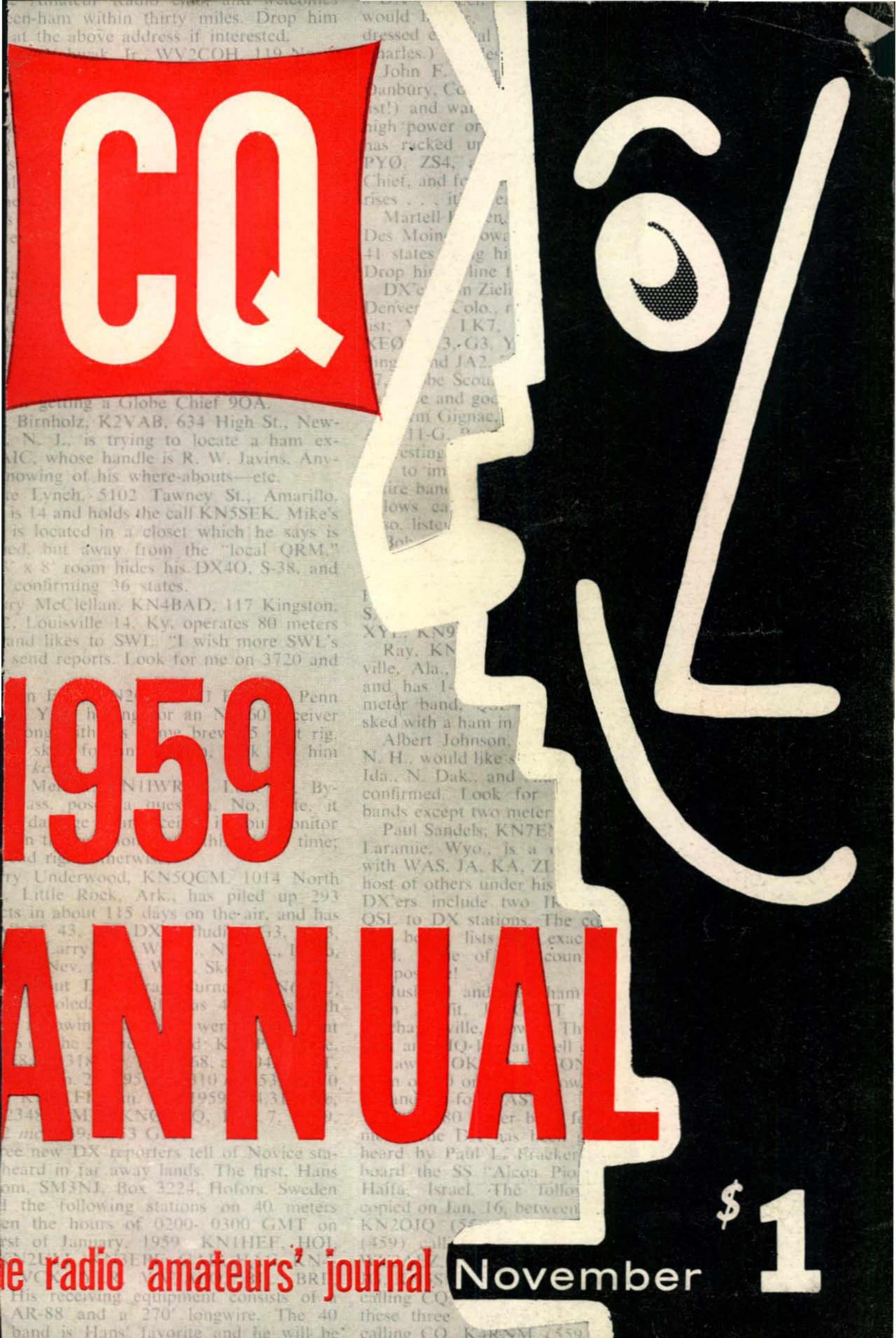
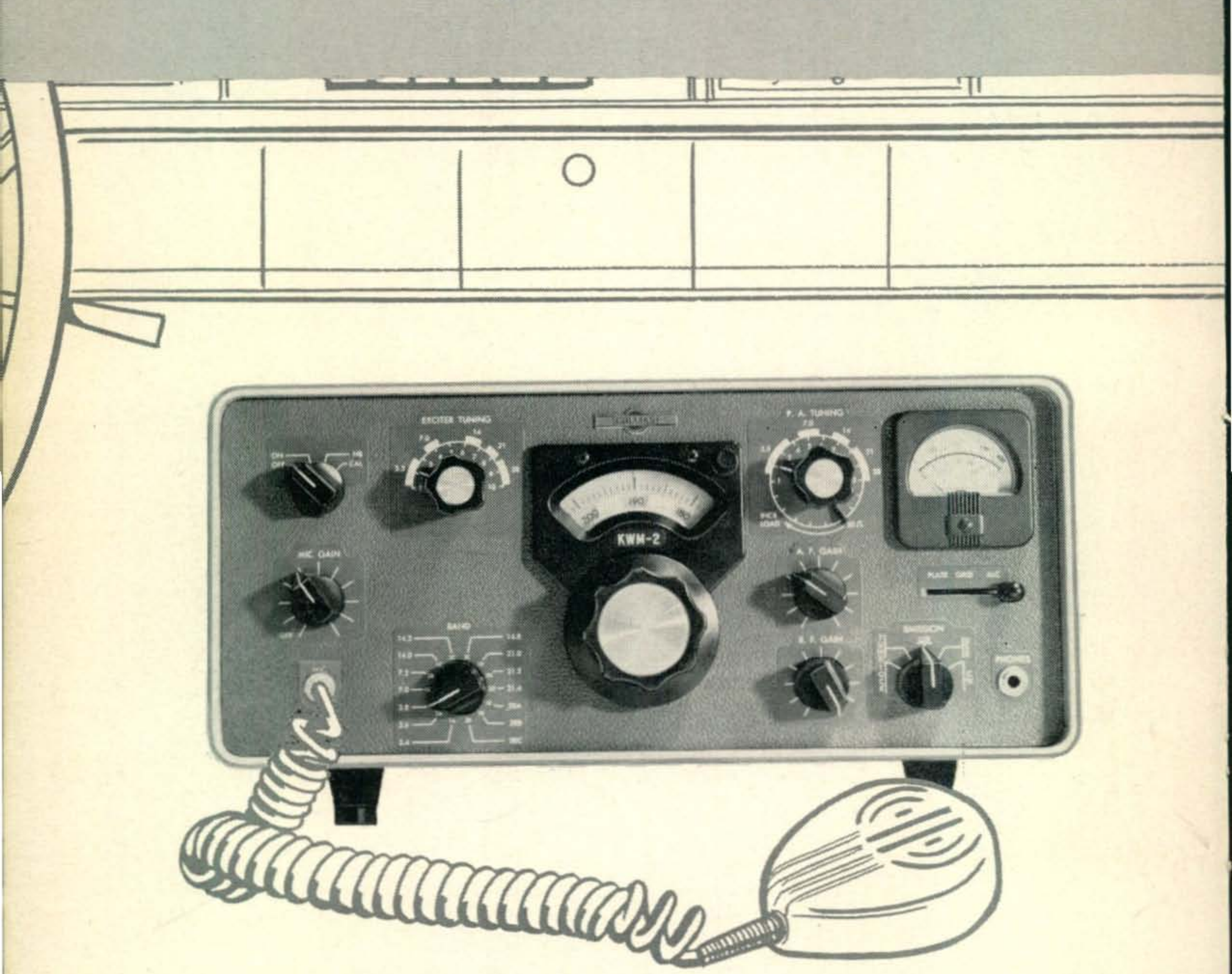

CQ
1959
ANNUAL
$1
November
he radio amateurs' journal

Collins KWM-2

Introducing another Collins an advanced amateur's system engineered for



Superior single sideband performance in a variety of installations is assured by the Collins KWM-2 Mobile Transceiver. Engineered for the amateur who desires an 80 through 10 meter mobile transceiver, the KWM-2 design incorporates time-proven and advanced communication concepts.

COLLINS

For further information, check number 1, on page 190.

Mobile Transceiver

creative design –
80-10 meter transceiver –
mobile and home operation.

The new KWM-2 provides high frequency stability on fourteen 200 kc bands from 3.4 mc to 30.0 mc. With 175 watts PEP input on SSB, or 160 watts on CW, the KWM-2 provides ample power for excellent communication. Filter type SSB generation, permeability-tuned oscillator, crystal-controlled double conversion, VOX and anti-trip circuits, and exclusive ALC and RF inverse feedback are distinguished features of the KWM-2. The Collins Mechanical Filter, RF amplifier, all tuned circuits, and several tubes perform the dual role of transmitting and receiving. CW break-in and monitoring sidetone circuits are built-in, and all four plugs in the mobile mount connect the KWM-2 automatically.

The Collins KWM-2 Mobile Transceiver weighs 18 lbs., and measures 7-3/4″ H (with removable legs), 14-3/4″ W, and 13-1/4″ D. Mounts, accessories, and power supplies are available for 12 v dc, 24-28 v dc, and 115 v ac operation.

See the KWM-2 now on display at your Collins Distributor. Ask for the colorful KWM-2 brochure with complete specifications.

An attractive Collins amateur radio system built around the versatile KWM-2 Mobile Transceiver. Shown are the 516F-2 AC Power Supply with SC-301 Antenna Control Console, KWM-2, 312B-5 PTO Console, and 30S-1 Linear Amplifier.

Wayne Green, W2NSD — *editor*

Barry Briskman, K2IEG — *assistant editor*

department editors

Bob Adams, W3SW — *sideband*

Frank Anzalone, W1WY — *contest calendar*

Lee Aurick, W2QEX — *citizens radio*

Urban Le June Jr., W2DEC — *dx*

Ken Grayson, W2HDM — *surplus*

Sam Harris, W1FZJ — *vhf*

George Jacobs, W3ASK — *propagation*

Byron Kretzman, W2JTP — *rtty*

Marvin Lipton, VE3DQX — *club bulletins*

Louisa Sando, W5RZJ — *yl*

Charles Schauers, W6QLV — *ham clinic*

Don Stoner, W6TNS — *novice & semiconductors*

contributing editors

E. L. Klein, W4UHN — *printed circuits*

Norman McLaughlin, W3LNT — *grounded grids*

CQ, the Radio Amateurs' Journal is published for active hams by active hams. Not affiliated with any clubs or other political groups, CQ endeavors to be a true and honest reporter for those interested in the hobby. Suggestions for improvement are welcomed.

Authors would do well to send for the CQ Style sheet which will explain our confused system of abbreviations and symbols. The article "Author Author" (October 1952 CQ) tells all about how to write articles for CQ, how much we pay, etc. Reprints of this article are available from CQ if you have been improvident in keeping up your radio library.

CQ CERTIFICATES:

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

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

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

TECHNICAL INFORMATION:

Please check the 11-year cumulative index which was published in the January 1956 CQ for information about articles in past issues of CQ. The December 1956 to 1958 CQ yearly indexes will bring you up to date. Most back issues are available at $1 from us. Check our "Back Issue" ad for details on those not available. Reprints of the Cumulative Index are available free. For further information see the Ham Clinic column.

DISCLAIMER:

The authors and editors do the best they can to make everything as correct as possible in the articles. If for any reason any of them should happen to goof we hasten to point out that everything is experimental and we guarantee nothing.

← For further information, check number 4, on page 190.

CQ—The Radio Amateur's Journal

November 1959
vol. 15, no. 11

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

DEPARTMENTS

Branch Advertising Offices:

Ted E. Schell, 2700 West 3rd Street, Los Angeles 57, Calif. DUnkirk 2-4889.

Charles W. Hoefer, 1664 Emerson Street, Palo Alto, Calif. DAvenport 4-2661.

publisher **S. R. Cowan**
production manager **Bill Gardner, Jr.**
circulation manager **Harold Weisner**
editorial production **David Fish & Robert Jordan**
advertising representative **Jack Schneider**
advertising representative **Dick Cowan**
classified advertising **Kathi Gerace**

CQ—(title registered U. S. Post Office) is published monthly by Cowan Publishing Corporation. Executive and editorial offices at 300 West 43rd Street, New York 36, N. Y. Telephone JUdson 2-4460. Second-class Postage paid at New York, N. Y.

SUBSCRIPTION RATES: U. S. A. and Possessions, APO, FPO, Canada and Mexico; one year $5.00; two years $9.00; three years $13.00. Pan-American and foreign: one year $6.00; two years $11.00; three years $16.00.

FOREIGN SUBSCRIPTIONS: Great Britain: RSGB, New Ruskin House, Little Russell St., London WC 1, England. Australia: Technical Book Co., 297 Swanston St., Melbourne C 1, Victoria, Australia.

Postmaster: Send Form 3579 to CQ, 300 West 43rd Street, New York, N. Y.

It pays to insist on PR *crystals*

STANDARD OF EXCELLENCE SINCE 1934

AMATEUR TYPES

40, 80 and 160 Meters, PR Type Z-2

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

24 to 27 Mc., PR Type Z-9A

Third overtone; multiplies into either 2-meter or 6-meter band; hermetically sealed; calibrated 24 to 27 Mc., ±3 Kc.; .050" pins. **$4.95** Net

50 to 54 Mc., PR Type Z-9A

Fifth overtone; for operating directly in 6-meter band; hermetically sealed; calibrated 50 to 54 Mc., ±15 Kc.; .050" pins. **$6.95** Net

COMMERCIAL TYPES

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

SPECIAL TYPES

Type Z-1 Aircraft
3023.5 Kc., .005%..... **$3.45** Net

VHF Type Z-9R, Aircraft
For Lear, Narco and similar equipment operating in the 121 Mc. region, requiring crystals in 30 Mc. range. Each.... **$4.95** Net

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 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.

TYPE Z-9R CITIZENS BAND CLASS "D"
FCC assigned frequencies in megacycles: 26.965, 26.975, 26.985, 27.005, 27.015, 27.025, 27.035, 27.055, 27.065, 27.075, 27.085, 27.105, 27.115, 27.125, 27.135, 27.155, 27.165, 27.175, 27.185, 27.205, 27.215, 27.225; calibrated to .005%..... **$2.95** Net

TYPE Z-9R RECEIVER CRYSTALS FOR CITIZENS BAND CLASS "D"—Specify I.F. frequency, also whether I.F. is above or below transmitter frequency. Calibrated to .005%. **$2.95** Net

TYPE Z-9R RADIO CONTROL CLASS "C"
FCC assigned frequencies in megacycles: 26.995, 27.045, 27.095, 27.145, 27.195, 27.255; calibrated to .005%..... **$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

Silver Anniversary Year 1934-1959

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 6, on page 190.

BUILD YOUR OWN

HEATHKIT®

HAM GEAR

"SENECA" VHF HAM TRANSMITTER KIT

Beautifully styled and a top performer of highest quality throughout. The "Seneca" is a completely self-contained 6 and 2 meter transmitter featuring a built-in VFO for both 6 and 2 meters, and 4 switch-selected crystal positions, 2 power supplies, 5 radio frequency stages, and 2 dual-triode audio stages. Panel controls allow VFO or crystal control, phone or CW operation on both amateur bands. An auxiliary socket provides for receiver muting, remote operation of antenna relay and remote control of the transmitter such as with the Heathkit VX-1 Voice Control. Features up to 120 watts input on phone and 140 watts on CW in the 6 meter band. Ratings slightly reduced in the 2 meter band. Ideal for ham operators wishing to extend transmission into the VHF region. Shpg. Wt. 56 lbs.

HEATHKIT VHF-1 **$159.95**

HEATHKIT DX-20 **$35.95**

DX-20 CW TRANSMITTER KIT

Designed exclusively for CW work, the DX-20 provides the novice as well as the advanced-class CW operator with a low cost transmitter featuring high operating efficiency. Single-knob bandswitching covers 80, 40, 20, 15 and 10 meters using crystals or an external VFO. Pi network output circuit matches antenna impedances between 50 and 1,000 ohms. Employs a single 6DQ6A tube in the final amplifier stage for plate power input of 50 watts. A 6CL6 serves as the crystal oscillator. The husky power supply uses a heavy duty 5U4GB rectifier and top-quality "potted" transformer for long service life. Easy-to-read panel meter indicates final grid or plate current selected by the panel switch. Complete RF shielding to minimize TVI interference. Easy-to-build with complete instructions provided. Shpg. Wt. 19 lbs.

HEATH COMPANY Benton Harbor, Michigan a subsidiary of Daystrom, Inc.

Mobile Gear...for the Ham on the Go!

"CHEYENNE" MOBILE HAM TRANSMITTER KIT

All the fun and excitement . . . plus the convenience of mobile operation are yours in the all-new Heathkit "Cheyenne" transmitter. The neat, compact, and efficient circuitry provides you with high power capability in mobile operation, with low battery drain using carrier controlled modulation. All necessary power is supplied by the model MP-1 described below. Covers 80, 40, 20, 15 and 10 meters with up to 90 watts input on phone. Features built-in VFO, modulator, 4 RF stages, with a 6146 final amplifier and pi network (coaxial) output coupling. High quality components are used for long service life and reliable operation, along with rugged chassis construction to withstand mobile vibrations and shock. Thoughtful circuit layout provides for ease of assembly with complete instructions and detailed pictorial diagrams to insure success. A spotting switch is also provided. A specially designed ceramic microphone is included to insure effective modulation with plenty of "punch". Plan now to enjoy the fun of mobile operation by building this superb transmitter. Shpg. Wt. 19 lbs.

HEATHKIT MT-1
$99.95

"COMANCHE" MOBILE HAM RECEIVER KIT

Everything you could ask for in modern design mobile gear is provided in the "Comanche" . . . handsome styling, rugged construction, top quality components . . . and, best of all, a price you can afford. The "Comanche" is an 8-tube superheterodyne ham band receiver operating AM, CW and SSB on the 80,.40, 20, 15 and 10 meter amateur bands. A 3 mc crystal lattice-type IF filter permits the receiver to use single conversion without image interference, and at the same time creates a steep sided 3 kc flat top IF bandpass characteristic comparable to mechanical type filters. The neat, compact and easy-to-assemble circuitry features outstanding sensitivity, stability and selectivity on all bands. Circuit includes an RF stage, converter, 2 IF stages, 2 detectors, noise limiter, 2 audio stages and a voltage regulator. Sensitivity is better than 1 microvolt on all bands and signal-to-noise ratio is better than 10 db down at 1 microvolt input. One of the finest investments you can make in mobile gear. Shpg. Wt. 19 lbs.

HEATHKIT MR-1
$119.95

MOBILE SPEAKER KIT

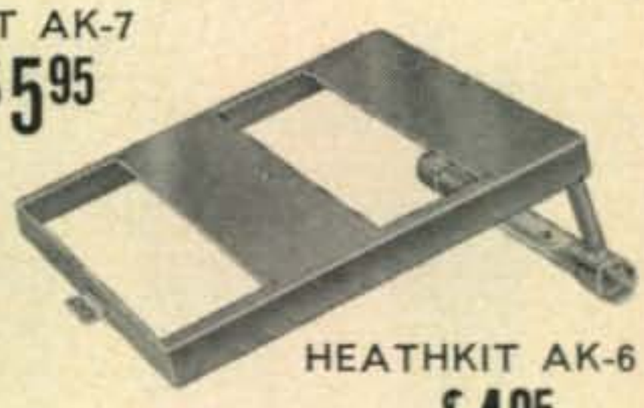
A matching companion speaker for the "Comanche" mobile receiver. Housed in a rugged steel case with brackets provided for easy installation on fire wall or under dashboard, etc. Uses 5 PM speaker with 8 ohm voice coil. Measures 5" H. x 5" W. x 2½" D. Shpg. Wt. 4 lbs.

HEATHKIT MP-1
$44.95

MOBILE POWER SUPPLY KIT

This heavy duty transistor power supply furnishes all the power required to operate both the MT-1 Transmitter and MR-1 Receiver. It features two 2N442 transistors in a 400 cycle switching circuit, supplying a full 120 watts of DC power. Under intermittent operation it will deliver up to 150 watts. Kit contains everything required for complete installation, including 12' of heavy battery cable, tap-in studs for battery posts, power plug and 15' of connecting cable. Chassis size is 9 1/16" L. x 4¾" W. x 2" H. Operates from 12-14 volt battery source. Circuit convenience provided by self-contained relay which allows push-to-talk mobile operation. Shpg. Wt. 8 lbs.

HEATHKIT AK-7
$5.95



HEATHKIT AK-6
$4.95

MOBILE BASE MOUNT KIT

The AK-6 Base Mount is designed to hold both transmitter and receiver conveniently at driver's side. Universal mounting bracket has adjustable legs to fit most automobiles. Shpg. Wt. 5 lbs.

POWER METER KIT

This handy unit picks up energy from your mobile antenna and indicates when your transmitter is tuned for maximum output. A variable sensitivity control is provided. Features a strong magnet on a swivel-mount for holding it on a car dashboard or other suitable spot. Has its own antenna or may be connected to existing antenna. Sensitive 200 ua meter. Shpg. Wt. 2 lbs.

HEATHKIT PM-2
$12.95

HEATHKIT®

COMPANION UNITS

HEATHKIT TX-1 **$234.95**

"APACHE" HAM TRANSMITTER KIT

The many features and modern styling of the "Apache" will provide you with just about everything you could ask for in transmitting facilities. Emphasizing high quality the "Apache" operates with a 150 watt phone input and 180 watt CW input. In addition to CW and phone operation, built-in switch selected circuitry provides for single-sideband transmission using the SB-10 External adapter. The newly designed, compact and stable VFO provides low drift frequency control necessary for SSB transmission. A slide rule type illuminated rotating VFO dial with full gear drive vernier tuning provides ample bandspread and precise frequency settings. The bandswitch allows quick selection of the amateur bands on 80, 40, 20, 15 and 10 meters. This unit also has adjustable low-level speech clipping and a low distortion modulator stage employing two of the new 6CA7/EL34 tubes in push-pull class AB operation. Time sequence keying is provided for "chirpless" break-in CW operation. The final amplifier is completely shielded for TVI protection and neutralized for greater stability. A cooling fan is also provided. The formed one-piece cabinet with convenient access hatch provides accessibility to tubes and crystal sockets. Die-cast aluminum knobs and control panel escutcheons add to the attractive styling of the transmitter. Pi network output coupling matches antenna impedances between 50 and 72 ohms. A "spotting" push button enables the operator to "zero beat" an incoming frequency without putting the transmitter on the air. Equip your ham shack now for top transmitting enjoyment with this outstanding unit. Shpg. Wt. 110 lbs. Shipped motor freight unless otherwise specified.

HEATHKIT SB-10
$89.95

SINGLE SIDEBAND ADAPTER KIT

Designed as a compatible plug-in adapter unit for the TX-1 "Apache" transmitter, this unit lets you operate on SSB at a minimum of cost, yet does not affect the normal AM and CW functions of the transmitter. By making a few simple circuit modifications, the DX-100 and DX-100-B transmitters can be used, utilizing all existing RF circuitry. Extremely easy to operate and tune, the adapter employs the phasing method for generating a single-sideband signal, thus allowing operation entirely on fundamental frequencies. The critical audio phase shift network is supplied completely preassembled and wired in a sealed plug-in unit. Produces either a USB, LSB or DSB signal, with or without carrier insertion. Covers 80, 40, 20, 15 and 10 meter bands. An easy-to-read panel meter indicates power output to aid in tuning. A built-in electronic voice control with anti-trip circuit is also provided. 10 watts PEP output. Unwanted sideband suppression is in excess of 30 db and carrier suppression is in excess of 40 db. An EL84/6BQ5 tube is used for linear RF output. Shpg. Wt. 12 lbs.

MODIFICATION KIT: Modifies DX-100 and DX-100-B for use with the SB-10 Adapter. Model MK-1. Shpg. Wt. 1 lb. **$8.95.**

HEATHKIT AR-3
$29.95
(less cabinet)

ALL-BAND RECEIVER KIT

A fine receiver for the beginning ham or short wave listener, designed for high circuit efficiency and easy construction. Covers 550 kc to 30 mc in four bands clearly marked on a slide-rule dial. Transformer operated power supply. Features include: bandswitch, bandspread tuning, phone-standby-CW switch, phone jack, antenna trimmer, noise eliminator, RF gain control and AF control. Shpg. Wt. 12 lbs.

CABINET: Opt. extra. No. 91-15A. Shpg. Wt. 5 lbs. $4.95.

HEATHKIT QF-1
$9.95

"Q" MULTIPLIER KIT

Useful on crowded phone and CW bands, this kit adds selectivity and signal rejection to your receiver. Use it with any AM receiver having an IF frequency between 450 and 460 kc that is not AC-DC type. Provides an effective "Q" of approximately 4,000 for extremely sharp "peak" or "null". The QF-1 is powered from the receiver with which it is used. Shpg. Wt. 3 lbs.

OF DISTINCTIVE QUALITY

ACCESSORY SPEAKER KIT

Handsomely designed and color styled to match the "Mohawk" receiver this heavy duty 8" speaker with 4.7 ounce magnet provides excellent tone quality. Housed in attractive ⅜" plywood cabinet with perforated metal grille. Speaker impedance is 8 ohms. Shpg. Wt. 7 lbs.

HEATHKIT AK-5
$9.95

HEATHKIT RX-1 $274.95

"MOHAWK" HAM RECEIVER KIT

Styled to match the "Apache" transmitter the "Mohawk" ham band receiver provides all the functions required for clear, rock-steady reception. Designed especially for ham band operation this 15-tube receiver features double conversion with IF's at 1682 kc and 50 kc and covers all the amateur frequencies from 160 through 10 meters on 7 bands with an extra band calibrated to cover 6 and 2 meters using a converter. Specially designed for single sideband reception with crystal controlled oscillators for upper and lower sideband selection. A completely preassembled wired and aligned front end coil bandswitch assembly assures ease of construction and top performance of the finished unit. Other features include 5 selectivity positions from 5 kc to 500 CPS, bridge T-notch filter for excellent heterodyne rejection, and a built-in 100 kc crystal calibrator. The set provides a 10 db signal-to-noise ratio at less than 1 microvolt input. Each ham band is separately calibrated on a rotating slide rule dial to provide clear frequency settings with more than ample bandspread. Front panel features S-meter, separate RF, IF and AF gain controls, T-notch tuning, T-notch depth, ANL, AVC, BFO, Bandswitch tuning, antenna trimmer, calibrate set, calibrate on, CW-SSB-AM, receive-standby, upper-lower sideband, selectivity, phone jack and illuminated gear driven vernier slide rule tuning dial. Attractively styled with die-cast aluminum control knobs and escutcheons. No external alignment equipment is required for precise calibration of the "Mohawk". All adjustments are easily accomplished using the unique method described in the manual. An outstanding buy in a communications receiver. Shpg. Wt. 66 lbs. Shipped motor freight unless otherwise specified.

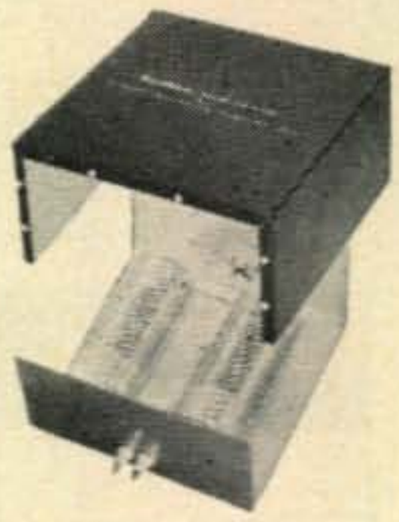
HEATHKIT AM-2
$15.95

REFLECTED POWER METER KIT

The AM-2 measures forward and reflected power or standing wave ratio. Handles a peak power of well over 1 kilowatt of energy and covers 160 through 6 meters. Input and output impedance provided for 50 or 75 ohm lines. No external power required for operation. Use it also to match impedances between exciters or RF sources and grounded grid amplifiers. Shpg. Wt. 3 lbs.

BALUN COIL KIT

Match unbalanced coaxial lines, found on most modern transmitters, to balanced lines of either 75 or 300 ohms impedance with this handy transmitter accessory. Capable of handling power input up to 200 watts, the B-1 may be used with transmitters and receivers covering 80 through 10 meters. No adjustment required. Shpg. Wt. 4 lbs.



HEATHKIT B-1
$8.95

HEATHKIT VX-1
$23.95

ELECTRONIC VOICE CONTROL KIT

Eliminate hand switching with this convenient kit. Switch from receiver to transmitter by merely talking into your microphone. Sensitivity controls allow adjustment to all conditions. Power supply is built in and terminal strip on the rear of the chassis accommodates receiver and speaker connections and also a 117 volt antenna relay. Shpg. Wt. 5 lbs.

HEATHKIT VF-1
$19.50

VFO KIT

Far below the cost of crystals to obtain the same frequency coverage this variable frequency oscillator covers 160, 80, 40, 20, 15 and 10 meters with three basic oscillator frequencies. Providing better than 10 volt average RF output on fundamentals, the VF-1 is capable of driving the most modern transmitters. Requires only 250 volts DC at 15 to 20 ma, and 6.3 VAC at 0.45 a. Illuminated dial reads direct. Shpg. Wt. 7 lbs.

Save 1/2 or more...with Heathkits

HEATHKIT DX-100-B $189.50

DX-100-B PHONE AND CW TRANSMITTER KIT

A long standing favorite in the Heathkit line, the DX-100-B combines modern styling and circuit ingenuity to bring you an exceptionally fine transmitter at an economical price. Panel controls allow VFO or crystal control, phone or CW operation on all amateur bands up to 30 mc. The rugged one-piece formed cabinet features a convenient top-access hatch for changing crystals and making other adjustments. The chassis is punched to accept sideband adapter modifications. Featured are a built-in VFO, modulator, and power supply, complete shielding to minimize TVI, and a pi network output coupling to match impedances from 50 to 72 ohms. RF output is in excess of 100 watts on phone and 120 watts on CW. Band coverage is from 160 through 10 meters. For operating convenience single-knob bandswitching and illuminated VFO dial on meter face are provided. A pair of 6146 tubes in parallel are employed in the output stage modulated by a pair of 1625's. Shpg. Wt. 107 lbs. Shipped motor freight unless otherwise specified.

HEATHKIT DX-40 $64.95

DX-40 PHONE AND CW TRANSMITTER KIT

An outstanding buy in its power class the DX-40 provides both phone and CW operation on 80, 40, 20, 15 and 10 meters. A single 6146 tube is used in the final amplifier stage to provide full 75 watt plate power input on CW or controlled carrier modulation peaks up to 60 watts for phone operation. Modulator and power supplies are built in and single-knob bandswitching is combined with the pi network output circuit for complete operating convenience. Features a D'Arsonval movement panel meter. A line filter and liberal shielding provides for high stability and minimum TVI. Provision is made for three crystals easily accessible through a "trap door" in the back of the cabinet. A 4-position switch selects any of the three crystals or jack for external VFO. Power for the VFO is available on the rear apron of the chassis. Easy-to-follow step-by-step instructions let assembly proceed smoothly from start to finish even for an individual who has never built electronic equipment before. Shpg. Wt. 25 lbs.

Free Send now for latest Heathkit Catalog describing in detail over 100 easy-to-assemble kits for the Hi-Fi fan, radio ham, boat owner and technician.

HEATHKIT

HEATH COMPANY BENTON HARBOR 12, MICH.

pioneer in do-it-yourself electronics

a subsidiary of Daystrom, Inc.

Send latest Free Heathkit Catalog.

All prices and specifications subject to change without notice. Please include postage on orders to be shipped parcel post. 20% deposit is required on all C.O.D. orders. All prices are NET F.O.B. Benton Harbor, Mich., and apply to Continental U.S. and Possessions only.

NAME

ADDRESS

CITY ZONE STATE

QUANTITY	KIT NAME	MODEL NO.	PRICE

For further information, check number 7, on page 190.

Letters . . . . . to the Editor

Dhahran Airfield

Dear Wayne:

I have been an avid reader of CQ magazine and also of your editorial column for several years so I thought I would take this opportunity to write you about several things I have on my mind.

You may print these in any part of your wonderful book that you feel is most appropriate.

As for the ham family I feel I qualify along with most of them. They are as follows: Myself, K5IUO, Dad, K5JYX, Brother, K5ORQ, XYL, KN5SNQ, Mother-in-law, KN5PXZ, brother-in-law, K9DJQ and another brother-in-law, K9GHS. Up until my father-in-law passed away he also was a ham. This makes a total now active of 7 but was 8.

Now I wish that you would also print that the Sq. Commander of the 1949th AACS in Saudi Arabia encourages amateur radio operation and is well aware of the morale factor that it has on the fellows stationed over here at this isolated spot. I feel that amateur radio operation is highly encouraged at almost all Air Force installations as I have never been given a cold shoulder anywhere that I have been in the service. We have several set ups over here for amateur operation and it is also encouraged by the base commander here at Dhahran Airfield.

I realize that you are not in any way connected with ARRL but in their recent CW contest I worked lots of your readers and would in some manner like to inform them that I will answer all received QSL cards 100%. I will wait first on their cards to insure that I have their correct address as you can understand I have hundreds of cards to send out each month and found I had to duplicate lots of them as I had wrong addresses. This is why I prefer to receive their cards first. Please inform them to send my QSL's to HZ1AB Opr. "Bud" APO 616 New York and they will surely get a card from me.

Also I operate 20 CW daily at 0330 GMT at 14325 kc for those interested in working DX and also our station is on 10 meter AM fone daily at about 1500 GMT about 28460 kc for those on that band. I try and keep all skeds that are requested if they fit in with my working schedule as I work shift work over here.

Well enough for this trip. Keep up the fb work on your magazine Wayne. By the way I will be looking for W5AXI/mm to see how a perfect operator works. Hi. Only kidding as I agree with most of his article and enjoyed it very much.

73,

S/Sgt. Bud McClure AF16377273

Blame

Dear Sir:

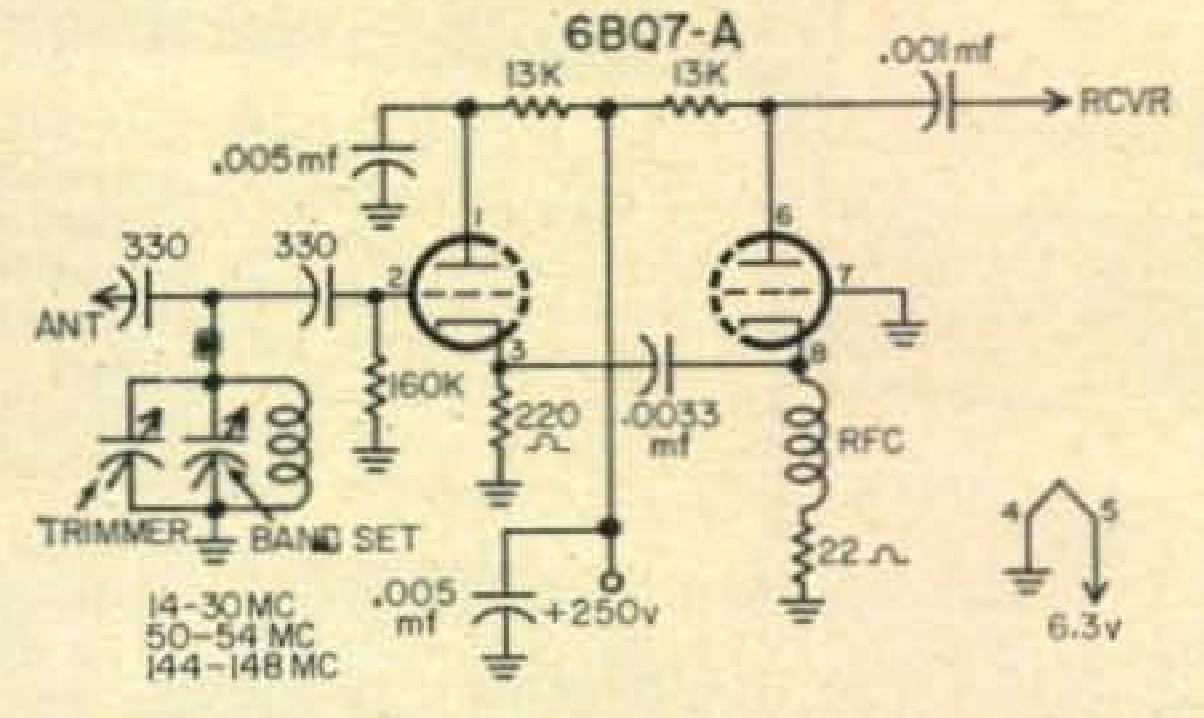
It is indeed a pleasure to see W5AXI/MM put the blame for the banalities of language in the amateur bands squarely on the shoulders of the General licensee. The population of Tech and Novice men on the 15 meter phone band is quite small. To the recent authors of similar articles concerning the 50 mc. band, may we quote an old proverb. "Pray child, why do you walk so crooked", said the mother crab. "Do but set the example and I will follow you", said the youngster.

K5OQN
Houston, Texas

Tuned Amplifier

Gentlemen:

Experiments with the cathode-follower, grounded grid amplifier combination without a tuned input circuit have resulted in gain losses of 6 "s" meter units on a 75 A1. It would appear that the enthusiasm of youth by-passed this writer's common sense to ground.



A tuned input circuit is a must.

Thanks to W6CBO, we now have a name for this thing. We call it a "Match Amplifier."

73, Tom Rivera, K6MXO

Emergency

W2NSD,

The American Red Cross had many words of thanks for the way amateur radio assisted during the flood emergency that hit Cleveland, Ohio, on Monday June 1, 1959. Four inches of rain fell on the city in one hour washing out sewers, roads, business establishments and homes.

The Mayham Amateur Radio Club under the leadership of Ed Reilly, W8OKE, was called out by the Red Cross to help with communications. What telephone lines were not affected by high water, were helplessly jammed by the extreme load of worried callers. Using six meter gear, the Mayhams set up base stations at the Red Cross Headquarters (Chuck Farley, K8DQB), at University Circle, Cleveland's hardest hit section (Ron Liff, K8NNA), and at Shaker Heights City Hall, the hardest hit suburb (Colin Donaldson, K8EXL and John Horvat, K8ISN).

Searching for flood victims, flood damage, as well as bringing relief to those in need of food, clothing, shelter, and medical aid were the mobile units Ed Reilly, W8OKE; Dick Roberts, W8NMV; Paul Maynard, K8JDJ; Fred Klotzman, K8JDQ; Dee Harvey, K8GQL; and Bob Blair, K8NYZ.

This was the first opportunity for the Mayhams to perform under actual emergency conditions for the Red Cross. The Mayhams, basically a group from the eastern suburbs of Cleveland have successfully handled emergency communications many times in the past. Being a closely knit organization, they can mobilize quickly so that communications are available when they are needed the most. With monthly meetings at their club headquarters in the Mayfield Heights City Hall, the Mayhams have found their services are needed most for floods, search parties, and mock disasters.

Fred W. Klotzman, K8JDQ

Band Revisions

Dear Wayne,

Your editorial in April 1959 CQ was read with interest, by me, an OT reared on cw and who occasionally uses AM phone.

It was also a surprise to learn QCWA suggest petitioning the FCC for a revision of the subassignments in the ham band. Like you, my feathers ruffled but it started me seriously thinking. So with two of us with serious thoughts may I present mine to you.

First, my observations will be confined to conditions on the 40-meter band because I have worked this band consistently for over thirty years. The other bands present similar problems, no doubt.

[Continued on page 20]

Feenix, Ariz.

Deer Hon. Ed:

Merry Crismus!! No joking, it are later than you thinking. If you not planning ahed to Crismus time, you letting yourself in for lotsa trubble. Yes indeedy. Always planning ahed for presents you wanting to getting for Crismus. You knowing old saying: Stitch in time are worth two in the bush.

You wondering how can having problums? Easy. If peeples not knowing that you wanting lotsa amchoor radio geer, then you might be getting such things as hankercheeves, toilet water, shaving loshun, books, rist watches, wallets, or even cameras, while all time you giving your Hon. Eye Teeth for 60K hundred what resistor, or 6146 toob, or new DSB kilowhat rig or even to pounds of 60-40 sodder.

Now, before you running off quicklike to taking care of things, like red-hots dee-x after giving RST report, letting me clewing you in on how to doing this Crismus present deel. It not as easy as it sounding, taking it from expert.

First things you not doing is hinting. Giving hints to peeples not only not worth doing, likesame trying to working dee-x on 10,000 megacycles band, but giving hints might even getting you in trubble.

Like take time I hinting to one of my Hon. Ants that I getting back on air as soon as getting enough monies to buying new FCC license (thinking she sending me money). What happening? She riting to FCC to finding out howmuch it costing to get me FCC license. That reel narrow squeek.

Or taking time I needing new reseever and I tossing out cupple hints to Hon. Relatives. Getting reseever all right—portable BC set. Lucky my XYL-to-be needing portable BC set. Giving it to her for late Crismus present so not cumpleet loss. No, Hon. Ed., not hinting for what you want. No good.

It not even working when you telling peeple what you want. So, rule number to—not telling peeple what you want. Last time I doing that I

[*Continued on page* 26]

Choice of the careful buyer

GSB-100, SINGLE-SIDEBAND, AM, PM, CW TRANSMITTER/EXCITER

GSB-100 is a welcome exception in today's market . . . returns full value for each of your hard-earned equipment dollars. It is truly the choice of the careful buyer—and there are many—as the number of GSB-100's on any band will clearly show.

GSB-100 performs . . . does what it is designed to do . . . with ease. Non-marginal, non-critical, stable. You set up on any band . . . 80-40-20-15 or 10 meters . . . on any mode, SSB with selectable sidebands, AM, PM, CW . . . in seconds. Exciter circuits are ganged for single control. Pi network output setup is simplified by output indicating instrument. You change sidebands at the flip of a switch . . . a quartz crystal "notcher" keeps carrier nulled perfectly without adjustment. The voice-operated-relay (VOX) adjusts precisely to your own voice characteristics . . . gives you "at ease" operating enjoyment. "Peek" control allows you to zero-in without turning on amplifier. CW men all agree that keying of this unit when on CW is exceptionally good.

Power . . . 100 watts P.E.P.—is sufficient for "barefoot" use as a transmitter . . . more than enough to drive the Gonset GSB-101 Linear Amplifier when you want a ten-fold increase in power.

GSB-100 . . . choice of the careful buyer

$499.50

Watch for the new Gonset Mobile SSB!

For further information, check number 8, on page 190.

GONSET **GONSET** *Division of Young Spring & Wire Corporation*
801 SOUTH MAIN ST., BURBANK, CALIFORNIA

EXPORT SALES: WESTREX CORP., 111 EIGHTH AVE., NEW YORK 11, N.Y.

QSL contest

Winner

HK5LI from down South America way wins this month's coveted award with his startling three-color card. We assume that the theme behind the design is: "To a ham, the world is so small you can put it in the palm of your hand." True as true can be, so Eduardo takes the honors. Congrats! OM.

Losers

Happy losers are W3QA, K5IQL and K1GCV. These lads submitted praiseworthy entries, but must satisfy themselves with only fame and a free copy of that famous amateur mag, CQ.

From the engineering team that developed the incomparable HT-32A comes a transmitter that brings SSB within reach of all...

HT-37

The price: $450.00. Here, for the first time, is a moderately priced SSB transmitter that retains the essential performance characteristics which made its big brother the most wanted single sideband transmitter of all.

Same power. Same rugged VFO construction. Identical VOX. And a smooth, distinctive speech quality that insures excellent on-the-air reports.

You can judge — and own — the HT-37 now. Your distributor will soon have it on featured display.

Technical Details

VFO employs double reduction disc drive, fixed T.C. **Sideband suppression** 40 db. at 1000 CPS. **Power rating:** 70-100 watts P.E.P. output CW or SSB. 17-25 watts carrier on AM phone. Two 6146's in the final. 3rd and 5th order distortion products down 30 db. **Carrier suppression:** 40 db. or better. **CAL System:** Instant CW CAL signal from any transmission mode. **Cooling:** convection with final operated at low dissipation in standby. **Size:** 9½" high, 18¼" wide, 16¾ "deep.

the new ideas in communications are born at . . .

hallicrafters

Chicago 24, Illinois

Export Sales: International Division
Raytheon Mfg. Co., Waltham, Mass.

For further information, check number 10, on page 190.

Announcements

Malden CD Aids in Massachusetts "Operation Roadwatch"

Participating in "Operation Roadwatch" over the Labor Day weekend was the Communications Unit of the Malden Civil Defense. Operating as Unit 14, it was located at a heavily travelled traffic rotary. At specific intervals the operators radioed in such information as traffic conditions, traffic flow, the average estimated speed and road conditions.

The communications van transmitted the information by a stacked 2-meter yagi array directed at Headquarters Radio. From Headquarters Radio the reports were collected and then sent in to State Police Headquarters. Malden, along with other communities operated Civil Defense equipment manned by volunteer operators. These units freed many State Police for vital road patrol operations.

Starting Friday afternoon the heavy traffic was monitored by various teams. The Malden operators participating were Warren Holmgren, W1BAB; Eli Nannis, W1HKG; Sheldon Goldberg, K1LJH; John Plummer, W1VN; Anthony Guide, W1YVE; Ben Littlefield, W1QJF; Frank Fortier, W1AAS; David Smith, W1HOH; Arthur Pugsley, W1RZE; Ronald Meuse, K1JML; William Doyle, W1TV; Marvin Tepper, W1YCV; Arthur Shulman, W1HXK; and Phil Stoddard, W1NXE.

Photo by Arthur Shulman, W1HXK.

Wichita, Kansas

The Wichita Amateur Radio Club and the Air Capital Amateur Radio Association are sponsoring the First Annual Convention of the Federation of Kansas Amateur Radio Clubs, November 21, 1959, at the Broadview Hotel, Wichita, Kansas. Activities will include a banquet, valuable prizes, technical talks and a dance. There will be radio displays and ladies' activities. Everyone interested in amateur radio is invited. Registration fee $6.00. Pre-registration fee $5.00. Write to Convention Chairman c/o Amateur Radio Equipment Co., 1203 East Douglas, Wichita, Kansas. Pre-registration closes November 14.

Join the Navy—Be an Admiral

The State of Nebraska in the heart of the good earth has a Navy and an Admiral's Commission all set for framing is available for you—after you have ten Nebraska contacts.

Here are the rules, check them closely:

1. The PROJECT — ADMIRAL'S COMMISSION — kicks off January 1, 1960,
2. State side stations and Canada need work one member of each of ten amateur radio clubs in the State of Nebraska (actually there are 15 clubs in the State, work any 10). DX stations need work only one member of *five* clubs.
3. Nebraska amateurs do not qualify for the contest.
4. After working the Nebraska amateurs, send your log to Box #626, Omaha, Nebraska. State side contacts send two 4¢ stamps, DX contacts—no postage required.

So get on the horn, there's a flock of Nebraska

FOUR WILL GET YOU A THOUSAND!

Wonderful odds certainly. But no gamble involved. GSB-101 gives you a big, thousand watts P.E.P.— avoids completely, any need for expensive-to-replace large tubes.

Four 811 triodes. . . well-proved, top performing sideband veterans. . . provide this power. . . conservatively, economically. A single low-cost spare keeps you constantly in business.

Modern circuitry adds further value. Highly stable grounded-grid linear amplifier doesn't waste drive power in swamping, lets it appear as useful talk power in amplifier output circuit. (Drive requirement, 60-70 watts, ideally supplied by Gonset GSB-100.)

Operation on 80-40-20-15-10 meters. . . full bandswitching of course. Heavy-duty power supply with 2-866A's and bias supply built-in. Operating conveniences include, quiet, DC-operated antenna relay, indicator for constant check on output.

GSB-101 LINEAR AMPLIFIER.

Unquestionably, your biggest power-for-dollar value!

$459.50

Watch for the new Gonset Mobile SSB!

For further information, check number 12, on page 190.

GONSET *Division of Young Spring & Wire Corporation*
801 SOUTH MAIN ST., BURBANK, CALIFORNIA

EXPORT SALES: WESTREX CORP., 111 EIGHTH AVE., NEW YORK 11, N.Y.

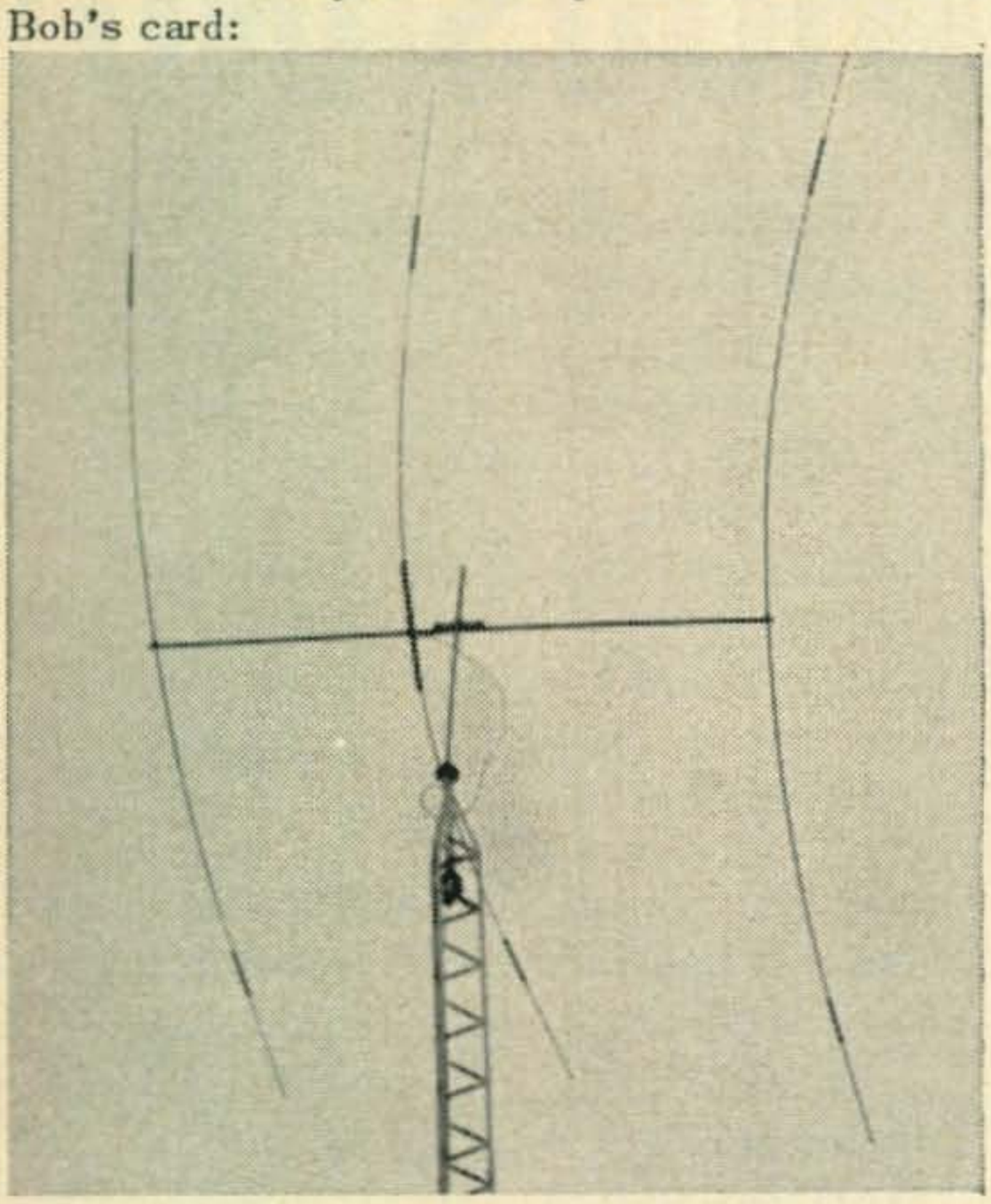
There's No Biz Like Ham Antenna Biz! . . .

Our apologies to Ethel Merman, Georgie Jessel, Tin Pan Alley, *et al*, but there is a striking similarity between their business and ours. We, too, get an occasional over-ripe cabbage tossed at us. (Like all good troupers, though, we don't duck because the produce thrower's aim is most always way off!)

But these gratuitous discourtesies are overwhelmed by the *kudos* that constantly come our way. Why they make working almost fun! Some days we go home positively glowing—and we haven't stopped off somewhere, either!

Like yesterday, for example . . .

Bob Hoffer, K9KKK, sent us a card and a snap-shot of his MOSLEY Trap Master Beam. Here's the snap and we quote *verbatim* from Bob's card:



Bob says, *"The picture was taken during a 50–60 mph wind hr. The beam suffered no damage. It works tremendously for me. The beam is at 70 feet. Make mine Mosley."*

Since Bob—in addition to obviously being a fine fellow—is crowding DXCC, has WAC Phone, WAS Phone and goodness knows what all, we think his opinion of our Trap Master Beam means a great deal.

That picture isn't to be sneezed at, either.

amateurs ready to be picked off and after you've worked the prescribed number of Nebraska amateurs, Governor Brooks has a Commission for you as an Admiral in the Great Navy of Nebraska. All you have to do then is buy yourself a uniform and a used battleship and you're in business.

Philadelphia, Pa.

On November 7, 1959, the Phil-Mont Mobile Radio Club will hold its Annual Banquet. This will be a particularly outstanding event in the Greater Philadelphia Area this year due to the greater program to celebrate our tenth (10th) year.

Visitors who attend this affair travel more than 100 miles (one way) yearly to enjoy our banquet and fellowship with Phil-Mont members and their YL's and XYL's.

Yonkers, N. Y.

On Friday, November 13, 1959, the Yonkers Amateur Radio Club will hold its sixth hamfest at Steve Phillips Restaurant, Yonkers, New York.

Harleysville, Pa.

The following have been elected as officers of the North Pen Amateur Radio Club for the year, June 1, 1959 to May 31, 1960.

Roger Beamon, President	W3BFM
Elmer Schorle, Jr., Vice-President	W3GSC
Richard High, Treasurer	W3HO
J. Harold Currens, Secretary	W3EQZ

Hot Springs, Arkansas

The Hot Springs Amateur Radio Club met at the Naval Reserve Training center here, Monday night, September 28. Wayne Jeffries, radio officer with the Arkansas Civil Defense unit, was the principal speaker. Mr. Jeffries outlined the chief purpose of civil defense and explained fully the important part that "ham" radio operators can have in this vitally necessary program.

Following the Jeffries' talk, a question and answer period followed. With 27 amateur operators in Hot Springs in this club, this group had participated in several civil defense programs which helped train them for better service in an emergency.

Officers of the Hot Springs club are: Kenneth Beavers, president; C. V. Thomas, vice-president; and H. C. White, secretary.

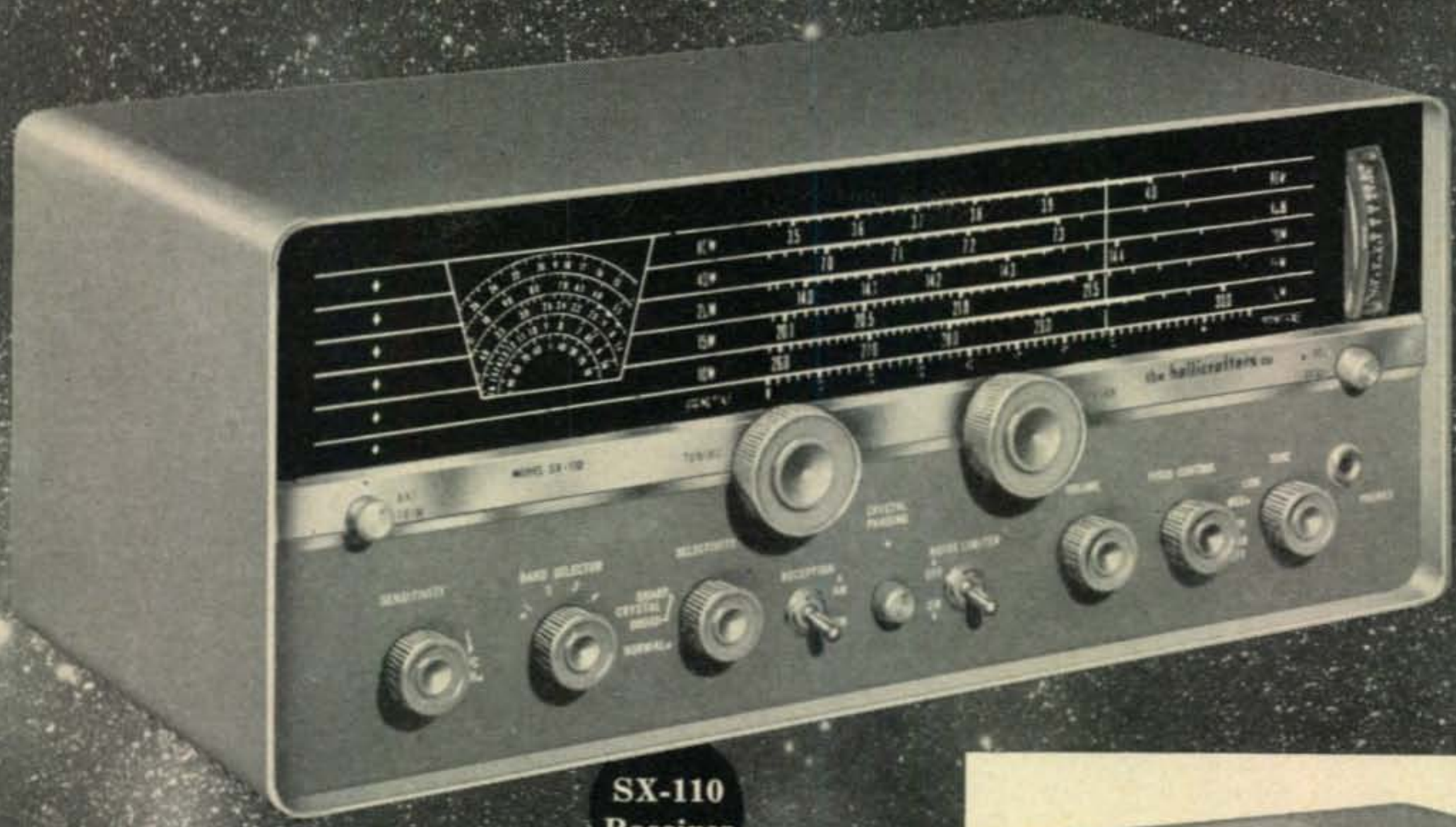
Conway, Arkansas

The first Mid-South "Hamfest" ever held at Conway, Arkansas, attracted 75 amateur radio operators and many members of their families, Sunday, September 20. Out-of-state places represented included Frankfurt, Germany; New Orleans, La.; Oklahoma City, Okla.; and Houston, Mo. George Steed of Oklahoma City, a veteran "ham" operator and former mayor of Pine Bluff, Ark., attracted considerable attention because of his long experience.

C. V. Robinette of Conway, Arkansas Radio Amateur Communications Emergency System chief, and Wayne Jeffries, also a Conway man who is communications officer for the Arkansas Civil Defense program, had charge of the meeting. Radio stations set up at the Faulkner County Fairgrounds were used in directing mobile station operators to the site of the hamfest.

Twenty-two Arkansas towns and cities were represented at the meeting. So successful was the program that radio amateurs in Conway say that they will start planning for the second hamfest at Conway next year. They declared that they will ask for active support from the Conway Chamber of Commerce to help promote the 1960 program by helping finance most costly prizes for amateur radio operators.

(*Continued on page* 174)



SX-110 Receiver

The new ideas in communications are born at Hallicrafters

S-108

S-38E

S-107

***NEW:* SX-110 Receiver.** Advanced features and design make the SX-110 an exceptional value for the radio amateur and short wave enthusiast alike. Standard broadcast plus three short wave bands (540 kc-34 mc). Slide rule bandspread dial, calibrated for ham and citizens' bands; built-in "S" Meter, antenna trimmer, crystal filter. Seven tubes plus rectifier.

***NEW:* R-48 Speaker.** (not shown) Perfect match for SX-110. Latest design; uses new 5½" x 7½" speaker. Exceptional damping qualities, distortion-free response. Switch for selection of voice or music response.

***NEW:* S-107 Receiver.** Outstanding new styling and impressive features. Standard broadcast plus four short wave bands—unusually wide coverage (540 kc-34 mc and 48-54.5 mc). Separate bandspread and logging scale; slide rule dial; phono jack and headset tips. Seven tubes plus rectifier.

***NEW:* S-108 Receiver.** Exceptional value and performance. Same as SX-110 in frequency coverages but without "S" Meter, antenna trimmer and crystal filter. Built-in speaker. Calibrated slide rule dial; temp. compensated oscillator. Seven tubes plus rectifier. Ideal general coverage receiver.

***NEW:* S-38E Receiver.** Latest version of the world's most popular short wave receiver. Modern new styling, improved circuitry for utmost in performance and dependability. Standard broadcast plus three short wave bands (540 kc-32 mc). Electrical bandspread; slide-rule overseas dial; headset output; built-in speaker.

For further information, check number 14, on page 190.

Export sales: International Div., Raytheon Mfg. Co., Waltham, Mass.

hallicrafters Company

Chicago 24, Illinois

LETTERS *[from page 11]*

The QCWA are off balance when they state 80% of the operation is on phone, and large segments outside the phone strip is little used. It just seems that way, offhand.

The phones, in many cases are tuned broad and splatter over 10 *kc*. Then SSB came to life and splattered 20 *kc* with their 2 *kw* PEP commercial rigs. AM and SSB are incompatible, so when more SSB rigs get on the air and spread out over the entire phone band, there will be such a bedlam of QRM, many of the phone men will become disgusted and quit ham radio or take refuge in the cw bands if they can adjust themselves to code and use it properly.

I make no issue out of phone verses cw, as they are both the hobby of the individual choosing to major in one or the other, giving him and his friends the pleasure and pastime he seeks.

In reality, on cw, I get a kick out of skillful tuning to circumvent QRM. This is not true on phone as it it impossible to tune out a 1 kw SSB signal that opens up on your frequency, using an AM receiver. Likewise the carrier of a kw AM phone takes over and blanks out the frequency for 5 *kc*. That is the inherent nature of the beasts, phone is broad, cw sharp.

I fully believe in the equality of rights and privileges and would propose the bands be divided equally, half for phone and half for cw.

Further, I would propose to limit the SSB and DSB phones to two segments of 25 *kc* each, or a total of 50 *kc* and keep AM off these channels. It is the nature of SSB boys to congregate on one frequency and round table and there would be plenty of room for round table groups.

For example:

7000–7150 A1
7150–7175 SSB–DSB
7175–7275 AM
7275–7300 SSB–DSB

There is a revolting development on the 7 *mc* band in that foreign BC and phones take over about 75% of the phone band after 4 pm and 25% of the cw portion. They leave only a small portion of the band for ham phone operation. Sad, but true.

Here I would like to emphasize a few situations that will bear on what I will propose later. Although A1 is legally permitted over the entire 7 *mc* band, the cw boys keep off the phone band even though they could hold a 100% QSO in spite of phone QRM and the wrath of the phone men. Also the cw men respect 7000 to 7050 as a DX portion of the band. This has developed from a voluntary self-imposed unwritten rule.

By the same token I firmly believe any mutual understanding of band subdivision could be respected by the amateur fraternity without FCC designation as a matter of law. In fact, why should it be necessary for the FCC to make subdivisions and constantly police them? Could not the law state 7000 *kc* to 7300 *kc* is allocated to amateur use for A1, A3, F1, and etc. . . . transmission and let the amateur fraternity allocate its own subdivisions? What does Uncle Sam care so long as we keep within our allocated bands and do not interfere with other services?

Oh yes, the Novices. Let them spread out 7050 to 7150. We experienced operators with *vfo's* can wiggle around their rock-bound signals, besides it will educate them to increase their code speed and ability.

Sumpin's gotta be done; let's be fair and square about it. How can we do it? Here's my proposition.

Let us create an entirely new organization called the American Radio Amateur Council (ARAC).

The members shall consist of all American radio amateurs who can scare up the small sum of 25 or 50 cents as dues. Elect a representative from each call district, a representative of ARRL, CQ magazine (and any other magazine that has amateur following), and a representative from FCC. These men will constitute the members of the council board.

NEW!

GENERAL-COVERAGE AT ITS SSB BEST!

NEW HAMMARLUND HQ-180

- ★ 18-tube, triple-conversion, superheterodyne with automatic noise limiter.
- ★ 540 KCS to 30.0 MCS with bandspread on 80, 40, 20, 15 and 10 meter amateur bands.
- ★ Razor-sharp slot filter with up to 60db attenuation. Separate linear detector. Selectable Sideband. Controlled BFO. Selectable AVC. Built-in 100 KCS calibrator.

They said it couldn't be done — **professional-quality performance SSB in a general-coverage receiver** at a **price less than ordinary SSB general-coverage receivers.** Hammarlund did it! The all-new Hammarlund HQ-180 goes far beyond any previous concept in value and performance. See it and try it right now at your Hammarlund dealer . . .

$429.00

*Telechron clock timer optional, $10 extra.

WRITE FOR COMPLETE SPECIFICATIONS . . .

Established 1910

HAMMARLUND

MANUFACTURING COMPANY, INC.

460 West 34th Street, New York 1, N. Y.

In Canada: White Radio, Ltd., 41 West Ave., N. Hamilton, Ont.

Export: Rocke International, 13 E. 40th St., N. Y. 16, N. Y.

For further information, check number 16, on page 190.

Petition the FCC to eliminate from law all subband allocations. Then through the council let us regulate our own subband allocations.

This will relieve the FCC of a lot of unnecessary police work, and I am positive the amateur fraternity as a whole will fully respect the allocations determined by their own council.

The idea is not new. Today through the perseverance of Admiral Shepheard USCG (RET) the pleasure-boating fraternity have in full swing a similar organization called the American Boat and Yacht Council, organized to clean their own house by creating safety standards for the pleasure-boating industry with a minimum of governmental regulation. This organization was sponsored by the U. S. Coast Guard and is a welcome addition to all concerned. Its problems are far more detailed and complicated than the problems that now confront ham radio.

WHY CAN'T WE DO IT? WE CAN. LET'S DO IT THE AMERICAN WAY!

R. H. Sweeny, W1FEQ,
Marine Office of America

Some interesting ideas here. The broadness of SSB is, in my experience, somewhat exaggerated, but that is not really the important thing. Discussion by me of the suggested ARAC might lead to comparisons of the Russian one-party system vs the American two-party system and would upset things even more.

W6/K6 Stigma

Dear Wayne,

A few years ago, 14 to be exact, I picked up a copy of CQ from a newsstand. From that time forward, I was hooked. Having followed "Letters to the Editor" religiously and having weighed each side of the issues I have always drawn my own conclusions. Also, I have kept my mouth shut. But now I'm here to scream loud and long. If this is Brotherhood of Ham Radio then where are the brothers, pray tell?

I have been operating portable 6 for one month and have been on the air (?) daily, 4 and 5 hours at a time. Contacts to date? Three!!!! Surely the W6/K6 area couldn't carry that much of a stigma! During my short time as a "licensed" ham (5 years) I have yet to intentionally ignore anyone who has answered my CQ. Also I have answered several. Since I have been operating Portable 6, I have been shunned as if I had some rare, contageous disease.

I can hear the remarks and catcalls now. Sore head! Up-start! Well let 'em come. After all, I enjoy this fine hobby of ours, too, but I can take so much. Thank goodness my stay here is nothing permanent. I would hate to think of carrying on 2-way conversations with myself on 20 cw for the next 4 months.

I wonder how many of the W6/K6 boys share my feelings?

Also, I wonder how many answers I would get if I start signing AC4???

73s, W7ACC/6 ex W5EYL

Wanted—6M Rig

Dear Sir:

I constructed your "6 Meter Gamma Matched Ground Plane" as described in the July, 1959 issue of CQ. The total cost for components for this antenna was a mere $2.50. It really works wonderfully with my Globe Scout 65A transmitter, and I am certainly glad that I built it. By the way, how about a construction article on a simple 6 meter beam and a good 6 meter mobile rig?

Best 73,
Ronnie Evard, K4EPI
Fayetteville, Tennessee

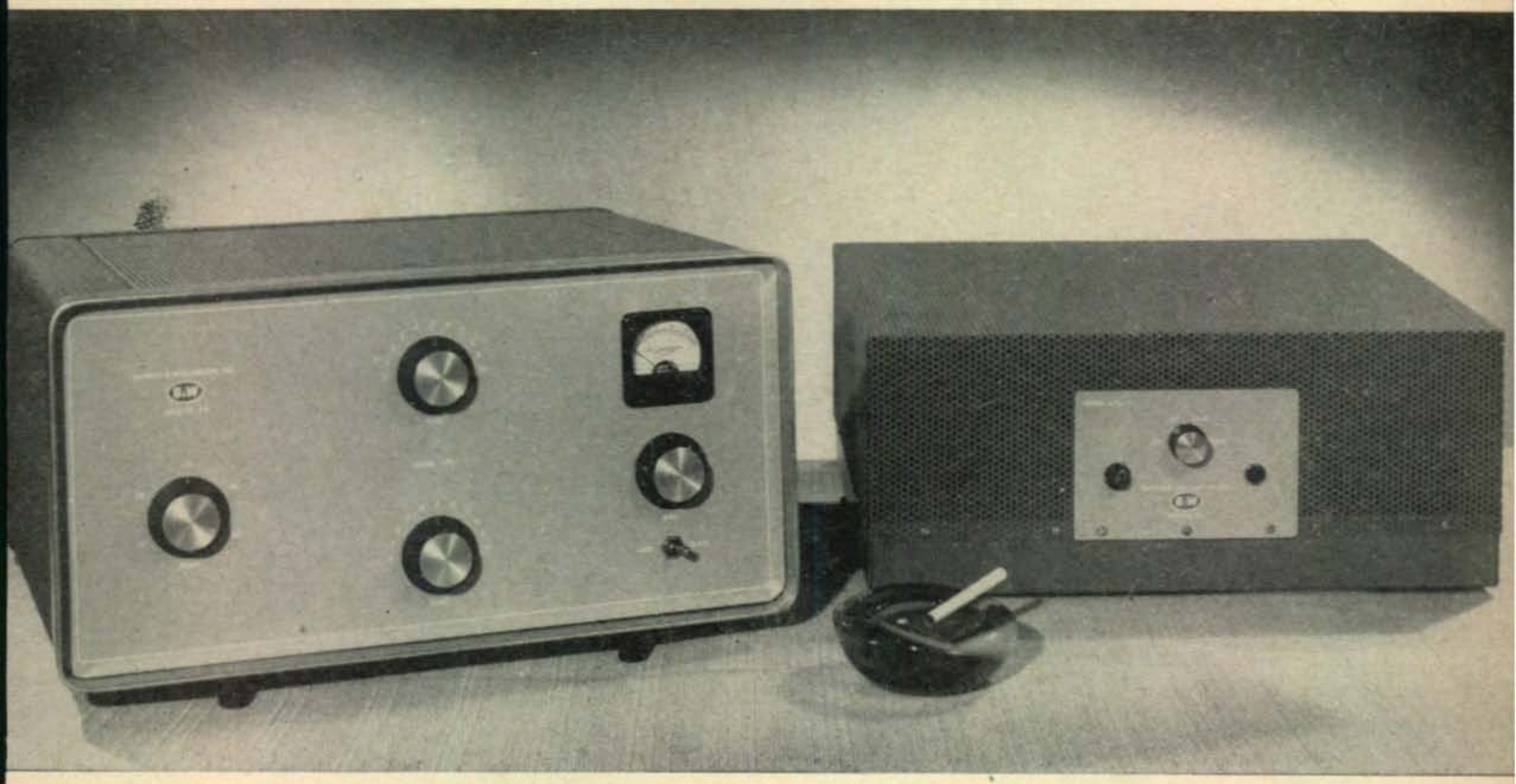
Spicy Liars

Dear Wayne,

After I had been hamming for a year or so I found I needed something to spice up my hobby. My mischievous mind immediately set on my tape recorder that lay dust-laden in the corner of the shack. Most

Merry Christmas from your XYL

POWER... PACKAGED FOR TODAY'S AMATEUR



LPA-1 GROUNDED GRID LINEAR AMPLIFIER
NET PRICE $375.00 COMPLETE WITH TUBES

LPS-1 POWER SUPPLY
NET PRICE $205.00 COMPLETE WITH TUBES

Power—a full kilowatt with this smartly designed, excellently styled version of the famous B&W linear amplifier family! New compactness . . . takes up no more space on your table than a receiver. New features . . . for greater performance and flexibility than ever before.

Separately housed LPA-1 R. F. section employs two Type 813 beam power tetrode tubes, connected as high-Mu triodes in a grounded-grid circuit. Blower, filament and bias supply are included in this section.

High voltage power supply unit LPS-1 may be remotely located. Switching control panel is removable for convenient installation at the operator's location. Circuit consists of a full wave single phase bridge rectifier, using four Type 816 mercury vapor rectifier tubes. R. F. filtering protects tubes and prevents mercury vapor hash radiation.

The LPA-1 can be driven by most exciters in the 100 watt class, such as the B&W 5100/5100B series, Vikings 1 and 2, Valiant, Collins 32V, KWM-1, 32S-1 series, Heath DX100 and others.

A compact impedance matching unit, the B&W LPA-MU, is separately available. It provides for operation with fixed output exciters such as the Hallicrafters HT 32 Series and similar types. A similar unit, the LPA-MU-2, is also available for use with the B&W L-1000-A and L-1001-A.

Your local distributor should have these advanced units *now* . . . see them soon.

LPA-MU MATCHING UNIT $36.00
LPA-MU-2 $36.50

Send for this illustrated brochure in full color giving specifications and detailed descriptions of the new B&W LPA-1, LPS-1 and LPA-MU.

B & W

Barker & Williamson, Inc.

Bristol, Penna.

OTHER B&W AMATEUR EQUIPMENT: Transmitters AM-CW-SSB • Single Sideband Generators • Single Sideband Receiving Adapters • Dip Meters • Match Masters • Frequency Multipliers • Low-Pass Filters • T-R Switches • R.F. Filament Chokes • Transmitting R.F. Plate Chokes • Audio Phase Shift Networks • Band Switching Pi-Networks • Cyclometer-type Counters • Antenna Co-axial Connectors • Baluns • Variable Capacitors • Fixed and Rotary Type Coils

For further information, check number 18, on page 190.

hams have probably had experience with tape recorders on the air; but since the idea was new to me, it sounded exciting. A friend, K2ZSQ, came over and together we planned our fun. Our first trick and probably the most popular is the CQ with the "chipmonk" type voice. This can also be accomplished by modulating an E. K. (he). The fun in this soon faded. Then I brought out a tape I made of a thunderstorm. We played this in the background of a QSO with a K9. We laughed as we got him to believe we were having a storm. This came to an unglorious end when a local K2 came on and spilled the beans. There wasn't a cloud in the sky. Now Bob (K2ZSQ) and I are known as the "Airwaves biggest liars." Well, I'm still not discouraged and am still looking for new ideas.

73es good luck,
Bruce Dembling K2DQU

Faithful

Hello there OM:

Being a faithful subscriber to famed "CQ" magazine, thought I would pass along this bit of advice received from a non-reader (tsk). You chaps who are running a DX-4 will at one time probably have to replace the 6DE7 modulator if you use the rig on phone. If you are like me and do not carry spares then a 6SN7 will do the job with no modification to the rig. I attached 8 wires directly to the pins on the octal-based 6SN7 and then wired the respective pin-leads to the underneath of the 6DE7 base. Works fine and dandy when in a pinch and I'm still using the 6NS7, just too lazy to pull the DX-4 apart and place the 6DE7 in its socket.

Just a word in closing, happy to hear K/W calls operating portable VE3 this summer. Especially on the old woman's band, 75 phone.

73, "Dave" Kimpton VE3CFK/3

Kudos

Dear Old Sir:

Before writing this letter I was lying on my chaise longue playing "Pale Hands Beside the Shalimar" on my nose flute, dreaming of my youth and hot nights spent pursuing elusive chimerae on 40 cw when the only problem was Mexican phone QRM—and trying to ignore a persistent mild burning in my guts. Ultimately this pain was identified as simple guilty backbone, a periodic phenomenon appearing quite regularly the day following the arrival of CQ. A very brief appraisal of this coincidence revealed a suppressed conviction that you are carrying the ball, to coin a phrase, for thousands of us bums, and carrying it with style while from the sidelines the inspiring rooting rises to a soft murmur. Burning with shame, for one reason or another my usual approach to letter writing, I found my way to the typewriter.

