna for 10 meter work with the set, for you can have a lot of TVI and burned up parasitic chokes!

EICO 720: The same remarks as apply to the DX-40 apply to this good little rig.

Globe Scout Deluxe: Overdriving this hot item can cause TVI. A good low-pass filter will clear up 99% of the stubborn cases. For optimum operation, this set needs a good ground.

B&W 5100-B: Overmodulating this set can produce TVI where the TVI signals received in an area are weak. (Please note that this remark applies to almost all a.m. transmitters) Overdriving the final is not recommended. If this excellent set is used with the s.s.b. generator 51SB, very little trouble, TVI-wise, will be encountered even in the weakest TV signal areas. This set does need a good heavy separate ground for maximum TVI suppression and it should *never* be the same ones used by the power or telephone company. On the set I owned while in San Franciso I had to install a low-pass filter because I was surrounded by older TV sets.

KWM-2: I have had no reports of TVI with this transceiver.

Heath Seneca: This v.h.f. transmitter if installed and operated properly has little or no TVI. However, if you are in a weak TV signal area, do, when aligning it, check each stage for TV harmonics. Retuning and the re-installation of parts *as recommended* by Heath will clear up most of those encountered.

HT-32: This is another transmitter that seldom gives one TVI trouble. However, one case was traced to power line conduction caused by trying to get more r.f. out of this fine set than it was designed for. A reduction of drive to the proper level cleared the difficulty. The TV affected was in an adjacent room.

TR Switches: Most transmit-receive switches will not cause TVI if properly terminated. If trouble is encountered with one, try a 100 ohm resistor in series with the grid-input of the tube. If the switch is a.c. operated, make certain that the line is filtered. One stubborn case required that the 110 volt line be shielded.

There you have a cross section of some of the sets used by many hams. Because your specific transmitter did not appear here, does not mean that it is wholly TVI-free. We simply do not have enough space to list them all.

Tracking down the stubborn case of TVI requires a lot of patience and time. Perhaps I have forgotten *some* tips, but I am sure that if you are persistent in your own case, you can eventually clear up *any* case of TVI.

Remember that the most perfectly TVI'd transmitter made can cause TVI under the "correct" conditions. With old TV sets, low TV signal areas, final stage overdriving, poor antenna and ground systems, overmodulation (in the case of a.m.), flat-topping (in the case of s.s.b.), defective power wiring etc., one can experience TVI.

I suggest that anyone interested in learning more about the subject, get a copy of Rand's *TVI Handbook* from *CQ* for $1.75.

Observation

Recently one ham wrote into HAM CLINIC and substantially said the following: "Nothing is often said about the interference that hams encounter in their daily operation. I have in mind radiating television sets (especially noticeable on 80 meters), arcing electric motors, neon signs, vacuum cleaners and so on. The minute we hams create a little TV or BC QRM everone hollers to high heaven, but yet, if we holler about interference to *our* reception, we get the 'deaf ear.' How come?"

Observed—most utility companies will go out of

their way to help reducing or eliminating man-made interference from their systems or appliances using their systems. However, I do agree with the writer that the ham is often maligned and those who "unknowingly" create interference through their appliances, signs etc. do not often take the steps (after they have been advised) to eliminate the interference.

Suggested—courteously contact the "offender" and tell him about the interference . . . it is up to him to get it eliminated. If a serviceman is not called in by them to remedy the situation, contact the power company serving your area. Stress the fact that an appliance creating interference is often operating improperly. TV oscillator radiation can be minimized by shielding in the TV set and your receiver.

Questions

813 Linear—"What are the typical operating conditions for an 813 Linear final in AB1 (not absolute values)?"

Using 2000 volts on the plate, 750 volts on the screen, a —90 volts on Grid 1, with a peak grid voltage of 80 volts, zero signal plate current of 25 ma and maximum signal plate current of 130 and maximum signal grid current on grid 2 of 20 mils, maximum signal power output of 165 watts will be obtained.

Taylor Modulation—"I want to use a 6V6 to drive a pair of 807s using Taylor Modulation. What transformer can I use from the plate of the 6V6 to the grids of the 807's for the purpose?"

Try a transformer having a 1:1.3 ratio; a primary of 4000 ohms and a secondary of 7000 ohms (Z). *Incidentally, we have more info coming up in future issues on Taylor Modulation using practical information sent in by user readers.*

Tech Twists—From George, K6YGK comes this tech tid-bit. He writes: "in conjunction with the Nov. 1956 *CQ* Product Detector as used in the NC-183D, an easy addition ('robbed' from the NC-303 design) is a 1N457 diode across the first a.v.c. resistor and 1.0 mf capacitor to ground. I put the circuit on a switch because it knocks down the S-meter sensitivity which is inconsequential compared to the results. For very strong s.s.b. signals which were previously unreadable unless the r.f. gain control was reduced, the fast attack feature works beautiful. Although not tried, a cheaper equivalent of the 1N457 diode would undoubtedly work very well." See fig. 1 for George's fast attack circuit. Thanks George and 75 to you!

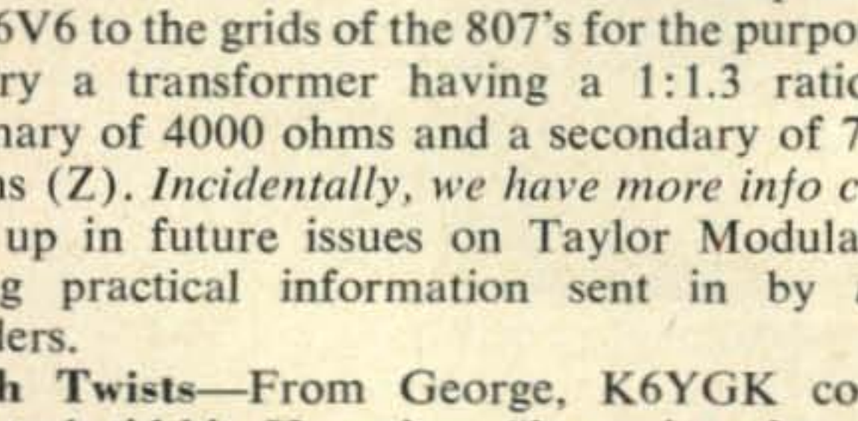


Fig. 1—Fast attack a.v.c. feature for the Product Detector appearing in the November 1956 issue of CQ. Parts marked with an asterisk are added. K6YGK gets the credit.

Super-Simple Phone Patch—Thanks to W7ZEV here's a "super-simple phone patch" for those of you who have 500 ohm receiver a.f. output connections. See fig. 2. Thanks OM and 75 to you for helping out fellow hams!

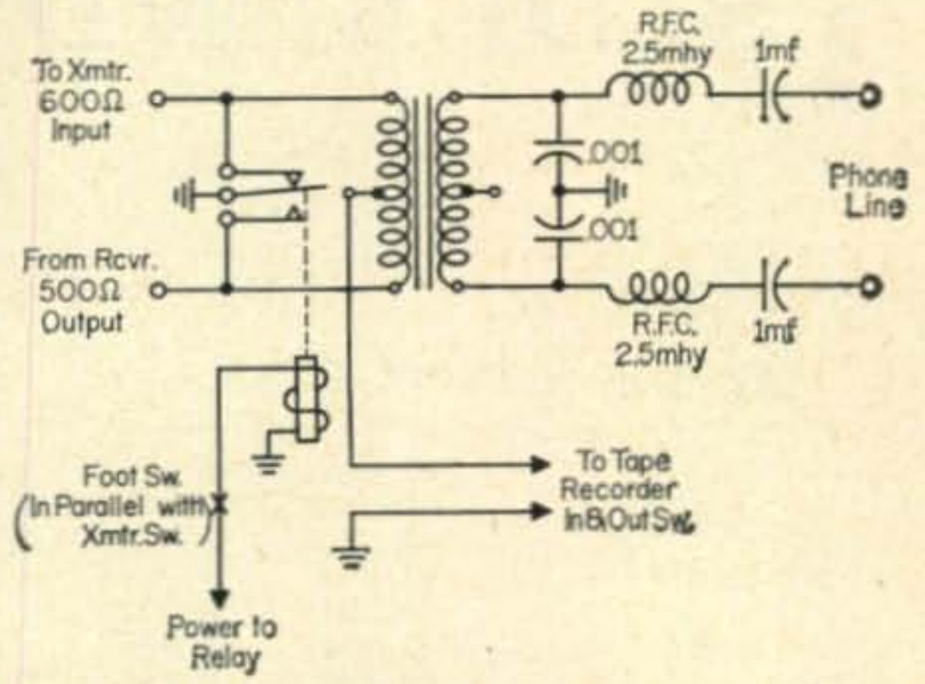


Fig. 2—W7ZEV sends in this very simple phone patch for 500 ohm receiver output.

DX-40 A.F. Gain Control—All right fellows (and gals) here is the DX-40 a.f. gain control addition which so many of you wrote in about. It is simple, and works very well. Remember to use shielded lead from the pot to the input grid as shown in fig. 3. If you are using a low gain microphone you won't need it. However, it you have a high output crystal mike you can use it to keep from over-modulating. The pot is mounted at the extreme lower left hand corner of the DX-40 front panel.

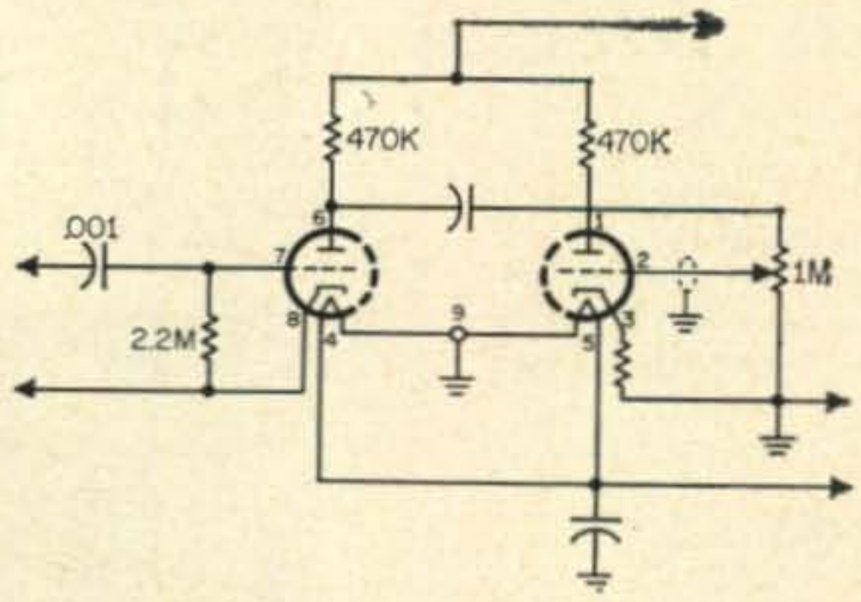


Fig. 3—A.F. gain control added to the DX-40.

Amperex "Computa-Guide"—Write the Amperex Electronic Corporation, Advertising Dept. 230 Duffy Ave., Hicksville, L.I. N.Y. for a copy of the Computa-Guide. It is the first graphic aid ever devised for quickly determining the performance of r.f. doublers and triplers as well as straight through amplifier electron tubes. It will be of great value to the ham transmitter designer. Be sure and tell them that you are a radio amateur transmitter designer. The guide is free.

Why Refer?—Often, a reader requesting information on a particular circuit or rig is referred to a past issue of *CQ*, other technical magazines or handbooks for his answer. Why is this? Well, with the large number of readers who write *CQ*, time is a precious commodity. Furthermore, if a printed answer in detail is available, there is little reason for repeating the information via the typewritten page.

[*Continued on page 104*]

sideband sideband sideband

SIDEBAND

Irv and Dorothy Strauber, K2HEA/K2MGE
12 Elm Street, Lynbrook, New York

SSB DX HONOR ROLL

TI2HP	237	K4TJL	186
W6UOU	231	VK3AHO	185
W8EAP	225	WØCVU	185
W8PQQ	224	W4OPM	183
VQ4ERR	218	W2VZV	182
PY4TK	215	ON4DM	181
W7VEU	210	K8RTW	180
W6PXH	210	K6ZXW	177
W6RKP	210	W5KFT	175
WØQVZ	218	K6LGF	175
K2MGE	205	K2FW	171
HB9TL	203	W3LMA	169
W6BAF	203	PZ1AX	168
W6WNE	203	KØCTL	162
W3NKM	202	W2YBO	160
W2JXH	200	W5RHW	159
K9EAB	200	K2JFV	158
W2ZX	200	WØUUV	154
W8YBZ	200	W1LLF	153
MP4BBW	192	XE1AE	152
W2FXN	191	W2NUT	152
W2LV	190	W2QKJ	150
W5AFX	187	W6YMV	150
W5IYU	187	W6VUW	140
ZL3IA	186	K6MLS	140

CQ SSB CERTIFICATES AND STICKERS

Worked 50
KL7AGU W6DQH
KØLUX K5ESW
W9BPW

Worked 75
KØRDP K8CFU
W6DQH K9KZO
K2YIY

Worked 100
W2HTO WØBMQ
OD5CT K2ZKU
W9SFR W8WT
K8CFU VE6EN
VP6WD UR2AR
SM5LL

Worked 125
W9CYL K4JEY
G6LX W2BQM
UR2AR

Worked 150
W6YMV

Worked 175
K6LGF K8RTW

Worked 200
W2ZX W6BAF
W8YBZ

Jack and Henry Jackson

The Sideband Fraternity is delighted to welcome Jack and Henry Jackson of San Ysidro, California to its midst. Jack, WA6QMY, and Henry, WA6QMX, are 24-year old twins who have been bedded with arthritis for the past twelve years. With the help of their local parish priest, the boys became interested in ham radio, mastered the code and theory, and passed their exams with flying colors. The Collins Radio Co. supplied them with a KWM-2 and local hams teamed up to get the boys on the air in March. Henry and Jack use boom mikes fed with a mixer and their contacts are hard put to distinguish one from the other. We hope you'll all be on the lookout for the Jackson twins and add your note of welcome to ours.

S.S.B. "Worked All States" Contest Sept. 9-10, 1961

The Third Annual S.S.B. "Worked All States" Contest will take place on the second weekend in September, Sept. 9-10. Starting at 1500 GMT, Saturday, the contest will end at 2100 GMT, Sunday, with a 6 hour rest period obligatory. The WAS Contest will again be sponsored by the Single Sideband Amateur Radio Association which will award a Lifetime Membership in the SSBARA to the highest scoring contestant and an engraved trophy to the highest scoring member of the SSBARA. See next month's column for complete rules of this ever-popular contest.

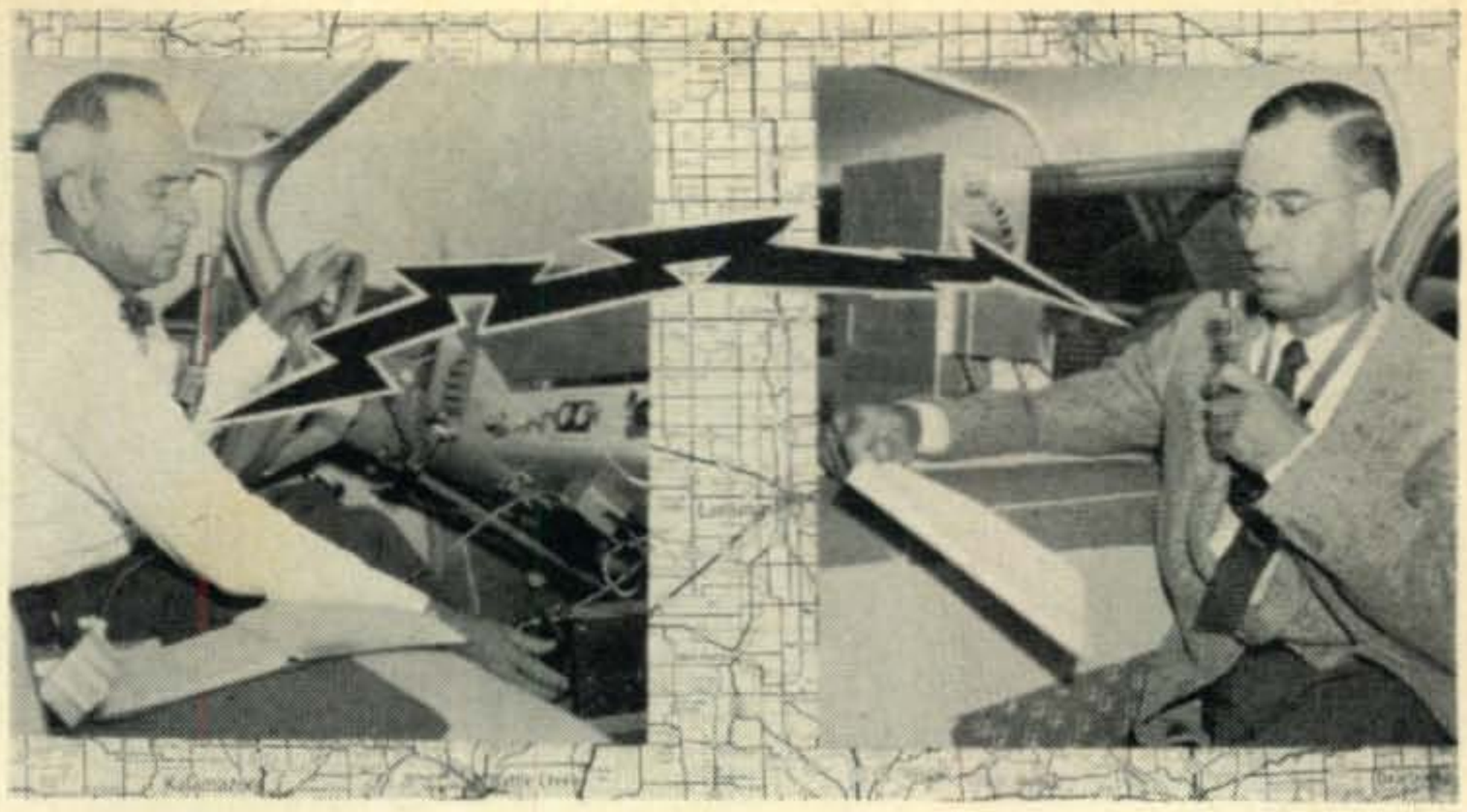
Still More on 20 Meter S.S.B. DX

In our April SIDEBAND column, we recommended that some thought be given to a "Code of DX Ethics" and accordingly requested most of the major DX clubs in the States to give some consideration to the matter. As we half-expected, we lit no fires! A few of the clubs made mention of our proposal in their *Bulletins* with the editors adding their views on the subject but the general consensus of opinion seemed to be that a "Code of DX Ethics" would not work. Human behavior can't be regulated, especially on the ham bands so obviously another tack must be taken.

In Toronto, Canada, a group of sidebanders assembled and formed the Ontario DX Association. Al, VE3UC, was elected President; Ham, VE3BWY, Vice President; and Bill, VE3BQP, Secretary. These Canadian DXers presented a proposal which has since been backed by a number of DX luminaries in other parts of the world. Their proposal, in brief, is that the frequencies 14.100 to 14.140 be utilized by DX s.s.b. stations.

News has reached us that, almost at the same time the Ontario group was formulating their plan, the ARRL Board of Directors, meeting in

Those dauntless Jackson boys—Henry, WH6QMX and Jack, WA6QMY—of San Ysidro, Calif., pushing out the walls of their room with sideband.



Al, W8DLD, and Bill, W8-WFH, of Cleveland, Ohio, who were the first to go mobile with a kw of home-brew sideband. Their feat stands out as a monument to the ingenuity of radio amateurs.

California, also had turned their attention to the 20 meter s.s.b. DX situation. The League has recommended that the top 15 kc of the 20 meter band be reserved for s.s.b. DX.

We are pleased to see that the problem is at last getting the attention it deserves in the interest of international good will and look forward to seeing a speedy solution. Why not make your thoughts known on the subject.

WØCVU Temporarily QRT

We regret very much to report that the cheery voice and booming signal of Chuck, WØCVU, of Cedar Rapids, Iowa, will be missing from the 20 meter band for an indeterminate period. Due to an unfortunate accident, Chuck's tower and beam toppled (see *CQ*, Feb. 1961, p. 61) to the ground (no one injured, thank goodness) and, at the moment, Chuck sees little prospect of replacing them. WØCVU is a longtime sideband enthusiast with the emphasis on DXing; in fact, the 200th country was within his grasp when he was forced into this silence period. Chuck has been a most welcome and dependable contributor to this column. We shall miss his long, newsy letters and hope that circumstances will permit him to rejoin us on sideband in the very near future.

Clair, WØNFA, Ian, MP4BBW, and Chuck, WØCVU, admiring the new microphone presented to Ian at the WØDXCC Convention. Little did Chuck realize at the time that he'd be off the air due to the loss of his beam and tower. Hurry back, Chuck!

Have Mobile—Will Travel

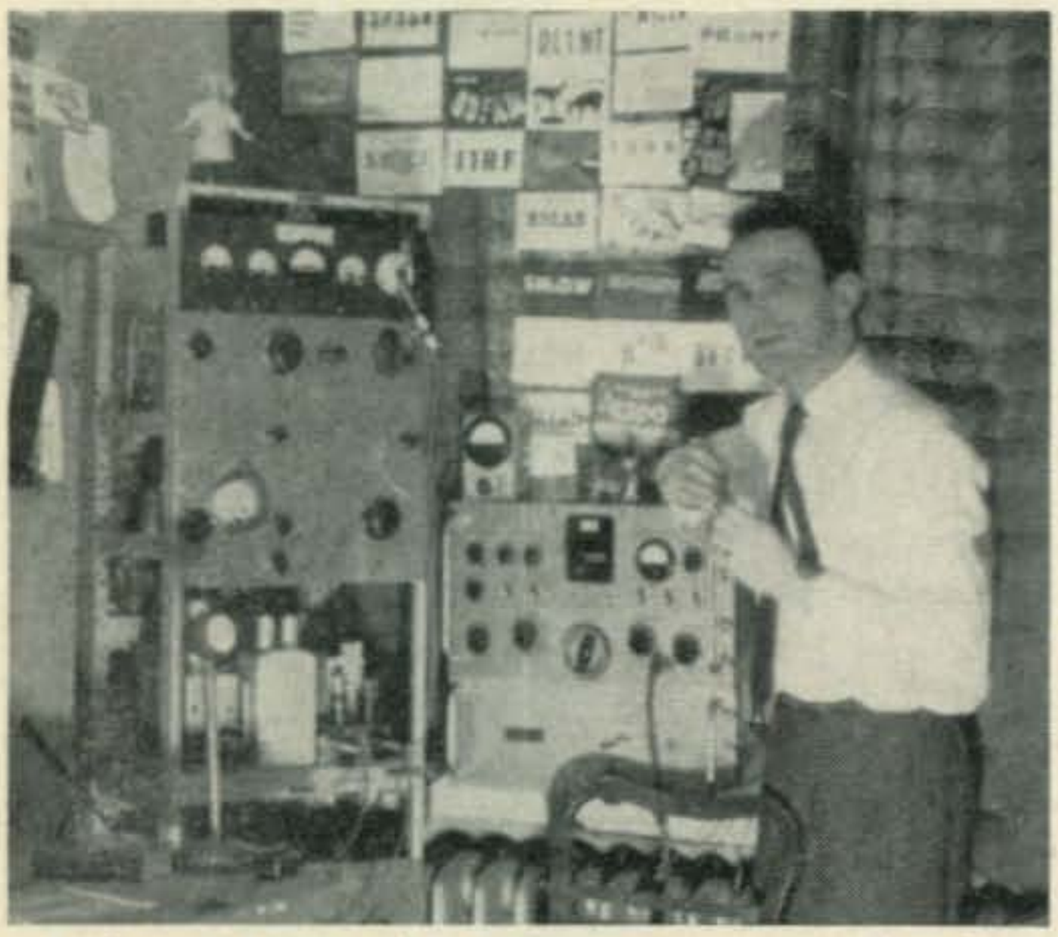
The lure of the open road is heightened by azure blue skies, miles and miles of highway and the opportunity to give the mobile a real workout away from noisy traffic that cruds up some real fine contacts. It can be real "aggaravatin" tho' to lose out to the home stations who have the advantage of higher power and better antennas. A couple of guys, called Bill, W8WFH and Al, W8DLD, have taken steps to even up the match and come up with mobile kilowatt rigs that anyone can have. In the G.E. *Ham News* for November 1960, Bill described his mobile kilowatt using a pair of 4-125A's in a cabinet measuring 6 × 9 × 16. The 2500 v.d.c. supply is housed in a separate box as is a motor-driven, remote-tuned oscillator, hetrodyning and driver stages for the amplifier. The s.s.b. generator, audio and VOX circuits are under the front seat. Both Bill and Al run similar units with the same devastating effects; nobody argues with their signals!!

A publication of interest to mobileers is the *Mobile News* published by the Amateur Radio Mobile Society and edited by G3NMR and his XYL. Full of interesting news about "G" mobileers and technical scoop about mobile operation, it is a most pleasant publication.

Dayton HAMVENTION

They did it again at Dayton! Held a fabulous Hamvention, that is, on April 29, with bigger forums, more numerous prizes and a larger gathering than ever before. Many of the country's outstanding amateurs . . . calls that are known to all of us . . . got together in Dayton and had a wonderful time. Among them were Bill, W7PHO; Arne, W2DTJ, Editor of *CQ;* George, W8YBZ; Al, W8PQQ; Gus, W4BPD; Glen, ex-9N1GW; Don, W6TNS; Les, ZL1AAX; Sam, W1FJZ; Urb, W2DEC, *CQ*'s DX Editor; Wes, W9DYV; Al, W8DLD; Harold, K2FF; Mike, W2BDS; Jim, KØSGY; Fritz Francke and Bill Halligan, W9AC, of Hallicrafters; the gang from the North Jersey DX Association; the great group from the Dayton area, and a host of others. Dana, W1HKK, proved to be a wonderful choice as main speaker at the Banquet and delivered a

sprightly, informal talk on "Ham Radio in the U.S.S.R." based on a visit he made there recently. The main prize . . . a Johnson Invader 2000 . . . was won by Roy, W8UKW, an engineer with the General Electric Co. in Cleveland, Ohio. Ed Bonnet, W8OVG, was the recipient of the Seventh Annual Dayton Hamvention Radio Amateur Award . . . a well deserved honor for a man who has given so much to amateur radio.