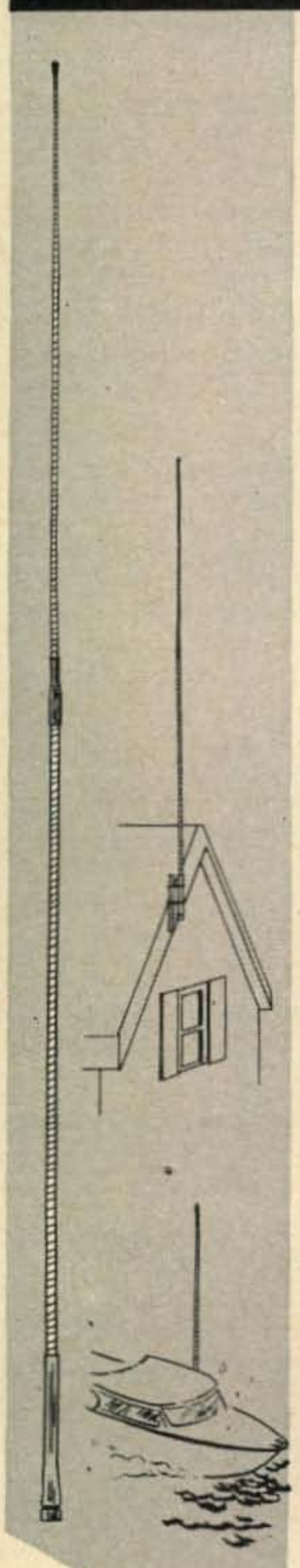
First things first, and the editorials are in the front of the magazine—I would like to tell you that they give me more in entertainment and education than anything else you print. An issue without an editorial is almost no bargain. Several of us at the transmitter where I work chip in for a subscription, but even at this cheapskate rate I feel cheated when your literary provocations are omitted. On the rare occasions when I don't agree with your opinions your style, irreverence and winsome phrasing makes me feel that to quarrel with your views would be disgracefully gross.

I think that, on the whole, the assortment of departments and articles is well balanced. My only reason for thinking this is that I don't like most of them, including Scratchi, and have a history of contradicting majority views on almost everything. For example, sometimes I think you err in padding out the book with non-definitive tests of commercial gear—items everyone probably likes to read. And occasionally the humorous pieces make me cry. But more often than not there are articles that are worth my piece of the year's subscription, and above all the mad editor's disquisitions which we assume are delivered to the printer and handled in the manner of the essays of the

[Continued on page 143]

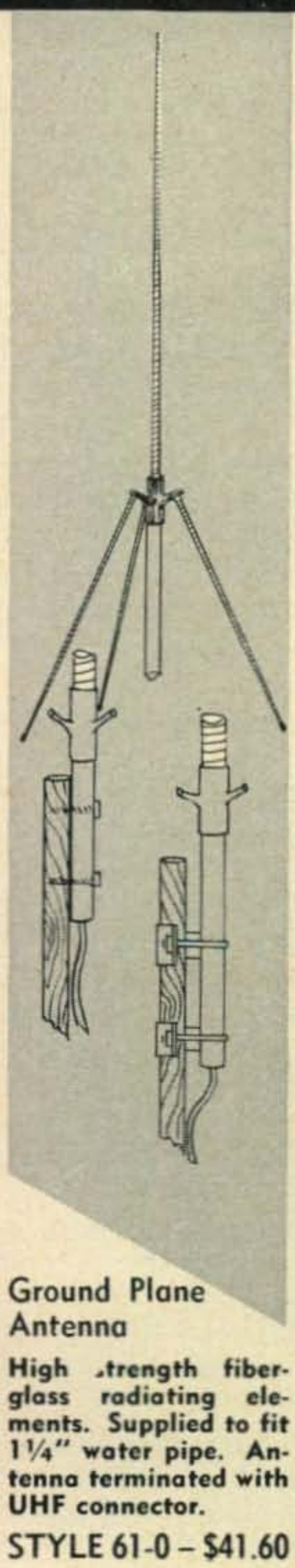
27 MC citizens band FIBERGLASS antennas

Shakespeare WONDERODS



Loaded Coaxial Sleeve Antenna

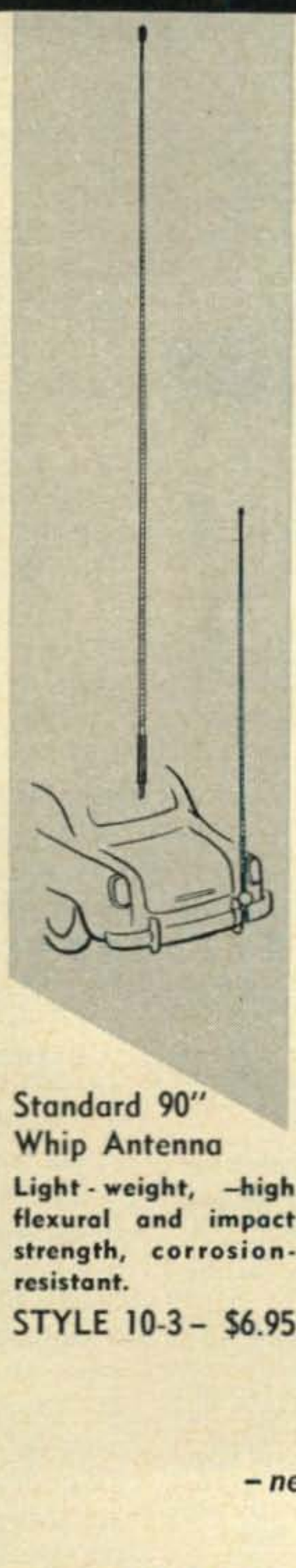
Ideal for both marine and base station application. Antenna terminated with UHF connector. – STYLE 72-0 – $46.00



Ground Plane Antenna

High strength fiberglass radiating elements. Supplied to fit 1¼" water pipe. Antenna terminated with UHF connector.

STYLE 61-0 – $41.60



Standard 90" Whip Antenna

Light-weight, –high flexural and impact strength, corrosion-resistant.

STYLE 10-3 – $6.95

Normal Mode Helical Antenna

Distributed-load antenna eliminates standard loading coils; four ft. length permits choice of mounting positions.

STYLE 62-0 **Deluxe model, in white** $15.90

STYLE 73-0 **Std. model, metallic gray** – $11.25

Rain Gutter Antenna

The convenient, detachable installation with all exceptional benefits of lightweight fiberglass.

STYLE 74-0 – $14.40

– *net prices*

We Solicit Orders for Custom-built Antennas for Industrial Application

COLUMBIA PRODUCTS COMPANY

SUBSIDIARY OF THE *Shakespeare* CO. • R.F.D. 3, COLUMBIA, S. C.

Look for the spiral markings of genuine Shakespeare Wonderods.

For further information, check number 20, on page 190.

SCRATCH *[from page 12]*

telling Hon. Uncle if he wondering what to getting me for Crismus, he can bying me Handbook. I getting book on palmistry. Well, Hon. Ed., that are a Hand Book, are it not?

Howsumever, being not discouraged. Now I telling three good ways to getting presents you wanting for Crismus. First are reel easy. You finding ad for something you wanting, and you cutting it out of Hon. Magazine. Next, you writing note to yourself on ad, saying: "Checking price and if not to much bying for shack." Then leeving ad around where somebuddy will seeing it who having money enuf to buying same.

Second idea are if having rich old relatives who loaded with bux, and you not sure how much they going to spending on you. You getting amchoor radio catalog, and you going thru it and marking all items you thinking you needing. Using big heavy black pensil so easy to seeing, on acct. relative might having week eyes.

Next, planning visit to relative who loaded with bux, and carry catalog with you. When they asking what you been doing resently, you telling them you are rebilding your rig, and have been busy going thru catalog picking out what you need. NOW, when you leeving, be sure to leeving catalog behind and not taking it with you.

Of coursely, they might sending it back to you rite away, but in that case they weren't going to buy you any Crismus presents anyway, so you having time to getting catalog to some other loaded-with-bux relative.

These first to schemes are fine for local relatives, but not much good for relatives far away. So, here comes the reel sneeky idea. Getting order blank from amchoor radio store, filling it out compleet with your name and adress, list what you wanting, and putting total bux needed at bottom.

Now, riting nice letter to some far-away loaded-with-bux relative, and talking about anything you want in letter. After finishing letter, putting on P.S. In this you saying that you are losing an order blank for stuff you needing, and may have accidently put it in letter, but can't looking on acct. letter is sealed, so if finding order blank they knowing where it coming from.

Aren't that a reel dandy!! Well, Merry Crismus, and getting lotsa nice letters out to relatives so you getting lotsa nice presents.

Respectively yours,
Hashafisti Scratchi

P.S. I losing order blank for subscripshun to your Hon. Magazine and maybe it in this letter by misteaks. If so, you knowing what to doing.
H.S.

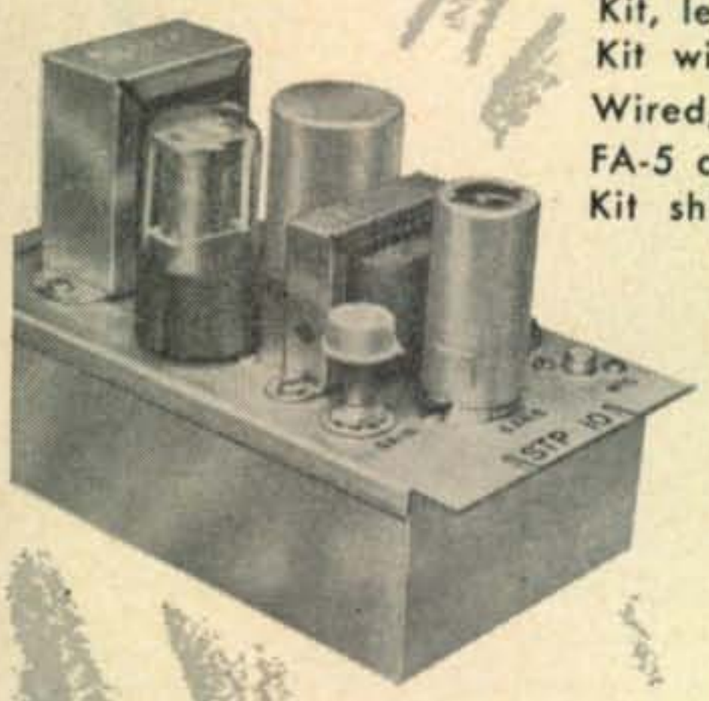
Santa's Bag is full of International gifts . . .

HAMS WANT MOST!

FREE! Gift Wrapping on all orders received by Dec. 15.

STP-50 6 meter transmitter

Kit, less tubes & crystal, $21.50
Kit with tubes, less crystal, $26.50
Wired, with tubes, less crystal, $32.50
FA-5 crystal, 12MC, $4.00
Kit shipping weight 5 lbs.



STP-10
10 WATT MODULATOR

Designed for STP-50 transmitter.
Kit, less tubes, $22.75
Kit, with tubes, $25.25
Wired and tested, with tubes $30.50
Shipping weight, 3 lbs.

FCV-2 CONVERTER

Model 50, 6 meters. Model 144, 2 Meters. Kit with crystal, less tubes, $12.95. Wired and tested, with tubes and crystal, $17.95. Shipping weight, 2 lbs.

KB-1 TRANSCEIVER KIT

FOR AMATEUR USE ON 6 METERS OR 10 METERS. Tunes 300 KC portion of the band for which the unit is ordered. (Specify portion of band desired when ordering. Complete kit with 3-way power supply for operation on 6 volts DC, 12 volts DC or 115 volts AC, $98.00.
Shipping weight 20 lbs.

ORDER BY MAIL NOW!

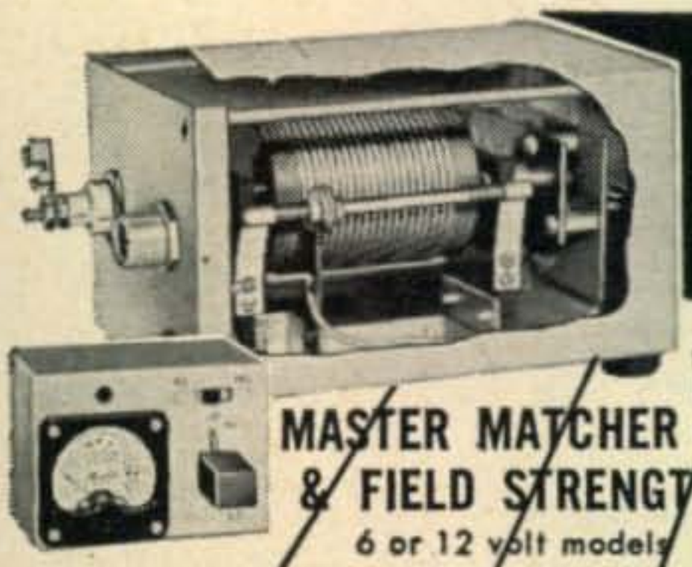
Terms F. O. B. Oklahoma City or C. O. D. with 1/3 down payment on orders of $25 or more.

International
CRYSTAL MFG. CO., INC.
18 N. LEE • OKLAHOMA CITY, OKLA.

For further information, check number 22, on page 190.

For further information, check number 23, on page 190.

Leaders in the Design and Manufacturing of Communication Antennas & Equipment



MASTER MATCHER & FIELD STRENGTH METER

Automatically tunes entire band by remote control.

6 or 12 volt models **$24.95**

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

Your Choice **$5.25**

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

3 ELEMENT 11M. BEAM NO. SR-500

Provides a power gain of approx. 2½ (8DB) in forward direction. 10 to 1 interference reduction from sides and rear. VSNR 1. 1 to 1 at band center when fed with 52 OHM coax. . . **$36.00**

THE CITIZEN SR.

FIBRE-GLAS WHIPS

The Feather-Weight Antenna with Spring-Steel Strength!

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

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

MARINE ANTENNA

Center-loaded, provides max. power on all marine freq. from 2 - 3 meg. Weatherproof, waterproof. 10½' overall length, 4' S.S. plastic-coated whip, 18" impregnated coil. Colorful.

$29.95

11M. CITIZEN BAND ANTENNA

40" base loaded S.S. whip antenna. Fitted with a ¼" dia. brass slug for use with a standard-broadcast 8-ball type cowl mount, also rooftop or trunk lid type mount. Low standing-wave ratio on most of band when fed with a 52 ohm coax.

8B-27 **$12.95**

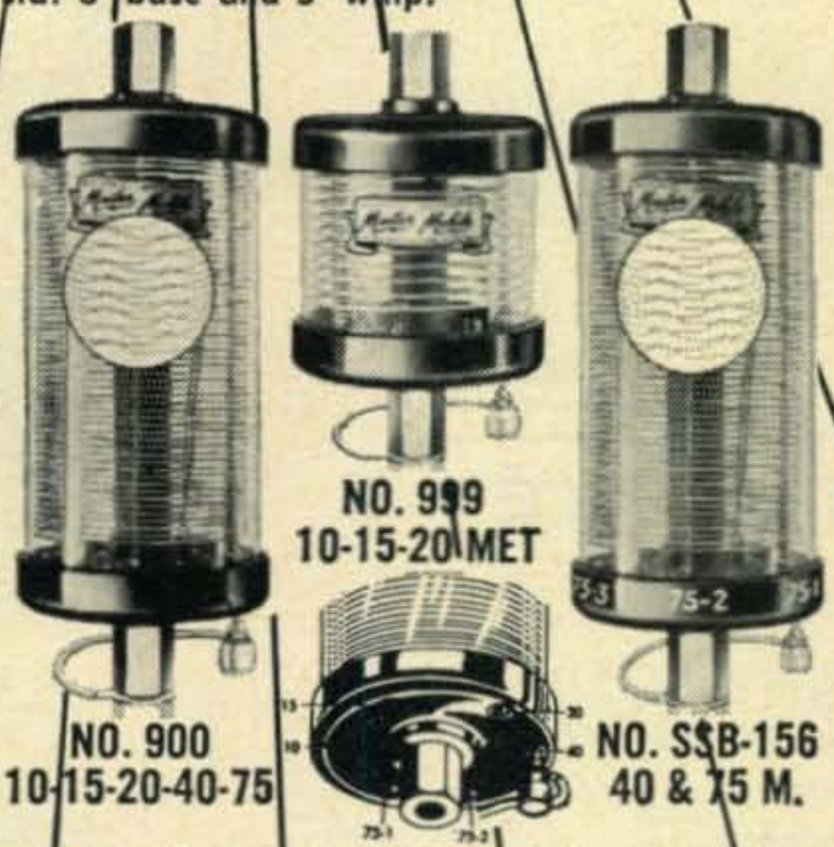
MARINE LAYDOWN MOUNT

Can be mounted in any position. Adjustable swivel for all positions. Chrome-plated brass, waterproof phenolic insulator.

$19.95

MULTI-BAND ANTENNA COILS

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



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

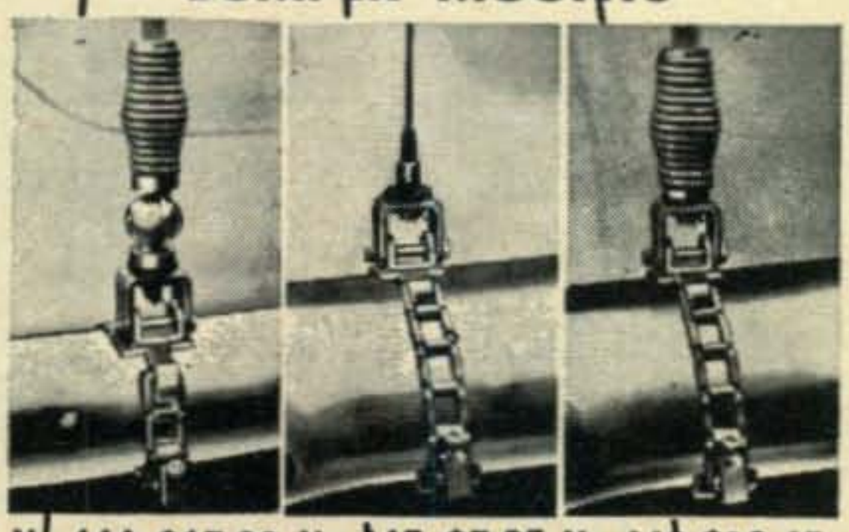
NO. 999
10-15-20 MET

NO. SSB-156
40 & 75 M.

- Rigidly tested & engineered—found to have "Q" of 525
- Handles 500 Watts input
- Operates into a 52-ohm cable
- Positive contact—noise free, trouble free operation
- Weathersealed
- Factory pre-tuned—no adjustments needed.

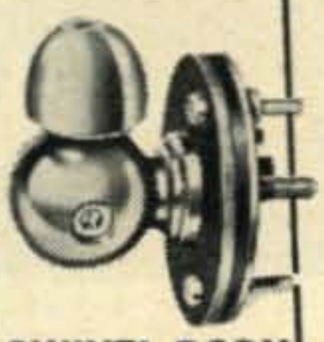
YOUR CHOICE EACH **$14.95**

BUMPER MOUNTS



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

Adjustable to any bumper. No holes to drill.



SWIVEL-BODY MOUNT

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

No. J-11 **$2.95**

CITIZEN BAND ANTENNA 26.960-27.225 MC

VSWR under 1.5-1 at resonance. Complete with 50' RG 58/U Cable. Swivel type antenna base for flat or peaked roof installation.

GP 27-11
$34.50

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

96" WHIP

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

SIZE 1⅜" x 19"

NO. B-1080

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

$17.95

MASTER-MAGIC WAND

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

10 Met.-	5 Ft. L.	$8.95
11 Met.-	5 Ft. L.	8.95
11 Met.-	35 In. L.	8.95
11 Met.-	45 In. 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

SUPER HI-GAIN CITIZEN BAND

Stacked coaxial antenna provides 5-6 DB gain. 42" high from ground plane. Furn. with 12" ext. for bumper mount.

460-465 MC
No. CL-465
$21.95

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

WRITE FOR FREE CATALOG OF COMPLETE LINE

EIA Electronic Industries Association Est. 1924

Master Mobile Mounts, Inc.

1306 BOND STREET · LOS ANGELES 15, CALIF.

AT LEADING RADIO JOBBERS EVERYWHERE

For further information, check number 24, on page 190.

MARS BULLETINS

First Army MARS SSB Technical Net

Wednesday evening, 9 PM N. Y. time on 4030 kc upper sideband.

Nov. 4—"SSB Exciter Circuits for a New Beam Deflection Tube," by Harold Vance, K2FF, Manager Sales Engineering, Distributor Products, RCA Electron Tube Division.

Nov. 11—"Modern Communications Receiver Circuitry," by Byron Goodman, W1DX, Assistant Technical Editor, American Radio Relay League.

Nov. 18—"Thess vs. Transistors in RF Circuits," by Kenneth Redmond, Applications Engineer, Amperex Electronics Corp.

Nov. 25—Transistorized Gadgets and Gimmicks," by Robert Gunderson, W2JIO, Editor, Braille Technical Press.

Air Force MARS Eastern Technical Net

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

Nov. 1—"Basic X-Rays and Their Applications in Industry." Mr. Paul Lublin, Sylvania Research Center.

Nov. 8—"Elements of Radar." Mr. Robert Franklin, Sperry-Rand Corporation.

Nov. 15—"Guided Missiles and Propulsion Systems." Mr. Leigh Mathews, Sperry-Rand Corp. and Mr. Phil Roundtree, Republic Guided Missiles Division.

Nov. 22—"Elementary Particles." Dr. Clifford Schwartz, Brookhaven National Laboratories.

Nov. 29—"Applications of the Atom." Dr. Lyle Borst, New York University.

Air Force MARS Western Technical Net

Sunday 2-4 PM local time—7832.5 kc, 3295 kc, and 143.46 mc.

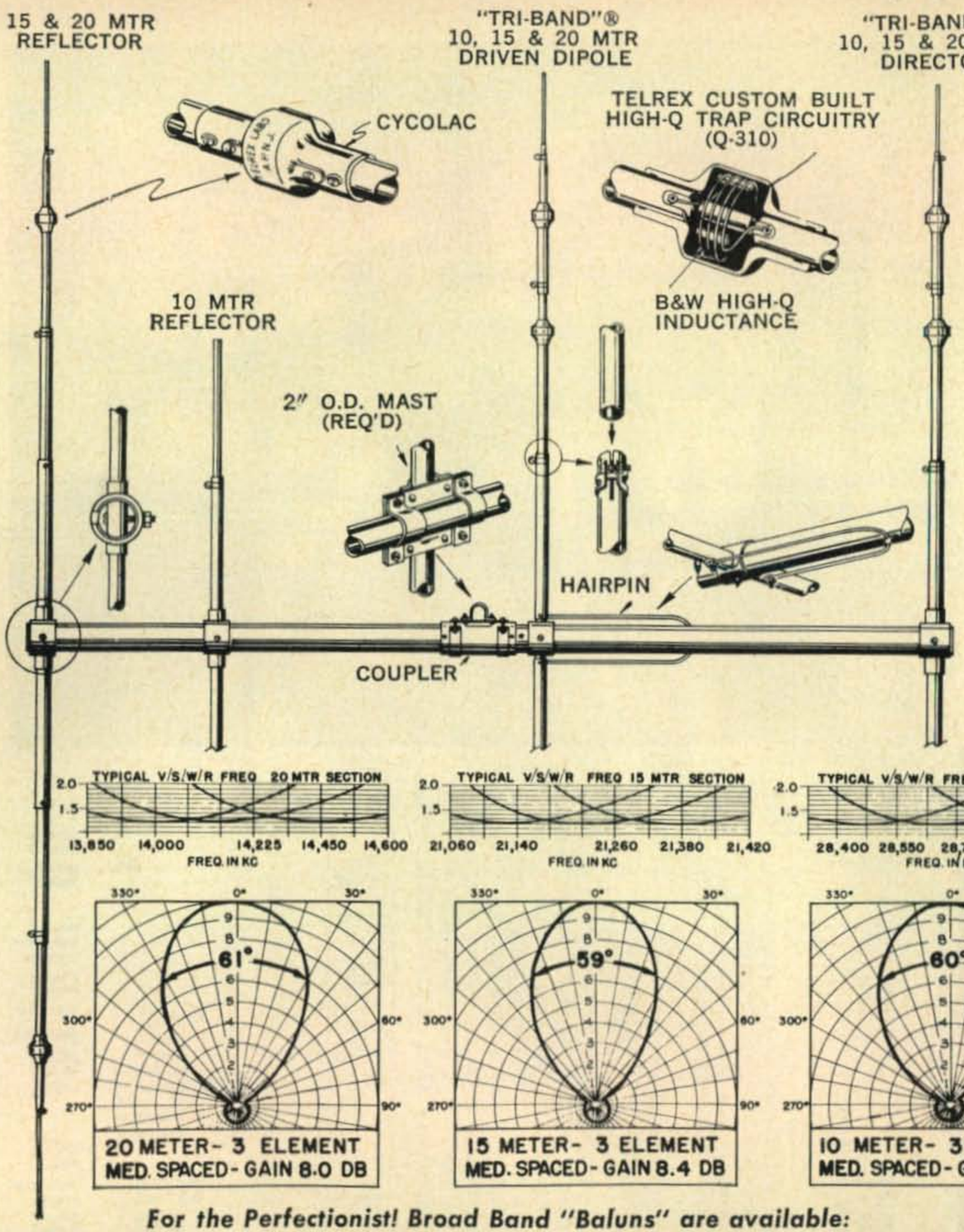
Nov. 1—"Emergency Communications and Civilian Defense Communications," by Mr. Roy I. Post, Director of Communications, O. C. D. M. Region 7, Santa Rosa, Calif.

Nov. 8—"A Review of Parametric Amplifiers," by Dr. Glen Wade, Stanford University Research Labs.

Nov. 15—"VHF 2-way Mobile Communication," by Mr. Howard Coleman, Motorola Communications & Electronics, Inc., Hollywood 28, Calif.

Nov. 22—"Amateur Communications," by Mr. John Griggs, W6KW, Past Director Southwest Division ARRL Hopkins Engineering, San Fernando, Calif.

Nov. 29—"Net Session and Conversion Information."



For the Perfectionist! Broad Band "Baluns" are available:
Model BBB 1/5 (1.5KW) $18.50 Model BBB 3/0 (3KW) $24.50

TELREX
CHALLENGER "TRI-BAND"®
Single-Transmission-Line Array
Model TBS-416 $159.50 F.O.B. Asbury Park, N. J.

Telrex Model TBS-416—tuned, matched and calibrated for easy assembly (to your favorite band sectors) and Telrex specified performance at your site — without tuning or adjustments of any kind, required, or recommended!

Model TBS-416 consists of 4 medium spaced elements (two of which are "Tri-Band"® elements) on a 16 ft. boom, providing optimum 3 element 10, 15 and 20 MTR performance.

Model TBS-416 is engineered to provide maximum performance and satisfaction per dollar, per element!

SPECIFICATIONS

V/S/W/R at resonant point (using 50 ohm coax)	1.2/1
Bandwidth within 2/1 V/S/W/R	1.5%
F/B ratio on 10, 15 and 20 meters	26DB
Max. power rating	1.2 KW 100%AM
Boom length and diameter	16 ft. x 2" O.D.
Longest element length	Approx. 30 ft.
Turning radius approx.	17 ft.
Support mast required 2" O.D.	Seamless .125 wall min.
Wind surface area	5-29 sq. ft.
Wind load at 100 m.p.h.	164 lbs.
Recommended rotator— Telrex Model	175 RIS
Design wind load rating with ½" radial ice load	85 m.p.h.
Antenna net wt. 44 lbs.— Shipping wt. approx.	58 lbs.
Shipping container size approx.	11" x 6" x 10'

The following Single-Transmission-Line "Tri-Bands" available:

CHALLENGER TBS-308 ..... $ 99.75
3 Elements (8' x 2" O.D. Boom) gain 5 db.
Recommended Rotator—Telrex 175 ..... 198.50

MONARCH TBS-626 ..... 259.75
6 Elements (26' x 3" O.D. Boom) gain 10 db.
Recommended Rotator—Telrex 500 ..... 435.00

CHALLENGER DTB-30 ..... 38.50
Rotatable 10, 15, and 20 Meter "Tri-Band" Dipole, unity gain bi-directional pattern. Any good TV rotator may be used or Telrex 175-RIS rotator.

ANTENNAS SINCE 1921 — Communication and TV Antennas
telrex LABORATORIES
ASBURY PARK 42, NEW JERSEY, U.S.A.

no matter what you'll get

NEW!

"6N2" THUNDERBOLT POWER AMPLIFIER—Rated at 1200 watts P.E.P.* input SSB and DSB, Class AB_1; 1000 watts CW input Class C; and 700 watts input AM linear, Class AB_1. Drive requirements approximately 5 watts in Class AB_1 linear or 6 watts Class C continuous wave. Continuous bandswitched coverage on 6 and 2 meters—effectively TVI suppressed and filtered—wide range pi network output. Outstanding efficiency—losses on 2 meters held to approximately 5%, instead of common 25% losses experienced in some other 2 meter circuitry! This is possible due to the unique silver-plated Hi-Q coaxial line; silver-plated anode and other external metal portions of the 7034 tubes; silver-plated inductors; capacitors; and switch! With tubes.

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

"6N2" TRANSMITTER—This compact VHF transmitter offers instant bandswitching coverage of both 6 and 2 meters. Completely shielded and TVI suppressed, the "6N2" may be used with the Viking "Ranger," Viking I, "Valiant," or similar power supply-modulator combinations capable of at least 6.3 VAC at 3.5 amp., 300 VDC at 70 ma., 300 to 750 VDC at 200 ma. and 30 or more watts of audio. Power input is rated at 150 watts CW and 100 watts AM phone . . . shaped keying results in excellent waveform. With tubes.

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

"6N2" CONVERTER—This compact Viking "6N2" Converter provides instant front panel switching from normal receiver operation to either 6 or 2 meters. Maximum sensitivity and low noise figure . . . excellent image and I.F. rejection. With tubes. Available kit or wired in either 26 to 30 mcs., 28 to 30 mcs., 14 to 18 mcs., or 30.5 to 24.5 mcs. ranges. Specify range desired.

Kits	Amateur Net $59.95
Wired Models	Amateur Net $89.95

"6N2" VFO—Exceptionally stable and compact—designed to replace 8 to 9 mc. crystals in frequency multiplying 6 and 2 meter transmitters, including types using overtone oscillators. Temperature compensated and voltage regulated for minimum drift and high stability. Plexiglas dial calibrated from 144 to 148 mc., 50 to 51.5 mc., 51.5 to 53 mc. With tubes and pre-calibrated dial.

Cat. No.		Amateur Net
240-133-1	Kit	$34.95
240-133-2	Wired	54.95

Other equipment for 6 and 2 meters!

"6N2" TRANSMITTER

"6N2" CONVERTER

"6N2" VFO

you expect from a transmitter...
much more with a Viking

"CHALLENGER" — 70 watts AM input 80 through 6, 120 watts CW input 80 thru 10 —85 watts on 6. With tubes.

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

"RANGER"—75 watts CW and 65 watts phone input. Bandswitching 160 through 10. Built-in VFO. With tubes.

Cat. No.		Amateur Net
240-161-1	Kit	$229.50
240-161-2	Wired	$329.50

"VALIANT"—Instant bandswitching 160 through 10. 275 watts input CW and SSB (P.E.P. with aux. exciter) 200 watts phone. With tubes.

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

3 feature-packed amplifiers!

"COURIER" AMPLIFIER—Class "B" linear rated 500 watts P.E.P. input with aux. SSB exciter—500 watts CW and 200 watts AM! Continuous coverage 3.5 to 30 mcs. Drive requirements: 5 to 35 watts. With tubes.

Cat. No.		Amateur Net
240-352-1	Kit	$244.50
240-352-2	Wired	$289.50

"THUNDERBOLT" AMPLIFIER—Rated 2000 watts P.E.P.* input SSB; 1000 watts CW; 800 watts AM linear! Continuous coverage 3.5 to 30 mcs. May be driven by "Ranger", or other unit of comparable output. With tubes.

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

"KILOWATT" AMPLIFIER—This exciting unit is the only power amplifier available which will deliver full 2000 watts SSB* input and 1000 watts CW and AM! Continuous coverage 3.5 to 30 mcs. Excitation requirements: 30 watts RF and 10 watts audio for AM; 10 watts peak for SSB.

Cat. No.		Amateur Net
240-1000	Wired and tested	$1595.00
251-101-1	Matching desk top, back and 3 drawer pedestal..FOB Corry, Pa.	$132.00

The FCC permits a maximum of one kilowatt average power input for the amateur service. In SSB operation under normal conditions this results in peak envelope power inputs of 2000 watts or more depending upon individual voice characteristics.

New Catalog

Yes, dollar-for-dollar and feature-for-feature you'll get more of everything in a Viking transmitter . . . that's why Viking transmitters outsell all others! Write for your free Viking Amateur Catalog and you'll soon see why your best transmitter buy is a Viking!

E. F. JOHNSON CO.

2916 SECOND AVENUE S.E. • WASECA, MINNESOTA

Viking

FIRST CHOICE AMONG THE NATION'S AMATEURS

For further information, check number 27, on page 190

A Crystal Synthesizer
3.000 to 3.999 MC

Henry G. Elwell, Jr., W2JKH
392 Lafayette Ave.
Westwood, N. J.

Whether the Crystal Synthesizer will introduce a new mode of frequency selection is a moot question; certainly it is the ultimate in frequency stability so necessary for SSB transmitters. Its instantaneous selection of any integral crystal frequency in a 1 *mc* band certainly eclipses the tuning rate of a *vfo*. Its seeming complexity must be weighed with the above features and balanced against the limits of mechanical rigidity, problems in temperature compensation, purity of *dc* supply voltage and problems of frequency repeatability associated with the *vfo*.

For over ten years I've been planning for a push button oscillator which would permit the selection of 1, 10, and 100 *kc* steps throughout a 1,000 *kc* band and it is now an operating unit. The earliest approach in the design of such a unit was to switch condensers in a *vfo*, but even the best of this type of oscillator may drift 500 cycles from a cold start in two hours, hence left something to be desired. High accuracy of frequency selection, repeatability, and absence of drift was desired.

The February 1957 SSB issue of the Proceedings of the IRE mentioned the use of crystals as a means of obtaining any desired frequency by suitable mixing arrangements. Here at last was the ultimate for me. Surplus crystals can be bought very cheaply in 1 *kc*, 10 *kc*, and 100 *kc* steps and by the use of simple mixers can be combined into a Crystal Synthesizer.

What would this do for W2JKH? Well, it would:

(1) Provide crystal controlled signals at any frequency relegated to amateur operation, very important for SSB work.

(2) Provide instantaneous frequency selection at the touch of a button to an accuracy limited only by my ability to grind crystals "right on." By use of a "rubber" crystal, as explained later, the 1 *kc* steps could be varied to produce infinite resolution in the 1,000 *kc* band.

A block diagram of what was being undertaken is shown in fig. 1.

Output from the Crystal Synthesizer must fall from 3.000 *kc* to 3.999 kc to provide a direct reading push button board regardless of what band operation is desired. If the board shows 242 *kc*, it could be 7242, 14242, etc., or if it showed 756 *kc* it would be 3756 *kc*. The higher bands would be determined by the operating frequency of a conversion oscillator.

Ten crystals separated 1 *kc* apart produce a zero to nine *kc* change in *kc* steps when selected on a ten button push type switch. Ten crystals were used for 10 *kc* steps and ten for 100 *kc* steps. Since it is desirable to insert a SSB signal into the mixing circuits, an additional crystal frequency was provided to permit this at some later date.

Originally the use of low frequency crystals, 300 to 500 *kc* was considered, but it was learned that they are difficult to modify for frequency shifts and are not exactly "right on" values. Desiring to keep crystal costs down, surplus crystals* were used as noted later.

*Texas Crystal, River Grove, Ill.

At this point, several problems had to be analyzed to insure satisfactory operation.

(1) Mixing Frequencies

Mixing frequencies must be selected to minimize superfluous frequencies. The problem involved is adequately discussed in the October 1958 issue of CQ, "All-Band Conversion Exciter" by W7ATV. Figure 2 shows a suitable arrangement as used by W2JKH for the Crystal Synthesizer.

(2) Proper Crystal Switching Sequence

The problem concerned here is that of switching in the crystals so that the output would progress from 3000 to 3999 *kc* as the crystals were switched in; 1, 2, 3, 10, 20, etc. Since addition and subtraction of frequencies is taking place, this problem, although simple, must be solved. Table 1 shows the position of

*Texas Crystal, River Grove, Ill.

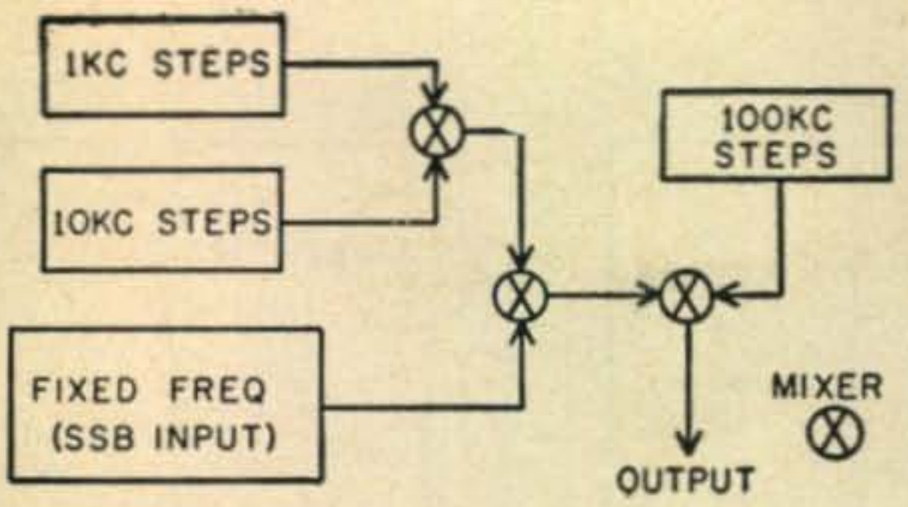


Fig. 1—Block diagram of the crystal synthesizer.

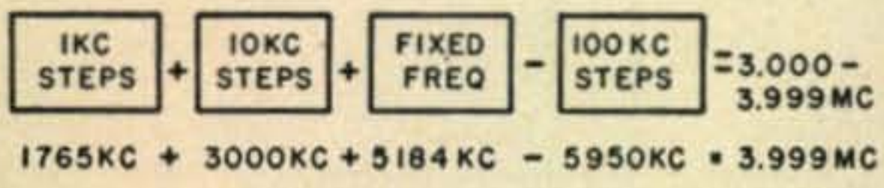
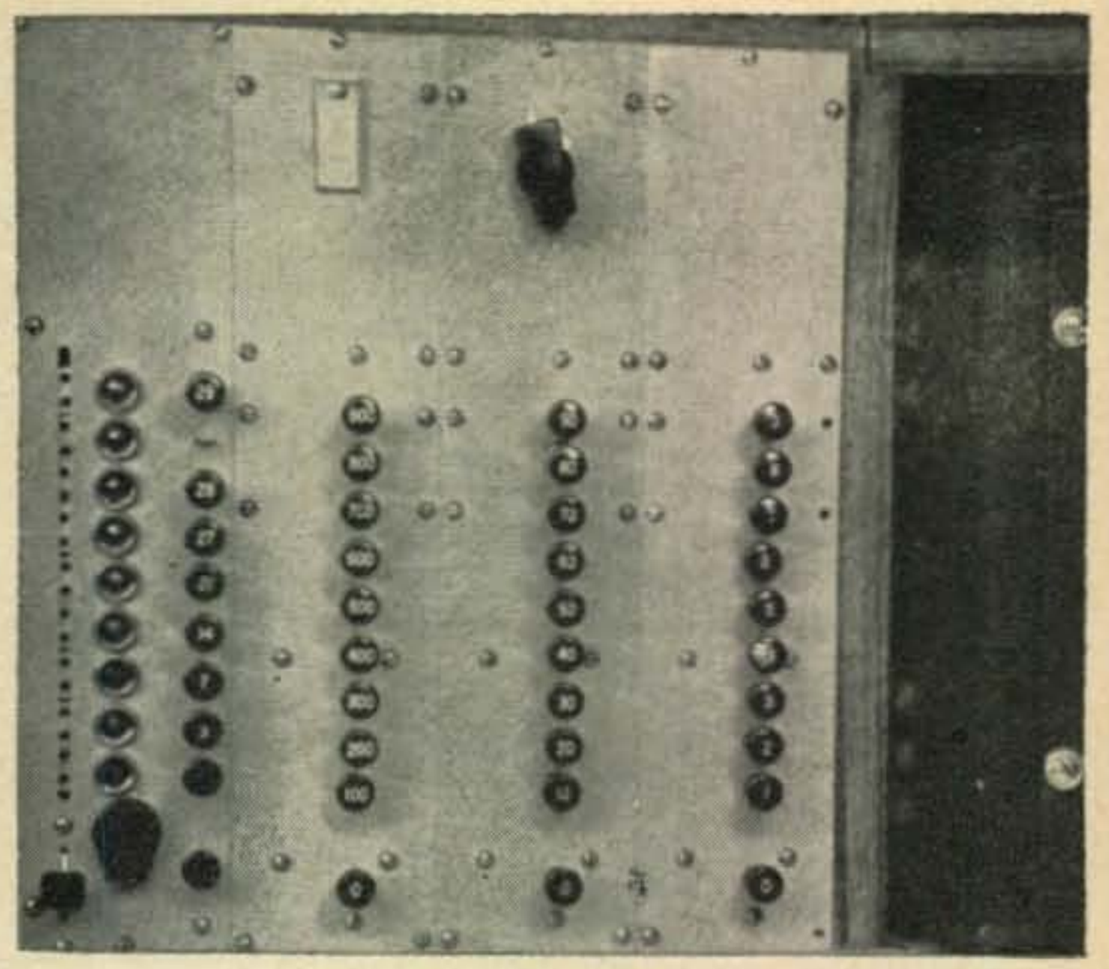


Fig. 2—Mixing procedure used to produce a minimum of spurious outputs.



Front view of Crystal Synthesizer which also shows band selecting module.

crystals to give progressive frequency shift from 3000 *kc*.

TABLE I

Switch Position	*1 kc Steps*	*10 kc Steps*	*100 kc Steps*
0	1756	2910	6850
1	1757	2920	6750
2	1758	2930	6650
3	1759	2940	6550
4	1760	2950	6450
5	1761	2960	6350
6	1762	2970	6250
7	1763	2980	6150
8	1764	2990	6050
9	1765	3000	5950

(3) Constant Output Without Tuning Controls

Since the Crystal Synthesizer is a push button device inferring a minimum of controls, it was imperative that no external tuning be necessary over the output of the 3 to 3.999 *mc* band. Broad band double tuned circuits were used in all the mixer output stages in a conventional manner, and worked fine for the 1 *kc* and 10 *kc* steps. The 100 *kc* steps were made a part of the output mixing and the output tuned circuit split in nine 100 *kc* ranges, each separately tuned. This was done by switching in a small fixed capacitor with each 100 *kc* step.

Discussion of Circuitry

Although this is a crystal controlled device, every effort was made to minimize the possibility of drift. As the photographs show, all heat contributing elements were placed at the top of the structure with the crystals at the bottom. Also, the crystal oscillators, using 6BH6 tubes, were operated in a circuit which minimizes *rf* current flowing through the crystal. That this has paid off is shown by the fact that it is necessary to permit my 100 *kc* standard to warm up one half hour in order to be stable enough to detect the approximate 5 cycle total drift of the Crystal Synthesizer from a cold start.

All oscillators are identical and have untuned plate circuits. It was necessary to grind the edges of some low activity crystals to produce proper output, whereas other crystals were shunted by a resistor to lower their output. Oscillator output from crystal to crystal should remain constant within 10% so that final output remains reasonably constant across the band. All mixer stages are identical except for the tuned circuits.

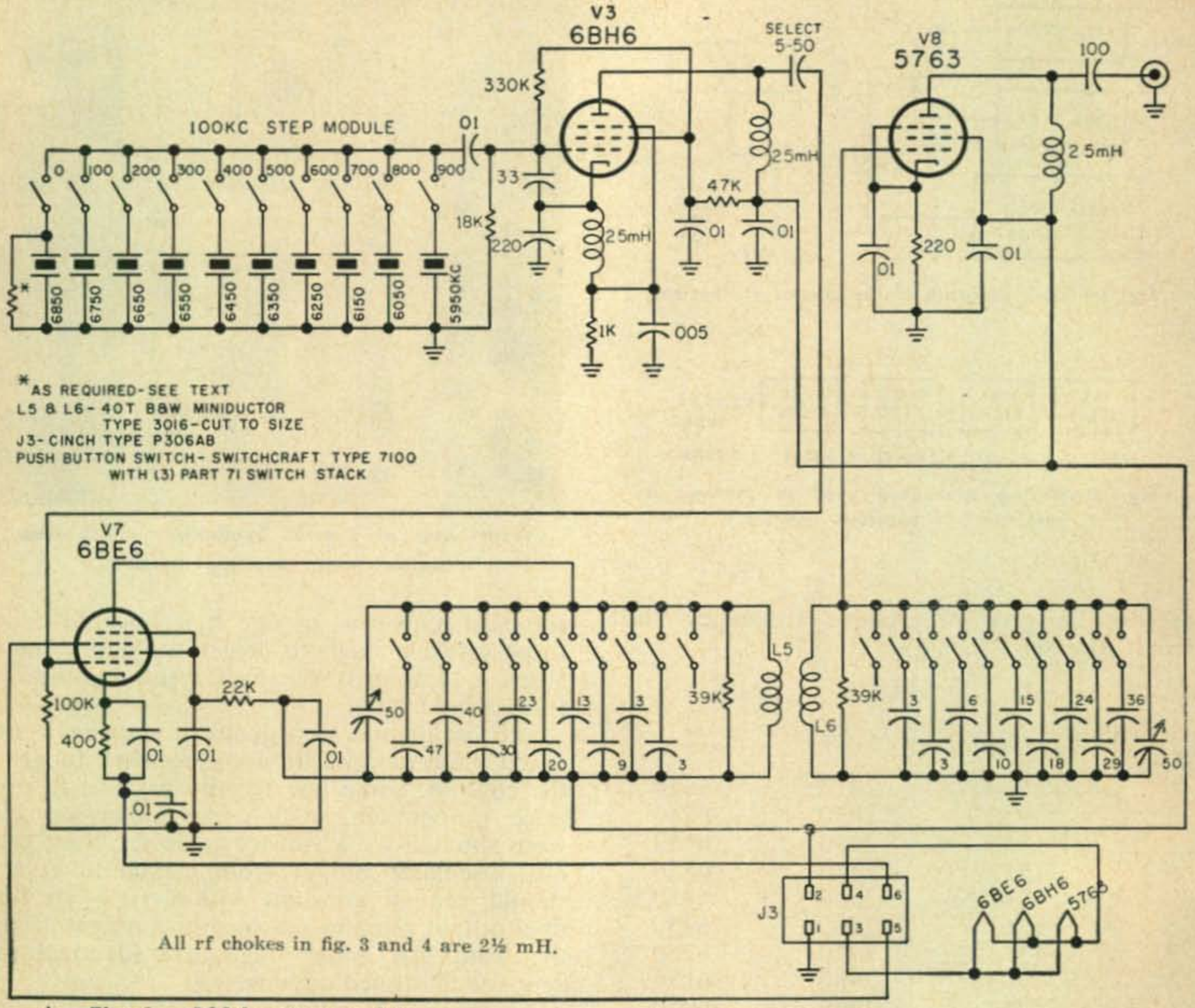
To provide a buffer stage between the output mixer stage and any driven stage, a 5763 tube is used. With an untuned plate circuit, an output voltage of approximately 30 volts is obtained.

A switch is connected in the cathode of the output mixer to provide output when desired other than when transmitting. It may be seen that all oscillators are operating continually and output in the 3.000 to 3.999 *mc* band is obtained only when the output mixer is in operation. A key jack is also provided in this stage for any cw use desired. Incidentally, perfect break-in and keying characteristics can be obtained in any band since the oscillators are never interrupted and their frequencies are far removed from the operating one.

Construction

To any one who has built his own equipment, the circuitry is conventional; it all boils down to identical oscillators, and similar mixers. If it were not for the fact that the 1 *kc* step crystals are of the DC34 type (large holders), all modules would have been mechanically the same.

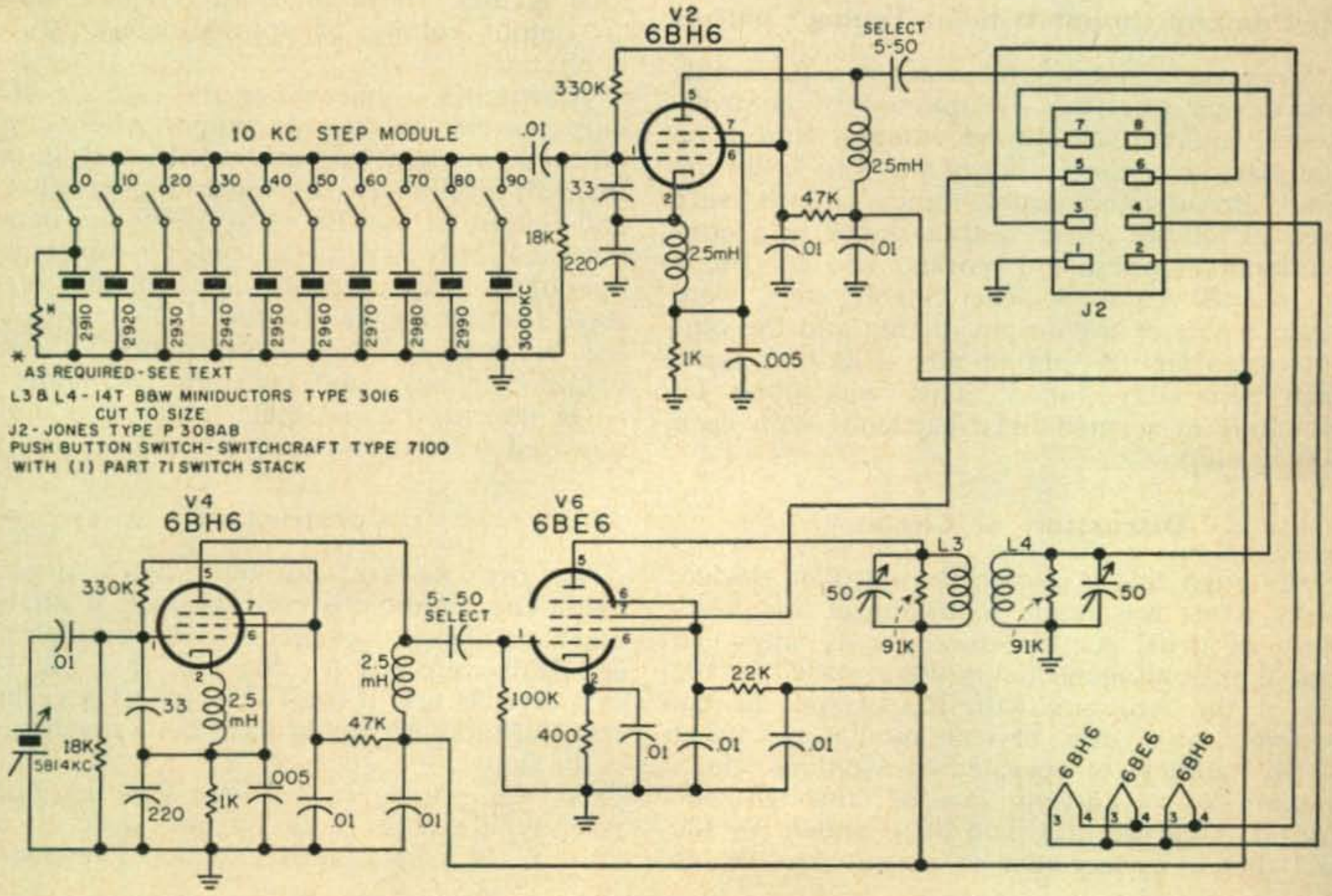
As the photographs show, the ten button push type switch is an integral part of each 12¼ x 2¼ x ⅛ aluminum panel. The crystals,

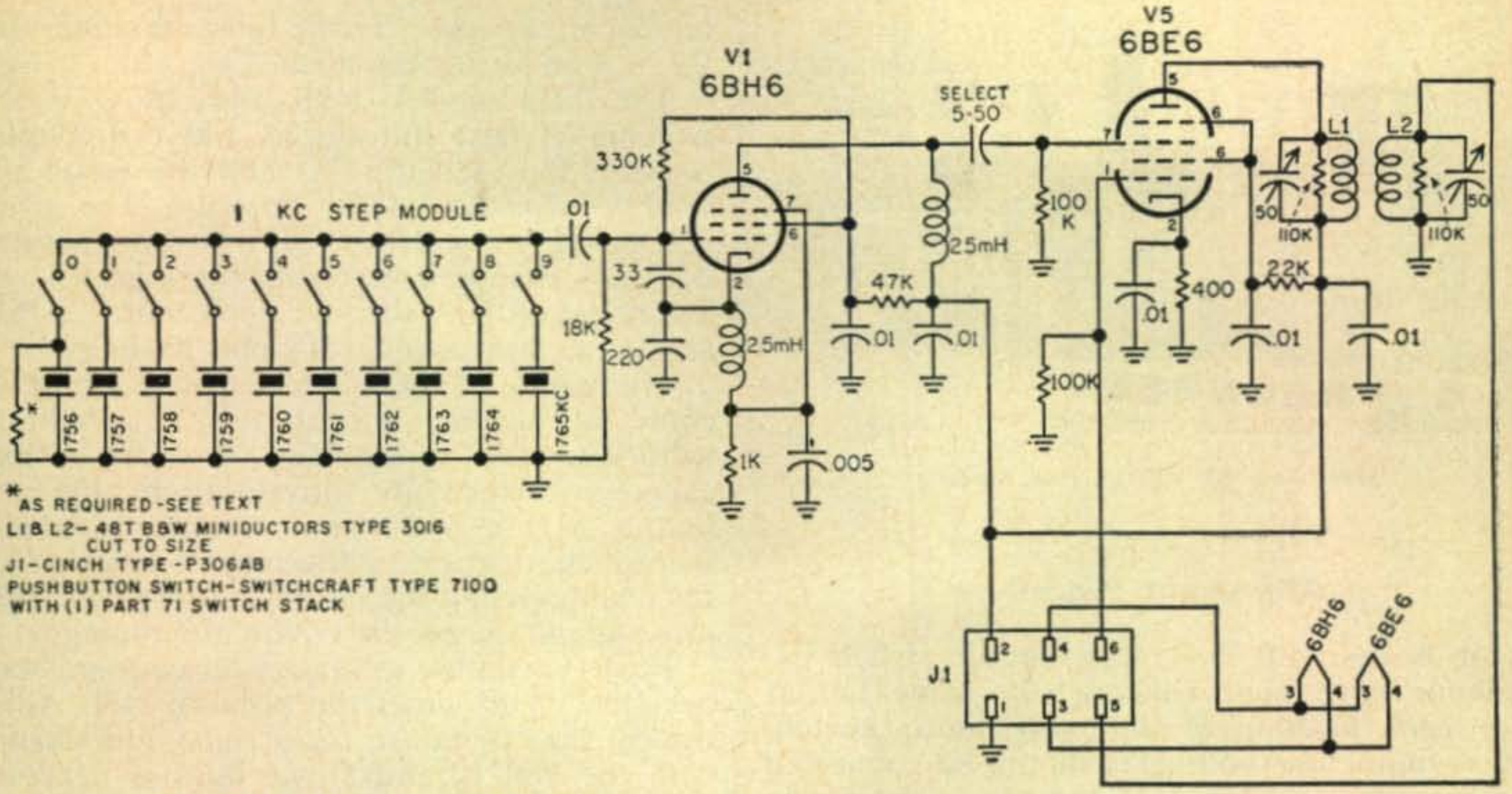


All rf chokes in fig. 3 and 4 are 2½ mH.

▲ Fig. 3— 100 kc step module.

▼ Fig 4—10 kc step module.





*AS REQUIRED - SEE TEXT
L1 & L2 - 48T B&W MINIDUCTORS TYPE 3016 CUT TO SIZE
J1 - CINCH TYPE - P306AB
PUSHBUTTON SWITCH - SWITCHCRAFT TYPE 7100 WITH (1) PART 71 SWITCH STACK

Fig. 5—1 kc step module.

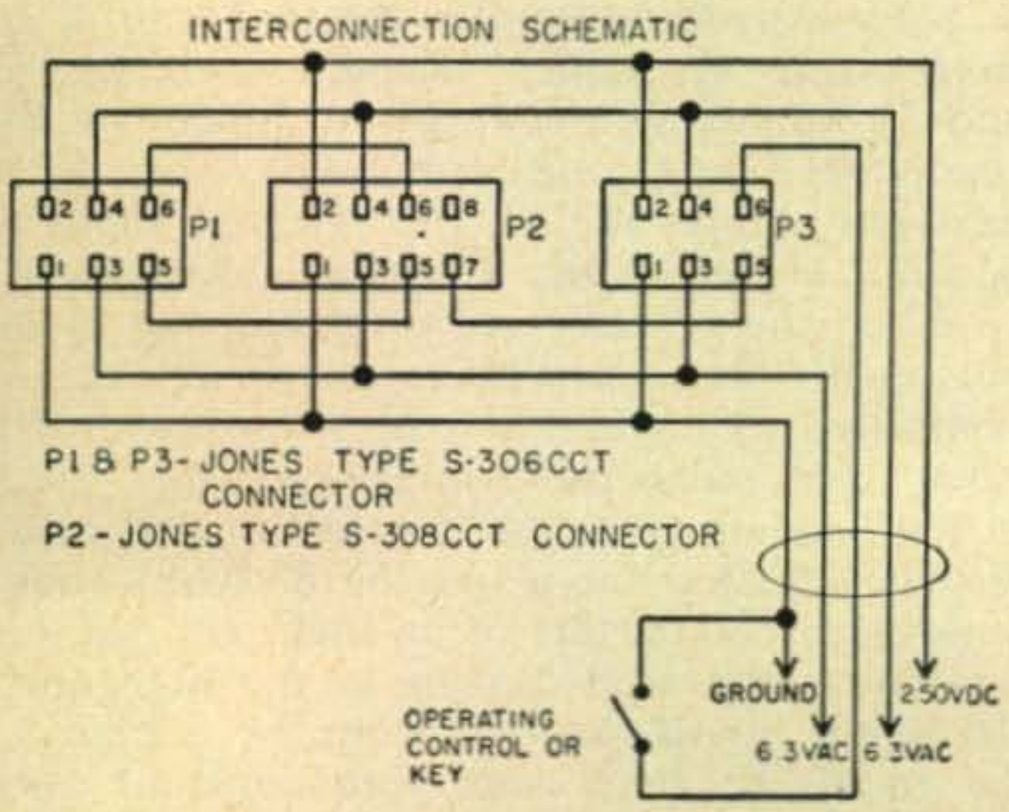
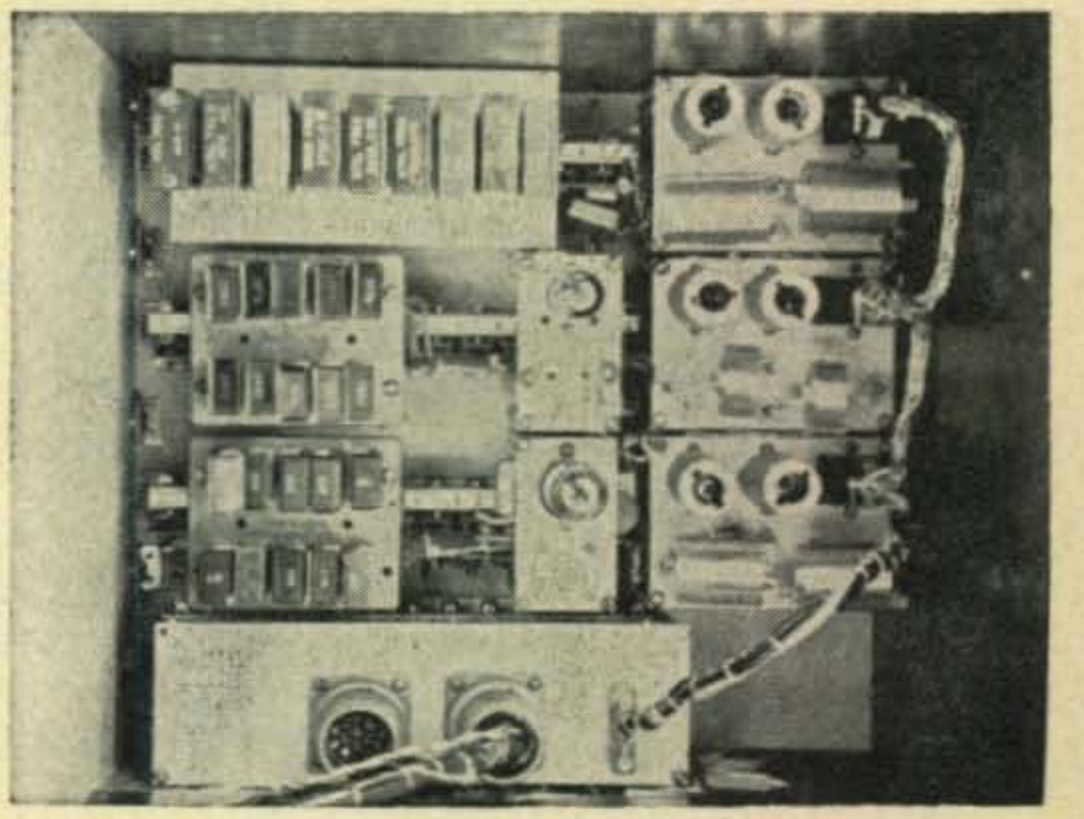


Fig. 6—Interconnecting cable.



Rear view of the assembled modules. From left to right: 1 kc step unit; 10 kc, 100 kc and band selector.

tube circuitry, and auxiliary equipment sub-panels are mounted from the main panel by ¼" diameter aluminum posts suitably drilled and tapped for 6-32 screws.

It was necessary to fabricate a sub-panel to hold the DCS-3 sockets for the 1 *kc* step crystals, but the FT243 size crystals were mounted on a Johnson 126-120-1 ten socket crystal board; built just for this application it would appear.

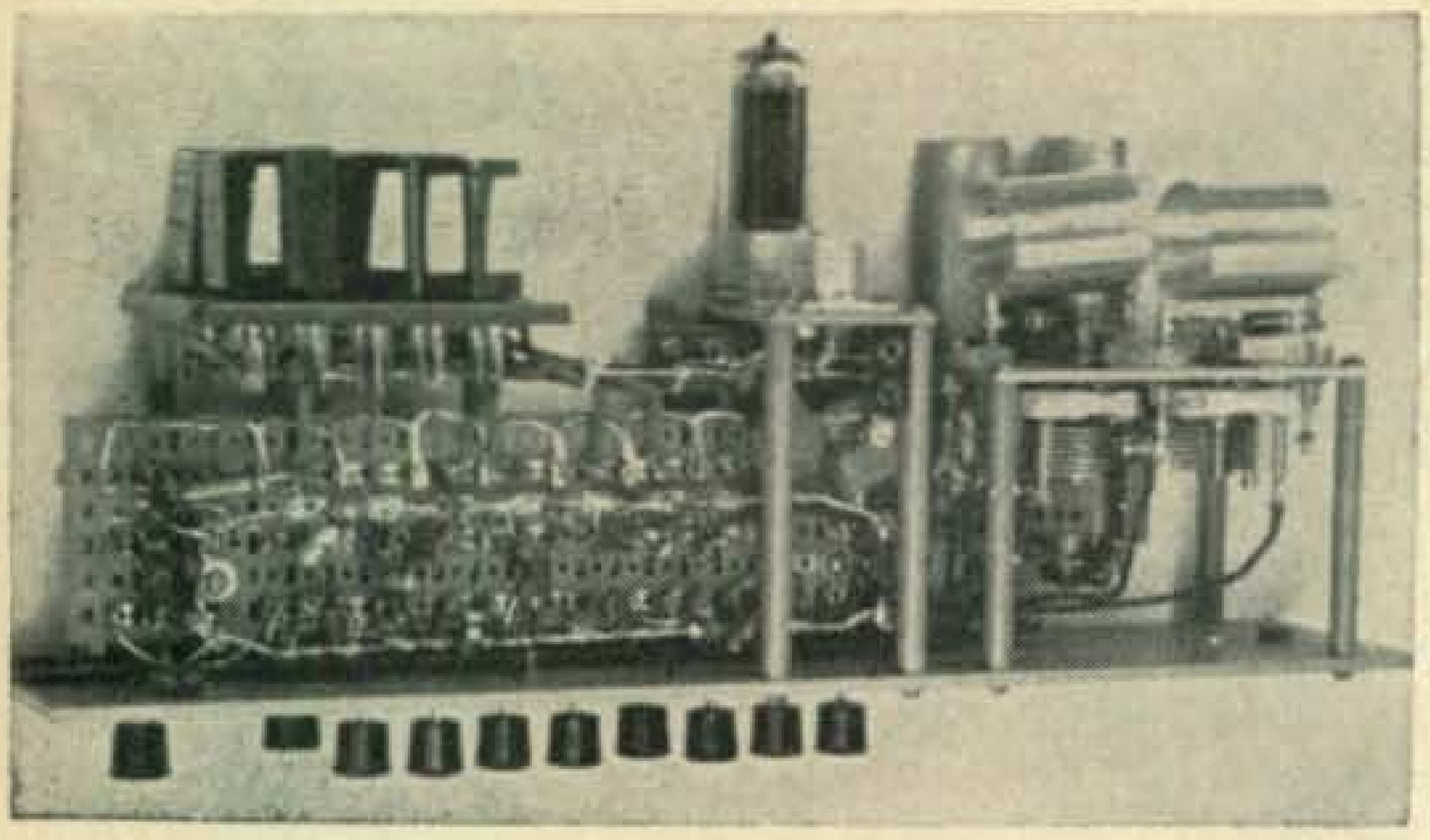
The tube circuitry sub-panel holds the two tube sockets, the two 50 mmf trimmer condensers mounted underneath the coils below deck, 4 feed thru type insulators for wiring and supporting the coils, the coils, and a Cinch-Jones connector. The sockets are the turret type and all components were wired to them before installing.

The 5184 *kc* oscillator sub-panel contains a turret type tube socket; the crystal being mounted on the main panel of the 10 kc step so that it may be adjusted. The FT243 crystal case has been modified so that the air gap may be changed to provide a frequency shift of 1 *kc* as explained in Feb. 1956 QST. Such a shift permits a "filling-in" of the spectrum between the 1 *kc* steps permitting zero beating as required. Such a device may be called a rubber crystal.

The 5763 output subassembly contains a tube socket and a coaxial type receptacle and is mounted to the 100 *kc* step-panel.

Oscillators are placed as near to their mixer stages as possible. However, it was necessary to wire from one panel to another in a few cases. No harmful results were evident and by using Jones connectors, it is a pleasure to pull out a plug instead of unsoldering when necessary to remove.

No shielding or TVI precautions were taken and were not felt necessary due to the low signal levels encountered. No TVI has developed in a receiver located within 20 feet of the unit.



Side view of 100 kc step module.

Alignment Procedure

It is desirable that each decade switch oscillator have approximately the same output for each position of the push button switch. A vacuum tube voltmeter should be connected to the output of V1, for example, to determine that this is true. Note, in all measurements with the *vtvm,* try to have a buffer stage between the circuit being adjusted and the *vtvm* to eliminate the input capacity of the voltmeter from your measurements. For those crystals that produce an output greater than 15 volts, shunt resistors were placed across the crystal. The value ran between 18,000 and 22,000 ohms. Those producing less output required a little grinding of the edges to increase their activity.

The next step is to connect the 1 *kc* step module and the 10 *kc* step module together and select coupling condensers to grid one and grid three of V5 to produce voltages of 10 volts and 7.5 volts respectively. The capacity will be from 5 to 50 mmf.

The plate tuning of V5 must next be undertaken. It is very desirable to use a grid dip oscillator for this part of the tuning procedure. With the 1756 *kc* and the 2960 *kc* crystals punched in the 0 *kc* and 50 *kc* switches respectively, tune the mixer primary for a maximum reading on the *vtvm* connected across the secondary coil; make sure this output is 4716 *kc*. Then tune the secondary for maximum, and retouch the primary as required. Next swish across the 100 *kc* band by punching the 10 *kc* switches and note the output. Then adjust the spacing between the two coils, favoring maximum spacing, until the output remains essentially constant with a 10% fall-off at the ends of the band. The output from this stage is approximately 11 volts.

Next adjust the coupling to the grid one of V6 for 10 volts. It will be found that the voltage measured at grid 3 is about 8 volts due to losses through the Jones connector probably; this is just what we need.

Now fire up the 5184 *kc* oscillator, put the *vtvm* on the secondary of the V6 mixer plate circuit and tune up for 9900 *kc* (4716 + 5184) in the same manner as was done for V5. Final tuning of the plate circuit must be done using V7 as a buffer for the *vtvm*.

The third module with the 100 *kc* step switches is next introduced and the coupling between the oscillator V3 and the mixer grid 1 of V7 is adjusted for 10 volts. The grid 3 voltage of V7 will be 7-8 volts. Mixer output does not change appreciably for a grid 3 voltage range of 5-10 volts so don't worry as long as it is in this range. If it's not, fix it!

The tuning of the V7 mixer plate circuit becomes a cut and try deal. We are attempting to tune ten 100 *kc* segments by means of fixed capacitors which are introduced by the push button switch. A 50 mmf trimmer condenser is available for setting the highest segment and for counteracting the effects of the *vtvm* which must be put across the circuit for tuning.

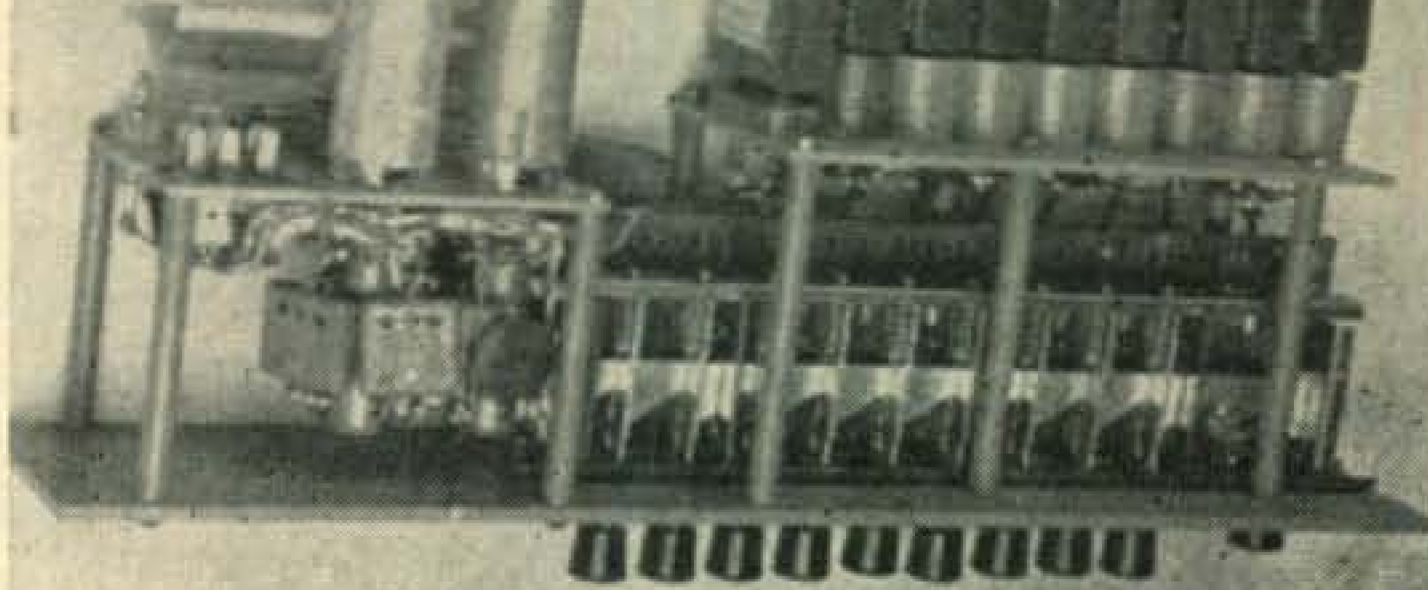
First, open the secondary circuit and connect the *vtvm* across the primary coil. Adjust the 50 mmf trimmer for a maximum reading with the 900 *kc* and 50 *kc* buttons depressed (the middle of the 100 *kc* segment to be tuned). By the use of the *gdo* make sure that you are tuning to 3.95 *mc*. Next depress for 850 *kc* and select padding condensers in 3 mmfd steps to produce resonance. Repeat with the 700 and 50 *kc* switch as depressed. Since the fixed capacitors from one switch position to the next are not paralleled, the selected capacitors become bigger as the frequency decreases.

When the primary is completed, the *vtvm* is put on the secondary and the primary trimmer readjusted to account for the withdrawal of the *vtvm* from across the primary circuit.

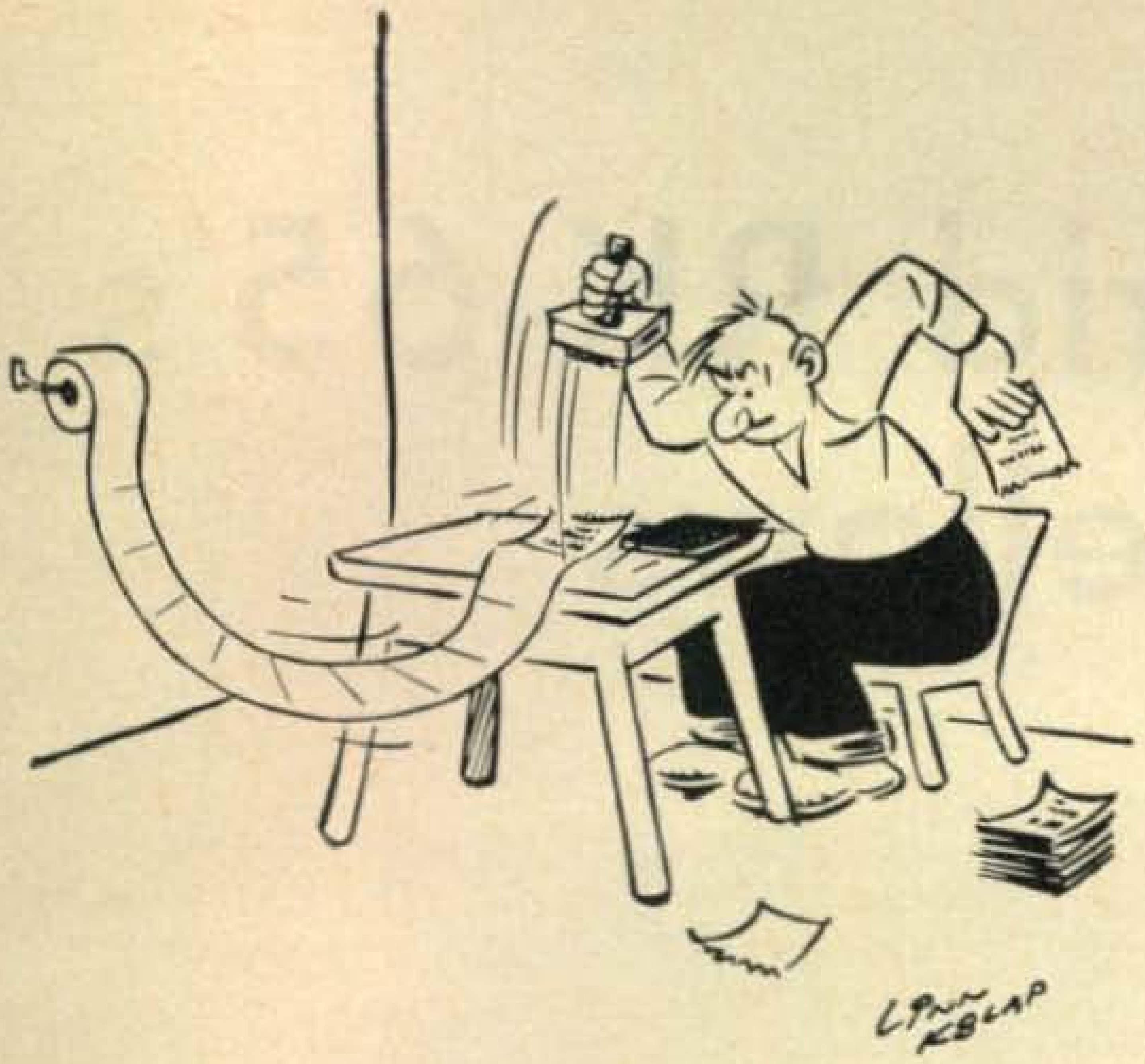
The secondary coil is then connected into its circuit, adjusted for a spacing between ends of coils of three-quarters of an inch, and the same procedure repeated starting at the high end of the band. Swish through from 3.0 *mc* to 3.99 *mc* in 50 *kc* steps and note constant output touching up any 100 *kc* segments that are not within ± 10% of the average.

Finally, connect the *vtvm* to the output of the 5763 stage, V8, and adjust the V7 mixer secondary capacitor at 3950 *kc* for maximum output. The output from the 5763 from one end of the band to the other varied from 25 volts to 40 volts in a linear relation; a function of the output choke perhaps.

[*Continued on page 187*]



Side view of 1 kc step module.



Dry Those Eyes

Tom Harmon, WØIUB
5019 Gramar
Wichita, Kansas

The band is dead, the kids are in bed and the wife is watching TV—a good time to catch up on the QSL backlog. So Mr. U. S. Dxer swings into action. Finished, he can't help wondering what all this card business cost during the last year. He tabulates.

"Holy smokes—$25.50—it can't be!" But brother it is. And that kind of expense list will be fairly typical. Then the thought usually hits our friend, ". . . if it is that stiff for me, imagine what a pocketbook problem it must be for busy rare ones around the globe." At this point tears begin to trickle down the cheeks of alabaster white.* By this time he is ready to take back most of those naughty words he has been calling certain overseas operators.

Dry those eyes, men, for sending out QSLs is not the financial suicide you may think it is. As a matter of fact, folklore to the contrary, I will state flatly that DX stations who do not QSL, fail to do so for lack of interest and not for monetary reasons. Strong words you say. Want proof—read on my friend.

Let's take a typical, fairly rare, DX station and look at his problem. If he makes 40 contacts per week and enters a contest or two, he may easily rack up 4000 QSOs per year. That means he may possibly have to fork over 2000 confirmations or more to keep the fraternity happy. If he sends out a nice two cent card, airmail direct, he will have to sink about $240 yearly into the project to answer the above assumed 2000 confirmations. That is quite a bit of sinking in anybody's monetary system. At first glance it seems hopeless. But it does not have to be.

Let's take a look at ways to cut the costs to the bone. There are two methods. First of all our DX friend can put out a cheap card. Hams like to get the pretty ones and award chairmen prefer those with substance, but neither will turn down a flimsy one. Show me a man with shoebox so full as to turn up his nose at a light weight, poorly printed AC3 or ZA 1. A rubber stamp impression will count just as much with the certificate givers as a fancy FS7RT type card. Use typewriter paper, make the QSLs 2 2/3 by 3 2/3 inches and you can turn out 70 cards to the ounce. Even this cost could be further cut if wrapping paper, old envelopes, etc. were used as card stock. Our 2000 cards on typewriter paper would cost the grand total of $1.50! We could go into the tissue paper QSL discussion but you surely have the message by now.

The other road to lower prices is to cut the postage cost. It's nice to get cards direct but it is not necessary. If our rare colleague would join the International Short Wave League, 86 Barrenger Road, London N. 10, England, all of his outgoing cards would be forwarded anywhere in the world. Not only that, but he would receive incoming cards as well. This ISWL service would take only $2.00 per year in dues. Using the ISWL, his QSLs would be sent out four times a year at a total postage cost to him of $1.52. Putting all the expenses involved together he could send out his 2000 cards for about $6.00 per year—and that includes paper, stamp, dues, ink and postage.

Your tear glands should have clamped shut by now. But the situation looks brighter for the DX when we consider the fact that they have an income with which to pay their QSL expenses. I refer of course to the International Reply Coupons they receive. Lately a great deal of publicity has been given to the fact that in some countries the IRC is not good. But remember, in PRACTICALLY ALL PLACES it is redeemable. Remember, also, that when sold the COUNTRY OF ORIGIN is the only one stamped on the coupon. It is supposed to be good in ANY OTHER

[Continued on page 186]

* It is usually written "cheeks of tan" but remember this boy is a DX hound and does not come out into the sun any more than necessary.

Grounded Grid RK-65's Here, Fellows

Commander Paul H. Lee, USNR, W3JHR

6606 Hillandale Road
Chevy Chase 15, Md.

While overseas awhile ago, we had the interesting experience of supervising the installation of some high-powered multi-channel single sideband transmitters, together with their associated receivers and terminal equipment, and tuning them up. It was indeed a pleasure to have the U.S. operator come back and report us coming in loud and clear on each channel. This, our first actual experience with single sideband, made such a lasting impression on us that upon our return to the states and to amateur radio which had been forbidden to us for two years, we found the 150 watt output of our AM transmitter completely unsatisfactory and frustrating in the battle with twenty meter phone conditions. A temporary location in an apartment precluded the purchase or construction of a kilowatt AM rig from the standpoints of lack of space and of power line capacity.

As we were bemoaning our sad fate, and dreaming of kilowatt finals, rotary beams, and acres of land with rhombics in all directions, along came a suggestion from Captain H. E. Thomas, USN, W6CAB, currently on duty here in the Navy Department. "Why don't you get the most signal for your money by going single sideband?" We said, "Sure, that would be nice, but the gear is too expensive." His answer to that was to invite us to his basement to show us the old W6CAB rig which had been gathering dust in storage for several years. To make a long story short, the price was right, we bought W6CAB, and our AM transmitter is now overseas furnishing intersite project communications! We would not go back to AM for anything, now that we have "found" SSB.

We wish at this point to pay tribute to W6CAB's initial design and workmanship, for this transmitter was built every bit as well as many commercial models for which one would pay many times the price. The exciter unit is a beauty. You can see it at the left hand side of the console in the photos, mounted beneath its power supply unit. The vfo in the exciter is stable as a rock, and is calibrated for all amateur bands from 80 through 10 meters. The unit as bought ended up with a single 6146, with 700 volts on the plate, of which we will say more later. This exciter in itself made a nice little low powered set for local work.

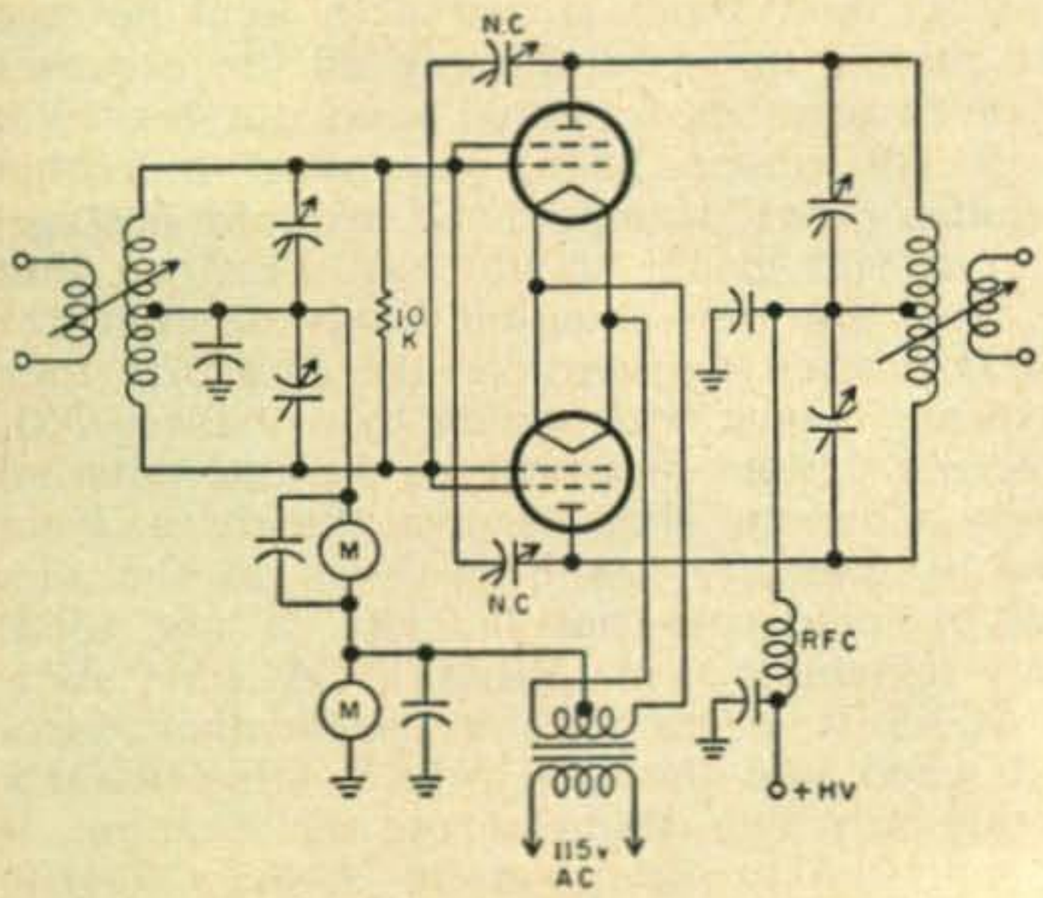


Fig. 1—Original power amplifier circuit.

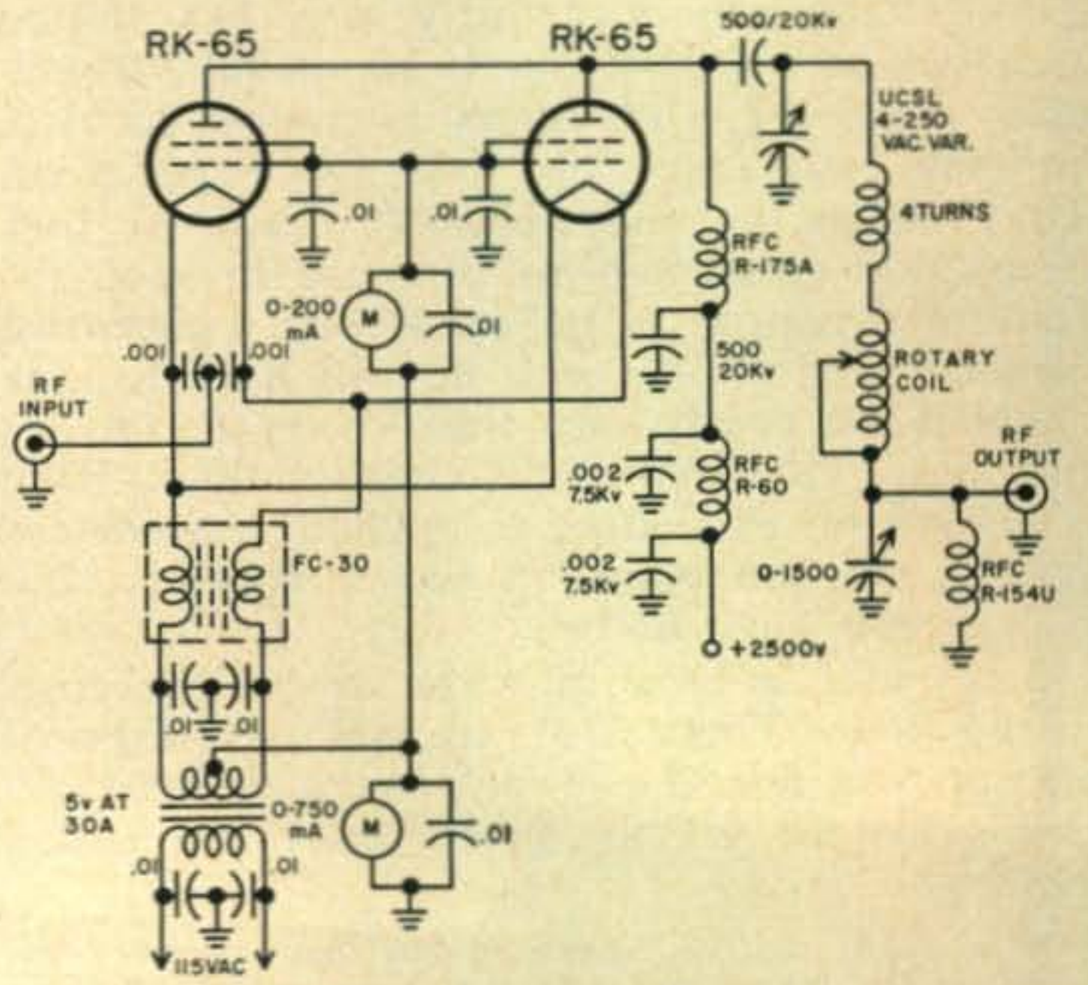
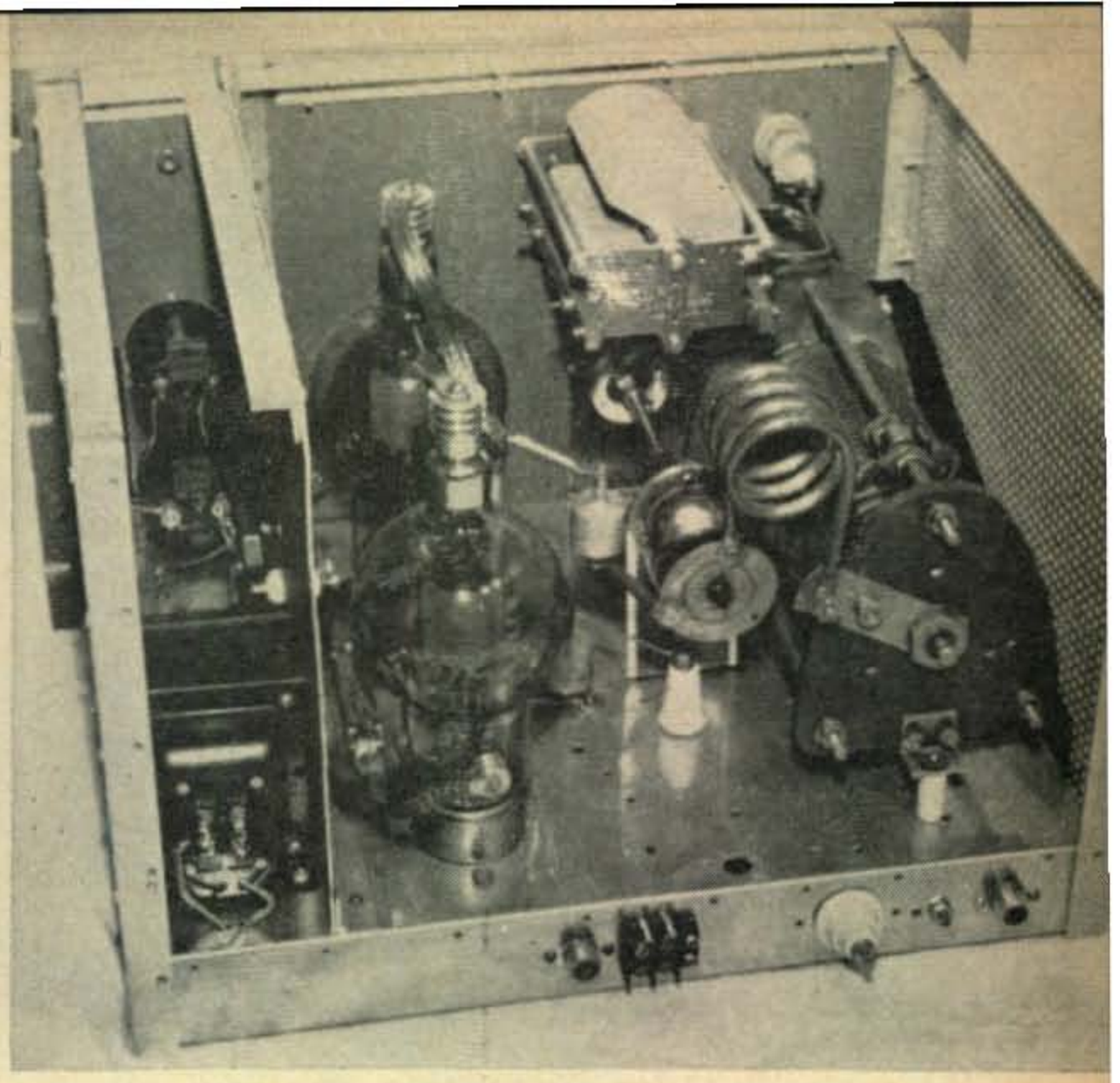


Fig. 2—Revised power amplifier circuit.



Also included in this deal was W6CAB's final amplifier which was mounted in a 36" cabinet rack, plus the loose components necessary to build the 2500 volt plate supply. We say "loose" laughingly, for the plate transformer itself is a monster which weighs some 100 lbs., and has a 2 kva rating! The power amplifier used a pair of RK-65's of which we had heard little before, and thereby hangs this tale.

The purpose of this article is to present some factual and useful information on this tube employed in a grounded grid zero-bias linear amplifier. We have never seen anything in print about the RK-65/5D23, and we feel that this tetrode, which sells in surplus for around $8.00, is a really good buy for those who want a low cost, efficient, and simple high powered linear. The RK-65/5D23 is a large tetrode of about the same size, appearance, and power rating as the familiar 250TH triode. It was apparently used in large quantities during the war, for it is quite plentiful in surplus. Many N.Y.C. surplus houses have them. We bought a spare pair which bore a 1944 inspection date, and they are as good as new.

The power amplifier unit as purchased used a pair of RK-65's in the standard push-pull, cross-neutralized arrangement, with the familiar large split-stator capacitor for plate tuning, and kilowatt-size plug-in coils with swinging link. The grid was tuned in the same manner by a small split-stator capacitor, with a smaller plug-in coil and variable link. The whole thing was unshielded, and was mounted in the cabinet rack in the open. The old circuit diagram is shown in fig. 1. W6CAB told us that this set with the RK-65's operating with grid and screen tied together as zero-bias tubes had performed very well for him several years ago. When the grids of the RK-65 are tied together, the tube operates as a zero-bias tube, and no screen nor grid voltage is required. Very little *rf* drive is required when the tube is used in the standard grounded cathode circuit.

The power amplifier unit was built on a 12¼" rack panel, and a 13" x 17" x 2" chassis. There was a vertical sheet aluminum shield which separated the grid tank from the remainder of the components. The plate tank was mounted to the left of the tubes, with the large plug-in coil projecting up above the top of the panel. There was an arrangement for feeding a two-wire feed line. The plate and grid current meters were located on the panel to the right of the shield, along with the filament transformer. After due consideration of such factors as TVI, modern circuitry, size, and appearance, we decided to redesign and rebuild the amplifier unit, and at the same time to make the power supply a roll-away affair that could be hidden beneath our operating desk. You can see the results of our labors in the photographs. Those of you who have push-pull finals would do well to consider this type of modernization.

To bring the power amplifier up to date, we decided to make use of a parallel arrangement of the RK-65's, feeding a pi-network output circuit. There is no need at this time to go into the many admantages of this type of circuit, as it has been adequately covered by other authors in the past. Needless to say, such measures as this, coupled with a low-pass output filter in the coaxial line, are the first steps towards prevention of TVI, and no transmitter should be built in these times without such basic design. The possibilities of using the RK-65's as *zero-bias grounded grid tubes* intrigued us, as nothing had ever been published on this type of operation of these tubes, and always wanting to do something original, we wanted to try the idea out. We have been very pleased with the results.

We stripped all components from the old amplifier except the sockets, filament transformer, and meters. This left many unused holes in the chassis, which appear in the photos. The holes in the front panel were plugged by dummy bolts, for the sake of appearance. The

circuit of the new linear amplifier is shown in fig. 2, and it is simplicity itself. No screen supply is needed, nor is there any requirement for grid bias. The grid and screen of each tube are tied together at the tube, as shown in the diagram, and as may be seen in the photos. Each of these common grid leads is grounded for *rf* right at the tube by means of a 0.01 mfd 2500 volt mica capacitor. The two capacitors are individually mounted to the chassis by means of a 6-32 bolt and a ¼" metal stand-off bushing. They are connected together by a heavy, low-resistance copper strap, and the *dc* return goes from the center of the strap to the grid current meter, by means of a shielded lead. We might have eliminated the meter and the 0.01 mfd capacitors, and grounded all grids directly to the chassis, but in an amplifier of this type and power rating it is very essential to be able to read grid current at all times to be sure that during tune-up the grid ratings are not exceeded by having the plate loaded too lightly.

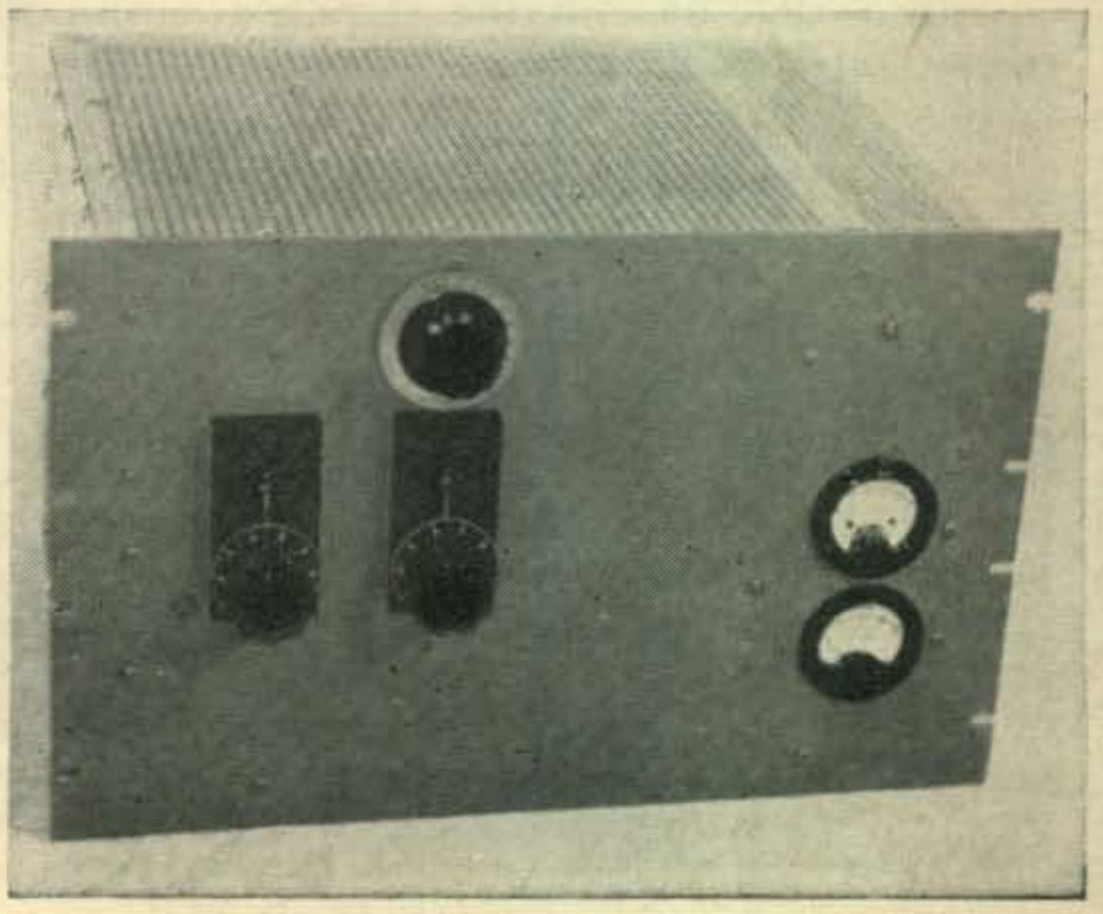
The plate circuit is the familiar pi-network arrangement with shunt feed of plate voltage through a National R-175A choke. The plate blocking capacitor and the one at the cold end of the choke are of the 500 mmfd 20 kv ceramic variety. Experience has shown that mica capacitors do not last long in these positions in a high power amplifier, but the ceramic type seems to do very well. The one at the cold end of the choke is mounted in place of the small stand-off insulator and it serves as a tie point for the high voltage lead. The choke is mounted as much in the clear as possible to minimize the chances of harmful self-resonances developing. The plate inductor is a large rotary coil with ¼" by ⅛" copper ribbon, with a "trolley wheel" which rides along and shorts out turns. This unit is one which we have had in "safe keeping" for several years for just this purpose. It came out of a broadcast antenna phasing unit. The E.F. Johnson type 226-1 is recommended as an equivalent substitute. The input capacitor is a Jennings type UCSL 4-250, of 3000 volt rating. The large vacuum variable capacitors recently advertised by Harvey Radio and Barry, of N.Y.C., for under $40 would be excellent for this application. The output capacitor is a Cardwell 1500 mmfd variable, and it is mounted on the panel. This capacitor is type PL-8013. It was hard to find in stock, but came through quickly when ordered from the factory. A 2" wide strap of 1/16" copper is used to connect the ground side of the vacuum variable to the panel mounting of the 1500 mmfd variable, to provide a direct, low impedance ground bus. No reliance is placed on the panel-to-chassis contact for carrying the tank current. The copper strap is securely bolted to the panel and chassis at several points. It can be seen in the photos. The plate leads to the tubes are made of double weight braid, made from RG-8/U outer braid. Copper tubing is used for *rf* leads.

The drive shaft of the vacuum variable capacitor is coupled to the dial through an insulated flexible coupling. This shaft is at ground potential, but we wanted to prevent any possible multiple path from the capacitor to ground, through the front panel bushing. The ground strap is the proper connection between the two capacitors.

A small plate tank coil of 4 turns of ¼" copper tubing, wound 1½" in diameter, is used in series with the hot end of the variable coil. This is done to reduce the shunting effect of the distributed capacity from the rotary coil to ground, which would otherwise appear across the input capacitor of the pi-network. This effect can be very undesirable in 21 and 28 *mc* operation. Use of this added plate circuit inductance is very helpful in keeping efficiency high on these bands. Also, in mounting and connecting the rotary coil, care was taken to connect the end with the shorted turns to the output capacitor. This puts to ground, the capacity of all the unused, shorted turns across the output capacitor, where it has no harmful effects. This further contributes to efficient operation on the higher frequency bands. This stray capacity should never be allowed to appear across the input capacitor. The drive shaft of the rotary coil is coupled to the dial through an insulated, flexible coupling. R. W. Groth Co. type TC-2 dials are used to drive the vacuum variable and the rotary coil. These counter dials have a very ingenious mechanical counter mechanism which works like a charm. It is so flat that it is contained within the front-of-panel unit, and it is not necessary to carve large holes in the panel for windows for viewing dial plates or veeder counters as with other types. These dials will mount with only one hole for the shaft bushing. However, on the rotary inductor which requires quite a bit of torque, we used the small bolts supplied to further secure the dial to the panel.

Component Layout

Arrangement of the components in the new

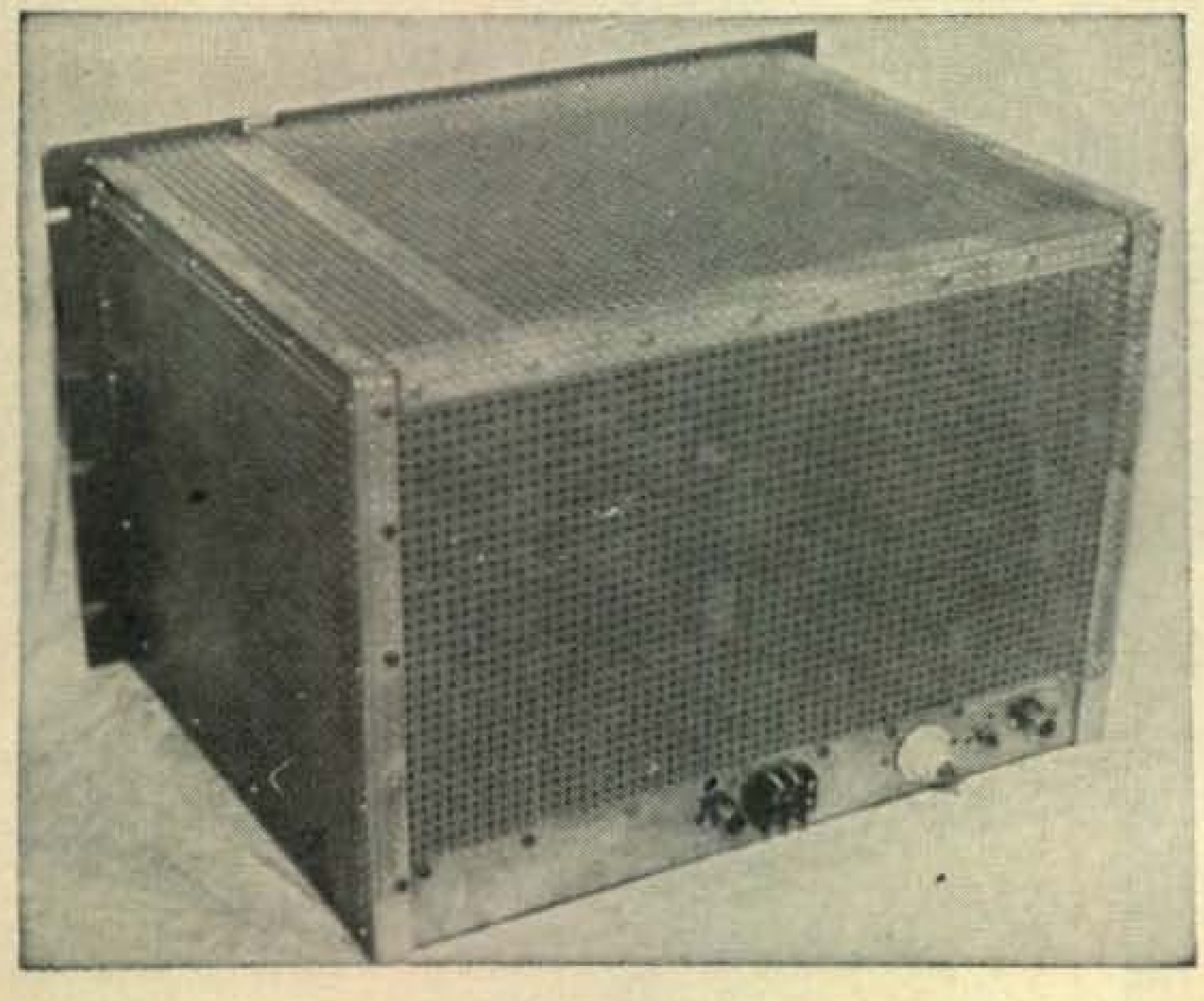


power amplifier is very straightforward and clean. The vertical shield was left in place to provide protection for the meters and filament transformer from high powered *rf* field. Beneath the chassis is the Barker and Williamson type FC-30 filament choke, the development of which has been a god-send to the proponents of grounded grid amplifiers. This choke is a dual wound affair which carries the filament current of both tubes, which is 28 amperes. We could have used a 10 volt filament transformer and a choke to carry only 14 amperes, but we had the 5 volt transformer in place, and so used it for reasons of economy. This transformer is a Merit type P-2943. A Chicago type FV-530 or Stancor type P-6468 would be equivalent.

Rf drive is applied to the filaments through a center-tapped arrangement of 0.001 mfd 2500 volt mica capacitors. The filament leads at the cold end of the choke are bypassed to ground by 0.01 mfd 1000 volt micas. Disc type ceramics could be used just as well, but we used what we had on hand in our parts box. The filament wiring on the hot side of the choke is of No. 10 copper wire, and is so arranged as to be as symmetrical as possible, to provide balanced drive to the tubes. From the cold end of the choke to the filament transformer, ¼″ x ⅛″ copper bus is used.

The vhf harmonic choke in the high voltage lead is a National R-60, and it is bypassed at both ends by 0.002 mfd 7500 volt micas. The high voltage lead goes through the back of the chassis and the bushing serves as the terminal for the external connection.

The *rf* input and output connections are made by means of SO-239 chassis type coaxial jacks. The output lead from the 1500 mmfd capacitor to the jack is made from a short length of RG-8/U cable, with the outer plastic jacket stripped off. The outer braid is grounded to the chassis at several points. A dc return is provided across the output capacitor by means of the National R-154-U *rf* choke. This prevents the plate voltage from remaining on the coaxial line due to failure of the plate blocking capacitor. If plate voltage should ever appear here, it would be very evident from the resulting fireworks, and the tripping of the overload relay in the power supply.



The whole amplifier is enclosed in a shield made from perforated Reynolds "Do It Yourself" aluminum, and ¾″ angle is used for the corners and frame. The sheet is fastened to the angle with ½″ sheet metal screws. A sheet of 1/16″ aluminum is used as a bottom cover for the chassis. Thus the only exits from the unit are through the bypassed and filtered leads, and the coaxial line. An external low-pass TVI filter is mounted in the coaxial output line as close to the output jack as possible.

In addition to this unit shielding, the unit is mounted inside the sheet metal console on the desk top. The back cover of the console and the top cover are of perforated stock, for ventilation. Thus the amplifier is actually double-shielded. No trouble is experienced from TVI on any amateur band in our TV receiver in the same room. The exciter is also shielded in the same manner, and the drive lead from exciter to power amplifier is RG-8/U coaxial line, whose outer shield is grounded. Provision is made for coaxial patching of the exciter to the antenna for low powered operation if desired.

Parallel Exciters

To return to the exciter for a moment, we found that the original single 6146 which had provided more than enough drive for the RK-65's in push pull, was not now sufficient to drive the grounded grid final amplifier to full output. Fortunately there was sufficient space in the exciter for the installation of a second 6146 in parallel with the first one, thus doubling the exciter output power. The pair of 6146's runs with about 150 watts peak input, in driving the grounded grid RK-65's, on all bands. A pi-network output circuit is used in the exciter, and it connects directly to the power amplifier through the RG-8/U cable.

Peak grid current to the final is about 100 milliamperes. With a plate voltage of 2500 volts on the RK-65's, peak plate current for voice operation is around 700 to 750 milliamperes. Resting current is below 50 milliamperes. The meter connections shown provide for reading grid and plate current separately, for by returning the dc grid lead to the filament center tap the plate current meter reads only plate current, not the sum of the two.

This is the nicest power amplifier we have ever worked with. It is impossible to make it "take off," for there are no signs of parasitics or unwanted products under any conditions. Grounded grid operation is inherently very stable due to the degenerative coupling between grid and plate circuits. The grounded grid arrangement provides a perfect swamping load

[*Continued on page 179*]

Eastward Ho!

DXpedition to Chatham Islands

W. H. Win McGee, ZL3DA/ZL3DX
Christchurch, N. Z.

Early in June of last year, it became apparent that some fortunate fellow would be required to visit the Chatham Islands which lie some 500 odd miles East of New Zealand. This trip would be necessary, in order that scheduled maintenance on Meteorological equipment in use there, could be carried out. The duration of stay would depend on several things, but in any case did not appear to be in excess of three to four days. To me this looked for all the world like a bang-on DXpedition in the brewing, and yours truly was quick to offer his services. As is usual however, my growing enthusiasm was swiftly curbed, when it was decided my presence would be necessary elsewhere. All was not lost though, for shortly afterwards, our Head Office advised that in future a technician would be called upon to service this equipment annually. So if I hung around long enough, and remembered which was the hot end of a soldering iron, within the next decade or so I might still make Chatham Islands.

Casual mention on twenty meter SB, of the facts so far related, indicated that my presence, complete with SB rig on Chatham Islands was an immediate and absolute necessity. Apart from resigning from my job and swimming there, I could see no immediate solution to the problem. The lucky break came around early August, when out of the blue came the news that I was to be the lucky tourist. Now being a good civil servant, I responded with as little enthusiasm as was possible under the circumstances, and secretly began to organize myself for the said DXpedition. A letter to the P.M.G. (Postmaster Generals) Department requesting permission to operate from my proposed DX location, was rapidly pushed off. This was followed by one to ARRL Headquarters requesting them to give consideration to allowing Chatham Islands to be listed as a separate country for purposes of DX awards and the like. Two weeks later, confirmation of the latter arrived. From here on things began to move fast.

One look at the six-foot rack, convinced me I should need something a little smaller, especially as I should most likely be paying the excess freight, and doing all the handling. At this point, my good friend Lester ZL1AAX came to the rescue with the necessary exciter, but without power-supply or amplifier. This little 5 watt exciter puts out a very clean SB signal on either 20 or 75 meters and is very suitably called the "PATHFINDER 20." A power supply was already on hand, so this was modified to suit. I am indebted to Lester for his generosity in lending this piece of equipment, without which the DXpedition would not have been possible. I would mention at this stage, that he had very little time available to modify the exciter for 5 *mc* xtal operation and air-freight it down to me in time. The departure date had been set at September 13th and time was moving on rapidly. A few days before Lester checked it out he burnt both hands and arms very badly when a pot of boiling wax caught fire. Finding himself unable to complete the job in time, he enlisted the aid of ZL1PA. Needless to say, the outfit complete with spare xtals and tubes arrived on schedule. Meanwhile, plenty of thought had been given to the receiver side of things. During the course of a Radio-Telephone conversation with Jack Ryan ZL3VB, (Postmaster-Chatham Islands) he very kindly offered the use of an S22R receiver.

This came as a very pleasant surprise, at least I should not have to take along my prized *Collins 75A-4*. Next some parts were mounted on a small chassis along with the little 6146 and a couple of regulator tubes to take care of the screen requirements. This little amplifier turned out to be extremely stable, though I must say a little unconventional in looks. Peak envelope power input ran at 60 watts. It was decided to use a 300 ohm folded dipole for transmission and a suitable long wire on reception. No time was on hand to arrange for *vox* operation or antenna changeover relay systems. This was no doubt going to be a distinct disadvantage as *vox* operation would have overcome many thousands of switching sequence. The rig, complete in every detail was given a thorough work-out on twenty and left

The operating position ZL3DA with the OM in the chair.

Jack Ryan, ZL3VB, Postmaster of Chatham Islands.

very little to be desired.

If the results I had during these tests were any indication of my future operation on Chatham Islands, I would have very little to worry about.

I had been giving consideration to building up a simple converter of the crystal controlled type, to run in ahead of the *S22R Hallicrafter's*, but the more I thought about it, the more I convinced myself I should take along the *Collins 75A-4*. This certainly ran against the grain and I frequently broke into a cold sweat when I imagined my beautiful receiver being harshly treated by some individual, or slipping from the sling and disappearing beneath the tide! After several consultations with my good friend Ted W6UOU, who pointed out that what I couldn't hear I couldn't possible work, I decided there and then to take along the Collins. This was indeed a fortunate decision. The XYL promptly blew her top when she heard of this latest addition to the pile. She however resumed her normal self once again when she heard I intended having it fully insured.

Further valuable assistance was given at this stage by my very good friend Floyd W6ZEN, who offered to have my QSL's printed and arrange for the despatch of same. Apart from the expense such a gesture involved, Floyd will have a tremendous task making out some thousand odd QSL cards and posting same. His most generous offer was graciously accepted and it was with much pleasure that I learned that many of my Stateside friends whom I contacted, were donating a $1.00 to ease the burden on him. I wish to thank these kind fellows for thinking of this and also for the many pleasant messages included.

Tuesday September 2nd brought with it a sudden bombshell. The Shipping Company rang to advise me that the *Holmglen* was leaving from Wellington, for the Chatham Islands on the following day. This was ten days in advance of the scheduled sailing. A signal from the Meteorological Officer Chatham, stated that an electrical fault had developed in the wiring of one of the buildings and that urgent repairs were called for. This almost spelt disaster for me, for it was work that only a licensed wireman could carry out. It was agreed however that I should do what I could in the matter.

With nothing packed, antennas still up, no insurance on the equipment and having to arrange for the freighting of all the gear to Wellington in the North Island, I could see I was in for a busy time. The insurance premium on the 75A-4 was staggering, costing more than twelve-months coverage on the house and furnishings! It seemed that the Company had heard about the facilities, or lack of same at Chatham Islands and were taking no risks. Several hours later, with all the gear stacked ready in a pile, I almost collapsed at the sight of it. Surely Ted Henry didn't look like this on his expedition to KS6-land. No, I seem to remember he had a KWM-1. Should I write to Art Collins? No, there wasn't time for that now! Eventually, over two-hundred pounds of gear was rushed out to the Airport and loaded aboard a Dakota for the first flight in the morning. Came Wednesday, I soon found myself flying in brilliant sunshine towards the Capital city, Wellington. A short bus trip to the city, final checking of luggage etc and I at last made the wharf where the *"Holmglen"* was berthed. It looked much bigger than I anticipated thank goodness, and I soon had my gear on deck and stowed away for the next two days. Accommodation was far from first-class, but the time passed quickly and minor inconveniences were overlooked.

Around four-oclock on Friday afternoon, land was sighted and we finally tied up at Waitangi at about eight-thirty. The Met-Officer in charge, Bill Sinclair and his right-hand man Bruce Griffiths were there to meet me. As luck would have it Bill had a jalopy, and we were soon mobile, heading for the Hotel Chatham. Bill immediately offered me the use of one corner of the weather-office for my ham activities together with the use of the local power plant. This offer was quickly taken up, and on Saturday morning we started to get things organized. The folded-dipole was strung out between the tank-stand and the fence, whilst the long wire was run almost at right-angle to this. For a table, we found an old packing case which filled the bill adequately. This was set up in one end of the office. All the gear was carefully unpacked and checked over for breakages. So far, the luck was with us. The switches were thrown, and the equipment allowed to warm up for a short time. A quick listen around the top end of twenty gave all the indications that the band was dead. A CQ however brought immediate results. The first station contacted was ZL3ID followed shortly after by W5DA, W4IYC, W5BGP, W9NDA, W5KBU, TG9AD, TI2RC, W5BZT, W4TM, W4INL, and W9QLH in that order. Further CQ's were uncalled for, the entire twenty-meter band was alive with Sideband-AM and CW stations all calling ZL3DA frantically. We were really in business now, and settled back for many hours of pleasant operating. What

The Post-Office and Courthouse, Waitangi.

an asset VOX would have been. Manual switching of both receiver and transmitter took up valuable time, and was a real problem at times.

Due to the pressure of traffic at the start, it was decided not to QSO the CW boys at this stage. If things eased off later, they would be given an opportunity also.

I should have pointed out earlier, that arrangements were made at the last moment for me to return on the next sailing of the *Holmglen*. This fitted in well with my activities and permitted me to operate from this remote outpost for just on three weeks. After the first week passed, I found that I was able to concentrate on all three types of transmission. Some confusion no doubt resulted at times, but all came right in the end.

There were a few instances where chaps persistently called me when asked to QRX, but on the whole I was impressed by the good manners shown by the majority. The worst feature of operating I found, was that many of those calling me congregated around 14300 instead of spreading out and making better use of the band. This point was stressed on many occasions and took up valuable operating time.

Local interference from the Diesel generator plant was causing me considerable trouble when trying to read the weak ones, so something had to be done about it. After some deliberation, it was thought that a half-wave antenna, fed with low impedance line would be a better proposition than the long wire at present used on reception. This was done and an immediate improvement was evident. I was now able to dig down for that fourth layer stuff and gladden the hearts of some of the low power boys.

One serious drawback during my visit, was the distance from shack to hotel. This half-mile uphill climb had me almost done-in for the first few days. But I gradually became accustomed to it and worked up a terrific appetite by the end of the day. Twenty did not open up till around 0400 GMT (1645 local) so it fitted in well with my schedule. At 0830 GMT things had quietened off and did not improve again until 1100 GMT. This was unfortunate, for a special midnight Radio-sonde flight was run off at this time, and I found my gear was causing interference in the 72 *mc* band.

Two early morning sessions were tried out, but the results were so poor, this idea was dropped. In all, sixty hours were spent operating, during which time 1064 QSO's were logged, involving some 44 countries and approximately 46 states. Of this total, 43% were two-way sideband contacts, 24% Antagonistic Modulation and the remaining 33% CW. Stateside contacts accounted for 76% of all QSO's. Regarding the eternal SB versus AM debate, I can only say that the SB gang win hands down. For hours on end I was able to study the advantages and disadvantages of both. I found I was able to copy about 10% of the guys calling on AM, whereas with SB a good 90% of those calling in were 100% copy. I still fail to see why all this power is wasted in putting useless carriers on the air, when far more satisfactory communication is guaranteed without. The day is not too far distant, when twenty meter operation will be confined mostly to SB and CW. This is the only way to cope with the congested conditions we are suffering today.

Those of you who were unfortunate enough not to make the grade, will be pleased to know that Jack Ryan ZL3VB who is the Postmaster and Superintendent of the Radio Station on Chatham, is now operating CW on the low end of twenty. Jack has a nice little 100 watt rig donated by one of the W7 boys, together with a suitable power supply that Jock ZL2GX presented to him. He is operating during the evening hours at the moment and putting out a solid signal. I had the pleasure of visiting Jack and his charming XYL on several occasions and nothing was too much bother to them. I hope some day to be able to reciprocate.

The hospitality shown by the local residents was really fine. I saw much more of the Island than would have been otherwise possible. During my off duty hours, I was able to study up a little on the geographical and historical points of interest. These are briefly outlined below.

The Islands are located 521 miles East of New Zealand, and have a total area of some 305,200 acres. Of this, 5700 are lakes and lagoons. The international date line of 180 deg passes about midway between New Zealand and Chatham Islands, therefore New Zealand is a day ahead of Chatham. However for the sake of convenience, Chatham keeps to the same date but stays 45 minutes advanced in time. The original inhabitants of the Islands were the Morioris, who migrated there prior to the 14th Century. In 1835 the Cannibal Maoris from New Zealand invaded the Chathams and brutally massacred the majority of the Morioris. Lieutenant Broughton, in command of H.M.S. Chatham, discovered the Islands in the year 1791, however not until

[*Continued on page 178*]

Funeral hearse complete with coffin and mourners

TRANSISTORIZED AUTOMATIC LEVEL CONTROL

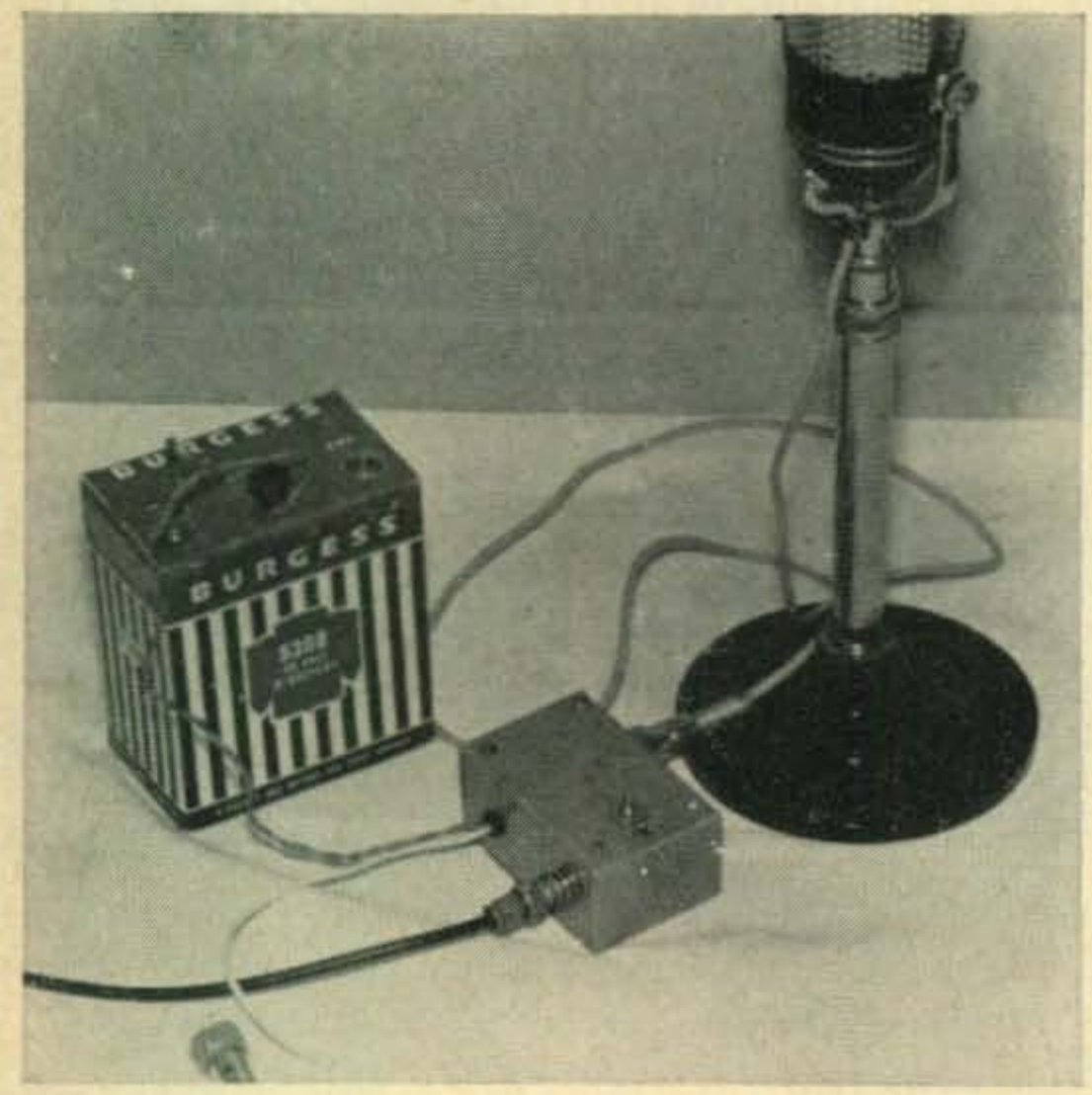
Daniel K. West K6DFM
5632 Wish Ave.,
Encino, Calif.

For obvious reasons, most hams do not like to use a soldering iron on their rigs, particularly if the rig is a piece of commercial equipment. The method I have developed of adapting Automatic Level Control should be of interest to the amateur.

I wanted ALC but I did not want to do anything that would change the operation of the HT32 which is an excellent piece of commercial equipment. "Keep your cotton pickin' fingers out of it," I told myself. So I took the will for the deed and worked with the outside connection, i.e., power, mike and antenna.

Now! How to get ALC. First, the ALC had to have a closed loop system. The mike and the antenna were there and with the black box between these two connections. ALC seemed possible. Then that little genius the transistor waved its magic wand like crazy. I picked the brains of a few friends who have designed transistor circuits. The transistor would need only a very small black box and a small amount of power for the box. Furthermore, one of the characteristics of the transistor suitable for black box application is the gain variation due to base current variation. Since this is reasonably linear, it appeared to be the suitable method of getting what I wanted.

The transistor is a low impedance device so I would have to have an impedance matching device between the mike and the transistor. An impedance transformer was just what the doctor ordered because this gave a direct method of controlling the base current via the secondary winding without the problem of interaction between *rf* and *af* signals. However, this was not the complete remedy because the *rf* that feeds back also contains the amplified and transmitted audio. As previously mentioned, the operation of the transistor gain is a function of base current variation. By varying the base voltage, the base current can be



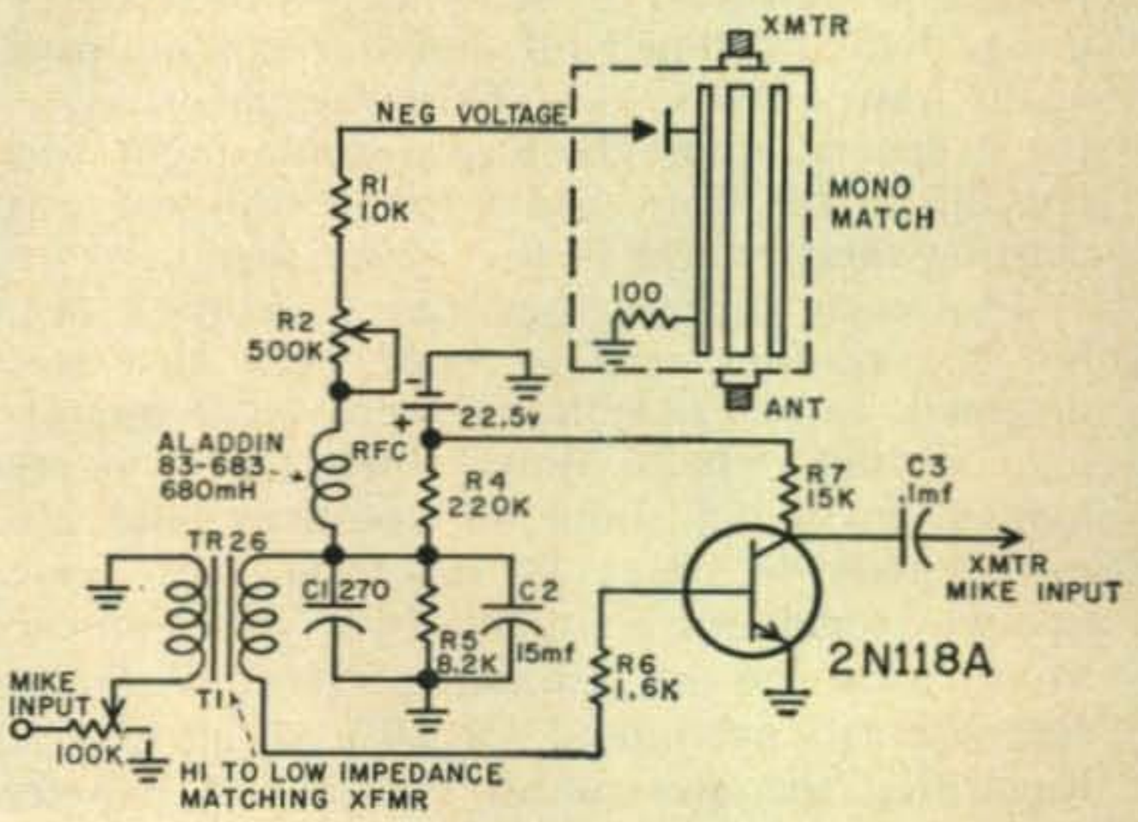


Fig. 1—Schematic of an ALC unit that requires no modification of equipment. The negative voltage is the rectified rf taken from an SWR unit.

controlled. This is possible by rectifying the *rf* signal, filtering out both the *rf* and *af* signals, and then applying the *dc* component to the cold end of the secondary of the transformer.

Since the transistor is a low level device, only a small amount of *rf* feedback is necessary to change the base current. In this case, the amount of base current variation for the transistor was in the range of 12 to 30 microamps to change the gain by two to one. This required a voltage change of approximately only 0.2 volts. The final step was to control the degree of coupling of *rf* to afford the proper operating point for the transmitter.

To use this device effectively, always be sure the station is clean and that no *rf* is floating around the shack. In fact, a clean station is a must at all times for a good operating station.

Component Functional Description

As shown in the schematic diagram, the microphone is coupled to the ALC circuit with an impedance matching transformer, T1. Potentiometer R3 functions as a control to prevent overdriving the transistor with audio from the mike. Negative feedback from the transmitter is rectified by a diode and coupled to the ALC circuit through R1, R2, and the *rf* choke. R1 is a limiting resistor that prevents the transistor base voltage from becoming too close to ground. R2 is the ALC control and is used to set the average level of output. The *rf* choke helps to filter out *rf*. Additional filtering for both *rf* and audio are provided by C1 and C2. R6 functions as a base current limiting resistor, and R7 is the collector load resistor. Audio is coupled to the transmitter mike input by C3.

Construction

This unit can very easily package in a box 3 x 3 x 1½. The wiring is not critical. The only precaution that should be taken is to shield the unit from any *rf* radiation. If germanium transistors are used, the unit should be kept away from any heat since, should it be exposed to temperature above ambient room temperature, the ICo of the transistor will change operating point and may cause distorted audio.

Methods Of RF Coupling

Most of the shacks today are using reflected power meters; this becomes an ideal spot to obtain RF. Those who would like to build this ALC and do not have a reflected power bridge would have to build the tomato can mono match recently described in CQ, Nov. '57, page 96. This is a very excellent unit to have around the shack for checking standing wave measurements. This then would serve as a dual purpose device with the ALC unit.

I have shown two types of ALC circuits, one for NPN and PNP. When the NPN transistor is used the diodes in the mono watch should have the anode connected as shown in fig. 1, i.e., the diode is to furnish a negative polarity, and vice versa for the PNP as shown in fig. 2 which would be positive potential.

Setting The Control for AM Operation

The level control is set to a point to give approximately 98% of modulation. This is best done with an oscilloscope. Using a two tone modulation, set the transmitter to show 100% modulation without ALC working, then set ALC control to just start controlling the modulation level. As can be seen, this setting will have to vary with different output level and in order for ALC to work properly, transmitter will have to be tuned to the power level of the initial setting for proper ALC action.

SSB Operation

For SSB operation the saturation point of the linear amplifier has to be determined. The ALC is then adjusted to a level to prevent the flat topping of the amplifier.

Point of measurement is at the junction of R4 and R5 when ALC action takes place. This voltage will change negative going with NPN, positive going PNP type transistor. The voltage variation will be in the order of 0.1V-0.2V dc. Use high impedance meter. ■

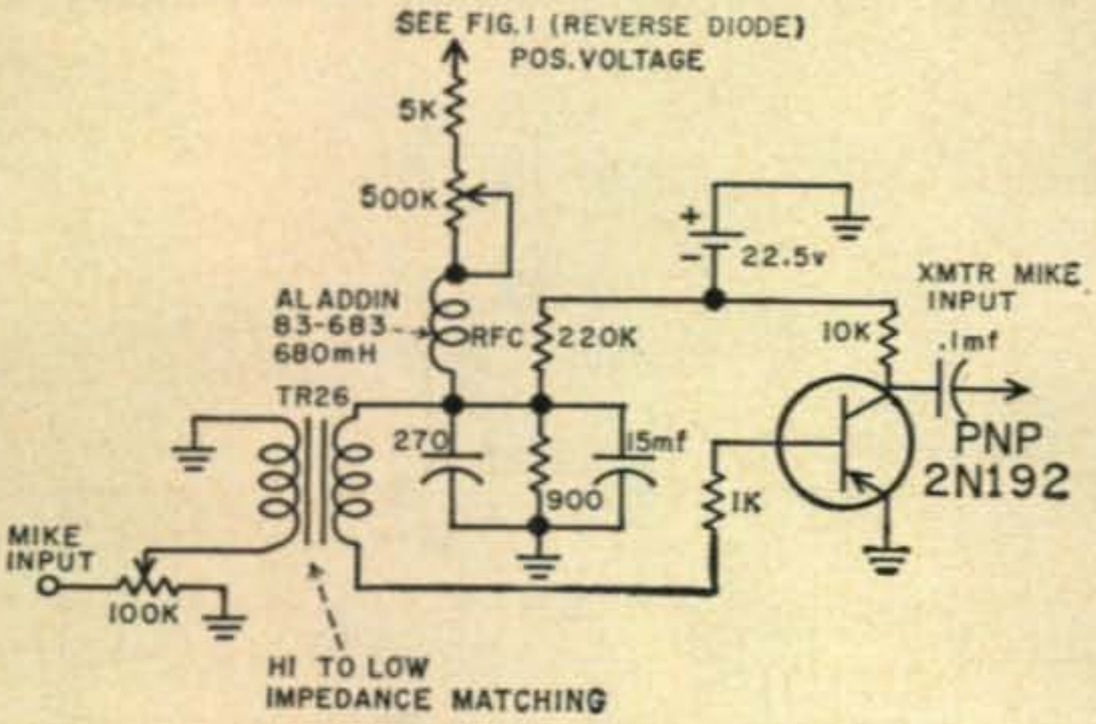
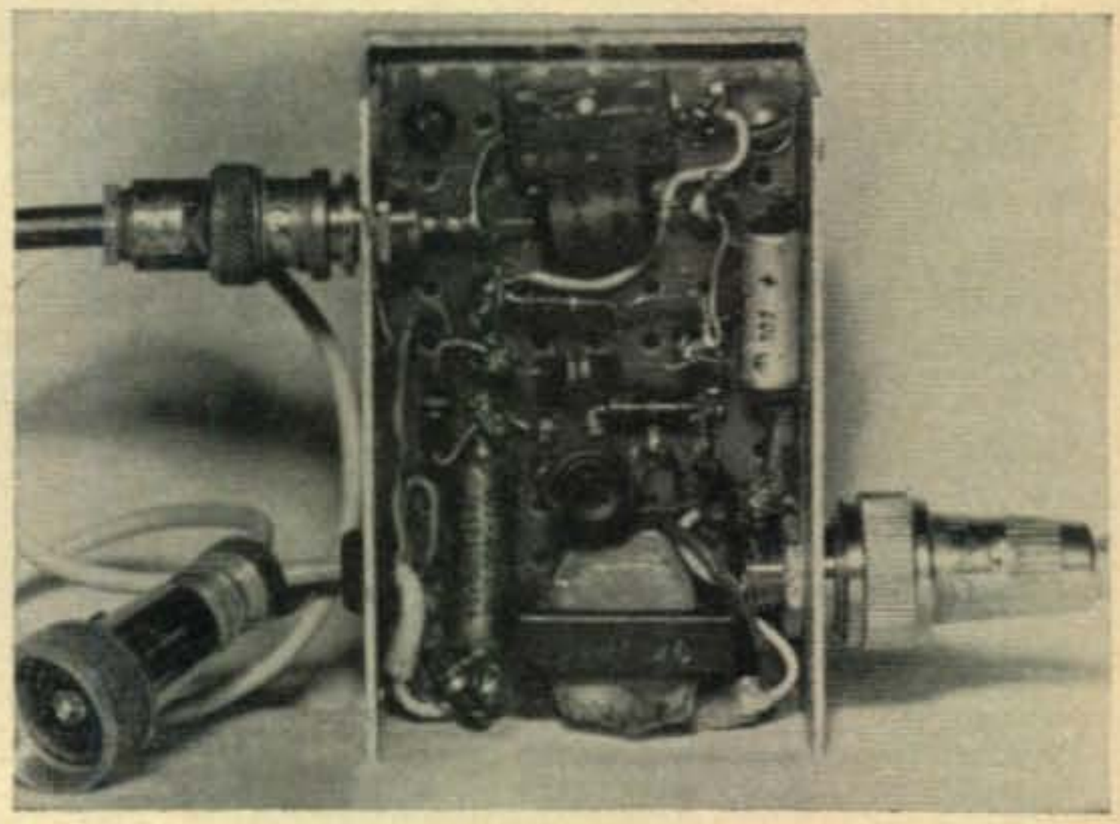


Fig. 2—The same unit as shown in fig. 1 set up for a PNP type transistor. This requires the reversal of the diode to produce positive voltage.



Know Your Filter Choke Coils

How To Find Inductance Values For Various Load Currents

Harold Reed, W3EJP
3917 Madison St.
Hyattsville, Maryland

Power supply filter choke coils are an important item in a well designed audio amplification system. When building the power supply for an audio amplifier, the constructor should be aware of this and should ascertain that the particular chokes selected for his equipment will provide satisfactory results. Also, there may be some chokes in the usual miscellaneous collection of parts which would be suitable for a certain application if measured data were obtained under various operating conditions.

This article deals with the important property of inductance with varying load currents, assuming that the current rating of the coil is satisfactory for the load requirements. Naturally, if the load current demand is greater than the current rating of the choke coil, it will run too hot and should not be used in the power supply.

The important characteristic of a choke to be used at the input of the filter of a well regulated power supply is the value of inductance relative to the amount of direct current flowing through it at any particular time. The inductance varies with the *dc* current due to the varying flux density in the iron core. With a varying load, such as when powering a Class B power amplifier or modulator, the inductance of the choke will change considerably between full load and no load conditions. For good operation over a wide range of load conditions, care must be taken to see that the choke inductance value is always sufficient to do the job.

The critical inductance value is determined by the equation, Lcrit=R/1000, where L is in henries and R is the load resistance in ohms. If the input choke inductance is equal to or greater than the critical inductance value, then, when the load current is small the output voltage will not rise way above the average rectified wave appearing at the choke input.

The optimum inductance is, L=R/500. When the input choke inductance is equal to or greater than this optimum value when the load current is large, the peak rectifier current will not exceed the load current by more than 10%. Thus, for best operating conditions over a wide range of load currents, it is important to make certain that the choke will give the critical inductance value, or greater, when the load current is minimum, and that it will provide at least the optimum value of inductance when the load current is maximum.

A so-called "swinging" choke is designed with the foregoing conditions in mind, and as its name implies, its inductance value "swings," or varies with variation of the direct current through it.

Inductance of a choke coil may be found, of course, by means of a standard impedance bridge. This will give the rated inductance, approximately, but does not supply information about the coil under varying operating conditions when the load current is changing over a considerable range.

As an example, a Thordarson T-20C54 swinging choke is rated at 8 henries. This is at the rated current value of 150 *ma.* However, at zero *dc,* the inductance is given as 16 henries, while at maximum current rating, that is, 200 *ma,* the listed inductance is 4 henries. Thus, it can be seen that the inductance of this coil varies over a 4 to 1 ratio between zero and maximum current rating.

Test Circuit

Choke coils may be checked under operating conditions with the simple circuit shown in fig. 1. A full-wave vacuum tube rectifier can be used for this purpose but semiconductor diodes provide a simple, quickly set up test circuit and do not require a filament supply source. Any selenium rectifiers may be

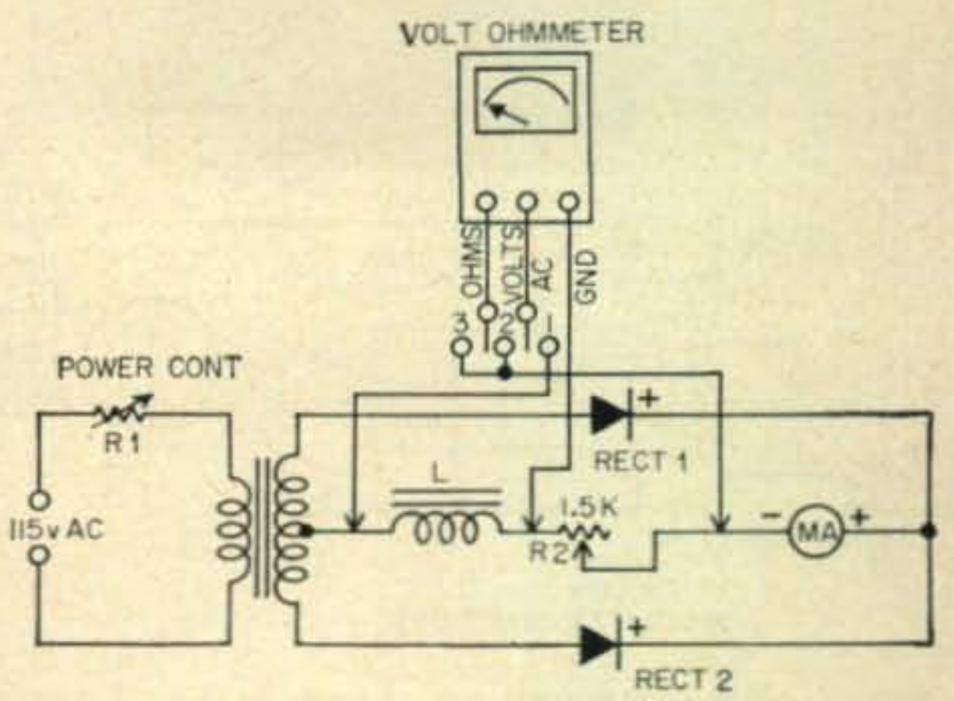


Fig. 1—Simple full wave power supply test circuit for finding choke coil inductance.

used, the only precaution necessary is to make certain that their voltage and current ratings are not exceeded.

It might interest some readers to know that power transistors connected as collector-base diodes make excellent rectifiers. They are extremely efficient, will handle high current flow, use low voltage supply source and are inexpensive. The Motorola 2N554 power transistor, for example, has a maximum steady state *dc* collector current rating of 3 amperes, maximum collector voltage of 30 volts, maximum dissipation rating of 40 watts and costs only $1.35.

Most of the few parts required may be on hand. Transformer, T, can be any suitable type capable of handling the necessary current demand. The secondary voltage is adjusted by the power control in the primary to a satisfactory value for the rectifiers. A transformer could be selected just to suit the rectifiers used, then the power control would be unnecessary. The meter value will depend, of course, on the current range over which any tests will be made and variable control, R2, should likewise be chosen. The author used a 50 watt, 1600 ohm control that was found in the junk box. This could also be a fixed type resistor with adjusted slider, but would not be quite as convenient.

Using The Circuit

To use the circuit, three easy measurements are made at any given current value within the rating of the choke, as observed on the meter. The current value is set by means of R2. The volt-ohmmeter is then switched to position 1 to read the voltage across the choke, L. This is recorded, and the volt-ohmmeter is switched to position 2 to check the voltage drop across the variable control R2, which is also recorded. The meter is then switched to position 3 to obtain a reading of the resistance of R2. Be sure to cut the power off before making this resistance measurement. Having recorded the results of these three measurements, we now have the information needed to find the inductance at this given current.

Finding Inductance Value

Now, the inductance L of the choke coil may be found by solving the simple equation, $L = E_L R / E_R 2\pi f$, where L is in henries, E_L is the voltage drop across the choke, E_R the voltage drop across R2, R the measured resistance value of R2, 2π is equal to 6.28, and f is 120 cycles. Therefore, for a given current, it is only necessary to substitute the measured values of El, Er, and R in the equation to obtain the inductance. The choke coil may be measured in this manner at the minimum and maximum current that will flow through it as required by the load when used in the power supply, or at any level in this range.

In the foregoing equation the choke coil impedance is neglected since the resistance value of the coil is small compared to its reactance. In other words, the reactance at 120 cycles is so much higher than the resistance that a negligible error results.

Saturation Point

The approximate saturation level of the choke coil can also be determined with the test circuit. At first, with current flow, the magnetizing force increases and flux density increases rapidly, and then, there is a decrease in the magnetization rate followed by little further increase. As the direct current magnetizes the iron core the permeability and the inductance decreases. When the inductance begins to level off, as the current flow is increased, saturation level is being approached. Several checks may be made with the test circuit to find this levelling off point. The choke will not provide optimum results when it is operated beyond the saturation point.

Some Measured Data

Using the method just described and solving the equation with the measured data so obtained, the Thordarson choke referred to previously, checked out as follows. At the rated current value of 150 *ma* the inductance was found to be 9.3 henries. At maximum current rating, that is, 200 *ma* the inductance measured 4.5 henries, and at 10 *ma* it worked out to be 17 henries.

As an example, the inductance of 9.3 henries at the rated current value of 150 *ma* was arrived at as follows. El measured 95 volts. Er was 10.2 volts. R measured 754 ohms. Thus, L=95 x 754/10.2 x 6.28 x 120, or 9.3 henries. The other inductance values at 200 *ma* and 10 *ma* were obtained in the same manner.

This particular choke coil when measured on a General Radio impedance bridge showed an inductance of 8.7 henries. Note that the measured values are close to the manufacturer's ratings and are close enough for all practical applications.

It might be mentioned, that if the reader does not have a variable power control such as a Variac for R1 in the 115 volt *ac* input circuit, he may adjust the secondary voltage of the transformer to a suitable value for the rectifiers employed by connecting ordinary lamp bulbs in series with the primary winding to drop the secondary voltage as required.

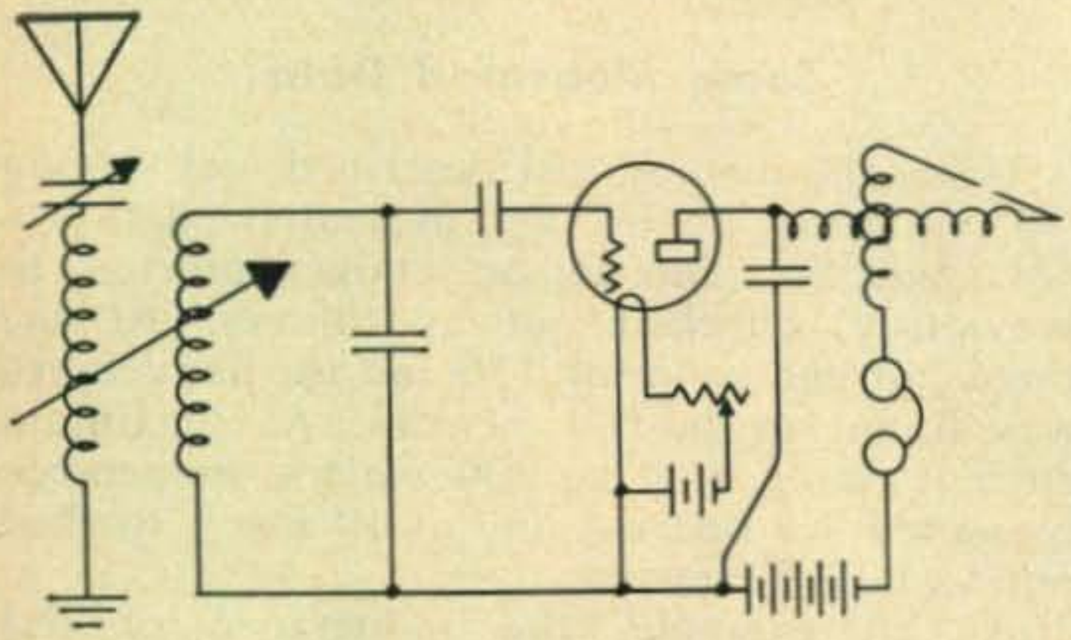
The foregoing data and test circuit will give a better understanding of this important part of the audio system and will assist the power supply constructor in selecting the proper coil for any particular application. ■

In The Beginning

F. D. Whitmore, W2AAA
223 W. Holly Ave.
Pitman, N. J.

Part VIII

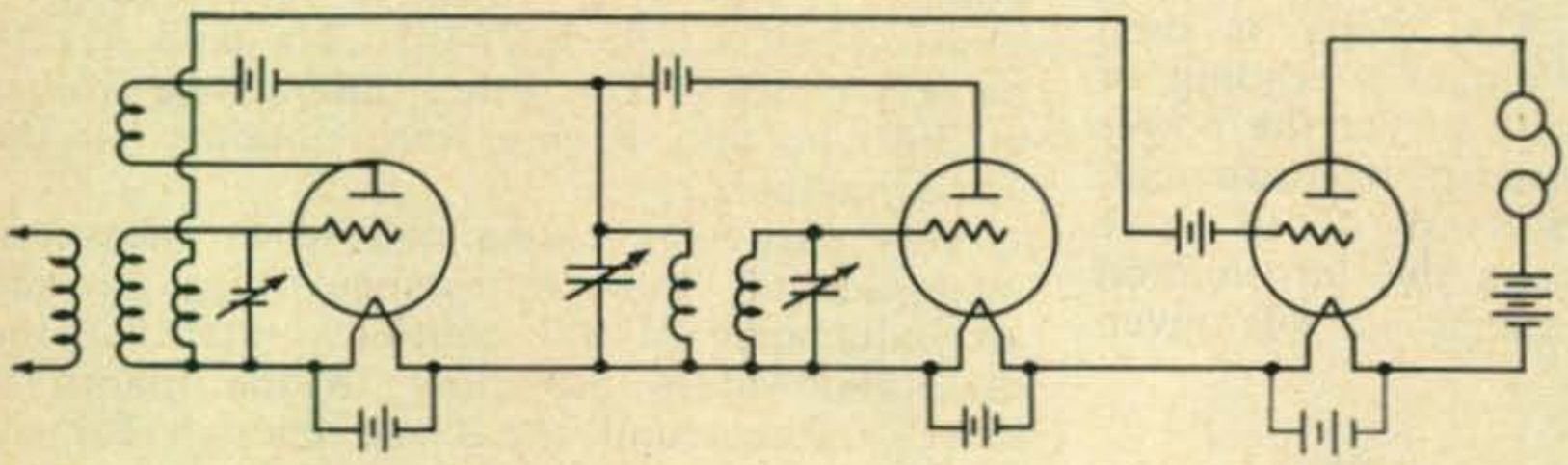
Reception Before Superheterodynes



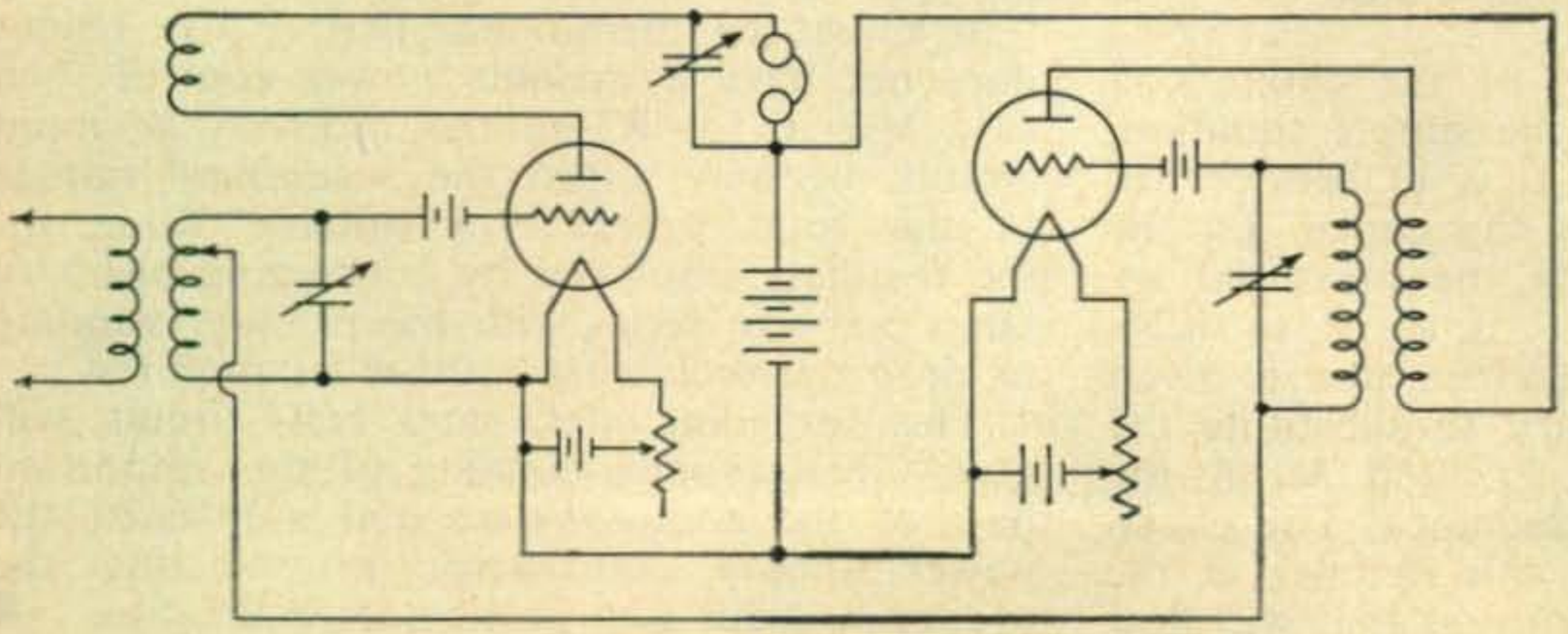
Regenerative circuit.