Andrew, SP5PO, who is the most active sideband in Poland, with his fine sounding homebrew equipment. In 5 months, Andrew worked 76 countries on s.s.b.; many more than he worked in 5 years on a.m., c.w., and n.b.f.m. together.

We understand that as soon as one Hamvention is ended, the Committee goes to work on the next one. All we can say is that this long range planning sure pays off and we doff our hats to Joe McNutt, W8GFN; Bob Montgomery, W8CUJ, Ass't. General Chairman; Bill Ingling, W8SVI; Jack Sargent, K8BSM; Al Gunston, W8GQ; the other members of the Hamvention Committee; and the officers of the Dayton Amateur Radio Association for the excellent job they did in 1961.

Sideband Around the World

Manuel, EA4EQ, has been straining his ears, hoping to get a contact with Hawaii on sideband, so please, all you KH6 stations, turn your beams toward Spain and listen for EA4EQ . . . There's been so much visiting going on these days, it's a wonder that we can hear any DX activity at all. Rolf, DL1UX, had a vacation in Italy with his family; Rene, OE1RZ, visited Ralph, DL4PI, at the same time that Ian, MP4BBW, was in Stuttgart; Ian, our much-traveled sidebander, joined Jack, HB9TL, in a visit to Mirko, YU1AD. Yes, the world is becoming a small place indeed. In fact, it was quite delighful to meet John, OZ2JT, for the first time on the air and have him say, "I'll be in New York day after tomorrow!" John will be spending 8 months in Mississippi in an Air Force training program and we're sure he'll have a wonderful time in the States . . . Although we were told that K7BFY would operate from EA6 and then leave the rig built by W7VEU in EA6-land for six months, we haven't heard any activity from there as yet . . . Chuck, F7BD, and Russ, F7CR, took an S-line to a local French ham convention and proceeded to amaze the French hams with a demonstration of sideband. One of the highlights of the occasion was a contact with Frank, OE1FF, who more than held his own in a friendly contest of languages . . . Gus, I1BKL, proved to be a most wonderful host to Helen, W2-BNC, and OM, Fred, K2AG, when they visited Rome . . . If you still need Monaco, Ralph, DL4PI, and Gene, DL4FX, will operate from there the last 10 days in June; good frequencies to watch are 14.288 and 14.313. Joe, W4OPM, will handle the QSLs . . . Al, KG4AP, has elected to stay in Guantanamo Bay one more year instead of leaving this June as had been the original plan . . . Among the new DX sidebanders, we are happy to welcome Epile, HP3DA; Sant, G2PU; Hans, JT1AF who seems to prefer 15 meters; VR2BJ, VK9RO, VK-9DM, and GI3NUM. It is so rewarding to hear these chaps after they have been on sideband just a short while and listen to their evident enjoyment of this means of communication . . . At long long last—a contact with Harry, JA1ANG! Conditions did not permit the long ragchew we had hoped for but it sure was fine to hear his voice on 20 meters . . . Ian, GI3NUM, is a diesel engine designer in Belfast and a most interesting contact. Believe it or not, some W/K 6-meter operators could actually be heard on the TV sets in Northern Ireland! Is this better than commercials? . . . Wish we had a crystal ball to see into the future and learn if Chuck, VK8TB, ever completed his trip to CR1ØAA and if conditions were good. Never were hopes raised so high, then dashed so low as the rumors about the CR1ØDX-pedition flew thick and fast . . . Welcome back to Mahmud, ex-SU1MS, who is now operating as DJ-ØFB from Heidelberg, Germany, where he is completing his studies at the University. Mahmud expects to be back in Cairo for the summer and will reactivate his s.s.b. rig . . . It was very nice to meet Rowley, G8KW, on the air. It is Rowley's company which is responsible for some of the fine sounding sideband equipment being manufactured in the U. K. . . . Once the news got around that KL7DNE on Pribiloff Island might be under consideration for new country status, operators Bill and Irv had their hands full trying to keep up with the calls . . . KC6TM is the radio station of Xavier High School on Truk Island and has been putting an excellent signal into the States.

Hansheinrich, DL1IN, of Cuxhaven, Germany, whose listing of earned certificates reads like K6BX' *Directory*. DL1IN is a well-known Old Timer whose advent into sideband has been the occasion of great joy to his many friends.

Well-known sidebanders under new calls are Colin, ex-AP2CR, now GW3JET and Pete, ex-5N2PB, ZD3P, now G3JHZ . . . Thanks to Elsie, W3ICQ,

California's top sidebanders gathered to welcome Ian, MP4BBW, on the first leg of his stateside visit. A surprise guest was also Paul, BV1USC. Front row, l. to r., K6LAS, W6WNE, W6UOU, WA6EYP, and K6ZXW. Back row, l. to r., W6YY, W6NGA, W6GT, MP4BBW, WA6HOH, BV1USC, W6RKP, and K6-RWO. *(Photo courtesy W6BAF)*

for passing along information from Martin, OY7ML that anyone interested in QSLing OY8RJ may reach him through Box 184, Thorshavn, Faeroe Island . . . By the time you read this, John Hunt, KR6JR, will be at his new duty station, 1927 AACS Sqn., Barksdale AFB, La. using his stateside call, W5DKK. John asked us to tell you that he has plenty of KR6JR cards to take care of anyone still needing a QSL from him so write to him in Louisiana.

Band Hopping

It was good to hear Bert, W6MNC, and Ed, W2OCL, back on the air again after each returned from hospitals. Both sounded in fine shape and we hope their recuperation progresses rapidly . . . Louis, W4FZC, who normally operates from Sheffield, Alabama, was heard with a beautiful signal from Annamaria Island in Florida where he and the XYL were surrounded by their entire family, including 8 grandchildren . . . We contacted Jack, K4YUX, just as he started mobiling out to California on his way to duty in BV1-land; good luck to him and his family . . . Ran into Doc, W8BXO, who told us how he used to contact Dean, W8BP, regularly when they were both mobile. It took several months, however, before they discovered that each worked diagonally across the street from the other! . . . If you hear Al, W3FSZ/M on 40 meters, be sure to give him a call. Al is chief pilot of the bus which transports the Duke Ellington orchestra around the country to its concerts and his rig is set up right in the front of the bus. Bet sideband is sweeter music to Al than even the fabulous Ellington melodies! . . . We're looking forward to hearing W4CG on the air again from Ft. Myers, Fla. The operator is Bill, ex-KV4BB, who, sad to relate, lost the sight of his right eye in a skirmish on Saigon . . . Bill, W4JVF, and Dave, W2SNM, had ringside seats at the first U.S.A. manned space shot; Bill is connected with "Project Mercury" and Dave with NBC television . . . Ed, W3LMA, is a big sideband booster. "S.s.b. takes the honors" wrote Ed as he went on to explain that, in his DX chasing, he wondered which contact would eventually be his #300 (c.w. and phone combined). To his delight, it was East Pakistan, thanks to Colin, AP2CR, who also sent Ed his 300th confirmation . . . The Western Single Side-Band Association puts out a very interesting *Newsletter*, edited by Prexy Al, W6ZHH . . . Walt, W7ETK, asked us to let you know about AROPA—Amateur Radio Operator and Pilot Association with temporary headquarters at Walt's QTH. Founded by W7-ETK, W7LRQ, W7PYY, and W7VPW, the Association's membership is open to all amateurs who also hold pilots' licenses. If you qualify, write to Walt who will be happy to pass on all information to you.

To confuse an already mixed-up world, Resolution Island is the home of K4THQ and K4THV, both answering to the name of Harry . . . Dick, W4TGW, ex-president of the "Short-Timers Club" at Camp LeJeune, N. C., should now be operating from his home station, W4TSB, after receiving his discharge from the Marines.

We got a great big kick out of working Christina, EA8CT, from the mobile. However, just as soon as we signed, all heck broke loose. Just shows how careful you have to be on the air—there are people listening! . . . Bill, W3RMS, is one guy who is cheerful—even at 7 A.M. . . . Mel, W8LLX, is having a big time with his KWM-2 on 40 meters . . . Even got to work some DX on 40 mobile; almost ran into a tree when we got a call from TI2LA on our way home one night! Luis had just gotten his S-line and was putting in a beautiful signal . . . Gerry, K9QHJ, does supercharger research when he isn't hamming. Ever see a hot-rod tractor? If Gerry keeps on with his work, Caterpillar may end up with one yet! . . . Les, W9YSZ, retired from the U.S. Forest Service and is doing what we all wish we could do all the time—HAM!! . . . The U.S.S. *Skywatcher*, a radar picket ship, has ham gear aboard very capably operated by Jim, W4OUV/MM.

Carl, W5KEY, finally got the bugs out of his rig and is back on the air from Bartlesville, Okla. with XYL, Grace, sounding prettier than ever . . . Everyone's been missing Fred, W4CF, on the air but don't worry, Fred just has the golf bug worse than ever . . . Herman, W7TPG, and the other members of the Mummy Mountain Radio Club have their station so well equipped it's impossible to see how they could get another rig in there. Yet everytime you talk to one of them, the latest piece of sideband gear is being installed! . . . Looks like Henni, WA-2DLK, and Rauol, K2AOS, have the urge to mobile, having gotten a taste of it thanks to Harry, W2JSW, who loaned them his car plus rig for the ride to Columbus, Ohio to visit their daughter, Sandy, at Ohio State U.

Thanks to the many sidebanders who have taken the time to write to us. We appreciate your thoughts and comments very much.

73, Irv and Dorothy

Results of the 5th Annual *CQ* S.S.B. DX Contest

January 28-29, 1961

Irv and Dorothy Strauber, K2HEA/K2MGE

Sideband Editors, CQ

"THIS contest is tops!"; "A sheer waste of time"; "Don't change a thing!"; "The rules must be changed"; "How can s.s.b. do so much?"—never was there such a wide divergence of comments as at the conclusion of the 5th Annual S.S.B. DX Contest on January 28-29, 1961. Although band conditions were at their worst for areas in all parts of the world, Olliver, ZS5JY, proved himself the champion by emerging with 80,456 points—only 39 less contacts and 3 less prefixes than in the score of last year's winner, Jack, CN8JF. Following very closely behind Olliver and the first W to come within a stone's throw of first place was Bob, W2VCZ, who managed to cut through the tremendous QRM and come up with a terrific score.

Humberto, TI2HP, tied up third place again as he did last year while two U.S.A. stations—Oscar, W3JNN, and Dick, K6CTV—romped off with fourth and fifth place, never before occupied by W/K stations. Making a strong comeback, Peter, HB9IE, winner of the 1959 contest, delighted us with his fine showing in 6th place and reliable "Nosey," KH6IJ, earned himself still another certificate as 7th place winner. Puerto Rico was ably represented by Bob, KP4ATU, who had the 8th highest score in the world. Guatemala was back in the Top Ten listing, thanks to Bob, TG9AD, who returned to repeat the find job he did in the 1959 contest. Another repeat in this group of outstanding sidebanders was Win, ZL3DX, rounding out the list and occupying the same spot as in 1959. Each of the Top Ten will receive certificates attesting to their superior operating.

Olliver, ZS5JY, becomes the winner of the K2HEA-K2MGE Trophy and we couldn't be more pleased with his victory. Long an outstanding member of the sideband fraternity, Olliver distinguished himself especially when he operated from ZS7, ZS8, and ZS9 last year. Through masterful operating, he maintained order and decorum in addition to dispensing a tremendous number of contacts.

Bob, W2VCZ, is the winner of the unique W7DLR Trophy being donated this year by Jack, W7DLR, to the top American scorer, in honor of Jack's 40th year on the air. Bob has been a top DXer for many years but concentrated his attention on sideband only in the past two years. He has since become well known and well liked by sidebanders all over the world.

It gives us great pleasure to award the Mickey Unger, W8YIN, Memorial Trophy for the first time this year and it goes to the top scoring American station using under 175 watts p.e.p.—Rick, K6VVA! Making the most of his HT-32A to a Hy-Gain tribander beam, Rick—a teenager in San José, California—racked up a total of 29,920 points, giving him second place in W6-land. This is really nice going as you will agree.

The top scorers in those W/K, VE, and VK districts and in countries where three or more logs have been submitted will each receive certificates.

Now, let's take a look at the Contest. We feel that January is not a good month for a DX contest of this kind and hope that the next one can be scheduled later in the Spring when conditions normally improve. We shall not, of course, approximate the conditions prevalent during the first few s.s.b. DX contests until the sunspot cycle comes full turn some eight years from now, so we must take advantage of every break that we can; we feel that a Spring contest will bring with it much better conditions.

This Fifth Annual Contest was followed by more comments and suggestions than any of the others. Many of them were enthusiastic—Comps, VK5EF: "Won't miss next year's contest"; Per, LA5LG, and Dick, PAØFX: "It was great fun"; Joss, ZS6L, "really enjoyed it all", even though a defective tube in his slicer distorted received signals; Ralph, DL4PI, "My first contest—a ball!!" Fritz, DL7AD, and "Doc", SM5BPJ, also enthused about their first s.s.b. contest and were amazed at the results. G4CP, celebrating his first month on sideband, wound up as top scoring G station. Les, G8KS, noted "The best contest of all. Please do not alter. The 6-hour break is a splendid idea; period of contest ideal."

On the other side of the ledger were detailed comments, primarily from the W/K stations, all saying approximately the same thing: "There was no incentive for working DX stations"! Because of this, too much interference was gen-

Top Ten

ZS5JY	80,456	HB9IE	53,218
W2VCZ	76,627	KH6IJ	52,437
TI2HP	62,688	KP4ATU	50,402
W3JNN	59,738	TG9AD	48,564
K6CTV	53,720	ZL3DX	46,041

Here are some of this year's outstanding contestants. Top row, l. to r.; Wes, K5DGI, forgot all about his college studies and hurried home to Shreveport, La. to win top honors in the Fifth District; Oscar, W3JNN, did the W/K hams proud by winning fourth place worldwide; Bob, W2VCZ, almost but not quite ran off with top honors in the Contest; he wound up in second place as top American scorer and winner of the W7DLR Anniversary Trophy.

Second row, l. to r.; That quizzical look on Hank, W8CLR, simply means that he thought we were kidding when we said, "You're the top W8"!. Tom, KP4AVQ, followed up his participation in the Contest by creating enormous excitement as VP5CD on South Caicos Island. Pacing the Australian contestants was Bill, VK3A . . . Haitch . . . O, one of sideband's leading exponents. Dick, K6CTV, topped the Sixth District, assisted no doubt by his excellent mountain top location.

Third row, l. to r.; Neville, G3NUG, took third-place honors in England, despite a very heavy schedule of studies. Here is Win, ZL3DX, famed throughout the world for his DXpeditions, who again repeated his triumph of winning tenth place worldwide. Hans, DL1KB, is another chap whose location atop a mountain helped him make a fine showing in the Contest. Our top winner and Champion, Olliver, ZS5JY, who is undoubtedly one of the finest operators on sideband today. By winning this Contest, Olliver proved that superior operating can overcome poor conditions and that South Africa is just as good a location as Morocco from whence have come three previous Contest champions.

Bottom row, l. to r.; Harry, DL3LL, shown with his lovely XYL, Ursula, emerged as Germany's top scorer. Inset, Chris, YV5ADZ, whose fine performance placed him at the top of the list for Venezuela. Don, W1ONK, is making a habit of winning contests. He also topped the list in the First District for single band operation in the CQ WW Contest. Walt, W4HXC, was leader of the Fourth District for the second time in two years. Goran, SM6SA, took time off from golfing long enough to repeat his performance as Sweden's top s.s.b. contest operator; Here is George, UA3FG, one of a large group of Soviet sidebanders who participated for the first time in this year's Contest.

erated by W's working each other. In past contests, signals from out of the States were strong enough to counteract the QRM so the rules worked out real fine. This year, if we had had a crystal ball to foretell the poor conditions in existence during the contest period, the rules would have been altered. But forewarned is forearmed so we're working on new rules for next year—no multipliers for stations contacted on the same continent except for individual prefixes; extra points for contacts on 40 and 80 meters; mandatory checklists (*you* try to search for duplicates among 700 contacts!); and possibly a few others that will return this contest to the status of one for DX operation only.

We were surprised that such a great number of stations active in the contest neglected to turn in their logs. Probably the operators felt

that their scores did not compare favorably with those of past years. But a quick check of the listings will have a lot of fellows bemoaning their lack of confidence in their own scores, we're sure. In those cases where the totals were very small, comments were made on the logs that only part-time participation was possible but "wait until next year!"

We are indeed grateful to all the stations who participated in the 5th Annual *CQ* S.S.B. DX Contest and who made it so enjoyable and we are particularly grateful to the stations who submitted their logs. Congratulations to one and all.

The following listings indicate the calls, the totals, the number of stations contacted, and the number of different prefixes worked. Asterisks indicate certificate winners.

North America

United States

W1ONK*	41,511	411	101
W1AOL	25,201	319	79
W1FZ	23,940	315	76
W1ORV	20,880	240	87
K1LRB	16,779	329	51
W1YDO	14,965	205	73
W1HX	6552	104	63
W1EQ	6384	114	56
K4SGB/1	6118	161	38
W1ZD	4559	97	47
W1HR	3150	70	45
W1BDF	2688	64	42
W1BIH	2451	57	43
W1WY	1767	57	31
K1KSY	1100	55	20
W1PCD	1085	35	31
W2VCZ*	76,627	703	109
W2GBC	30,295	415	73
K2GXI	20,196	198	102
K2MGE	16,720	220	76
W2WMG	10,455	205	51
W2QKJ	7072	136	52
W2CVW	1386	63	22
W3JNN*	59,738	502	119
W3TLN	18,285	265	69
K3NZV	17,680	221	80
W3WGH	14,287	157	91
K3CHP	2442	74	33
W3CJS	1276	58	22
W4HXC*	31,824	408	78
K2YDZ/4	26,475	353	75
W4EEU	11,857	167	71
W4INL	6468	98	66
W4RLS	4400	110	40
W4DS	3640	91	40
K5DGI*	38,936	628	62
W5INL	23,936	352	68
K5MDX	22,960	280	83
K5USE	22,910	395	58
W5SCM	12,388	326	38
K5MUX	2624	82	32
K6CTV*	53,720	632	85
K6VVA	29,920	440	69
W6EKZ	14,491	223	67
K6HZU	12,332	241	52
W6YMV	7176	104	69
WA6KNE	4795	137	35
W6WX	3408	71	48
W6UWL	320	20	16
W7EOI	10,836	252	43
W8CLR*	12,692	167	76
W8BKO	10,360	146	71
W8TWA/8	7560	140	54
W8WT	6102	113	54
W8BMX	4255	115	37
W8PQQ	3478	74	47
W8UMR	1568	56	28
W8TQN	1170	39	30
W8JPT/8	1008	48	21
W9EWC*	34,542	342	101
W9EXY	33,947	409	83
K9GZK	29,568	365	81
W9YT	12,054	294	41
K9GMD	6650	133	50
K9JEL	1008	36	28
WØNFA*	19,320	280	69
KØRAL	16,006	302	53
WØMCX	10,080	168	60
KØSCM	7872	246	32
WØMKF	7383	107	69
WØQGI	5830	110	53
KØMNO	5290	115	46
WØOIV	1960	70	28
WØKCG	748	34	22

Alaska

K1IFS/KL7	3450	75	46
KL7DGC	1320	55	24

Bahamas

VP7NT	9480	237	40
VP7BP	1975	79	25

Canada

VE1EK	1320	60	22
VE2GJ	3201	97	33
VE2AZN	796	38	21
VE3ES	7865	143	55
VE3BQP	5096	98	52
VE4SC	1474	67	22
VE6TF*	11,725	335	35
VE6TP	3090	103	30
VE6IN	1150	50	23

Canal Zone

KZ5DU	4522	119	38

Costa Rica

TI2HP	62,688	653	96

Guatemala

TG9AD	48,564	639	76

Puerto Rico

KP4ATU	50,402	638	79
KP4AVQ	22,904	409	56

Africa

Eritrea

ET2US	1976	52	38

Lebanon

OD5CW	3861	117	33

Liberia

EL1C	629	37	17

Southwest Africa

ZS3AD	1566	54	29

Swaziland

ZS7P	44,200	442	100

Union of South Africa

ZS5JY*	80,456	712	113
ZS6AHW	43,407	477	91
ZS6AMV	30,324	361	84
ZS1JD	25,024	368	68
ZS6UR	24,938	337	74
ZS6L	6327	111	57

Asia

Bahrain Island

MP4BBW	41,406	309	134

Formosa

BV1US*	1566	54	29
BV1USC	1508	52	29
BV1USG	90	10	9

Iran

EP2AG	2394	57	42

Israel

4X4DK	41,920	320	131

Japan

JA1AEA*	5117	119	43
JAØAC	156	13	12
JA5HT	18	6	3

Hong Kong

VS6EK	2205	63	35

U.S.S.R.

Asiatic

UA9CM*	4717	89	53
UA9KOG	3504	73	48
UAØLA	3150	70	45

Kazakh

UL7JA	2623	61	43

Europe

Austria

OE1RZ	25,095	239	105

Azores

CT2AH	3081	79	39

Belgium

ON4DM*	19,952	232	86
ON4AD	4484	76	59
ON4QX	234	18	13

Canary Islands

EA8CT	35,136	488	72

Czechoslovakia

OK1AAT	216	18	12
OK1AAA	210	15	14

Denmark

OZ7BQ	560	28	20
OZ8RH	1472	46	32

England

G4CP*	34,556	326	106
G3DO	27,368	311	88
G3NUG	27,132	266	102
G8KS	22,440	255	88
G3KFX	12,495	147	85
G3OEY	12,069	149	81
G3NMH	3504	73	48

Faeroes Island

OY7ML	4692	102	46

Finland

OH2XZ*	13,770	170	81
OH2RZ	9936	144	69
OH2GF	9792	136	72
OH1UZ	1920	60	32

France

F7BI	15,738	258	61

Germany

DL3LL*	45,843	413	111
DL1KB	45,200	452	100
DL4PI	23,072	224	103
DL4KN	22,878	246	93
DL3DC	17,512	199	88
DJ3CP	15,136	172	88
DL5BR	14,857	179	83
DL3DW	8658	117	74
DJ3WP	6930	110	63
DL9PU	6216	111	56
DL1FK	5820	97	60
DL7AD	4788	84	57
DL4XF	2806	61	46
DL5DJ	1247	43	29
DL7BQ	540	27	20

Greece

SV1AB	26,460	252	105

Ireland

EI8P	14,952	178	84

Luxembourg

LX1DE	7998	129	62

Netherlands

PAØFX	6328	113	56

Norway

LA5LG*	9170	131	70
LA1TE	4680	90	52
LA3B	475	25	19

Poland

SP5PO	9890	115	86

Roumania

YO3GK	156	13	12

Scotland

GM3CIX	8060	124	65

Spain

EA2CQ	24,128	232	104

Sweden

SM6SA*	19,764	244	81
SM5BPJ	17,544	204	86
SM5DW	13,031	157	83
SM6ZR	9792	153	64
SM6JO	8968	132	59
SM5MC	2294	62	37
SM5BFR	1998	54	37

Switzerland

HB9IE	53,218	451	118

U.S.S.R.

European

UA1DZ*	21,855	235	93
UA3FG	16,704	192	87
UA3CR	15,996	186	86
UA3FU	1760	55	32

Estonia

UR2AR*	17,143	217	79
UR2AO	6413	121	53
UR2KCA	4900	100	49
UR2AT	1947	60	59

Lithuania

UP2CG	7950	150	53

Ukraine

UB5FJ*	19,716	212	93
UB5KAB	15,385	181	85
UB5WF	7021	119	59

Oceania

Antarctica

KC4USV	17,375	225	77

Australia

VK2EL	1080	40	27
VK3AHO	22,515	237	95
VK3SX	7965	135	59
VK5AB*	17,800	178	100
VK5QR	7140	105	68
VK5EF	420	35	12
VK6RU	13,608	168	81
VK6VK	432	24	18

Hawaii

KH6IJ	52,437	681	77
KH6AN	70	10	7

New Zealand

ZL3DX*	46,041	447	103
ZL1ACI	5800	100	58
ZL3RT	110	11	10

Philippines

DU7SV	4719	121	39

Wake Island

KW6DG	9435	185	51

South America

Argentina

LU3EQ	5800	100	58
LU2DAW	560	28	20

Chile

CE1AD	8651	211	41

Peru

OA4BR	3800	200	19

Venezuela

YV5ADZ*	10,192	208	49
YV3BT	6727	217	31
YV5AKP	4551	123	37

RTTY

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108 WEST TERESA DRIVE
WEST ST. PAUL 18, MINNESOTA

Last month we described an autostart circuit and showed how it is applied to the Twin City TU, the radioteletype converter or terminal unit whose description appeared in the March and April RTTY columns. This was the necessary control circuit, and we said that it could be used either with the simple continuous monitoring method where just a motor relay is actuated, or with a time clock arrangement *and* motor relay arrangement that turns on the v.h.f. receiver and TU at certain preselected times.

Clock timed monitoring requires two additional simple units besides the control circuit. One is a "clock unit" which is required to provide selection of contact closures at the desired times, and the other is a relay control unit which does the actual turning on an off of the receiver, TU, and the machine motor itself.

The Clock Unit

In autostart net operation, particularly if the radio channel is a busy one, each operator decides at just what times the station will be "open" to receive traffic. For example, one station might set up clock times at 7 AM, 11 AM, and 4 PM. Another station might set up for 8 AM, 1 PM, and 5 PM. Traffic can thus be separated merely by transmitting to them at their particular clock times. If it is desired to monitor the channel during the rag-chewing evening hours, additional clock times can be set up at 7, 8, 9, 10, and 11 PM, for instance. Therefore, the basic requirement for a clock unit is that it should be capable of being set up at any and all hours.

Figure 1 is the schematic diagram of a clock panel that can be put together with standard, readily available parts. Two electric clock motors are the heart of the unit. One revolves 1 revolution-per-day, and the other 1 revolution-per-hour. (These are available from Herbach & Rademan, 1204 Arch St., Philadelphia 7, Pa.) The 1 r.p.d. clock drives a Mallory #13124L 24 position tap switch which selects the particular hour, through an on-off panel toggle switch for each hour, while the 1 r.p.h. clock operates a microswitch at the desired minute. Switches were not installed for all 24 hours, but the holes were drilled and covered with plug buttons. The times left out were the wee hours of the morning (by threat of dangerous domestic consequences) and most of the working hours.