Unlike his brothers, Walt and Hal, Sam plunged into radio with divided interest. For quite a while the radio broadcasting art claimed most of his attention. Examples of his early preference appeared in his house and the homes of relatives and friends. His *fame* consisted of an oatmeal-box special housed in a wooden box and tuned by two switches passing across groups of taps. Sam sold quite a few of these crystal sets before graduating to vacuum tube designs.

Regeneration—Ordinary regeneration consists of feeding energy back to re-enforce the oscillation in the circuit. This increases the am-



Super-regenerative circuit best for CW and spark.



Super-regenerative circuit best for phone.

plitude of the oscillation and creates the same effect as attained by introducing negative resistance. Feedback overcomes some of the positive resistance in the circuit; it lowers the effective resistance.

Paul Godley was the first man to adapt the Armstrong regenerative circuit to short-wave work. He originated variometer regenerators which made possible the wonderful short-wave DX work of American amateurs during the "teen" years.

Oscillation represented the theoretical boundary of amplification. The increase in amplification just below the oscillation point was amazing. Everyone realized how wonderful it would be if only a little more amplification could be squeezed out. Major Armstrong pondered this problem and announced a method for doing just that. He called his system "super-regeneration."

Super-Regeneration—Super-regeneration extended the range of regeneration without letting the receiver break into oscillation. Using two tubes, Armstrong claimed amplification of telegraph signals a million times greater than the output of a single regenerative tube. This caused quite a flurry of experimentation among receiver enthusiasts.

The idea of super-regeneration was to prevent spilling over as the oscillation point neared. It carried regeneration on and on without ever breaking into oscillation. To accomplish this, the circuit fed negative and positive resistance alternately into the detector circuit. The second tube created these resistance effects.

Two tubes in this super-regenerative circuit were claimed to do the work formerly done by ten. One could expect phone signals 100,000 times as strong as those produced by ordinary regenerative detectors.

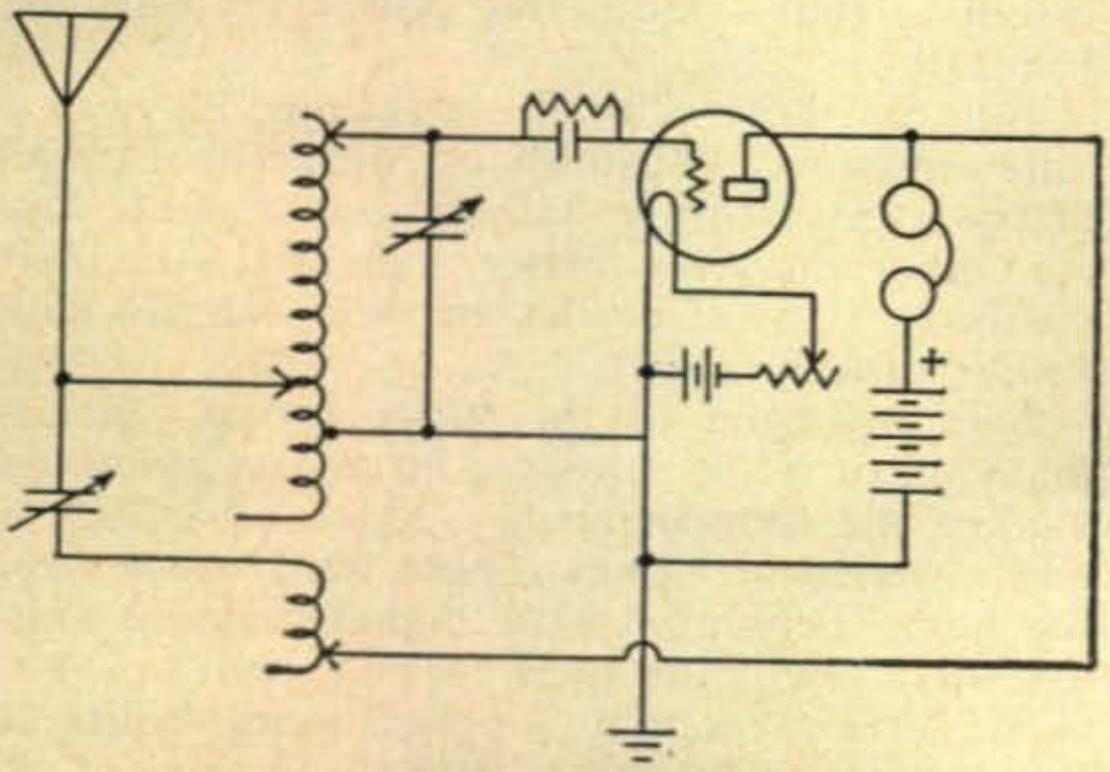
Reinartz Tuner—A tuning circuit that captured both interest and enthusiasm during 1921 and 1922 was the Reinartz circuit. This simple and inexpensive tuner outshone competition at the time. It had three chief advantages:

1.—The primary functioned aperiodically condensing tuning to a single control varying the secondary condenser.

2.—A combination of static and electromagnetic methods produced feedback. It was an adaption of the system originated by Roy A. Weagant. By removing tuning from the plate circuit, re-adjustment of feedback was not necessary for each change in tuning.

3.—Hand capacity effects were nil. Proper feedback could be set so the tube oscillated properly and evenly though tuning was varied through its entire range. When receiving spark transmission, an adjustment of the feedback condenser held for a very large range of the tuning condenser without readjustment. The tuner performed best, however, with CW. Users liked it because they could return to each station heard without any inconvenience.

In the original Reinartz tuner, moving inductances flanked a fixed main inductance. To simplify it for do-it-yourself constructors, Reinartz eliminated the moving coils. Some of the hams will remember the eighty-five turn coil with a break at forty-five turns. Taps from the coil came out to three switches. The tuning range covered 130 meters to 370 meters enabling it to pick up commercial broadcasts. Grounding of the rotary condenser plates eliminated body action. External coils, switched in at will, extended the wavelength coverage.



Reinartz circuit.

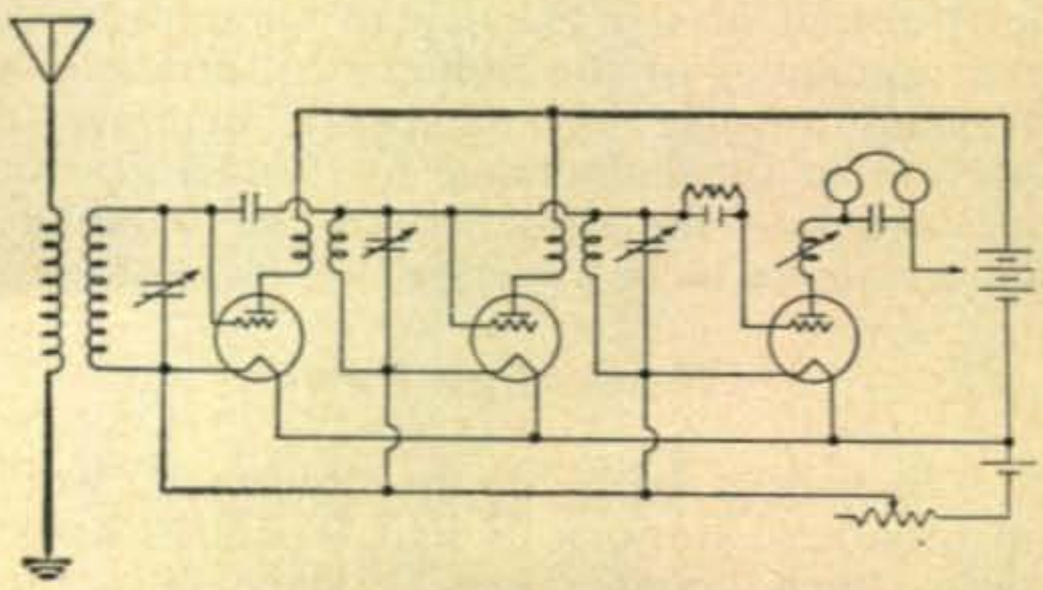
Neutrodyne Circuit

Neutrodyne was the name given to a method for neutralizing the capacity coupling in triode *rf* amplifiers to prevent their self-oscillation. Previous lack of a suitable method for preventing undesirable regeneration delayed general use of radio-frequency amplifiers.

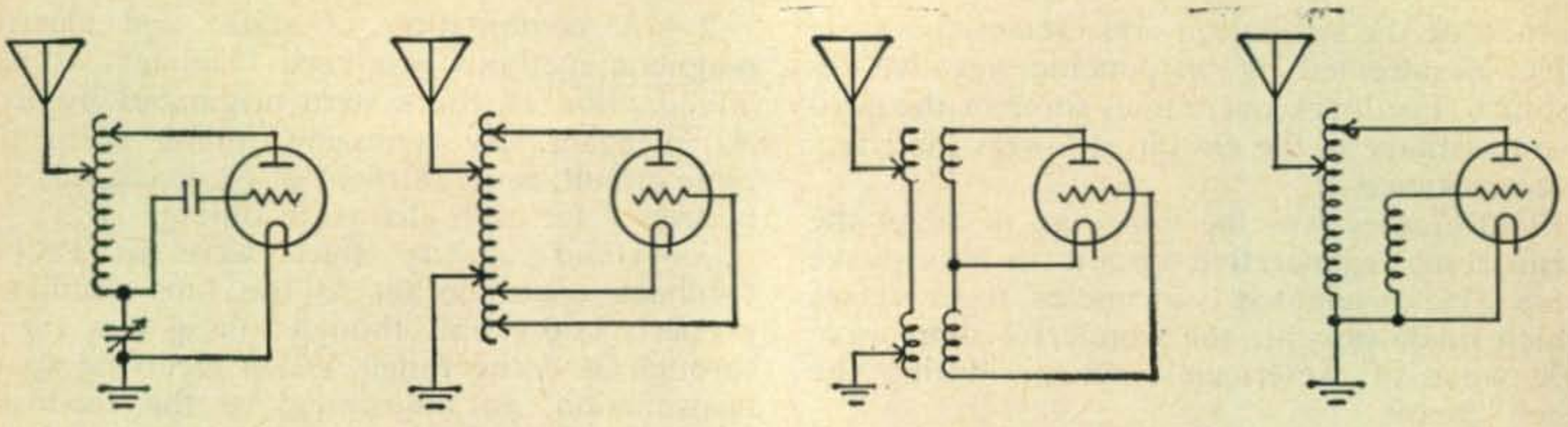
Each *rf* stage required separate neutralization. An easy method of doing this used a strong input signal. After tuning in the strong signal, filament current to the tube was turned off and the unlit tube left in the socket. Adjusting the neutralizing capacitor until no signal could be heard, correctly neutralized the stage. Until this point was reached, capacity coupling of the circuits on each side of the tube transmitted the signal on through the set.

Oscillators

Oscillating circuits made use in some way



Regenerative neutrodyne circuit.



Variations in oscillator circuits.

of Major E. H. Armstrong's discovery of the feedback principle. Though subsequent investigators created trick oscillators for particular purposes and used their names for identification, all these circuits were Armstrong because they included feedback. The four chief oscillators were: Colpitts, Hartley, Meissner, and Heising.

Colpitts—This circuit contained a series condenser in the ground lead. Grid and filament connected across this condenser to obtain a direct voltage feedback. RF power reached the antenna due to charging of the condenser formed by the antenna. It was a capacitive coupled circuit.

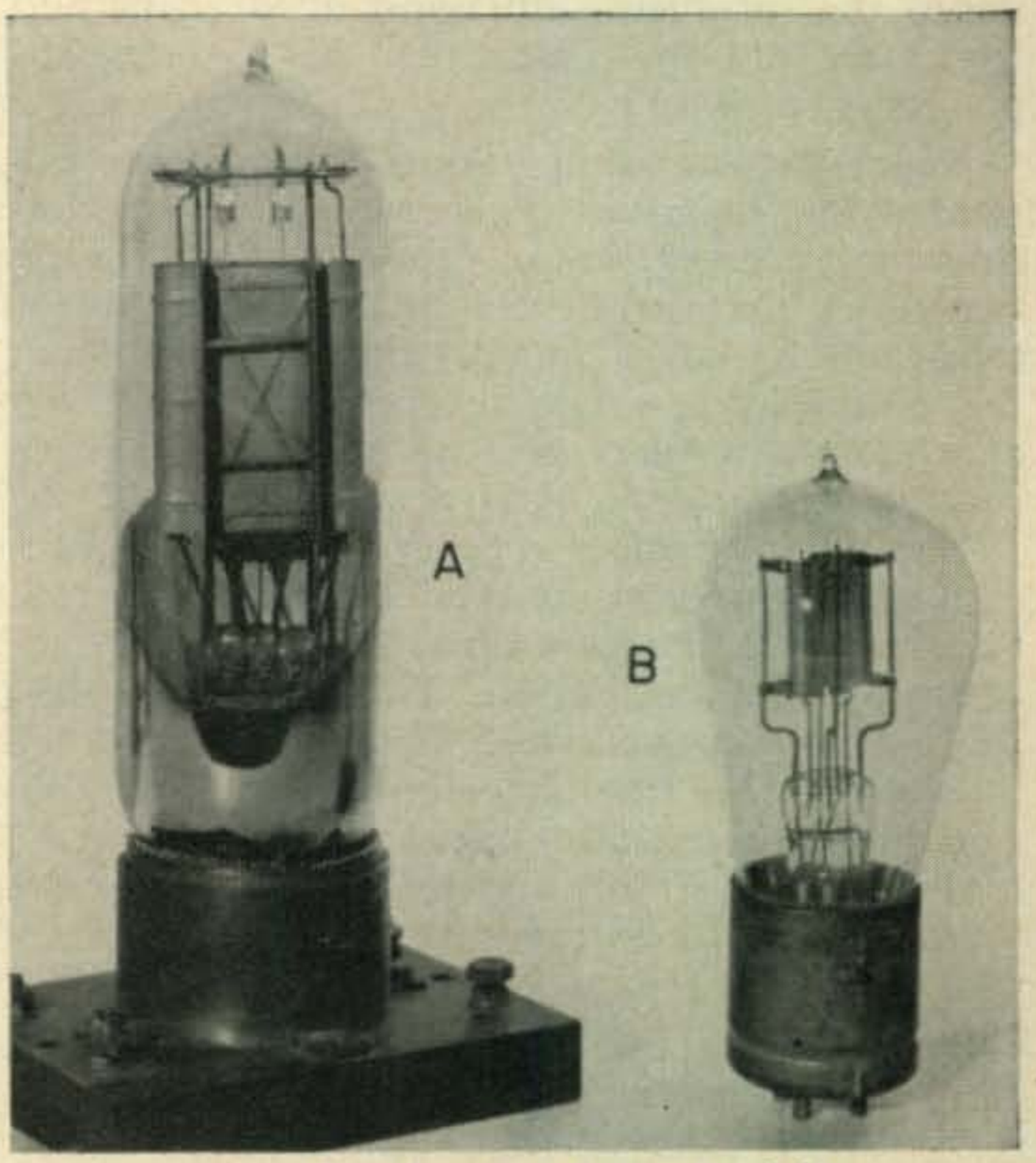
Hartley—This really became the favorite in hamdom. Its split-inductance circuit was the simplest of the electromagnetically-coupled oscillators. Connection of the filament tap lay between the plate and grid connections. Besides connecting the aerial and ground to the same inductance, inductive coupling was possible without destroying the Hartley feature.

Meissner—The Meissner circuit differed greatly from the Hartley oscillator. In this circuit, grid and plate inductances were not electromagnetically coupled to each other. Each coupled independently to the antenna circuit inductance. The Meissner oscillator operated over a considerable band of frequencies without changing the grid or plate inductances. The circuits functioned aperiodically leaving adjustments of the antenna circuit control the wavelength.

Heising Reverse Feedback—The Heising circuit is close to a Hartley. Bending back the grid circuit of the Hartley to telescope within the remainder of the inductance, produces the Heising reverse arrangement. Bending this portion of the inductance to form a grid tickler, required the direction of the winding or its terminals to be reversed.

Weak High Power

The luckier hams of the "twenties" worked in broadcast stations or had broadcast associations. Such "connections" conveniently raised the power of their rigs. Lacking such contacts,



The long and short of it:
A—Fifty-watt transmitter tube 203-A
B—Five-watt transmitting tube, UV-202

a large portion of hamdom, caught by tough finances, remained in the low power class. This group, after cutting their eye teeth on the UV-202 five watt transmitting tube, modernized by installing that famous low power favorite, the UX-210.

But for those with "connections," it was a different story. Most all of their shacks had fifty-watters sitting up taking nourishment. And a number did even better than that—in their stations 250 watt bottles blushed merrily with *healthy* ruddy glows.

Sam belonged to the lucky group. At the first sign of weak emission, broadcast operators yanked the foundering UV-203s and UV-204s and installed new ones. These weak tubes were the hams' delight. A little higher filament voltage for a few hours soon pepped them up. After this treatment they supplied many hours of fine service in ham rigs. But, as is true of all procedures and regulations; exceptions crept

in—*not every tube passed out was weak.*

Sam enjoyed his friendship with the broadcast fraternity for quite a few years before joining their ranks. Such contacts kept his home a focal point for local amateur activity. His easy access to "lame" power tubes inspired constant experimentation. Something new was always underway. With modulated UV-203s, and a UV-204 CW transmitter; his shack was an envious communications center.

Sam Signs on a Tramp Ship

Like his brothers before him, Sam itched to see strange things and exotic places. Finally, he could stand the yearning no longer and signed-on a rusty tramp steamer bound for Buenos Aires.

He left his ham elysium with dreams of other galaxies and wave-skimming flying fish. But neither the Southern Cross, Clouds of Magellan nor cavorting deep-sea denizens made very deep traces in Sam's memory. Other events crowded them out.

Gliding smoothly through the water under a river pilot's guidance, the old hull buckled gently each time its keel touched bottom. Standing by the wireless room door, Sam watched passing traffic with one ear alert to

Cargo vessels took their wireless operator right into port. Tankers often docked at the end of a pipe line four miles or more from town.

the receiver's signals. He looked mighty "sharp" in his officer-type peaked white hat.

Soon after dropping the pilot and heading out to sea, Sam's popularity got a nick for the worse. The third mate, shouting heavily accented English, stormed into the "shack." It seemed an antenna insulator broke letting part of the antenna crash to the deck. In falling, it just missed the third mate's head. To be polite, Sam apologized. But for some reason the mate eyed Sam warily each time they passed.

For four and a half days after leaving Overfalls lightship, Sam enjoyed a sea as smooth as glass. Neither a swell nor a ripple marred its surface. With no excitement on deck, he spent a good bit of time with the rig. The simple transmitting circuit supplied plenty of power with a pleasant copying note. It was a 2KW converted spark using a pair of UV-204 tubes in a self-rectified circuit.

Around the south side of Cuba, pleasant West Indies trade winds swept across the deck. As Sam admired the Cuban mountains in the distance, a fresh puff snatched off his peaked white cap sending it skimming aloft. It soared high and long before striking the water several hundred yards beyond the stern. From then on it was hard to tell Sam from one of the deck gang.

The wireless shack nestled under the flying bridge two decks above the main deck. It was a swell spot. A cool breeze constantly filtered through, and it had easy access to the flying bridge where all navigating took place in the tropics.

After ten days in these warm waters, the deck crew washed down the flying bridge. That's when Sam experienced his first trouble.

Under the intense sun, deck boards contracted and seams opened. Down through these slits poured half of the sooge water soaking all *rf* parts in the transmitter.

Sam wiped the excess water off the parts with rags. But each time he tested the transmitter, sparks snaked all around the components on the top shelf.

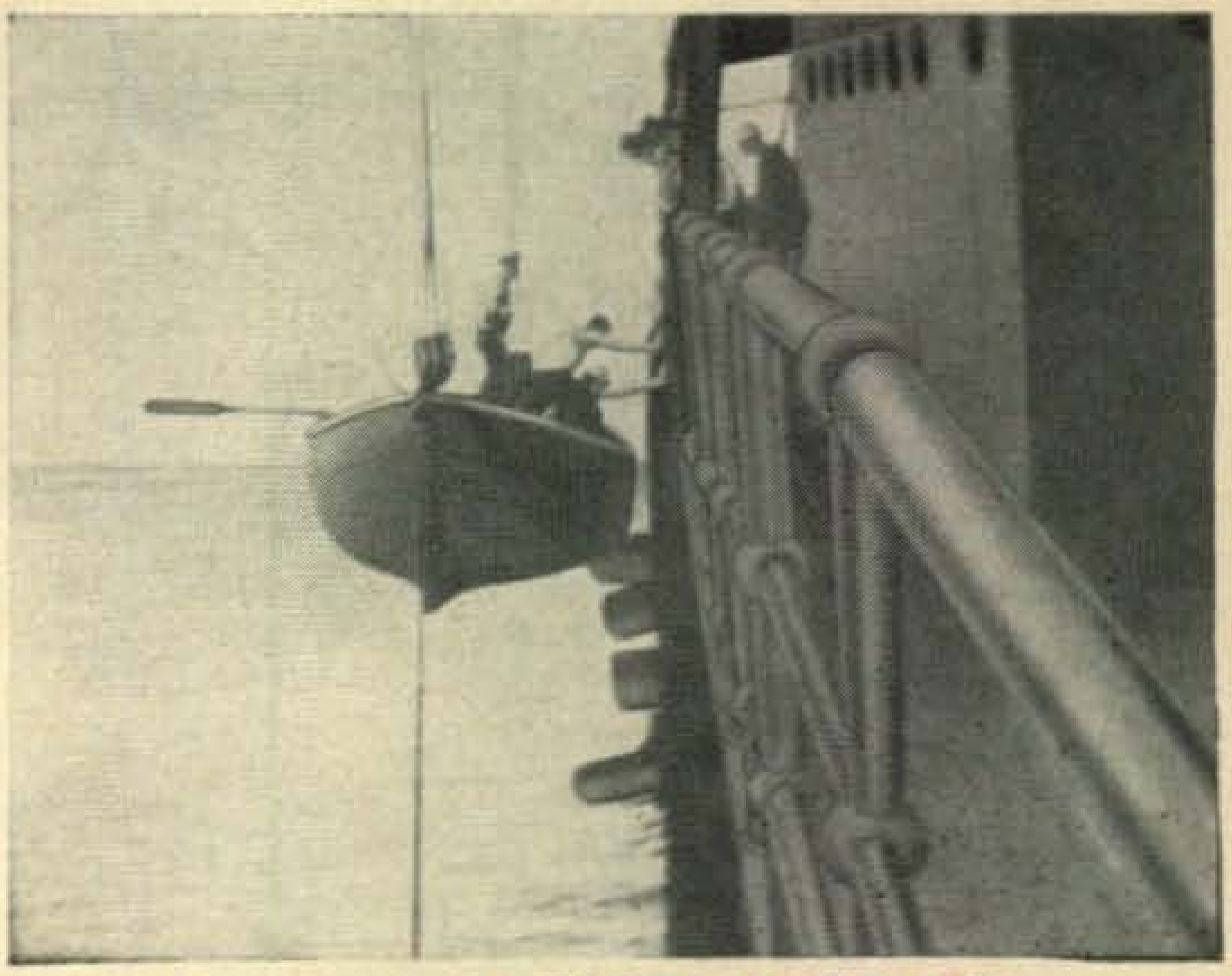
In desperation, Sam did the inevitable. He dissembled the parts and placed them on the sunny deck to air dry. It didn't help much that WOE at Palm Beach, Florida was calling him. That message he didn't get until the next day.

After that incident, Sam had nothing to do for days on end. There weren't even weather reports to copy. They were beyond the range of United States weather coverage, and South American reports failed to fulfill the need. Therefore, Sam lazily deepened his tan and perused his English-Spanish dictionary.

In Argentine waters, they hove to for several days. Lying at anchor in the hot sun is a sweltering experience. In motion, there's always a breeze. But the breeze disappears when you anchor, and soon it is hard to breathe.

How inviting the water all around you looks. The longer you look at it the more tempting it

[*Continued on page 178*]



Lowering the lifeboat to beat the sharks to the cabin boy.

5/8 Vertical

William F. Frankart, W9KPD
1259 S. Boeger St.
Westchester, Ill.

The following article describes a vertical radiator having dimensions of 5/8 λ and explains why it is a good DX and Multi-Band Antenna. A 5/8 λ is the length of antenna that results in in maximum radiation and a very low vertical radiation pattern, i.e., high energy at a low angle. The 5/8 λ should be figured and cut for the band most desired to work. It will work on all bands, including those lower in frequency than for which it is cut.

Figure 1 shows the maximum field strength for the 5/8 λ or .625 of 1 λ antenna and the effect of higher or lower frequency operation of any given grounded vertical. This chart shows what happens when a length of vertical conductor is operated at frequencies below 5/8 λ the field strength being high. When the length is longer than 5/8 λ, the field strength drops very rapidly until at 1 λ the field strength is very feeble as compared to what it is at an antenna length of 5/8 λ. For example, a radiator of 41.5 feet in length provides optimum performance at 20 meters and works efficiently at 40 and 80 meters, but is poor at 10 and 15 meters. The vertical radiation pattern chart (the most important pattern characteristic of all) is shown in fig. 2. The low angles obtained from lengths of vertical grounded antennas operated from 5/8 λ to lower frequencies. Longer vertical conductors result in higher and higher angles and thus make poor radiators. Lengths over 5/8 λ also reduce the relative field strength as shown in fig. 1. One point of special interest is that in the 5/8 λ vertical grounded radiator you have maximum low angle (vertical angle) and maximum field strength making for an exceptional DX antenna. In addition you have a small high angle (vertical angle) lobe for short haul communications.

Figure 3 presents the schematic of an antenna tuner that will match lower antenna impedances to the line impedance. Since the 5/8 λ antenna is good when operated all the way down to 1/8 λ, multi-band operation requires an antenna tuner that can also match antenna impedances higher than the feed line. This basic current is shown in fig. 4. The two circuits combined produce fig. 5.

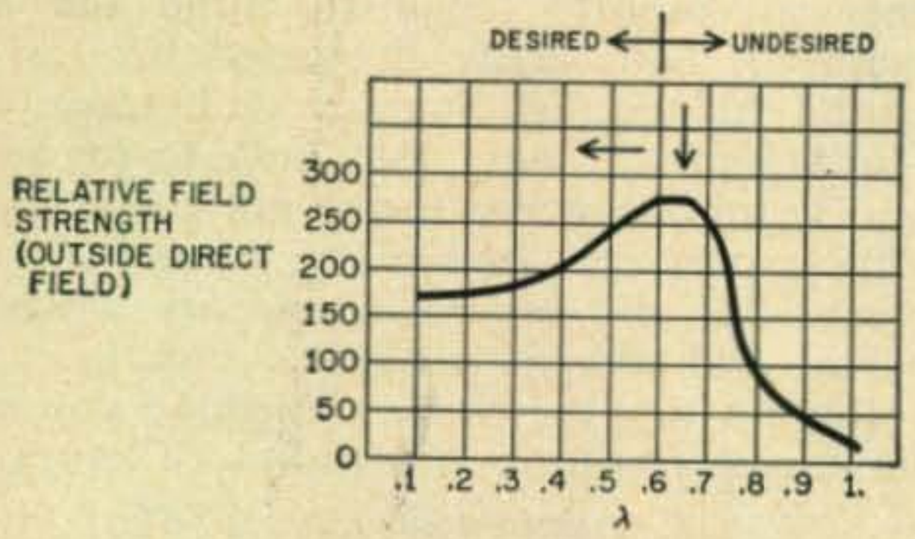


Fig. 1—A graph showing the relative field strength of various length vertical antenna of the grounded type, i.e., exitation between base and radical system.

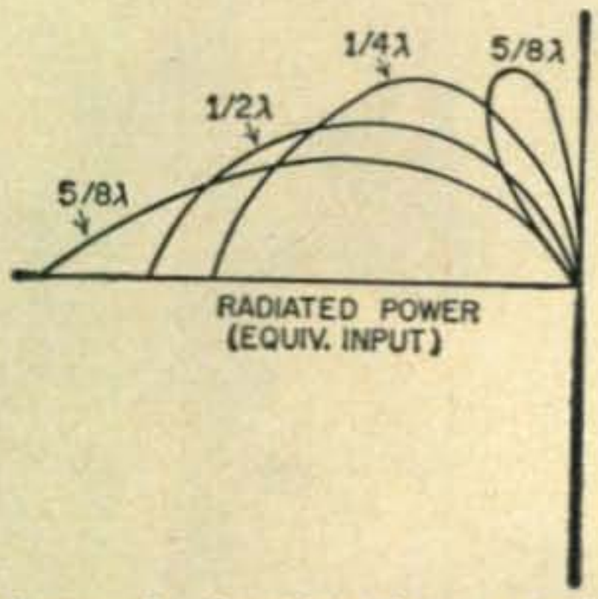


Fig. 2—A graph showing the vertical radiation patterns for various length vertical antennas of the grounded type.

Operation

To operate, merely follow the following simple rules: For Hi-Z Antenna; C open, Tune L, Tune C_1. For Low-Z Antennas; C_1 open, Tune L, Tune C. Again, since there will never be an ideal installation of the grounded vertical, we will probably have to tune all three adjustables. However, we should tune for

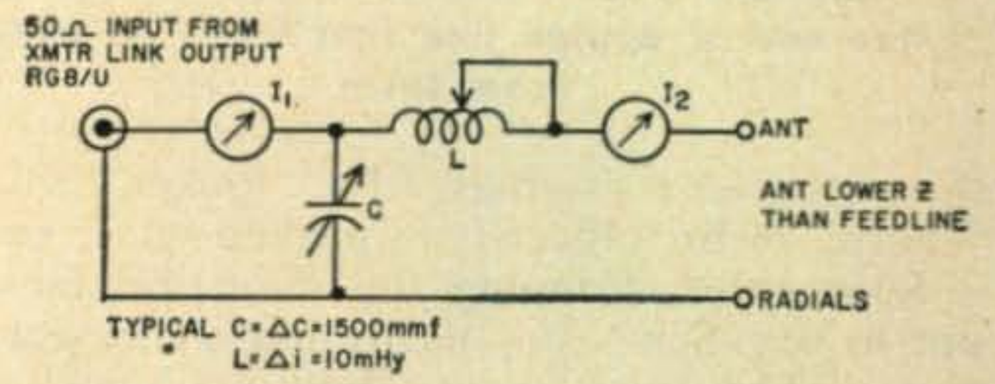


Fig. 3—Basic antenna tuner for an antenna whose impedance is lower than the feed.

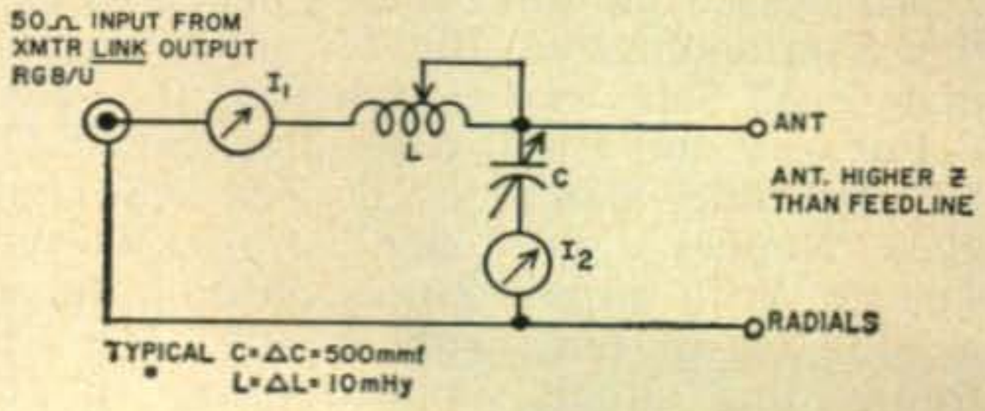


Fig. 4—Basic antenna tuner for an antenna whose impedance is higher than the feed.

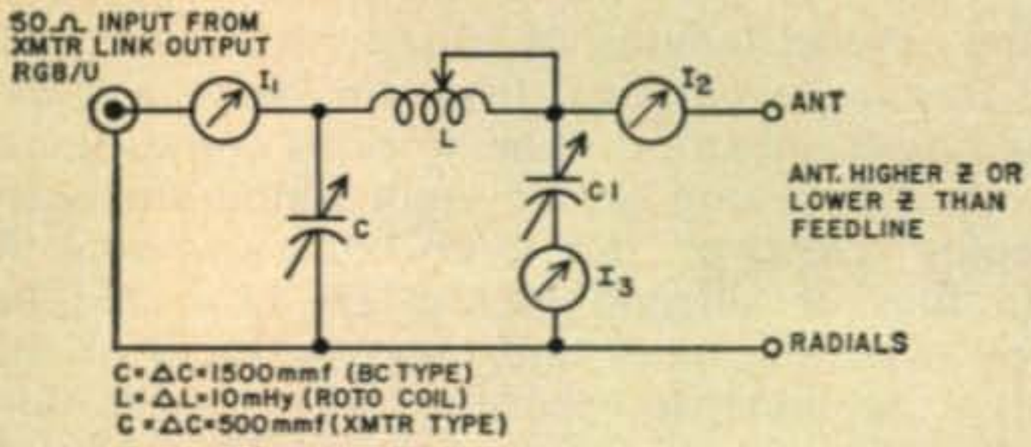


Fig. 5—Combined circuit of figs. 3 and 4 to provide for an antenna whose impedance may be above or below the feed line.

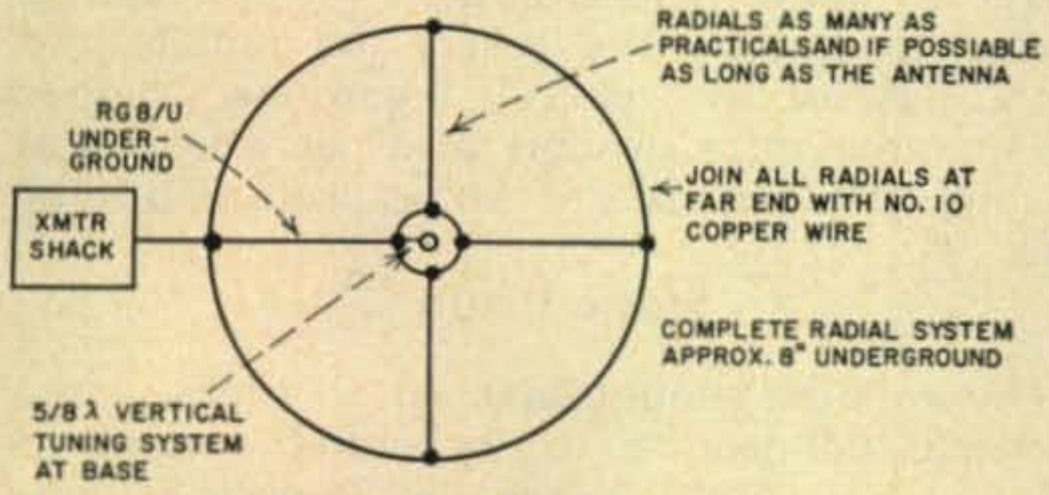


Fig. 6—An ideal radial system.

maximum coincidental current readings of I_1 and I_2 always favoring the highest reading on I_2 when the two maximums do not co-incide.

A typical adjustment for Hi-Z Antenna (ideal) is as follows: For a transmitter with an output of 700 watts, the proper adjustment would be when I_1 reads 3.75 amps (*rf* Ammeter) and if the antenna was 100 ohms I_2 would read 2.65 amperes. Typical adjustment for a Low Z Antenna (ideal) would be as follows: Here in all cases I_2 would read more than I_1. For the same 700 watts output, I_1 would read 3.75 amps. $I = \sqrt{\frac{P.}{R}}$

The tuner should be constructed in an aluminum or copper box (C.R.S. probably plated) using *vhf* techniques, i.e., heavy copper or silver straps for all connections (wiring), regular co-ax connectors used on the input and suitable feed-thru insulators for output. The meters should be shielded in a low capacity (electrostatic) manner. You will have a very high degree of harmonic suppression and attenuate TVI to the antenna.

The tuning system is located at the base of the antenna and should be (if external) housed in a weather-proof box of metal which is connected to the radial system. The tuning system may be a fancy motor driven job or a relay switching, tapped system, whatever suits your fancy or pocketbook.

Radial System

Ideally, a vertical radiator should have a complex ground radial system for proper loading, maximum radiated power and improved wide band operation. A poor or insufficient radial system results in increased I^2R losses. Experience proves that an antenna is no better than its ground radial system. The use of the earth as a reflector has proven to be inefficient for proper antenna operation.

An ideal ground radial system should have a configuration analogous to a wheel having a multitude of radials having the same dimensions as the radiator to be used. For our specific case, the length of the radials should be $\frac{5}{8}$ λ.

Since the efficiency of the system is dependent on its conductivity, such a wheel should be made of conductors of large diameter properly soldered at each joint. In practice however, the use of #10 copper conductors were found acceptable for this application. The radial system just described is shown in fig. 7 after being placed just under the top soil.

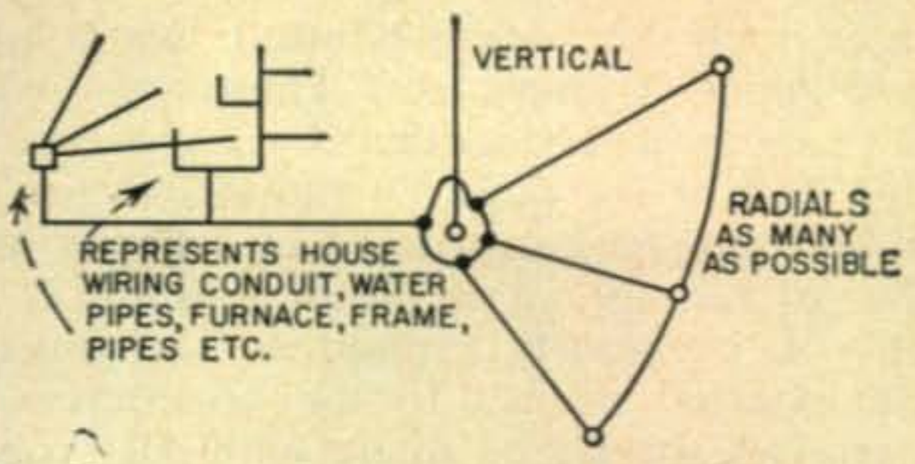


Fig. 7—A radial system for an offset antenna using the house plumbing and wiring.

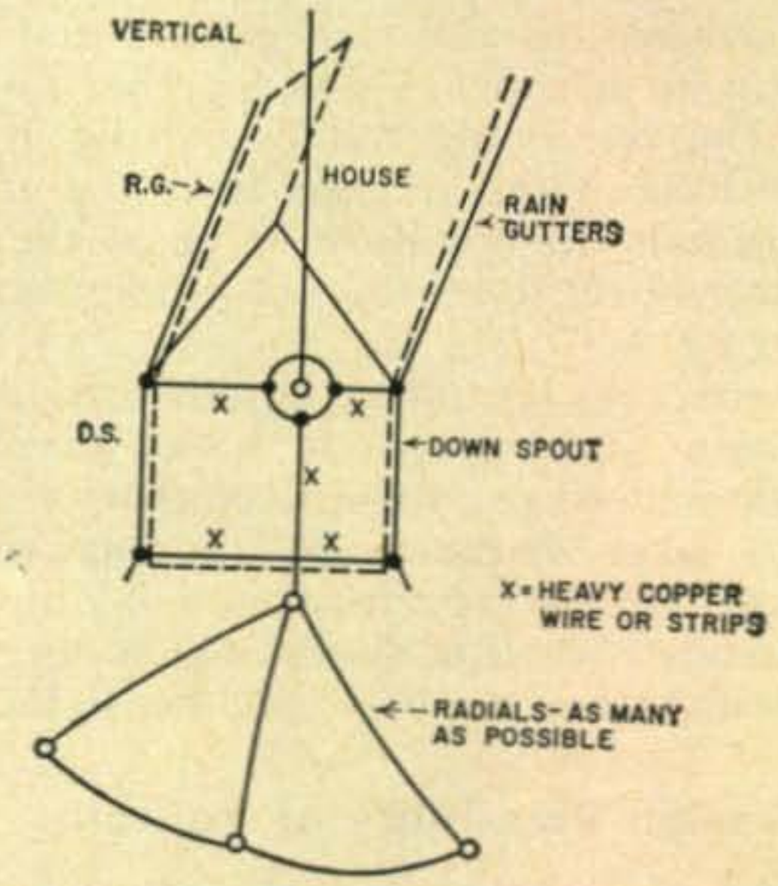


Fig. 8—An alternate radial system for an offset antenna using the rain gutters and down spouts of the house.

Alternate Radials

The system shown in fig. 6 is ideal and often does not lend itself for an amateur installation. In many instances, the space is not available to construct such a system. In such cases, it is best to follow the simple thoughts outlined herein in order to obtain the best results from the existing conditions.

If the antenna must be located off the center of the radial system, the configuration shown in fig. 7 has been found to provide good results in fact, nearly equivalent to those obtained from the system shown in fig. 6.

The configuration of fig. 7 takes advantage of the conductors already existing on the

premises such as: wiring conduit, water pipe, furnace pipes, frames, etc. These conductors when properly tied together by copper straps provide half of the required radial system. The other half can be constructed by using a large number of radials cut to the dimensions of the radiator as previously explained. The junction of the external radials to the conductors on the premises should be made with #10 copper conductor. This junction should be properly soldered and strapped.

If the antenna is located on the side of the roof of a building, the rain gutters and down spouts can be electrically tied together to act as radials. The remaining radials can be brought up to the base of the antenna from the ground, i.e., all radials do not have to be at the same level with respect to earth. The configuration is shown in fig. 8.

By connecting the upper conductors, (downspouts, rain gutters) to the lower conductor (water pipes, wiring conduits, etc.) with a conductor of large diameter, #10 copper wire or larger, the antenna performance is improved and spurious radiation lobes which might interfere with other services can be reduced.

Design Possibility of Radiator

These are two factors of importance in cutting the vertical radiator: the length and the diameter of the conductor used. For optimum operation, the radiator should have a length of $\frac{5}{8}\ \lambda$ and a diameter as large as practical. If a commercial antenna is desired, a guyless antenna such as Premax Type AL and its base Type 1, make an excellent installation. However, a good guyed antenna can be made up by using several lengths of aluminum downspout which can be obtained from tin shops and the building trade stores. The sections could be assembled by using six or eight aluminum self-tapping screws or aluminum bolts and nuts. A thin film of silicone grease, DC4, should be applied on the inner and outer surfaces of the joined sections to prevent noise generation when used as a receiving antenna. This type of radiator can be guyed by four guy assemblies. Each individual guy wire should be cut to one quarter-wavelength of the highest operating frequency used. The length of the antenna is figured from the point where the radials join at the base of the vertical; regardless whether the antenna is at ground level or above and whether the radials are in several planes or not.

Static Drain

The antenna should have, at all times, some electrical connection to its radial system to provide static drain. When the antenna is connected to the tuner and transmitter, it has this connection. If, however, the system is not used for long periods of time or in stormy weather, a knife switch, antenna grounding relay, grounding strap, etc. should be used. It is a good idea to have, as part of the installation at the antenna base, a spark gap set-up. This can be two pointed rods with ⅛" gap rigidly mounted; one connected to the antenna base and the other connected to the radials. With any of the above static drain systems, you can drain quite a large static area and thereby have the best lightning protection for all objects within several hundred feet of the antenna including, of course, the antenna itself. ■

Statement of Ownership

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION of CQ—THE RADIO AMATEUR'S JOURNAL, published monthly at New York, N. Y., for October 1, 1959.

1. The names and addresses of the publisher, editor and business manager are: Publisher: Sanford R. Cowan, 6 Embassy Court, Great Neck, N. Y.; Editor: Wayne Green, 300 West 43rd Street, New York 36, N. Y.; Managing Editor: none; Business Manager, Richard A. Cowan, 6 Embassy Court, Great Neck, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address as well as that of each individual member must be given.) Sanford R. Cowan, 6 Embassy Court, Great Neck, New York.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and beliefs as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) Richard A. Cowan, Business Mgr.

Sworn to and subscribed before me, this 28th day of August, 1959.

WILLIAM M. FORGIONE, Notary Public
(Commission expires March 30, 1961)

Using DC Relays on AC

Joseph L. Reiffin, W5CWP
Site Engineer (SAGE)
Military Field Service Division
Burroughs Corporation

Anyone who has ever worked on Mobile equipment has, at one time or another, wished that relays would have the wonderful property of not caring whether the voltage applied to the coil is *ac* or *dc*. Most mobile transmitters use relays for antenna change-over and/or voltage switching and these relays are always designed to operate at the *dc* battery voltage available in the vehicle. For amateur work, this is usually 6 or 12 volts and, as a rule, the same voltage is used for the heaters or filaments of the tubes in the equipment.

This presents a problem whenever the equipment is brought indoors for troubleshooting, modification or actual on-the-air operation. When bench testing or operating the mobile transmitter at a fixed location, the usual method is to connect the unit to a AC power supply using either 6 or 12 volts *ac* for the filament supply. This is fine for the tubes since they are designed to operate equally as well with *ac* as with *dc,* but the application of *ac* to a *dc* relay will result in one of two things. Either the relay will not operate at all or it will sound off like an old-fashioned door buzzer.

The usual method of coping with this problem is to disconnect one lead of the relay coil and wedge the armature of the relay into position so that the required contacts are made. This is, at best, a rather crude way of handling the situation and completely useless if actual operation of the mobile equipment at a fixed location is desired. In this enlightened world of transistors, ICBM's, and SSB, such brute force methods are particularly unimpressive.

Solution

The development and availability of the miniature sized silicon rectifiers provide a method of solving this problem that is effective, inexpensive and easily installed.

The modification is simplicity itself. The *ac* filament voltage is rectified by the silicon rectifier, filtered with a high capacity electrolytic capacitor (100 mfd to 500 mfd) and the *dc* voltage thus obtained is used to actuate the relays.

There is no need whatever to use this *dc* voltage for the tubes since the high current drain would necessitate the use of an expensive, high current rectifier. The average relay used in mobile installations draws something between 100 and 400 *ma*. The small, inexpensive silicon rectifiers can handle upwards of 500 *ma* without any strain.

These remarkable rectifiers are amazingly efficient. At the voltages and currents used in this application, there is little or no voltage drop at all. With a relatively high capacitance, 100 mfd or more as the filter, peak voltage is developed. With 6.3 volts as the *ac* filament source voltage, 8.88 volts of *dc* is obtained. With 12.6 volts *ac* as the source, the peak voltage obtained is 17.76 volts. These voltages are "no load" readings. With the load of the relay coil applied, the vo'tage drops down close to the *rms* values of 6.3 and 12.6 and the relays operate beautifully at their normal design voltage.

The hot connection to the relay coil is opened and the rectifier is inserted in series. Watch the polarity—the anode of the rectifier is connected to the positive side of the source voltage, referring, of course, to the battery polarity as used in the vehicle. The polarity of the electrolytic capacitor must be correct also. If all cars had standardized the battery polarity, there would be no problems of this sort. However, since some cars use the negative terminal of the battery connected to the chassis and other cars use the positive terminal of the battery connected to the chassis, we must watch the polarization of the rectifier and the capacitor.

This is not a really great problem and is easily solved by following the rule listed below and the illustrations shown in fig. 1 A and B.

[*Continued on page 177*]

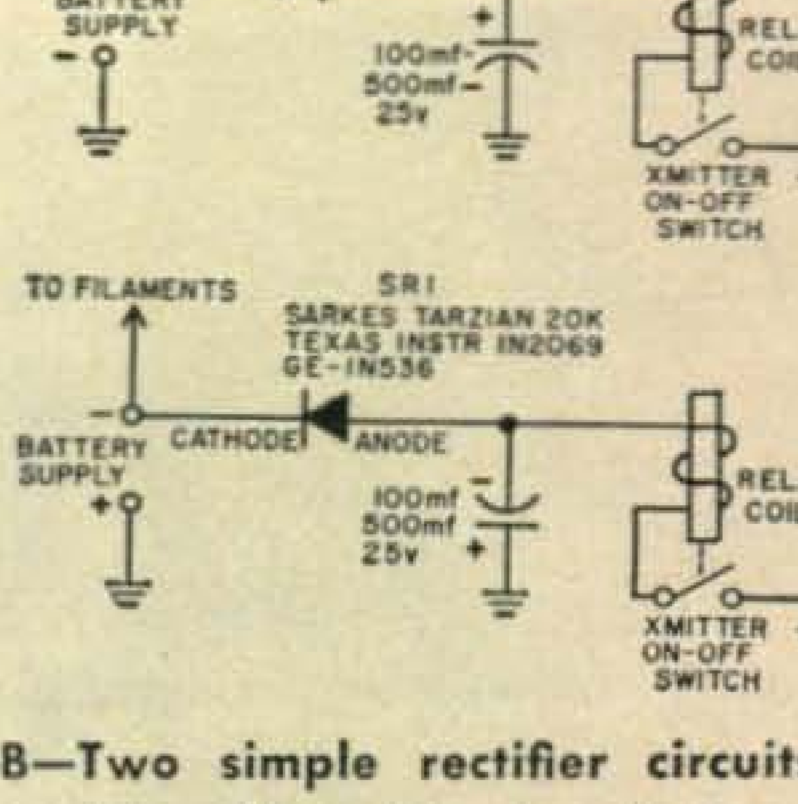


Fig. 1A-B—Two simple rectifier circuits for use with either input polarity.

The Peculiar Behavior Of The EFP60

John W. Campbell, Jr., W2ZGU
1457 Orchard Rd.
Mountainside, N. J.

"A very strange bird is the pellican,
"His bill holds more than his bellycan."
Old rhyme.

And a very strange tube is the EFP60—its plate can conduct more current than its cathode can! The plate output impedance is lower than the cathode input impedance, because, when operated as a grounded-grid amplifier, it has current-gain. You can, also, get a highly amplified output signal that is *in phase* with the input to the grid, or an even more amplified signal that is 180° out of phase. The output capacity is only 6 mmf, but the Gm of the tube is 25,000 micromohs—which means that it'll do broadband amplification that's really a wide, wide band.

It can be set up as a blocking-oscillator, *without* need for a transformer—straight RC coupling can be used because of the cockeyed phase-relationships between its numerous and somewhat unusual electrodes.

It'll make a one tube flip-flop type multivibrator that, as a crystal-controlled harmonic generator, puts out a 200th harmonic that's about as strong as the 10th harmonic. With the setup arranged so that the 1 megacycle harmonic of a 100 *kc* crystal comes in S-9 on the receiver, the 20 megacycle harmonic also shows S-9! (And the 5.0 *mc* harmonic showed up S-9 plus!)

As a trigger tube in a sawtooth generator, it allows me a retrace time under 0.05 microseconds, and with sweep voltage output adequate for use on the Supersimplescope setup discussed here some while back.

What Is the EFP60

The EFP60 is a Holland-made Amperex tube; it has *no* equivalent in any US line that I've heard of. No equivalent, and no vaguely comparable substitute even—for the EFP60 is a secondary-emission, electron-multiplier type pentode amplifier.

The essential principle of the electron-multiplier is simple enough. Suppose you fire a rifle bullet at a pebbly beach; where the bullet hits, a number of pebbles are going to be kicked into the air.

Now the problem of getting electrons out of metal and into the vacuum of a vacuum tube where electrostatic fields can start making them do things, is just that—getting them out of the metal. There's plenty of electrons in the metal; if you can once get them just a fraction of a millimicron out of the metal, you've got electrons loose to do things with.

In the standard tubes, the trick is worked by heating a cathode coated with something that doesn't hold electrons quite so tightly, or by using tungsten and heating it so enormously hot that even though it does cling to electrons, some get boiled off.

In photoelectric tubes, light is used to kick the electrons loose, so they can be used.

In an electron-multiplier, electrons are used to knock electrons loose.

By itself, that statement sounds sort of circular; if you've already got electrons loose, you don't need loose electrons, so why use the ones you've got to knock others loose?

That's where the rifle-bullet analogy above comes in; one bullet can kick five or six pebbles loose. In the electron-multiplier, one electron can be made to kick loose five new electrons—a clear gain of four extras.

Now inasmuch as the meaning of "current" in any electronic discussion is "number of unit charges per unit time," if five electrons go where but one went before—that's a current amplification of 5 times.

The characteristic curves for the EFP60 look slightly weird; the reason has to do with that electron-multiplication business. The tube has a perfectly ordinary cathode, an ordinary

grid, a familiar screen-grid, and a suppressor grid quite like a 6SJ7 or any other ordinary pentode. Up to this point, the EFP60 behaves like any other well mannered pentode. But the next electrode in the EFP60 is the "secondary emission plate," or *dynode*. The electron-stream coming from the preceding section does not go to the anode directly; instead, it impinges on the secondary emission, or electron-multiplier, plate.

The electrons kicked loose from the secondary-emission plate are then attracted to the final anode—but due to the secondary emission electron-multiplication effect, approximately five times as many electrons reach the plate as originally left the cathode.

That's why the EFP60 plate current is greater than its cathode current! Part of the electrons reaching the plate never came from the cathode—they came from that secondary-emission plate, or *dynode*.

Now you don't get something for nothing, and unless Dr. Einstein was very fundamentally wrong, you can't create electric charges from nothing. The electrons that come to the plate, have to come from the dynode—and the dynode in turn has to get them somewhere, or it would run out of electrons. This means that the dynode draws electrons into itself from the external circuit. In practical terms, the dynode tends to go positive (due to loss of negative charges), and the heavier the current through the tube, the more the dynode tries to drive positive.

In any pentode, when the grid goes positive, the electron stream through the tube increases. The heavier electron stream tends to make the screen and plate in a normal pentode go negative; thus the plate-wave is 180° out of phase with the grid-wave—when the grid goes positive, the plate goes negative. And of course, you can find a signal at the screen of the pentode; that, too, is negative when the grid is positive—it, too, is 180° out of phase.

But in the EFP60, the screen-wave is quite orthodoxly out of phase with the grid wave . . . but the dynode goes *positive* when the grid goes positive. The dynode, then, moves *in phase* with the grid.

This makes possible an extremely high-power positive-feedback system by simply coupling the dynode to the grid. If the grid once moves a whisker positive—you've got the gain of a normal pentode between the grid and the dynode . . . but the dynode drives positive, not negative, and the system heads for all-out-everything-it-can-carry, right then and very, very immediately.

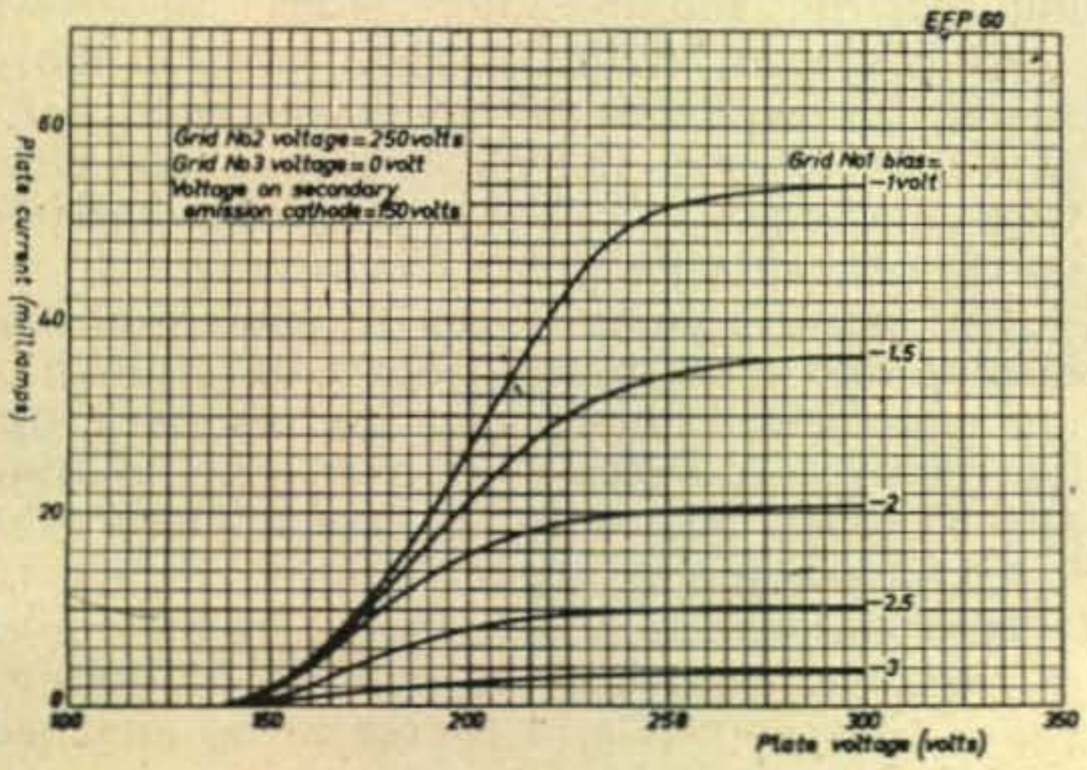
Now take a look at the curious recurved characteristic of the secondary emission cathode current versus secondary emission cathode voltage.

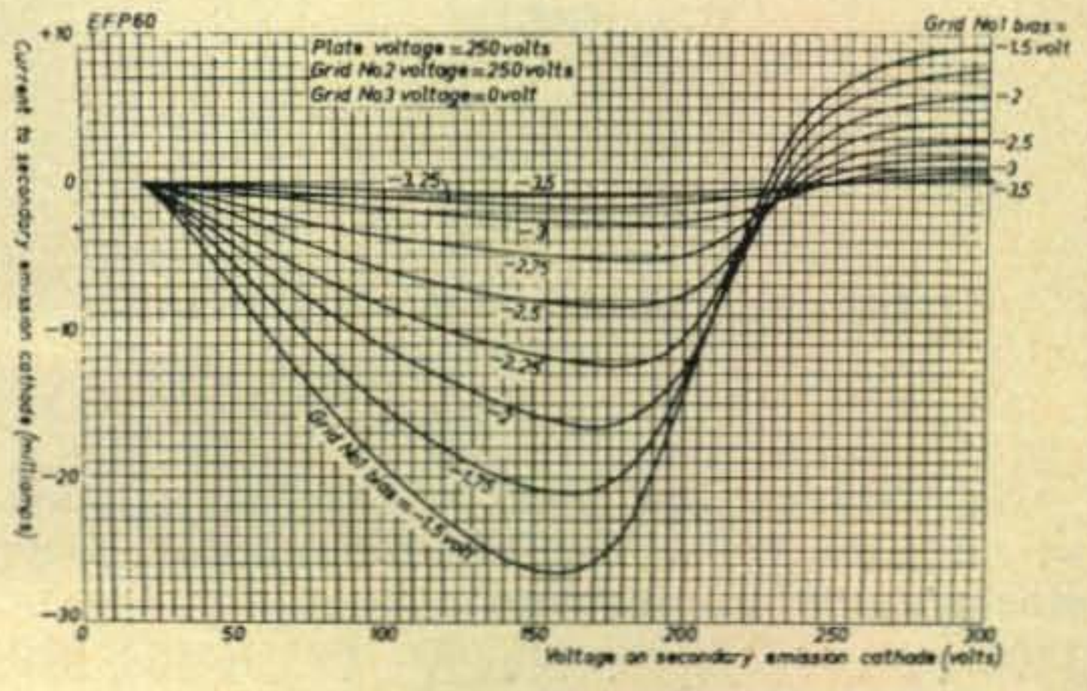
If that rifle-bullet just dribbles out the end of the rifle and plops gently on the pebbly beach, there will be no pebbles kicked into the air. If the electrons just gently plop onto the secondary emission surface . . . there will be no secondary emission. The characteristic curves for the EFP60 show that if the voltage between suppressor and secondary emitter is less than 30 volts, nothing happens. At 50 volts, a few electrons get knocked loose, but darned few. As the voltage—and therefore energy—of impact increases toward 150 volts, the electron-multiplication increases rapidly. From 150 volts to 240, however, the gain decreases again, and from about 240 up, the direction of the current reverses.

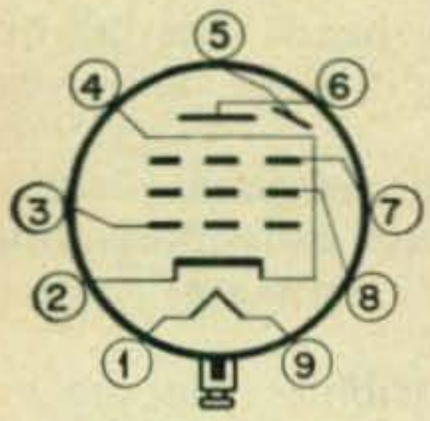
Reason: if we knock electrons loose, they'll normally fall right back into the metal, unless there's an electrostatic field to snatch them and haul them off elsewhere. If the final anode is at 250 volts, once the secondary emitter reaches 250 volts, there's no electric field to haul electrons away; electrons kicked loose simply fall right back into the emitter.

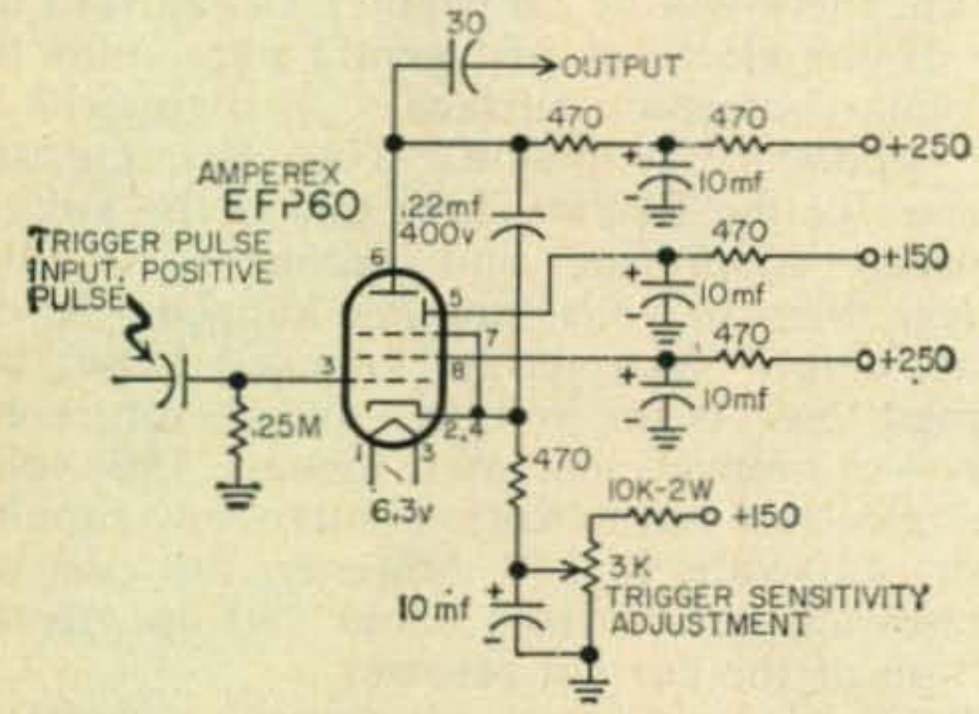
But remember that the stream of electrons from the cathode is still hitting the secondary emitter; the consequence is that if the secondary emission plate is at 250 volts, electrons arrive, but none leave it—which is what the characteristic curve is saying.

Now if the tube is used as a straight super-high-gain amplifier, the normal conditions would be that the screen and secondary emitter would be at 250 and 150 volts respectively, and held at a constant *dc* voltage by adequate bypassing capacitors. The suppressors would be tied to cathode, the cathode would have about 1000 ohms of bias resistor, adequately bypassed, and the plate would be fed from a 250 volt supply.

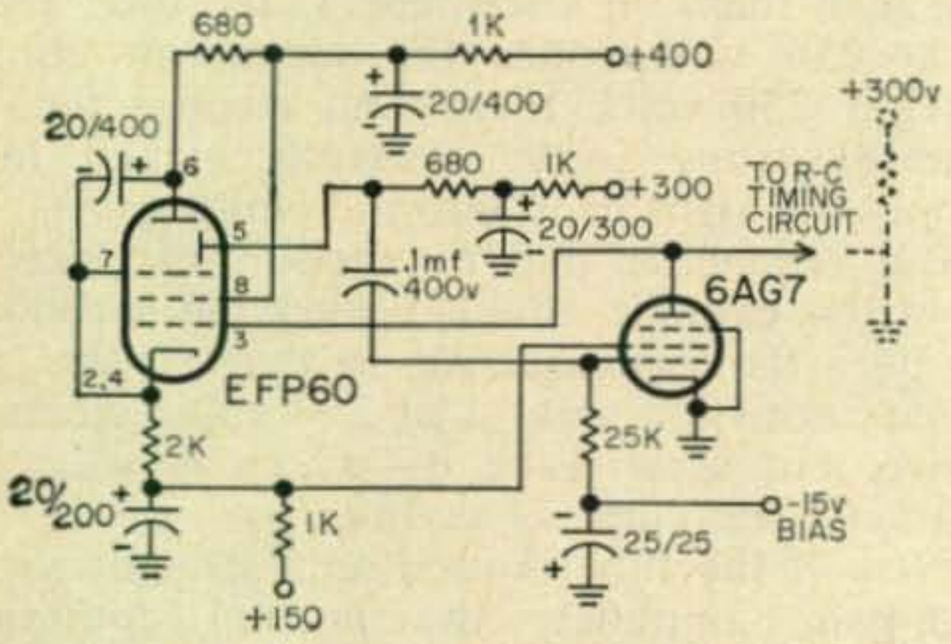




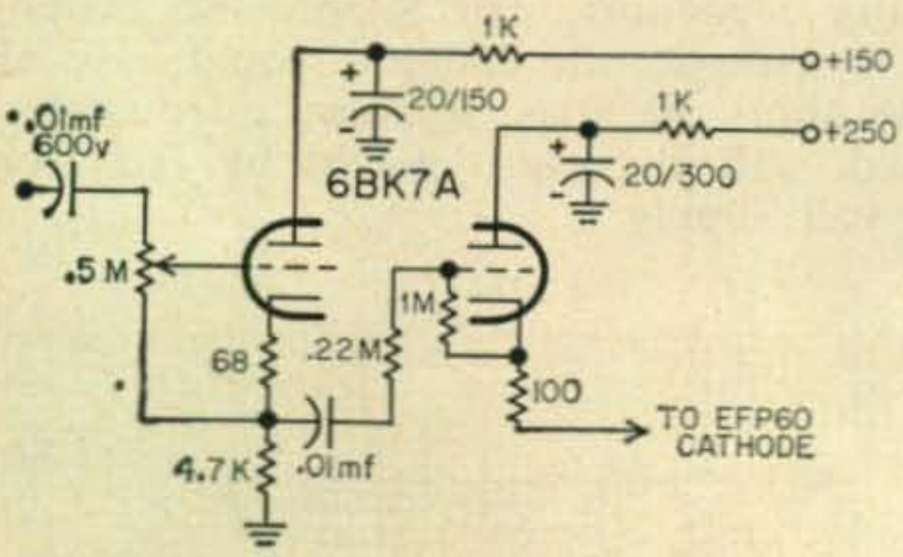




Trigger circuit harmonic generator—.01 to 10 mc.



EFP60 sawtooth generator circuit.



Sync circuit for the EFP60 sweep circuit.

So long as the plate voltage stays above about 200 volts, the EFP60 gives a pretty linear amplification, with a huge transconductance of 25,000 micromohs. But if the plate swings down toward 150 volts . . . the electron-multiplier action fails. You can *not* use an EFP60 as a linear amplifier for anything but very small signals—signals in the range of 0.01 volts or less.

But as a trick oscillator—it has no peers!

The simplest configuration takes advantage of the fact that the plate current is some five times the cathode current. The plate can, therefore, drive its own cathode.

Now if the cathode moves *positive* the effect is the same as though the grid moved *negative*. The grid and cathode are 180° out of phase in any pentode.

The plate and grid are also 180° out of phase in any pentode, which means the plate and cathode are in phase. But you can't use that fact in any ordinary pentode, because the cathode-impedance is lower than the plate-impedance, and the plate can't drive the cathode.

In the EFP60, however, the plate can drive the cathode. Take an *ac* coupling from the plate back to the cathode, and consider what happens:

If the cathode moves a little negative, the current through the pentode section will increase. But the current to the plate will increase five times as much, due to the electron-multiplier action. The plate will go negative under the flood of electrons.

Being coupled to the cathode, it drives the cathode more negative.

Which makes the plate get a heavier dose of electrons, and go negative even more violently.

Which drives the cathode further negative.

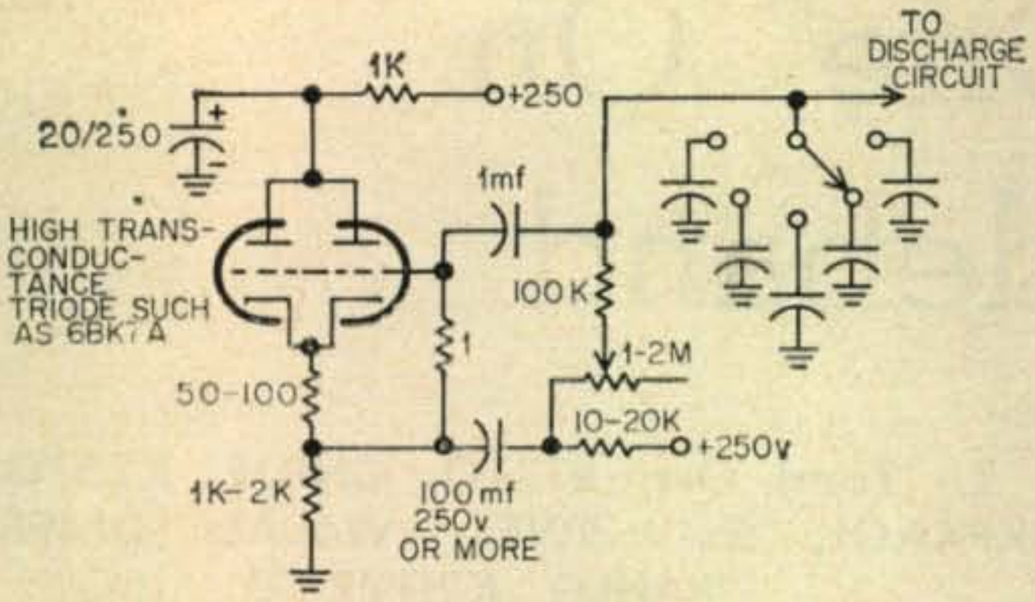
In an exceedingly minute fraction of a microsecond, the tube goes from cut-off to full-blast-all-out. What the rise-time of that current-change is, I can't measure. My Supersimplescope has a resonance in the cathode ray tube at around 180 megacycles; all I can say for sure is that that resonance is being excited, so I guesstimate the rise time as something under 0.002 microseconds. It's really in *quite* a hurry.

What stops the reaction is, of course, the matter of an EFP60 being inherently nonlinear for any considerable plate-voltage change. The plate-voltage gets down somewhere near the secondary-emitter voltage, and the electron multiplication stops.

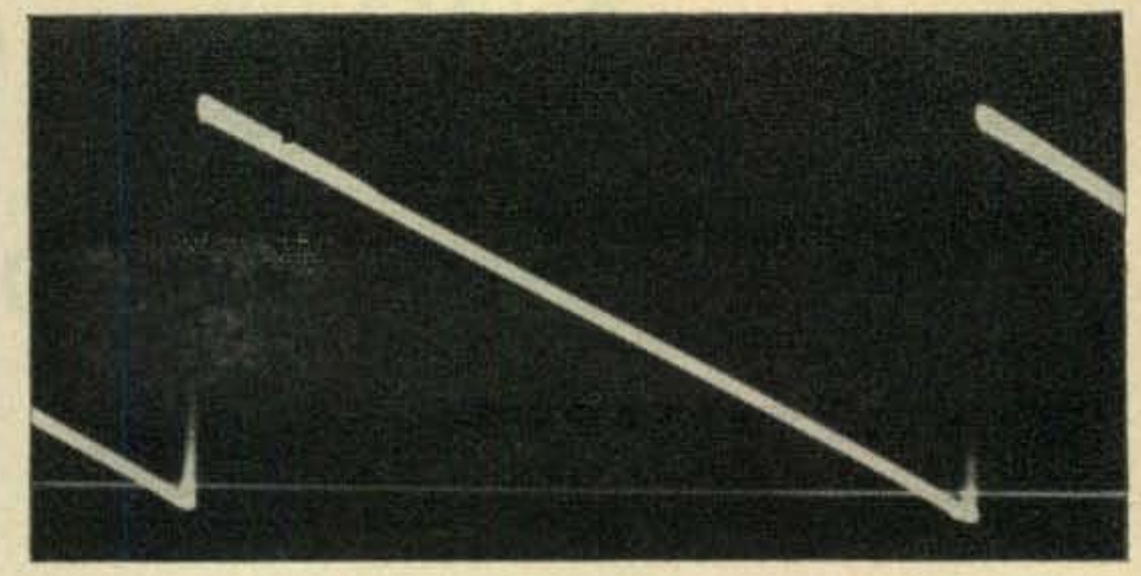
At this point, if the cathode starts to move a wee bit positive, the chain reaction starts in frantic reverse; the plate, getting less electrons, starts positive, which drives the cathode positive, which cuts off the electrons, which . . .

This positive-going sweep is limited by the rate at which the plate-load resistor can drag the plate and cathode capacitances back up; it's relatively moderate—it may take as long as 0.05 or 0.1 microseconds, determined by the value of the plate-load resistor.