The Clock Unit.

The 1 r.p.d. clock drives a surplus right-angle gear mechanism to bring the main shaft parallel to the panel. This could have been another Millen #10012, which item was used to drive the pointer knob on the 24 hour dial on the panel. (The 24 point dial comes with the switch.) The switch is modified only by removing the two detent rollers. The pressure of each contact should be lightened to decrease the friction as much as possible. This is easily accomplished by removing the wafers and using a small screwdriver to open up each contact ever so slightly.

A collar with a round head screw about 1 inch long is fitted to the shaft of the 1 r.p.h. clock. The microswitch has a roller arm which is operated by the head of the screw each hour. Slotted holes are used to mount the microswitch so that the time-on period can be adjusted. (This switch need be closed only a few seconds but it should not remain closed more than 1 minute.) Also mounted on the shaft of the 1 r.p.h. clock is a 1 inch diameter clear plastic pill box which is used as a drum dial. A paper scale on the inside, visible through a slotted window in the panel, indicates the number of minutes of the hour elapsed.

Referring to the schematic diagram, it will be seen that the microswitch contacts are in series with the 24 hour tap switch and a toggle switch. Naturally the tap switch stays closed the longest, so the time-on is determined by the microswitch. (The lock-up and release mechanism is part of the associated relay control unit.) A domed pilot

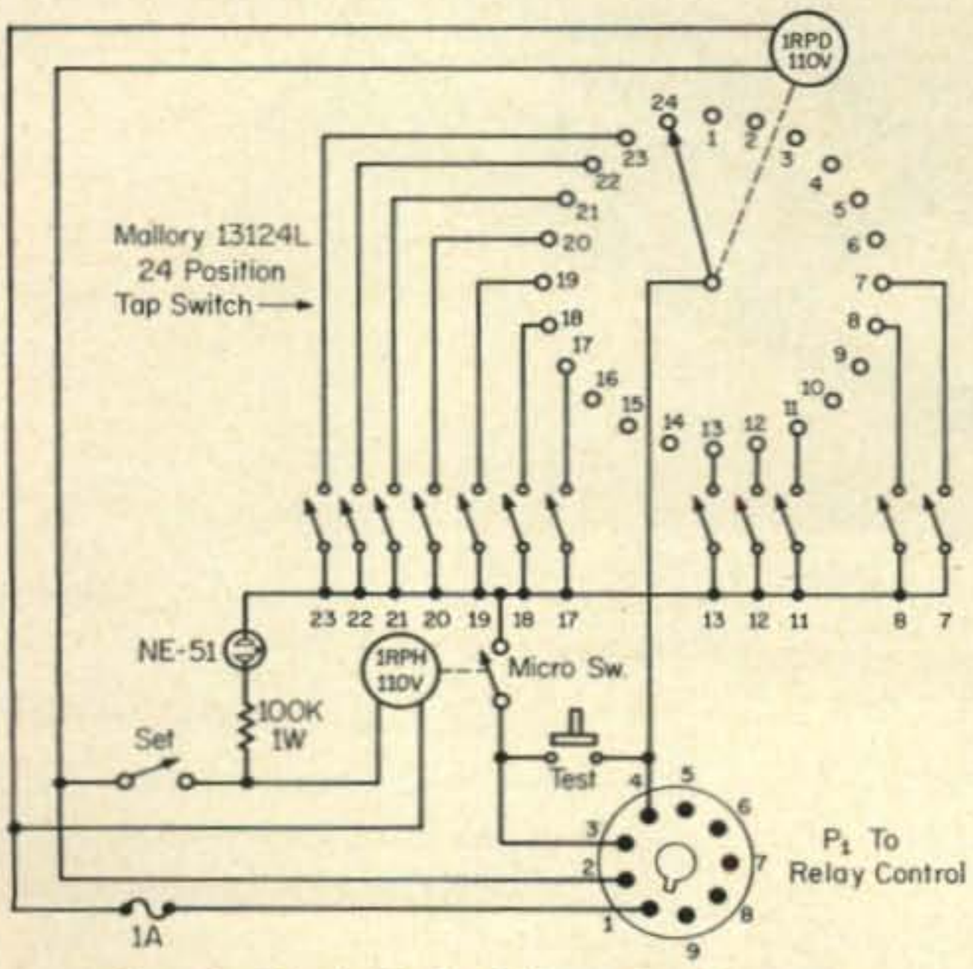
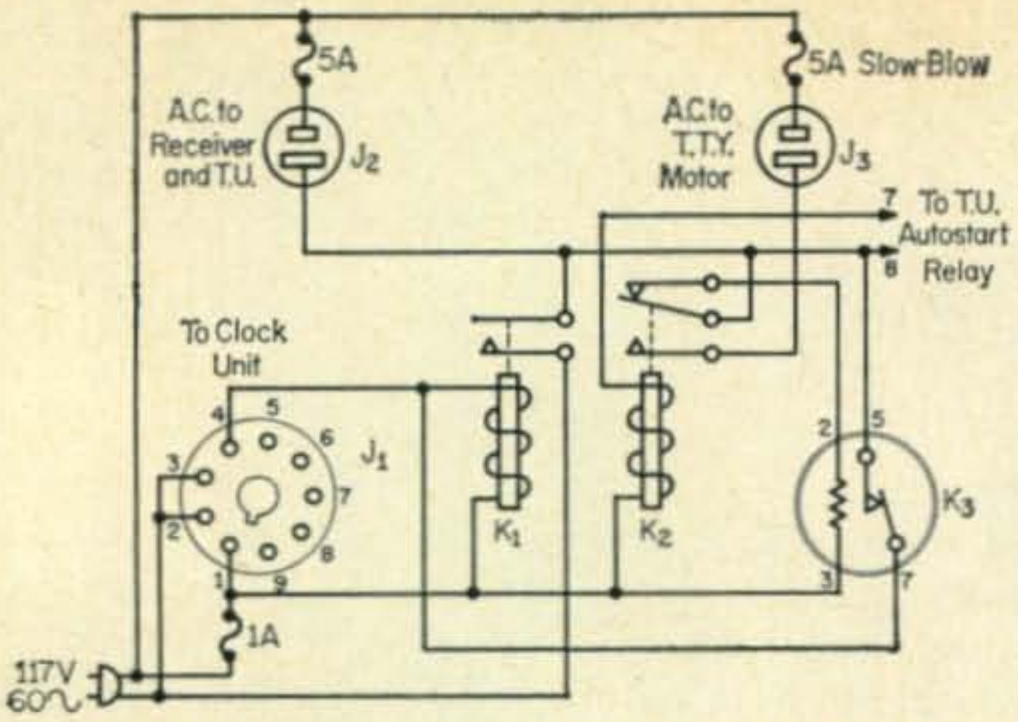


Fig. 1—Clock Unit Schematic Diagram.



K_1, K_2—115-volts a.c., 60 cps, Potter & Brumfield MR5A.

K_3—115-volt, 2 min., n.c. time delay relay, Amperite 115-C120.

P_1, P_2—Not shown. Polarized a.c. plugs, Amphenol 61-MP11 (to plug into J_2 and J_3).

J_1—9 pin keyed socket, Amphenol 77-MIP-9.

J_2, J_3—Polarized receptacle, Amphenol 61-MIP-61F.

Fig. 2—Relay Control Unit Schematic Diagram.

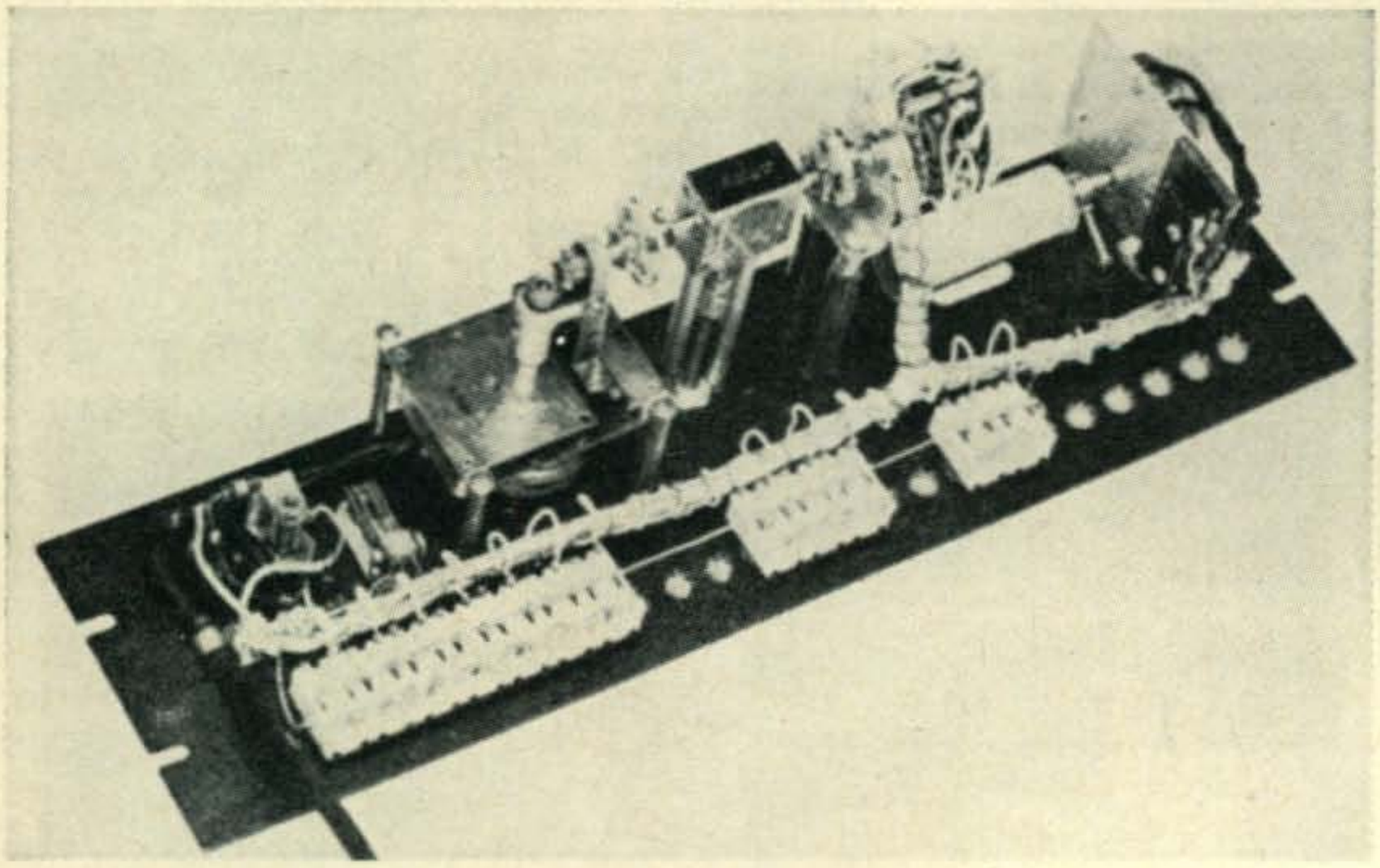
lamp on the front panel houses an NE-51 neon lamp which is used to indicate closure of the clock trip circuit. The SET switch in the 1 r.p.h. clock motor circuit is used to synchronize this clock with WWV or a time signal from a local broadcast station. To synchronize, the clock is stopped just as the microswitch contacts close, and it is started by the SET switch upon reception of the time signal. The TEST switch is a push-button switch used to check the lock-up and release operation of the relay control unit in between clock times. For the sake of the safe operation of this particular piece of unattended equipment, a 1 ampere fuse protects the unit. The clock unit should be connected in the a.c. line *before* the fuse for the receiver and/or the TU.

The Relay Control Unit

Figure 2 is the schematic diagram of the relay control unit used with the clock unit described above. J_1 is a keyed 9 pin socket provided to accept the 9 pin plug from the clock unit. The receiver and TU plug into J_2, and the Teletype machine motor plugs into J_3. Terminals to the TU autostart sensitive relay are marked *7* and *8* to correspond with the pin numbers on the INPUT socket of the Twin City TU. Note that every a.c. circuit is fused. *Do not leave these out!*

The heart of this relay control unit is relay K_3, an inexpensive Amperite thermal type time delay relay. Its contacts are normally *closed*. This relay determines how long the equipment listens to an unoccupied channel before shutting everything down until the next listening period. The 115 volt relays K_1 and K_2 should have contacts with at least a 5 ampere rating.

Operation is as follows: When the clock unit comes up to a preset time, the circuit between pins *3* and *4* on J_1 is closed for a short interval, just a few seconds. This closes relay K_1 which locks up through the normally closed contacts of the time delay relay K_3. The contacts of K_1 then apply a.c. power to the receiver plugged into J_2. If a steady *mark* tone is detected by the TU, the autostart sensitive plate relay in the TU closes the circuit (between terminals *7* and *8* on the Twin City TU INPUT socket) to the coil of K_2. This starts the motor of the machine plugged into J_3. The autostart relay in the TU stays closed during normal teleprinter keying, but should a long *space* or no signal be received, this relay will open K_2 to cut off power to the machine motor. Note that when K_2 is closed, the circuit to the heater of the time delay relay K_3 is opened so its contacts remain closed, keeping



Rear view of the clock timer unit. Near the top center of the panel can be seen the 1 r.p.d. motor mounted on a small subpanel. Two right angle drives and a flexible coupling are used to drive the 24 position Mallory tap switch. A shaft from the center of the Millan right angle drive operates the 24 hour "dial" on front panel. On the bracket at the far right is a 1 r.p.h. motor operating a micro-switch as described in the text.

Harold Roth WØLFH of Algona, Iowa (left) and Harold Roth WØVER of Minneapolis; two active RTTYers at a recent RATS dinner meeting.

the "start" relay K_1 closed. Should no signal be received for a period of about 2 minutes, the time delay relay K_3 opens, causing K_1 to drop out, thereby turning off the receiver and TU until the next "clock time."

Dayton Hamvention

Your RTTY Editor attended the Dayton Hamvention April 28th and 29th and had even a better time this year than last. Over 2,700 registered and about 850 attended the Grand Banquet. There were prizes galore and activities of interest to everyone. Andy Henderson W8WYL conducted the RTTY Forum as usual, and it drew about 110 people. (Standing room only.) Speakers were, Bob Lerche W9IQS who demonstrated his remarkable automatic carriage return and line feed attachment for the Model 15, Ken Netzly of Ohio Bell who gave a very interesting talk on lubricating the Model 15, and your RTTY Editor who discussed the application of autostart to the Twin City TU.

Ray Morrison W9GRW, the machine expert of the midwest, donated a completely adjusted ready-to-use Model 15 machine as a door prize. This was won by a YL, Pat Schafer K4QIO of Louisville, Kentucky.

Much thanks go to the hard-working but always cheerful Hamvention Committee for putting on such a stupendous and colossal ham convention.

On the Bauds

W2QBS is now /3 in State College, Pa., and is working on a method to convert the 5 unit teleprinter code to voice (!). K2HHH is now W8WNE and is on from the Detroit area. W3KFB of Cheswick, Pa., has the dual diversity AN/FRR-3 receiver bay to go with his Model 14 and 15 machines, and is active mostly on MARS RATT frequencies. K3LNN, the Burroughs Radio Club of Radnor, Pa., is setting up on RTTY, according to WV2RDV. W3OGD operated /3 RTTY at the Amateur Radio Exhibit at the U.S. Naval Supply Depot at Mechanicsburg, Pa., on Armed Forces Day. W5NEP also operated portable in Garland, Texas, as a RTTY exhibit for Armed Forces Day.

The May *RTTY Bulletin* of the RTTY Society of So. California ($2.75 per year via W6AEE, 372 West Warren Way, Arcadia, Calif.) had a mighty fine article by W9DPY on how to adapt the Collins 75S-1 receiver for RTTY operation. W7LVU of Casper, Wyoming, has a Model 15 and TU problems. (*Try the Twin City TU, Gordon!*) W7ESN of Bellingham, Washington, modified a DX-100 to use *three* 6146's, and runs 250 watts input on 20 meters. W8CRY of Lake Orion, Michigan, puts in a terrific signal at KØWMR on 40 meters.

Bill Crane W9ZNG/2, U.S. Naval Facility, Cape May, New Jersey, has a TT-52 TD, an REC-30, and some h.v. power supply parts he would like to trade for a Model 15 or 26. W9FJI of Princeton, Indiana, is looking for a noiseless machine. (*Try the 401-A strip printer, Fred.*) W9AIU, the famous Egyptian Radio Club, near Granite City, Illinois, sure makes itself heard on 40 meter RTTY. KØEPT of Redwood Falls, Minnesota, is on with a Model 19, and a BC-458 v.f.o., shifted as per October '60 RTTY column. KØGVD of Brooklyn Park, Minnesota, is on 80 and 40 with low power. WØOXY is on 40 from Crest, Iowa.

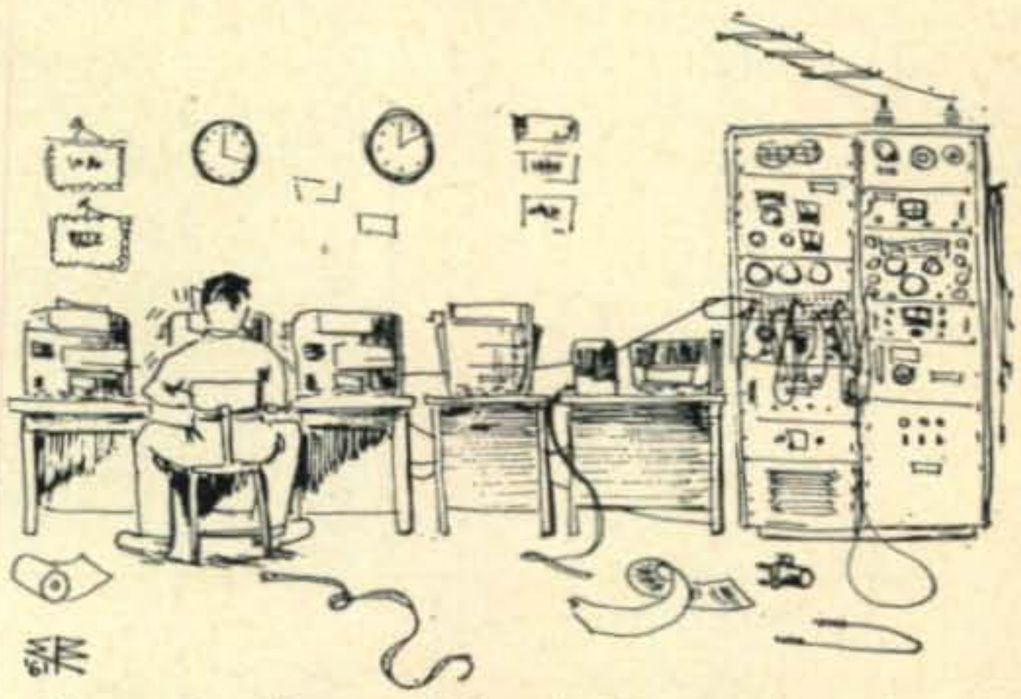
VE3DJX of Napanee, Ontario, is on 80 with a 26 and a Ranger. Jim reports VE3DKW of Oshawa has a 26 and 100 watts, and VE3BHW of Belleville is almost ready with a 26 and a GSB-100. VE3BAD and VE3OE of Scarborough also active. (*What ever became of VE3ATC?*) In the April issue we incorrectly referred to G3NPF as G3*M*PF. G3NPF reports that he operates mostly on 80 with a Creed 7A machine, an AR88LF receiver, and a G3BST TU. DJ4KB is on 80 and 20 with an Olivetti machine. A Clap v.f.o. and a "QRO final."

Comments

The old man at the green keys says, "It is the courteous thing to leave the other fellow's machine at the *beginning* of a line, not in the middle or at the end, when you sign."

73, Byron, KØWMR

RTTY THE HARD WAY... NO. 1



"Never could see sideband, Harry, too much expense involved. . . ."

Novice

by **DONALD L. STONER, W6TNS**
P.O. Box 137, Ontario, Calif.

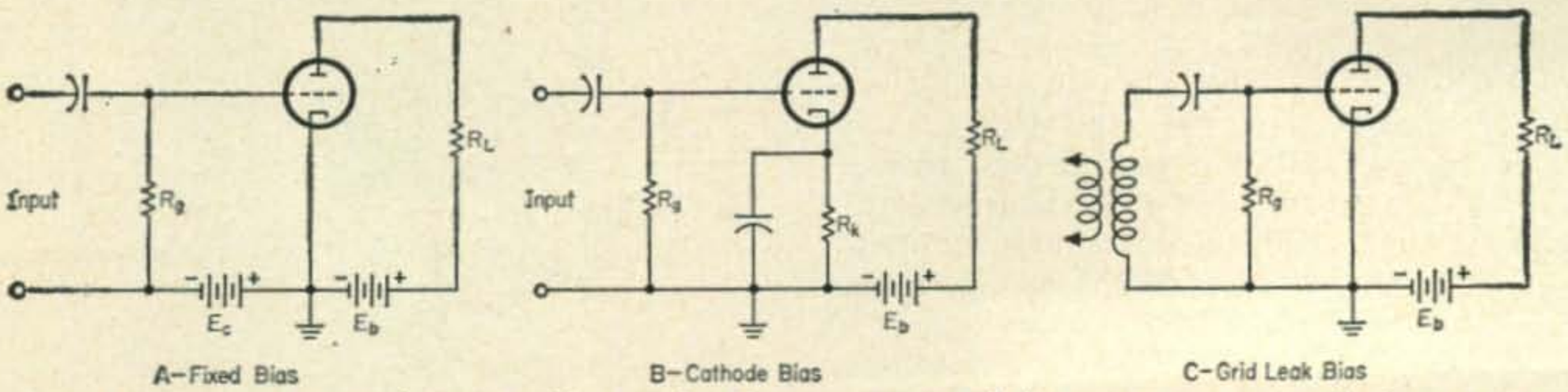
Last month we discussed characteristic curves for vacuum tubes. By examining the curves you could see the large change in plate current produced by a small change in grid voltage. You no doubt noticed that the grid must *always* be negative to prevent grid current flow and excessive plate current. This negative potential adjusts the *operating point* along the characteristic curve for the tube and is called the *bias voltage*. Normally, bias is applied directly and continuously to the grid. Bias must not be too high, or the grid voltage will exceed the cut-off value and introduce *distortion;* a deviation from true reproduction of grid voltage which will be discussed in later columns. There are three general types of bias employed to furnish negative grid voltage for vacuum tubes. They are *fixed bias, cathode bias,* and *grid leak bias.*

Fixed bias is usually supplied by a battery, called a C battery (fig. 1A). However, a battery often is inconvenient and is usually avoided unless there is no other practical source of voltage. Another method of providing fixed bias is the voltage divider system discussed several columns ago. Negative voltage can be taken from the voltage divider system in the power supply.

One of the simplest methods of supplying a steady negative voltage on the grid of a tube is *cathode bias.* This method consists of placing a resistor between the cathode and ground and applying to the grid the voltage drop developed by the plate current flowing through this resistor. To keep this bias voltage applied to the grid constant and free from the effect of a.c. variations in plate current, a capacitor is connected in parallel with the cathode biasing resistor. The capacitor charges to the average value of the cathode-to-ground potential, and the cathode voltage cannot change unless the charge on the capacitor increases or decreases. However, since the capacitor is quite large and the resistance through which it charges or discharges is likewise fairly large, the time of charge or discharge is too great for the cathode voltage to be affected by the high-frequency variations in the plate current produced by the signal voltage applied to the grid.

The capacitor connected across the cathode resistor is called a *bypass capacitor* for in effect it bypasses the a.c. around the cathode resistor. In the cathode bias circuit (fig. 1B) the grid is connected to ground through the grid resistor R_g. As no d.c. flows through the grid resistor, the grid is actually at ground potential. The cathode is positive with respect to ground due to plate current flow through it. Thus the cathode is more positive than the grid or in other words, the grid is negative with respect to the cathode by the amount of the cathode-to-ground potential.

Grid leak bias makes use of the flow of grid current during a portion of the input cycle to develop negative voltage for biasing the grid. Earlier it was stated that the grid is always held negative and a positive excursion would produce distortion. This is still true, but one popular amateur circuit, the class C power amplifier, makes good use of this distortion. The circuit is usually like the one shown in fig. 1 C. When the input voltage across the transformer secondary is positive, grid current flows and the capacitor charges. When the secondary voltage becomes zero or negative, the capacitor discharges through the closed path of the secondary winding and resistor R_g. Since this resistor is quite large, the capacitor discharges slowly during the entire negative portion of the input cycle. The dis-



A–Fixed Bias B–Cathode Bias C–Grid Leak Bias

Fig. 1—There are several ways to bias a tube. Here are some of the more common methods you are likely to find in amateur equipment.

charge current through R_g is in such a direction as to make the grid end negative with respect to ground. Thus the average grid potential is negative, provided the grid becomes positive for at least a small portion of each cycle. The cathode is at ground potential therefore the grid-to-cathode potential is negative.

Load Lines

You can apply characteristic curves in analyzing an amplifier circuit as shown in the triode circuit and E_p-I_p characteristics in fig. 2. The straight line drawn across the E_p-I_p curves is called

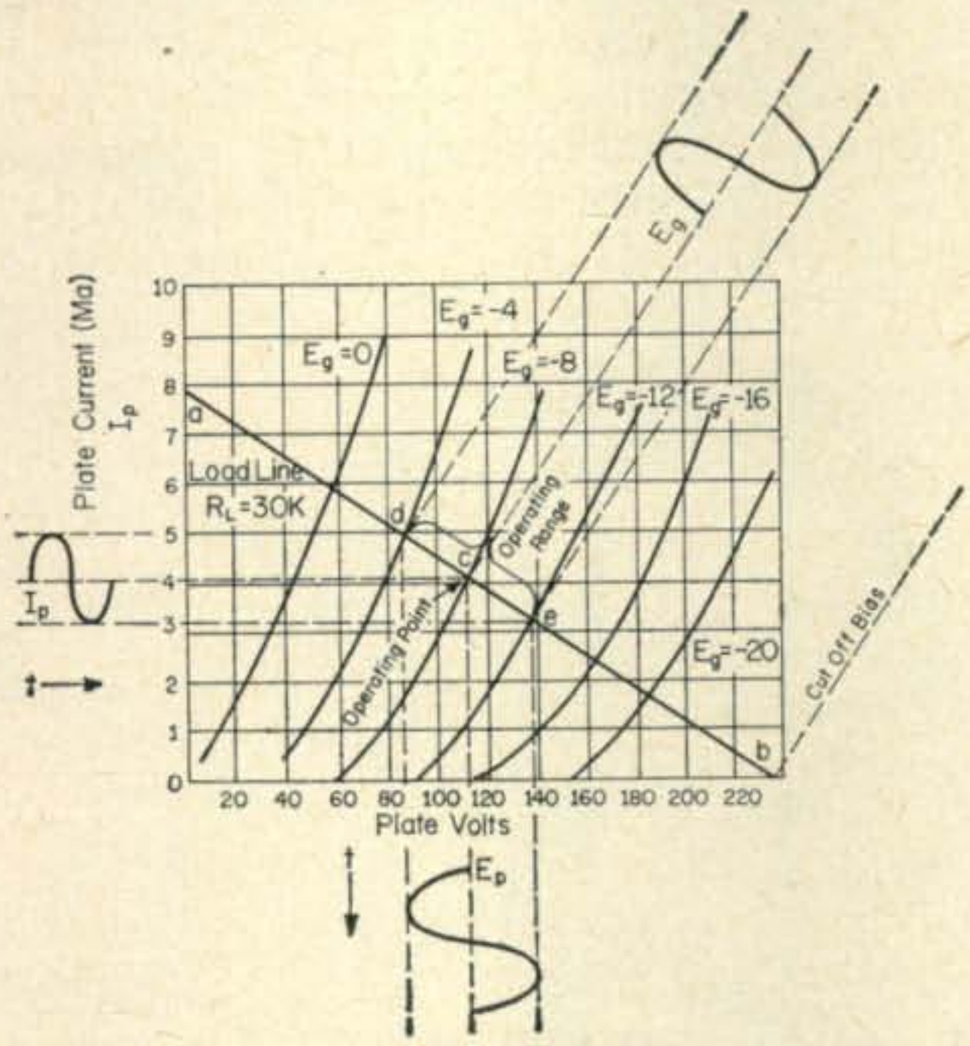


Figure 2

a *load line*. It is the result of plotting the values of plate current and plate voltage in the triode circuit and connecting all of the plotted points by a straight line. One end of the load line is the place where the plate current is zero and where the voltage drop across the load resistor is zero. The other extremity is the point where the plate current is absolutely unlimited by the tube; that is, the place where the tube acts like a short circuit. Current flow at this point is limited only by the load resistor and is obtainable by Ohm's Law. When the tube is shorted, it's plate voltage is zero. Thus the entire B supply voltage will appear across the load resistor. The slope of the load line is determined by the load resistor, hence the name load line. The greater the load resistance, the less the slope. The load line across the E_p-I_p curves is based on the triode circuit shown, and the curves are likewise based on the same circuit.

Here is how the line is located. Suppose in the triode circuit (fig.3) that the plate current drops to zero. The plate voltage will then be 240 volts. Thus one end of the load line is located at a point where I_p=0 and E_p=240. When the tube is shorted, the plate voltage is zero and the current in the load resistor is the supply voltage divided by the load resistance. Thus for fig. 3.

$$I = \frac{E}{R},\ I = \frac{240}{30000} = .008 \text{ amps or } 8 \text{ ma}$$

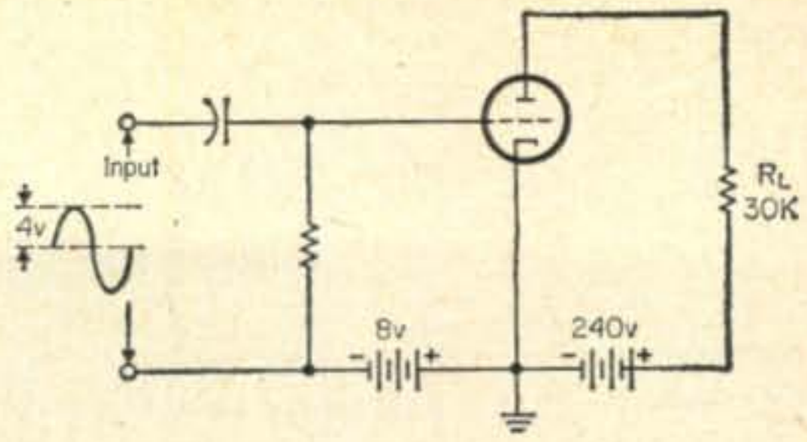


Figure 3

Therefore, with the tube shorted E_p= 0 and I_p= 8 ma. This locates the other end of the load line. The load line is useful in that if one of the quantities E_p, E_g, or I_p is given, you can determine the value of the other two by consulting the line.

In the triode circuit, the battery bias is 8 volts. With no signal applied to the grid you can determine the static E_p and I_p from the intersection *c* of the —8 volt curve and the load line. The point *c*, called the *operating point*, corresponds to I_p= 4.2 ma and E_g= 114 volts. Suppose now you apply an a.c. voltage of 4 volts peak amplitude to the grid. Since the grid is biased at —8 volts, this 4 volt signal will cause the grid voltage to vary between —4 volts and —12 volts. The two curves E_g= —4 volt and E_g= —12 volts intersect the load line at points *d* and *e*, which corresponds to E_p= 87 volts and 142 volts at each end and I_p= 5.1 ma and 3.3 ma respectively. The portion of the load line between *d* and *e* is called the *operating range* since the normal voltage variations during operating stay within these limits.

The waveshapes of the plate voltage and current and grid voltage of the triode curves are drawn in time reference to each other (see fig. 4). They point out that the plate voltage variation is opposite to the phase of the grid voltage. We say, in this case, that the signals are 180°

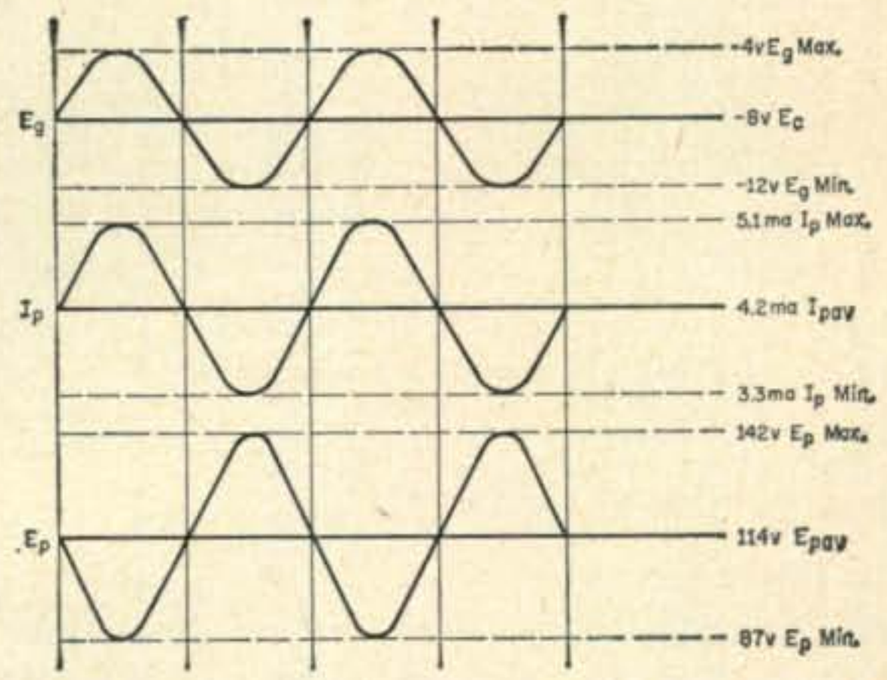


Fig. 4—Phase inversion occurs in the fig. 3 amplifier circuit, as shown here.

out of phase or that *phase inversion* occurs. The grid voltage variation is 4 volts while the variation in plate voltage is 27 volts. The amplification of the stage is 27 volts divided by 4 volts or 6.75. The reason that the amplification of the stage is less than the amplification factor (discussed last month), which is 9 for this tube, is that a voltage divder is formed by the plate resistance and load resistance but only the voltage across R_L (the load) is usable as output.

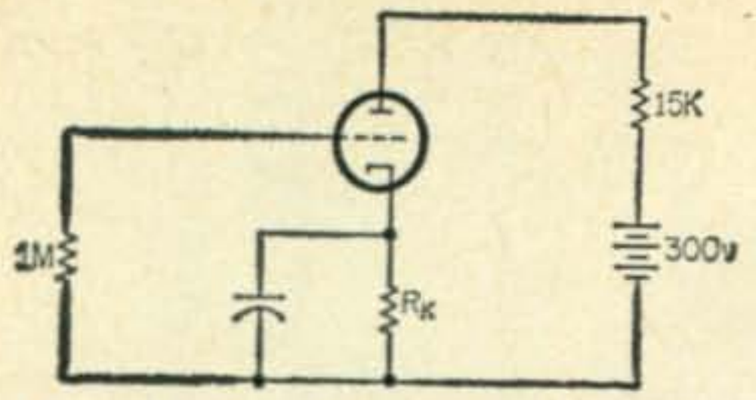


Fig. 5—A problem in tube circuitry and Ohms Law. Can you determine the resistance and power rating of R_k? Use the curve shown in Fig. 6.

To see if you understand the principles just discussed, let's work a couple of problems out together such as you might encounter in building a piece of ham gear. **Problem #1:** Find the value of R_k in fig. 5, using the curve in fig. 6, which will give 8 volts of bias across the cathode resistor. **Solution:** Using the family of E_p-I_p

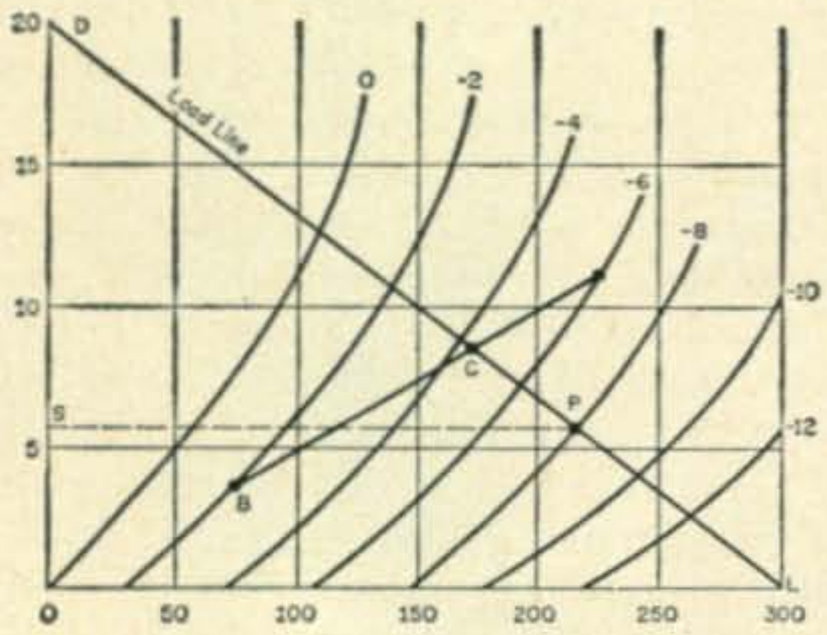


Fig. 6—Load lines impressed on the I_p-E_p curves are useful for determining the operation of an amplifier circuit.

curves (fig. 6) locate the intersection marked —8 volts and the load line. This give point *p*, which is projected to the vertical axis (point *s*) to determine I_p. In this case it turns out to be 5.5 ma. Determine the value of R_k by Ohm's Law.

$$R_k = \frac{E_k}{I_p} = \frac{8}{.0055} = 1450 \text{ ohms}$$

Thus a 1450 ohm cathode resistor would be used to provide the desired conditions. Since 5.5 ma will flow through it we can easily calculate the wattage required to dissipate the heat developed by using the following formula:

$P = I^2R$, $P = .0055^2 \times 1450$, $P = 0.435$ watts

Thus a ½ watt resistor would be adequate for the cathode resistor.

Problem 2—Using the same circuit, find the cathode bias if R_k were reduced to 500 ohms. **Solution**—Assume that $I_p = 4$ ma; then the drop across $R_k = 500 \times .004$ or 2 volts. Locate the point on the $E_g = 2$ volts curve which is opposite 4 ma. on the vertical axis. This is point *b*. Next assume that $I_p = 12$ ma. and locate a corresponding point in a similar manner (point *a*). Connect these two imaginary plate current and grid voltage points with a line. This line will intersect the load line at some point which we shall call *c*. The point *c* lies between the curves marked —4 and —6. You can determine the intersection point by scaling the distance between the two lines. In this example the voltage is approximately minus 4.3 volts which means that the cathode is 4.3 volts more positive than the grid, or in other words there is 4.3 volts developed across the cathode resistor.

Red Face

In the May '61 column, fig. 2, the resistor required is 42 ohms, 1 watt. The formula should be 6.3 volts divided by 0.15 amps! How many caught this boo-boo?

Letters

Mike, WV2QEM, The Choate School, Wallingford, Conn., writes to say that the recent 45 mph winds wiped out their 10 and 15 meter quad but the 80 meter dipole is keeping them on the air. So far Mike has worked OH, G's, IT1, DJ3, F2, OK2 and VE6. Since getting his ticket in Jan. He has made about 150 QSO's.

Hi says Tom Morgabi, K7IUF, of Moneta, Wyoming.

Tom Morgabi, K7IUF, Moneta, Wyoming, writes to sing the praises of amateur radio and wishes everyone could enjoy the hobby. Tom says "there is no other hobby with the sport and the feeling of unity that goes with amateur radio nor a greater thrill than the marvel of amateur communications." I'll buy that 100%, Tom!

It took Roger Warren, K9UHH, 8715 Guilford Avenue, Indianapolis 20, Indiana, three years to write. In the mean time, he lost the "N". Rog cranks away with a DX-40, a homebrew kilowatt with 2 813's and a wild antenna farm (beams, beams and more beams!). DX too numerous to mention covers every corner of the globe. OM Warren will assist prospective novices

Meet and greet "Ti" Monfort, WN4APB. Ti was working a KN9 when this snap was taken. Was it you?

Bill Axsom, KN9BUG, is cooling the log with a choice one, no doubt!

and can be reached at VI 6-5275. Roger is 16 years old.

Randy Brook, WV2PPE, 25 Parkview Avenue, Bronxville, New York, got the ham bug after visiting his counselor's home (K2UTV) and received his ticket a few months later. Randy's WAS is currently 33/25 and DX includes PAØ, DL3, G3, WP4, LA7 and VE3, all on 15 meters. Randy's OM is W2RNA and even his sis is getting interested in ham radio!

Gary Brown, WV2ROU, 529 Morgan Parkway, Hamburg, New York, gasses 'em with a "souped up" Heath AT-1 running 33 watts and a Hallicrafters S-85. On 2 he uses the receiver with a converter and converted 522. The antenna farm consists of a 2 meter beam, 75', 40' and 130' wire antennas.

Dick Duell, K3IWT, RD #3, Coudersport, Pa., dropped the "N" in Aug. of '60 but continues to work 15 and 40 meter c.w. with an S-85 and DX-40 into a 80 or 40 meter dipole. Among Dick's accomplishments he includes WAS, WAC, RCC, and WAZ-36, not to mention a whole raft of DX.

Pat Knowles, KN9ZPU, 266 George Rd., Wheeling, Illinois, runs a Heath AR-3 but is having trouble with a rough note in his DX-20. So far this problem has held his number of QSO's down. Can anyone help him out? Pat also uses a random wire for an antenna along with a ground plane.

Mike Brown is now W5DEC and resides at 47 Kelly Pl., Walker AFB, New Mexico, and has added a new SX-111 to his trusty DX-40. His new gear also includes an electronic keyer from the '60 handbook.

Tom Hyde, KN5FKA, Box 683, Denison, Texas, shares the rig with his brother who is KN5DHE and operates on 80, 40 and 15 meters with a DX-40 and S-85 receiver operating into

[*Continued on page 106*]

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Noteworthy Novice

Sometime back in 1954 Jim Free became interested in shortwave radio, largely through the *Boy's Life* SWL contest. Naturally enough, his interests led to that particular hobby known as "ham radio." After periods of on-again-off again interest he finally took the big step after moving to Mishawaka, Indiana. Largely through the help of Bob Lewis, K8HPO and the Michiana Amateur Radio Club Jim passed with flying colors and received call letters KN9WZL, he passes along hearty thanks to all the fellows who helped him.

His Novice year has logged 475 QSO's in 48

states with 45 confirmed with a trusty ole S-76 and DX-40 combo shaking up a 40 meter dipole. Like everyone else, Jim needs a few states; N. Dakota and Nevada and hopes Del., Wyo. and N. Carolina kick through with the QSL's.

As you can see from the picture, Jim's shack is a little cramped for space. That's because it is located in what used to be the bedroom of their trailer. He built the table and the xyl, who is helping him through college, whipped up the curtains—nothing like a cooperative xyl to help the OM!

Jim is currently working on the General ticket and you can intercept his signals on 15 c.w. in the mornings, 1600 to 1800 GMT.

Keep up the good work, Jim, and good luck from all the Novices. ■

Space Communications

GEORGE JACOBS, W3ASK
11307 CLARA STREET
SILVER SPRING, MARYLAND

Space Catalog

According to reports received from satellite-monitoring radio amateurs, and from information released by the National Aeronautics and Space Administration (NASA), transmitters on the following satellites were still in operation during early June.

Name	*Period (Minutes)*	*Freq. (mc)*	*Type of Modulation*
Vanguard I	134	108.022	Continuous carrier
Explorer VII	101	19.9904	AM carrier, with 4 FM sub-carriers
Tiros I*	99	107.997	Frequency Modulation
Transit 2A	102	108.06,162 & 216	Continuous carrier, exceptionally high stability
Courier 1B	107	107.971	Frequency Modulation
Tiros II	98	108 & 108.03	Frequency Modulation
Explorer XI	108	108.058	Phase Modulation

*The transmitter on Tiros I was designed to be shut off from the ground. Efforts to silence it, however, have so far been unsuccessful.

The 54 and 324 mc transmissions from Transit 2A went dead during March, as did the 107.94 mc beacon transmitter on the Echo balloon satellite.

In compliance with NASA's policy to terminate the transmissions of satellites which no longer provide useful scientific data, the Greb satellite's transmitter was successfully turned off by ground control at 2202 GMT on April 18, 1961. The transmitter, operating on 108.00 mc since June 22, 1960, will be turned on for short periods of time once every two months in order to obtain information on the useful life of the power supply and telemetry system.

The Echo passive communication satellite, launched on August 12, 1960 is still in orbit. Although its beacon transmitter is now silent, it can be tracked visually with little difficulty. It is now making several passes each evening over the United States, and is almost as bright as when first launched.

The 100 foot, mylar coated balloon satellite still retains much of its original shape, and is still capable of reflecting high power u.h.f. radio signals from its outer surface. Echo's present period of rotation is about 117 minutes, and it is in a fairly circular orbit varying between about 800 and 1100 miles above the surface of the earth.

The Echo satellite has survived the rigors of outer space for a considerably longer period of time than originally anticipated. It has already outlived its predicted life span by more than six months, and it is likely to remain in orbit for many more months, perhaps years.

Based on the success of the Echo project, Leonard Jaffe, Chief of NASA's Communication Satellite Programs (and radio amateur K3NVS) recently announced that NASA is planning future experiments with much larger passive satellites. Although its launching may be more than a year away, NASA's next passive satellite is expected to be a 140 foot diameter balloon, coated with mylar and aluminum laminations more than twenty times stronger than Echo's surface. It is hoped to place the balloon into a 1700 mile orbit above the earth. More information about this satellite will be carried in this column as the program materializes.

Amateur Interest Rises

Judging from the heavier volume of mail received during the past few months, amateur interest and perhaps of even greater importance, *participation* in space communications is on the rise. Many amateurs throughout the country are either converting old gear, or building new equipment for monitoring the several satellites in orbit that are still transmitting signals back to earth. Many other amateurs and amateur radio clubs are building equipment and making serious plans for the very difficult task of attempting to communicate by reflecting signals from satellites. The following letters are typical of the many received indicating serious interest and participation in space communications by radio amateurs.

Gordon Wightman, VE2UQ, 39 Malcolm Circle, Dorval, Quebec writes:

> "I've built up a six element rotatable Yagi for 108 mc and I started to really hear things. The rotary beam gives excellent azimuth bearings on the satellites as well as enhancing the S-meter. I received the modulated signal of Tiros II on 108 mc, and incidentally, it not only transmits on 108 mc but on each passage can be heard simultaneously on 108.03 mc with the same modulation characteristics. However, the signal strength and QSB varies on each frequency independently, perhaps indicating that two different antennas are used, or that the radiated powers are different. The modulation frequency is about 1300 cps. The percentage of modulation is near 100.
>
> "Tiros II is the strongest signal here, a good S9 on close passages. Until Greb's transmitter was turned off, it could be easily identified on 108 mc by its seven tones repeating every ten seconds. Tiros I is not as strong as Tiros II or Greb, but is still an S6 at peaks here.
>
> "The Doppler Shift is quite apparent on these satellites, and shows up very well when low selectivity is used. At present I am building up

George Jacobs, W3ASK, CQ's SPACE COMMUNICATIONS Editor (left) is shown with Leonard Jaffe, K3NVS, Chief of NASA's Satellite Communications Program (center) and Col. Phillip H. Pope (right) at a recent panel discussion on the role that amateur radio can play in space communications. The discussion, held under the auspices of the D. C. Foundation of Amateur Radio Clubs, took place at Fort George G. Meade, Maryland. Col. Pope is Post Commander. Representatives of ARRL, the Project OSCAR Association, and the Military services also participated in the timely discussion. *(U. S. Army Photo).*

another Yagi for 136-137 mc as I understand this segment will soon replace 108 mc for American satellite work.

"Back in western Canada, when I was operating as VE7HC, I used to be avid on DX, (WAZ #63, etc.) but digging for the satellites has got low frequency DX skinned. I haven't put my transmitter on the air since I started satellite monitoring, hi."

The following letter was received from K3HKK, the Nittany Amateur Radio Club, P.O. Box 60, State College, Pennsylvania:

"Re your SPACE COMMUNICATIONS column and in particuluar, June's item referring to Raphael Soifer's (K2QBW) Office For Satellite Scatter Coordination, I hope that we will be able to start some activity in the field of radio amateur space communications. I would like to begin by setting up some schedules for satellite scatter. Our club, K3HKK, has several interested parties and can at the present time operate on 15, 10 and 6 meters. I, myself K3IQU, will be interested in 15 meters using the Club's S-line equipment. Ten meters will be covered by W3POP, Earl; and 6 will be covered by K3AKR, John (possible alternate). I am also a member of the moonwatch club here in State College, and consequently can get recent ephemeris predictions for various satellites from our leader, Dave Whitmarsh. In order to insure a reasonable probability of successful communications, I suggest that we begin with the Echo satellite, since it is the largest scatterer of radio waves. I will attempt to determine schedule passes that are in the early evening for initial work since this is probably the most convenient time for all of us.

"George, if any readers of your column are interested in working out satellite scatter schedules with us, please have them drop me a line as soon as possible, even if only by QSL card. Cards should be sent to: A. J. Campanella, K3IQU, c/o K3HKK, The Nittany Amateur Radio Club, P.O. Box 60, State College, Pennsylvania."

Ray Soifer, K2QBW, Director of the Office For Satellite Scatter Coordination writes the following:

"George, it is my pleasure to report that the response to our distribution of the March 1, 1961 letter (setting up the OSSC) has been quite good. It appears that the long time delay between the *QST* article (on the K2QBW-K3JTE QSO which was believed to have taken place as a result of scatter from a satellite) and the formation of OSSC (has) had little effect.

"In these days of spectacular space achievements, it is well to remember that the American amateur radio service has the distinction of having been *first* with a workable communications system using earth satellites. In your hands (radio amateurs) rests the future of this development. Although some work is being done in industry on satellite scatter, it remains at this writing primarily an amateur (radio) project . . . (and) other (radio amateur) groups than ours are working along different lines, *i.e.* moonbounce and OSCAR. The objectives of these programs, however, are one and the same—the continued advancement of the amateur radio service through space communications. I do not propose to treat this subject here in detail, since this has already been done in a soon to be published *QST* series on amateur radio's future in space (and in *CQ*'s column for the past year, as well as in several articles now in preparation for early publication in *CQ*). I wish only to reiterate that you (radio amateurs) are an integral part of this combined effort. . . .

"A scant six weeks old, OSSC has already proved its worth by the services it has performed during this exceedingly short time. What it can do for you (amateur radio) is a function only of your activity and persistence in keeping us (OSSC) informed on your doings, problems, and ideas—yes, even wild ones. Please keep them coming. Next month, we will try to put out a summary of "who's doing what" around the country. Even if you aren't doing anything, let us know what you would like to do (in the field of amateur radio space communications), so that you may be included in the tabulation."

CQ strongly endorses the effort of the OSSC. In the above letter from K2QBW, the remarks shown in parenthesis are those of the editor of this column, and are supplied for editorial clarification. For further information concerning the work of the OSSC write directly to: Raphael Soifer, K2QBW, P.O. Box 308, Cooper Station, New York 3, N. Y. (after September 15, 1961 OSSC correspondence should be addressed to OSSC, Room 10-206, Massachusetts Institute of Technology, 77 Massachusetts Avenue, Cambridge 39, Mass.)

Ionospheric Beacon Satellite S-45

NASA's first attempt to orbit the S-45 ionospheric research satellite ended in failure on February 24th. As this column is being written, NASA is making final preparations at the Cape for a second attempt to orbit the S-45 satellite. If the launch is successful, the bird should be in orbit when this column appears in print.

The S-45 project was discussed in April's SPACE COMMUNICATION column. It will transmit on the following six frequencies simultaneously: 20.005 mc, 40.010 mc, 41.01025 mc, 108.027 mc, 360.09 mc and 960.240 mc. This is the greatest number of frequencies to be used by any satellite to date. Once in orbit, reception of S-45's transmissions is expected to be a most valuable scientific tool for studying the ionosphere.