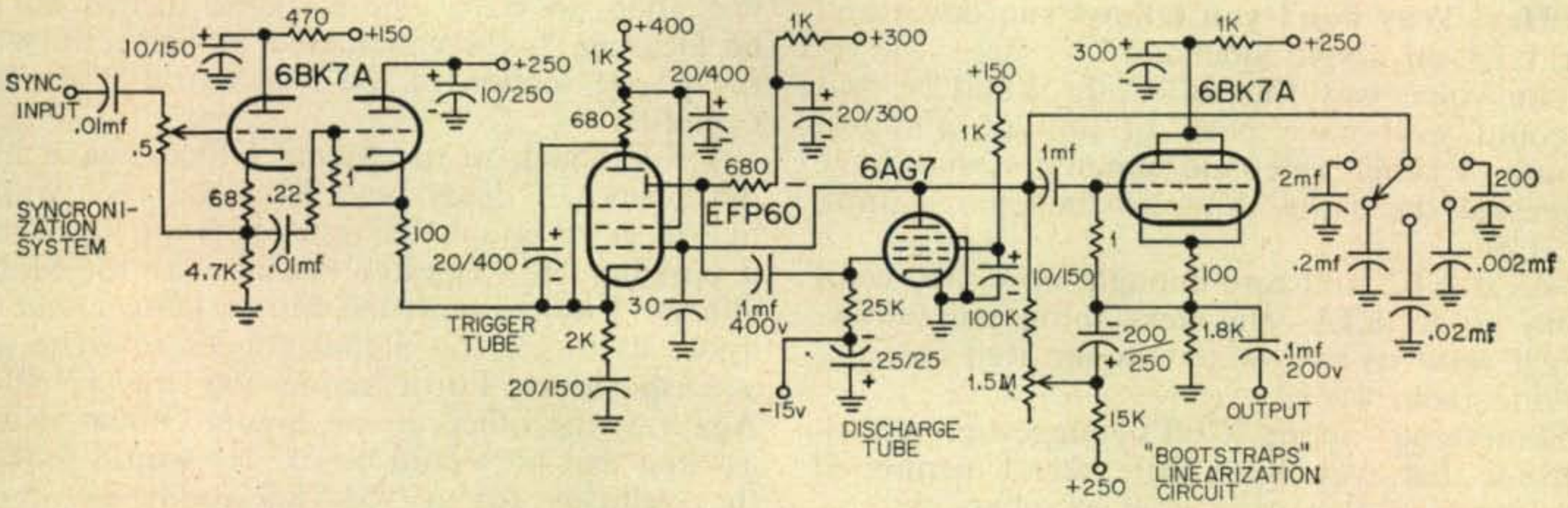
Now the beauty of this system is that *none of the other electrodes is involved in the circuitry*. The control-grid is free to be attached



"Bootstraps" linearization circuit.



Output at the plate of the 6AG7 at 100 kc.



All circuits combined into one.

to any controlling circuit you want. The dynode-secondary-emitter can be hung on a moderate resistor—100 ohms or so—and give you an output 180° out of phase with the plate-and-cathode wave.

If the tube is biased enough so that it's cut-off, it will sit there doing nothing until a control pulse is fed into the grid. A positive pulse to the grid will, however, immediately trigger the enormously rapid plate-cathode interaction.

If the output of a 100 *kc* crystal oscillator is fed to the control grid, when the 100 *kc* wave goes positive, the EFP60 will trigger into all-out conduction, and stay that way until the 100 *kc* wave starts going negative. It will then trigger the other way, and cut off again.

Now this is *not* a multivibrator, but a flip-flop system. That is: it triggers one way, and remains that way until an inverse signal comes along telling it to flop the other way. In the circuit shown, the coupling from plate to cathode is 0.22 mf; the condenser is large enough that the cathode stays pretty much at the voltage the plate drives it to, for a time longer than the half-cycle period of a 100 *kc* wave. Hence the crystal oscillator has full control. If that plate-cathode coupling condenser is made 1.0 mf or even more, the EFP60 will flip-flop at 10 or 1 kilocycle, *without any change in the circuit*.

A multivibrator has to be adjusted to approximately the frequency of the controlling frequency; this circuit does not.

Because of the inherent low-impedance of the plate-cathode circuit of the EFP60, and the very low tube capacitances, the speed of change-over is enormously rapid—which is another way of saying it generates harmonics of practically equal amplitude all the way up the spectrum.

The variation of intensity on the unit shown here over the entire tuning range of my Hammarlund Super-Pro was less than two S-units—and that's from 600 *kc* to 20 *mc*!

Because of the nature of the flip-flop circuit, driving it with a 10 *kc* oscillator would cause it to generate just as wide a band of harmonics.

I haven't tried it myself, but theoretically the unit could be screen-modulated to put an identifying note on the output. This modulation would not be amplitude-modulation—the tube's going to and from complete saturation already—but a form of pulse-time modulation, since varying the screen voltage would vary somewhat the time at which the trigger-effect set in. The result would be clearly identifiable in any AM receiver, however.

The EFP60 is a totally different *type* of tube; its characteristics make it a unit that can be the source of hundreds of entirely different approaches to ham problems. As an amplifier, it's not too satisfactory—but as an oscillator, trigger-tube, and the like, it has practically unexplored possibilities.

IBM made up an experimental computer doing arithmetic at a *50 megacycle* rate; the EFP60 was the tube they used to handle the required super-high-speed pulses. ■

A "New One" On Single Sideband

H. T. (Tom) Orr, ET2TO, CN8JE, KZ5TO, KP4AOL, Ex-WØWET, W4SAL, DL4FF, K5HLG, K2HVE

"Hey! Why don't you fellows run down and put ET3 on single sideband?"

The voice was that of Cliff, W8GCN, but it could well have been of any of about a thousand other sideband amateurs that have suggested the same thing to the club station, ET2US.

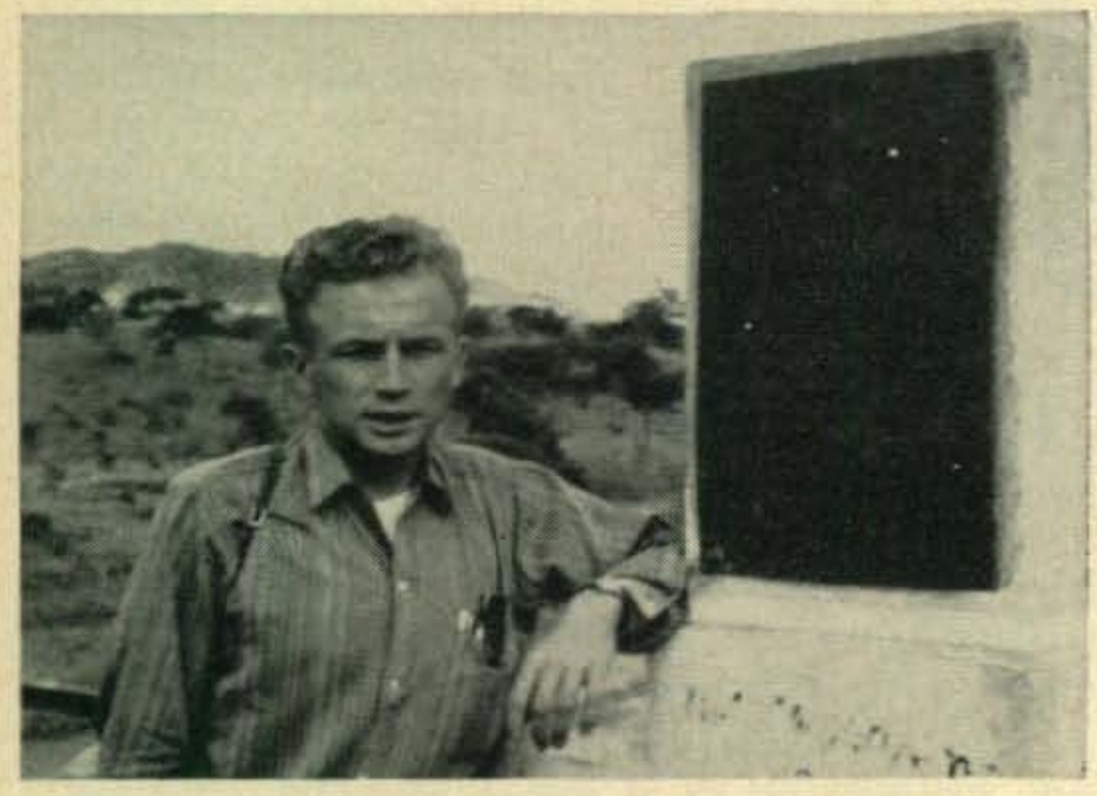
"As if ET2 isn't rare enough; now they want us to go to ET3—the next thing you know, they'll want us to row across the Red Sea and operate from 4W1."

Something about Cliff's suggestion stuck with me that evening. A little later I mentioned it to some of the other club members. Everyone seemed enthusiastic enough, it was just a matter of getting things and people together. One thing seemed certain, if we were going it would have to be "subito" as many of the old-time members would soon be due to rotate back to the States. As for myself, I would shortly be leaving this country for a few months.

As the club's only civilian member, it was up to me to start the necessary arrangements as I could talk to anyone on the Post without going through the necessary chain of command. The first visit was to the Post Signal Officer who seemed very enthusiastic about the whole matter. Next was the Special Services Officer who told us there was only one weekend in the next few months that we could get any quantity of camping gear as the big-game hunting season was about to start. The weekend turned out to be October 24-26 which tied in perfectly with the phone section of the CQ World-Wide DX Contest.

I went back to the Signal Officer, gave him the proposed dates, and said that we would like to get a couple of vehicles from the Army if possible. He suggested talking with the Motor Officer. I talked with the Motor Officer and he asked us to get the Signal Officer to write out a Disposition Form requesting the vehicles. Again at the office of the Signal Officer, I was assured that all would be ok. He would request the vehicles for a "MARS radio exercise."

Ethiopia's first Single Sideband station. Shown operating are the author and MARS operator, Bud.



The author at the Ethiopian side of the Eritrean-Ethiopian border.

(MARS is probably the military ham's best friend.)

Everything seemed set, so the word was passed around to the gang. Work started on the necessary leave papers and requests for three-day passes. (It's nice to be a civilian.)

Since it was too late to get the word into any of the amateur periodicals, we started a campaign of telling all the SSB contacts of our trip and the dates of operation and asked them to pass the information on. The effectiveness of this "single-sideband grapevine" was soon proven as within two days fellows were calling us with the sole desire of inquiring about the trip to ET3 land.

A couple of days later I ran into the Special Services Officer at the Officers' Club who said, "I hear your trip to Ethiopia has been called

off due to lack of vehicles." This was very disheartening news indeed as we were all enthused over the prospects of the trip. I visited the Signal Officer again. It turned out that it was not the lack of vehicles that was stopping us but no way of obtaining gasoline in Ethiopia. Back again to the Motor Officer; after much discussion and figuring, we decided that it would be possible to carry enough gasoline in drums on the truck to get us to Ethiopia and back—provided we could secure the necessary drums. Back again to the Signal Officer. Got him to re-submit the necessary paper work.

Radio equipment was not much of a problem. The ET2US shack was full of it. Since we

It was necessary for us to carry a full gasoline supply with us as it was unobtainable in Ethiopia.

could not hope to take the 600-watt amplifier for the 20A, we told the gang that we would be running it '"barefoot." The day before leaving we managed to obtain a small amplifier using four 6AG7 tubes in grounded-grid. As one operator put it, "While in Ethiopia we were not running the 20A 'barefoot' but only with 'one sock on'."

Jim, KØMHK, was going to come along and bring his Viking Ranger for use on 10 and 15 *am* and *cw*. It turned out at the last minute that Jim was not able to go but he very graciously let the club take the Ranger.

Obtaining a power unit seemed a problem for a while until it was discovered that the Naval Unit attached to the post had a small, 2.5 *kva* unit. A little coaxing of the Naval Storeman plus a phone patch back to the States had him on our side.

We were informed that the drive to Ethiopia would be an all-day affair and all driving must be done during daylight hours. The portion of the country around the Eritrean-Ethiopian border is especially dangerous due to the presence of tribes of native bandits, known locally as "shifties." We were required to carry arms and maintain constant vigil. Due to lack of rain and a very large locust crop this year the "shifties" are especially desperate. While they rarely kill Americans, they usually show the Italians no mercy. As a precaution against vehicle breakdown, two vehicles were required to make the trip. We obtained a three-quarter

The U. S. Army provided us with two vehicles. Civilian vehicles probably would not have been able to make the trip.

and a two-and-one-half-ton truck.

As the zero-hour approached, it became apparent that the "leave and three-day pass" department wasn't doing very well. Only four club members were able to obtain passes. Wishing to justify the use of two vehicles and paying attention to the old adage "safety in numbers," we took quite a few non-hams along.

A visit to one of the company commanders got us the necessary weapons plus cooking gear. One of the houseboys came along to cook for the group. We bought a supply of groceries at the commissary and managed to secure a king-size ice box for meats and drinks.

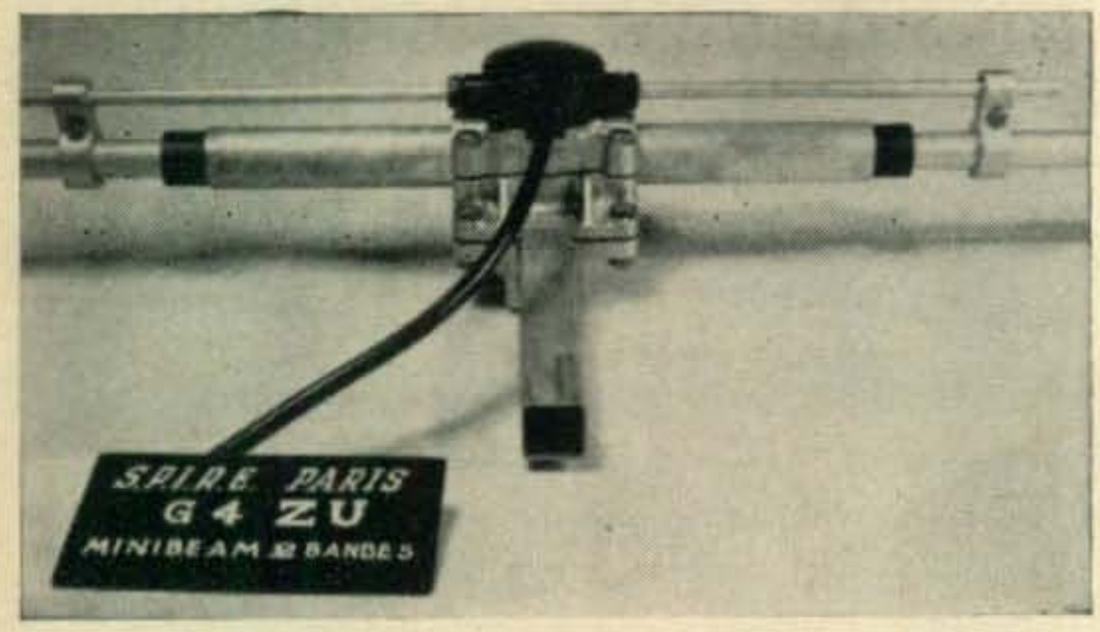
Just before leaving, a couple of us went to the Military Police station to sign out, a procedure that is deemed very essential for the military personnel. The desk sergeant "informed" us that we would not be able to cross into Ethiopia without passports and written permission. We had checked with Customs earlier and found this not to be the case, but, not wishing to argue the point, the fellows signed out as going to the "Ethiopian border." Since Eritrea is now a part of Ethiopia, there are no border guards so we weren't worried about entrance into ET3 land.

Our scheduled "all day drive to the Ethiopian border" turned out to take no more than three hours. After crossing into ET3 land, we started a search for a likely spot to set up operation. The border is a river bed (a river during the rainy season) between two mountain ranges. Our idea was to find a nice mountain top with a few scattered trees for hanging antennas. Most of the road through the mountains was a vertical wall of rock on one side and a drop-off of a thousand feet or so on the other. It took us well over an hour of just driving through the mountains until we found a near suitable place. As there are practically no side roads in this part of Ethiopia, we defined "suitable place" as any place where driving off the road was not impossible. The two trucks bounced off the road and up the mountain we went. Probably no civilian vehicle would ever have made it up that mountainside.

Our location turned out to be surprisingly

[*Continued on page 172*]

The Coaxial Minibeam



Dick Bird, G4ZU
c/o Bird Patents, Ltd.
Sumner House
26 Upfield
East Croydon, England

A new version of the G4ZU beam using a Coaxial resonator with bi-nodal coupling.

It is probably safe to assume that by now, most Amateurs are familiar with the basic principles of the G4ZU beam. Six years ago when details of the design were first released it caused quite a stir. Constructional articles and translations in nearly every known language have since appeared in the national magazines of all major countries.

As the design was protected by patents it is not surprising that many attempts were made to achieve similar results by different methods. Within the space of a year or so a number of hurriedly designed tri-band beams began to appear on the amateur market using various devices such as traps, loading coils, interlaced elements, etc., but it is interesting to note that many manufacturers are now reverting to single band beams.

As originally conceived the G4ZU beam was intended for home construction by amateurs. To obviate the difficulties normally encountered in obtaining a low *swr* in a coax line a somewhat unusual method of feed was adopted. A medium impedance line of 300 - 450 ohms was run from the beam to a matching unit at the base of the mast. From the matching unit, a coax line of any desired length was run to the transmitter. Although this arrangement sounds a little complex it had the advantage that final tuning and matching adjustments could be made at ground level.

A light weight tri-band beam cannot be expected to compete with a full size beam on 20 meters. Rather than accept a compromise with mediocre performance on all three bands the design of the G4ZU Minibeam was weighted intentionally to favour the two *hf* bands, 10 and 15 meters and the 20 meter performance was regarded as a secondary consideration. The wisdom of this approach is proved by the fact that the R.S.G.B. 10/15 Phone contest has been won on every occasion during the past few years by a Minibeam user.

Due to the special design of the radiator section which operates with two current maxima either side of center, the Minibeam can out perform any normal single band beam on these *two* bands and need fear little in the way of competition from compromise type tri-banders. Numerous tests have proved that the gain on 10 meters is comparable to that of a five element beam and not far short of this on 15 meters; on 20 meters the *measured* space gain was not much more than 2½ to 3 *db* although DX signal gain was often found to exceed this figure due to lowering of the angle of radiation. It is doubtful whether any of the lightweight tri-band beams achieve anything better on 20 meters.

In spite of the excellent performance of the original design it must be admitted that many amateurs have stressed that they would prefer direct coax feed to the beam even if this resulted in somewhat more complicated adjustment. Helpful suggestions along these lines have been received from various quarters and some of the methods tried were described in the July 1958 issue of this magazine. Mention was made of a coaxial resonator which was being tested and which showed promise. Until this device had been patented and developed to the stage of commercial production the principles of operation had to remain a closely guarded secret.

A number of beams of G4ZU type using this new device are already in use on government and commercial networks, and the Minimitter Company of London and Societe Spire of Paris, who developed the invention in their respective countries have now kindly agreed to release full information. The coaxial radiator is used with a bi-nodal coupling arrangement

(Pat. app. 31012/57) and it is therefore possible to retain many of the special features and advantages of the original G4ZU beam with the added attraction of direct coax feed.

The principle of operation is as follows:—

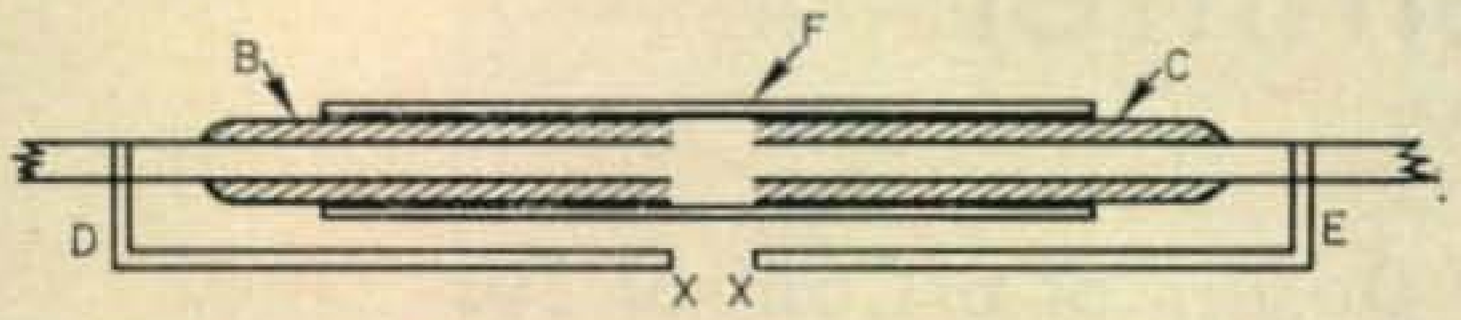


Fig. 1—Cross section of the radiator described in the text.

Figure 1 shows a cross sectional view of the radiator element which is approximately 22ft long. It will be observed that the radiator is broken at the center and supported by two shatter proof polythene sleeves B and C inside a metallic tube F. The assembly DX - XE appears at first sight to be a T-match but this is not the case because the element is split at the center.

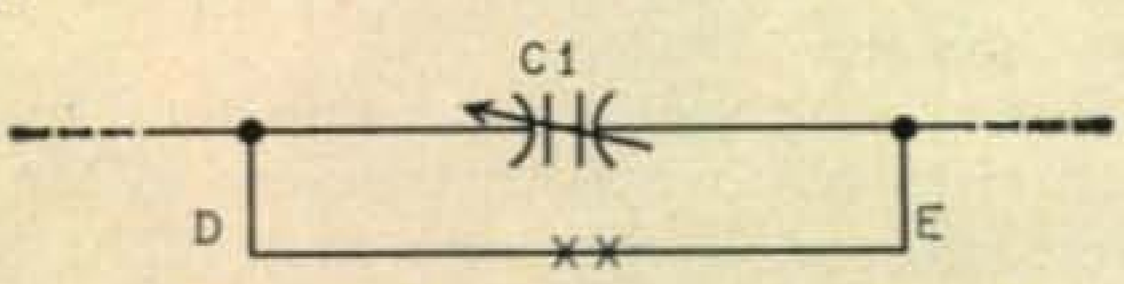


Fig. 2—Equivalent circuit of the radiator element.

The equivalent circuit is shown in fig. 2 and reduces in effect to two linear inductive loops series tuned by a condenser Cl. The plates of the condenser are formed by the metal of the inner and outer tubes with the polythene as the dielectric. The polythene sleeves are slideably adjustable and it is clear therefore that the exact value of Cl can be precisely adjusted in the factory before sealing.

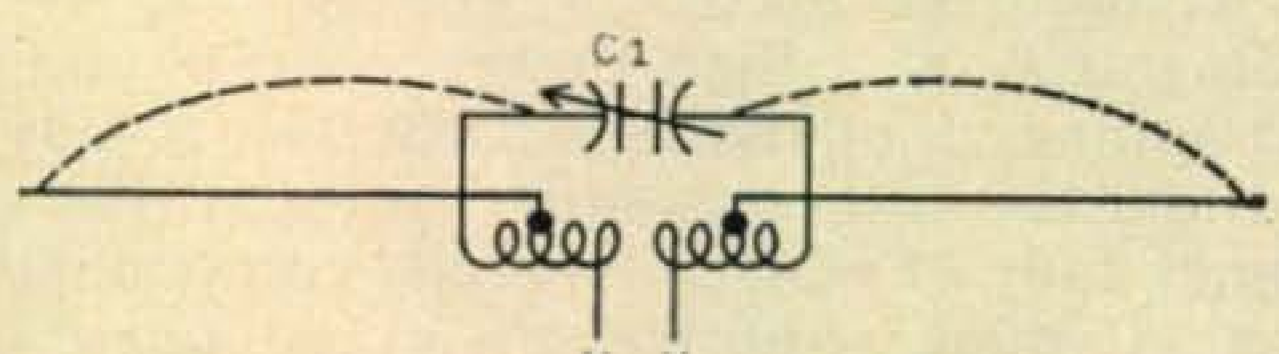


Fig. 3—Equivalent circuit of the radiator showing the inductive elements in a more conventional form.

The inductive elements are shown in more conventional form in fig. 3 and it can be seen that if the whole assembly is resonated at 10 meters the two halves of the element will be driven more or less after the style of two half waves in phase as per dotted line. This gives a considerable increase in gain as compared with a normal half wave element (as in the original G4ZU beam). The capacity of Cl is quite small and on 21 *mc* has negligible effect apart from a slight shunt reactance which is easily corrected by a small adjustment of tip to tip length which is approximately a half wave on this band.

The impedance along the length of the element in a complete beam is shown in fig. 4. It will be observed that at the two points D and E the impedance is the same on both bands

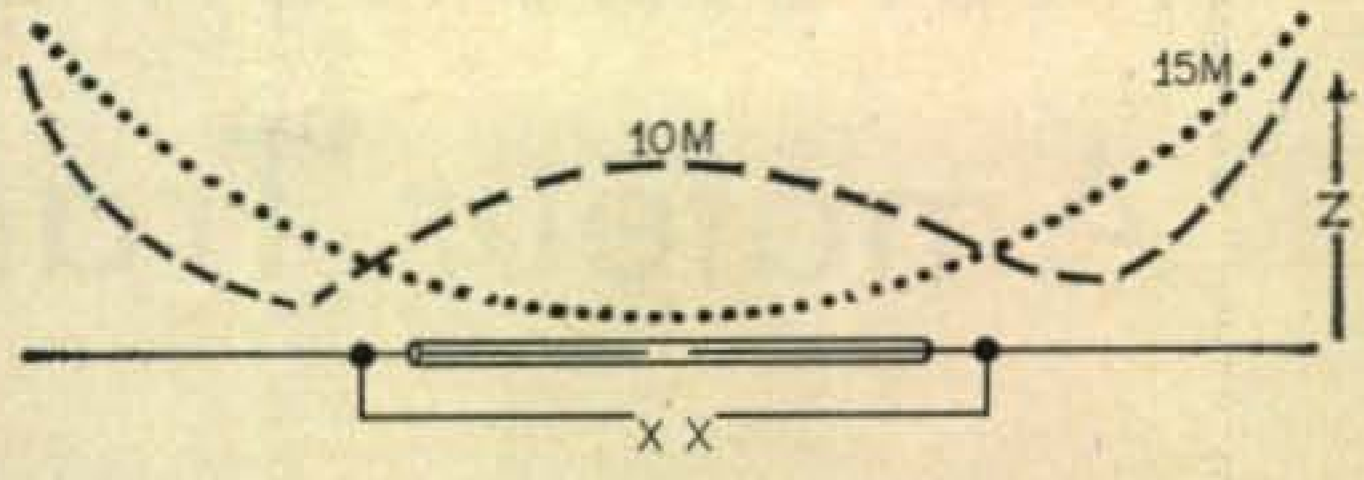


Fig. 4—The impedance along the length of the radiator in a complete beam.

and this is in fact the exact point where the feeder rods are connected. It would be quite a temptation to make the impedance at this point exactly 52 ohms and claim unity *swr* at a spot frequency on each band.

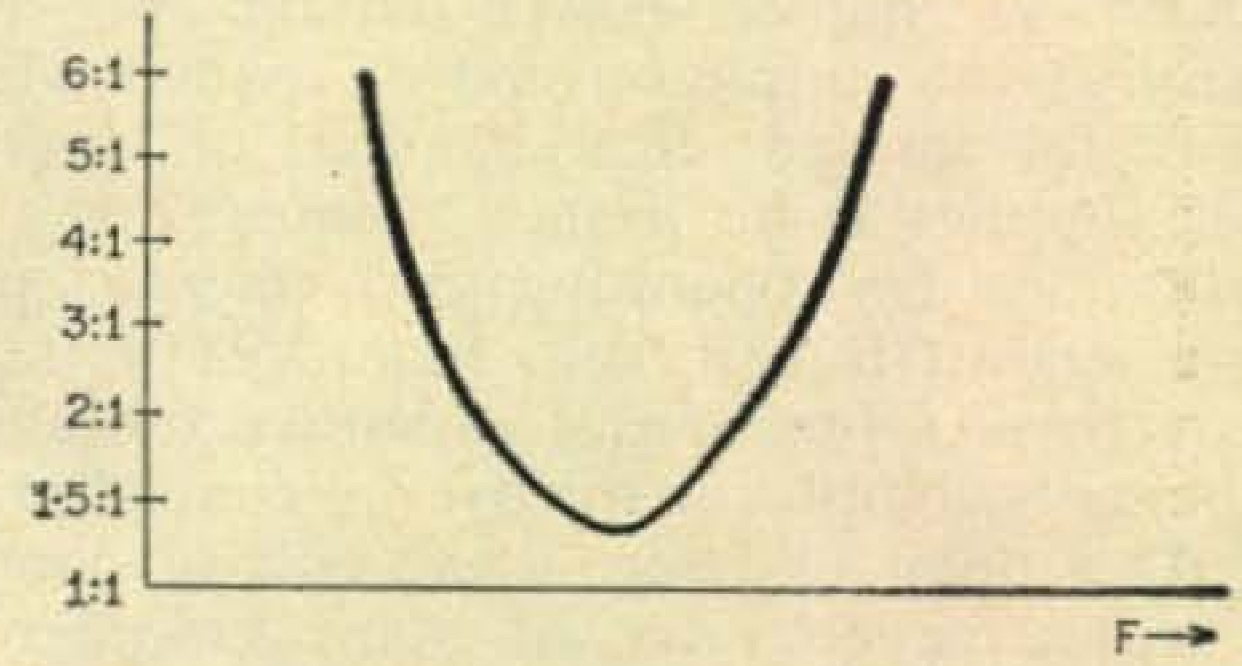


Fig. 5—Typical swr curve of a manufactured single band beam.

This would produce an SWR curve similar to fig. 5 which is typical of the average manufactured single band beam. This was fine in the days of crystal control but is obviously of little value now that most amateurs have a *vfo* and want to make full use of the spectrum available. It would in any case be very much a matter of luck if an *swr* lower than 1.5 to 1 was achieved at any frequency in practical use because the impedance of a beam is affected quite considerably by height above ground, the nature of the soil and even by the direction in which it is pointing when in the proximity of nearby objects.

Although it meant going somewhat ahead of current commercial practice it was decided on technical grounds to work on a basis similar to two point tracking, the general shape of the curve being as per fig. 6.

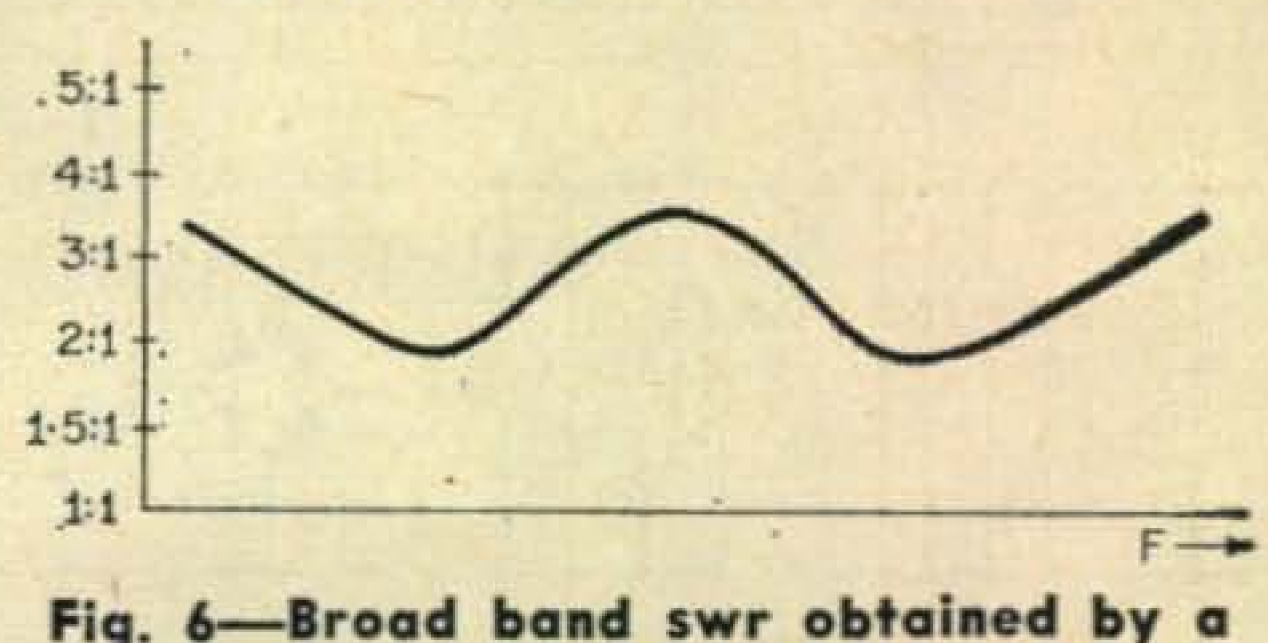


Fig. 6—Broad band swr obtained by a beam impedance 40 percent lower than the feeder impedance.

It will be noticed that the SWR does not normally fall to unity at any specific point but the

[*Continued on page* 160]

Automation Applied To The Amateur Transmitter

Roy E. Pafenberg
Box 844
Fort Clayton,
Canal Zone

"Economical Building Block" Design of a Control System, Using Surplus Components, Featuring Operating Convenience, Safety and Circuit Protection.

The amateur who ventures into the construction of higher power equipment soon learns that the simple on and off switch which sufficies for low power transmitter or receiver power supplies is no longer adequate.

Provisions for operating convenience, protection against injury from hazardous voltages and overload protection of expensive tubes and components complicate the overall control problem. As a point of interest, the cost of control and protective circuitry of many commercial communications transmitters exceeds the cost of any other section of the equipment.

While individual requirements must be considered when designing control and protective circuits, the following features are considered desirable in any higher power transmitter:

1. AC line switching and protection.
2. Line voltage compensation and metering.
3. Relay control of transmitter on and off, with provisions for remote control and pilot light indication of "On" condition.
4. Inter-lock protection of the final amplifier tube in event of air cooling fan failure, with pilot light indication of normal operation.
5. 30 second time delay following application of filament voltages before plate voltage may be turned on, with pilot light indication of "Ready" condition.
6. Bias interlock protection to prevent the application of screen and plate voltage unless bias voltage is present, with pilot light indication of "Bias On" condition.
7. Power amplifier tube protection during tune-up by inclusion of a reduced voltage "Tune-Operate" switch.
8. Power amplifier screen and plate overload protection to remove both voltages in the event of overload and to provide pilot light indication that overload has occurred.
9. Key switch interlock to prevent unauthorized persons from applying plate voltage to the transmitter.
10. Door interlock protection to remove plate voltage when doors giving access to high voltage points are open, with pilot light indication of closed interlocks.
11. Relay control of plate on and off with provisions for remote control, push to talk or VOX, and pilot light indication of "Plate On" condition.

Diagrammed in fig. 1 and shown in the photographs is a high power control unit incorporating all of the above features. It may be said that this is a large order and it is. Further, a quick tally of new commercial components to meet all these requirements would quite possibly disclose the cost to be prohibitive.

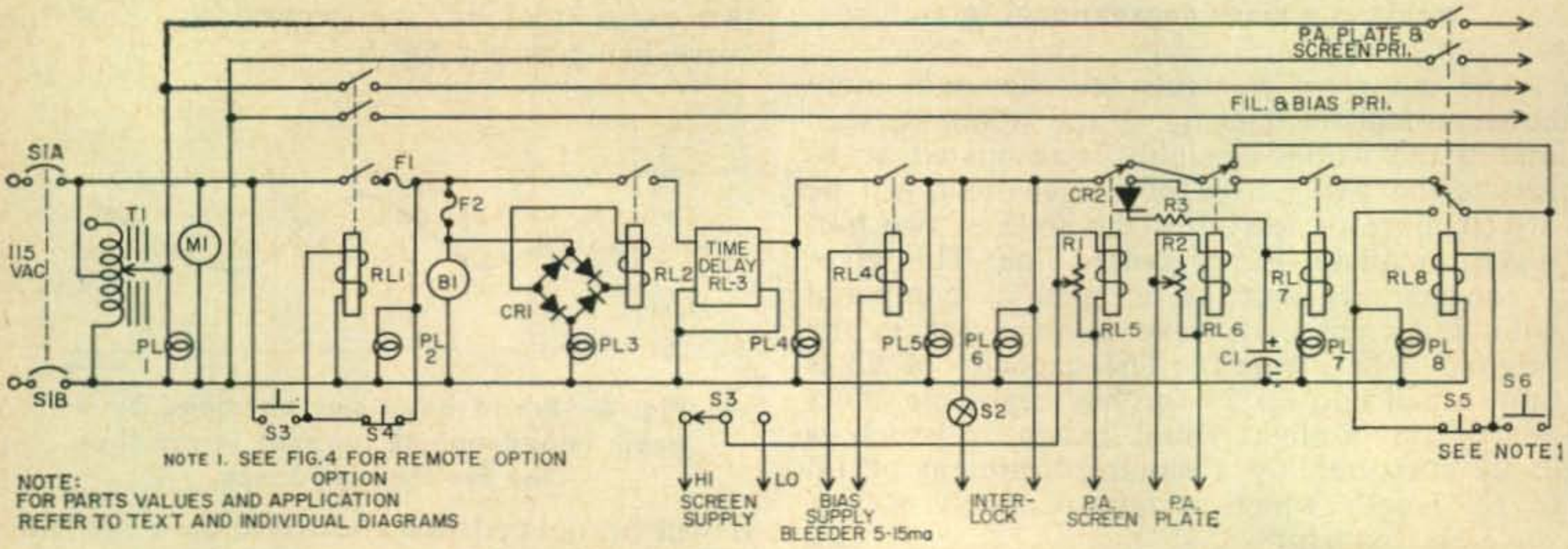


Fig. 1—Diagram of complete control system.

However, by breaking the system down into basic "building block" elements, and by adapting the circuits to readily available, low cost surplus and commercial components, a flexible economical control system can be tailored to meet any specific requirement.

Examination of fig. 1 will disclose that the system is divided into two portions; a "control ladder" and branched power distribution circuits fed through power control relays. The control ladder consists of a series of interlocking relays, circuit elements and controls to insure proper sequence in the application of transmitter voltages and to provide the desired protective and control features.

The remainder of this article will be devoted to the detailed description of the "Building Block" elements which the amateur may combine in a control system to meet his specific requirements. In combining the various circuits, caution must be exercised to insure that elements are arranged in a "fail safe" sequence. For example, any circuit removing plate voltage from a high power stage, should also remove screen voltage; some tubes require cooling air with only the filaments on, therefore the cooling air protective circuit must be placed before the filament relay, etc.

Since the low cost of many of the circuits is dependent on the use of surplus or junk box relays, a few words on the selection of relays for the various applications are in order. The majority of surplus relays are *dc* units, designed to operate with a terminal voltage of 6, 12 or 24 volts.

Relay Checking

Since specifications of the relays are seldom known, the suitability of a relay for a specific application must be determined by test. Of interest is the *dc* resistance and the pull in and drop out current rating of the relay. From these ratings the approximate value of any required shunts or dropping resistors may be calculated. Figure 2 shows a test circuit for experimentally determining relay characteristics and the value of any required shunts or dropping resistors. Values of R1, R2, and source voltage will depend on the relay and the proposed application. R1 and R2 should be wire-wound units of suitable wattage rating and care should be used to avoid damaging the milliammeter.

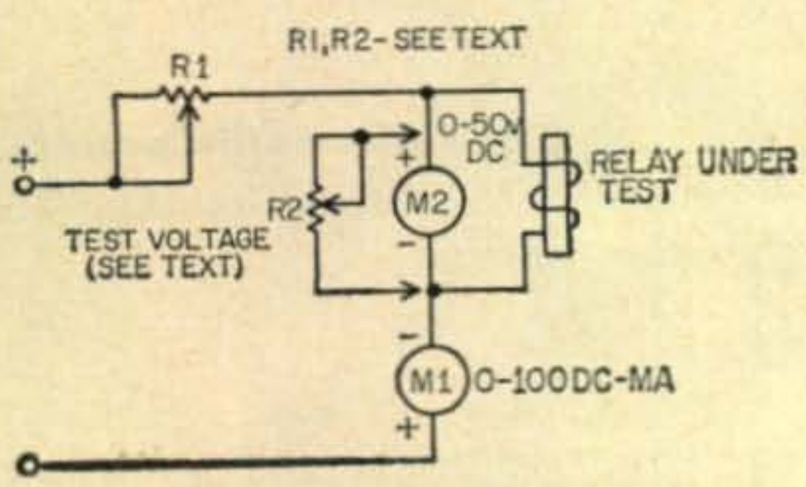
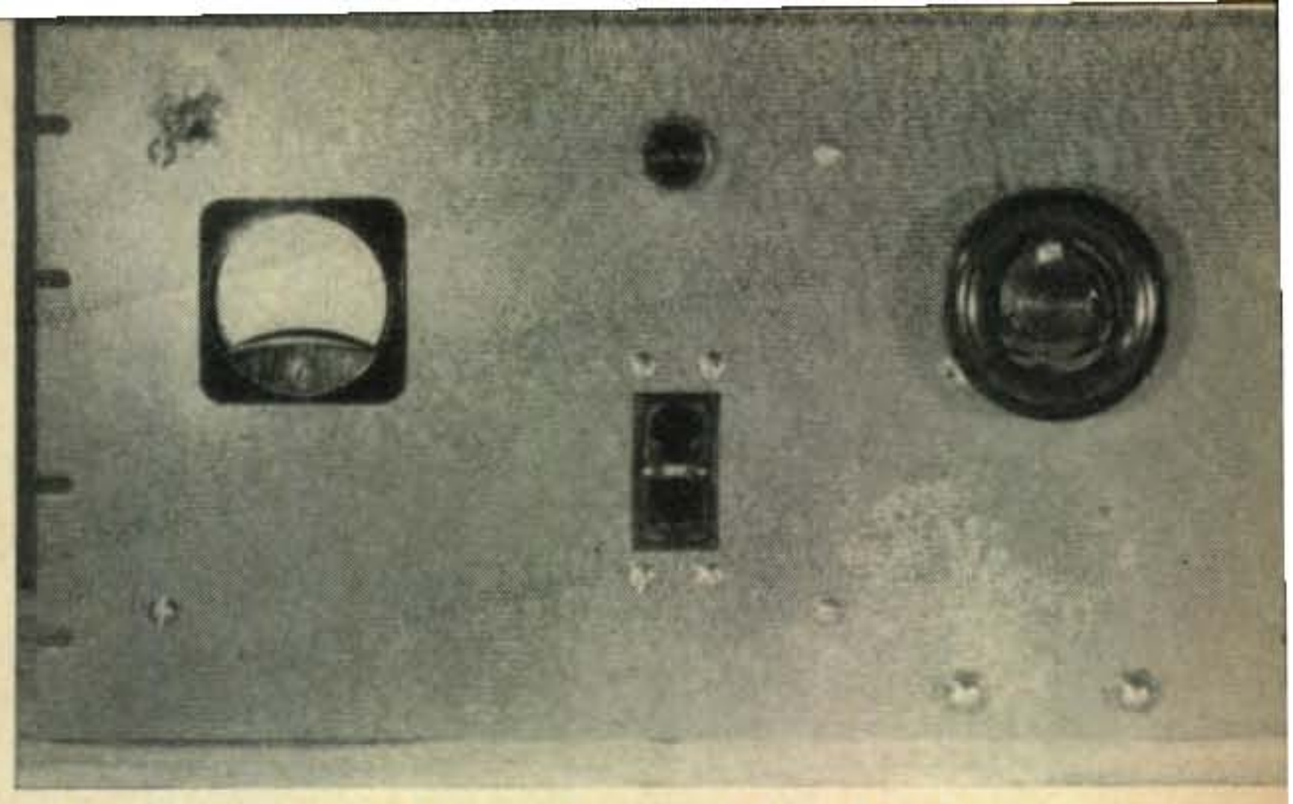
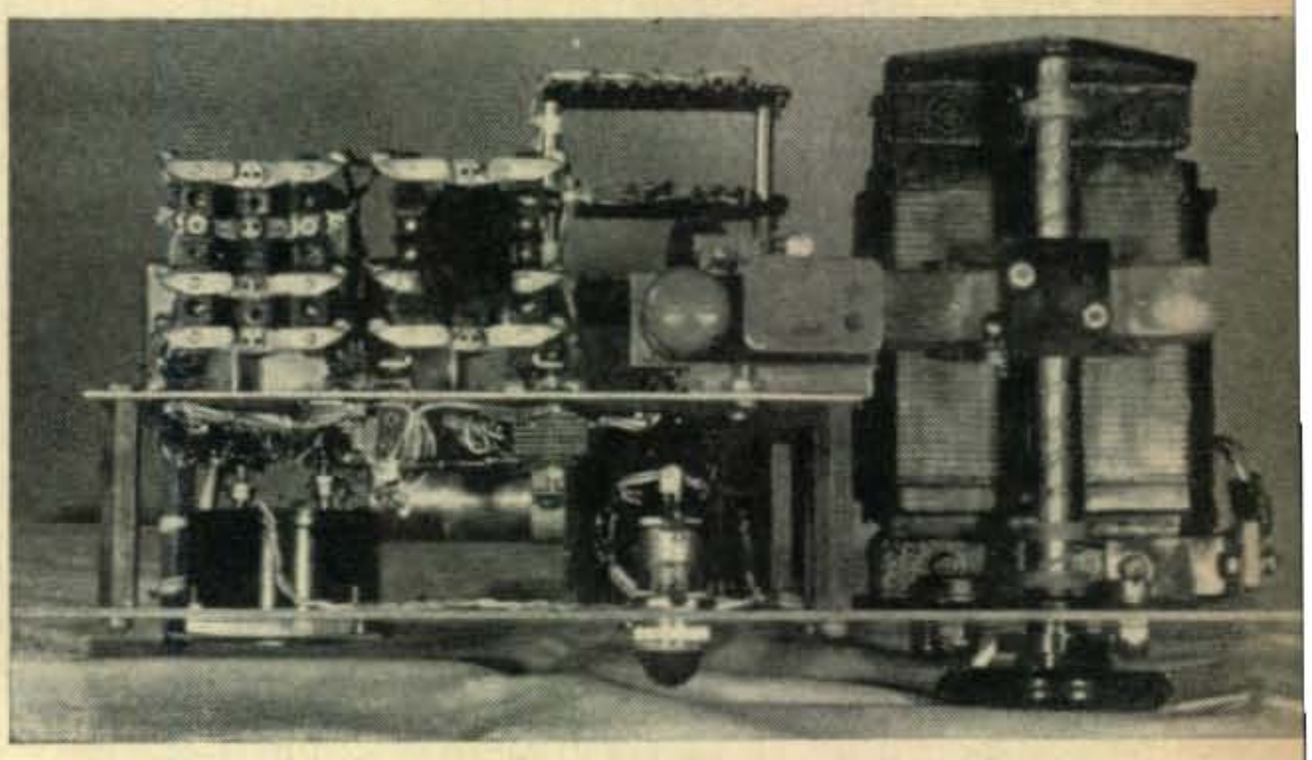


Fig. 2—Relay test circuit.



Front view of Power Control Panel. Since this unit is used with a remote control panel, it may be mounted in the bottom of a rack or console as access is required only for line voltage adjustment and circuit breaker reset.

Rear view of the Panel. Note the removable relay mounting plate and terminal strips for interconnection with other units of the transmitter.



Top view of the Power Control Panel. Cabled wiring contributes to neatness and accessibility.

AC Line Control

AC line voltage control can be provided by a circuit breaker or by a fused switch. Figure 3 shows the details of both circuits. Circuit breakers designed to mount in house wiring distribution panels provide an excellent, low cost answer to the line control problem. Rat-

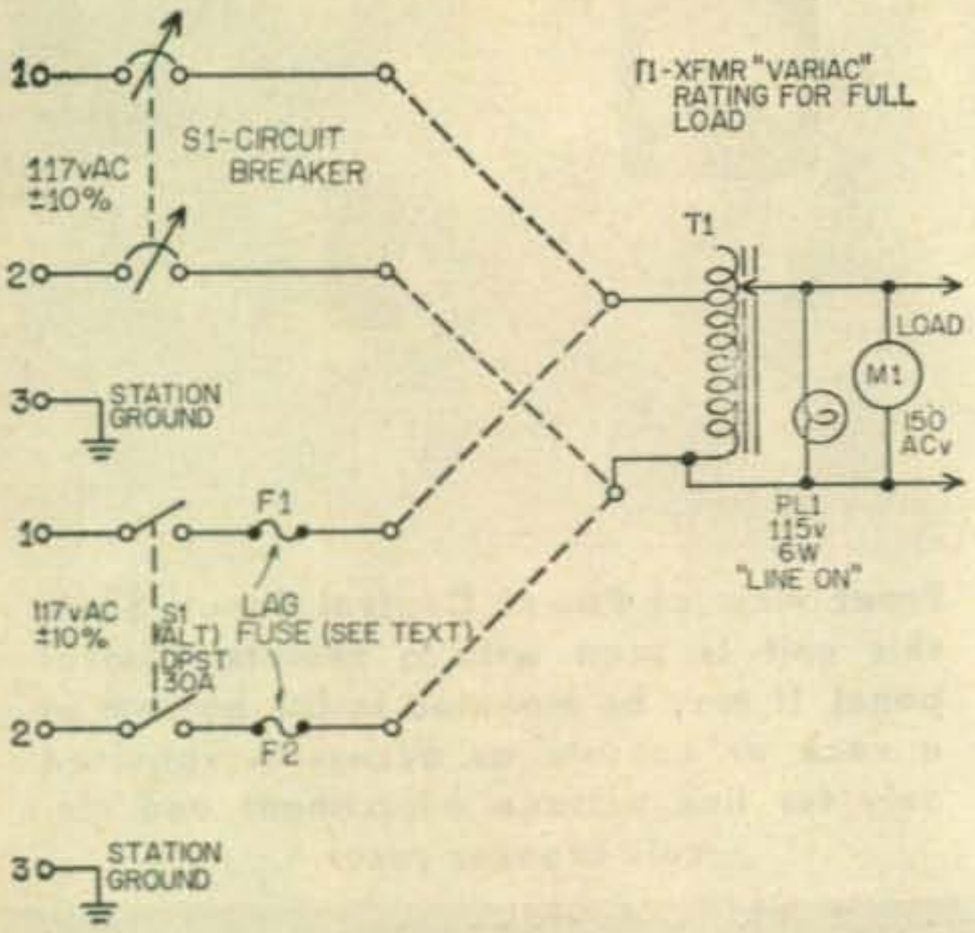


Fig. 3—AC line switching circuit.

ing of the circuit breaker or fuses should be selected to meet total power requirements. Also shown in fig. 3 is a "Variac" line voltage compensation circuit with metered output. These units are still available on the surplus market at comparatively reasonable prices.

Remote AC Control

The requirement for remote operation of *ac* "On" or plate voltage control, on either a latching or 'push to talk basis," may best be met by using motor start power control relays. These units are widely used and are readily available at nominal cost. The basic circuit of such a control system is shown in fig. 4A. For "push to talk" or remote operation, remove strap marked "X" and wire as shown in figs. 4B and 4C. If extra contacts are available on the relay, isolated power control circuits may be provided as shown on the diagram.

Overheating Protection

Protection against tube overheating due to cooling air failure and pilot light indication of "Air On" is provided by the circuit shown in

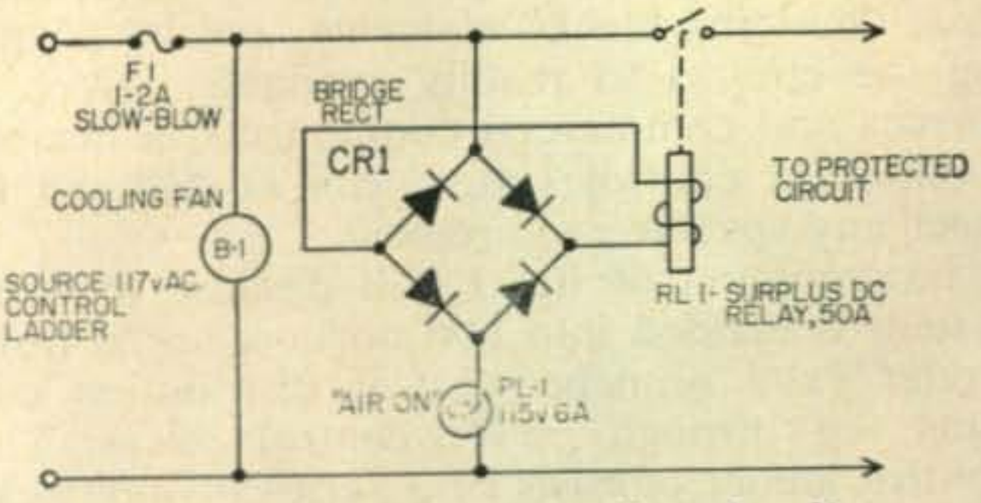


Fig. 5—Air loss protection circuit.

fig. 5. The operation of this circuit is based on the principle that a defect in the cooling fan would cause the failure of the low ampere fuse, F1. This approach is not original and has been published[1]; however the use of a surplus dc relay is economical and quite satisfactory. The "Air On" pilot light performs the dual function of indicator and dropping resistor for the 50 ohm relay. The rectifier is a low voltage, low current, copper oxide bridge unit of unknown surplus vintage.

No-Bias Protection

Protection against the application of plate voltage, without bias voltage first being present, is very simply met by inserting a surplus *dc* relay in series with the bias supply bleeder resistor or vr tube string. The resistance of the relay shown in fig. 6 is 200 ohms and it closes reliably at 10 *ma*. The normally open contacts of the relay are series connected in the "Plate On" control circuit.

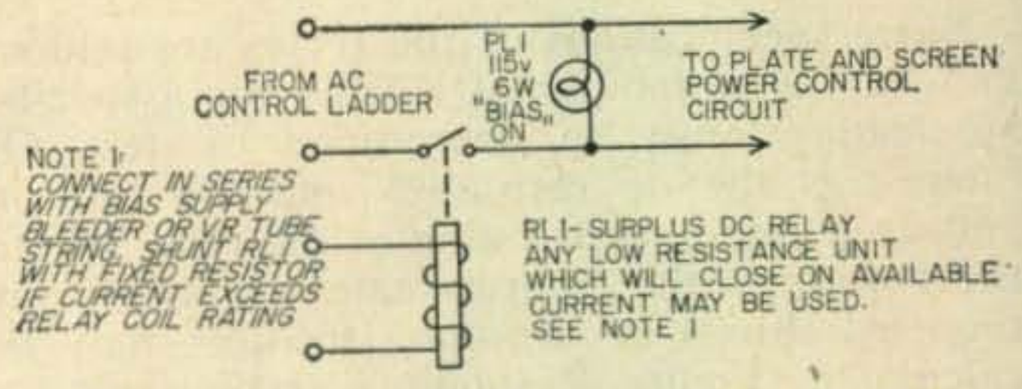


Fig. 6—Bias interlock protection circuit.

[1] "Protecting Tetrode Transmitting Tubes", by Thomas F. Snyder K6PGB, August 1958, "CQ".

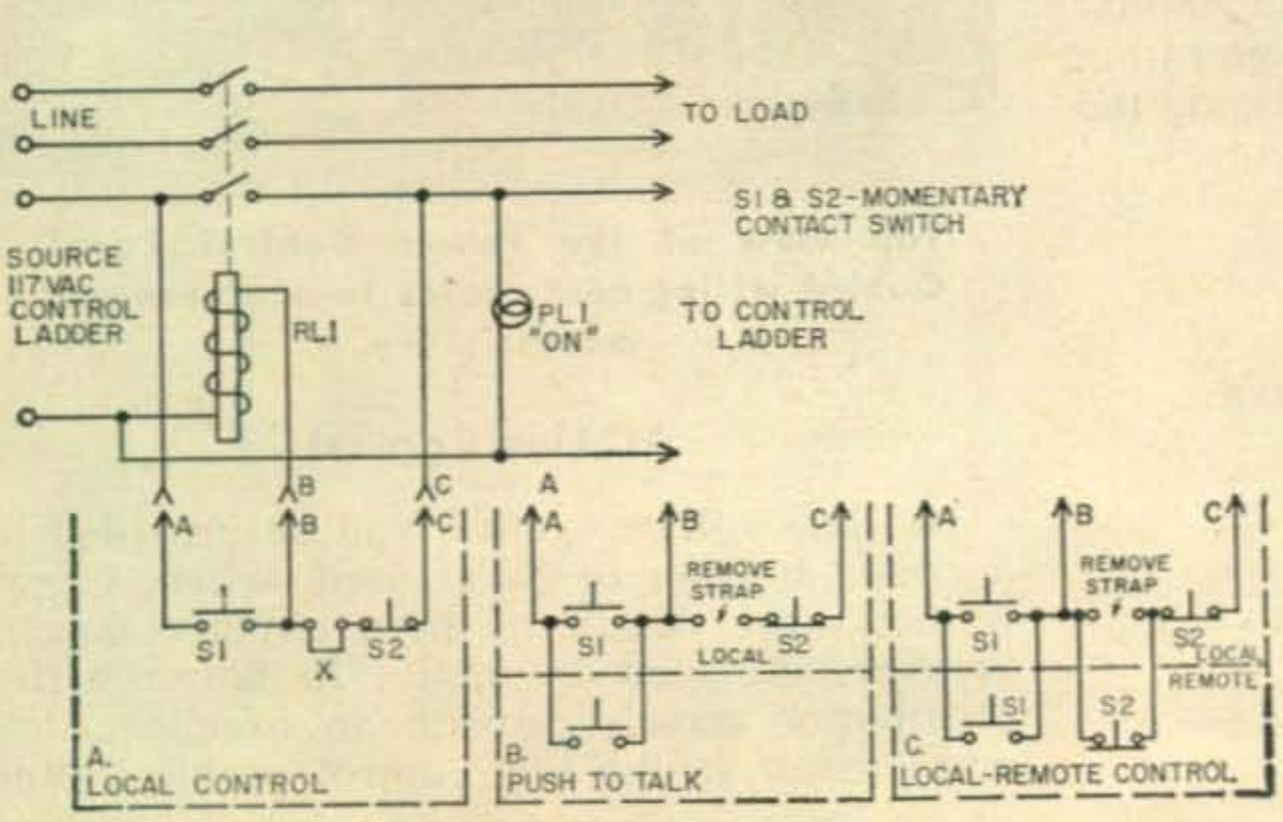


Fig. 4—Versatile power control circuit.

Key Switch

The addition of key switch and door interlock protection is readily accomplished, as reference to fig. 1 will show. The contacts of these switches are series connected in the "Plate On" circuit, with a 120 volt pilot lamp wired across the control ladder after the interlocks to provide "Interlock Closed" indication.

Time Delay Circuit

While a commercial time delay relay is shown in the photographs, fig. 7 shows a seldom used circuit that has certain advantages over commercial units. As the 117Z6

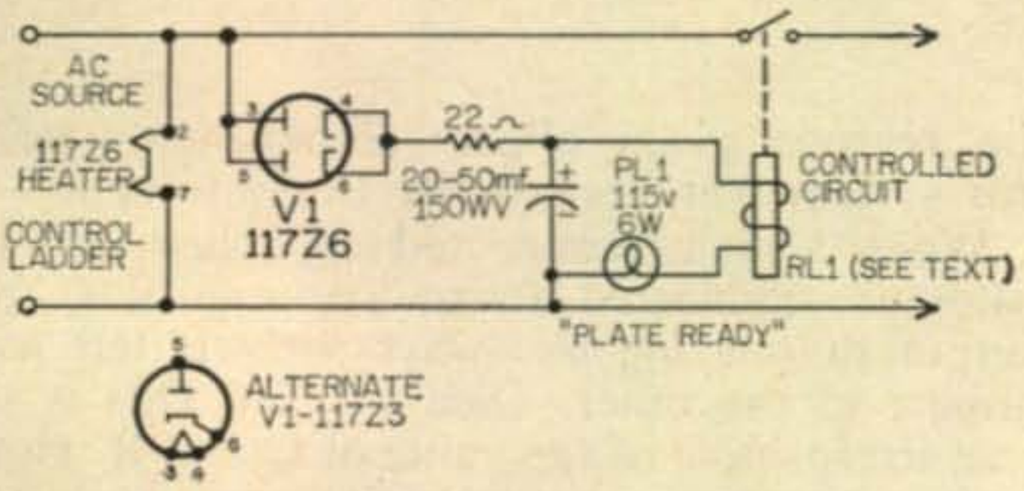


Fig. 7—Time delay circuit.

tube warms up, the tube conducts and current flows through RL1 and PL1. Capacitor C1 eliminates relay chatter and boosts the voltage to compensate for the voltage drop across RL1, giving normal brightness of the "Plate Ready" pilot lamp. Since the thermal lag of the 117Z6 heaters approximates that of the tubes being protected, a momentary interruption of power will result in a re-cycle delay proportional to the length of the interruption.

Overload Protection

Fig. 8 demonstrates how *dc* overload protection for plate and screen circuits may be inexpensively obtained by variation of the basic control system of fig. 2. Relay, RL1, is a surplus *dc* relay, of low resistance, which will close on a current below that for which protection is desired. A satisfactory range of adjustment may generally be obtained by making R1, "Overload Adjust" control, equal in resistance to the coil of RL1. Closing S2 will close RL3 which will latch up, with holding voltage fed through the back contacts of RL1, the normally closed contacts of S1 and the normally open contacts of RL3. When the load of the protected circuit exceeds that preset by adjustment of R1, RL1 will close. Closing RL1 charges capacitor, C1 through the rectifier, SR1, closing RL2 and lighting the overload indicator, PL1. RL3 drops out, removing voltage from the load and reapplying voltage to RL2 through CR1. Capacitor, C1, prevents relay chatter and holds RL2 closed during armature travel time of RL3. Pilot lamp, PL1, serves the dual function of dropping resistor for RL2, and overload indicator

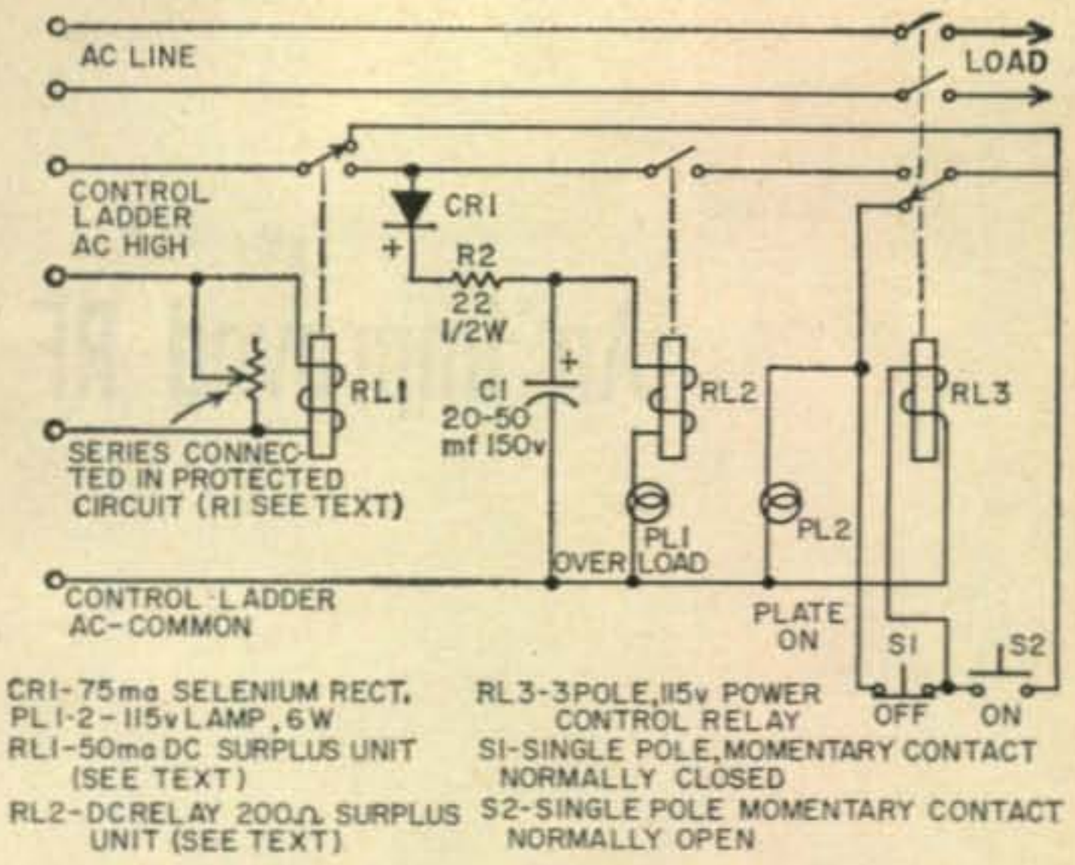


Fig. 8—DC overload and plate control circuit.

light. Closing switch S2 returns the circuit to normal and closes the plate contactor, RL3.

Tune Operate Switch

With the trend toward high power tetrodes in power amplifier service, tube protection during tuning is easily accomplished by reducing

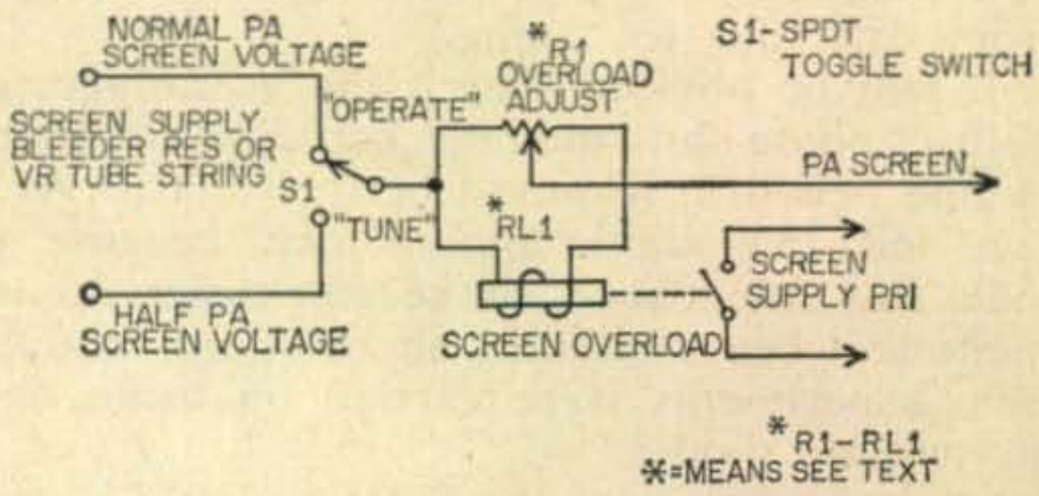
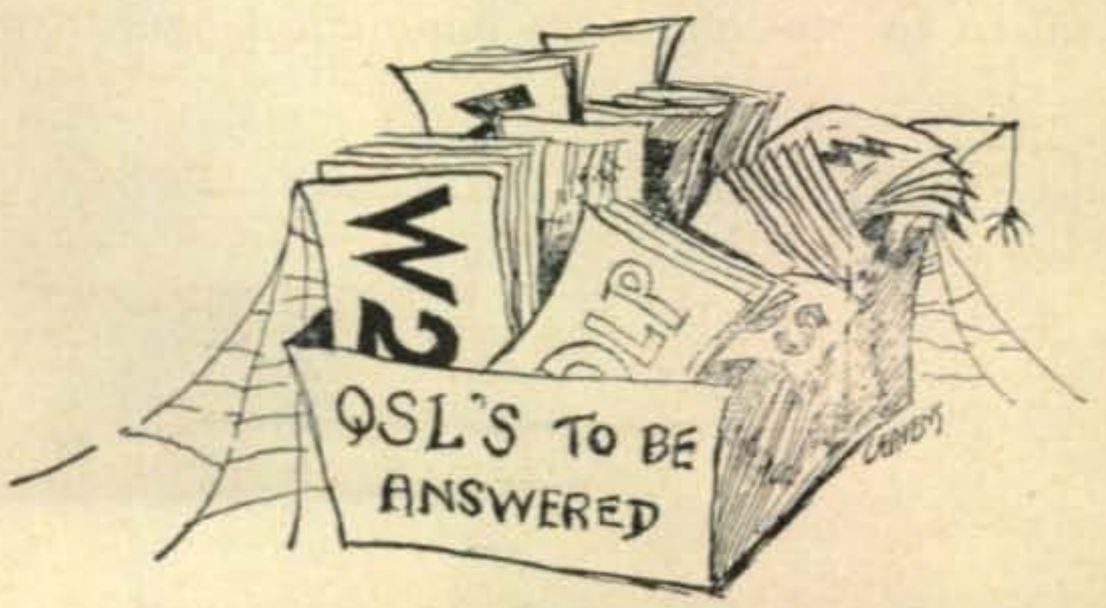


Fig. 9—"Tune-Operate" protection circuit.

screen voltage. Fig. 9 shows such a circuit, incorporating screen overload protection as shown in fig. 1. The exact value of screen voltages to be applied in the "Tune" and "Operate" positions will depend on the tube type and operating voltages. "Tune" screen voltage will usually be 1/3 to ½ of normal.

In addition to cleaning out the junk box, the use of any or all of these circuits will provide a measure of operating convenience and equipment protection that will be a source of pleasure and satisfaction to the operator. ■



An Improved RF Phase-shift System

Lester A. Earnshaw, ZL1AAX
Post Office Box 51
Warkworth, New Zealand

Perhaps the most widely used *rf* phase-shift systems in phasing type exciters are (a) the two coil system and (b) the R/C network.

An improvement on these systems would ideally (1) allow the use of diode balanced modulators, (2) have less adjustments than the "finicky" two coil system, (3) have high output similar to the two coil system, but better than the R/C method, and (4) be free from drift due to "aging."

It will be obvious that if the advantages of both *rf* phase-shift methods could be contained in one network, it would be truly ideal. As it was felt that diode modulators, because of their low impedance, make for easier adjustment and better stability in balanced modulators, experiments were carried on using only germanium diodes.

R/C Networks

The R/C network in fig. 1 is a well used system. Used in conjunction with diode balanced modulators, its impedance must be kept low. Diode modulators have a measured impedance of between 800 and 1000 ohms and this impedance is effectively shunted across the network. Any attempt to raise the voltage across the network, by raising the impedance of the network arms, will result in undesired phase-shift. The impedance of the network arms is usually kept at around 50 ohms, the load having only small effect at this impedance. To obtain a voltage comparable with the two coil system, the arm impedances had to be raised to 200 ohms; an impractical figure for the reasons given above. Experiments using this system were eventually discontinued.

When a series connected capacitor and resistor are connected across a source of *rf*, the output of one leg is always 90° shifted with respect to the other. (See *fig.* 2.) This is the case irrespective of the value of C and R. However, to obtain an equal voltage on each leg, with respect to the center point, the reactance of C must equal the resistance of R at the frequency concerned. This arrangement offered definite possibilities. What would the effect be when the circuit was loaded by the balanced modulators? It was thought that the load would be primarily inductive and that (because it was of the opposite sign) it would have the greatest effect on the capacitive leg. This proved to be the case. An exciter that had used the two coil system was altered to use the R/C set-up shown in fig. 2 and then a phase correcting network was added in one leg as in fig. 3. Though the phase was corrected, the voltage in the phase corrected leg was now so low that the output was virtually useless.

Suppression

It is interesting to note at this point that the unequal voltages did not prevent good suppression! This has been noted on many previous occasions when diode balanced modulators have been used. It was concluded that the formula:

$$\text{Sideband Suppression} = \frac{200 + E}{E}$$

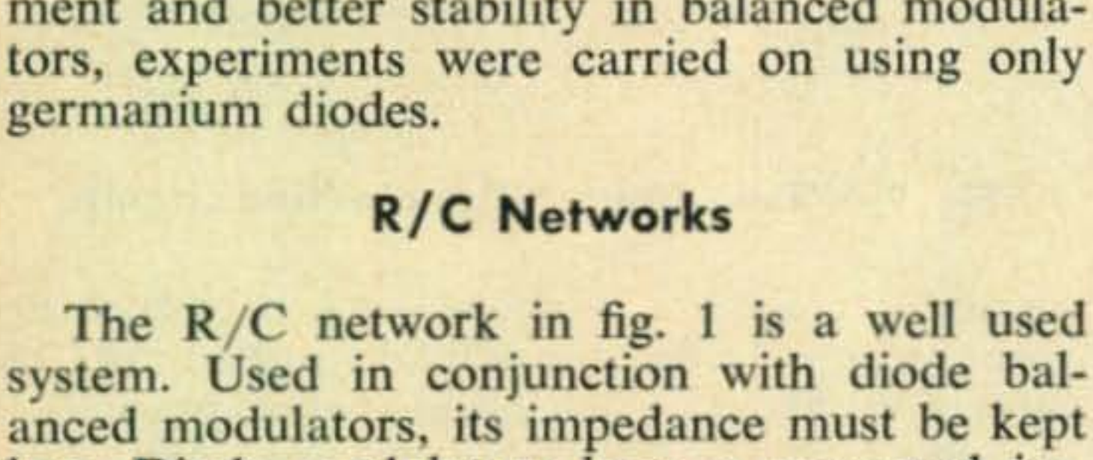


Fig. 1—A common R/C phase shift method.

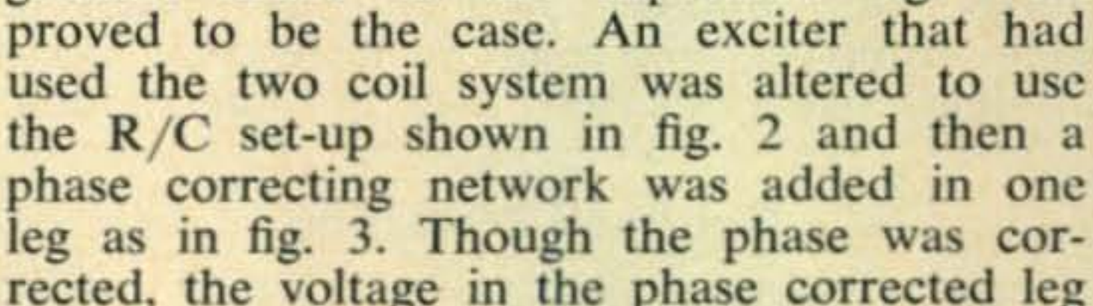


Fig. 2—A simple R/C phase-shifter illustrating the problems described in the text.

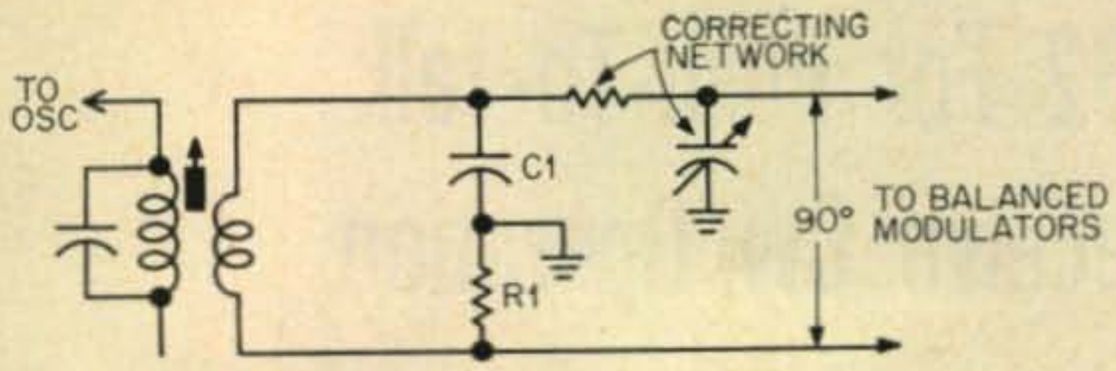


Fig. 3—A variation of fig. 2, with a phase-correcting network added.

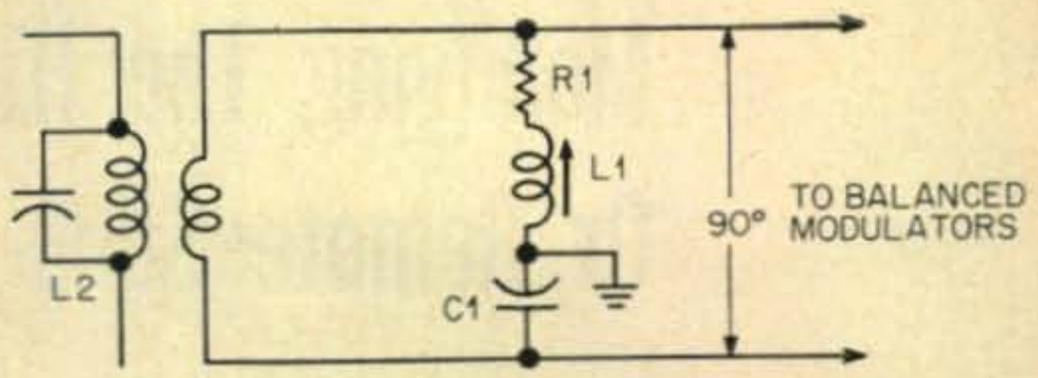


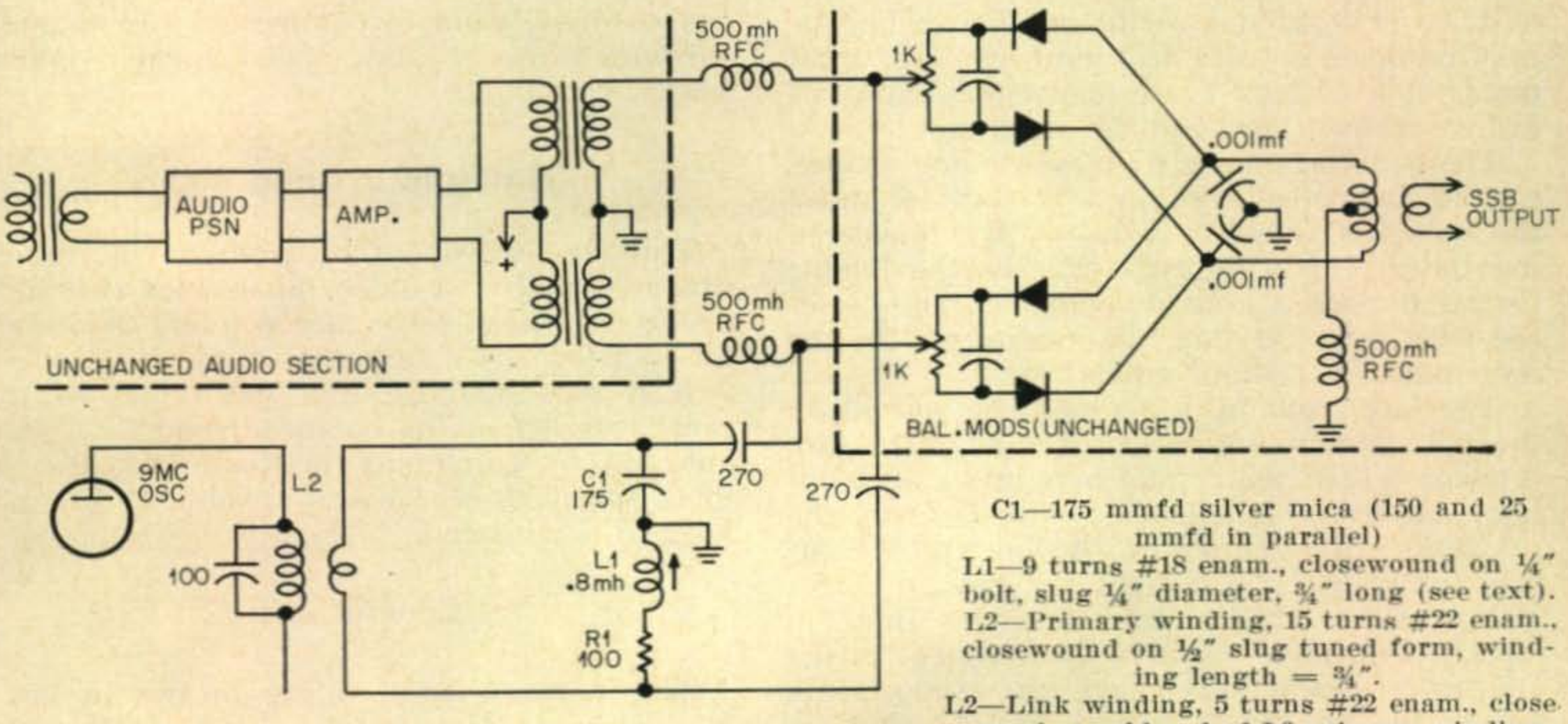
Fig. 4—An ideal rf phase-shift method. An inductance has been added to neutralize the effects of the capacitive load.

where E is the difference in voltage between the two arms, applies only to multi-element tubes where the action is that of mixing in lieu of the rectification process that takes place in diodes. Diode balanced modulators may be likened to a high level modulated AM rig; an increase in carrier power does not give an increase in sideband amplitude. So long as the ratio of *rf* to audio does not fall too low, the *rf* unbalance is not critical. The ratio of *rf* to audio has been found to be optimum at 10:1. Ratios lower than say 6:1 will cause distortion.

In fig. 4 an inductance has been added in series with the resistive arm of the network. This inductance neutralizes the effect of the load. Admittedly, the network now becomes C/R/L, but as the L is but a small part of the whole reactance it is in fact not critical. In addition, whereas *fig.* 1 was in reality two networks in parallel across the oscillator, the new network has its components in series. The voltage across this network is correspondingly higher for the same oscillator load. Various experiments were made with R of different values. A value of 100 ohms was found to be the best design value. A value of C, whose reactance is also 100 ohms at the frequency concerned, is also chosen. The size of the correction inductance is governed by the impedance of the load. More of this later.

Stability

When the network was adjusted it was found that the voltage on each leg was even; as it should be, for the reactance in each leg should now be equal. Experiments were conducted with a view to determining the long term stability of the network. The value of R was changed to 80 ohms simulating a change in resistance which might take place over a period of time. No other adjustments were made. The effect upon the suppression was unreadable on the scope though a slight readjustment to the carrier balance potentiometers had to be made. The *rf* voltages across each leg were now unequal. Next a 15 mmf capacitor was shunted from first one side of the network to ground, and then from the other side to ground. Once again the effect was negligible. A change in the value of C by 10% had no effect whatever except for the need for a carrier null adjustment. The corrector slug is in reality a vernier control. Even if the slug is removed altogether, the suppression will not move more than a degree or two at the most. The above points all add up to the fact that the network is extremely stable. The resistor may be ordinary carbon, no particular effort



C1—175 mmfd silver mica (150 and 25 mmfd in parallel)
L1—9 turns #18 enam., closewound on ¼" bolt, slug ¼" diameter, ¾" long (see text).
L2—Primary winding, 15 turns #22 enam., closewound on ½" slug tuned form, winding length = ¾".
L2—Link winding, 5 turns #22 enam., close wound at cold end of L2 primary winding.
R1—100 ohms (3 one-watt carbon resistors in parallel).

Fig 5—A method of fitting the new rf shifter to existing phasing exciters.

Modifying The HT-32 For Push-To-Talk Or Remote Send-Receive CW Operation

Harold DeVoe, KL7MF
P. O. Box 644
Anchorage, Alaska

If you have an HT-32 and wish to provide for push-to-talk or remote send-receive operation on CW, the folowing simple modification will do the trick. (The new HT-32A has this provision)

1. Remove the ground from Operation Switch OS-2R, Terminal ♯4.
2. Remove the ground from Control Outlet Socket SO8, Terminal ♯9. (Terminals ♯1 and ♯5 will provide all grounds).
3. Run a wire from Operation Switch OS-2R, Terminal ♯4 to Socket SO4, Terminal ♯6, which you will find unused.
4. Run a wire from Plug P4, Terminal ♯6, which you will find unused, to Socket SO8, Terminal ♯9, from which you previously removed the ground conection.
5. By-pass Socket SO8, Terminal ♯9 to ground with a 0.005 mfd disc ceramic.

Various auxiliary methods of shorting Terminal 9 of the Control Outlet Socket to ground will provide on-off operation of the transmitter when the Operation Switch is in the MOX position. To have transmitter control with the Operaion Switch, the new auxiliary terminal must be shorted. Terminal ♯9 will have to be shorted for Calibration Operation, also.

An additional refinement would be to remove the present single terminal mike connector and replace with a double terminal connector. Then a wire to the additional terminal thus afforded to the Operation Switch OS-2R, Terminal ♯4 would make push-to-talk available at the microphone. In the MOX position, no Calibrate Signal will be available until the remote switch is closed. ■

An Improved RF Phase-Shift System

[*Continued*]

need be made to reduce stray capacities and the capacitor may be a simple mica unit.

The resistor wattage should be ample to dissipate the power across it. Three one-watt resistors in parallel will be ample for the usual 6C4 or 6U8 crystal oscillator. The capacitor may be made up of a 150 mmf and a 25 mmf mica in parallel. These capacitors may be ordinary silver micas at 5% tolerance.

The coil L1 is made by closewinding 9 turns of #18 enamelled wire on a ¼" bolt. Remove the bolt and screw in a ¼" X ¾" powdered iron slug. The wire itself may be the female thread if such a core is available. The closer the wire is to the slug, the greater will be the inductance variation attainable.

The link winding, L2, should be wound on the cold end of the oscillator coil. If the link is made larger, the crystal may refuse to oscillate and if too small, the voltage across the network will be too low. A link of 5 turns was found to be just right for the coil used.

If desired, this system may be used in "straight through" exciters for a change in the frequency does not affect the suppression where the frequency excursion is within an amateur band.

An exciter working on 6 mc was also constructed. Here are the component values for this frequency: L2, 6 turns (link) on a ½" slug tuned oscillator coil, the primary of which tunes with a 200 mmfd capacitor. L2 wound with #22 enamelled wire. R1 = 100 ohms, C1 = 250 mmfd, and L1 is about 2 microhenries, made by winding 12 turns of #33 enamelled wire on a ¼" slug tuned form, winding length ¾".

Fitting to Existing Rigs

This should present no problem in rigs of similar circuitry. A sideband selector switch, if connected in the secondary winding of one of the transformers may be left untouched.

It is recommended that the values of the capacitors across the balanced modulator output coil or combining network be close to those specified, otherwise the value of L1 may have to be changed.

Conclusions

This network is presently in use in quite a number of ZL stations and they all make the same report concerning the ease of adjustment and stability of the network. This may be expressed in one word—excellent. ■

Radio Circuit Blueprints

E. H. Marriner
528 Colima Street
La Jolia, Calif.

How often have you wished there was some simple way to make blueprints of your home constructed equipment so that it could be filed or make extra copies for the radio club members? Besides making circuit prints it is easy to make club news or secretary report duplicates, by the OZALID method.

The process is the following: Obtain a transparent sketching pad 8½x11 inches and several sheets of orange colored carbon backing paper from the blueprint supply house. The orange paper is put under the sketching paper to increase the dark pencil lines or typewritten letters. Make your sketch of the radio circuit using an Electroneer #31 drawing symbol guide and type letters on with the typewriter. This is now your negative and you will now need some OZALID blueprint or black line paper which can also be obtained from the local blueprint company. The advantage of this process is that it is a dry process, only needing exposure to light and then put in ammonia fumes for developing.

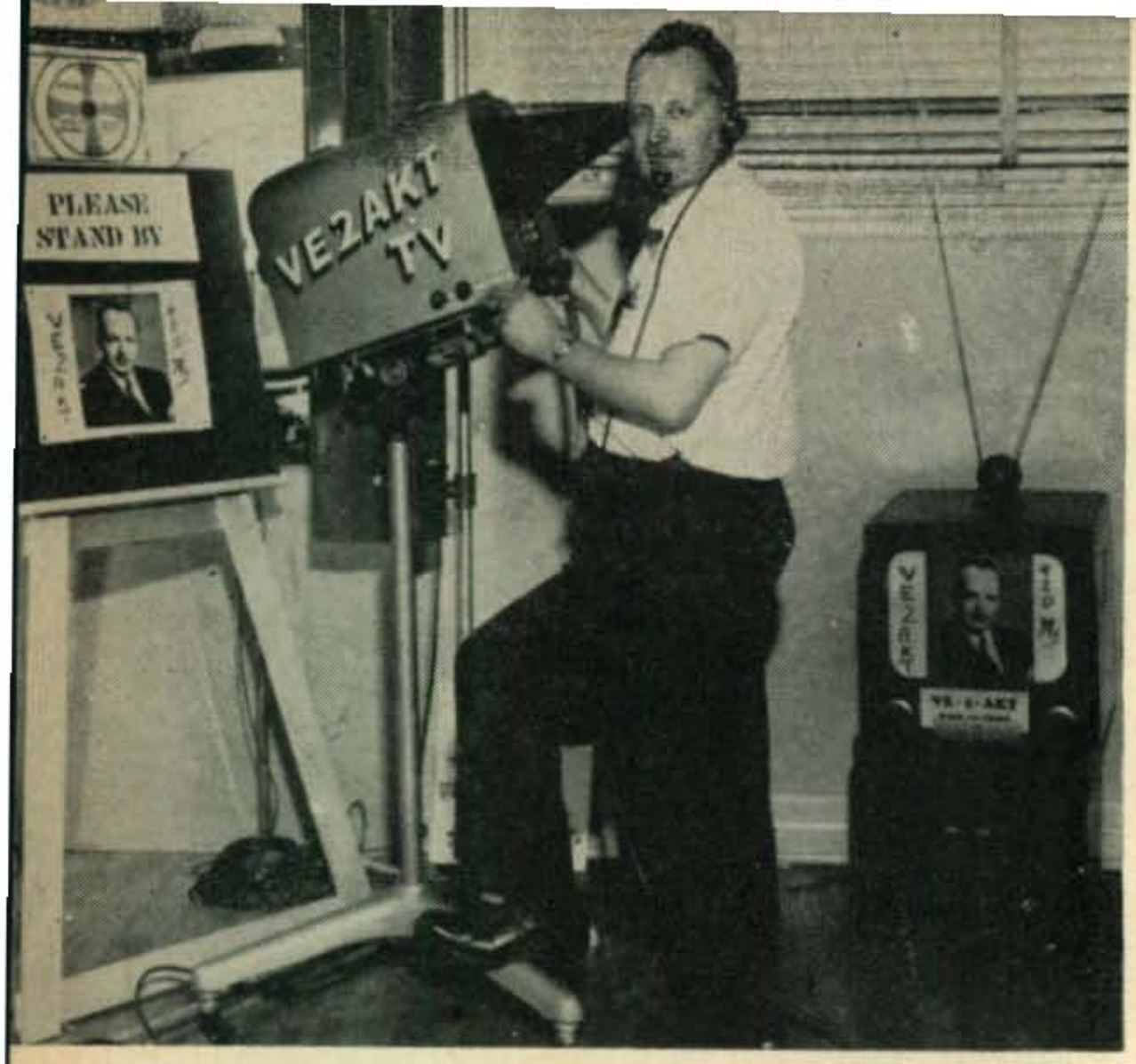
To expose the negative to the paper, an exposure box can be made using five 100 watt lamps. Several inches above the lamps there should be placed two layers of frosted or opal milk glass to diffuse the light.

The paper and negative can be held smooth by laying another piece of glass on top of them to prevent wrinkles. An exposure of two minutes is about right. As the lamps radiat heat it will be impossible to make many prints because the glass will get hot. It is therefore necessary to install several holes and apply a fan or blower to keep the air circulating under the glass, or use another method of exposure if a large number of prints are contemplated.

As soon as the paper has been exposed it is placed in a field of ammonia fumes. Chemical supply houses sell a pint of 28% solution of ammonia for about $1.50. This will last a long time and can be used over. For letter size printing a small jar lid can be filled with ammonia and put in a box with a tight lid. Soon as the fumes are circulated the exposed paper can be slipped in for a few minutes. An alternate method is to use a long plastic tube several inches in diameter and the prints placed in the tube. The tube is then set over a jar lid full of ammonia and the fumes rising by the paper will develop it.

A note of caution: when handling the ammonia hold it away from your nose and eyes and work in a well ventilated space as this percentage is stronger than household ammonia.

The author made a small plastic box (see photo) two inches high and one foot square. A slot was sawed in the sides before assembly for a shelf which has holes drilled around the edges for the fumes to come up over the paper. A lid was also made to slide in a slot on the end so that it could be lifted up and the paper slide into the shelf. Boxes of this type can be made on a table saw and cemented together with household cement. The advantage of this type of box is you can watch the paper develop and remove when necessary. Over exposure of the paper will be light and under exposure will be a dark blue. Leaving the paper in the ammonia developer is slow enough that you can remove it at any shade of blue desired. A photo timer also comes in handy to help gauge the length of time for exposure. ■



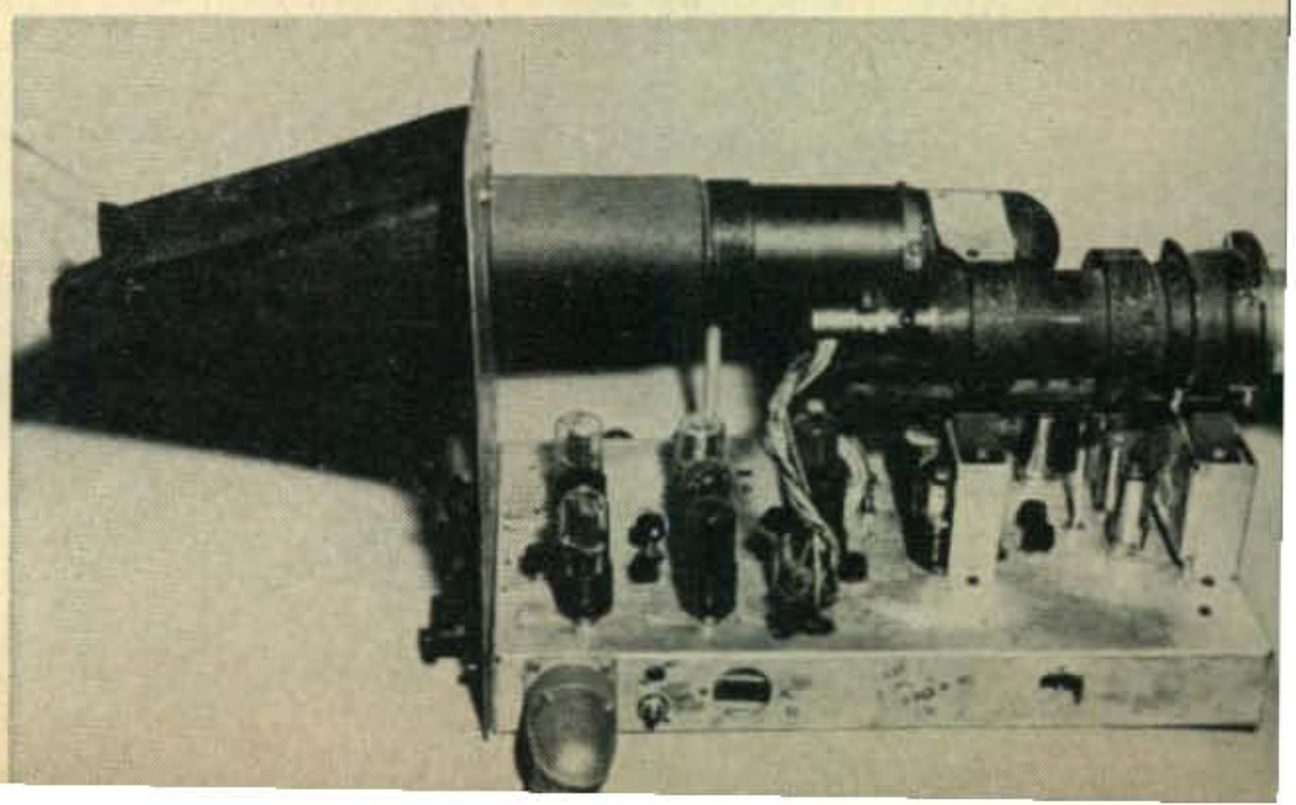
Ham TV

Bennie Halickman, VE2AKT

About three summers ago I was down in Old Orchard Beach Maine on vacation and (luck for me) I made contact with Connie Ducette W1ULL.

Connie was all tangled up in ham TV and had made attempts to transmit from Mt. Washington, N. H. to Biddeford, Me. I was present for one of these tests, no picture just sync bars, but that got my get up and go feeling really going. I had been talking to Bill Still, W2GJR/VE2 about getting set up but he was too busy at the time and I thought if I could get Connie to come up to Montreal, I might get a chance and get Bill on the go again. (This almost did not work). Connie who had gone through a lot of trouble building up from a few articles that appeared in Radio Electronics and others as such did a great job of it but according to Bill, it was impossible for the stuff to work according to the diagrams supplied. Bill had of course seen the articles before and had seen the errors and problems involved. I want to stop now and say that I certainly do not want to take any credit away from Connie Ducette because he did build a very fine hunk of camera and control unit, not to mention the fine transmitter which I will try and describe later. All around Connie did a great job but it needed the hand of Bill Still and that it got after a lot of arm bending and such. . . .

Now here is what happened when Bill finally got the stuff on his bench. To give it to you briefly, he started ripping out condensers and resistors like they were going out of style. No kidding, when I got a look at what had happened to the stuff, I flipped two eyeball gaskets and my ulcers started to play a tune. Boy what a mess, but Bill was very confident all the time. (The stinker never told me he had done this before) By the way, Bill did start TV in Ham fashion in NYC some time ago, but it did not catch on. He had a good picture and sig, but the other fellows had a tough time of it and gave up. I'm sure if one can scrounge around some of the timers, they will find what looks like a TV camera gathering loads of dust. The IKE IN THE CAMERA is a 5527 as that was the one available from Connie at the time and it does a fair job but needs great care in handling. I watched Bill at work, which lasted about six weeks day and nite and for those six weeks, I did not know what my family looked like. The wife was not talking to me and the kids hated their Daddy. But when we got it going at my QTH and I let them see my kisser on the living room set when I was in the basement, brother that did it. They were all down and all was forgiven after I promised to make TV stars out of the entire family. Getting back to the work bench, Bill really worked very hard and took all kind of pains to achieve perfection, even filing a couple of resistors in order to get the exact values. The odd thing about the whole deal is that there is not one special part which is necessary for the entire job. It's just a bunch of resistors, condensers and tubes, sockets and pots. And oh yes, an 0-1 meter which Bill quickly converted to a center reading job, and that has to do with the audio which is pure FM. In plain words, to make it short, if you have the picture, you have the audio and vice versa. The control unit also has provisions for the fly spot scanner if you want to run slides or film. By the way, the building of this unit has not been accomplished as yet, but it won't be long. Last fall at a demonstration of the equipment on a few 21" sets at the Montreal Amateur Radio Club, so many became interested that we had to print schematics of the deal and prepare a talk by Bill



On Standby Operation or Earsmanship

"Jo" English, W1ZXT
Southport, Connecticut

One of the most useful devices for efficient spectrum use is an interesting conversation. Its usefulness is based on the known principle that no man can talk while he's listening.* Everybody recognizes that a roundtable is a useful thing, because it keeps a number of operators on a single channel, occupying a fraction of the frequencies they'd fill as separate twosomes. But a roundtable that's interesting is more, much more, than that.

An *interesting* roundtable extends in widening concentric circles, with row on row of operators standing by. Each practices his own form of kibitzing, consisting primarily of listening and is politely known as Earsmanship.

Now, I'm not talking about SWLs. I'm talking about operators, qualified and equipped to raise a voice at the roundtable when sufficiently moved to do so. A True Blue Earsman doesn't lurk forever in silence. In fact, a TBE never listens for extended periods without making his presence known. That's the least a considerate Earsman can do, to protect himself and the more vocal participants in the roundtable from the embarrassment which would be general if he, the TBE, happened to be roasted by the repartee at the roundtable.

There are several accepted techniques of Earsmanship, each having its own special characteristics.

1. The delayed response, or double take: The practitioner of this system is likely to appear very sage. He listens to all sides of a topic under discussion, mulls it, makes up his mind over coffee, frames his comments carefully, and consequently seems a decisive and masterful man of affairs when he finally does break in on the roundtable, just in time to sum everything up.

2. The delayed delayed response, or double double take: This takes extraordinary skill. It involves listening through several topics, then breaking in to comment on the whole list in rapid sequence. The big danger for an unpracticed TBE using this gambit is that he'll press his luck and wait so long that everyone else will have forgotten the topics he comments on.

3. The Darter, Aural: This one listens quickly. He hears three words, guesses at the rest, and begins tuning up on the frequency. Impetuous and incurable, he livens up the party and sometimes switches topics just when a switch is most welcome.

4. The Darter, Vocal: Here's an effective system. Quick on the vox, this fellow can get a "You bet!" or a "Hah!" into the tiniest lull. Puts it in edgewise, with exquisite timing.

5. Big Brother: Same as #4, but with a bigger signal. Doesn't have to wait for a lull.

6. Quick Changer: Uses various techniques intermixed, is hard to predict. A most effective kind of Earsman, because he has sub-Earsmen listening constantly to him.

7. TBE First Class: This one does everything just right. Enjoys listening. Sparkling conversationalist. Good operator. Unfortunately extremely rare. Offhand, I couldn't name anybody who really belongs in this group except you . . . and me. That reminds me—last time our roundtable talked about TBE techniques we wondered if there was some way a TBE could identify himself to other TBEs at hamfests, conventions and the like. Somebody suggested blue ears. Do you think that would be going too far? ■

* No man, I said.

Still for the ones interested. At present, there are a few in town who are on the way. We also made a trip to Burlington, Vt. with the entire setup and put on a demonstration at WCAX Channel 3 in Burlington for the Burlington Amateur Radio Club and that went over with a bang. The gang sure enjoyed it. In fact, when we had the demonstration in Montreal, about 20 from the Burlington gang came up to observe.

Camera Stand

I guess many will wonder where the camera stand came from? ? ? Well it's an old commercial clothing rack which we cut down and had wheels welded on the base and the camera cabinet was constructed from steel by a friend who is in the business. Shielding is very important, as we had lots of trouble with a local station on 800 *kc*. Modulation was noticed and it was quickly discovered by Bill that the terrific ground wave was getting into the first video amp of the camera. The shielding for the ike was from war surplus scopes used in radar which did a good job. (Also for the 3" monitor.) The only critical part in the setup was an old *if* can which has the 4½ mc coil and that can be a cinch if you know how. The lens for the camera had to be fitted by a machinist and the lens can be any 3.5. The one being used now is a 2.9, but it's no great difference. As far as lighting goes, all you need are a couple of 500 photofloods and they will be plenty as that's about the point of saturation. ■

Semi-Break in With Vacuum Tube Keying

E. H. Marriner
528 Colima Street
La Jolla, Calif.

Back in the beginning of amateur radio double pole knife switches with a notch filed on one blade were used to close the antenna relay before the transmitter power came on. With the advent of manufactured transmitters, this function became lost and now the antenna relay comes on at the same time as the transmitter *rf* power. This is bad because the coax relay contacts burn or the contacts arc to the case blowing the main line fuse.

The antenna switching problem along with what is the best way to key a transmitter have bothered the author for many years. How to make a fool-proof system which would turn the antenna relay on before the transmitter was keyed, mute the receiver for monitoring CW, remove the oscillator *vfo* voltage, have vacuum tube keying and work two transmitters with one coax antenna relay.

I would like to answer this problem for those who have had the same difficulty as myself. Having built four of these systems I feel reasonably sure this article should solve most situations for the radio amateur.

First, let us consider the keying problem. In essence block grid keying, primary keying, differential keying and all of the other types of keying systems apparently seem satisfactory several miles away from the transmitter. However up to a mile away, all have a slight "Tick" when the key opens and is annoying to copy through. This is hard to eliminate because when the "Tick" is removed by key filtering, the back wave makes the signal unreadable. Thus our experiments began.

The finished product was the use of vacuum tube keying in the cathode of the final or buffer stages. (See fig. 1.) Vacuum tube keying has no disadvantages because the negative bias voltage needed can be taken from the existing exciter power supply by adding a 6X5 rectifier tube. (See fig. 2.) The voltage taken from the side of the power transformer is reduced through a series resistor to be within the limits of the cathode to filament break down of the 6X5. A separate filament transformer may be used with the winding insulated from ground if desired. The 6AS7 has a low internal resistance of 150 ohms and the 6BX7, 600 ohms. The 6AS7 tube will carry 250 *ma* and takes –300 volts of bias to cut it off, the 6BX7 carries 80 *ma* and requires –90 volts to cut it off. Both tubes work well as keyers and the advantage of vacuum tube keying over the slight loss of voltage due to the internal resistance makes them worth using. The 6BX7 is the smaller of the two and operates very fine for an 807 tube, or equivalent, while the 6AS7 can be used for higher powered tubes. The blocking is derived through the high resistance of R-11, R-5, and R-4, which is grounded out by the key which has the arm at ground potential.

If the keyer tube modulates the signal and the transmitter sounds like a 500 cycle coastal station, the difficulty can be overcome by inserting a 100 ohm resistor in each grid of the keyer tube, to prevent this type of oscillation.

The keyer system functions as follows: As the key is pressed relay #2 is closed. At this time the transmitter buffer does not have any excitation because the power to the oscillator screen is off. As relay #2 closes the contact also closes the antenna coax relay, thus making certain that the antenna is closed to the transmitter and not going into the antenna coil of the receiver. As the antenna relay closes the auxiliary contacts on the outside of it close and thus open the receiver gain control inserting an external volume control which is set so that the signal can be monitored at a reduced volume. Again as relay #2 closed it also applied power and closed relay #3 with a delay of about one second. This time is controlled by the values of R15 and C6. When RY3 is closed, R-13 discharges the condenser so that on opening there will be no delay but a fast relay action. This delay of relay #3 in closing insures that the antenna relay is closed before the power is applied through its contacts for the *vfo* and buffer screens.

We now have vacuum tube keying, a reduced monitoring signal, the *vfo* is off during receiving and the antenna relay comes on first. In the exciter shown, the 2E26 is protected by the internal resistance of the keyer tube when the excitation is off.

This system can be tied into another transmitter if only one coax relay is available. Figure 3 explains how this is done. A separate

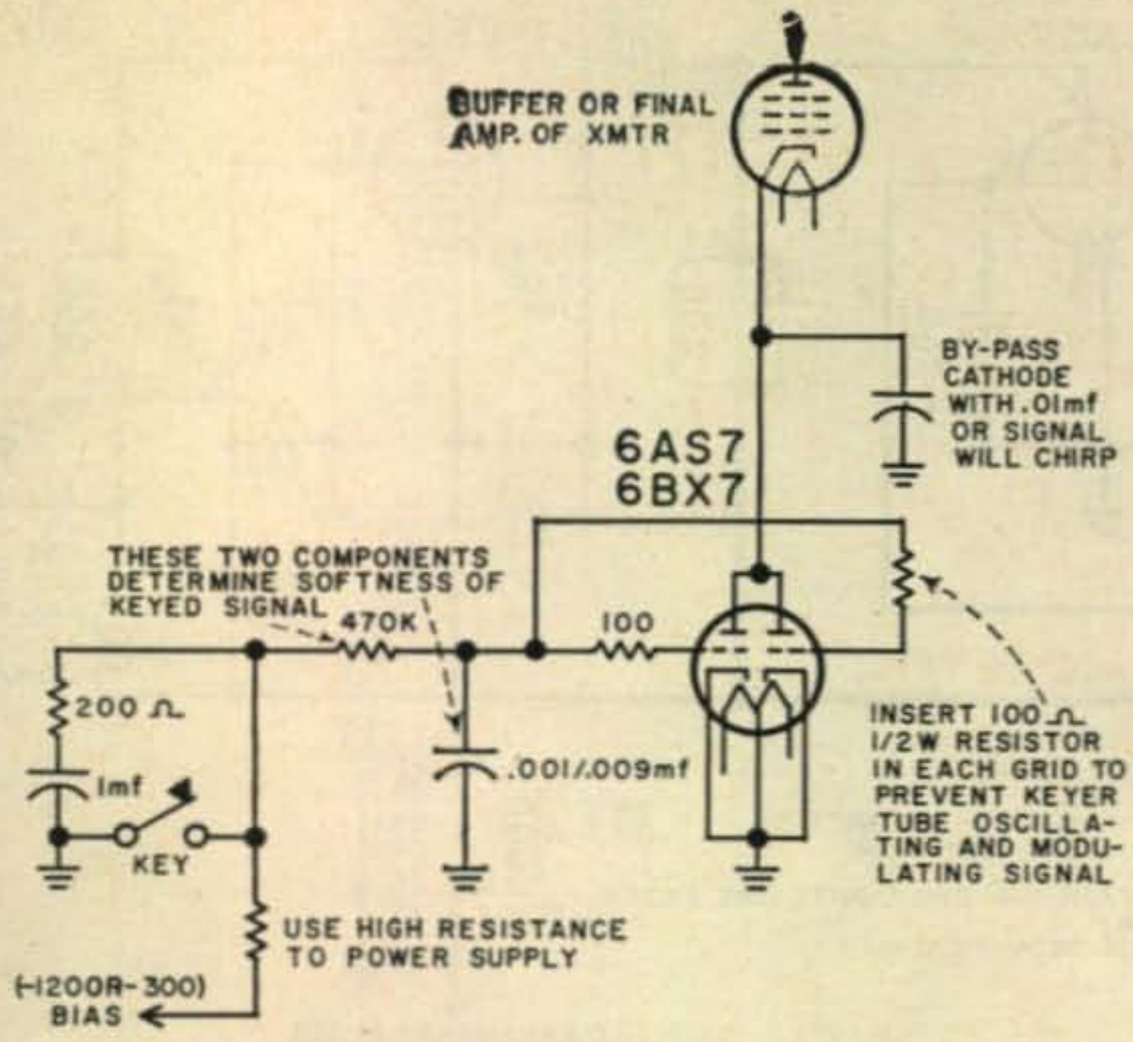


Fig. 1—Basic vacuum tube keying circuit. If a 6A57 is used it can handle 250 ma.

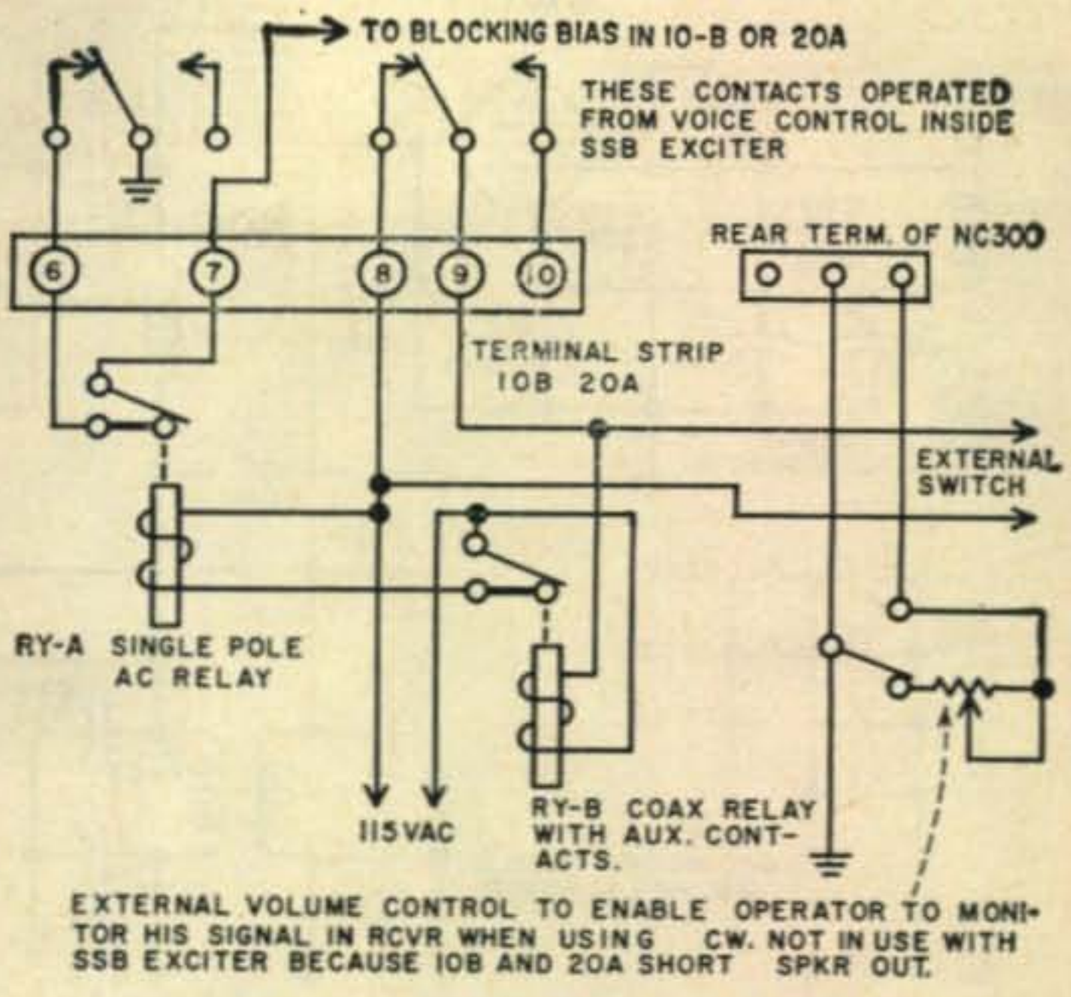


Fig. 3—Circuit for operating with the 10B and 20A SSB units.

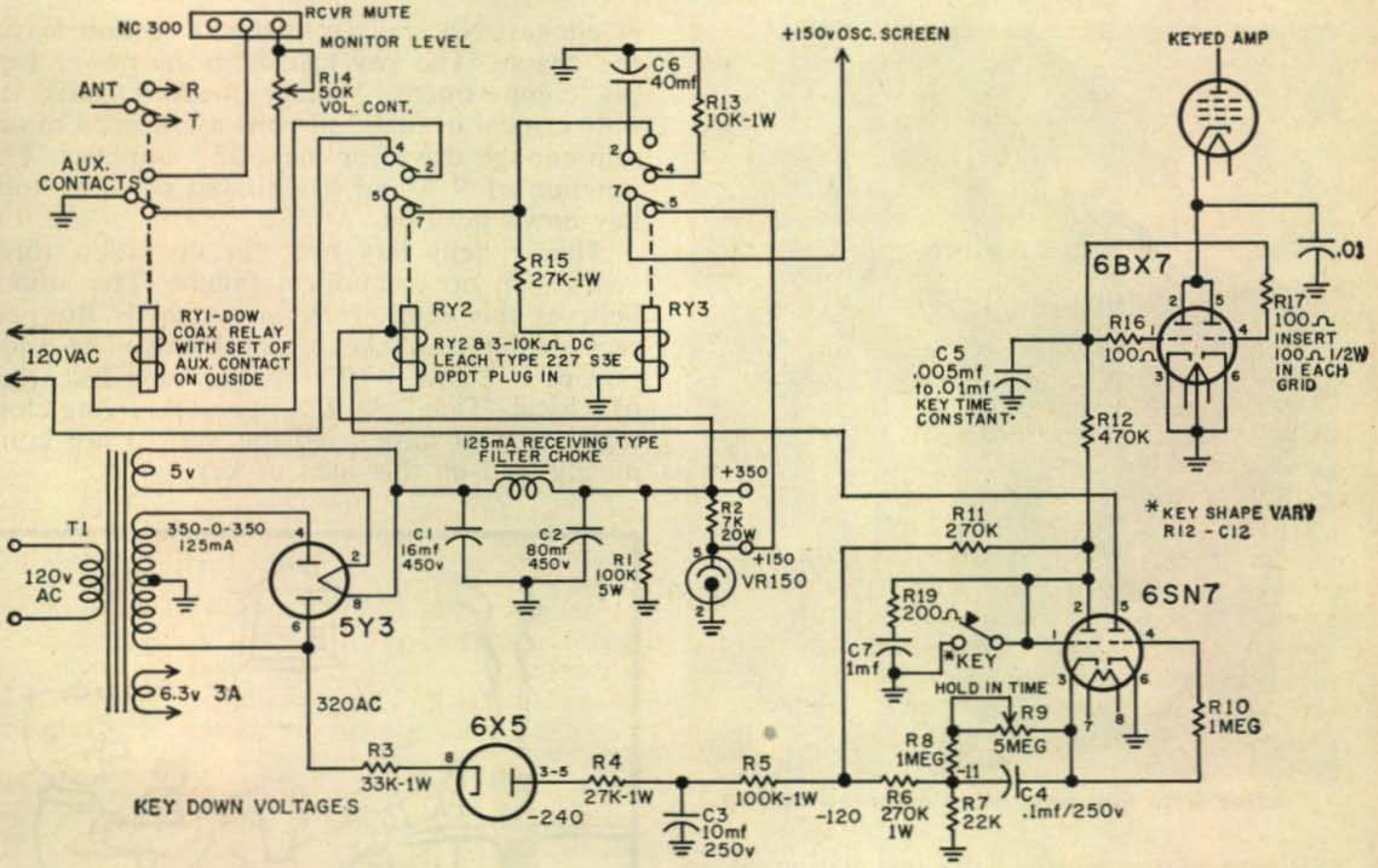
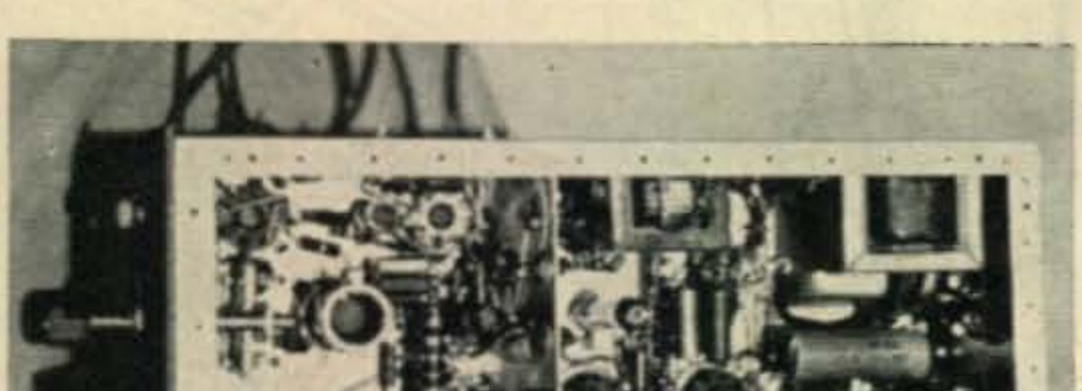


Fig. 2—Complete circuit of the vacuum tube keyer and break-in circuit used to control the vfo shown in fig. 4.



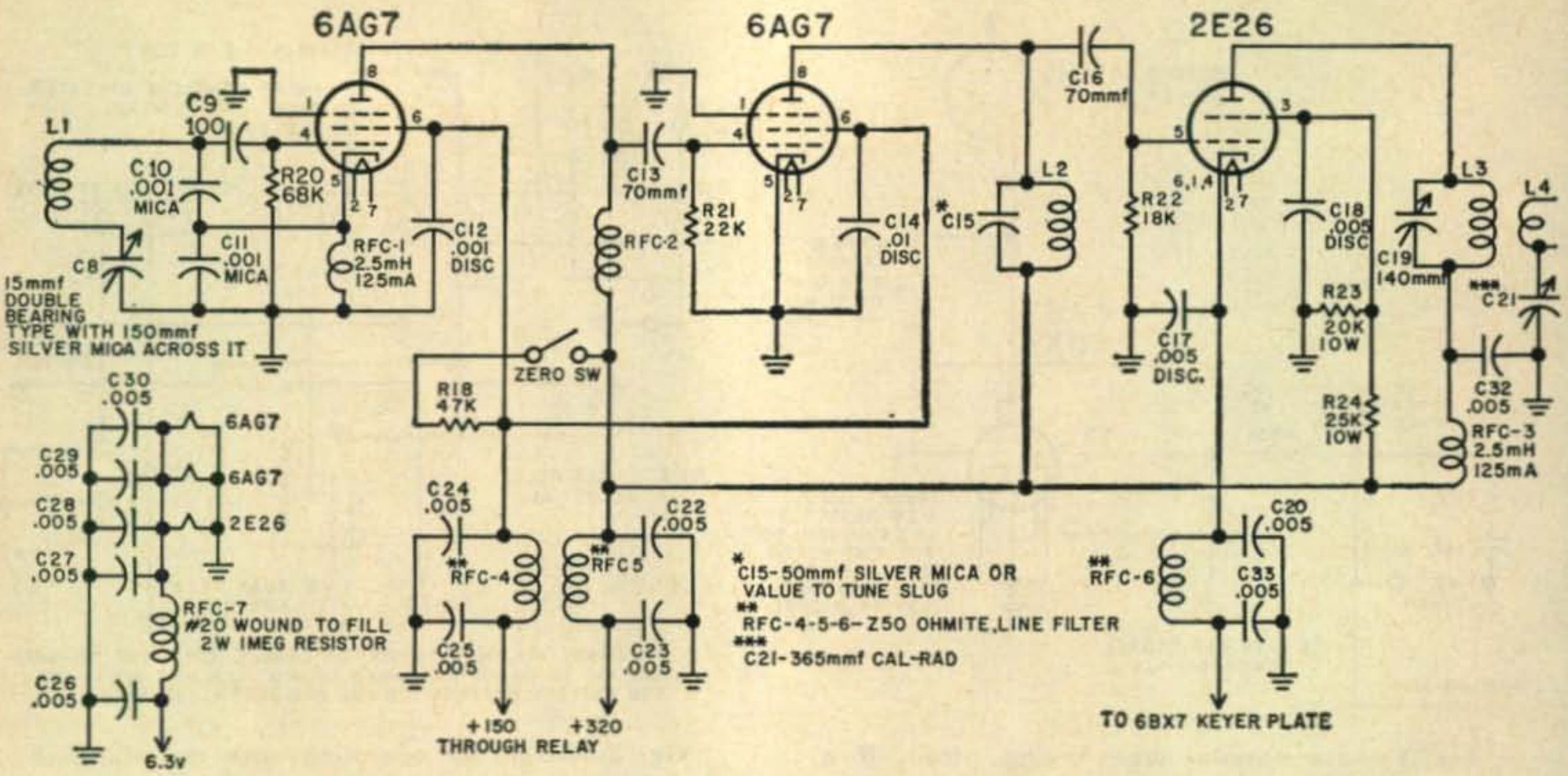
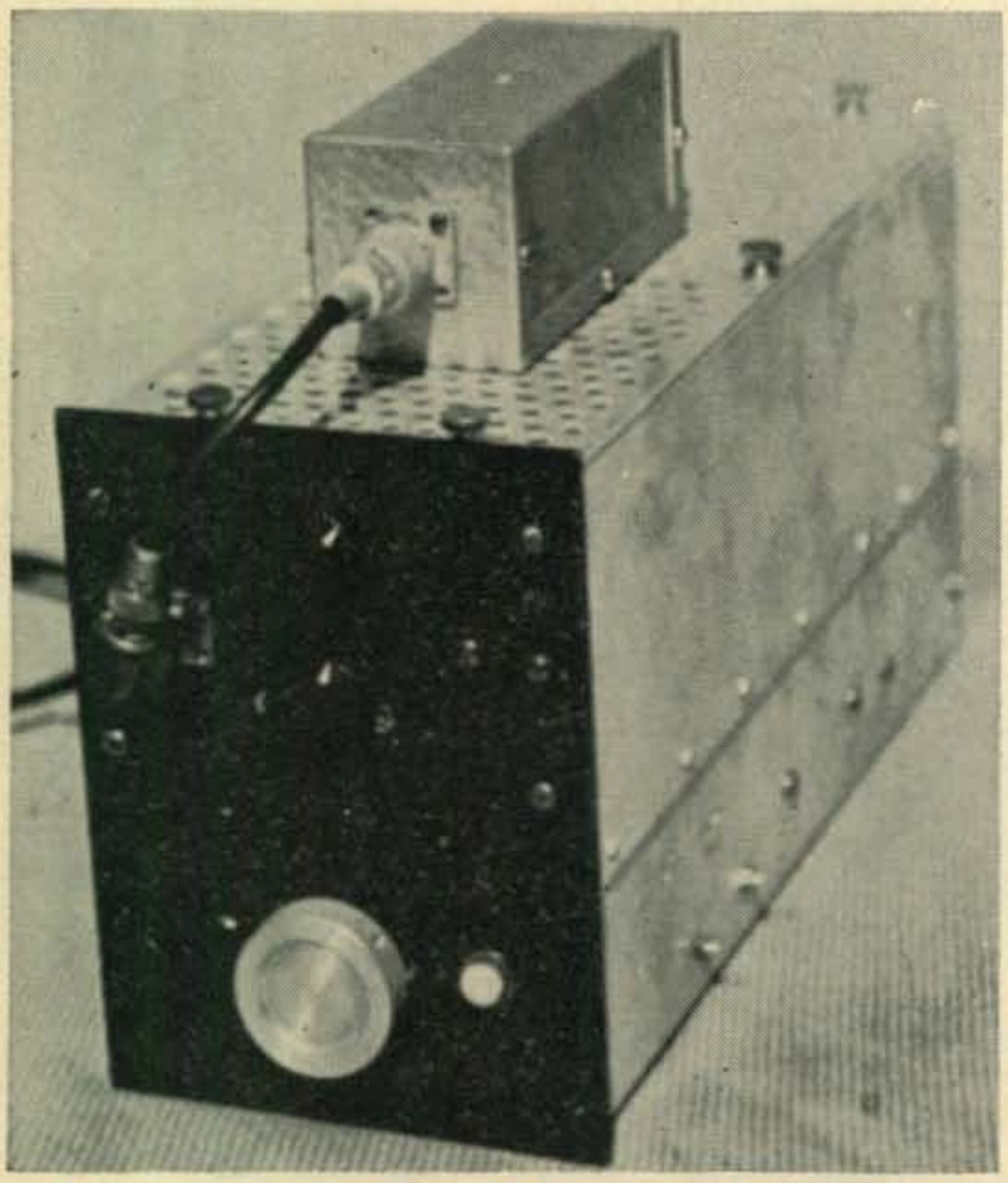


Fig. 4—A suitable exciter that may be used in conjunction with the keyer and break-in unit of fig. 2.



Exciter with low pass filter mounted on top.

SSB transmitter required the installation of an additional relay for further delay as shown in fig. 3. To prevent the arm of the coax relay from becoming hot before it hits the antenna the coax relay closes and energizes RY-A which then fires the exciter.

The complete system is shown and all or part of it may be used.

The *vfo* indicated in fig. 4 has enough output to drive a 4-250 with 15 *ma* grid drive. A harmonicar TVI filter was installed on top of the exciter to reduce any harmonics driving the final amplifier. All leads coming out from the *rf* section of the exciter are shielded and filtered with disk condensers and Ohmite Z50 *rf* chokes. No lead from the *rf* section leaves the chassis. The key lead is in the power supply compartment. Voltage measurements are only critical in that 320 volts are needed to obtain enough drive for the 4-250 amplifier. The junction of R-7 and R-6 should be —11 volts key down position.

This system has been in operation three years with no component failure. The author believes this semi-break in system is the perfect answer to all keying problems. The addition of C-7 and R-19 eliminates any last trace of a local "Tick." All DX operators living close together who have tried the system are completely sold on this idea of keying. ■

Organizing And Operating An Emergency Net

Florence V. Collins, W3DBN
James M. Collins, W3DBL

Box 116
Landenberg, Penna.

This article is based on the experience of the authors in the organization of and operation in the Chester County Emergency Net. The CCEN has been in operation for two years; has grown in membership from the four original members to the thirty some now on the roll; has experienced the usual difficulty in convincing the local disaster relief organizations of the merits of the net; and finally has assisted in five emergencies—three minor floods, a drowning, and a severe snowstorm. This article was not written with the intention of stipulating how emergency nets *must* be organized and *must* be run. Local conditions have to determine this. Rather, it is an account of lessons learned by this net, written with the idea that your group might profit from the experience of the CCEN.

Organization

There are only two things necessary to start an emergency net. First, there must be a group of amateurs interested in emergency communications and willing to check into a regular net. Second, there must be an amateur willing to serve as net control station, preferably someone with equipment capable of hearing and being heard over the entire area the net intends to cover. The number of stations checking in at first is not important. Two or three are quite sufficient. If you wait until you have a dozen or more interested people, the net may never get going. After you have become organized and in operation for a while, the number of stations checking in will increase rapidly.

The next step is to select a time and frequency for regular net drills. A drill once a week is usually sufficient to keep interest and training sustained without being too much of a drag on the participants' time. The time and frequency selected should be chosen with care so as not to conflict with any other nets already in operation. At first, it may be well to select a frequency for which surplus crystals can be obtained, particularly if you are operating on the *vhf* bands. This will net you many more new members. The band chosen may depend somewhat on the bands usually worked by people in your area but thought must be given to the practicality of the band for emergency coverage at any time under adverse conditions. Heavy QRM, erratic skip, insufficient coverage of the area are very difficult to cope with during an emergency. The Chester County Emergency Net has found six meters to be very good in all these respects. A one hundred watt station with a halo antenna can be copied all over the 760 square miles of hilly terrain that makes up Chester County, Pennsylvania.

After selecting a name for your net, you are now ready to go into operation.

Operation of Net Drills

The formality of net operation depends somewhat on the size of the net. With a small group, there may be an informal ragchew session following net business but with a large group it is usually necessary to maintain formal net procedure even during a comment period. It is well to use directed net procedure for any emergency net as this is the procedure that must be used during actual emergency operation. A directed net simply means that *no* transmissions are made except at the direction of the net control station. Stations wishing to break into the net may do so only when the NCS stands by for breakers, unless, of course, they have emergency traffic. A definite prologue, stating the name of the net, the type of net unless this is specified in the name, and an invitation for anyone listening to check in, should be used. The roll call usually follows the prologue. Care should be taken by the net control to call the roll as quickly as possible. Each station should indicate when called whether or not he has any traffic but should make no further comments unless they are planning to check out immediately. At the end of roll call and frequently throughout the remainder of the net, NCS should stand by for breakers. There is nothing more maddening than trying to get into a net for twenty or thirty minutes and not being able to. This drives many good prospective members away. An excellent method of training a good NCS is to establish several alternate control stations and allow them to run the net occasionally. The NCS then has an opportunity to see things from the other side of the fence.

An emergency net that allows members merely to check in and listen perhaps to a few announcements usually doesn't last very long. All hams like to talk, and those interested in emergency communications are no excep-

tion. After roll call and announcements and the handling of any traffic or other business, there should be a comment period, with one or two rounds of transmissions from the stations checked in. NCS should also try to have some business for the net or at least some topic, more or less controversial, for net discussion. This keeps net interest up.

As soon as you have a working size net established, NCS or a volunteer should prepare a questionnaire to be filled out by all net members. This should include, besides the obvious name, call, address and phone number, such information as: place of business and phone number; hours worked; whether the amateur will be paid for time lost from work due to emergency operation; the type of equipment owned; whether he is or can be mobile or portable; whether he has a 6 or 12 volt car; and the type of license he holds. When this information has been collected, your net is now ready to offer its services to some local organization interested in emergency service.

Affiliation

There are many organizations throughout the country that could use emergency communications if the program is presented to them in the right way. The committee approaching the organization should be prepared to explain how many members there are in the net, exactly what services they can perform, and when they will be available. If approaching a group that already has some form of radio communication, such as a fire company or police department, much diplomacy should be used. These boys are usually pretty proud of their radio equipment and will not take kindly to the idea that it is inadequate either in scope or in license for anything they may wish to do with it. It should be stressed that the net wishes to serve merely as an auxiliary source of emergency communication; that the term "amateur" connotes someone who works without remuneration rather than someone who is playing at something he knows very little about, and that the net is not asking for money or equipment, merely a chance to be of service to the people of the area.

What group to approach first depends very much on what groups are active in your area. The Red Cross, the Salvation Army, the local or state police, and local Fire Companies are obvious choices. Civil Defense is for many reaosns one of the most practical groups with which to affiliate. But whatever group you select or whatever group accepts your services, be sure to keep the affiliation very loose. Even though the group may buy equipment for the net, provide publicity and send out net literature and bulletins, you should remember that you are first and foremost a group of radio amateurs devoted solely to emergency communications. Unless your independence is preserved from the start, you may find yourself taking orders that conflict with your original principles.

If Civil Defense is at all active in your area, or even if it isn't, it should be one of the organizations investigated very closely. Federal regulations have designated Civil Defense as the coordinator for all relief activities not only in time of war but also during natural disasters. The FCC has recognized this and accordingly established the Radio Amateur Civil Emergency Service (RACES) as a Civil Defense amateur radio service. A RACES affiliated net has a number of advantages and also a number of more or less stringent requirements. The first necessity is the appointment of a Radio Officer for the area or the stirring up or replacement of one already appointed but inactive. Next is the writing and filing of an area RACES plan, describing how the net will function during an emergency. After these two things have been carried out, the net may function as a RACES net during any emergency that calls Civil Defense into action and at any other time that the Radio Officer sees fit to call a training exercise or drill. Advantages of this are that tactical or numerical calls may be used, saving much valuable time; log keeping during an emergency may be kept at a minimum by the NCS or even dispensed with entirely if it will interfere with the efficient handling of emergency traffic; mobile stations during an emergency do not have to indicate their location or the fact that they are mobile and do not have to keep a log; and that third class commercial operators or those who hold a restricted operator's permit may operate the amateur stations, provided that they do not make any adjustments to the transmitter. This last point is a somewhat controversial one to many amateurs but just wait until you get into a ful-fledged emergency. After six hours or more of continuous operating and talking you'll be mighty glad to have someone take over for a while, and sometimes there aren't enough hams to go around. These restricted operators should be well trained in emergency radio operation, however.

If Civil Defense in your area isn't doing anything, don't get discouraged. If you feel that this is the place where your group will do the most good, select a Radio Officer, file a RACES plan and get started. In many cases, people interested in other phases of rescue work and disaster services will join the organization too after hearing of one active division.

Now that you are organized, affiliated with a disaster service organization, all you have to do is to keep in training and wait for the next emergency.

Emergency Operation

There are no hard and fast rules for emergency operation. It all depends on the type of emergency and you can count on each one being different and presenting a different type of

problem. The only thing certain is that there will be lots of people running in several different directions at once and much resulting confusion. Your net should be composed of hams who are used to working together, who are level headed and can think on their feet even though "out on their feet."

The NCS should be established at the focal point of relief operations, preferably in a room away from most of the confusion. This room should contain the station, the operator and one or two runners at the most. All extra operators or sidewalk superintendents should be kept out.

The person who usually acts as Net Control for your net should assume the responsibility of keeping track, insofar as is humanly possible, of all phases of the situation. He must maintain net discipline and establish an on-off schedule for the operators and see that it is followed if at all possible. Sleepy operators aren't accurate traffic handlers. He should also establish liaison with amateurs on other bands to get rid of welfare traffic and should establish traffic priority as indicated by the general situation. He or any other operators at the base of operations or out in the field should be careful to give no information to the press until it has been cleared by an official of the organization for whom you are working.

Net frequency or the primary channel should be kept clear for stations to call NCS or for him to call them. Contacts between net members should be referred to another frequency and welfare traffic should also be handled on an alternate frequency unless that is the only type of message the net is handling. Stations in the net should keep their transmissions short with brief pauses between transmissions to allow breakers with emergency traffic to get in. NCS should acknowledge all breakers as received and give them a chance to state their business. Stations should always listen before transmitting. If absolutely necessary to break before NCS calls for breakers, the "blip" system should be used. Flipping your transmit switch three times indicates that you wish to break in. Two answering "blips" indicate someone in the net has heard you and will notify NCS. Four "blips" are used if you have emergency traffic. When you are identified be sure to identify your traffic as emergency or non-emergency.

During a lull (and you will get an occasional lull even in the most dire emergency) NCS should identify the net, the type of emergency and the type of help needed at the time. This discourages the merely curious from calling in on the frequency.

When making a transmission, do not repeat information unless requested to do so. Keep your transmissions clear and concise. If calling in with requests for equipment, etc., be sure to obtain the name of the official who requested it. Formal message form may, in fact must be dispensed with to facilitate traffic handling but each message should indicate the time (in 24 hour time) and date, the name and presumed location of the addressee, the amateur station of origin and the name of the sender. Discourage traffic sent to a specific individual when there is no title given or no way to locate him or his alternate. When you accept a message, indicate to the sender the approximate time lag in delivery. Don't use local people's names to indicate location. People at headquarters may not know the same folks you do.

Above all, don't be afraid of taking responsibility. Under severe conditions you may find yourself assisting to direct traffic, marking blocked roads and several other things besides operating the rig. For this reason, it is well never to send out a mobile with a single operator, if at all possible. Ideally each mobile should carry three people all capable of driving—two operators and one runner. *Never* leave a mobile station unattended while that station is on the air. And *never* leave the air without first notifying NCS.

It is very helpful to have some set form for relaying messages about weather and similar conditions. For example:

Streams—height, clarity, debris
Roads—open, surface conditions, traffic

Even if some operators cannot be mobile or cannot get down to NCS to assist, they should still be on the air. NCS may often need to call on a fixed station to act as a relay for one of the mobiles or may need to call for help from a more powerful station in clearing the frequency of QRM. He should never hesitate to do this.

As the emergency goes on and operators get little to eat and less sleep, tempers may become a bit frayed. Arguments over minor things may develop. It calls for all the emotional maturity one can summon to keep calm, cool and collected. But after it is all over and you are caught up on your sleep, it is a very satisfying feeling to know that in a small way you have rendered a vital service to your community.

Activities Other Than Emergencies

Fortunately or unfortunately, emergencies don't happen every week or even every month. It is necessary to sustain interest and keep the net members on their toes in between times when they are called out. That "esprit de corps" the net developed during the last emergency shouldn't be lost. A number of devices are useful. Field Day, various contests should be entered, preferably from a "field location" for practice in working together using emergency power. Maybe Mother Nature will provide some inclement weather to further simulate emergency conditions! The net should also volunteer to assist in parades and fund raising drives. This is excellent training. A number of local

[*Continued on page* 152]

A Signal Generator For Alignment Of Low Frequency IF Amplifiers

Richard A. Genaille, K4ZGM
719 Quarterstaff Road
Winston-Salem, North Carolina

Low frequency if amplifiers for improved receiver selectivity have been popular with the amateur fraternity for some time. The present popularity of the low frequency *if*'s can probably be attributed to the war surplus BC-453 Command Receiver which provided a sharp *if* amplifier at 85 *kc*. Many of the "hams" who searched for improved receiver selectivity discovered that the BC-453, when coupled to the tail end of their receiver's 455 *kc* or 465 *kc if* amplifier, provided tremendous help for the separation of phone signals and backing up of crystal filters for improved cw reception. The author made use of the BC-453 and its 85 *kc if* in conjunction with an inexpensive commercial receiver for a number of years and enjoyed receiver selectivity comparable to that obtained with more expensive receivers. The present receiver, a Hallicrafter SX-96, was purchased when first put on the market because of the author's partiality toward the low frequency 50.5 *kc* second *if* amplifier used in this receiver. Super-selective *if* amplifiers, using 50 *kc if*'s, are described in detail in several of the popular amateur radio handbooks. It is interesting to note that the excellent kit form receiver, the Heath Company "Mohawk," which has been described and evaluated in several of the popular radio publications, makes use of a second intermediate frequency of 50 *kc*.

In order that the maximum capabilities of any *if* amplifier be realized, the *if*'s must be adjusted to provide the optimum, desirable selectivity curve that can be obtained with the particular *if* transformer used. The effectiveness of the selectable sideband feature of some of the newer, commercially available "ham" receivers is greatly dependent upon the care with which the *if* alignment is performed. Unfortunately, the problem of aligning receivers and selective *if* amplifiers using a low frequency *if* can become somewhat difficult if one does not possess a wide range audio generator or a radio frequency signal generator capable of covering the range of from 50 *kc* through 100 *kc*. Wide range audio generators are not usually encountered in the average "ham" station since the usual modulation and audio checks of most amateur transmitters can be accomplished by means of a limited range audio oscillator covering the speech frequency range. Many amateur stations are equipped with *rf* signal generators which provide signals from approximately 100 *kc* and up. A check of the various catalogs and manufacturer's brochures covering test equipment revealed that the lower frequency limit of the majority of moderately priced kits or factory built units is around 100 *kc*. Several units tuned from 85 *kc* up and one generator had 75 *kc* as its lowest frequency. Modification of *rf* signal generators to extend the range lower is not usually advisable or convenient.

The purpose of this article is to describe the construction of a stable, low frequency signal generator capable of producing signals in the range from 45 *kc* to 120 *kc* which can be used for performing the alignment of the popular low frequency *if* amplifiers.

Circuit

Basically, the circuit as shown in fig. 1 consists of three stages; a variable frequency oscillator, cathode follower output and power supply. The constructor need not include the power supply if an external source of power

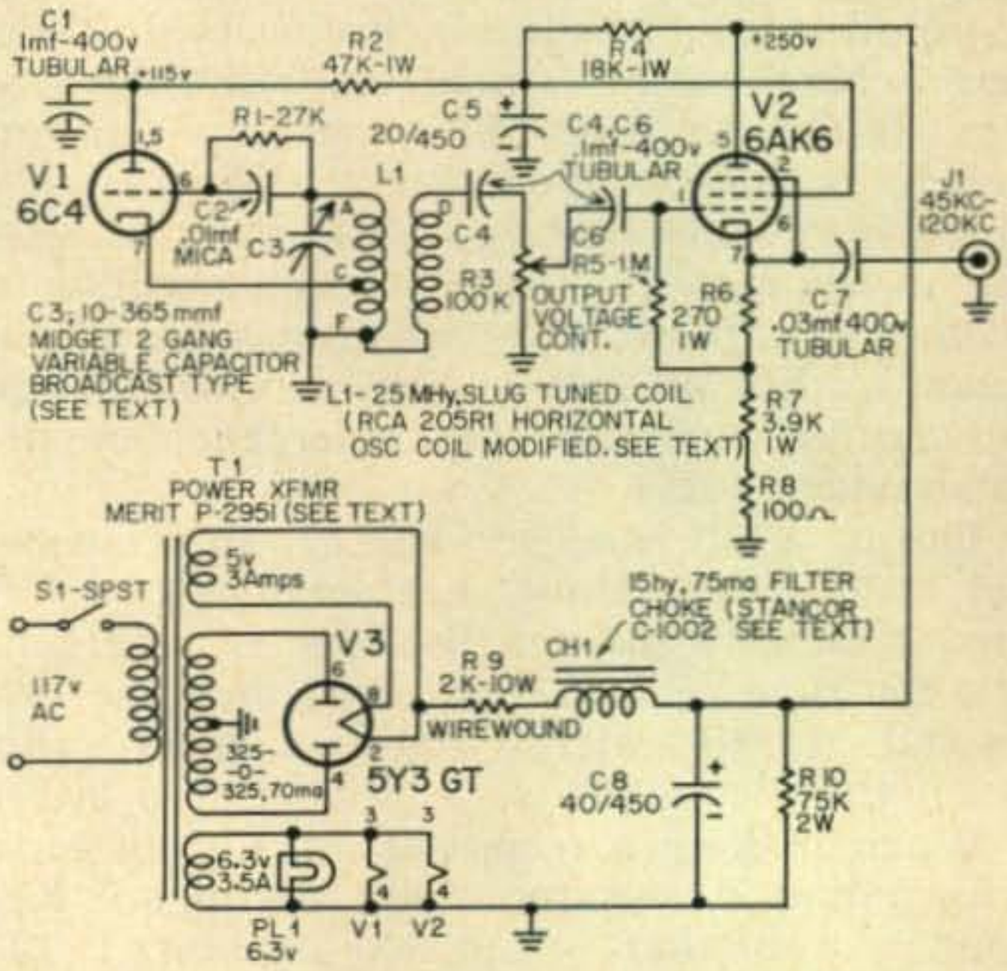


Fig. 1—Circuit of a low frequency signal generator for use in alignment of low frequency if's.

is available. The power supply is included here simply because the author found sufficient material in raiding the junk-box to make the signal generator a completely self-contained unit. This is quite obvious since the capabilities of the power supply components shown far exceed the demand of the oscillator and cathode follower combined. A source of 250 volts *dc* at 16 milliamperes and 6.3 volts *ac* at 0.3 amperes will satisfy the oscillator-cathode follower combination.

The oscillator consists of a 6C4 triode in a simple Hartley type circuit. The plate voltage on the oscillator tube, V1, is kept at a reasonably low value to minimize currents through the oscillator coil L1 and subsequent drift of the oscillator frequency due to coil heating. The 115 volts *dc* applied to the oscillator plate is sufficient to maintain oscillation and insure adequate output. The only component in the oscillator circuit which might be considered unusual is the coil, L1, which is a modified RCA 205R1 Horizontal Oscillator Coil originally designed for television receiver application. The electrical and mechanical modification procedure, which is quite simple, is described in detail under "Construction."

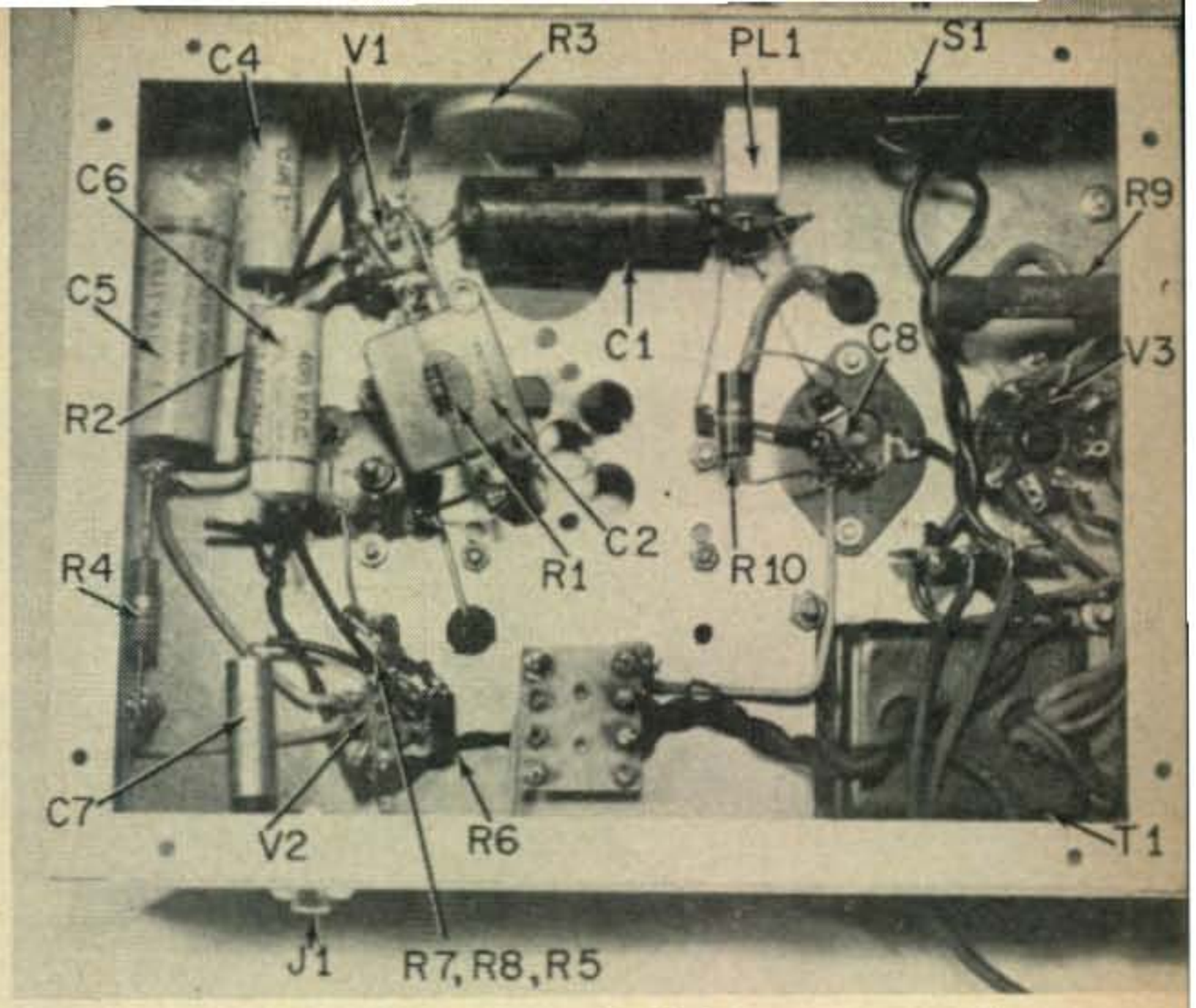
A 6AK6 is used in a cathode follower stage to provide a stable, isolated, low impedance output. The cathode follower circuit is very straightforward. Output is controlled by the "Output Voltage" control, R3, located in the grid circuit of cathode follower tube V2. Pulling of the oscillator frequency due to the external load being connected to the signal generator output is eliminated by the buffer action of this stage.

The power supply stage, which may or may not be included as the builder desires, consists of a full wave rectifier, V3, feeding a choke input type filter. The components indicated in fig. 1 are heavier duty than required by the signal generator circuit proper and it is recommended that the builder consider the use of a power transformer and filter choke of sufficient capacity to provide the voltages and current ratings mentioned previously. The rectifier tube used in the power supply is a 5Y3GT.

No gimmicks were required to obtain satisfactory operation of the signal generator and no large amount of time was spent in parts placement. The usual variable frequency oscillator construction practices were applied in order to achieve reasonable oscillator stability. The unit operated satisfactorily, throughout its entire range, immediately upon application of plate and heater voltages.

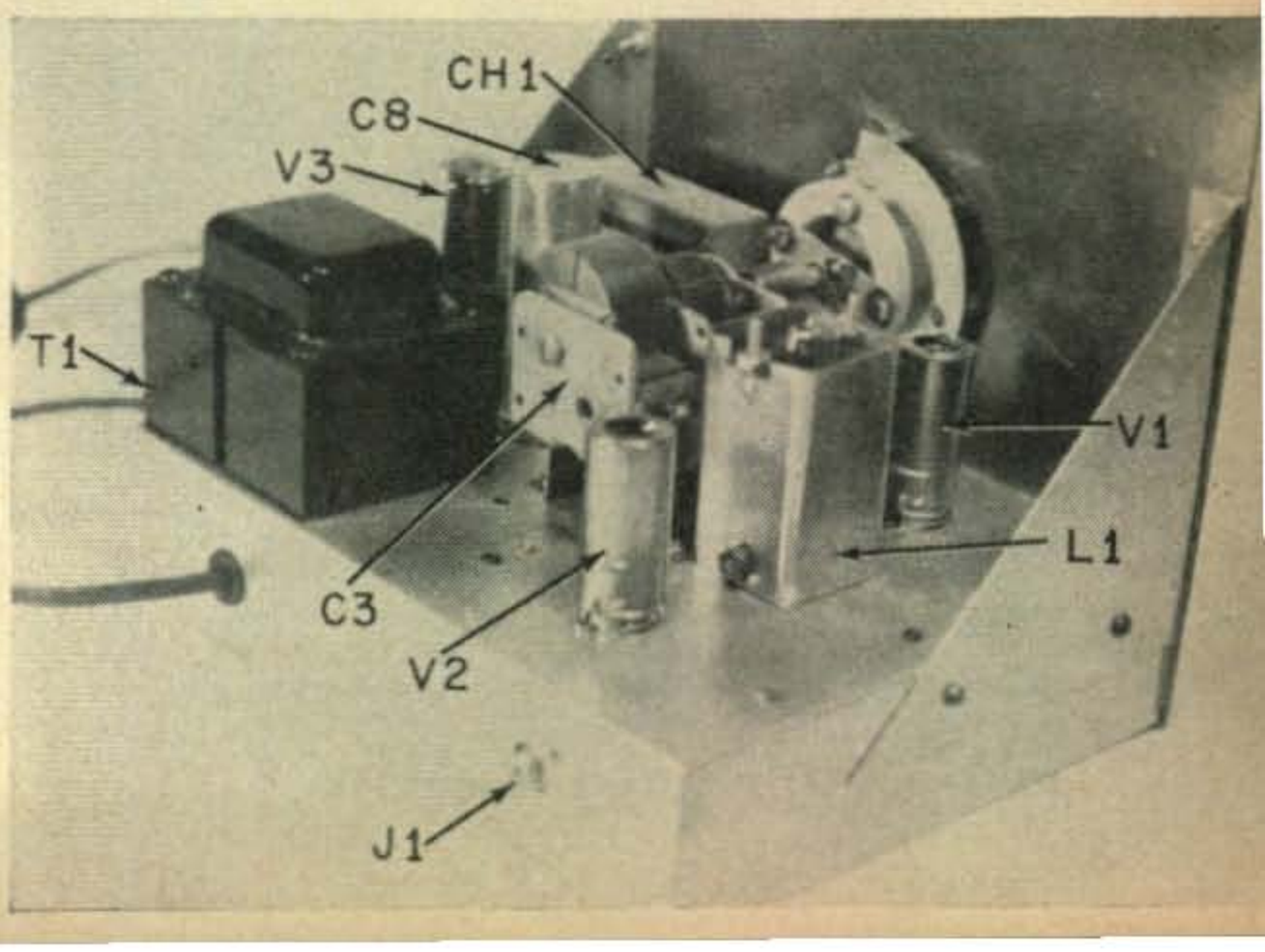
Construction

The unit was constructed on a standard 2 by 7 by 9 inch steel chassis. The layout of major components is shown in the photos. The panel, which is not of standard size, was fabricated by the author to accommodate the particular dial used. Since the oscillator tuning



capacitor, C3, and its control dial are mounted on two different surfaces, it was deemed advisable to provide small side brackets for additional front panel rigidity. The brackets help to reduce the slight front panel flexing which occurs if a little pressure is placed upon the tuning dial. This reduces the subsequent slight frequency jump. This arrangement satisfied the situation in the author's unit. A photo of the underside of the chassis shows the placement of various components and wiring. Here again, major components have been identified as an aid to those interested in constructing the generator.