The 20 mc channel should allow radio amateurs and shortwave listeners all over the world to participate in the S-45's study of the ionosphere. This relatively powerful transmission is expected to be received quite easily on a communications receiver, and it should be located without difficulty since it is in the pass-band of the popular 20 mc WWV channel. Reception of the other frequencies will require somewhat more elaborate receiving equipment.

Reception reports on S-45's transmissions from radio amateurs and shortwave listeners could be a valuable contribution to the research program. Reports of reception should include *exact* time of signal peaks (check your watch against WWV), Doppler shifts, and other unusual observations. Special attention should be given to signal fading, sudden signal drop outs, etc.

The following scientists have been given the responsibility for publishing results of the S-45 research program. Reception reports should be sent to the nearest scientific installation for evaluation.

Mr. Fernandez de Mendonca
Radio Science Laboratory
Stanford University
Stanford, California

Dr. J. E. Titheridge
University Of Auckland
Auckland, New Zealand

Mr. Robert S. Lawrence
National Bureau of Standards
Central Radio Propagation Laboratory
Boulder, Colorado

Dr. G. W. Swenson
Department of Electrical Engineering
University of Illinois
Urbana, Illinois

Dr. W. J. Ross
The Ionosphere Research Laboratory
Pennsylvania State University
University Park, Pa.

It must be stressed that accuracy, especially in timing, is of the greatest importance in reporting reception of the S-45 transmissions.

73, George, W3ASK

The USA-Counties Award

CLIF EVANS, K6BX
BOX 385, BONITA, CALIF.

THE USA-Counties Award (USA-CA) program sponsored by *CQ* has opened an exciting new frontier of operational pleasures to all hamdom. Participation is equally challenging and competitive to all whether OT, newcomer, or Novice and whether rabid DXer, awards hunter or plain rag chewer, and regardless of location, power or band/modes.

In case you missed the first USA-CA announcement, it is an awards program for contacting each of the 3078 counties of the 50 U.S. states with basic class certificates beginning with 500 different counties without date restrictions. Seven classes of USA-CA are available, each a separate certificate. Classes are: USA-500; USA-1000 with 25 states represented; USA-1500 with 45 states represented; USA-2000 representing all 50 states; USA-2500; USA-3000 and USA-3078-CA for all counties.

Twenty-six states already have All-County awards and many others are projected. The *Directory of Certificates* published by K6BX is actively promoting sponsorship of an all-county award in remaining states and suggests responsible organizations in such states take advantage of rich public relations opportunity.

Obviously, over night, the USA-CA has made all U.S. hams sought after and their QSL cards have taken on much added significance. Many, especially in "rare" counties, will experience pile-ups. Likewise, the pleasure road for mobilers is paved with more meaningful contacts. Field-day trips to "rare" counties will reap rich rewards.

To make the USA-CA more enjoyable and to facilitate record keeping, *CQ* has available a 108 page booklet, 8½ × 11", containing Rules, application blank, certification form, U.S.A. map, maps of each individual state with alphabetical listing of counties and with space for listing city, town or location (postmark) of contact together with pertinent log data should applicant seek special endorsements. The booklet will constitute application and become *CQ*'s file record. Booklets are available direct from *CQ* (*not* K6BX) for $1.25 each and it is suggested at least two be purchased, one for application use and other for permanent personal copy and record. Would like to add that these books are worth the price even if used only as a map-reference guide.

Applications will be processed direct by K6BX *(not CQ)* who will administer the program.

K6BX is proud to join *CQ*'s staff in connection with USA-CA and to spark plug this new column which will expand as USA-CA news develops.

Send for your USA-CA booklets today.

Clif, K6BX

USA-CA RULES and PROGRAM

The United States of America Counties Award, sponsored by *CQ*, is issued for *confirmed* contacts with specified numbers of U.S. counties under Rules and conditions hereafter stated.

A. Awards Classes

The USA-CA is issued in seven (7) different classes, each a separate award certificate and further, each class can be separately issued for all one band or all one mode or mixed; subject to the Rules.

Class	*Counties Required*	*States Required*
USA-500	500	any
USA-1000	1000	25
USA-1500	1500	45
USA-2000	2000	50
USA-2500	2500	50
USA-3000	3000	50

USA-3078-CA for ALL counties and special Honors Plaque

B. Conditions:

1—USA-CA is available to all licensed amateurs everywhere in the world and is issued to them as individuals for all county contacts made, regardless of calls held, operating QTH's or dates whatever.

Special USA-CA's also available to s.w.l.'s on a *heard* basis.

2—All contacts must be confirmed by QSL and such QSL's must be on one's possession for identification by certification officials.

3—Any QSL card found to be altered in any way disqualifies applicant.

C. County Identity:

1—The *Directory of Post Offices* (P.O.D. Publication #26) will be the official guide in determining identity of counties of contact as ascertained by name of nearest municipality. It is suggested a copy of P.O.D. Publication #26 be obtained to facilitate operating reference and precheck cards for application purpose. Publication #26 is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C. (Price $2.25)

2—Unless otherwise indicated on QSL cards, the QTH printed on cards will determine county identity.

3—For mobile and portable operations the postmark shall identify the county unless information stated on QSL cards make other positive identity. When in doubt of location, mobile stations should name the nearest municipality as identified by road sign or road map.

4—In the case of Cities, Parks or Reservations not within counties proper, applicants may claim any *one* of adjoining counties for credit.

D. Administration of USA-CA Program:

1—The USA-CA program will be administered by a *CQ* Staff member acting as USA-CA Custodian, and all applications and related correspondence should be sent direct to him at his QTH.

2—Decisions of the Custodian in administering these Rules and their interpretation including future amendments are final.

E. Record Book and Bookkeeping:

1—The scope of USA-CA makes it mandatory that special Record Books be used for application. For this purpose, *CQ* has provided a 108 page, 8½ × 11" Record Book which contains application and certification forms, a USA county map, maps of each of the 50 U.S. States showing county outline, and which provides record-log space meeting the conditions of any Class award and/or endorsement requested.

2—Completed USA-CA Record Books constitute the medium of application and become the property of *CQ* when submitted. A new Record Book must be used for each separate class of USA-CA applied for and recorded data must be complete within itself and without reference to any other applications. The scope of USA-CA makes cross referencing and cross checking by the Custodian impracticable.

3—Record Books are to be obtained *directly* from *CQ*, 300 West 43rd Street, New York 36, N. Y. for $1.25 each. Recommend two be obtained, one for application use and one for personal file copy.

F. Application:

1—Make Record Book entries necessary for county identity and enter other log data necessary to satisfy any special endorsements (band-mode) requested.

2—Complete the application form provided, by filling in all spaces.

3—Have the certification form provided signed by two license amateurs (General Class or higher) or an official of a national-level radio organization or affiliated club, verifying that QSL cards for all contacts as listed have been seen. The USA-CA Custodian reserves the right to request any specific cards to satisfy any doubt whatever; in such cases applicant should send sufficient postage for return of cards by registered mail.

4—Send completed Record Book, application and certification forms and handling fee of $1.00 U.S., or 10 IRC to USA-CA Custodian, Clif Evans, K6BX, Box 385, Bonita, California.

VHF

BOB BROWN, K2ZSQ
C/O CQ, 300 W. 43 ST.
NEW YORK 36, N. Y.

50mc. 144mc. 220mc. 420mc. and above

CQ World Wide V.H.F. Contest!

August 26-27

Here we go again! Coming next month is the year's biggest v.h.f. contest . . . and this time we have three major subdivisions for your convenience.

When: From 12:00 noon local standard time (includes daylight saving time), Saturday, August 26, 1961, until 12:00 noon local time, Sunday, August 27.

Where: Any v.h.f.—u.h.f. bands, 50 mc and up.

How: Just follow the complete contest rules listed below.

Single Band, Single Operator

A—Operation on any *one* of the v.h.f.—u.h.f. bands may be considered for an award.

B—Contest contacts must include the following exchange of information: county, (section), and state (or country), signal reports, contact number, and handle. *Two way acknowledgement of information must be made.* Contacts shall be numbered consecutively beginning with 001.

C—In the U.S.A. or Canada, sections shall be considered as the *counties* in which the stations are located. In other countries, equivalent political subdivisions shall count as sections.

D—Contacts with mobile stations count the same as all other contacts. However, contest logs from *mobile* stations cannot be accepted for award consideration or listing due to the difficulty in determining the section category of the mobile station. The same is true for maritime mobile, aero mobile, etc.

Here's the attractive array of equipment at K2LRI that helped provide many 2 meter contacts from N. Y. during the V.H.F. contest.

E—Scoring is as follows:

1. Each completed contact scores two (2) points. Uncompleted contacts do not count.

2. A multiplier of on (1) is received for each new section worked.

3. A multiplier of one (1) is received for each operating hour in which at least one contact is made. (Maximum of 24).

4. A power multiplier of ten (10) is granted for final power inputs from 0 to 25 watts, a multiplier of five (5) for inputs from 26 to 75 watts, a multiplier of three (3) for inputs from 76 to 150 watts and a multiplier of one (1) for inputs from 151 to 1000 watts. Obviously, this applies to the standard plate-modulated transmitter, and due consideration must be given to other equipment. A transmitter with voice controlled carrier, such as the Heathkit Seneca, must be rated by the carrier level (full power input) at *maximum* modulation. Single side-band is rated the same, by power input at maximum modulation. If there is a question as to qualification, drop a line to the v.h.f. editor.

5. If, for example, you were to work 110 stations in 25 different counties, running 50 watts and operating a total of ten hours, your score would be computed as follows:

110 (contacts) × 2 (points) × 25 (sections) × 10 (hours) × 5 (power multiplier) = 275,000 points.

F—Only *one* operator is permitted during the 24 hour contest period. Others may aid in logging, but the operation for the full period must be by *one* amateur. More than one operator entered in this division constitutes immediate disqualification and transfer to the multi-operator division.

G—Awards will be made to the highest scoring individual operator stations on each *separate* v.h.f. band in every state, province, and/or foreign country from which at least three logs are received. A special gold plaque will be awarded to stations submitting scores in excess of three (3) million points.

H—For qualification in this division, only one band may be worked. If you work both 6 and 2 meters for example, you must enter under the multi-band division. There are individual contests for each band in this division—If you work 6 meters, you will be competing against other 6 meter stations. If you work 2 meters, you will be competing against other 2 meter stations, etc.

Multi-Operator, Single Band

A—Rules for multi-operator are basically the same as that of single operator with the omission of paragraph *E* above.
B—Any number of operators at one station may be entered under this division; all operators must sign the entry log.
C—Scores submitted under this division will be entered and are competing only with other multi-operator stations.

Multiple Operator, Multi-Band

Rules for single operator using more than one v.h.f.—u.h.f. band are basically the same as those for single band, single operator entries, except that the contacts and counties worked and scored separately during the contest are *combined* for logging purposes. For example:

If you made 10 contacts on 432 mc, 25 contacts on 220 mc, 100 contacts on 144 mc, 150 contacts on 50 mc, your total contact points would be 570 (285 total 2 points each). If you ran 25 watts on 432 mc, 25 watts on 220 mc, 75 watts on 144 mc, and 175 watts on 50 mc, your power multiplier to be used in final scoring would be one (1). Always use the *highest* power rating to determine your overall power multiplier. If in the above example, your 50 mc power was 100 watts, then your multiplier would be three (3).

Multi operator, Multi-Band

Rules for multi-operator using more than one v.h.f.—u.h.f. band are the same as mentioned above under section *A*. The only difference will be in your award and listing in the actual and final contest results. You will be competing only against other multi-operator multi-band entries.

Logs

A—Logs are available from the log department (c/o Bob Brown, K2ZSQ, 67 Russell Avenue, Rahway, New Jersey) to aid you in submitting your scores. An official log form is not necessary, however. Any sheets submitted with the proper information will be accepted.
B—The following information must be on every entry:

1. Name, call, street address, city, and state, (or country) of station.
2. Division
   a. Single operator—Single band.
   b. Multiple operator—Single band.
   c. Single operator—Multiple band.
   d. Multiple operator—Multiple band.
3. Band or bands operated
4. Total score
   a. Number of contacts.
   b. Number of counties.
   c. Power multiplier.
   d. Number of hours.
5. Signature of operator or operators
   a. Include name, call, address of each operator if more than one.
   b. Number of hours each (if more than one) operated.

Jack Hellwig, KN9ZWU turned in the top Novice score from Illinois in the February competition with his Globe Hi-bander, SX101 and Johnson 6N2 converter.

C—The following information must be on all log sheets:
1—Your number to other station (beginning with 001); *2*—Time beginning contact and, of course, date; *3*—Call of other station; *4*—Band operated; *5*—His country; *6*—His state; *7*—His signal report; *8*—Your signal report; *9*—His handle; *10*—His number to you; *11*—Time ending contact.

Awards

Proper awards will be made to each station so deserving in his own division. For award consideration under state category (or country), however, at least three contest logs must be submitted from that area. Awards will be made as follows:

A. Single Operator, Single Band.
   1. Highest World-Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
B Multi-Operator, Single Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
C. Single Operator, Multi-Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer. (Each band)
   3. Three Million Point Plaque. (Each band)
D. Multi-Operator, Multi-Band.
   1. Highest World Wide Scorer. (Overall)
   2. Highest Statewide Scorer.
   3. Three Million Point Plaque. (Each band)
E. Contest Winner
   1. All awards listed above for Highest World Wide Scorer in each division will be compiled and will compete against one another for the final Contest Winner award. Competitors under the Single Operator, Single Band division will be given a 1,000,000 point bonus towards the top winner award.
F. For award consideration and listing, all logs must be in by Sept. 15!

Your contest chairman will handle all contest correspondence, awards, logs, etc. For this reason, please address all correspondence to the

Meet John, K4MHS at his Salisbury, North Carolina QTH. John was active on 2 meters during the February V.H.F. contest.

address at the head of the column.

Results will be printed in the December 1961 edition.

S.S.B. on V.H.F.

If you are like me, and read everything you can get your hands on, no doubt you are aware of the tremendous growth of single side-band on the lower frequencies. Although a somewhat recent innovation, s.s.b. is now holding its own on the lower bands and proving itself more every day. If you read further, and check top contest winners, top WPX holders, etc., you'll find also that many of these men are sidebanders. The advantages of this mode are greatly evident when weighed in this manner.

The v.h.f. bands, too, have their growing crop of sidebanders. Hardly a day goes by when I don't hear a new sideband appear on 6 or 2 meters, or hear about one. They have grown to such an extent in this area that many new sideband nets are forming nightly on 6 meters. Since, on v.h.f. we have more varied propagation effects than just about all the lower frequencies put together, we try all means to take advantage of them. For our easiest mode, Sporadic-*E*, almost anyone can "work out" on 6 meters. Signals are usually of such a great intensity that working a DX station involves no more than being on a clear frequency at the right time. But what about meteor showers, tropo work, aurora, and scatter? To satisfactorily make regular contacts along somewhat rougher paths, more power, more antenna, and more skill is required. This involves the use of the maximum in equipment. Single sideband holds the advantage of extending the intelligible range of voice signals not possible before. If, for example, you are trying to work a station 300 miles away under normal conditions, and although you are copying him at a readable S-5, he returns your report with an S-2, chances are that he won't be able to copy your audio. Time and time again I've come up against this very situation myself, and try as I will, good copy is almost impossible—until I switch over to sideband! With sideband operation, that S-2 signal of yours is turned off and on with every sound you utter. By inserting his beat frequency oscillator, the other station can tune you in and presto, you have a QSO! If you can successfully work 400 miles on c.w., you can work the same 400 miles on phone, using s.s.b. The boys who are converting to s.s.b. are no fools . . . they know we have a rough period of years of minimum favorable propagation ahead, and they're going to make the most of it. Long after the band has closed, after a solid Sporadic-*E* session, I still hear certain W4's on s.s.b. coming through with weak but copyable signals. And they're working W2's, too . . . sidebanders, that is.

We here at *CQ* are interested in your efforts with sideband and would like to hear about them.

If You Operate S.S.B.

. . . send your QSL card with information as to band, frequency, power, etc., to Phil Gural, K2PCG, 204 East Northfield Road, Livingston, New Jersey. Phil adds that he'd like to know the time you usually get on the air, and if on a net, its starting time.

York Road R.C. Certificate

The York Road Radio Club, one of the oldest continuously operated radio clubs in the United States, has announced the requirements for obtaining the YRRC Worked Ten Members certificate. . . .

Contacts must be made on 6 or 2 meters after February 7, 1961. Any contacts made during official net times will not count. (The YRRC conducts nets on 50.6 mc every Thursday at 2200 hours local time.)

All legal modes of transmission are acceptable. Cross-band operation is also permitted.

A certificate will be issued upon receipt of a list of ten contacts containing the YRRC member's call, date worked, time, and band(s) used. Send your list to Robert Bettinson, W3ZYO, 4629 N. Rosehill Street, Philadelphia 20, Pen. nsylvania.

Clubs and Societies

Line Of Sight A.R.C. — The LOSARC of Western New York is a real active group. According to Milt Illi, WA2HBT, secretary . . . "Membership requirements are: An active interest in amateur radio, especially the promotion of v.h.f. techniques. Full membership is offered unlicensed persons who are planning to acquire a license in the future. The initiation fee is $3.00 which entitles the new member to two club net frequency crystals for 6 meters (52.5 mc) and 2 meters (145.8 mc), and, of course, the right to participate and vote in club activities. The dues are $5.00 annually. The meetings are held once a month, usually the first Sunday of each month at 1400 EST at the Grover Cleveland Clubhouse at Main Street and Bailey Avenue in Buffalo, New York. This, of course, is subject to change. Prospective members are invited to attend the meetings (there is usually ample notice of these meetings on the club net nights) where they apply for membership or contact me personally for a membership blank. All parties interested are urged to write me today . . . Milton

H. Illi, WA2HBT, Secretary, LOSARC, 2822 Harlem Avenue, Buffalo 25, New York."

V.H.F. High Banders of Marion, Ohio. Betty Satte, K8TFL, writes . . . "I would like to let you know that there is a new v.h.f. club called the V.H.F. High Banders, in the Marion, Ohio, area. We started last January (1961) and have twenty-three members and is open to anyone in Ohio. Our net meets every Thursday at 2000 local time with K8TFL as a NCS and meetings are the second Saturday of every month, being held at member's homes. Our project is to get everyone mobile for emergency operation.

"The officers are: Roy Philip, K8NQQ, President; Carl Durband, K8LMK, Vice-President; Betty Satta, K8TFL, Secretary and Treasurer.

"Anyone interested in finding out more about the club please contact me, Betty Satta, K8TFL, 795 W. Center Street, Marion, Ohio."

Independance, Ohio—on April 15 the Soft Tube Club of Ohio presented its semi-annual awards to outstanding v.h.f. amateur radio operators in northeastern Ohio. The recipients were Nick, W8LGG, from Kent, Ohio, for his determination to keep amateur radio as his hobby even though he has recently lost his sight, and to John, K8LMP, also of Kent, for his assistance in helping W8LGG attend all the ham functions and being his "eyes" whenever needed. Billy, K8TCI, who obtained her Novice ticket without the knowledge of her OM, who is also a ham, and going ahead and obtaining the Technician ticket under the same circumstances, also received an award. Bob, W8WUP, of Akron, was awarded his as one of the outstanding newcomers to the six meter band and qualified by his many excellent construction projects. (Thanks to K8CHE for this info!)

Project Moonbounce

144 mc—Summer 1961

This is an open letter, written by K1HMU, Farmington, Connecticut, and directed towards anyone interested in reviving moonbounce communication on 144 mc. Copies of this letter are being sent to about fifty hams all over the world that I think might be interested; all those interested are urged to pass along the information.

"It is true that W1FZJ, K6QKI, W2NLY and others tried moonbounce a few years ago, and had rather discouraging results, with weak and fading signals; however we believe that with improved equipment and greatly increased activity, two-way communication *is* possible via this method, and should not be overlooked. Since the pervious attempts, advances have been made in transmitter efficiencies, and receivers have become more and more sensitive; also, the problem of antenna design has been receiving more and more attention. By straining all equipment to the utmost, we believe that weak two-way communication is definitely possible. To get an idea of what is involved, here is a description of the equipment to be used at K1HMU this summer:

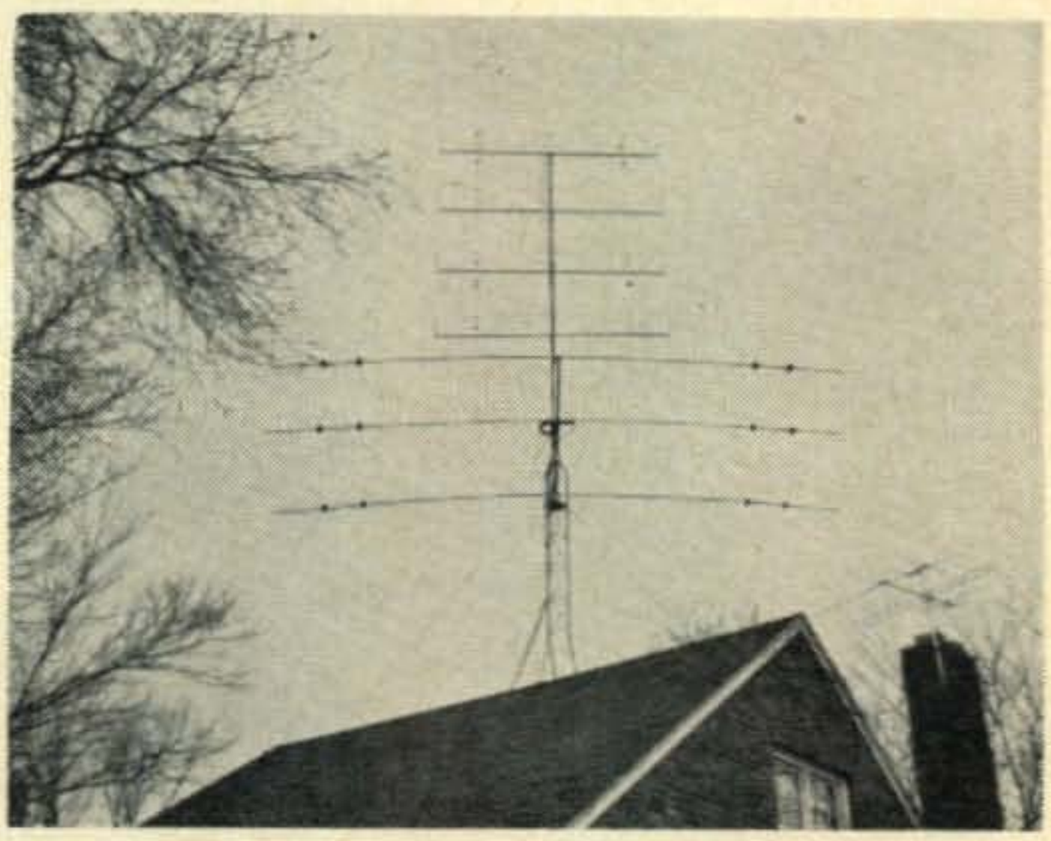
"*Transmitter:* stabilized crystal oscillator feeding into a Viking 6N2. Output from the 6N2 goes into a p.p. 4X250B final running at one kw input.

"*Receiver:* parametric amplifier feeding into 417A converter. Output from the converter at 14 mc goes into a GPR-90 receiver, with an i.f. passband of 250 cycles. Audio output from the receiver is fed into an audio filter, with adjustable bandwidth from about 10 cycles upwards.

"*Transmission line:* open-wire, made out of #12 copper; in any case the length of the line will not exceed 25 to 30 feet, since the equipment is to be housed in a shack right underneath the antenna.

"The antenna used rates a separate paragraph in itself. We believe that the primary reason former moonbouncers had such weak and fading signals was that they used linear polarization, either horizontal or vertical. However, there exists a phenomenon called Faraday rotation in the ionosphere, with the effect that any signal passing through the ionosphere has its polarization tilted a certain amount. Obviously, when this signal returns to the earth it will not have the same polarization it started out with; hence the receiving antenna is operating at much less than maximum efficiency. Also, this Faraday shift is not constant with time, hence the fading observed on signals. However, there is a solution: use circular polarization. For a circularly polarized signal, any Faraday rotation is negligible, since merely rotating a circle does not change its orientation. The helix is an antenna that produces a circularly polarized signal, and is the antenna to be used at K1HMU. Polarization of a helix can be either right or left circular; for conformity, let us fix on a standard method of winding the helix: when looking at the antenna from *behind* the reflector, the helix will be wound in a *clockwise* direction. The array used here will consist of four helices, each helix about 30 feet long, and stacked about 24 feet apart. The entire array will be mounted on polar axes, so that it will track the moon with a mimimum of difficulty. Approximate gain of the array is about 24 db; this may sound too low, but according

[*Continued on page 112*]



K8PCU's 32 element 2 meter colinear high atop his (unmentionable) 10, 15 and 20 meter tribander.

YL

BY LOUISA B. SANDO, W5RZJ
4417 ELEVENTH ST. N.W.
ALBUQUERQUE, N. M.

Results 12th YL-OM Contest

Once again, "congratulations" to the top scorers in the YL-OM Contest, this year the 12th annual, and held Feb. 25-26 (phone) and Mar. 11-12 (c.w.). On checking the scores YLRL V.P. W1ZEN, Onie, was delighted to find that the YL winners in each category were from our newest states—Alaska and Hawaii.

In the phone section KH6DLD, Sheila Goodhue, held the highest score among the YLs. She placed second in the '58 contest as KL7BHE. W5DRI, Dena Morgan, came in second, following up three straight wins. KØEPE, Martha Wessel, had third high, moving into the top three for the first time.

In the c.w. section, top YL scorer was Geraldine Nichols, KL7ALZ. Geri placed second in both the '60 and '59 contests. Mildred Wright, K5LIU/5, came in second this year, moving up from third place last year. (For phone and write-up check *CQ* for Mar. '61, p. 95.) Third high score was earned by KØIKL, Joyce Polley, who was winner in the c.w. section last year. (Photo and write-up in *CQ* for Mar. '61, p, 95,)

Among the OMs, W8AJW, Jack Siringer, won in the phone section. Jack has been a three-time winner previously, and last year placed second. W4SVJ, Richard Brandt, came in second on phone, while K4JIG, William Egbert, placed third.

On c.w. W5WZQ, David Blaschke, made top score. K2EIU/2, Kenneth Keeler, came in second. Last year he placed first on phone and second on c.w. In third place was W4VNE, Carl McCullough.

Checking the some 350 logs received was a huge job for W1ZEN, and she was grateful for help from K1IZT, Blanche, YLRL's secretary, and several other WRONE gals who gave her a hand. Six logs were disqualified for being mailed after the deadline.

Other comments from Onie: Once you have given a contest number, this number must not be changed. If you find you have skipped a number or given the same number twice, your log must show these errors. Total contacts would, of course, show the correct number worked. Once a number is given, if you change the number, then when the logs are cross-checked the numbers will not correspond. And you will have fewer errors if you will take the time to "roger" a completed contact. And Onie adds: "To about one third of you, a very hearty 'thank you' for having pity on my eyes—to the other two thirds, let me ask, 'would you like to check some 200 logs that looked like yours?' "

Sheila Goodhue, KH6DLD, high YL scorer on phone in the '61 YL-OM Contest. Sheila is ex-KL7BHE, W8EBM, and her OM Ed is KH6DLF. Most of Sheila's operating of late has been during contests with the assurance Ed will cope with jr. ops and house.

Martha Wessel, KØEPE, third high scorer on phone in theYL-OM Contest. Marte's OM Pete is WØJYW, and when she gets into a contest he takes time off to be sure the rig keeps working. Marte got her ticket in '57 and she is active on the LCL and Tangle nets. *(Photo by WØOEV.)*

High Scores

YL PHONE	Contacts	Sections	Score
KH6DLD, Sheila Goodhue	553	75	51,844*
W5DRI, Dena Morgan	554	62	42,170*
KØEPE, Martha Wessel	621	67	41,607
OM PHONE			
W8AJW, Jack Siringer	105	40	5,250*
W4SVJ, Richard Brandt	88	43	4,730*
K4JIG, W. H. Egbert, Jr.	74	37	3,423
YL C.W.			
KL7ALZ, Geraldine Nichols	424	66	27,984
K5LIU/5, Mildred Wright	414	54	27,945*
KØIKL, Joyce Polley	402	55	27,638*
OM C.W.			
W5WZQ, David R. Blaschke	74	36	3,330*
K2EIU/2, Kenneth Keeler	65	30	2,438*
W4VNE, Carl McCullough	59	30	2,213*

(* denotes low-power multiplier)

Geri Nichols, KL7ALZ, high YL scorer on c.w. in the YL-OM Contest. Geri's OM is KL7MZ and she says he really earned the cup for his many hours of baby-sitting and housekeeping.

YL-OM Contest Scores

YL PHONE

WIRLQ	23,283*	W5JCY	3,976	KØEPE	41,607
KILCI	12,100*	K6EXV	13,814*	WØRAW	13,740*
WIZEN	8,050*	W6WBH	11,008*	KØITP	9,950*
KIDWH	5,050*	WA6HKE	7,887	KØHEU	9,585*
WIYPH	2,828*	W6JZA	4,703*	KØIKL	6,418*
KIADY	2,498*	K6UHI	512	WØVTX	6,255
W2EWO	7,028*	K7JQG	20,591*	KØORH	5,539
K2JYZ	5,744*	K7MRX	9,713*	KØGIC	3,120*
K2OEW	2,920	K7ADI	4,703*	WØWDM	2,613*
KINKS/2	2,300	W7GGV	3,250*	KØVHR	2,338
W3TNP	27,525*	W6WDL/7	180*	WØOPX	924
K3JGV	1,339*	W8NDS	13,515	KH6DLD	51,844*
W4WYR	21,994*	W8ATB	496	VE4PE	6,191*
K4CGW	18,921	W8KLZ	435	VE6RP	11,110*
K4QNI	10,836	W8LGY	399*	CTIYE	3,996
W4GUZ	2,852	K8VFR	349*	G3LWY	188*
K4LMB	881*	K9AMD	19,316*	YNIEDB	16
W5DRI	42,170*	W9UON	7,576*	Confirmation only: W4HWR/2, W3MDJ, K5BNQ, K5BJU, K5JGC	
W5ERH	33,188*	K9QGR	3,240*		
K5YIB	21,490*	K9WGC	1,000		
K5JXD	14,630*	W9MYC	323*		
K5LIU/5	5,643*				

OM PHONE

WINEP	2,025*	K5IID	3,191*	W8CXS	123*
WIGKJ	1,290*	W5IWL	3,060*	K8NHC	1
WILKG	1,125	K5OCX	2,228*	K9AKF	1,375*
KIKDP	760*	K5UYF	891*	W9LKI	1,344*
KICEY	540*	W5DWO	858	W9LNQ	736*
WITQS	459	W5NXF	713*	W9QFR	720*
WIHOZ	391	W5OUH	660*	W9QWM	683*
KIAQE	120	W5GFT	432	K9LVK	60*
K2EIU/2	1,406*	K5FLD	316*	KØUAF	1,121*
W2COB	1,230*	K5CBA	244*	WØVKB	675*
W2KIW	1,150*	W5BJU	206*	WØKCG	495*
WA2OJD	765*	W6FGJ	3,023*	WØYQR	391
K2JTU	585*	K6CJF	1,890*	WØARO	375*
W2PEV	544*	W6JVA	1,856*	KØRFX	280*
K2GTC	100*	W6BSY	1,392	KØMRO	213*
W2MYN	40*	K6MPX	760*	KØGIA	110*
W2CVW	30	W6QXF	416	KØAJW	79*
W3BVL	660	KIHTK/6	40*	VE3RN	158*
W3QLW	486	W7SFK	2,176	G3NFV	5*
W3CDG	169*	K7ILQ	1,789*	HPIAC	689*
K3ALL	120*	K7NFU	1,755*	KW6DG	25
W3BXG	105*	W7DZB	1,406*	SM5CHA	1
K3BPQ	88*	W7KOI	630	VP7BP	630*
K3DFU	38*	W7RZY	595	Confirmation only: W2HYX, W2MWP, W2RZM, W3EOS, K3JKJ, W4CRN, WA6HWO, W8HTA, W9TXF, WØWUU	
W4SVJ	4,730*	W7ACD	588		
K4JIG	3,423*	W7OJV	244*		
K4HIA	2,513*	W8AJW	5,250*		
K4STY	2,248*	W8UMR	1,994*		
W4JUJ	1,125*	K8CIP	1,409*		
K4OVE	784*	K8RMK	808*		
W4KPB	206*	W8WT	744*		

YL C.W.

WIRLQ	19,451*	K4ZNK	13,500*	W9MLE	13,169*
KIIJV	7,065*	K4TFL	8,415	K9TUD	8,788*
KILCI	4,991*	W4UF	7,700*	W9USR	4,030*
WIYPH	3,000*	W4UTO	375	W9MYC	1,175*
K2ZQG	16,296	K4RHU	163*	KØIKL	27,738*
W2EBW	9,594*	K4LMB	149*	WØKJZ	16,394*
WA2LOZ	6,006*	KN4BWQ	53	KØGIC	11,615*
W2RUF	4,992	K5LIU/5	27,945*	WØOPX	60
K2AGJ	2,929	K6ENL	12,220	KL7ALZ	27,984
K2JYZ	2,219*	K6OWQ	18,495*	VE3AJR	4,800*
W2EWO	105*	K6QPG	4,185*	VE3DDA	380*
K2JBX	90*	W6PCA	2,480*	VE5DZ	2,079
W3TSC	16,233*	WA6AOE	613*	JAIYL	65*
K3EHZ	15,040*	K7HSB	17,700*	VK3KS	1,283*
W3SLS	13,073*	W7PUV	5,130*	YUIBKL	653*
K3JGV	7,308*	K7ADI	810*	Confirmation only: K4EQB, K5BJU, W6NAZ, KØJAS	
W3CDQ	1,008	K8MKG	14,513*		
W4JYQ	18,605*	K8LPI	13,205*		
		W8KLZ	6,521*		

OM C.W.

WIGKJ	1,140*	K4GPH	356*	W9YDQ	788*
WINEP	919*	W4HYW	320	K9UCR	308
WIAZW	489*	W4RZU	169*	W9DYG	188
WIOPZ	469*	W4HOS/4	90	K9YYR	188*
WINJL	298*	W4CHA	25	W9FNX	70*
KIITU	264	W5WZQ	3,330*	WØKCG	1,885*
WIGPN	255*	W5DQK	1,594*	WØVKB	1,200*
WIVBR	255*	K5OCX	1,300*	WØRNH	990*
WIMRQ	143	W5DWO	1,269	WØGAX	760*
WIINB	128	W5CYQ	1,073*	KØQLY	510*
WIMD	100*	K5PKA	808*	WØEMG	431*
WIEHJ	88*	K5IGW	293*	WØVFE	320*
KINOL	79*	K5UYF	179*	WØDEP	255*
WISXX	15*	K5CBA	64	WØARO	238
K2EIU/2	2,438*	K6CJF	1,519*	WØMCX	154
WA2DIG	1,590	W6WLV	163*	VE2IL	990*
K2GTC	1,294*	K7NFU	792	VE2AQO	180*
W2AAU	874	K7GFH	400*	VE3DYJ	520*
W2CVW	858	K7IWD	70*	VE3RN	413*
K2IMK	840*	K7JCA	30*	VE3MI	285*
K2SPP	808*	K7GTK	15*	VE3OL	20*
W2KAT	726	K8KFP	1,849*	VE7BFN	195*
W2EMW	725*	W8NAN	1,250*	DL6MK	113*
W2UAP	675*	W8IBX	1,200*	F8TM	20*
W2LHL	420*	W8CXS	1,064*	F2SQ	1*
W2NIY	248*	W8KPL	880	HK7ZT	20*
WA2KQG	248*	W8BQV	520*	ITIAGA	38*
K2DDK	240*	W8PYX	450	JA2JW	68*
WA2OJD	234	W8AJW	394*	JA2YAB	5*
WA2KQK	75*	W8APC	322	JA2WB	1*
W2HBO	15*	W8VDF	179*	JAICUM	1*
W2NHH	5*	W8DM	77	KW6DG	56
W3GYP	1,654*	K8NHC	61*	LA6U	20*
W3ARK	864	W9LNQ	1,957*	SP6FZ	156
W3QLW	551	W9BZW	1,690*	TF3AB	20*
K3DFU	446*	W9CLH	1,234*	VP7BP	25*
W3CDG	375*	K9DWG	1,170*	YUISF	1*
W3MSR	234	K9ICG	1,155*	Confirmation only: WIMGP, W2CC, W5GFT, W6BIL, K6SXA/Ø, SM3ATG	
W3UIU	200*	W9YAE	1,018*		
W3BXG	101*	K9ASF	1,104		
W4VNE	2,212*	W9RKP	880		
W4SVJ	2,135*	W9QWM	810*		
W4JUJ	1,208*				

KH6DLD

KH6DLD, Sheila Goodhue, who won the phone section of the YL-OM Contest, was first licensed as WL7BHE in Oct. '54, followed a few months later by General and KL7BHE. Her OM Ed was W1PIV (also KL7PIV and W8EBK) for several years in Massachusetts, and he is the reason for her getting her license. Sheila confides that she went with him on a hidden transmitter hunt in New England fog and out in the "wilds" of Southern Mass., they lost the grid drive on the rig . . . like the old one about running out of gas . . . anyway, they decided to become engaged!

KH6DLD-KH6DLF operate 20 mostly; 15, 10 & 40 under good condx. They both chase DX and both hold WAZ (#549 and #550). They also hold DXCC, DXCC phone and CHC in common, from Alaska, and DXCC from Hawaii. Shelia holds close to 50 other certificates. Currently she is president of the KH6-YL club.

In the contest KH6DLD used a B&W 5100 on a.m. and KWM-1 on s.s.b., with an A-4 receiver. They also have a linear final which they use for DXing, and an a.m. or c.w. final of 2 4-400's to go with the B&W.

Sheila and Ed have three jr. ops, ages 5½, 4

and 15 months, with a fourth due by the time you read this. She has spent 10 years as a Girl Scout troop leader, volunteer trainer and troop consultant; is active in PTA and church work. Despite all these activities she finds time for Ham radio and adds that it is more than a hobby with them—it is their way of life and center of much social activity.

Dena Morgan, W5DRI, earned second high phone score in the YL-OM Contest. She was top scorer in '58, '59 and '60 and placed second in '57. Dena was licensed in '54, works all bands, and she and her OM W5DQK have three jr. ops.

KL7ALZ

KL7ALZ, Geri Nichols, winner among the YLs in the c.w. section of the YL-OM Contest, has been licensed since 1951. OM Nick is KL7MZ and together they operate 10 through 75; a.m., s.s.b., c.w., RTTY (a.m. and s.s.b. on 10 only). She prefers c.w. with RTTY second choice. For equipment they use a Collins R-390 receiver; HT32A exciter. Thunderbolt amplifier, TA-33 beam, Ham-M rotator. For teletype: Boehme 5C audio-type convertor, Model 15 printer, Model 14 typing re-perf., Model 14 xmtr distributor (TD). Geri is a member of AF MARS (AK1ALZ) high speed c.w. net and RACES 2-meter CD net.

Geri holds DXCC phone (141 worked), YLCC (150), WAC-YL, WAC phone and also c.w., WAS phone and also c.w., Maritime Mobile, WGSA, WAV, etc. Geri really enjoys contests and has been district top scorer in many. She was D/C for YLRL in '58. A charter member of PARKA, she has served as V.P. and as president, editor of PARKA HI-LITES, and currently is custodian of PARKA award and membership chairman.

Geri and Nick have daughters ages 13 and 12, and sons aged 8 and 7. She also holds down a job away from home and wondered if it was worth it to take a day off for the contest—hi!

With the Clubs

Officers of GAYLARKS, at Houston: Pres., W5ERH, Betty; VP, K5UGC, Bea; sec-treas., K5YIT, Liz; historian, K5VNW, Edwina.

The Georgia Peaches have voted to give full membership to former honorary members in neighboring states and also to members who have moved elsewhere. Contacts with 10 Georgia Peaches are required for the Peach certificate, and these may be any members regardless of where they live. Confirmations should be sent to VP K4DNL, Olivia Coogler. For each additional five confirmed contacts a sticker is issued. The net meets every Thurs. at 0900 EST on 7260.

The Floridora YLs held their annual business meeting and 4th birthday party April 7-8 in Orlando, in conjunction with the Orlando Hamfest and Southeastern Div. Convention. The party was held in the home of K4UIZ, Evalyn, on the evening of the 7th with 23 members and their OMs attending. Highlights were the showing of color slides by W4UF, Dot, of her trip around the world, and the presentation of a charm bracelet to Evalyn in appreciation of her efforts in making the annual affair so successful.

At the business meeting the following officers were elected: Pres., K4RED, Lucy; VP, W4HRC, Little Bo; sec., K4ANR, Ruth; treas., K4RCX, Jeri; membership chm., W4BIL, Frances; historian, W4HRC, Little Bo; certificates, W4WPD, Shirley; P/C, K4RDX, Anne. There are 100 members of the Floridora YLs.

New net managers: K4JZX, Joan, Mon., 0900, 7225 kc; K4VRV, Rinnie, Tues. 0900, 7215 kc, ssb (lower); K4ACF, Nancy, Tues., 1000, 50.330 mc (So. Fla.); KN4NSY, Madlyn, Wed. 0900, 7185 kc c.w. (Novice); K4ANR, Ruth; Thurs. 2000, 50.30 mc; W4HRC, Little Bo, Sun. 0900, 7225 kc.

K4PPX, Fran, received the *Florida Skip* WAS V.H.F. Award for working 33 States in the recent Contest.

W1HOY, Helen, reports the WRONE spring luncheon, held May 6, was a tremendous success with over fifty YLs attending. K1ICW, Mary, hospitality chm, and her committee did a fine job to celebrate WRONE's 5th anniversary. A prize of 100 WRONE QSL cards was presented to K1EAV, Belle, as winner of WRONE Week Contest. W1ZEN presented awards to Chata, W1RLQ, as district YL winner on both phone and c.w. in the YL-OM Contest. . . . New adoptees sponsored by WRONE's "Yankee Lassies" Net are SM5BLX, Anna, and OA4HK, Jean.

New QTH

No doubt you noticed the new QTH for your column editor in the last issue—that's all we had time for. But just to keep you posted: OM Joe has been working as audiologist at the Lovelace Clinic here in Albuquerque since Feb. (he's tested some of the astronauts) so we sold our Santa Fe home and moved here in mid-April. Got a place with half an acre so plenty of space for antennas (and gardening). Also fun to be close to active YLs (though contacts mostly have been via landline). Only drawback, as my editor comments, is that now one has to learn how to spell Albuquerque—hi!

33, W5RZJ

IN STOCK AT HARVEY

Sparkling new . . . smooth-working combo . . . a powerful 100 watt AM transmitter, sensitive dual-conversion receiver . . . two-way operation on 80-40-20-15-10 and 6 meters. This handsome, designer-styled package is just slightly over one foot long, less than six inches high, mounts handily under the dash of your car—blends in too, belongs. Transistorized DC supply is separate, mounts in any small convenient space.

GONSET G-76

6-band 100 watt AM transceiver

You can take this G-76 out of your car, use it—with matching AC power supply and speaker assembly—for excellent 6 band fixed station operation. Here's opportunity to add new enjoyment —and DX—with operation on another lively amateur band, 6 meters. G-76 is a full-blown, star performer on 6 as well as the other five widely used 10, 15, 20, 40 and 80 meter bands.

While G-76 is properly called a **transceiver** because of some common audio circuitry, transmitter and receiver are separately tunable. Receiver can be set to out-of-band DX, transmitter VFO anywhere within the band. Transmitter VFO is intended to be spotted on receiver dial. Frequency control may be either by VFO or quartz crystal. (Except on 6 meters which is crystal controlled only.) Transmitter and receiver oscillators are both compensated so that drift with temperature is negligible. Oscillator circuit has very low drift even with exceptionally wide excursions in both plate and filament supply voltages.

HIGHLIGHTS: Transmitter power input 100 watts AM, 120 watts CW • pi network output for 52 ohms • Dual conversion receiver • BFO for CW/SSB reception • Automatic noise limiter • Sensitivity: approx. 1 microvolt at 50 ohms for 6 db S+N/N ratio • Selectivity: 3 to 3.5 kc bandwidth at 6 db down, 14 kcs or less at 60 db down.

G-76 less power supply and speaker, #3338	399.50
G-76 transistorized 12V DC power supply (neg. ground), #3350	145.00
G-76 power supply for 117V AC w/speaker, #3349	145.00

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 21, on page 126

VHF Contest [*from page 61*]

W2DTJ, were helping WA2LRO, accumulate a fantastic score on 6 meters! Next time something will have to be done about strange occurrences like this . . .

All kidding aside, though, we had one whale of a time reading your comments on the contests and suggestions for the next. Some conclusions

Tennessee 6 Meter Winner, Charles Tucker, K4YOF, at the operating position in Powell.

were reached which should affect next month's all-out contest:

1. Contest was suggested to run 12:00 noon Saturday local standard time (daylight standard for some) to 12:00 noon Sunday. This should allow some time to recooperate.

2. Next years' contest will be held in April to permit better weather conditions for mountain-toppers and also some better chances of Sporadic E for the 6 meter 'ops.

3. Power multipliers (an experiment) will remain the same.

4. No multi-operator stations shall be allowed to compete with single-operator stations. Multiple operator stations will be catagorized separately as with multi-band stations.

5. Only single operator stations may compete for nationwide honors.

There are also other little changes to be made here and there, but nothing major. As your suggestions pour in, revisions and changes will be made. See V.H.F. COLUMN for details.

'Till next month's big contest,

73, Bob Brown, K2ZSQ

Bold Face Listing [*from page 57*]

That is, I answered 'em all with a lonesome exception. One cunnilinguist offered to punch me in the nose if I didn't reply to his original QSL, which I still haven't received. I lost my temper and threw his card in the round file. This was probably an over-hasty mistake, as my nose has been hit several times before and it's awful tender!

This morning I mailed out between two and three hundred cards, and a note to the patient people who publish the *Call Book*. My final listing:

KL7CDQ. Terry Murray, Anchorage, Alaska. Sri OM, unable QSL. Anybody for a ragchew?

Propagation [*from page 72*]

period there is an increased likelihood that meteor-type openings may take place on frequencies as high as 148 mc.

Sunspot Cycle

The Zurich Solar Observatory reports a monthly sunspot number of 62 for April 1961. This results in a 12 month running smoothed sunspot number of 93 centered on October 1960.

A smoothed sunspot number of 70 is predicted for July 1961. This is about the same level of solar activity that occurred during the summers of 1940 and 1951.

See the Last Minute Forecast at the beginning of this column for the day-to-day conditions expected during July.

73, George

Ham Clinic [*from page 77*]

Most local libraries have copies of the better magazines. For those of you bent on obtaining a rare copy of *CQ*, the best way to get it is to advertise for it.

My file has been "shot full of holes" by inconsiderate hams who did not return a copy of *CQ*, *QST* etc. which I loaned them. Repeated letters have done little good. So from now on, HAM CLINIC will not loan its file copies. This is a sad state of affairs—when a ham is helped and then doesn't keep his end of the "bargain."

Viking Ranger—"I cannot copy any signal on my receiver when I switch from c.w. to the STAND-BY position on my Ranger because of the noise generated within the transmitter? What should I do?"

Replace the gassy clamp tube.

6AC7 vs 6SK7—For those of you who wish a little more gain with less noise, try replacing your 6SK7s with 6AC7s. Gino Giannotti says it helped in his set. Thanks Gino and 75 to you too!

Apache Key Defect—"What causes my Apache to continue operating after the key is released? Everything seems to check okay otherwise?"

Replace that little NE-2 neon bulb in the keying circuit. There is your culprit! (Thanks and 75 DL4BS)

On Surplus Manuals—W4FXQ owner of Propagation Products Co., Box 2513 Norfolk 1, Virginia says that he stocks over 200,000 surplus manuals and can supply original tech manuals for most of the electronic equipment on the surplus market today. Write him for full info, or your requirements. We would like to hear from others who can supply this service.

Thirty

For this month, thank you for reading and writing to HAM CLINIC. 73 and 75 and 72 to our overseas ham friends.

Chuck, W6QL/4V

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Complete Rules Appear On Page 95 of This Issue.

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Novice [*from page 91*]

doublets for each band. Look for Tom on 21.108, 21.140, 21.150, on 40 at 7185 or on 80 at 3725. So far Tom has picked off VE's, KL7, WL7, KP4, WH6 and LU6.

Bill Axsom sure has a call—KN9BUG, and lives at 1819 Waffoner Avenue, Evansville, Ind. Bill operates 40 with a Globe Chief 90A and NC-60 and has corralled a WAS of 42/39 plus a VP7. Bill will sked anyone needing Indiana and if he owes you a QSL drop him a line for he is a 100 percenter.

Finger talking artist Tom Hyde, KN5FKA, has his QSL collection mounted in a loose leaf notebook. Slick idea!

Carlton Carlson, WA2LYP, 28 Country Club Drive, Mount Marion, N.Y., is using the simple screen modulator described a few months ago. Carlton send along a simple trick for easy switching from phone to c.w. and is shown in fig. 7

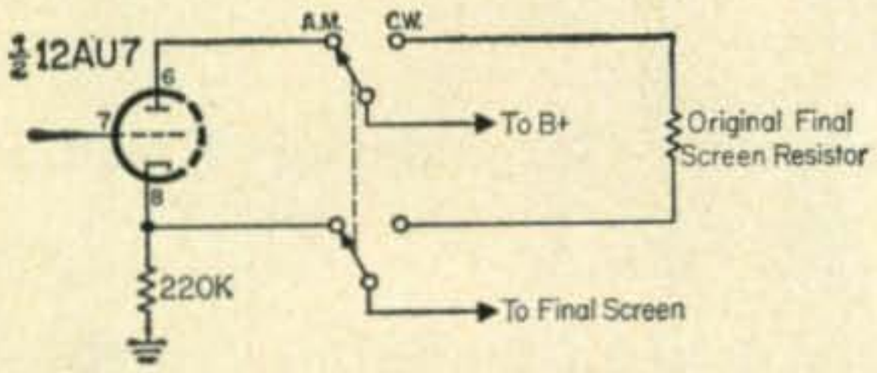

Fig. 7—A simple a.m.-c.w. switching system for the screen modulator shown in the May 1961 column, as suggested by Carlton Carlson, WA2LYP.

He says "First mount a d.p.d.t. toggle or rotary switch on the modulator chassis. Locate the original screen resistor in the transmitter and connect the screen of the final to the modulator. Finally connect the B plus directly to the modulator from the transmitter HV supply as shown in the diagram." Thanks for the tip, Carlton.

Let's close up shop this month with one of the new WN4's. Joseph Taylor Monfort, WN4APB, 6772 16th St., North, St. Petersburg, Fla. is 14 and can be found 99% of the time on 40 meters. His record so far? 17 states and 145 QSO's in one month, with a Knight T-50 and a Navy ARO inhaler. "Ti" as he likes to be called, will sked anyone for any reason and QSL's 100%.

That folds our dipole for another month. Get your nose out of the log and drop a line—hi!

73, de Don, W6TNS

Project "SPACE" [*from page 55*]

of power with the aid of reflectors to intensify the sunlight. Nickel cadmium storage batteries were used in conjunction with the arrays to maintain stable voltage and for storage. No standard electrical power was used for this experiment.

Our second difficulty was a suitable rig for the experiment. It was finally decided to use a transceiver from the pilot run of the Hallicrafter Co. FPM-200. This unit uses 41 transistors, 30 diodes, 20 quartz crystals, 3 gas regulators and 3 vacuum tubes. The latter consist of a 12BY7 driving a pair of 6146s. The unit weighs 24 pounds, is exceedingly compact, and is designed to operate on low power, which made it ideal for this experiment. It developed an output of 90 watts p.e.p. on s.s.b. which was the only mode of operation used in this experiment. The unit includes a transistorized d.c. to d.c. converter to obtain the required high voltages.

Antenna

The antenna used for the operation of the Fort Monmouth Station, K2USA-AA2USA was a Telrex Triband, Model TM-30. This antenna was also used for the K2USA/2 Field Day operation. The Triband was used as original plans were for operating on 10, 15, and 20 meters, although only 20 meters was used.