Before the oscillator coil, L1, is mounted on the chassis, two very simple modifications must be performed. One modification is mechanical in nature and makes it possible for the coil to be mounted so that the soldering lugs protrude beneath the chassis. Having the soldering lugs accessible beneath the chassis makes for convenience and neatness in wiring the coil. The second modification is electrical in nature and arranges the coil connections so as to be suitable for use in a Hartley type oscillator circuit. The coil is a readily available TV component, the RCA 205R1 Horizontal Oscillator Coil. As purchased, the coil has the soldering lugs and slug adjusting screw at the top of the can. To make the mechanical modification, the coil should first be carefully removed from its shield can. As shown in fig. 2, two small brackets or a pair of spade bolts should be fastened to the can on the same



side but at opposite ends of the can from the existing mounting bolts. By using flat-head 6-32 machine screws with the head of the screw on the inside of the can, to fasten the brackets or

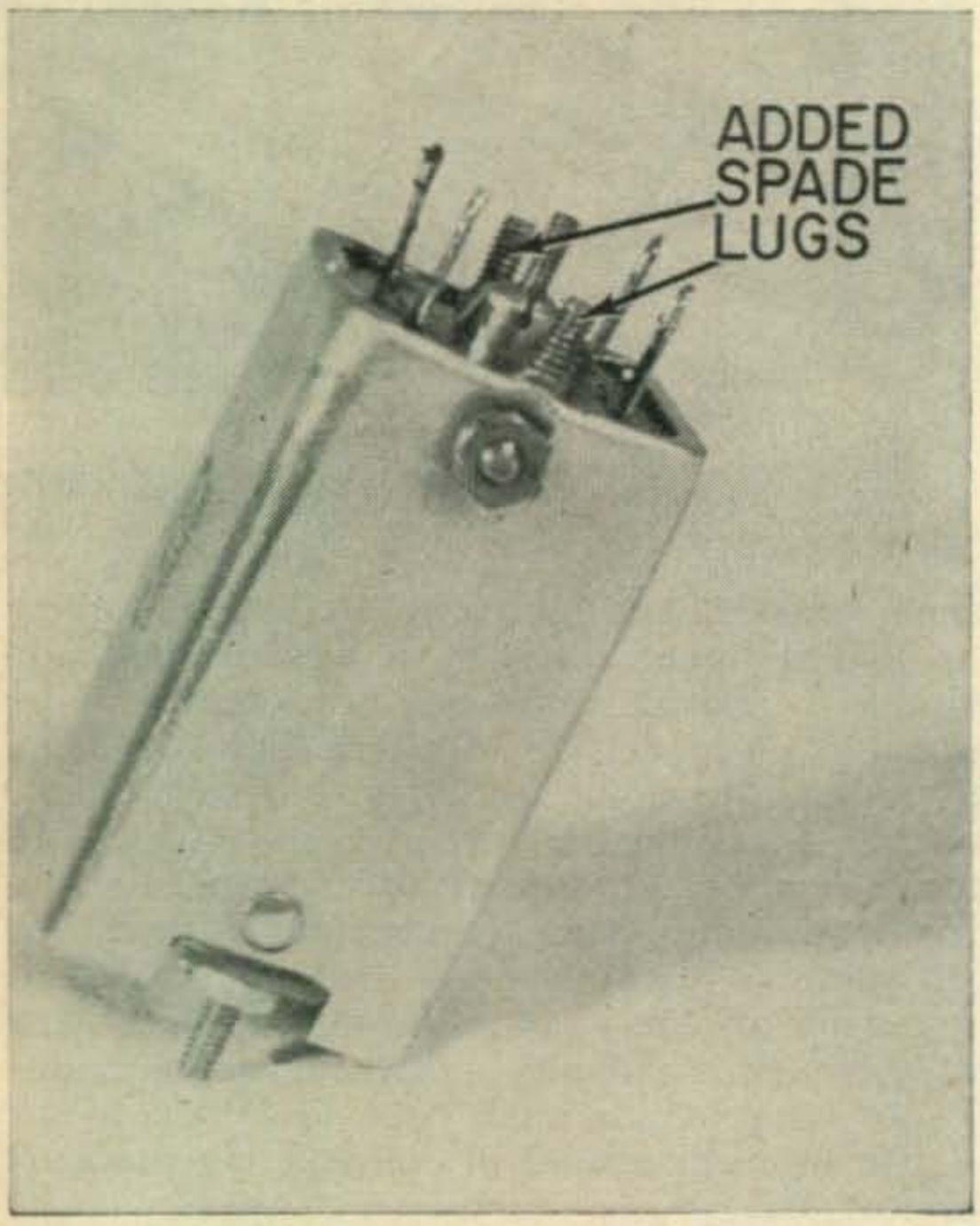


Fig. 2—Oscillator coil can modification.

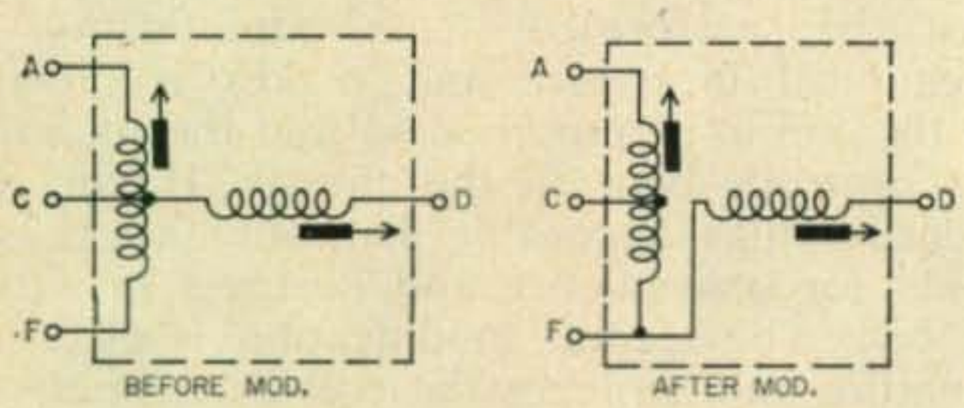
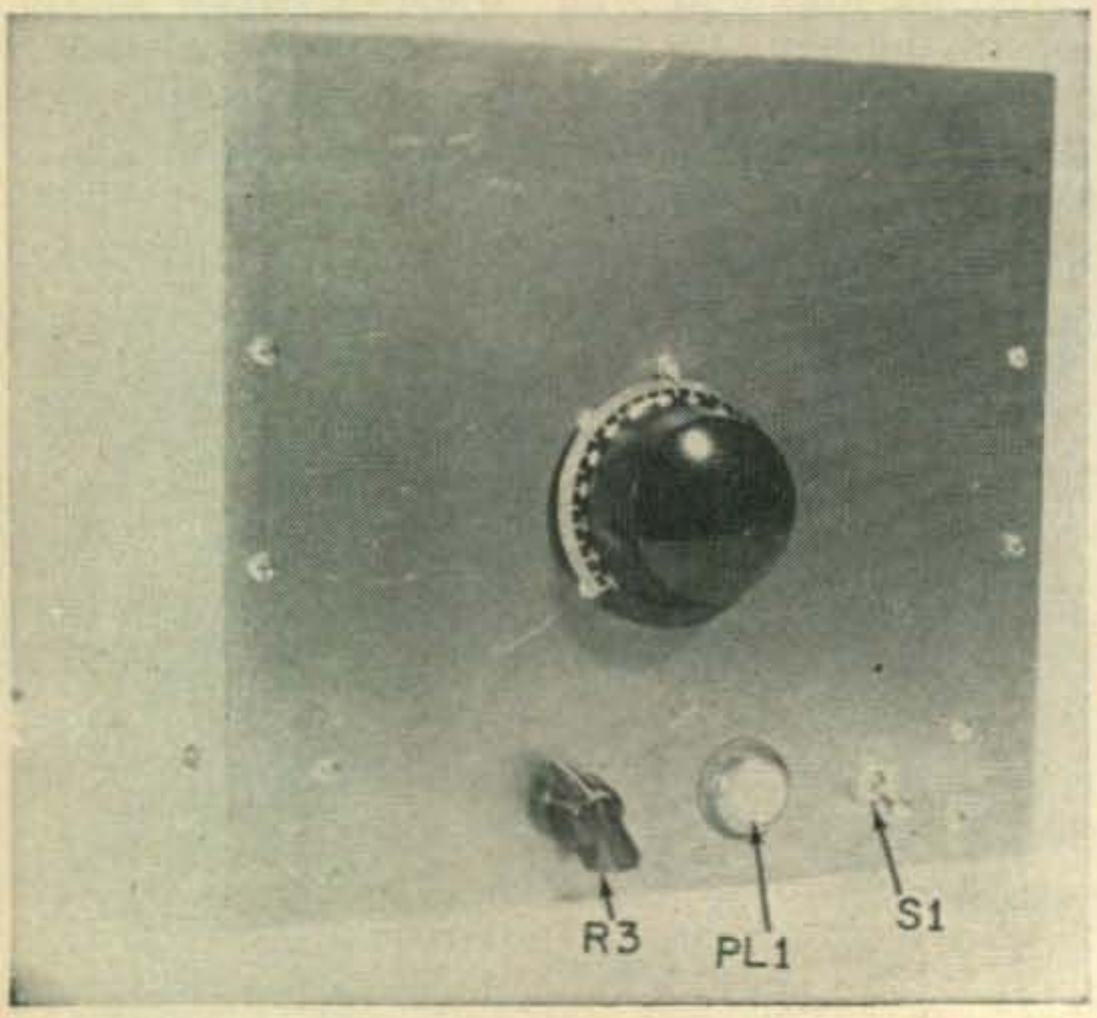


Fig. 3—Directions for modifying the RCA 205RI coil for use in a Hartley oscillator circuit.



spade bolts, it will be possible to slide the coil back to its original position inside of the shield can. Before reassembly, however, there is an uncomplicated electrical modification to be made to the coil itself. The original connections of the two windings to the soldering lugs are shown in fig. 3A. The center tap of winding A-F is connected to soldering lug C as is the opposite end of the winding which terminates on soldering lug D. The C end of the winding which terminates on lug D should be carefully unsoldered from lug C and resoldered to lug F. When electrically modified, the coil should be as shown in fig. 3B. The coil may now be reassembled in its shield can and mounted on the chassis with the soldering lugs on the down side. No further modification of the coil will be necessary.

The oscillator tuning capacitor is a standard, midget superhet 2-gang variable with only one gang used. The *rf* gang (the one with the most plates) with a capacitance range of from 10 to 365 micro-microfarads is used for tuning of the oscillator coil. This range of capacitance is sufficient to tune slightly lower than 45 *kc* and slightly higher than 120 *kc*.

The dial used on the author's unit is a National Company velvet vernier type dial which was removed from a war surplus tuning unit. It serves its purpose very nicely. One of the midget panel dials designed for use on small transmitters, receivers or test equipment and manufactured by the Millen or National Companies would serve admirably for signal generator tuning.

Calibration

The four major frequencies mentioned previously which will be found to be quite useful and can be generated by this unit are 50 *kc*, 50.5 *kc*, 85 *kc* and 100 *kc*. With the exception of 100 *kc*, which is most often used for amateur band-edge spotting, all of these frequencies find wide usage in low frequency *if* amplifiers. Equipments making use of those low frequency *if*'s have already been described. The calibration procedure which follows will show how the dial settings for these particular frequencies and others may be established. The procedure should be studied carefully before starting. While it may appear somewhat complicated and lengthy, it will soon become apparent to the builder that it is actually as easy as tuning in stations on a regular broadcast receiver.

There are several ways in which the signal generator dial may be calibrated for the aforementioned frequencies or any other frequency within the 45 *kc* to 120 *kc* limits of the generator. Two of these methods will be described in detail. The first method makes use of a reasonably sensitive broadcast receiver and a 100 *kc* crystal oscillator while the alternate requires only the broadcast receiver. Since the calibration is comparatively easy, the author

Fundamental Frequency	Usable Harmonics Falling Within Broadcast Band	Broadcast Band Assignments Corresponding To Usable Harmonics
45-kc.	12th and every even harmonic to the 34th	540-kc. and every 90-kc. to 1530-kc.
50-kc.	11th thru 32nd	550, 600, 650 and every 50-kc. to 1600-kc.
50.5-kc.	20th	1010-kc.
55-kc.	10th and every even harmonic to the 28th	550-kc. and every 110-kc. to 1540-kc.
60-kc.	9th thru 26th	540-kc. and every 60-kc. to 1560-kc.
65-kc.	8th and every even harmonic to the 24th	520-kc. and every 130-kc. to 1560-kc.
70-kc.	8th thru 22nd	560-kc. and every 70-kc. to 1540-kc.
75-kc.	8th and every even harmonic to the 20th	600, 750, 900, 1050, 1200, 1350, 1500-kc.
80-kc.	7th thru 19th	560-kc. and every 80-kc. to 1520-kc.
85-kc.	8th and every even harmonic to the 18th	680, 850, 1020, 1190, 1360, 1530-kc.
90-kc.	6th thru 17th	540-kc. and every 90-kc. to 1530-kc.
95-kc.	6th and every even harmonic to the 16th	570, 760, 950, 1140, 1330, 1520-kc.
100-kc.	6th thru 16th	600, 700, 800, etc. to 1600-kc.
105-kc.	6th, 8th, 10th, 12th and 14th	630, 840, 1050, 1260, 1470-kc.
110-kc.	5th thru 14th	550-kc. and every 110-kc. to 1540-kc.
115-kc.	6th, 8th, 10th and 12th	690, 920, 1150, 1380-kc.
120-kc.	5th thru 13th	600-kc. and every 120-kc. to 1560-kc.

TABLE 1

prefers to re-calibrate each time the signal generator is used.

The first calibration performed after the unit has been constructed is done to establish certain dial settings for major fundamental frequencies. Before proceeding with the calibration, two thoughts should be borne in mind; first, broadcast station channel assignments are made in 10 *kc* increments across the entire broadcast band. In other words, with a reasonably sensitive receiver of moderate selectivity, it should not be difficult to detect broadcast stations every 10 *kc* in the broadcast band. The second thought is that every broadcast station must stay within plus or minus 20 cycles of its assigned carrier frequency. It can be seen that the use of broadcast stations as check points to identify the signal generator fundamental frequency through the harmonics falling within the broadcast band is entirely feasible.

Let us first calibrate with a broadcast receiver and a 100 *kc* crystal oscillator and use the step-by-step procedure that follows:

1. Turn on the 100 *kc* crystal oscillator, receiver and signal generator and allow a warm-up period of approximately 15 minutes.
2. During the warm-up period, couple the crystal oscillator and signal generator outputs to the receiver antenna input terminal. Turn the "Output Voltage" control on the signal generator to the

zero output position.

3. After the warm-up period, tune in a local or nearby broadcast station which operates on a multiple of 100 *kc* (600, 700, 800 *kc*, etc.)
4. Trim the crystal oscillator so that a 100 *kc* harmonic zero-beats with the broadcast station. With the crystal trimmed, it should be possible to obtain harmonic check points every 100 *kc* over the entire broadcast band.
5. Adjust the "Output Voltage" control on the signal generator so that it is approximately half of the way open.
6. With the receiver tuned to one of the harmonic check points provided by the crystal oscillator slowly tune the signal generator dial across its entire range. If the unit has been constructed properly a number of beats will be heard in the receiver.
7. Starting with the oscillator tuning capacitor wide open (minimum capacitance) and slowly adjusting the tuning dial to mesh the capacitor plates, adjust the dial until the first beat is heard on the receiver. To determine if this is a beat of the 100 *kc* fundamental frequency of the signal generator tune the receiver to the next higher or lower 100 *kc* harmonic check point. If no beat is obtained, the signal generator is operating on a frequency other than 100 *kc*. With the receiver still tuned to a crystal oscillator 100 *kc* harmonic check-point, continue to adjust the generator tuning dial to open the capacitor plates further. When the next beat is obtained retune the receiver to the next higher or lower 100 *kc* check point and listen for a beat. If no beat is heard, repeat the procedure until a point is reached with the signal generator tuning that will give beats with the check-points on the receiver across the entire broadcast band. No harmonic carriers of the signal generator should be picked up between the check points. If one is not certain about the origin of other signals that may appear between the 100 *kc* markers it is recommended that the "Output Voltage" control on the signal generator be turned to the zero position in order to determine the source of these signals. When the signal generator produces a signal which beats with the 100 *kc* markers only the fundamental frequency of the generator oscillator will be 100 *kc* and the dial should be so marked.

To find the 50 *kc* setting of the generator tuning dial it is only necessary to repeat step 7 until harmonics of the signal generator fall on the 100 *kc* check points with one harmonic carrier falling exactly midway between each set of check points. The setting of the tuning dial which results in this condition is the 50 *kc* setting and should be so marked. The 100 *kc* markers may also be used to establish the 75 *kc* fundamental frequency of the generator by using the 8th, 12th, 16th and 20th harmonics of the oscillator which fall on 600, 900, 1200 and 1500 kilocycles respectively. These points on the receiver dial may be determined by counting off the check points starting from one point that coincides with the frequency of a broadcast station operating on a multiple of 100 *kc*.

Unfortunately, there are no harmonics of 50.5 *kc* or 85 *kc* which will beat with 100 *kc* check points within the broadcast band so the utility of the 100 *kc* crystal oscillator for establishing the generator dial settings for 50.5 *kc* and 85 *kc* just about ends here. For this reason, the author prefers to rely entirely upon the broadcast station signals appearing across the band for all of the calibration procedure.

Alternate Calibration Method

The second method of calibration, which may be less difficult and will still produce the same results, is by the use of a fairly sensitive broadcast receiver alone. This step-by-step procedure follows:

1. Turn on the broadcast receiver and signal generator and allow approximately 15 minutes of warm-up time.
2. During the warm-up period, couple the signal generator output to the receiver antenna input terminal. Turn the generator "Output Voltage" control to the zero output position.
3. After the warm-up, tune the receiver across the broadcast band and select two reasonably strong stations that are located on frequencies 100 *kc* apart, the frequencies being multiples of 100 *kc*. Tune the receiver to one of the two stations selected. (At the author's location, Winston-Salem, N. C., WSJS operates on 600 *kc* while WLW in Cincinnati is received with an excellent signal on 700 *kc*.)
4. Starting with the signal generator oscillator tuning capacitor plates completely opened, tune lower in frequency until a beat is obtained with the station tuned in on the broadcast receiver. Tune the receiver to the frequency of the other station and listen for another beat. If no beat is heard, the signal generator should be tuned lower in frequency until the next beat is heard with one of the two broadcast stations. Check the other station. The 100 *kc* fundamental frequency of the signal generator will

[*Continued on page* 150]

Modification for 6AG7 GG Amplifiers

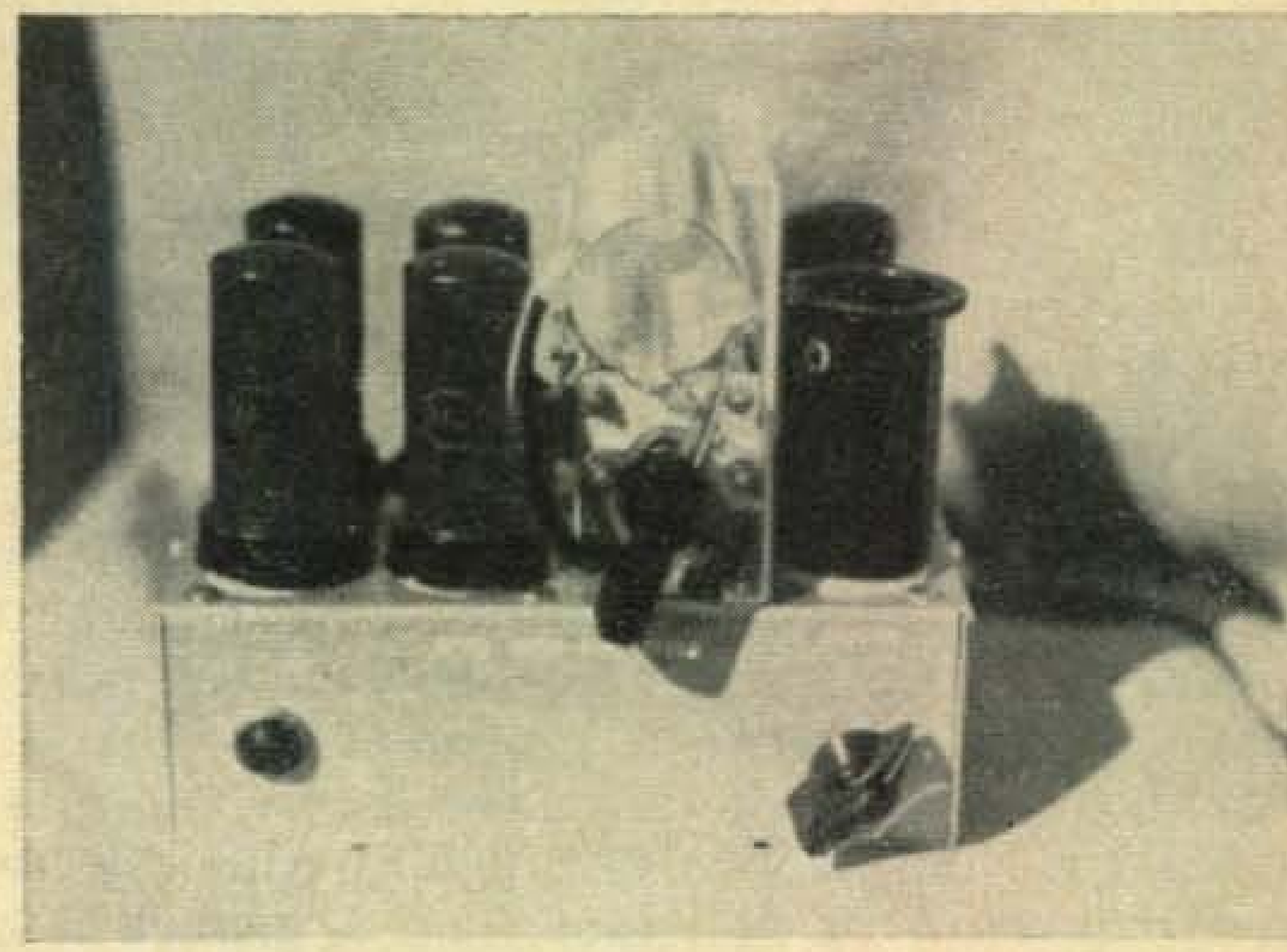
E. H. Marriner, W6BLZ
528 Colima Street
La Jolla, Calif.

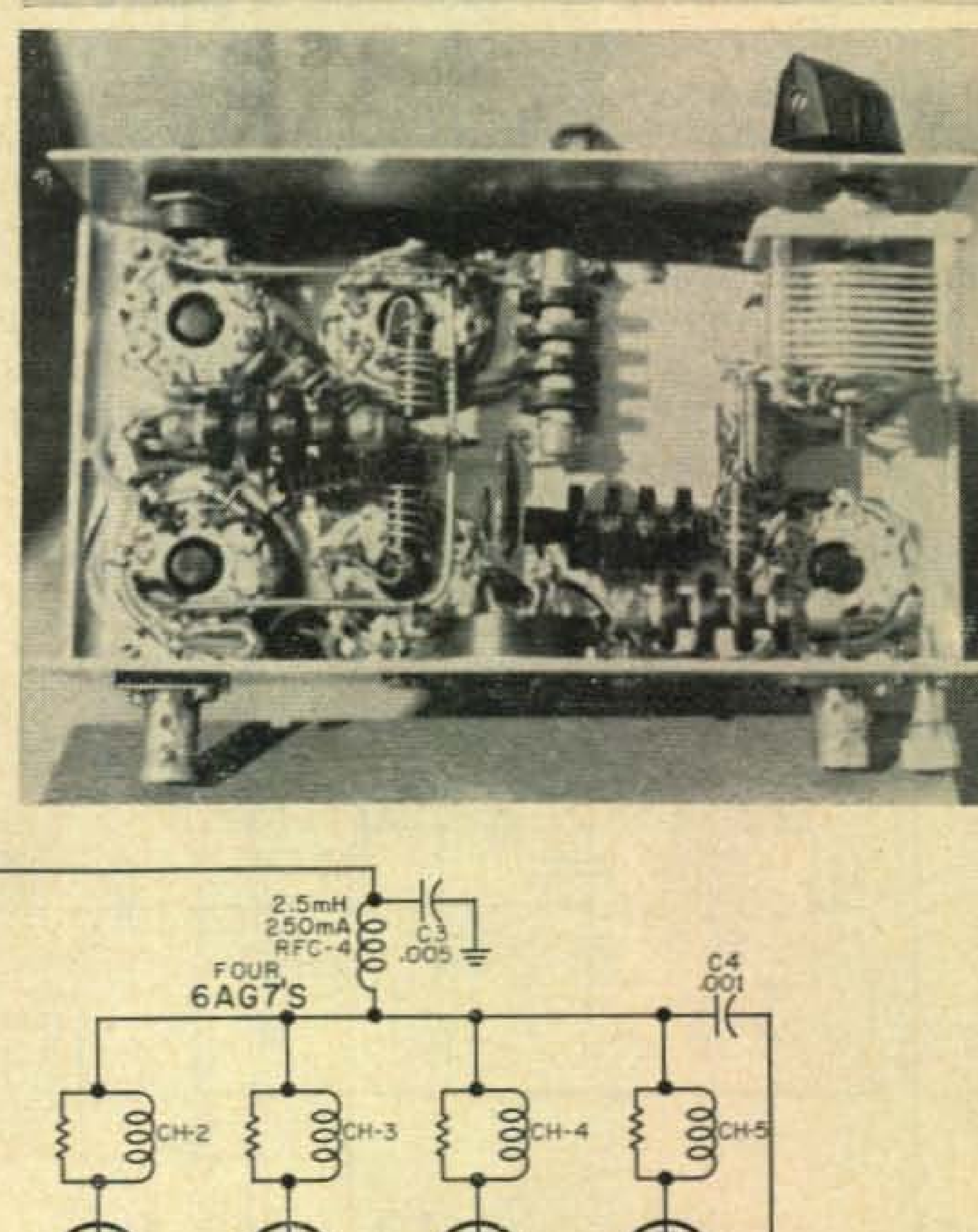
The subject of grounded grid linear amplifiers has been adequately described in preceding issues of "CQ" magazines. The object of this article is to present an answer to some of the difficulties encountered by amateurs writing in for information.

The major request has been on how to stop parasitics in the amplifier when attempting to add a driver for the four 6AG7's. Many found the 10B did not drive the 6AG7's as was expected and did not want to move the tap up a few turns for fear of ruining the coil for resale.

Experiments quickly indicated parasitics were there. Two things were done to overcome this situation. First, parasitic chokes, Ch-1/Ch-5, consisting of 6 turns of #18 wire wound on a 50 ohm, 1 watt resistor were placed in each plate lead to prevent interaction between the tubes. Second, a shield was absolutely necessary between the driver and the amplifiers. Amateurs were also removing the two 4700 ohm resistors across the output coil of the 10B to obtain more drive without moving the tap up a few turns. If the tap on the 10B output tank is not moved up a few turns these resistors should be left across the coil. Only if the tap is moved up can the resistors be removed. No adjustment of this tap should now be necessary to obtain enough drive after the 6AG7 driver stage has been added between the 10B and the four 6AG7's. The tests were conducted on 7 *mc*

[*Continued on page* 148]





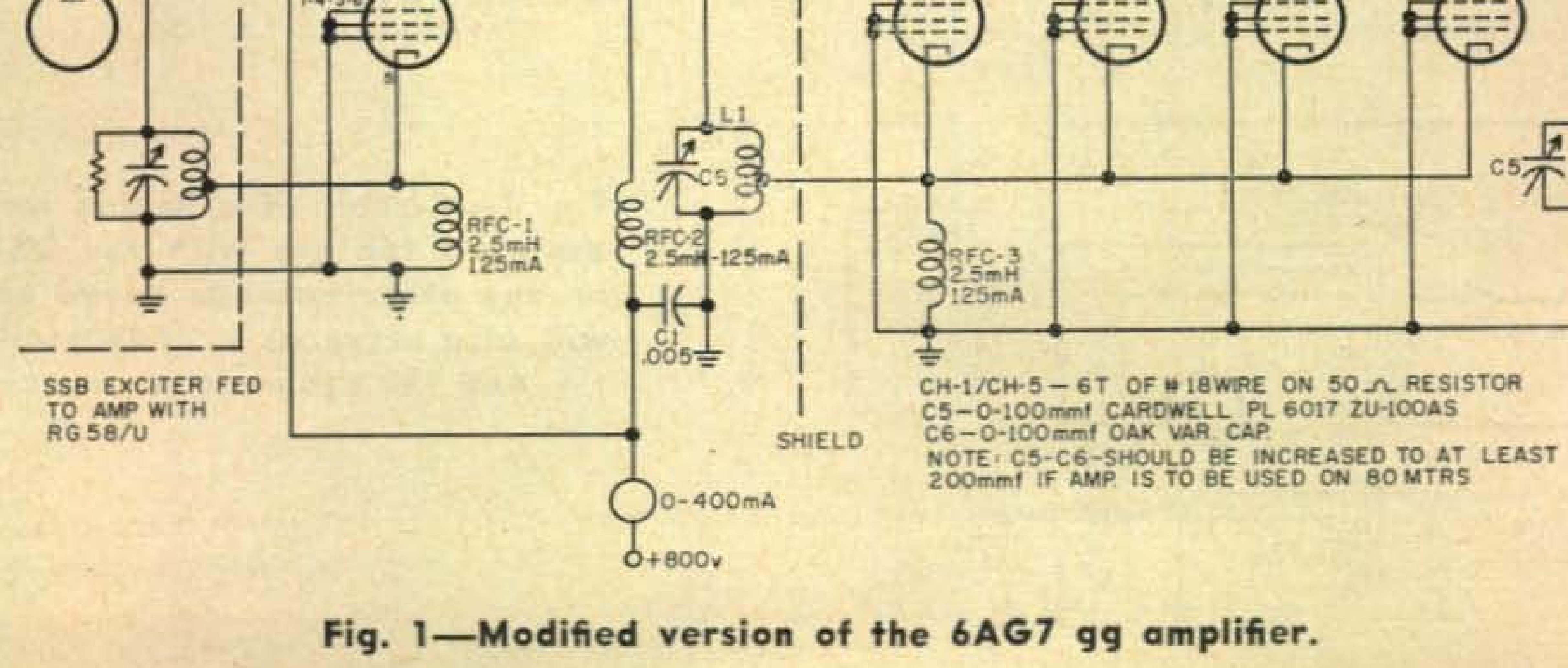


Fig. 1—Modified version of the 6AG7 gg amplifier.

A Keying Monitor For The DSB-100

John P. Costas, W2CRR
209 Palmer Dr.,
Fayetteville, N. Y.

It is no secret that a keying monitor is not absolutely necessary for operating CW. It is also no secret that a keying monitor is a big help in CW work. The station receiver may be used for this purpose but this generally means retuning and readjusting receiver gains when changing between transmit and receive. For those of you who have not used a monitor it will take only a few CW QSO's with one to convince most of you that such a gadget is a most worthwhile addition to the shack.

The unit to be described is the second that the writer has built and used and represents, in my opinion, a design which combines the maximum of utility with the minimum of complexity and expense. My first unit required a coupling loop to one of the transmitter tank circuits. The rf voltage thus obtained was rectified to produce a dc unblocking voltage for an audio oscillator. The audio oscillator in this case was a relaxation type which used an R-C charging network in conjunction with a neon bulb. Although this unit served me well for many years there were several things about it which were annoying. First of all the need for rf coupling from the transmitter was a nuisance. Secondly, although the relaxation audio oscillator worked, its frequency stability was very poor. This produced a rather sick sounding note every time the key was closed. (In spite of the opinion of my friends that this mournful sound was a perfect match for my fist, I still didn't like it.)

When I decided to rebuild there were several objectives in mind for the new monitor:

1. The unit must be simple and inexpensive to construct.
2. The required connections to the transmitter and receiver must be easily made.
3. The resulting keying tone should be reasonably pleasant to the ear.

The above objectives were attained but in addition the following features were made available without any real effort:

4. The unit may be used as a code practice oscillator.

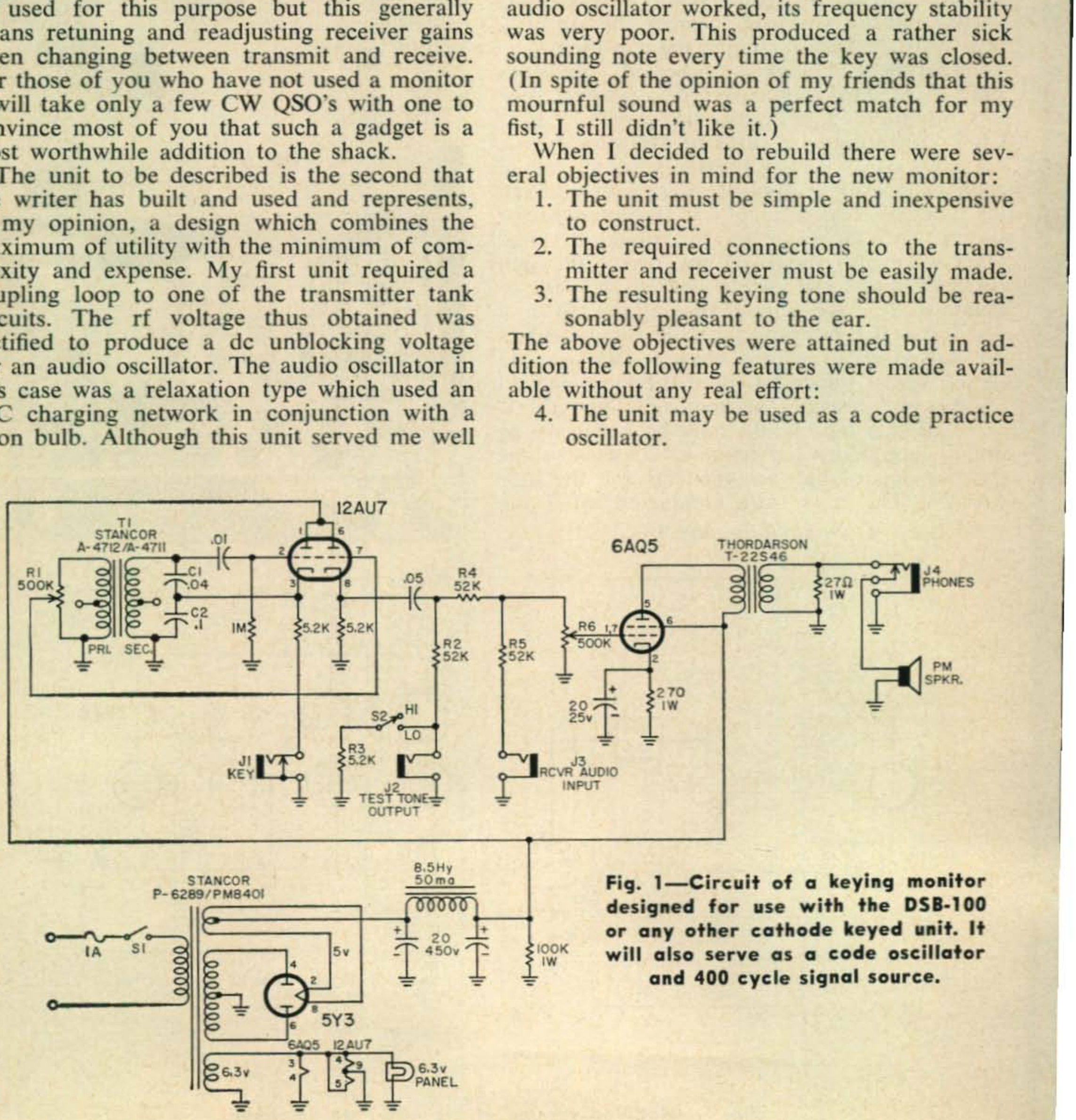


Fig. 1—Circuit of a keying monitor designed for use with the DSB-100 or any other cathode keyed unit. It will also serve as a code oscillator and 400 cycle signal source.

5. A 400 cycle test tone is made available with adjustable level for general purpose use around the shack.
6. Although intended for use with the Globe DSB-100, the unit will work with most other transmitters which employ cathode keying.

So much for the sales pitch; let's take a look now at the circuit.

Circuit

The monitor has only three tubes, including rectifier, as shown in the schematic of fig. 1. A 12AU7 is used as an audio oscillator and cathode follower, a 6AQ5 as audio output, and a 5Y3GT as rectifier. The first section of the 12AU7 is used in an L-C audio oscillator circuit. The secondary of the audio interstage transformer T-1 measures at about 5 henries and provides the oscillator tank inductance. The Stancor A-4712 unit which I used does no seem to be listed in the catalogues these days. A similar unit A-4711, should work just as well. As a matter of fact a transformer is not actually needed here as any 5 henry choke will do the job. If a choke is used the only circuit change necessary will be the relocation of the 500K pot, R_1, from the position shown to directly across the choke. The frequency of the audio tone is determined mostly by the .04 mf capacitor, C_1. As shown, the frequency is about 400 cycles. If a higher frequency is desired use a smaller value of C_1. C_2 controls the oscillator regeneration and if any difficulty with the oscillator is encountered try changing this capacitor. Any value for C_2 between .1 and .15 microfarads should be satisfactory. The cathode of the oscillator is keyed along with the transmitter.

The second half of the 12AU7 is simply a cathode follower. The audio oscillator signal level to this stage is controlled by R_1. R_2, R_3, and S_2 are used to provide an output tone for general test purposes. With S_2 open the audio voltage at J_2 may be varied between 0 and 15 volts by adjusting R_1. With S_2 closed the variation will be 0 to 1.5 volts. If a lower level is desired, reduce R_3. For example if R_3 is changed to 520 ohms the output range will be 0 to 150 millivolts with S_2 closed.

Resistors R_4 and R_5 provide for additive mixing of the receiver audio and the keying tone. The receiver audio is obtained from the phone jack of the receiver which is connected to J_3 of the monitor. Pot R_6 controls the input to the 6AQ5 output tube. This provides for volume level control at the monitor speaker or the headphones which may be connected to the monitor at J_4.

Construction

There is nothing particularly critical about this circuit so construction details such as layout may be varied to suit the individual builder. It would be wise to place S_1, R_6, and J_4 on the front panel of the monitor unit. J_2 and J_3 are phono jacks while closed circuit phone jacks were used for J_1 and J_4. Closed circuit jacks are necessary since the speaker circuit must be closed when the headphones are removed and it is convenient to have the oscillator circuit operative when the key plug is removed. The only precaution I observed when constructing the monitor was the use of shielded leads for some of the audio wiring where the lead lengths were rather long.

Testing

After the unit is completed and power is applied, measure the *dc* supply voltage. With the power transformer I used the voltage was 170 volts. This transformer, Stancor P-6289, seems to be a discontinued item. The manufacturer states that PM8401 is a near replacement. This isn't particularly a critical item as the supply voltage can be anywhere from 150 to 200 volts for satisfactory operation. You should be able to measure about 15 volts of audio across the oscillator tank. This measurement will require an *ac* voltmeter, of course. If no *ac* voltmeter is available proper oscillator operation will have to be determined by turning up the pots R_1 and R_6 and listening for the tone in the speaker. By the way, don't try to check oscillator operation by measuring the *dc* grid voltage at pin 2 of the 12AU7. Because of the 5200 ohm resistor in the cathode of the oscillator tube, the grid does not draw current. Thus there will be no *dc* voltage across the grid resistor in normal operation. If all has gone well the tone should be heard in the speaker and the volume should change when R_1 or R_6 is varied. At this point set both of these pots to about the mid position. As a final check, plug a pair of headphones into J_4. The tone should now be heard in the phones and the speaker should be dead.

Installation

If the monitor is to be used wih a transmitter other than the Globe DSB-100, check the schematic to see whether cathode keying is employed. Since this type of keying is used with most transmitters or exciters in the DSB-100 power class there should be no great problem here. Make up a pair of leads (line cord will do) with a phone plug on one end. The other end is connected to the key. Thus the key will now have two pair of leads connected to it; one pair connecting the key to the transmitter and the other pair being the ones just made up which plug into J_1 on the monitor. Be very sure that correct plug polarization is observed when making the connection to the key. That is, the transmitter ground lead and the monitor ground lead should connect together

[*Continued on page* 148]

Something Old, Something New, Something Borrowed, Something Blew

R. E. Baird, W7CSD
Box 792, Oretech Branch
Klamath Falls, Oregon

A "strictly from hunger" lash up that provided a summer vacation emergency rig. Doubler hv supply and cathode modulated final lend economy.

The writer, upon accepting a summer job as vacation relief engineer in a radio station some distance from home base, loaded a minimum amount of ham gear in a steel box and shipped same. Upon arriving at our destination assorted experiments on very low power met with little success. So, we cast about for the makings of a substantial amplifier.

One of our co-workers had torn down a diathermy machine having a pair of 3581 tubes, which he said we could play with. (No we don't know what they are either but they looked about the size of an 810.) We had brought along a couple of 8 mf 1000 volt filter condensers. No high voltage transformers seemed to be lying around loose but we did find a 350-0-350 garden variety transformer in the station's junk box. And from the discarded tube box we resurrected a pair of old 5R4GY rectifiers that still had a little emission and we also managed to scrounge a 10 volt filament transformer, a choke, and another filter condenser.

By trial and error we placed a coil of small copper wire in series with the 6.3v winding and adjusted it until 5 volts appeared across a 5R4GY filament. The other 5R4GY was connected to the 5 volt winding and the voltage doubler circuit of fig. 1 was built on an old 3″ x 17″ chassis. Tests revealed that 1500 volts *dc* at 100 mils could be delivered without heating of the transformer. (Caution! Load should not be removed from the supply or the voltage will go up to about 2500 volts!) We now had a power supply. This is a rather unusual way to get plate voltage for a sizeable tube.

Next the amplifier was breadboarded with odd and borrowed parts. Using battery bias the amplifier was neutralized and fired up. A 100 watt lamp coupled up to the tank glowed at nearly full brilliance. A borrowed speech amp failed to grid modulate the amplifier however. Once again we were in a quandary. Finding an old 6AS7G in the discarded tube department and not having any audio transformer for grid modulation we remembered series cathode modulation. The 6AS7G has exceedingly low plate resistance which makes it ideal

[*Continued on page* 146]

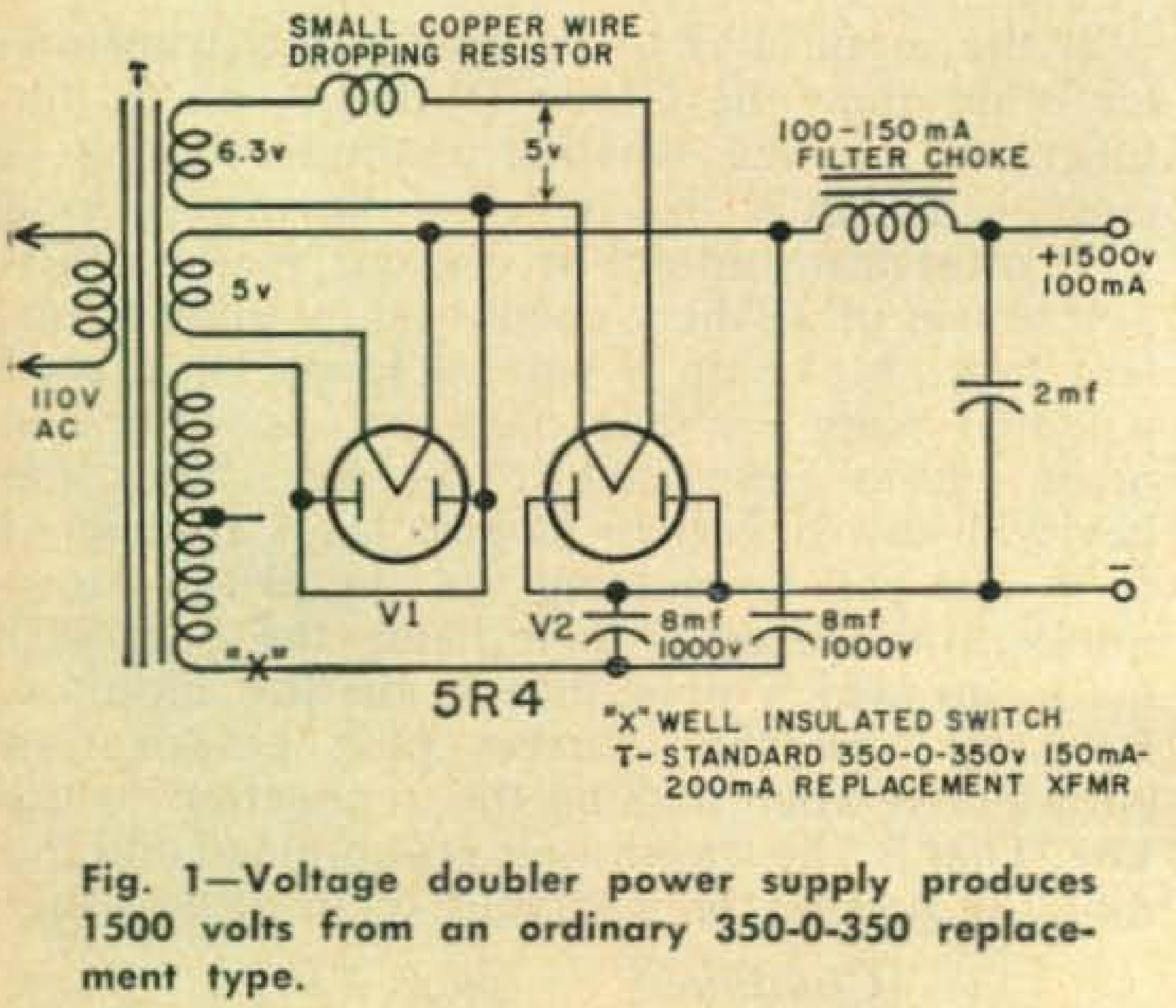


Fig. 1—Voltage doubler power supply produces 1500 volts from an ordinary 350-0-350 replacement type.

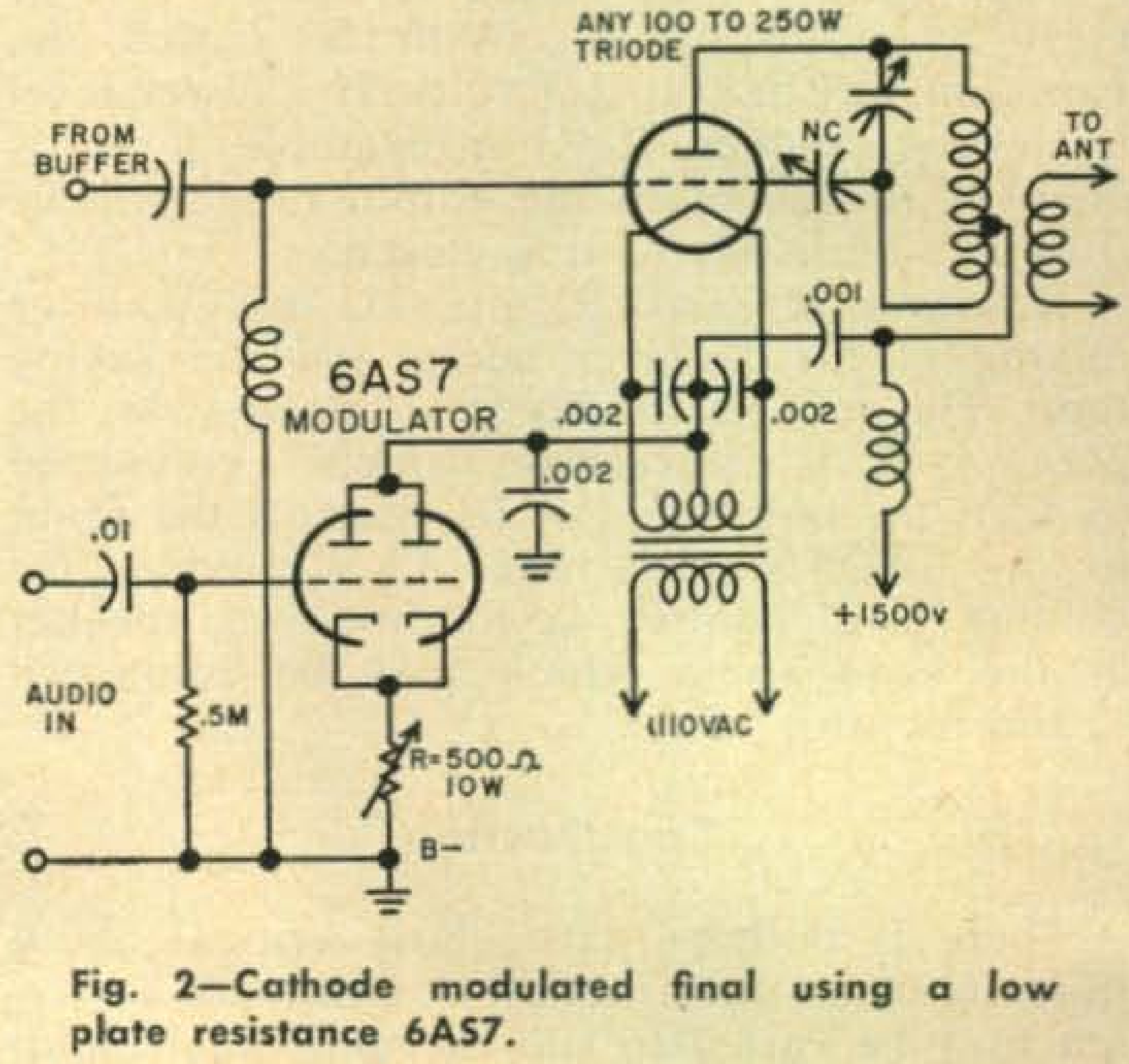


Fig. 2—Cathode modulated final using a low plate resistance 6AS7.

CASE NO. 807TV

Larry Dart, K4SIW
721 NE 141 St.
North Miami, Fla.

This is the city. People live here. Some are hams, some aren't. I'm a ham. I carry a badge.

Saturday, January 17th, 8:12 PM. We were working out of bunko. My partner's name is DX Smith; my name's Thursday.

8:14 PM. We were busy discussing Brigitte Bardot and other serious ham topics. The phone rang.

"Phone's ringing, Joe," DX said.

"Yeah. Sounds pretty, doesn't it?"

"Kind of like a ZL coming through the long way, you mean?"

"Yeah, that's what I mean. Sort of wavery, like."

"Think you ought to answer it, Joe? I mean, it might be important. You know, important."

"Yeah, guess I better." I picked up the phone. "Hello."

There was a woman at the other end of the landline. Sounded sort of upset, kind of like she'd stuck her finger in the high voltage, or something.

"Is this Joe Thursday? The ham, I mean? Don't want to talk to anyone but him. Figure he's the only one who can help me. That's why . . ."

"Just a second, Ma'am. Try to give me the facts. That's all I want, Ma'am, just the facts. Can't help you if you don't give me the facts. Now, what's wrong, Ma'am?"

"Well, it was last night it happened. Pete—that's my husband, Pete, short for Peter, you know—well, Pete and I had just gotten home from the movies. I didn't want to go, but Pete—he's my husband—insisted."

"Just a minute, Ma'am," I interrupted. "Was that a Bardot movie?"

"Why, yes. How did you know?"

"It figures. Go on, Ma'am."

"Well, as I was saying, Pete and I had just gotten home. For some reason, Pete seemed sort of restless. Don't know why. Maybe something he saw in the picture disturbed him, I don't know. Anyway, I thought it might calm him down to watch the Jack Paar show on TV. You know what I mean, change of pace and all that. After all, Brigitte Bardot, Charlie Weaver. Nothing alike.

"You can say that again, Ma'am."

"How's that?"

"Never mind, Ma'am. Go on.

What happened next?"

"Well, everything was fine until Charlie Weaver came on. You know, he reads a letter from his Momma each time. Had a good one last week. His Momma had written . . ."

"Stick to the facts, Ma'am. Just the facts."

"Oh. Well, it was really a funny one, but—anyway, as I was saying, I know Charlie's an old man, but last night he got all wrinkled. Funny herringbone shaped ones. Never saw anything like it. Then, this strange voice came on the TV set, and . . ."

I stopped her. "Just a minute, Ma'am. This sounds serious. I think my partner and I had better come over. What's the address?" I wrote it down as she gave it to me. It was in the next block. "We'll be right over, Ma'am. Stay inside until we get there. Don't talk to anyone. And above all, don't turn on your TV. Get that? Leave it off. We'll be right over."

I hung up. "Another one, DX. Sounds serious this time."

DX groaned. "Another one? That makes the third this week."

"Yeah. Must be a ring operating. Too many for coincidence, somebody must be masterminding it. Well, let's go."

We got there in three minutes. It was a small white bungalow. Nothing sinister looking about it, at all. You'd never know to look at it that a crime had been committed here.

We went up the walk. I rang the bell. Inside, we could hear footsteps rushing towards the door. It opened.

"Thursday? Thank God, you're here."

"Okay, Ma'am, you're under arrest. Better get your coat, it's cold outside."

"Under arrest? But I don't understand. What's the charge?"

I looked her straight in the eye. "Complaining of TVI. Let's go, Ma'am."

Complaining of television interference is a felony in the state of Florida, and is punishable by not more than 95 years in the state penitentiary. This woman is now serving out her sentence at the state prison in Raiford. ■

Facts About Vertical Radiators

Norman R. McLaughlin, W4GJR
3404 Lenox Ct.
Greenboro, N. C.

Now that vertical radiators may be "store bought" a discussion of vertical radiator fundamentals might be of interest to a greater number of amateurs. Performance of even factory built verticals can be enhanced by compliance with the constructional details we'll get into shortly.

As shown in fig. 1 two areas of loss exist with top loaded verticals as compared to one for a quarter wave vertical. The greatest loss usually takes place at the base in what is commonly referred to as ground loss. Since the base is the point of highest current such losses can be quite substantial if ground resistance is high.

When a vertical antenna is top loaded to provide an electrical length greater than its physical length, some loss also takes place in the loading coil. However, since current is lower at the top of the antenna than at the base, losses in top loaded schemes are less than with base loaded antennas. In fact, from fig. 1 it should be obvious that base loading compounds losses and should be avoided.

Loading coil losses are minimized by use of high Q coils. Ground losses are minimized through use of (1) a ground screen and (2) an extensive ground system. Since a vertical radiator works against ground it should be apparent that the better the ground system, the better the radiator efficiency.

Performance of vertical radiators is computed and theorized on the assumption that the radiator is operated above a perfect ground. The perfect ground is somewhat a relative of the free space upon which Hertzian antenna computations are based. We are never quite able to achieve either.

Nevertheless it is possible to come reasonably close and obtain antenna efficiencies that are satisfactory. Efficiencies of broadcast station antennas approximating 90% are not uncommon, so if we take a page from their book we might profit in better signals.

A ground screen is mandatory to all broadcast antennas. The screen, usually at least 50 feet in diameter, is located right at the base of the antenna. A copper or bronze mesh is frequently used, although many broadcasters make up a radial system of the same material that goes into their ground system. Ground screen radials are spaced about one degree at the circumference.

In amateur installations the size of the ground screen is apt to depend upon the economics involved. The screen pictured in fig. 2 happens to be three feet square simply because that size piece of duraluminum happened to be handy. A six foot square would be better than twice as good, but that size just didn't seem to be laying around.

Ground screens may be made of any material that is a good conductor. Obviously, the better the conductor the lower the ground

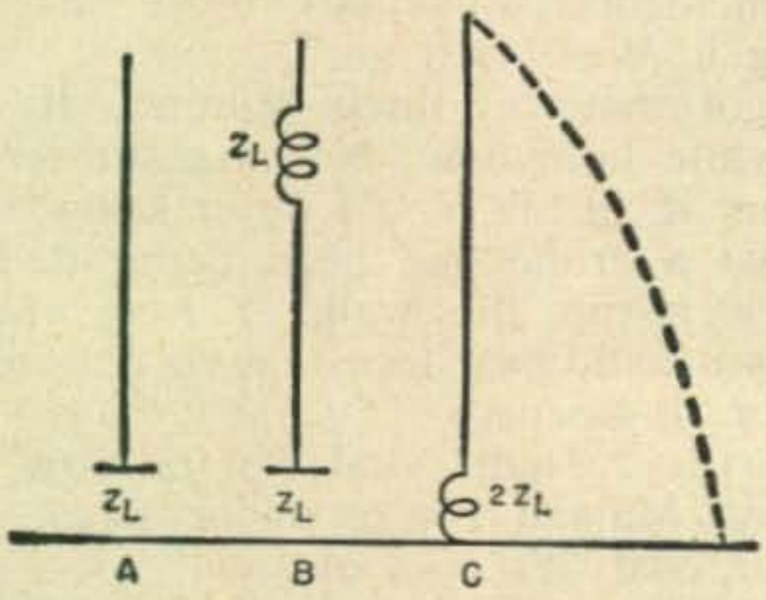


Fig. 1—In the ¼ vertical, A, one loss area (Z_L) exists and that's at the base of the antenna. In B losses exist at both the base (ground loss) and in the loading coil. In C two losses exist at the base, because C is base loaded. The dotted line shows the theoretical current wave form with the current peak at the base. For this reason coil losses are greater in C than in B.

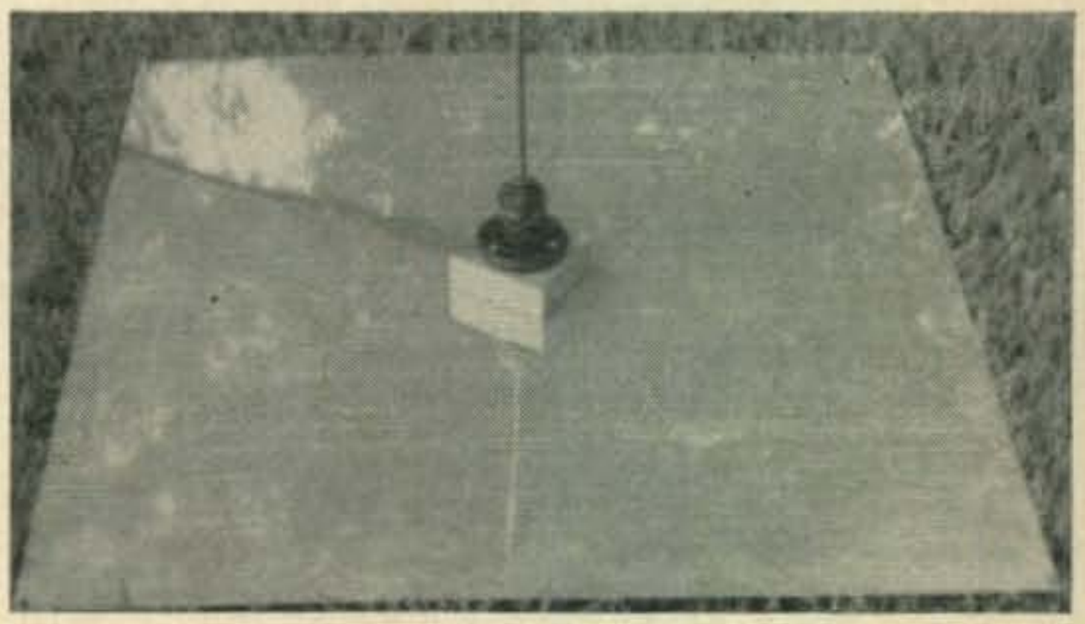


Fig. 2—A typical ground screen. This measures three feet square and is scrap duraluminum. The block of harwood under the base insulator is to provide entrance of the coax to the driven element above the ground screen. Holes to accommodate 6/32 machine screws are drilled in each of the four corners. Ground radials will be tied to the 6/32 machine screws.

loss contributed by the ground screen. However, even galvanized iron is better than no screen at all. So called "rabbit wire," a galvanized iron fencing material with about a half inch square mesh should be both satisfactory and inexpensive.

The second part of a low loss ground is the radial system. The radial system not only further reduces ground loss, but as A. B. Chamberlain, chief engineer of the Columbia Broadcasting System, wrote in a Proceedings of the IRE, it, in a measure, determines the angle of radiation. Chamberlain showed that the 45 degree angle of radiation loosely attributed to a quarterwave radiator did not result until ground radials exceed a quarterwave in length. His paper also showed a definite relationship between angle of radiation and radial length. Over-simply stated it amounted to, "the longer the radials the lower the angle of radiation".

G. H. Brown[1] pointed out that there is a definite relation to signal strength and the number and length of radials. Brown's work, like Chamberlain's, was done at broadcast frequencies. Nevertheless, both findings have application to amateur installations since fundamental wave propagation problems are so similar.

Brown showed that whereas an antenna system with tenth wave radials developed a signal of 140mv/m at a mile, the same 1000 watts into the antenna working over a ground system of .45 wavelength radials produced a signal strength of 195mv/m at a mile. Each radial system contained 120 radials.

When the number of radials was reduced from 120 to 60, signal strength dropped from approximately 195mv/m to 185. When a further reduction to 30 radials was made, signal strength dropped to approximately 170 mv/m. Inversely, the power gain represented in increasing signal strength from 170 to 195 mv/m is a handsome reward for quadrupling the number of radials in a ground system.

But, let's face it. Few of us have the means, real estate and, albeit, the ambition to put in a 120 radial ground system. What, then, is the best compromise to make?

In Brown's experiments it appears that as between length and number of radials, length is the more important. This is quite contrary to what is generally accepted. But, since it is usually simpler to run longer radials than great numbers of them, the break is in our favor. In short, run out as many as you can, but run them as far as you possibly can.

Not considered, so far, is another loss factor. That is the loss from absorption by surrounding objects. Like the half wave dipole, the vertical performs best in an environment approximating free space. This fact discourages puting vertical antennas at ground level, unless a substantial clearing exists around the antenna.

Mounting vertical radiators on house tops is to be preferred for two good reasons. First the elevation gained tends to get the vertical above surrounding objects which might inject a high absorption factor and secondly, roof tops provide handy support for ground screens.

Radials can be run from a ground screen similar to fig. 2 to the rain gutter. As many radials as is possible should be so installed. By judicious choice of wire these radials can be virtually invisible.

Most houses have at least four downspouts. If these are soldered to the rain gutters they provide excellent low resistance down leads to radials to be installed at ground level. If the downspouts are not soldered, better bond them yourself.

At ground level, radials should be soldered to each downspout and extended out through the lawn or graden as far as possible. They need be buried only deep enough to keep people from tripping on them. Connect the far end of each radial to a ground rod and drive the rod into the ground.

Ground rods need not be expensive. Junk galvanized water pipe cut into three foot lengths will work quite well. Scrap copper tubing, conduit or the xyl's old aluminum curtain rods will serve equally well. Welding rod, either brass or copper plated also does nicely yet is not too expensive. The brass rod will last considerably longer, however.

In the use of a top loaded ground plane[2]—for some time this writer has been unable to find much fact in statements bandied about on the air concerning performance of vertical radiators. Take, for example, the old saw that, "a vertical is no good for the first 300 miles, but after that it is superior to a dipole". Distance seemed to be no problem in actual practice and signal reports compared with those of neighborhood stations bore the same ratio without regard to that mystic 300 mile circle.

Another fancy that came down in flames is the one, "the vertical is fine for transmitting but no good for receiving". Without accusing that author of repealing the law of reciprocity, let it be said that the aforementioned top loaded ground plane worked equally well as both a transmitting and receiving antenna.

Probably the most ridiculous of all of these libels is the one that "the field around a vertical antenna is so great it causes excessive TVI and BCI". This is to say that people living in the immediate vicinity of BC stations must give up other BC station reception and TV too. They, of course, need do no such thing!

What might very well happen is that the improvement in antenna efficiency might be so great as to cause front end overload in older and misaligned BC and TV sets. Should this condition pertain it should only indicate how poor the former antenna was and at the same time point to the increase in power output from the vertical. ■

1 G. H. Brown, ELECTRONICS, January 1938.

2 Norman R. McLaughlin, CQ, June 1956

Simple Dummy Load

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

Stop hunting for a couple of resistors every time you need a 52 ohm load to test out your SSB exciter or low power transmitter. Build a good accurate 52 ohm load and hang it on a hook in the shop where it can be found in a hurry when needed.

Four reasonably accurate 200 ohm, 2 or 5 watt carbon resistors, all in parallel will average out very close to 52 ohms and act non-inductive for all practical purposes.

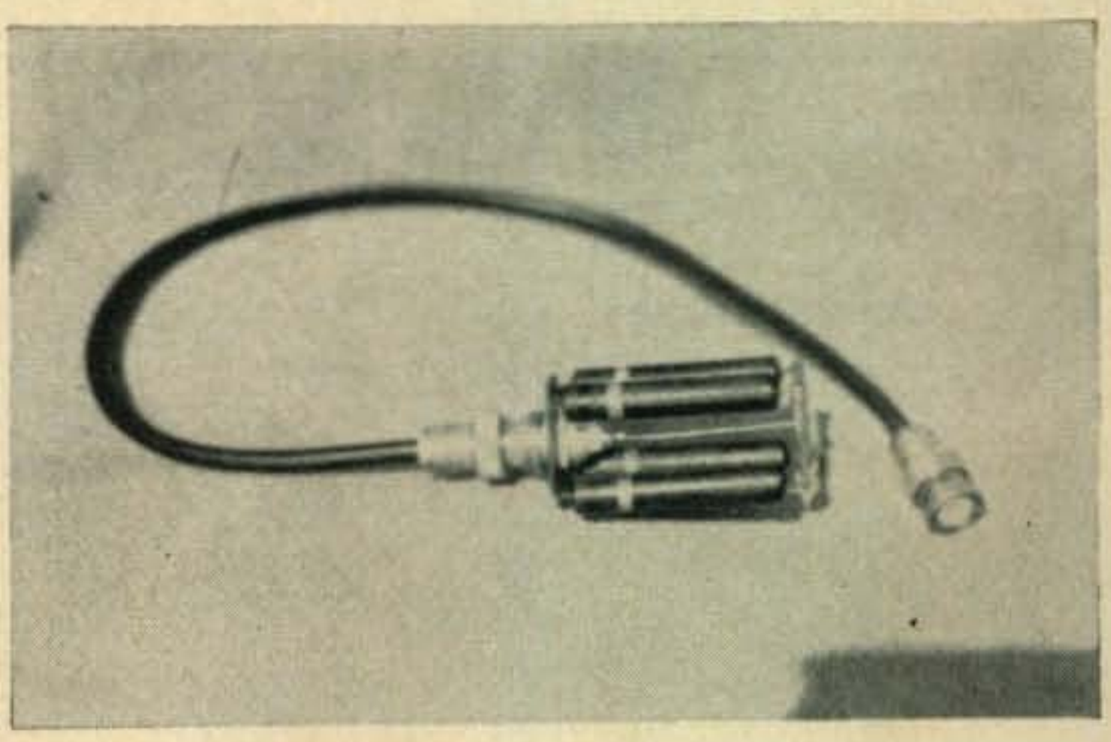
Construction

Punch out two 1⅛ inch copper or brass disks from 16 gauge material. Saw and file if necessary to get two round pieces. Nick four slots opposite each other with a hack saw. Make the slots about 1/16 inch deep to wedge in the resistor pig tails before soldering. One disk should have a small hole, #30 drill, and in the other punch or drill out a 7/16 inch hole (punching copper is easier than drilling) to fit a female coax connector type UG 625B/UCBM. The insulation material is Teflon and should not melt when soldering the resistor with a 200 watt iron or larger. This is necessary to make the solder flow evenly over the pig tail ends and co-ax fitting to make a solid bond. Cool or hit the resistors immediately with a wet rag to cool. Your load is now finished and it can be coupled to the exciter with a short piece of RG58U co-ax with fittings to match your exciter output fitting.

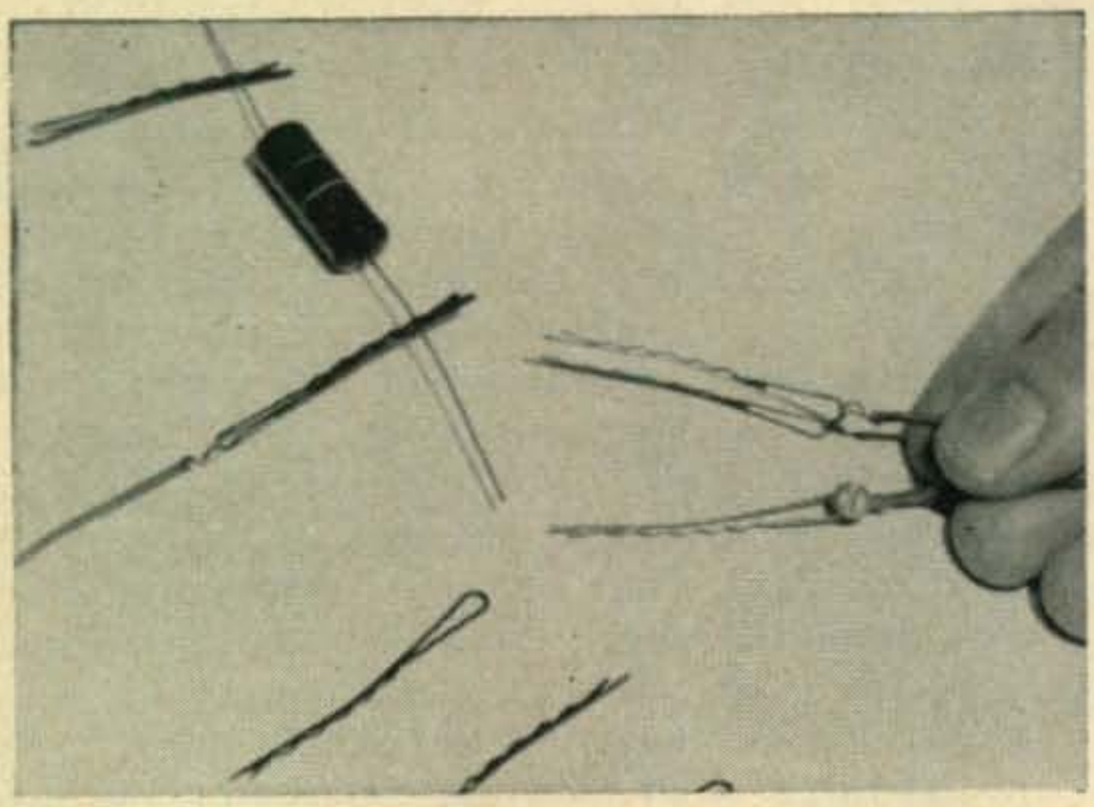
The load using four, 2 watt resistors will absorb 8 watts. Reduce exciter drive accordingly. On CW/SSB talking it will handle 20 watts.

This device can be used, when constructing a new rig to make the pi-network output tank. Values are calculated for 52 ohms termination. Set the condensers of the pi-input and output to values determined and tune the coil to resonance and prune.

Another very handy use is calibrating a SWR indicator. The load will present a non-inductive 52 ohm load for setting the 52 ohm calibration. Now by replacing the load with the feed line and antenna the difference from 52 ohms will be noted. Now—how many ideas can you think of for which this gadget might be used? ■

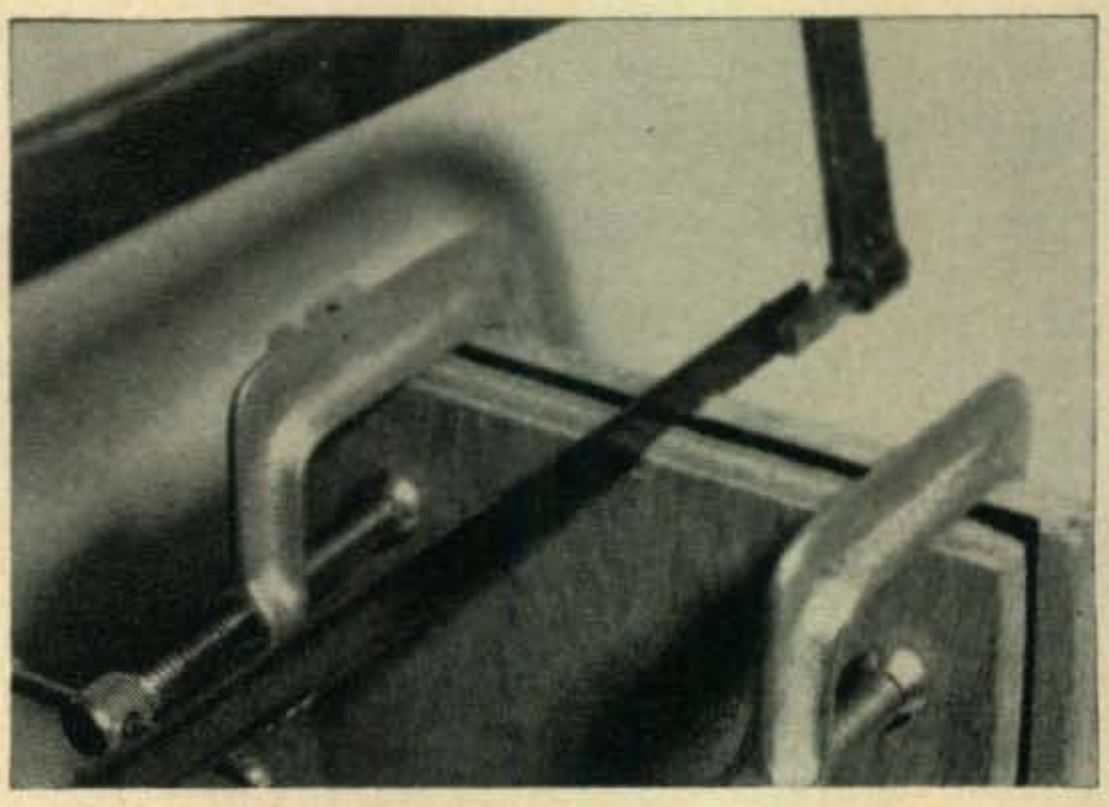


Shop Hints For Hams



Miniature Test Clip

XYL's bobby pins make handy miniature test clips. Solder them to ends of wires or attach them with small screws placed through each pin's eye. To make certain good electrical contact is maintained, remove the enamel coating from each clip with sandpaper or soak each one in solvent and scrape the enamel off with a sharp knife. Insulate the clips with lengths of spaghetti.