The first solar-powered contact from the Fort Monmouth installation, was made by Russ, W4PBX, and Mel, W2OAI, and was with Bill Long, W9VNQ, of Warsaw, Indiana on 20 meters. To say that Bill was somewhat surprised when we informed him of our power source, is putting it mildly. Col. Rouge, operating the Fort Monmouth station, made the first 2-way completed solar powered transcontinental contact, with Shelton Stern K2QKL/6 operating the station in California.

The array was set up and solar power was used for a part of the Fort Monmouth Radio Club (K2USA/2) Field Day operation. The array furnished adequate power during the daylight hours but of course would not function after sundown. It was used all day Sunday, 26 June, except for an hour at noon. During this period the array furnished power to charge the storage batteries.

Most of the Field Day solar power operation was conducted by Russ, W4PBX, Mel, W2OAI, and Art, K2UJA.

On 28 June the array was again set up at Fort Monmouth and operated for most of the day on 20 meters. We had a total of 75 completed QSOs, and our best DX contact was Germany; although from several reports we were being copied in VK land.

Personnel assisting in the project in addition to those mentioned above included George Uchrin, George Hunrath, Andrew Herchakowski, Richard Nichols, Wallace Smithline, Peter Gryson, Victor Beyer and Morris Stern of the USASRDL and P.F.C. Richard M. Maher, WØVZI and Sgt. Salvatore C. Insana, WA2K6N, both of whom were operators at K2USA. ■

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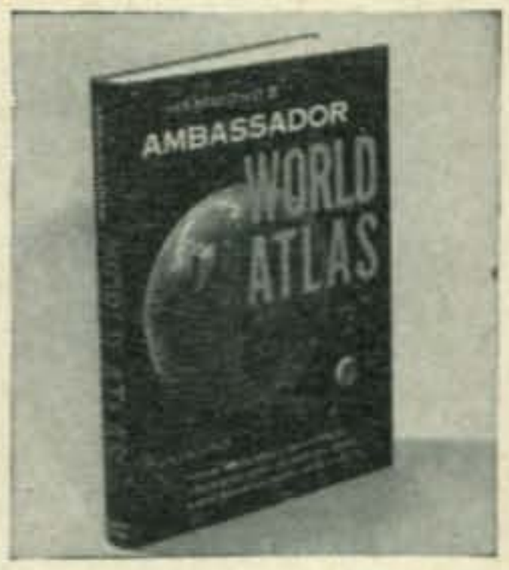

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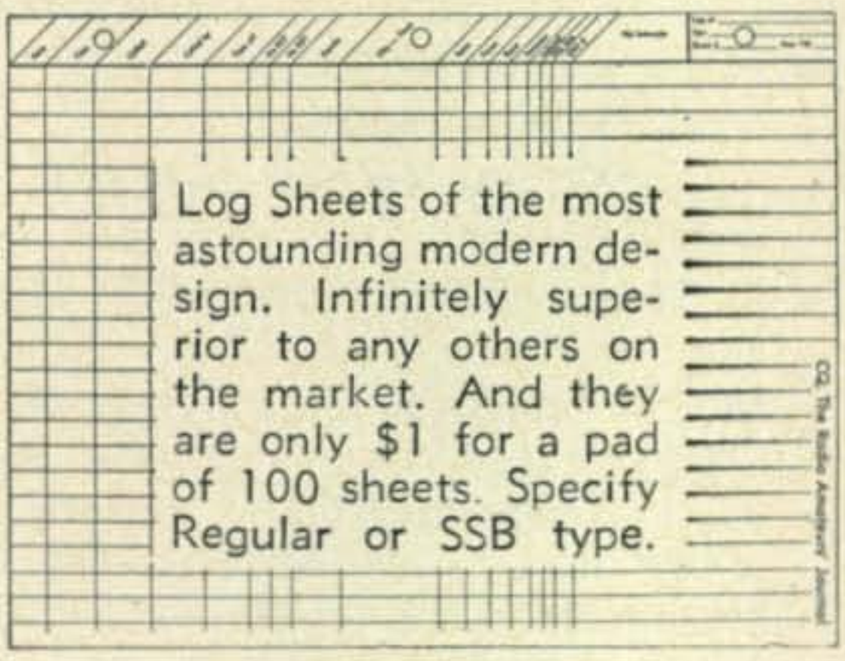

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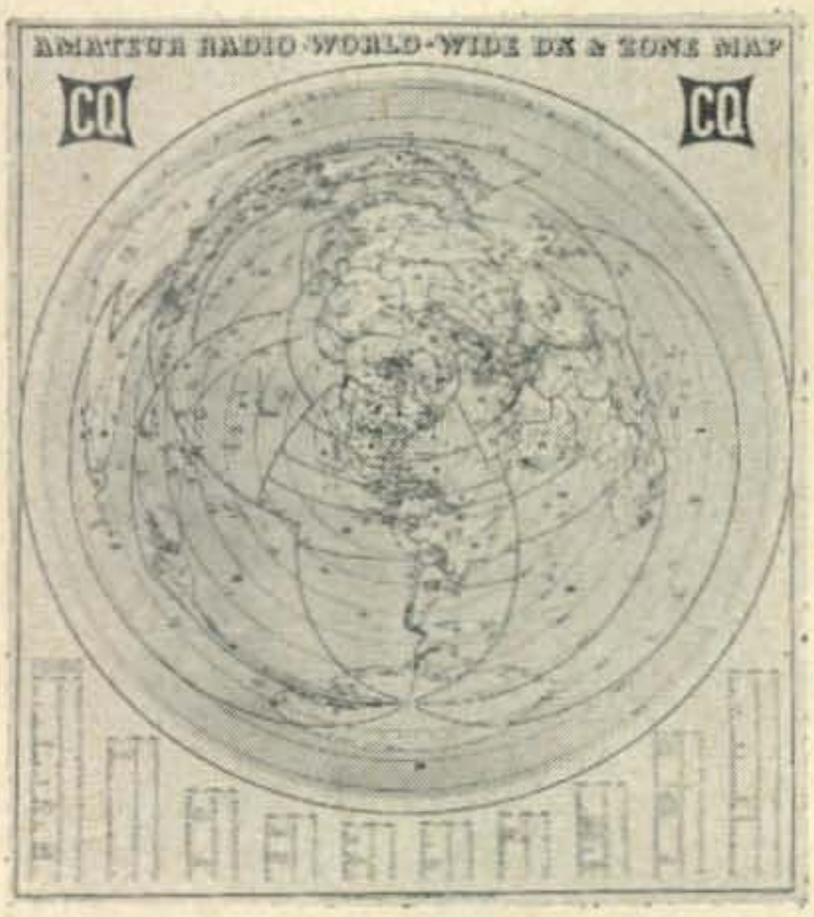

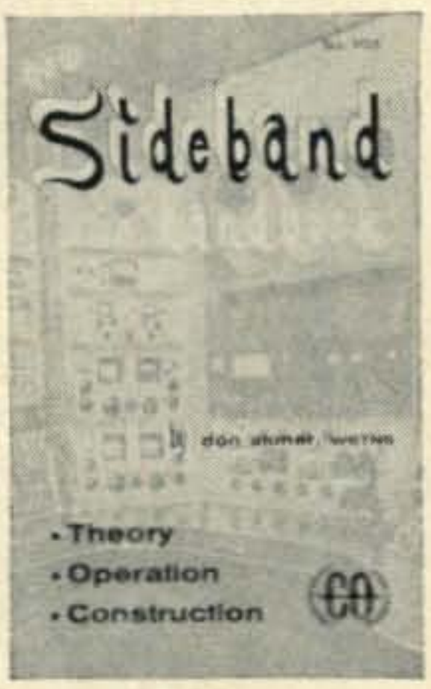

SIDEBAND HANDBOOK

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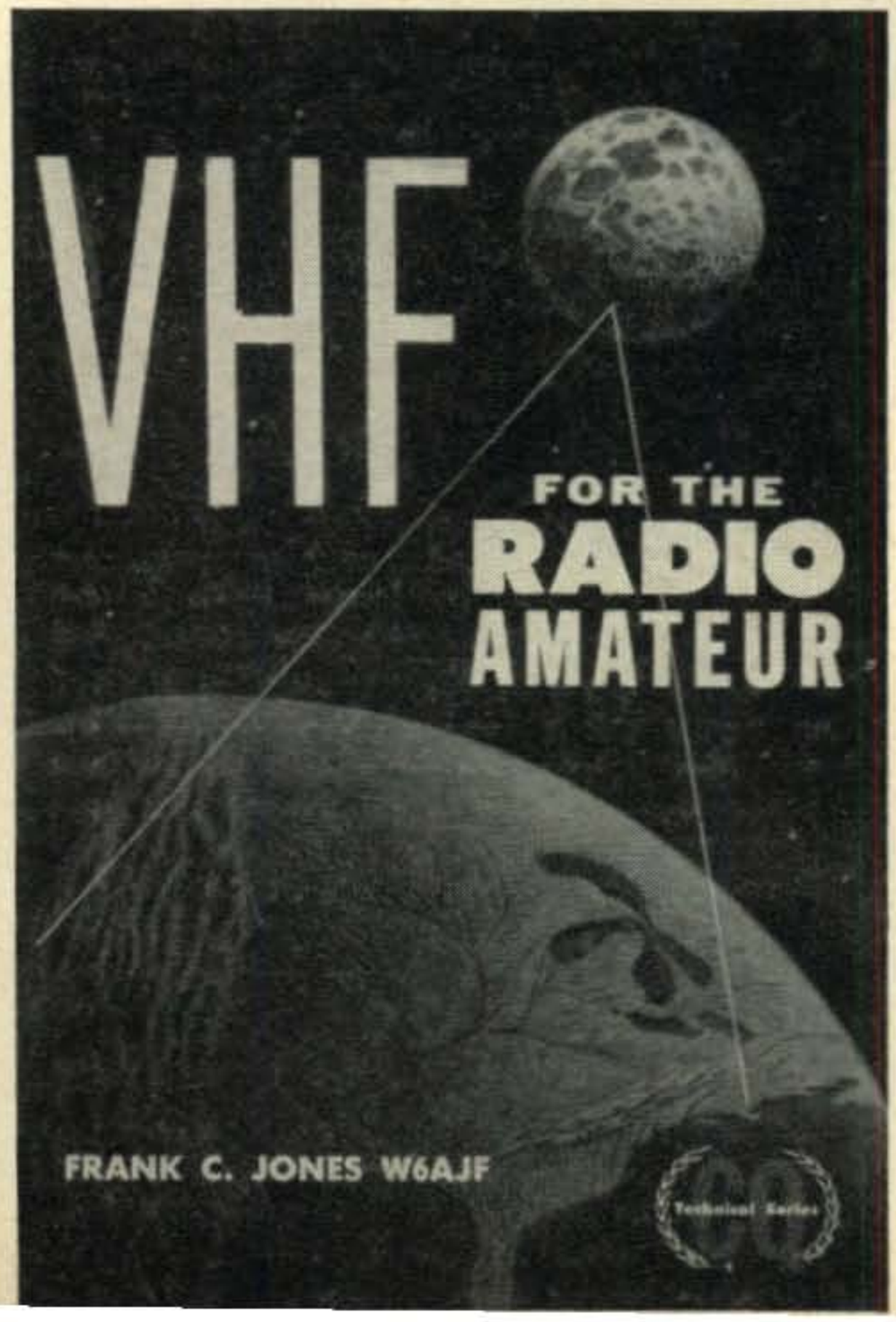

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see pages 118 & 119 May CQ

C-7

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V.H.F. [*from page 99*]

to all available data, this is just sufficient for a positive signal to noise ratio.

"This completes the roster of equipment to be used here; the only problems remaining are the cooperation of other stations for two-way communication, and the timing of the actual tests. The only equipment I have left to build is the antenna and the paramp; hopefully, for a well-equipped station on the other end, the only special equipment required would be the helix array. Thus testing could take place fairly early in the summer; I am hoping for about July 15.

"Will anybody who is interested in this project please take time to write me *now* at the address below; I have to know soon if there is going to be anyone on the other end! When you write, please include the status of your equipment, your preference for test scheduling, and especially any comments that you think relevant."

Ned Conklin, K1HMU
679 Yale Station
New Haven, Connecticut

Thirty

How about some of you heat stricken, sunburnt undiscovered literary geniuses dropping a line once in a while? In any case the heat is getting me too—I'll be darned if that wasn't W7MAH calling *CQ* on 50.112! *What better reason to sign!*

73, Bob, K2ZSQ

Contest Calendar [*from page 74*]

14 mc		UB5EF	4	KH6DMW	60
DL1YA	6	YU3TT	96	VK5NQ	2,067
HA5FX	46	**7 mc**		VK2GW	1,470
HB9J	429	UA4KAB	700	VK6RU	567
LA9K	36	OH2CM	1	VK9XK	2,640
OH3VJ	645	SM2CXM	1	ZL2GS	399
OK3JR	552	**Oceania**		**28 mc**	
ON4QX	270	**All Band**		VK2DI	220
OZ3CF	144	KØSLD/		**21 mc**	
PAØLOU	98	KW6	1,875	KH6DVG	36
SM5TW	115	KH6DLF	2,760	**14 mc**	
SP8HT	310	KH6CYB	800	VK4SD	368
TF3AB	9				
UA3RO	297				

Corrections

In the May 1960 CONTEST CALENDAR, two typographical errors slipped by unnoticed; namely W8QHW was listed as W8OHW and WA6ECF as WA6ECP.

The c.w. results of the *CQ* W.W. DX contest, (June p. 62) unfortunately did not list some of the European results. The omitted segment of the results is printed below. Our apologies to all concerned.

DLØIB	27,432	176	32	76	
(DJ2UJ, DL3ZH, DL6FG, DL9JJ)					
DL5BR	75,774	259	54	119	
(Club Station)					
Hungary					
HA5KFR	139,320	526	45	127	
(Club Station)					
HA5KDQ	82,050	406	34	116	
(Club Station)					
HA5KBP	42,658	490	18	59	
(Club Station)					
HA8KWG	39,220	310	28	78	
(Club Station)					
HA5KAG	28,662	200	28	74	
(Club Station)					
HA7KPF	18,252	200	21	57	
(Club Station)					
HAØKDR	56	7	3	5	
Luxembourg					
LX3AH	142,128	547	44	100	
(DJ2KS, DL7AH)					
Netherlands					
PI1MID	36,668	203	32	71	
(School Station)					
Poland					
SP5PRG	235,488	589	64	159	
(SP5ADZ, SP5BR, SP5ZZ)					
SP8KAR	10,841	177	11	26	
(Club Station)					
SP2KHB	3,751	110	8	23	
(Club Station)					
SP8KBM	1,830	26	13	17	
(Club Station)					

[*Continued on page 114*]

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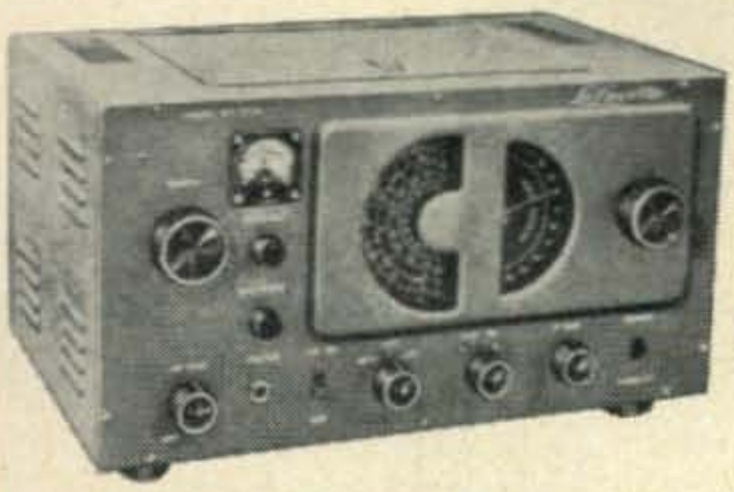

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For further information, check number 25, on page 126

Contest Calendar [*from page 112*]

Editor's Note

Just as I was completing this column I was pleasantly surprised by a visit from Konosuke Uenishi, JA3SQ. We spent a very enjoyable hour together discussing ham activities in Japan and in this country. Recently, restrictions on 2nd class operators have been lowered so that even greater activity can be expected from Japan.

Some weeks ago we were also very happy to meet Hardi Ludwig, DJ3JZ at the annual S.S.B. Dinner in New York. We are always happy to meet any of the overseas boys in person. Do drop in to say hello if you are ever in New York City. The *CQ* offices are easily reached in mid-town Manhattan.

On my recent visit to Nassau I was dismayed to learn of the untimely death of Charles Albury, VP7NM who was the QSL manager for the Bahamas. Charles suffered a heart attack while he was on an equipment inspection tour late in April.

The QSL duties for VP7 will be taken over by Donald Thompson, VP7NS, P.O. Box 48, Nassau, Bahamas.

Also had the pleasure of meeting Lowell Albury, VP7NY who took us on an extensive tour of the Island, Lowell is active on a.m. phone but also takes a crack at c.w. once in a while.

73 for now, Frank, W1WY

200 Mc Oscillator [*from page 51*]

the r.f. tuned circuit and crystal mixer junction. The capacitance is adjusted to give 300 to 1000 microamps crystal current.

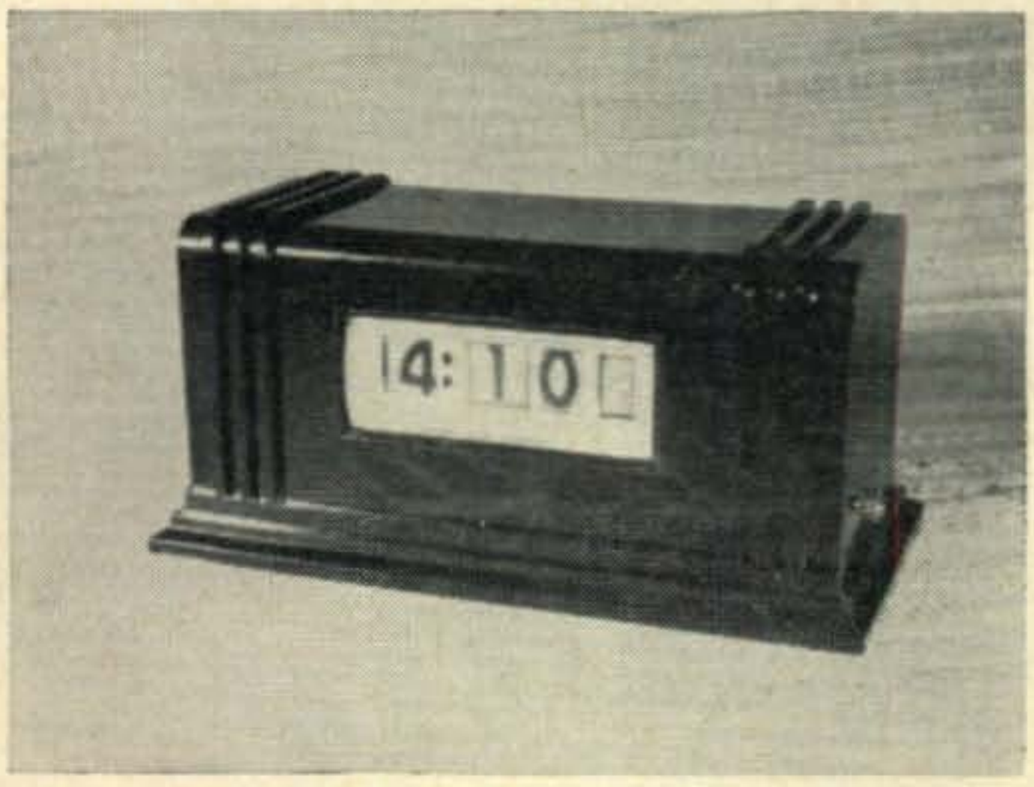
Tuning

The collector current changes very little with output. Therefore, the best way to adjust the oscillator is by measuring the crystal converter current or by a loop of wire near the tank circuit with a crystal diode and 1 ma meter in series with it. Adjust the tuning capacitor for maximum capacitance and then adjust the feedback capacitor for maximum output. The tuning capacitance is then decreased until the output drops appreciably and then is repeaked with the feedback capacitor.

The frequency should reach 220 mc with the circuit described. If the bottom of the coil is too close to the board, the frequency will be somewhat low but can be brought up by increasing the clearance. With a slightly smaller coil diameter the frequency can be brought up to 250 mc or higher.

The circuit was used in a 400 mc completely transistorized receiver with a 25 mc i. f. The oscillator was set at 187.5 mc and the second harmonic was used with good results. The stability seems to be good as the oscillator was adjusted to receive 400 mc one day and the following day the signal was heard loud and clear through a 150 kc wide i. f. strip as soon as voltage was applied to the circuit. ■

R for Clockwatchers [*from page 45*]



Front view of the modified clock. The push button switch on the right is used to zero against WWV.

here that while different models of this type clock may vary somewhat in construction, the general idea can be applied to practically all of them.

Conelrad

An added bonus can be had by using the buzzer as a Conelrad alarm. While this unit shown here does not contain this feature, it is only necessary to mount a small s.p.d.t. relay of the appropriate coil voltage (the voltage that appears on your Conelrad alarm output) inside the clock and wire it as shown in fig. 1b.

The buzzer used in this project sells for thirty-nine cents, plus postage.[1] When mounted as shown in this cabinet it produces a very pleasing tone because of the cabinet resonance.

A small, momentary contact push-button switch may be seen mounted on the right wall of the cabinet. This was incorporated a couple of years ago, and merely interrupts the a.c. to the clock for a more accurate setting with WWV without the necessity of removing the line cord.

Why not fill the prescription offered herewith? Then sit back and enjoy those rag chews just a little more. ■

[1] Burstein Applebee, 1012-14 McGee St., Kansas City 6, Mo., part no. 17A71

S-line Mobile [*from page 44*]

cause this location happened to be the best place to take advantage of the incoming ventilating air.

The Kupfrian unit must be mounted in a ventilating air stream. The MP-1 must be well ventilated but it did not need direct air blowing on it.

The distribution box was mounted on the side of the glove compartment because it was nearby and suitable. That other consideration I spoke of is the 2 kc whine which both of the transistor units are prone to emit. It isn't too loud but some people might find the noise objectionable. The vibrator bias unit was mounted on the after side of the front fender just below the voltage regulator.

Operation

Here's how it works once all the components are in and all lines are hooked up. Turn on the power control switches one by one starting from the left. Flip the transmitter and receiver power switches to desired operating position. Let the gear warm up a bit. Once it has, you're ready for business. When you're ready to talk reach down and turn on the MP-1 relay; now yak. If you aren't a contortionist I suggest this particular switch be paralleled to a more suitable location. On the other hand it just might be that I got a particularly lazy MP-1; yours may respond more eagerly than mine and the relay in the 32S-1 may do the business. Otherwise how about a mike button switch or a foot switch? Either ought to work fine.

If transceiver operation is desired a thing or two more must be done. You simply can't install both receiver and transmitter simultaneously. With those two transceiver cords binding the units together, the assembly becomes two unwieldy. I solved the problem by paralleling the transmitter v.f.o. input plug to the spare plug on the rear apron and doing likewise for the crystal oscillator output on the receiver. Now by installing a cable within each unit, (one in the transmitter crystal oscillator input and a second in the receiver v.f.o. output) the units may be installed separately and the cords plugged in on the rear apron of the respective units.

Be sure to adjust VOX and ANTI-VOX controls before installing the assembly. Once done the lid of the transmitter cannot be raised to make adjustments. If the lids tend to rattle on rough roads use a piece of sponge rubber to wedge them shut.

I suppose there are many ways to utilize a speaker in this sort of installation but the method I used seemed to be most simple. I simply disconnected the rear car radio speaker and connected it to the output of the 75S-1. By varying the setting of the car radio speaker shift control a point can be found where the 75S-1 will come in loud and clear.

Ignition Noise

I am tempted to round off this dissertation with a learned discussion of how I silenced ignition noise but I must sadly admit that I was

completely routed from that battle. None of the classic ways seemed to help. I even installed shielded ignition harness but the only result seemed to be a hearty protest from the old bus. I did discover that a large measure of the incoming noise signal originated on the transceiver cable. I shielded and shortened as much as possible but the noise continued varying from an S-2 all the way up to an S-9 depending among other unknown things on the type of pavement over which the car was traveling. Notwithstanding the noise, however, a wonderful time was had by me (not all) during the approximately three months our family wandered about looking for a new QTH. ■

9 Mc SSB Gen. [*from page 39*]

be used and should fit snugly against the chassis to prevent signal feedthrough. Adequate suppression can not be obtained at this frequency unless good shielding is used. For this reason, tube shields are a must. To further minimize r.f. feedthrough, all B+ leads are passed through feedthrough capacitors.

Good bypassing at pins 8 and 9 of V_3 must be made to prevent r.f. phase unbalance at the deflectors. The differential capacitor, C_9, is necessary at this frequency to achieve phase balance in the plate circuit of V_3. Potentiometer R_1 is used to equalize the current to both plates. Inductor L_2 consists of two turns of plastic covered wire wound around the center of the primary of L_1. If maximum carrier suppression is desired, the primary L_1 should be bifilar wound. With the Miller 4407 used for L_1, more than —50 db of suppression can be obtained.

In the generator described here, the carrier frequencies happened to fall at the right spot on the filter skirts without the use of C_1 and C_2. Normally, these trimmers are required to properly set the carrier frequencies.

Alignment

A frequency meter or calibrated receiver is needed for adjustment of the upper and lower sideband carrier frequencies. Capacitors C_1 and C_2 are adjusted till they position Y_1 and Y_2 at 8,998.5 kc and 9,001.5 kc, respectively. This places the carrier only 10 db down on the filter skirts rather than the usual 20 db. This is done because the filter skirts are very steep. The ouput meter of the transmitter or the S-meter of a receiver tuned to the output frequency can then be used to null the carrier. First, tune L_1 and C_{10} for maximum output. Set R_1 to the center of its range and null the carrier with C_9. Finally, adjust R_1 for minimum carrier output. The adjustment of C_9 is critical, but once set it will not have to be remade.

This is all the alignment required. After this is done, the subchassis can be mounted in the transmitter and the output of V_4 connected to the input of the first mixer. The generator provides a clean and sharp signal, and if care is used in later stages to prevent nonlinearities, the quality of the resultant signal will be excellent. ■

ARMCHAIR PHOTOGRAPHER

In this hectic era of space stations and amphibious autos, far be it from us to criticize progress. And yet, we shake our cranium a bit sadly, and we reminisce a bit remorsefully to the days not so long ago when we hadn't yet traded our souls for do-it-yourself kits. And looking back, we remember when the pioneer of the do-it-yourself phaze was the died-in-the-wool ham who built and serviced his own station.

Even so, we must force a faint smile as we remember that even the true-blue old timer occasionally referred to *CQ* to solve a tricky problem or refresh his memory on a technical point.

Mind you, we're not opposed to progress. We just realize that there are so many new phases of our hobby being developed today that *CQ* has become a second right arm to its regular readers. And those hams who only occasionally happen to browse through a copy of *CQ* . . . oh, well! Some hams still like to do things the hard way.

Ham Shop

Rates for the HAM SHOP are 5¢ per word for advertising which, in our opinion is obviously of a non-commercial nature. A charge of 25¢ per word is made to all commercial advertisers or business organizations.

Your copy should be preferably typewritten, double spaced on one side of the page only.

We do not bill for advertising in the HAM SHOP. Full remittance *must* accompany all orders.

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We reserve the right to reject advertising which we feel is not of an amateur radio nature.

Because the advertisers and equipment contained in the HAM SHOP have not been investigated, the publishers of *CQ* cannot vouch for the merchandise listed therein.

TRADE—Ham Radio—Citizens Band equipment for Hi-Fi equip. or vice-versa. Amateur Radio Exchange, Div. of Audio Exchange, 153-21 Hillside Avenue, Jamaica 32, New York. AX 7-7577.

TECH MANUALS—BC-375 $7.50; SCR-274N $7.00; ARC-5 VHF $8.50; ARC-1 $8.50; ART-13 maintenance $12.50, calibration $5.00; operation $3.50; URC/4 $4.00; BC-224, 342, 348 $6.00; ARC-5 LMHF $12.00, LM manuals $5.50 ARR-5, 7, $7.00. All postpaid, thousands of others on hand, write your needs. Propagation Products Co., Box 2513, Norfolk, Va.

ATTENTION Mobileers! Leece-Neville 6 volt 100 amp system, $50; 12 volt 50 amp system $50; 12 volt 60 amp system $60; 12 volt 100 amp system $100. Guaranteed no ex-police car units. Herbert A. Zimmermann, Jr. K2PAT, 1907 Coney Island Ave., Brooklyn 30, N. Y. Tel. DEwey 6-7388.

For Sale: TV Cameras, Teletype, Panadapters, Transmitting Tubes, Transistors, SSB gear. Write for list. Spera Electronics, 37-10 33 Street, L.I.C., N.Y. STilwell 6-2199.

ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog. Fabulous bargains. Meshna, Lynn, Mass.

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WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft. Box 399, Mount Kisco, N.Y.

"The VHF Amateur"—At last a magazine for VHF'ers! Don't miss a single issue! Send $2.00 for year or $1.00 for six big issues . . . 67 Russell, Rahway, N.J.

Interrogation: Applications are now being accepted for Election into our Research and Administration staff. The function of the organization is non-profit in nature, and will work under contributions and grants. The purpose of the organization is Research in Extra-Terrestrial phenomena; i.e. Radio Astronomy, Propogation, Scatter, etc. If you are seriously interested and would like more information write: Radiometric Research, Ltd., P.O. Box 4335-Annex, Las Vegas, Nevada.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash to reach item that you want preserved. 24-hour service. Send to C. Lee, P.O. Box 395, Times Square Station, New York 36, N.Y.

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Wanted: R-388/URR receivers, any condition. Electronicraft, Box 399, Mt. Kisco, New York.

WANTED: TELETYPE TG-7, Models 14, 15, 19, 26, 28, printers & reperforators: Rcvrs & xmtrs: AN/GRC-3 & higher, RT-66, -67, -68; Collins 51J, 17L3, -4, 18S-2, R-388, -390, -391: ARN-14 and -30; APR-9, -10, ARC-21, -27, -34; APS-10, -31, -33, -42, etc., and TEST EQP'T, TS or AN/URM. We pay freight. Amber Industrial Corp., 75 Varick St., New York 13, N.Y.

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QSL's, SWL's. That are different, colored, embossed card stock and "Kromekote." Samples 10¢. Home Print, 2416 Elmo, Hamilton, Ohio.

QSL's-SWL's, samples 10¢. Malgo Press, 1937 Glendale Avenue, Toledo 14, Ohio.

QSL's. SWL's XYL-OM's. (Sample assortment approximately 9¾¢). Covering designing, planning, printing, arranging, mailing, eye-catching, comic, sedate, fantabulous, DX-attracting, protoypal, snazzy, unparagoned cards. (Wow!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minnesota.

QSL's—"Brownie" W3CJ1, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QSL's-SWL's: 100 2-color glossy $3.00; 100 QSO file cards $1.00; Sample 10¢. Rusprint, Box 7507, Kansas City 16, Missouri.

QSL's four colors glossy stock forty design send $5 for 200 and get surprise of your life. 48 hour service satisfaction guaranteed, Constantine Press, Bladensburg, Md.
QSL's 100 duo-color for $1.50. Economy Card, Box 1141, Ada, Oklahoma.

QSLS? SWLS? CB? WPE? Variety samples 20¢ (re- Austin 17, Texas.

QSL's? SWL's? CB? WPE Variety samples 20¢ (refunded). Religious QSL samples (with bible verses) 10¢. Sakkers, W8DED, Holland, Michigan.

QSL's Samples 15¢. Rubber stamps: Name, Call, Address $1.35. Harry Sims, 3227 Missouri Avenue, St. Louis 18, Missouri.

QSL's Giant packet multi-color samples, 10¢. Don, K5OWT, Box 332, Ada, Oklahoma.

SALE: B&W TR switch 380—$12.00. Johnson low pass new $9.00. 812 tubes new $5.00. WANTED: Johnson matchbox. W3YHQ, 500 Hudson Ave., Altoona, Penna.

WANTED: Schematic or working manual for Eldico transmitter Model TR-75TV5. John Krall, Dubar, Pennsylvania.

GARAGE DOOR OPERATORS $59.95. Rugged chain drive automatic units. Highest quality. Free literature. DEMSCO, INC., Sebring 22, Ohio.

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SELL: Hammarlund HQ-170C, excellent condition, $275, firm; 120 watt 10 meter phone/c.w. xmtr, $50. Local area. Frank Stolpen, 2132 E. 13 St., Brooklyn 29, N.Y. Tel. DEwey 9-8175.

FOR SALE: SX-71 $135. Lakshore Phasemaster II-A with 458 v.f.o.—$175. Both for $300. Charles Bursey, W5UOV, Thalia, Texas.

S. A. R. L.

The Saskatchewan Amateur Radio League welcomes all visiting radio amateurs and their families to Saskatchewan the land of wheat and holiday fun. If mobiling, the net frequency is 3780 and net meets at 1830 daily, but call in any time! If you are planning to visit our fair country let us know at the SARL, Box 801, Saskatoon, Saskatchewan, Canada . . . drive carefully and keep your fingers out of the HV . . .

Cash for your gear. We buy, sell or trade. Send for bargain listing. DX-100s, $159.95, Apaches, $219.95. Sideband gear, new and used, real deals. H & H Electronic Supply, 506 Kishwaukee St., Rockford, Illinois.

Want back issues of *CQ*. Buy or Trade. Have spares back to 1947. VE4BU, 134 Renfrew St., Winnipeg 9, Manitoba, Canada.

Rubber stamps, Name/Address, $1.00. A. Travis, 2002 West 8th, Austin 3, Texas.

FOR SALE: Surplus BC-902 v.h.f. transmitter with accessories, new, $20. Gibson Girl emergency transmitter, checked out, $15. Transmitter 80 watt, 220 megacycle phone, $20. Inquire: Olean, Imperial Avenue, Westport, Conn.

Collins 75A-4 serial 2519, like new and perfect; $539.00; 75A-4 serial 5791 in factory carton with manual & warranty card, $669.00. Will sell either receiver, must keep the other. Collins 32V-2, excellent, $250.00; New Drake 2-A, sealed carton, $225.00. W8WGA.

DX-100 Owners: Increase your power output by 50%. Run 240 watts a.m.—300 watts c.w. or s.s.b. Additional 6146 installed in final and all modifications made to increase grid drive and audio. We furnish complete kit of parts and step by step instructions for only $19.95. Order or write for details. imilar kit also available for the TX-1 Apache. W4KUV-W4NZS, Best Radio & TV Service, 610 N. Madison Avenue, Goldsboro, North Carolina.

Wanted: Harvey-Wells TBS-50 bandmaster. Olean, Imperial Avenue, Westport, Conn.

Sell: $400: Seven foot rack mounted kilowatt linear transmitter; All parts: 75% wired; Commercial appearance; Write for details. Don Perriguey, KØKGG St. Clair, Missouri.

Sell Viking Ranger, excellent condition $195. Will ship FOB Waseca or deliver within 75 miles. $190 if you pick up. WØDAF 408 3rd Avenue S.E. Waseca, Minn. Phone 835-1092.

Selling out entire station. Will sell individually or entire lot: Super Pro-military with pwr. supply $115.00; Tecraft deluxe 6m conv. $35.00; CDR AR-22 rotator $25.00; Heath tube tester $20.00; Heath VFO $15.00; Heath reflected power meter $15.00; 48" rack gray crackle finish $40.00; SCR-522 trans., rcvr. and power supplies with cables and accessories $30.00; trans. and rcvr. need some work. Also surplus scope, needs conversion work, $5.00; $300.00 takes all. John E. Edwards K2TNW, 71 Armour Road, Mahwah, New Jersey, LA 9-3265.

Plate transformer; UTC S-46; 200v.c.t. at 300ma. Wt 23 lbs new $15.50 ea Plus shipping. Hiway Co., 1147 Venice Blvd. L.A. 15, Calif.

Complete s.s.b. station for sale. Collins KWS-1-75A-4 with 1.5, 3.1, 6 kc filters with controlled speaker. Also TA-33 Mosley beam. Ham-M rotator. Complete package for $1695, or will sell separate units. W2OQO 2951 Pearsall Ave., Bronx 69, N.Y. OL 2-7376.

For Sale: Surplus electronic equipment, parts, tubes. Free listing. Enormous stocks open Saturdays. U.S. #1 Electronics, 1922 Edgar Road, Linden, New Jersey.

Hammarlund HC-10 s.s.b. converter in original unopened factory carton. $130.00. D. J. Gleason, 320 Harwood Ave., Eau Gallie, Fla.

Display and protect choice QSL cards in the transparent polyethylene DX-QSL card packet. Holds ten cards. 49¢ postpaid. Ten packets for $3.95. Satisfaction guaranteed. DX-QSL, Box 19033-A, Houston 24, Texas.

For Sale: Hi-Gain 3 el. tri-band beam 8 mos. old cost $99.00. Take $45.00. E. Shafer, 3479 Kersdale Rd., Cleveland 24, Ohio.

S.s.b. Station. CE-100V, Johnson Pedestal Kilowatt, and HQ-170. All late models, in perfect condition. $2,000 F.O.B. Will ship. Would consider selling individually. Will demonstrate. Don Morgan, KØTAJ, 305 East 1st, McCook, Nebraska.

Wanted: SX-99 or comparabe receiver. Please airmail reply. 1/LT Peter E. Essex, 506th QM Co., APO 800, N.Y., N.Y.

Att'n Ham—Motorola FMT30-50D 2 case 2 way radios—all acces's—easy converted to 52.6 mc 6-12 volt. All parts—service info available. Jack Zeeck, Mt. Sterling, Ohio

6580 in G.G. [*from page 37*]

A dummy antenna is used to load the amplifier during all testing. A pair of 500 watt lamps in series or 8 100 watt lamps arranged in two groups of four parallel lamps in series make a good load. Keep the leads on the dummy load as short as possible. Using lamps has the added advantage of visual indication of resonance and loading.

Tune-up and testing is the most exciting part of "building your own." Anything can happen and usually does. I turned on the power with my usual skepticism. Nothing I build ever works properly when it is first tested. My amplifiers always oscillate and my oscillators rarely do. The power amplifiers are plagued with parasitics and spurious oscillations and I've reached the point in life where I expect it to happen.

You can well imagine my disappointment when the plate voltage was applied to the amplifier, without r.f. excitation, and nothing happened. No spurious oscillation—no parasitics—no matter where I set the tuning and coupling capacitors. When I did apply excitation, it acted just like an amplifier should. This was nothing short of amazing—for me.

Begin the amplifier tuneup at reduced plate voltage and start with the 10 meter band. Connect the coil taps as indicated on the schematic diagram. Turn C_2 to its maximum value. With 1500 volts, the plate resting current will be zero. Turn up the exciter output until the plate current increases to 200 ma. Rotate C_1 until the r.f. output and grid current meters peak and the plate current dips to near zero. Record the reading of C_1 and repeat this procedure on the other

bands. The amplifier may now be connected to the antenna or left on the dummy load for full voltage operation and adjustment of the output coupling capacitor, C_2. The most desirable loading for a linear amplifier is a slight overcoupling. Start again with the 10 meter band and set C_1 to the previously determined resonant value. Adjust the exciter output for a grid current of 60 ma. Decrease C_2 in small amounts, retuning C_1 after each adjustment. The exciter will also require adjustment to maintain 60 ma of grid current. When the plate current reaches 300 ma, vary the tuning procedure as follows. Continue decreasing C_2 in small amounts and retuning C_1, but now keep the plate current constant at 300 ma by controlling the exciter output. Observe the r.f. output meter. The desired coupling occurs just beyond the point when decreasing C_2 does not result in an increase in r.f. output. At this point, the exciter output can be increased to obtain 330 ma. The grid current will be about 80 ma.

During tuneup, keep an eye on the anode of the tube. Any sudden change of color from a dull red to a bright red is a warning of excessive plate dissipation. Back off immediately on the excitation until a resonant condition is obtained. Keep the C_1 and C_2 dial readings for each band handy to make quick band changes. During the tuneup, the exciter is operated in the c.w. mode. There is no substitute for a two tone generator in s.s.b. operation to check the amplifier linearity and waveform. The 6580 amplifier showed no flattening or waveform distortion with 1000 watts input.

Conclusion

For those who prefer to use their own ingenuity or those who do not like the designs of the ready made amplifiers or kits, this amplifier may supply some construction hints and component ideas. It is comparatively easy to build and the cost is surprisingly low, if the expensive vacuum capacitor is deleted in favor of an air spaced job. You can utilize some of the good 'surplus' items you bought six years ago and never used.

There is a great deal of satisfaction in operating equipment you build yourself and nothing else gives the experience and knowledge of the technical aspects of ham radio. ■

Operation Rebuild [*from page 33*]

the tube filaments wired in series?

The actual resistance of different 6-volts tubes can vary widely. For example, a 6K6 filament requires 0.4 ampere and, using Ohm's law, has a resistance of 15 ohms. A 6C5 filament requires 0.3 ampere and has a resistance of 20 ohms. When these unequal resistances are placed in series and 12 volts applied, the 6K6 tube will develop only 5 volts (approx.) whereas the 6C5 will have almost 7 volts. To equalize the voltages across each filament, a 60 ohm shunt resistor is placed across the 20-ohm filament (6C5) so that the combination is equivalent to 15 ohms. ■

For further information, check number 41, on page 126

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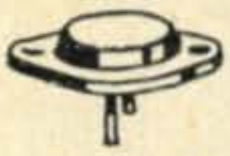

Factory Tested
***MFGRD in U.S.A.
Replaces Medium & HiWattage Types
2N155, 2N156, 2N234, 2N256, 2N307, 2N554

GENERAL TO 3GP 80¢ @, ... 20 for $15
PURPOSE ..... 100/$65
$10 or more this item we pay P.P./U.S.A.)

8 TOPHAT SILICON DIODES $1 EXPERIMENTERS KIT. USE AS STABISTORS, ZENOR DIODES METER PROTECTION CLIPPER & RECTIFIERS! $10 VALUE.

DIAMOND BASE MICA MTG KIT... $ .30
ROUND BASE MICA MTG KIT ..... $ .30
DELCO POWER HEAT SINK WITH FINS 80 SQ" $1.25
KIT DIODES COMPUTER ..... 20¢, 8/$1
KIT TRNSTR NPN or PNP. 39¢@, 3 for $1
IN34A DIODES 23¢ @, 10 for $2, 100/$18
($10 or more this item we pay P.P./U.S.A.)

GTD! HIPOWER-ROUND-TRNSISTRS

Factory Tested
***MFG in U.S.A.
2N277 or 2N441 $2.25.
2N278 or 2N442 $3.75.
2N173 or 2N443 $5.00 @.
4/$16. ($10 or more this item we pay P.P./U.S.A.)

Leece Neville Charger Systems
"SILTAB" Silicon Rectifier Replacement
Non-Aging Hermetically Sealed
FOR 6 or 12VDC @ 100A, Type YJ9 $24

POWER DIODES—STUDS

50Piv/35 Rms

Factory Tested—GTD!

1.5 Amp ¢30@, 100 for $27, 1000 for $225
3.0 Amp ¢50@, 100 for $45, 1000 for $390
6.0 Amp $1.50@, 100 for $100, 250 for $200
12 Amp $1.45@, 100 for $125, 250 for $225
35 Amp $2.30@, 100 for $200, 250 for $400
70 Amp $3.90@, 50 for $175, 100 for $300
240 Amp $4.50@, 50 for $220, 100 for $3.75
*Derate 20% for Capacative & Battery Load! Amp Ratings for Studs on Heat Sink ! ! !

Send 25¢ for Catalog

"TAB" Tubes Factory Tested, Inspctd, Boxed!

Six Months Guaranteed! No Rejects!

GOVT & MFGRS Surplus! New & Used

0A2	.89	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	.79	*We Trade!*		RK60	1.17
1A7	.90	6CB6	.89	HY69	2.20
1B3	.99	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	Q	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	Q	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	Q
2K28	30.00	6L6	1.19	707B	3.50
2V3	2/$1	6SN7	.72	715C	10.90
2X2	.48	6T8	.98	717A	3/$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	Q	12AT7	.89	804	9.95
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69	*We Trade!*	
We Buy!		*We Sell!*		807 1.10	5/$5, 10/$12
3E29	6.00	12AX7	.79	811	3.45
3Q4	.68	12AY7	1.29	811A	4.41
3Q5	.86	12B4	.95	812	3.95
4-65A	13.50	12BA6	.65	813	Q
4-125A	27.50	12BA7	.99	815	1.75
4-250A	34.00	12BD6	.59	826	Q
4X150A	Q	12BE6	.59	*Wanted Test Sets and Equipment*	
4X250	36.00	12BH6	.79	828	9.00
4X500	37.00	12BH7	.99	829B	8.00
5API	Q	12BY7	1.00	832A	6.00
5BPI	Q	12BZ7	.99	833A	36.00
5BP4	Q	12H6	.75	837	Q
5CPI	4.99	12J5	.69	866A	2.45
5CP7	9.00	12J7	.69	954	10/$1
5R4	1.00	12J8	1.35	955	3/$1
5T4	.90	12K8	.89	957	3/$1
5U4	.99	12SA7	.69	958A	2/$1
5V4	.89	12SC7	.89	*Send 25¢ for Catalog!*	
5Y3	.60	12SF5	.69		
5Z3	.89	12SG7	.89		
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	Q	5608	3.95
Top $$$ Paid for 304TL, 813, 811A, 812A Tubes					
6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.69	5725	1.95
Top $$$ 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	1.25		
6BZ6	.91	RK39	2.99	No See—Write!	

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5U4G SPECIAL!!
SILICON TUBE REPLACEMENT/1120
Rms/1600Piv $6@, 5 for $25

"SUNTAB"® SELENIUM PHOTOCELL
2BP 75μa ¾x⅝" ¢40@, 11 for $4
5AP 1" Dia., 5BP/Sq & Rect 220μa,¢55
15AP 750μa, 1¾" Dia, $1.45@, 4 for $5
10BP 350μa,1-11/16" Rect. ¢75@, 10 for $7
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SILICON DIODES 750MA* TOP HATS
General Purpose 400 PIV at 300 MA
Special 2 for $1 20 for $7

rms/piv 17/25 10¢	rms/piv 35/50 14¢	rms/piv 70/100 24¢	rms/piv 140/200 29¢
rms/piv 210/300 39¢	rms/piv 280/400 50¢	rms/piv 350/500 64¢	rms/piv 420/600 74¢
rms/piv 490/700 89¢	rms/piv 560/800 94¢	rms/piv 630/900 $1.10	rms/piv 700/1000 $1.50

Low Priced * T200 SILICON DIODES
rated 380piv/266rms @ 200Ma @ 100°C
36¢ each; 10 for $3.25; 100 for $27;

*CAPACITOR INPUT DERATE 20%:
($5 or more this item we pay P.P./U.S.A.)

SPECIAL! TRANSISTORS & DIODES!!!
Factory Tested & Guaranteed!
FULL LENGTH LEADS

2N123 PNP 45¢, 12 for $5, 100/$37
2N292 NPN 45¢, 12 for $5, 100/$37
2N293 NPN 45¢, 12 for $5, 100/$37
2N223 PNP 80¢ ..... 100/$65
2N597 PNP $1.90 ..... 6/$10
2N598 PNP $1.90 ..... 6/$10
2N599 PNP $3.50 ..... 3/$10

GENERAL PURPOSE—PNP—COMPUTER GRADE!
Use as Amplifier—Oscillator—HiFi Logic—Servoamp—Power Supply Pulse Amplifier or High Current Switch
Veb. Vce. Veb Approx 40V
GP3C rated 300 Milliwatts 65¢, @ 10 for $5, 100 for $39
GP10C Rated 1 watt 90¢, 6 $5, 100 $63

2N155 $1.39, 2N176 $1.80, 2N177 $1, 2N178 $1.75, 2N255 $1.20, 2N270 $1.95, 2N408 $.80, 2N544 $1.20, 2N578 $1.80, 2N579 $2.20, 2N581 $1.25, 2N582 $2.10, 2N174 $8.50, 2N443 $6.50, 2N670 $1.60, 2N671 $2.

"TAB"—THAT'S A BUY!—BARGAINS!!

TRANSISTOR POWER DIODE* up to 3 Amp ..... 4 for $1
TRANSISTOR POWER DIODE* up to 5 Amp ..... 2 for $1
*HEAT SINK MOUNTED
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
SNOOPERSCOPE TUBE 2" ..... $5@, 2/$9
MINI-FAN 6 or 12VAC/60 Cys $2 @ 3/$5
NEW PRINT CKT-PANEL, 11x12x.062" $2
IN34A 45¢@, 15/$5; IN35 $1; IN38 70¢@;
XTAL OVEN—115V&Thermostat $2
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Xmitting Mica's .006 @ 2500V, 5 for $1.00
829B Socket 85¢, 813 Socket $1
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600W Plate Xfmr 2460, 1880Vct @ 500Ma 1CAS STANCOR #P-8025. List Price $120.10. SPECIAL $27
2.2 Hy @ 450Ma, 27Ω, Filter Choke. SPECIAL $4
P.C. Boards contain 20-NE-2's, 39 Cond, 35 Res ..... 3/$2
6Mfd 1500V Oil Filled Condenser. SPECIAL $1.50
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24VAC @ 2A Filament Xfmr $1.95
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5Vct 15A Xfmr 5KV Ins. SPECIAL $3
365Mmf 2 Gang Variable Cond. SPECIAL 2/$1

Wanted 304TL Tubes & ALL TYPES!!!

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C-270, NATIONAL'S "COSMIC BLUE" HAMBAND RECEIVER

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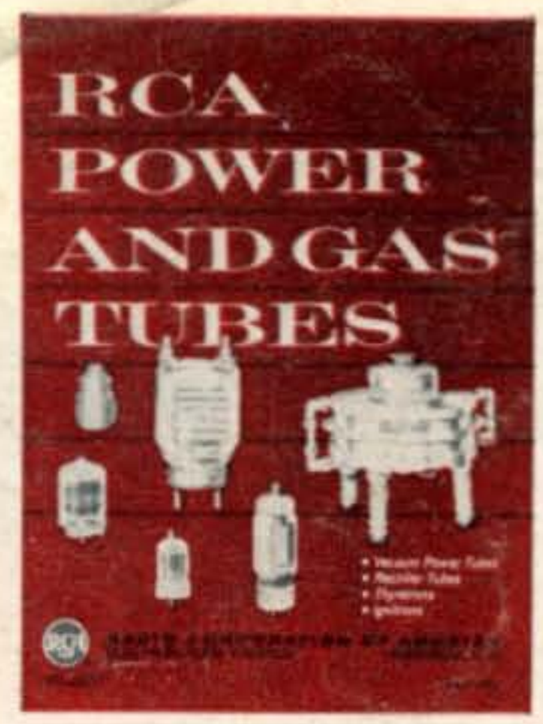

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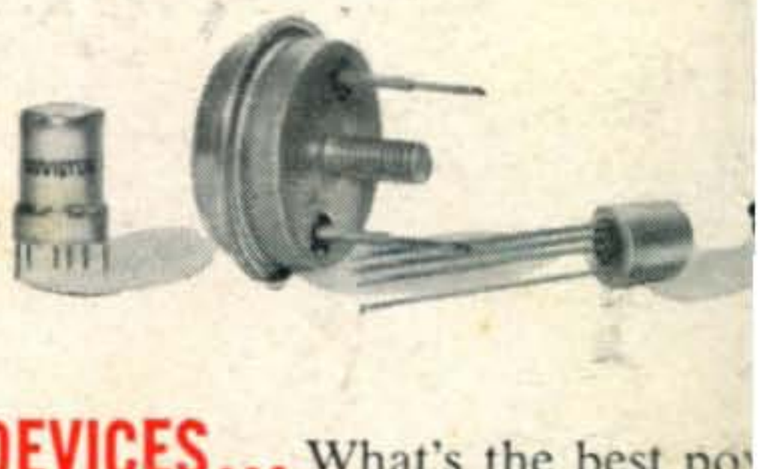

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