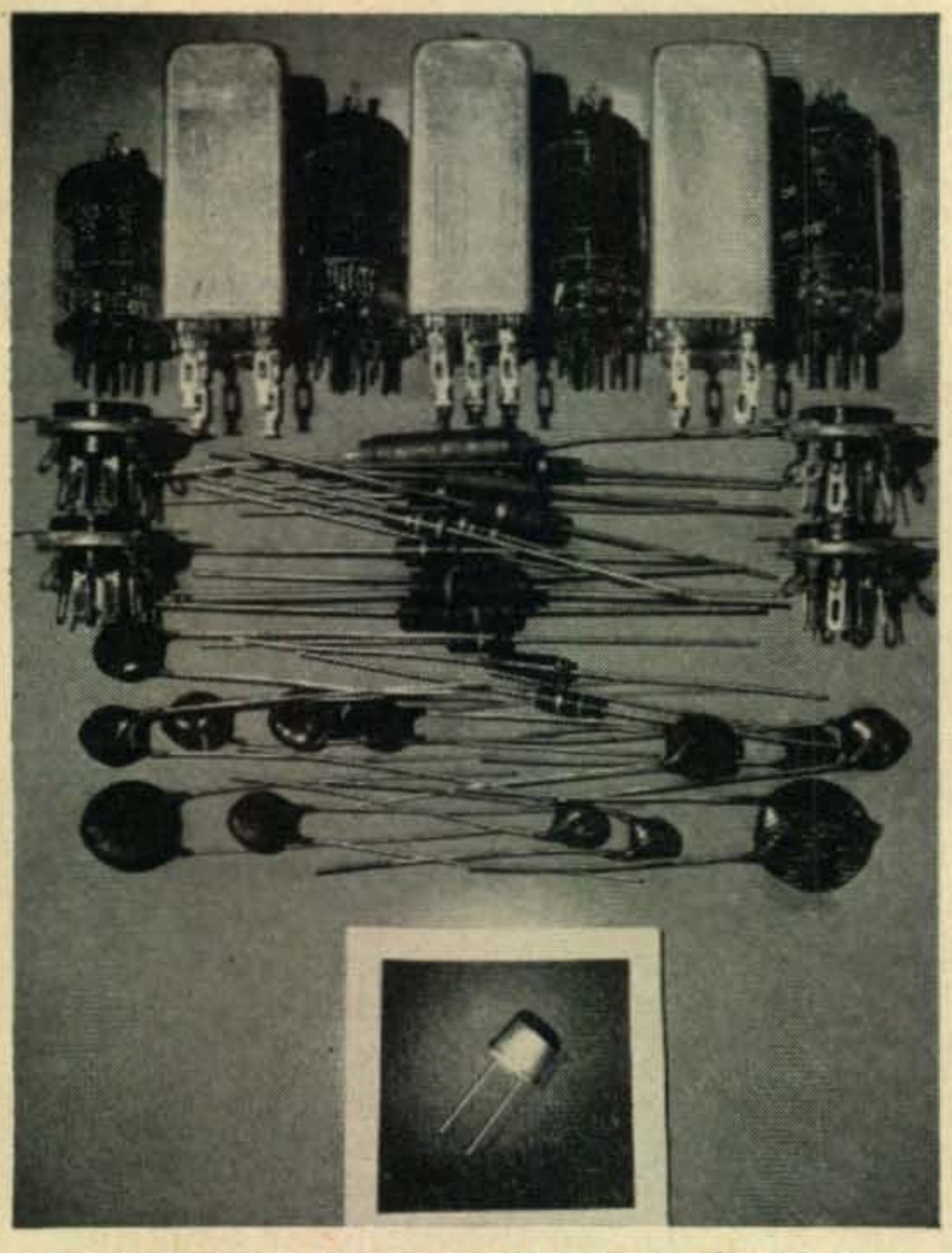
Sawing Thin Gauge Metal

If you have ever hacksawed thin-gauge metal such as an aluminum chassis or cabinet panel, you know how every time you push forward on the cutting stroke, the metal bends forward and resists cutting. To prevent this, just clamp a couple of thin pieces of scrap wood on either side of the work and hacksaw through the "sandwich".

The Amazing Tunnel Diode

Barry Briskman, K2IEG
CQ Staff

A complete tunnel diode transmitter compared to a 50-cent piece. It consists of a variable and two ceramic capacitors, a coil and the tunnel diode.



Tunnel diode (in can, at bottom of pix) can perform simultaneously: amplification, oscillation, conversion, limiting, detection and afc. If an fm set were built using a tunnel diode all of the conventional parts shown could be omitted with some sacrifice in operation, due to the early state of the art of tunnel diodes.

In line with CQ's policy of keeping the amateur informed of new developments in the electronics industry, this article describes a sensational new semiconductor device from the labs of General Electric, Radio Corporation of America and Bell Labs. Not since the development of the transistor has there been such industry-wide enthusiasm and optimism over an innovation. It seems that all major companies are working on "Tunnel Diodes," and both RCA and GE have heralded its appearance as a major step forward in the field of semiconductors.

What is a Tunnel Diode?

The tunnel diode was first discovered and reported in 1958 by Japanese scientist Dr. Leo Esaki. While it is in some ways similar to the transistor, the tunnel diode operates on a different principle and can offer advantages that are beyond the transistor. It seems at this time, that before long, the tunnel diode should find its way into communications equipment, television sets, high-speed computers and satellites, according to Dr. Guy Suits, Vice President and Director of Research at General Electric.

Due to intensive research, practical tunnel diodes should be available in limited quantity by late October, 1959. It is planned to bring them out at a cost of about $75.00 each.

The tunnel diode is named after the physical phenomenon that makes it a reality, namely: "Quantum-Mechanical Tunneling." This term describes the manner in which electrical charges move through the device. While the charges move through a transistor at a relatively slow rate, they move through the Tunnel Diode at the speed of light (186,264 miles per second). Since electrical charges move through the diode at such high speeds, it is possible for the device to operate at extremely high frequencies. Researchers have already obtained oscillations at frequencies as high as 2000 *mc*. This easily matches the performances of even the most advanced transistors. Frequencies of as high as 10,000 *mc* seem plausible in the near future.

The tunnel diodes high-speed response characteristics are ideal for computer applications. When used as switches, these devices have functioned at speeds of a fraction of a milli-microsecond . . . which is from 10 to 100 times as fast as the most advanced switching transistor.

The tunnel diode has been manufactured from various semiconductors. GE scientists

have made them from germanium, silicon, indium antimonide, gallium arsenide and gallium antimonide.

The tunnel diode is considerably smaller than a transistor, and due to its simple structure, it appears that in the near future it will be a mere fraction of even its present size. This device is extremely insensitive to environmental changes such as temperature variations. Silicon tunnel diodes made at General Electric operate at temperatures as high as 660°F; conventional silicon diodes will not work at temperatures over 400°F. As a matter of fact, the operating temperatures of a tunnel diode is greater than that of silicon and germanium transistors combined.

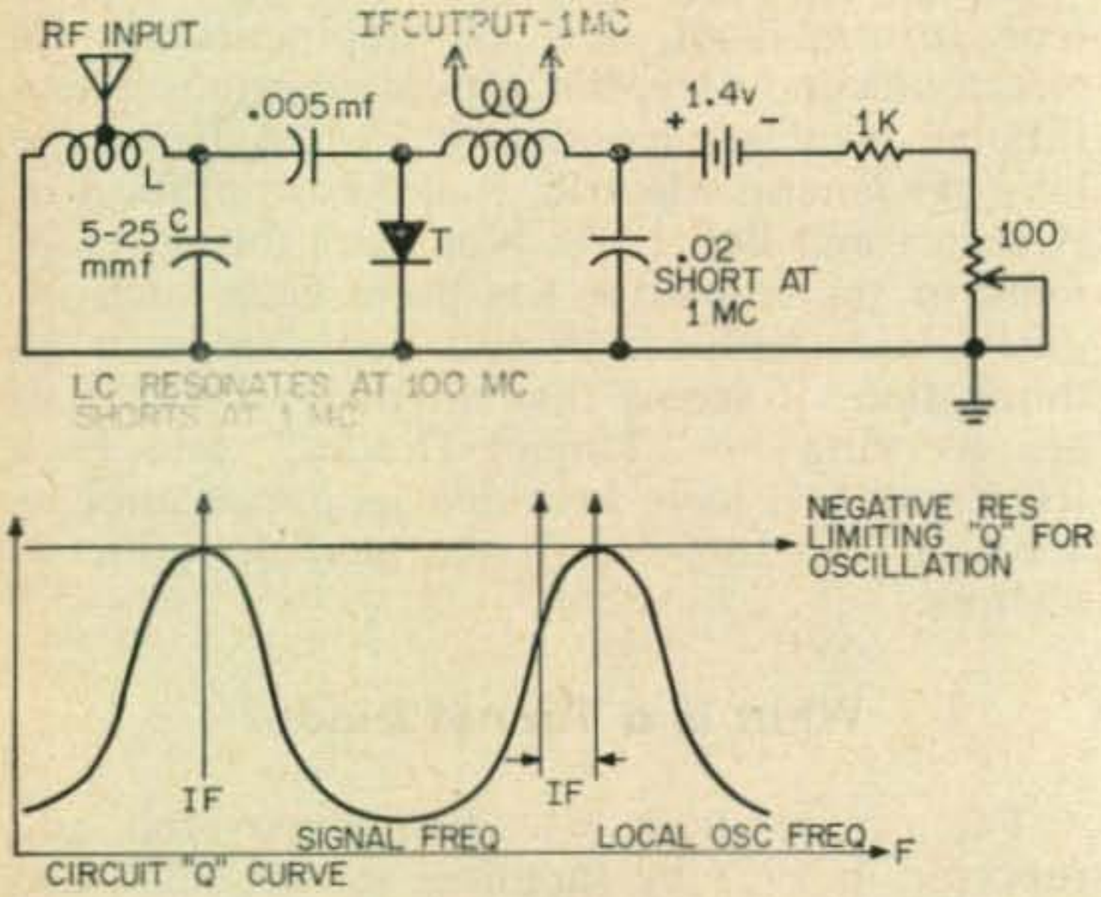


Fig. 1—Tunnel diode frequency converter (GE) changes 100 mc to 1 mc.

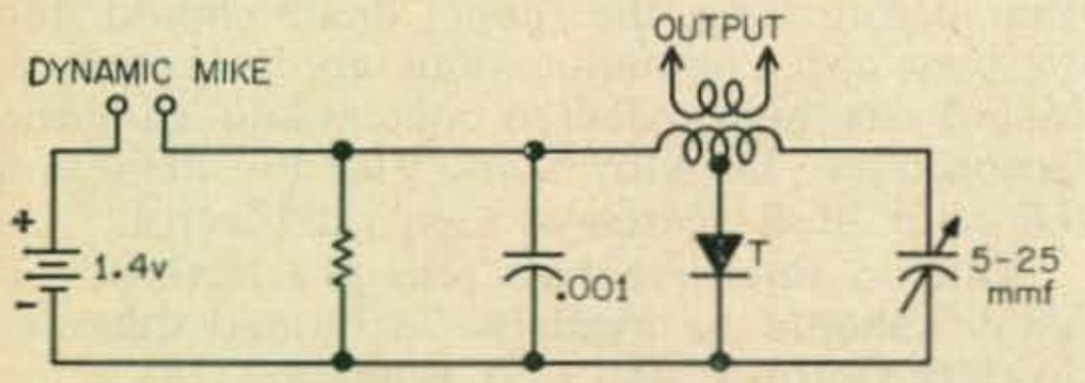


Fig. 2—An fm transmitter designed in the GE labs.

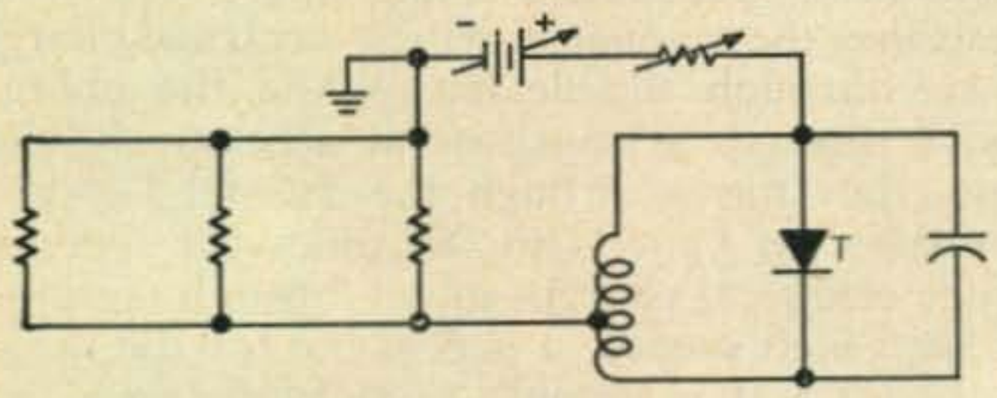


Fig. 3—Self-exciting 1 kmc oscillator.

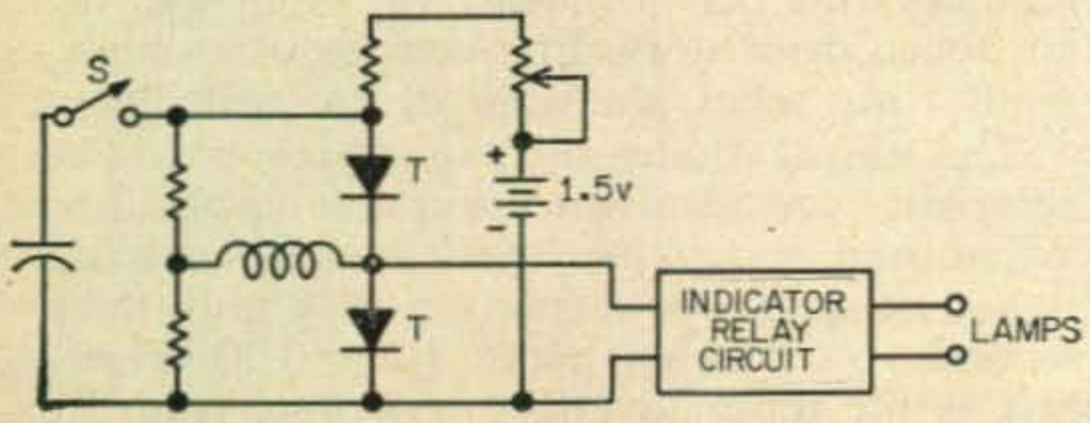


Fig. 4—Bistable fli-flop oscillator.

Uses of Tunnel Diodes

As a circuit element, the tunnel diode exhibits an unusual combination of electrical characteristics including "negative resistance" over part of the range of its operating voltage. It can, therefore, be used in a large variety of applications, such as an amplifier, a switching device, an *rf* generator (oscillator), and a mixer. Circuits using a single tunnel diode in as many as four different functions have been designed and operated. Dr. J. J. Tiemann of GE has developed a frequency converter (fig. 1) which utilizes a single tunnel diode for *rf* amplification, local oscillation and mixing. Another practical circuit from GE is a complete *fm* transmitter with a range of one half mile. This transmitter is smaller than a half-dollar. (Fig. 2). Other GE circuits perform microwave oscillation, (fig. 3), binary counting (fig. 4), and an *fm* receiver which is stable enough to lock onto the seventieth harmonic of a standard *fm* signal. These new circuits are most significant because they show the variety of functions available with tunnel diodes. The tunnel diode continues to register new levels of performance even with these first early models.

Tunnel diodes might be the long sought breakthrough to the wide applications of the negative-resistance principle, and, according to GE, to new types of amplifiers, oscillators, mixers, sensors, computer elements, drivers and new sources of ultrasonic generation. Design engineers at the various labs say the tunnel diode presents the following characteristics for them to work with:

1. Power drain as low as 1 microwatt, with low heat generation.
2. Noise levels that are surpassed only by Masers and Parametric Amplifiers, but no pump frequency sources required.
3. Inherent ability to handle extremely high frequencies . . . 2 *kmc* to a possible 20 *kmc*.
4. Extremely high response speed; fractions of a millimicrosecond.
5. Stability that is not affected by nuclear radiation; operates at very high temperatures.
6. Tiny size and two terminal simplicity.
7. Wide applications in amplifiers and oscillators due to negative-resistance characteristics.
8. High current handling capacities. GE has achieved current densities of 20,000 amps per CM^2.

9. Ability to generate ultrasonic waves. Vibrations up to 10 *kmc* with wavelengths of just a few angstroms have been generated in GE Tunnel Diode crystals.

Theory and Operation

Although the tunnel diode can perform many of the functions of more conventional devices, its principles of operation are entirely different from those of other semiconductor devices and vacuum tubes.

Such conventional amplifying devices as transistors and vacuum tubes depend on emitting a charge carrier into a region where its motion can be influenced by a signal electrode, and on subsequently collecting the charge carrier of an output electrode. The speed of this conventional amplification process is limited by the time it takes a charge carrier, having left the emitter, to traverse the control region, and appear on the collector.

This time is generally quite long compared, for example, to the time it takes for a signal to travel an equivalent length along a copper wire. The reason is that, in the wire, the signal is carried by the electric field of all of the electrons in the wire, rather than by the motion of a particular group of electrons. Each electron in the wire moves only a microscopic distance, and those coming out the other end are not the same ones that went in as signal. The signal in a tunnel diode moves with the same rapidity as does a signal travelling along a copper wire. It is for this reason that the diode has such a short response time.

The difference between the tunnel diode and the copper wire, of course, is that the wire cannot amplify. The wire has a positive resistance: that is, an increase in the voltage results in an increase in the current. In the tunnel diode, an increase in the voltage can result in a decrease in the current. That is, it has a negative resistance. It is for this reason that the tunnel diode can act as an amplifier and perform its many other functions. Instead of absorbing the signal, as a resistor does, it increases it.

Physical Description

A semiconductor has a forbidden region where there are no states available for its electrons. This region is called "The Band Gap." The states below this gap (which comprise the valence band) are almost all filled. The states above it (the conduction band) are almost all empty. The number of empty states in the valence band, or electrons in the conduction band, can be controlled by adding either acceptor impurities or donor impurities to the semiconductor crystal. Each acceptor impurity takes one electron out of the valence band, and each donor gives one electron to the conduction band. In this way p-type (empty states in valence band) and n-type (electrons in the conduction band) regions can be built into the crystal. The surface where two of these regions touch each other is called a p-n junction.

[continued on page 158]

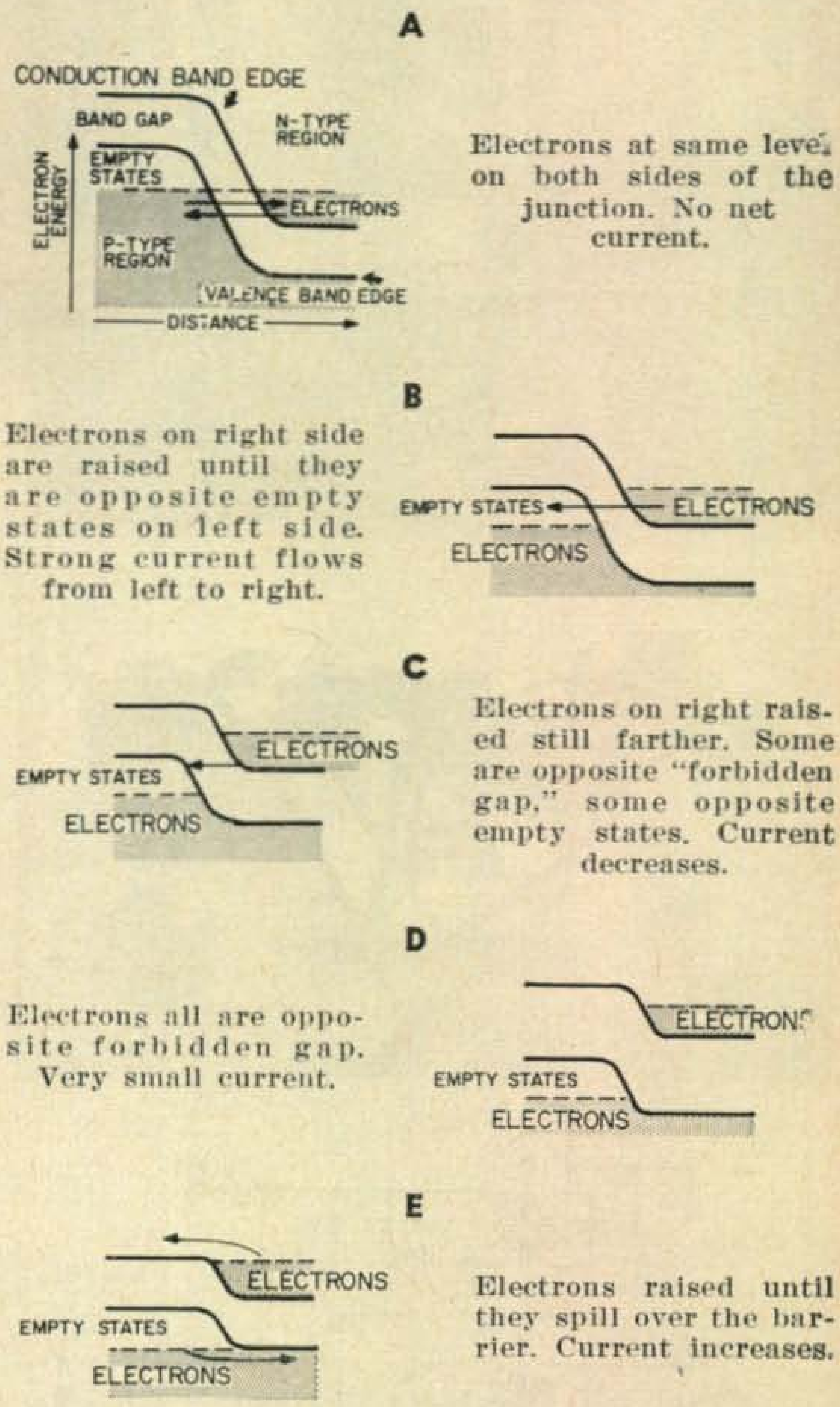


Fig. 5—Tunnel diode junction at various bias conditions. The lettered diagrams correspond to the lettered points on the curve in fig. 6.

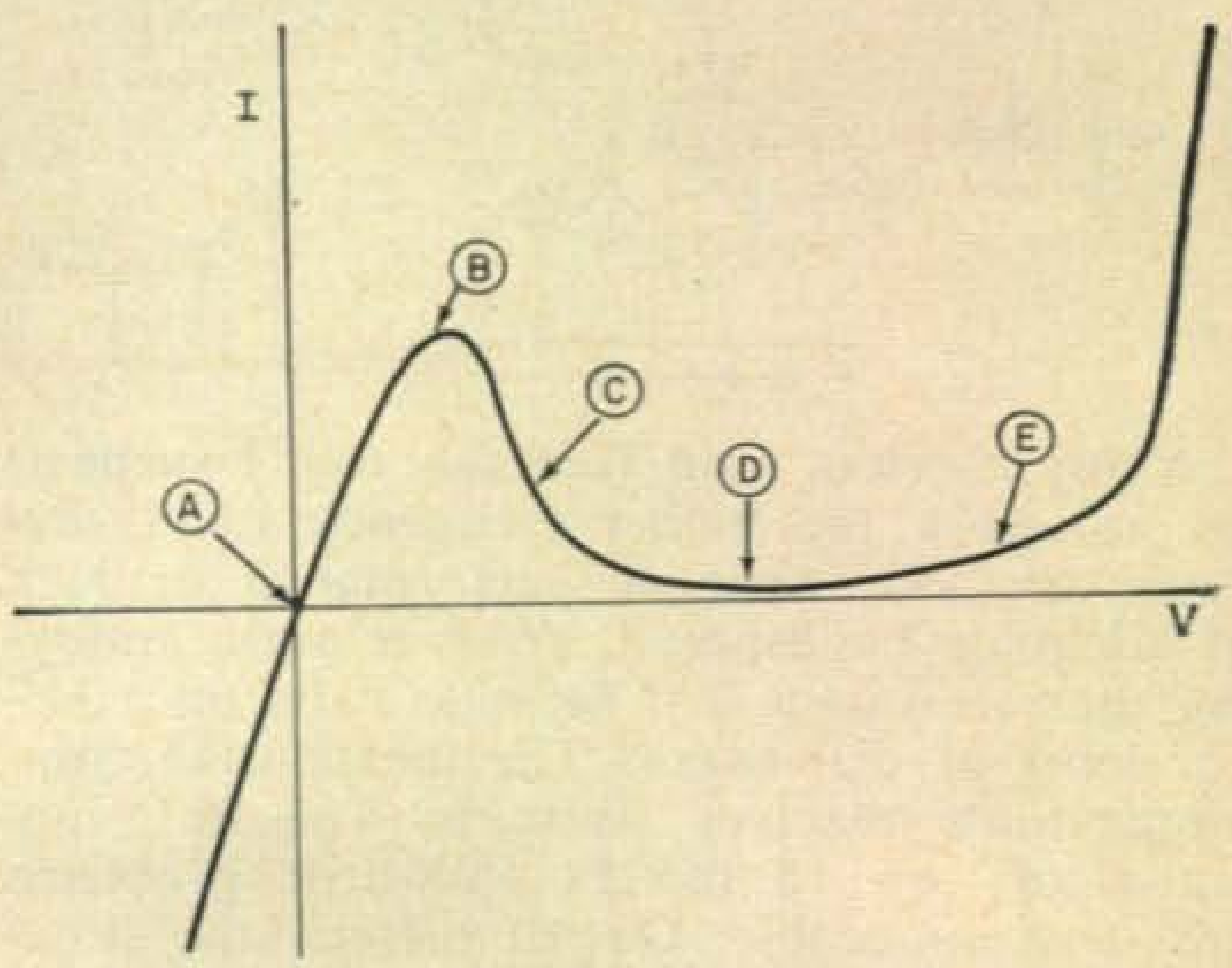
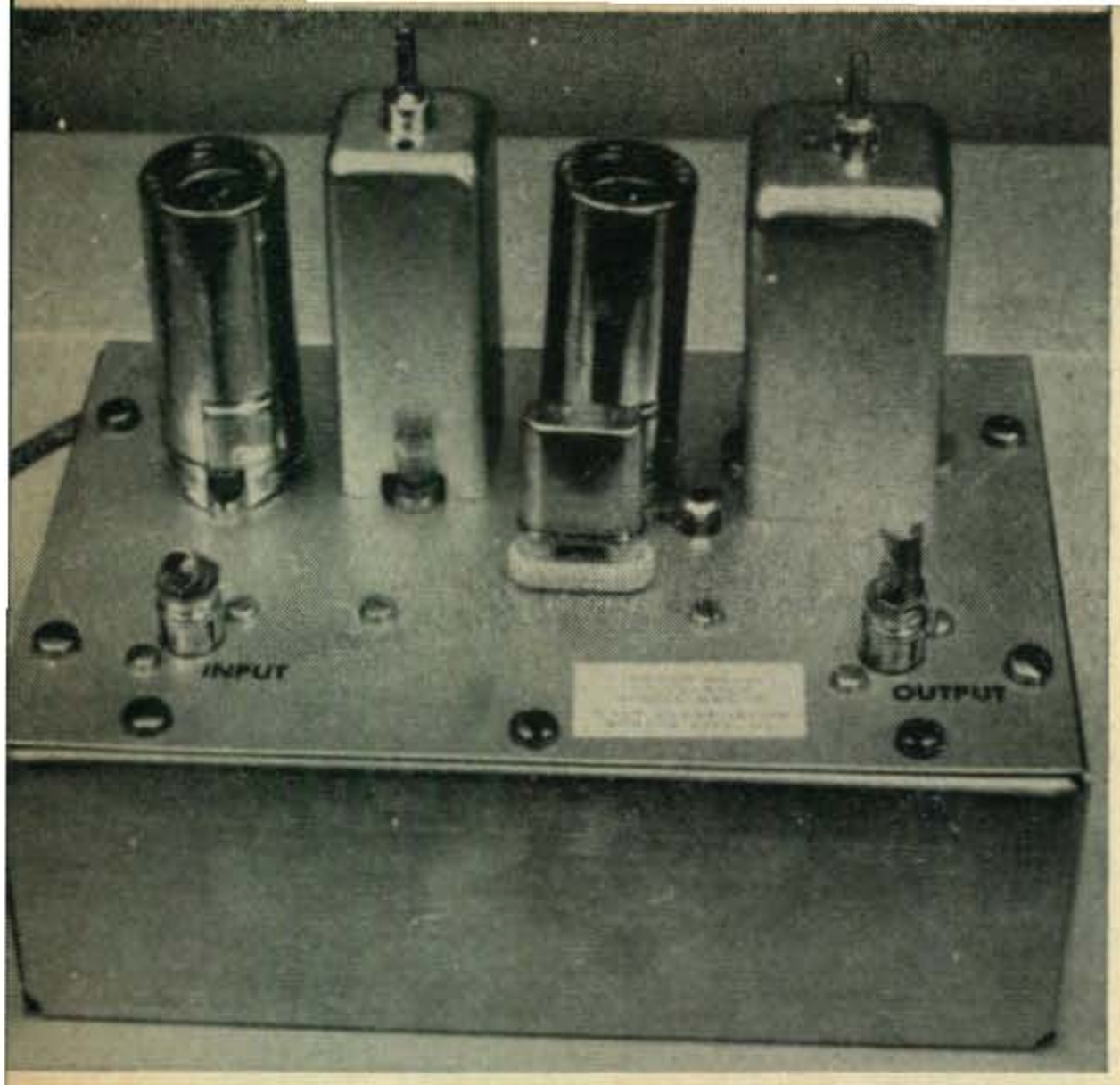
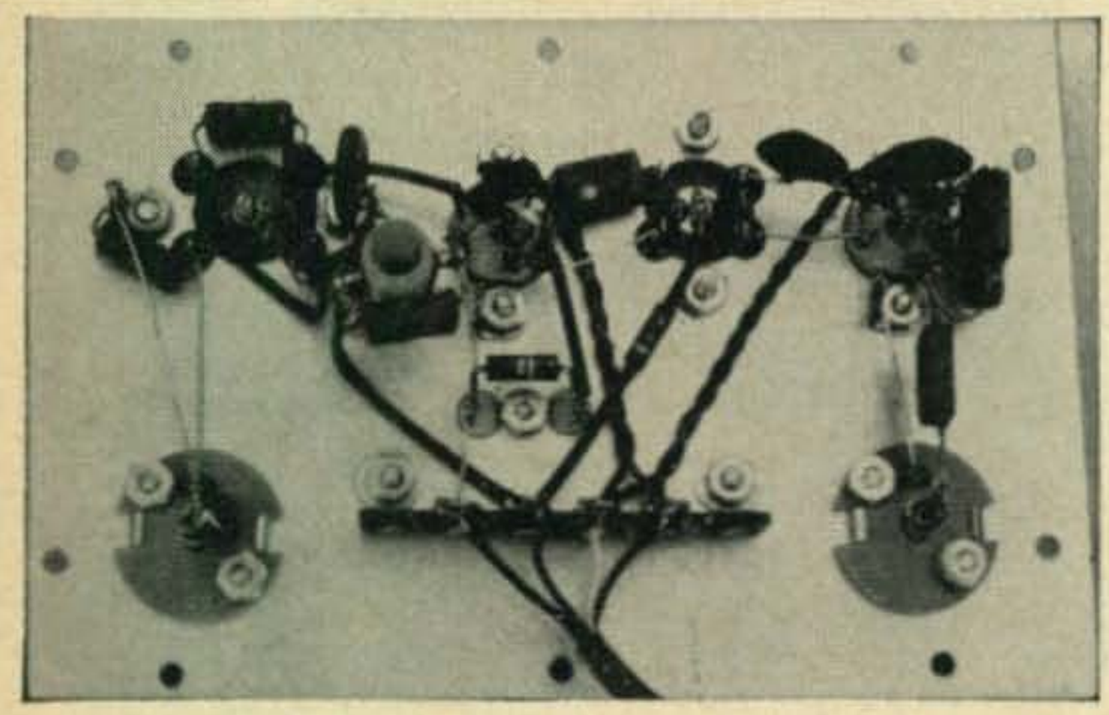
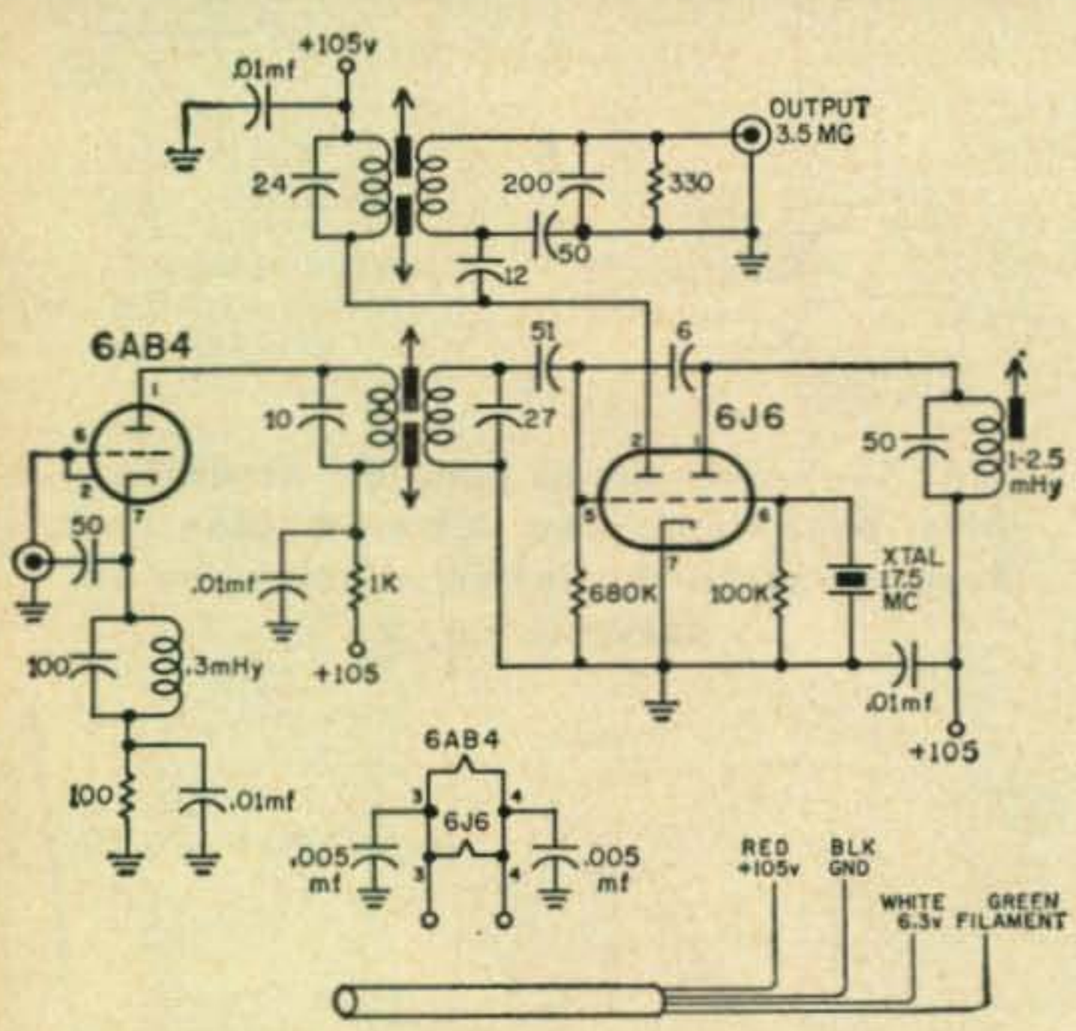


Fig. 6—Current voltage curve of a tunnel diode. For a description of the lettered points see fig. 5.







CQ Reviews the

BBC-15 Converter

with a new product made by Walt Clevenstine, W3CUO.

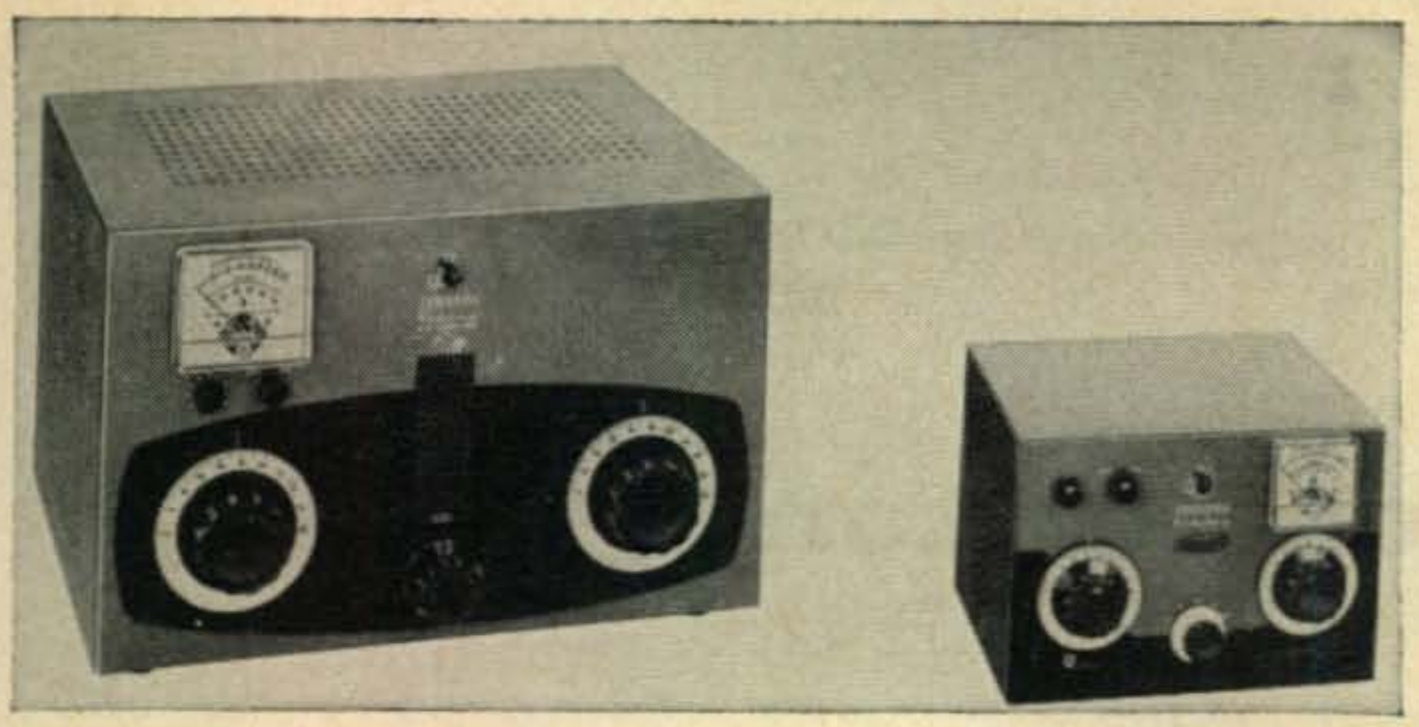
The Model BBC-15, shown in the photographs, is one of a family of 10 and 15 meter converters. They are broad-band crystal controlled devices that cover a 500 *kc* portion of either band, without tuning adjustments. The BBC-15 converts the 15 meter band so that you can tune it on the 80 meter position of your receiver. As an example, the Novice segment (21.1-21.25 *mc*) appears between 3.6 and 3.75 on the dial. All the bandspread advantages of your receiver on 80 meters are transferred to 15 with this arrangement.

Two tubes are used—a 6AB4 *rf* amplifier and a 6J6 oscillator/mixer. The *rf* amplifier is connected in grounded grid fashion, and the cathode circuit is broadly resonant at the center frequency. The noise generation is many *db* below the atmospheric noise picked up by your antenna. An overcoupled interstage transformer, between the amplifier and mixer, establishes the converter bandwidth. Energy from the oscillator circuit is coupled to the mixer, and beats with the incoming signal to produce the *if* of 3.5- 4.0 *mc*. The oscillator uses a third overtone crystal to produce the injection frequency of 17.5 *mc*. The injection energy is on the low side of the incoming signal, which will invert sidebands on SSB. The plate of the mixer feeds a broad-band impedance matching pi-network which effectively couples the converter to the receiver. This circuit appears to improve the mixer performance and produces more signal output than from untuned mixer plates.

The BBC-15 does not contain a supply, but the requirements are so small that you can probably swipe the power from your receiver. If you have an *ac/dc* model receiver you should build a separate supply to provide the required 90-150 volts at 15 *ma* and 6.3 volts *ac* at 0.6 amperes. For best results the power source should be regulated with a gas tube such as the VR-105 or minature OB2. Optimum performance is obtained with 105 volts. The instruction sheet provides complete information on obtaining the voltage from your receiver and also tells you how to regulate it. If your receiver has an accessory socket you can probably obtain the right voltage without going inside the case. The filament circuit of the converter is "floating", that is—neither side is grounded, which avoids the problem of getting the leads reversed and blowing the line fuse.

Many Novices (and Generals too, I suspect) do not work the higher frequency bands because of poor receiver performance or lack of adequate bandspread. What is more annoying than to tune a 200 *kc* wide band on a ⅛" (or less) of dial space? The inexpensive communications receiver starts to lose its "vim-and-vigor" on 15 meters and drift problems are very noticeable. On 10 meters, the situation is even worse. If you have been plagued with these problems, and want to work these bands, you can do it simply and inexpensively

Walt sent along a converter so that I could



CQ Reviews the
Viking Matchboxes

E. F. Johnson & Co. Waseca, Minnesota, who produce what is perhaps the largest variety of gear for the radio amateur, have come up with a couple of new ones which are certainly deserving of some descriptive representation.

A Matchbox, termed simply, is merely a device which effects proper matching of a given transmission line to the output of a transmitter, i.e. an antenna tuner. When the Johnson people first came out with their matchbox several years ago it was found in the hamshack primarily as an accessory to the Viking 2 transmitter. As a larger percentage of our group began to swing over to high power, the line was expanded to include the "Kilowatt" version of the matchbox. Progress being what it is, finds the 1959 product brought up to date.

The new Viking "Matchboxes" are completely integrated antenna matching and switching systems for transmitters up to 275 watts or one kilowatt and provide for continous monitoring of either incident or reflected transmission line power. A unique balanced high "Q" tuned circuit and careful shielding provide better than 20 *db* of additional TVI harmonic suppression. Both units are bandswitching on 80, 40, 20, 15 and 10 meters and completely front panel controlled. The versatile new "Matchboxes" easily match the transmitter to balanced or unbalanced transmission lines over a wide range of antenna impedances. The 275 watt version (catalogue ♯ 250-23-3) will match balanced line impendances from 25 to 1500 ohms and unbalanced lines of 25 to 3000 ohms. The KW version (catalogue ♯ 250-30-3) matches balanced lines from 50 to 1500 ohms and unbalanced lines of 50 to 2000 ohms. Matchboxes are also designed to provide separate matching of the antenna system to the receiver. A self-contained, heavy duty changeover relay switches the antenna from receiver to transmitter, grounding the receiver antenna terminal and muting the receiver when in the transmit position. In addition, these units are capable of tuning out a large amount of both capacitive and inductive reactance. The well engineered design does away with the annoying use of plug-in coils and completely eliminates the necessity to search for the right taps on the coils when changing antennas. An additional feature is provided in the form of a terminal on the rear of the units which permits the installation of an *rf* probe for the purpose of signal monitoring with an oscilloscope or signal monitor such as the Johnson "Signal-Sentry."

All in all, our tests indicate that the new "Matchboxes" are extremely versatile and flexible additions to any ham shack.

Barry A. Briskman, K2IEG

---

put it "through the paces." It was connected to a pre-war (Civil?) receiver. I could hardly believe my ears! The stations rolled in loud and clear, and rock solid stable. A few minutes tour with a BC-348/Q brought in the "unreceivable" 15 meter band. As a further test, the converter was connected to a current model receiver which will remain nameless. The antenna was transferred from the converter to the receiver with a switching system so that an "A-B" comparison could be made. The improvement in noise figure was even obvious to a non-technical observer. The "hiss" was absent even on the weakest DX station. I turned a critical ear to the SSB reception. The stations, which appeared to drift on the stock receiver, stayed put for the first time.

On the basis of several tests with several receivers, I believe I am safe in saying that this fine converter will improve the performance of almost any receiver. The BBC-15 is optimized for 15 meters, while bandswitching communications receivers are a compromise at best.

If you are interested in the same improvements on 10 meters, the Model BBC-10A (28.0-28.5 *mc*) and the BBC-10B (28.5-29.0 *mc*) are also available, and special ranges are available on order. A converter for 28.25 to 28.75 *mc* would be very popular with the DX'ers, Walt. The converters are priced at $39.95 postage paid. If you would like additional information, drop a line to Walt Clevenstine, 711 Arch Street, Spring City, Penna. He will be glad to answer your questions.

Don Stoner, W6TNS

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

semiconductors

Two 40-meter transistor transmitter circuits showed up on my desk this month, from widely separated countries.

The first design, from Jerry Meyers, W6LZY, 2268 Coldwater Canyon Drive, Beverly Hills, Calif., is shown in fig. 1, and features a class B modulator stage. The oscillator circuit was derived from a solar powered unit described by myself in *Popular Electronics*. A 2N170 is used as a current amplifier for the carbon microphone. This is coupled to the class B stage through a push-pull transformer. A pair of 2N190's are used as the modulator and are matched to the oscillator with a transistor interstage transformer. Both transformers are Thordorson TR-17, but notice that the modulation transformer is "reverse connected."

Construction is on a 2 x 2" phenolic board which is mounted in 3 x 3 x 3 box by means of four metal spacers. All components are mounted on the board, with the exception of the battery and on/off switch. The transmitter works with as little as 9 volts and as much as 13.5 volts. Jerry has been able to work 3's, 5's, and 7's on phone with this little rig. For cw operation, disable the modulator, short the modulation transformer secondary, and key the battery lead.

In operation, the base bias resistor is adjusted to 4 *ma*, with no crystal in the circuit. Then the crystal is inserted and the tuned circuit adjusted for oscillation and maximum output. Additional output could be obtained by using link, rather than capacitive, coupling.

Another interesting circuit comes from Australia and A. G. Smith, VK3AN, via *Amateur Radio* magazine. The circuit (fig. 2) consists of a crystal oscillator operating on 7 *mc* driving a straight through amplifier. The unit was constructed on a piece of perforated masonite. Modulation is accomplished by using a carbon microphone with a 1.5 volt battery. This is coupled in series with the amplifier supply voltage through a "reverse connected" miniature speaker transformer. The transformer ratio did not seem to be critical. The antenna coupling system did present some difficulties and the method shown proved to be the most practical.

A sensitive field-strength meter was used to tune the LC circuits to resonance. The meter used was a 0-50 microampere and full scale plus readings were easily obtainable close to the tank circuits. When the transmitter is coupled to the antenna, the meter was used to peak the circuits by closely coupling to the feedline. The little rig has been copied on cw at RST 549 by VK5JE and by VK7MX and MZ on Apple Island. The contacts were established with a 10-watt rig. Cliff, VK3AJA also copied the rig with an RST of 449 and on phone during a later contact.

The transistors used are European OC44's, but the RCA 2N371 should be an ideal replacement with the values shown. Coil L1 and L2 are 60 turns, tapped at 15 turns, close-wound with #34 enam., on ⅜ inch polystyrene rod. The taps, or tap capacitors (.001 and 100 mmfd) can be adjusted for maximum output. On cw, the secondary of the modulation transformer is shorted out to put full battery voltage on the collectors.

Several interesting circuits are given in the latest Bendix application bulletin. Unfortunately, I don't have room for all of them, but two are shown in fig. 3 and 4. Fig. 3 shows a clever way to utilize a transistor as a bias element in a Class B push-pull modulator circuit. The transistor can be used to supply extremely well regulated bias to the cathode of the Class B amplifier. The cathode voltage will equal the bias voltage, which is set by means of R1 for the particular vacuum tubes in use. The transistor should be bypassed for hi-fi applications. This circuit should be invaluable for triode class B stages that draw a tremendous slug of grid current.

Fig. 4 shows a transformerless intercom that would come in handy in any ham shack or home. Because of the low internal resistance of power transistors, the transformerless intercom gives very high gain and power output with direct coupling to the speaker. It is necessary to adjust the bias with resistors R1 and R2 to give three volts collector-emitter voltage across each power transistor. Once the bias is set, the resistors can be replaced with the nearest fixed carbon-type resistor. The talk-listen switch should be of the spring return type to give long battery life. The circuit layout is not critical, and a heat sink for the transistors is not necessary.

Note—The correct address for the miniature

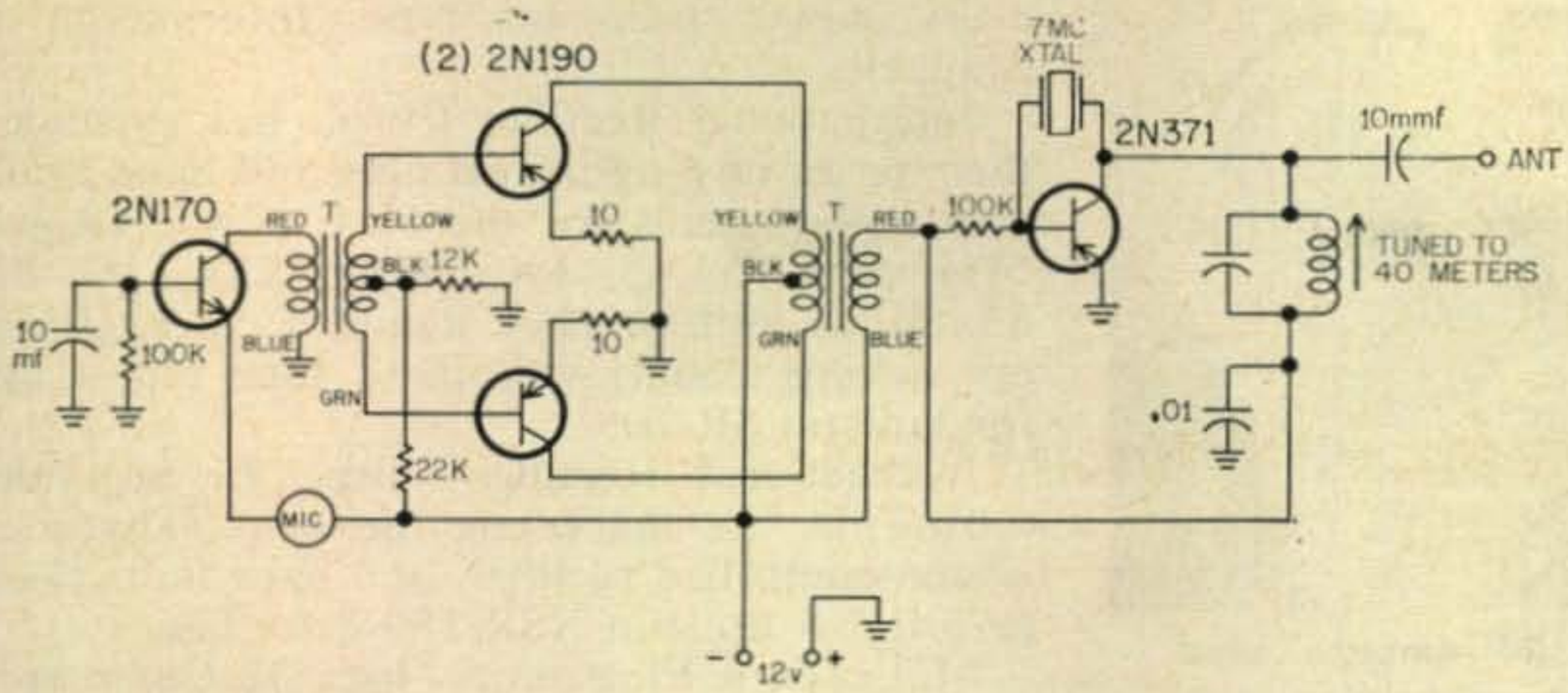


Fig. 1—Schematic of Jerry Meyer's, W6 LZY, 40-meter phone transmitter.

power supplies described in the August 1959 column should be Miniverters, 1881 Austin Avenue, Los Altos, California.

QRP Corner

Wm. J. Engle, Jr., W3KKO, 4264 N. Bodine St., Philadelphia 40, Pa., has had amazing results on 10 meters with a transistor handie-talkie with 40 *mw* input. The rig uses a 30-inch helically wound resonated whip and the circuitry is built into a 2 x 1⅝" x 10 inch minibox, complete with a crystal mouthpiece and earphone. The receiver is super-regen using a Philco SB-100 followed by three CK-722 for audio and modulation. The transmitter section is an overtone crystal oscillator using another SB-100 driving a MADT 2N500 (Philco). The final is transformer coupled, collector modulated, by a 2N223 driven by two CK-722 speech stages. Bill's best dx is Toledo, Ohio from Philadelphia using a three-element beam and station receiver. Line of sight contacts approaching a mile produce 9+ reports on the whip when the other station is H polarized. When the station uses V polarization, reports average S7 up to a few miles in the city, from street level! Nice going Bill, and I hope you can find time to write the project up for *CQ Magazine*.

Transistor News

Bendix is now in production with their 2N297A military-type transistor. This unit has a collector voltage rating of 60 volts and Ic of 5 amperes! It readily dissipates 35 watts at 25°C.

Burgess Battery Company has a new line of rechargeable nickel cadmium batteries. The individual cells, rated a 1.25 volts, include six button types, penlite (AA) and standard flashlight cells (D).

A new publication titled "Are You Destroying Transistors?" is available from CBS Electronics, 100 Endicott St., Danvers, Mass. Ask for bulletin PA-213.

General Electric Co. has a new series of 25-ampere stud rectifiers rated from 50 to 600 PIV. Prices run from $3.40 to $24.10. Ask for bulletin ECG-404.

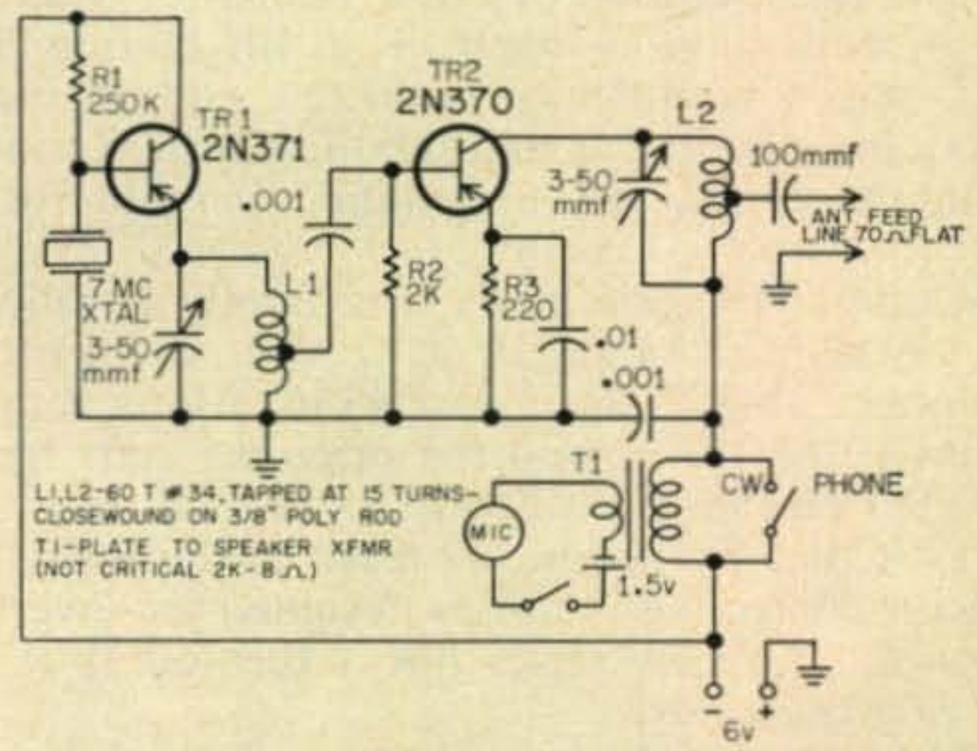


Fig. 2—Phone cw transmitter designed by A. G. Smith, VK3AN.

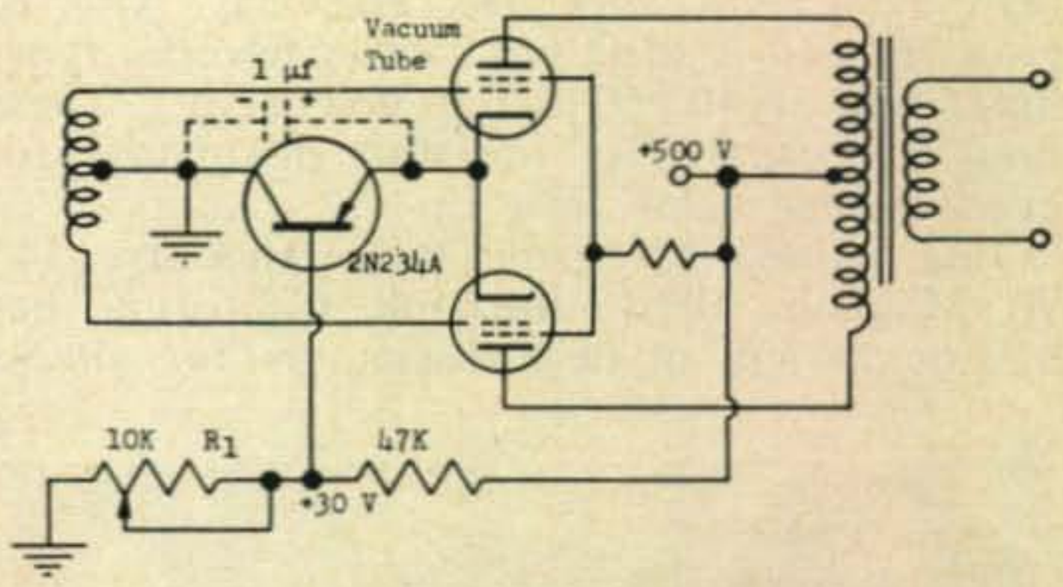


Fig. 3—Transistor class B bias circuit.

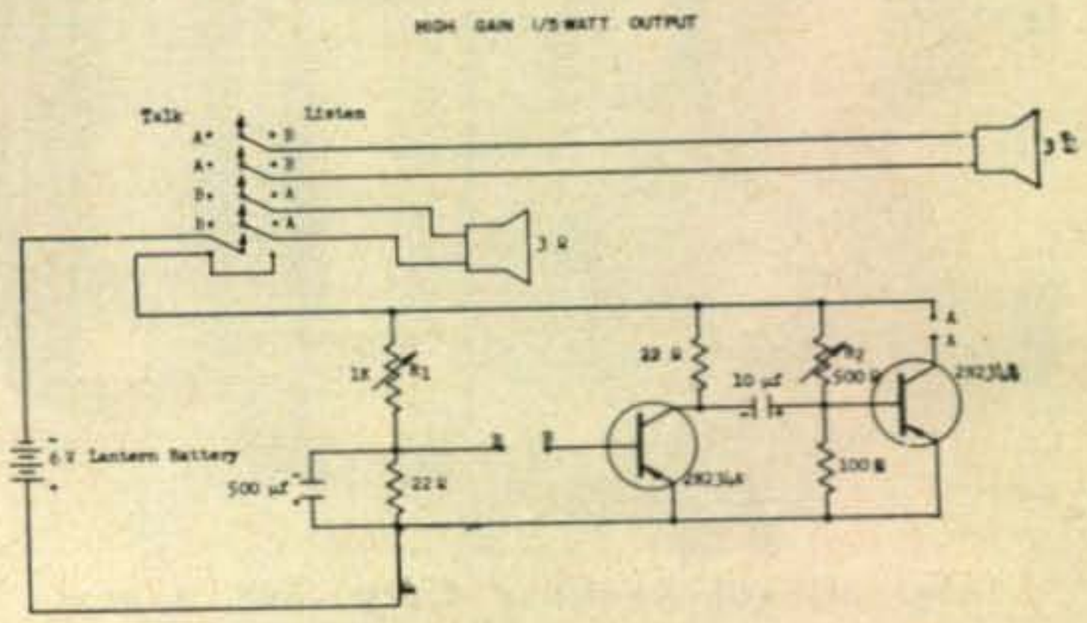
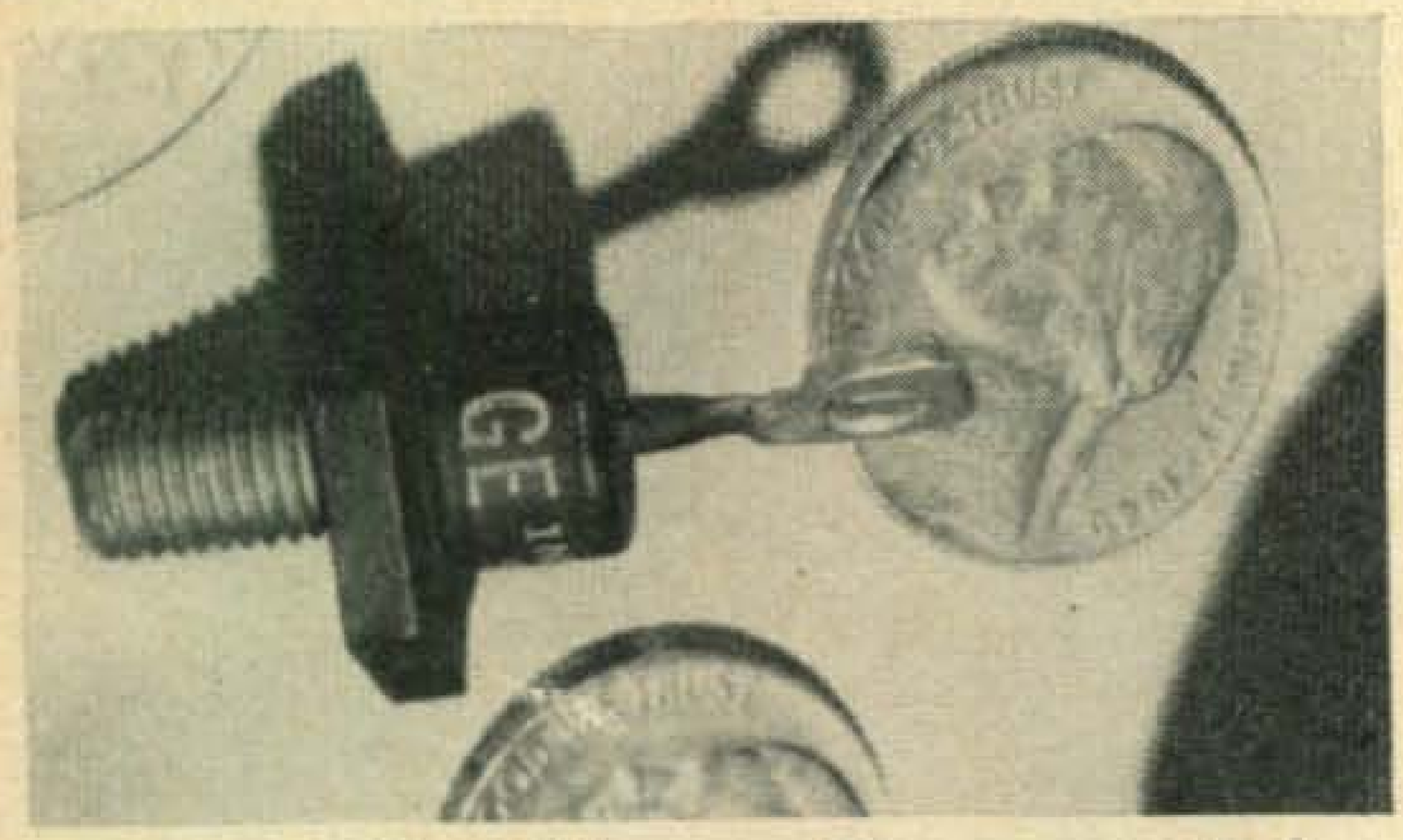


Fig. 4—Transformerless intercom with 1/5-watt output.



General Electric's new 24 ampere stud mount rectifiers are extremely compact, as shown here.

The latest edition of GE's Transistor Manual is an education in itself. The 4th edition has 227 pages completely rewritten and includes servicing theory, construction, characteristics, computers, etc. An unqualified bargain for a buck!

General Electric has a new family of silicon triode transistors rated at ½ watt dissipation, numbers 2N332 through 2N336. Alpha ranges from 10 to 15 *mc* and the price tag runs from $8.00 (bargain for silicon) to $17.20.

Last, but by no means least, is the new GE silicon-controlled rectifiers designed for inverter service. The new series has a turn-off time of 12 microseconds!

Minneapolis-Honeywell showed several new devices at the WESCON show, among them the 60-volt transistors 2N1262 (Hfe to 75) and 2N1263 (Hfe to 113) and the 80-volt 2N1202 (Hfe-120) and 2N1203 (Hfe-75). Also of great interest is their new power tetrodes types 3N45 and 3N46 (60 and 80 volts resp.). These units are capable of one-watt dissipation for every degree below 100°C.

International Electronic Research Corp., 145 W. Magnolia Blvd., Burbank, California, has a wide variety of heat dissipators for almost every power transistor type. Information is available.

International Rectifier Corp. has a new series of plug-in silicon replacements for vacuum tube rectifiers, with piv's between 1500 and 2800 volts at 85 to 600 ma.

International Rectifier Corp., has expanded their series of plug-in rectifiers and have available replacements for the 6X4, 12X4, 5AW4, 5U4, 5R4, 6AX5, 6X5, OZ4, 5X4, 80, 82, 83, 84, as well as other standard types. If you are having trouble wth these tube types, ask for bulletin SR-209.

International Rectifier Corp., El Segundo, California, are marketing the new "Thyrode" silicon-controlled rectifier, and have units rated to 200 piv. Bulletin XSR-350 describes.

Mid-eastern Electronics, Inc., 32 Commerce St., Springfield, N. J., has announced a new transistorized power supply featuring four regulated outputs—200 *vdc* @ 50 *ma*, 100 *vdc* @ 50 *ma*, -50 *vdc* @ 5 *ma*, and 6.3 *vac* at 5 amperes, all regulated to 0.25%.

Motorola, Inc., 5005 E. McDowell, Phoenix, Arizona, has again reduced the price on the MESA's. The 2N700 now sells for less than $15.00!

Pacific Semiconductors, 10451 W. Jefferson Blvd., Culver City, Calif., has a new group of millimicrosecond silicon switching transistors, MESA style. The 2N1409 and 2N1410 are manufactured by very advanced triple-diffused mesa techniques. They feature extremely low saturation resistance, fast-switching times, uniform characteristics, and high power dissipation. Also new from PSI is a line of High Q "Varicaps." The six-member family consists of three capacitances, 10, 22, 47 mmf, each available with Q's of 50 and 100. This amazing device can be used for electronic tuning, automatic frequency control, and harmonic generation.

The new RCA military/industrial diode series uses the "top-hat" construction.

Philco has announced a new family of *npn* silicon transistors for operation to 100 *mc* and a switch for frequencies up to 5 *mc*. The 2N1270 series are intended for amplifiers at 12.5 *mc* with 20 *db* min. gain. The units oscillate to 200 *mc*.

A new socket for breadboard layout is available from Plastic Associates, 185 Mountain Rd., Laguna Beach, Calif. The series includes 7, 9, octals, and all other standard bases.

New diodes from Radio Corporation of America include the 1N440-445 series intended for magnetic amplifiers and industrial applications and the 1N536-540, 547, 1095 series for industrial and military use.

[*Continued on page* 159]

Amateur Radio Legal Notes

Maurice J. Hindin, W6EUV
6505 Wilshire Boulevard
Los Angeles 48, Calif.

Your Editor asked Maurice J. Hindin, W6EUV, to write a series of articles relating to the history and development of the law as it affects amateur radio. Mr. Hindin is already well known to readers of CQ and has had numerous articles published in CQ from time to time. He is an attorney at law and has been active in both the practice of law and ham radio for over a quarter of a century. He is admitted to practice before the United States Supreme Court, the Federal Communications Commission, and all of the State and Federal Courts in California.

Probably no hobby is more closely linked with the law than is Amateur Radio. The very nature of the hobby owes its existence to the creation of the law, and, as such, the development of the law presents an interesting story, which is a definite facet of Amateur lore.

While, of course, statutory law has provided the framework for the development of radio, it is the case law which provided the color and precedent which round out the law of radio. One of the early cases of major importance in the field of radio communication arose in Texas in 1934. This case arose as follows. A group of persons commenced operation of a radio station without a Federal license. The station was operated in Houston, Texas, and operated with a power of only two to four watts input. The station operated on a frequency of 1310 kilocycles, which was at that time a clear channel. The Government brought an action in the United States District Court to enjoin and prevent the station from being operated since it did not have a Federal license.

The defendants presented two arguments which, to that time, had not been decided by any court. The first argument was that the signal which the station emitted could not be heard outside of the boundaries of the State of Texas. The second argument was that since no other station had been assigned the frequency upon which the station was broadcasting, the station did not violate any requirement of the Federal law. This station, therefore, contended that it was not engaged in interstate commerce but was active only within the confines of the State of Texas. The station contended that the Federal Government had no authority to legislate except as to interstate commerce, and that the station was not operating in interstate commerce.

The importance of this case can be readily understood when it is realized that the very authority for the Federal Radio Acts must be found in the Constitution of the United States itself. This constitutional authority is found in the provisions of the Constitution which authorize and empower the United States to make laws regulating and affecting interstate commerce and commerce with foreign countries. If the court held, as the station contended, that this station was not engaged in interstate commerce, then the Government would have no constitutional authority to pass or enforce laws relating to such radio stations which were not engaged in interstate commerce, but which were confined solely to operation within a single state.

The Federal Court, after hearing the arguments of the station and the Government, made a monumental ruling. It ruled that all radio communication was interstate commerce, whether or not the station's signals could be heard outside of the boundaries of the state wherein it was situated. The Court arrived at this decision on the theory that while the station in question could not itself transmit a signal that could be heard outside of the State of Texas, nevertheless, it would constitute a source of interference with the reception of signals coming into the State of Texas and originating outside of the State of Texas. Thus, it said, in effect, that both the reception of signals from outside of the State as well as transmission of signals constituted interstate commerce and, as such, it was properly the subject of Federal regulation.

The Court, therefore, held that a Federal license was required by the station, even though its power output was so low that its signal could not be heard outside of the state in which it was operating, and the Government won the case and secured an injunction against the station.

Prior to this time, serious questions had been raised as to whether or not a Federal license was required of stations which could not transmit a signal beyond the confines of a single state. Had the Court ruled that such transmissions wholly within the state were not activities in interstate commerce, the entire course of the

[*Continued on page* 161]

Urban Le Jeune, Jr., W2DEC
416 North 15th St., Kenilworth, N. J.

DX DX DX DX DX DX DX DX

The following certificates were issued between August 15th and September 15th, 1959:

CW/Phone WAZ

#1147 W6BIF, Les Abarta
#1148 W7AHZ, George D. Heitzman
#1149 W6BYB, John S. Mayes
#1150 W6BZ, Mel Whiteman
#1151 VE3CIO, Harry D. Gray
#1152 W6ZMX, Eric Erickson
#1153 W6JHV, John P. Nelson
#1154 I1FO, Franco Silvano Orefice
#1155 W6MUF, Eric T. Ledin
#1156 W7ZOH, Don W. Liebsch
#1157 KP4YT, Joseph Gonzalez
#1158 SM5BPT, Sune Ericsson
#1159 K2VUI, Joseph Green
#1160 W3AEL, Charles Marshburn
#1161 WØEWH, Harrison A. Miller, Jr.
#1162 DL3DD, Dr. Leopold Pomp

All-Phone WAZ

#43 DL7AA, Rudi Hammer
#44 W7MGT, John E. Holmes
#45 I1AOF, Gioacchino Loreti

CW WPX

#63 W1IJB, Albert A. Bellerose
#64 WØDMA, Alva A. Smith

SSB WPX

#10 TG9AD, Roberto W. Engel
#11 W6TNS, Donald Stoner
#12 W6BAF, H. E. Spaulding

WPX Honor Roll

CW WPX

W2HMJ	531	VE3DIF	357	DL7CS	330
W6KG	473	W5OLG	356	W6YY	330
W8KPL	436	W6WO	356	W4OPM	323
W5KC	433	W8LY	354	K9EAB	310
OK1MB	428	WØPGI	353	G3EYN	318
W5AFX	407	W3BQA	352	W9YSX	317
W1NLM	400	W5DA	351	VK6WT	316
W1EQ	377	W2MUM	350	F9MS	315
W2EQS	373	W8JIN	350	PAØVO	315
W9DYG	367	W1IJB	349	K2PFC	312
W9UXO	362	W9IU	344	SM5AHK	311

W2PTD	311	W6RLP	304	WØQYE	301
W8RQ	311	OK1AEH	304	K4JVE	300
PAØLY	310	SM5CCE	304	K4KOY	300
W9BPW	310	W1FZ	304	KL7MF	300
DJ3BB	308	W5AWT	303	W2FXA	300
SM5BCE	308	W9VIN	303	W3BCY	300
WØDMA	308	VK3KB	302	W3LMA	300
DL1QT	306	W3DBX	302	W4GXB	300
K5LIA	306	W5LGG	302	EA4CR	299
OK3DG	306	JA2JW	301	W1HWH	299
UA9DN	306	LU5AQ	301	WØGUV	299
K4HXF	305	PY4OD	301	W3UXX	280
K6SXA	305	W2DGW	301	OK1BY	207
VE3BWY	305	W4HYW	301	W4OMW	207
W1BFT	304				

Phone WPX

W8WT	446	CT1PK	350	W9UZC	302
G3DO	395	W5ERY	315	WE1ADE	250
PY2CK	354	ZP5CF	306		

SSB WPX

TI2HP	231	VE3MR	164	W1GR	152
K2MGE	191	TG9AD	160	W8YBZ	152
K9EAP	180	WØCVU	155	WØFUH	151
W6BAF	170	W2TP	153	W6TNS	150

Letters

The following letter was received from John, VQ3HE, describing his trip to Zanzibar. It is written so well that I haven't changed a word.

"I am sorry that we had to spring the Zanzibar CW DXpedition without much prior warning but I was in Tanganyika signing VQ3HE for two months—July and August, and being so near the opportunity was too good to miss!

Also of course, my company operates a fleet of Cessna 182's on our charter business, and over a few drinks in Dar-es Salaam, the idea just grew—like the proverbial Topsy! Actually, Peter, VQ3PBD, dired our enthusiasm by his highly colourful accounts of his 'phone dxpeditions in the past—BUT—whilst there have been a number of AM phone and an SSB expedition it was reckoned to be 12 years since anyone last operated a CW rig on "The Island of Cloves." Tina Wright (still a YL) had just been licensed as VQ1TW and is a keen CW addict having been a W.R.N.S. (WREN) during the war. Ron Tester VQ3HS, a fone operator, volunteered to come along as an established Zanzibar expeditionist to advise and guide our

August Sprock—PJ2CK, ex-Commercial ship's operator — now extremely interested in 160 meters, but unable to transmit because of local regulations, nevertheless listens faithfully and reports activities and conditions to W1BB. (Thanks W1BB)

DU1PAR installed at the 10th world Boy Scout Jamboree, Los Bancs, Laguni, Philippines which was recently held. 24-hour operation was maintained by a staff of volunteer DU hams. Special commemorative QSL cards will be sent to all who worked this station. At the operating position is Bert, Romy, DU1RC, and Dick, DU1CE. (Thanks DU1RTI)

path, help with the licensing authority, erect antennae, etc., etc.

So it was fixed, the Cessna 182 being laid on for 0800 Local The Minimitter "Mercury" 150 watt rig, NC. 100X rx, antennae (incidentally a G5RV multi-band di-pole for transmitting and a 40 meter Windom for the NC. 100X) together with all the attendant clobber, duly loaded. (See photo taken at Zanzibar airport alongside the Cessna.) Due to Ronnie's pre-knowledge the station went on the air at 1000 local (0700 GMT) on Friday 14th August. All but two hours for African contacts on fone, was spent on 20 meter CW as 10 and 15 did not prove lucrative of contacts. We closed down at 1600 local (1300 GMT) on Saturday 15 August. The pile-ups were phantasmagorical! It seems that more than we anticipated still needed CW QSO with VQ1—many thousands more! We were all so sorry that time did not allow us to work all who called—indeed 30 hours continuous operating under QRM condx were just about all we could take, and for future CW dxpeditions, it will be imperative to stay longer on the Island and have more CW brasspounders.

It was certainly hot on that roof—virtually no shade—and in consequence a certain quantity of liquid RF was consumed. Please see unexpectedly candid shot of John, VQ1HE, rather pre-occupied with reading the QRM surrounded by a number of useless containers.

There was one unfortunate incident when John, VQ1HE, with the cans on, was subjected to a very loud audio howl due to the TX being on when Ronnie, VQ1RET, tuned the NC. 100X across the frequency. In my anguish I wrenched off the headset leaving the small earpiece buried in my eustachian tub (ear 'ole to you). All operations had then to cease for an operation of a different sort—the removal of the offending earpiece from the said E.T. with a pair of medical forceps happily produced by Tina (VQ1TW) out of her handbag! My state of mind at the time was not improved by a

Zanzibar Airport—Tina, VQ1TW on the left and Ron VQ1RET (VE3HS) and a local fire-fighter whose services were happily superfluous. The rig is a NC100X and mini-transmitter in the foreground.

series of corny wisecracks about "hams with built-in headphones" and "what are you worrying about—it looks like we're getting out" etc., etc., etc. Otherwise, apart from Ronnie losing his voice entirely, i.e. superchronic modulation due to a cold, there were no undue hazards, antenna erection excepted.

As to operating, in general terms all went fairly well. No one paid any attention, of course, to such o-sigs as QHL and QLH—one or two intentionally or not called us off the frequency and these usually succeeded in making a contact with one of us. Certainly we gave priority to anyone calling off our frequency even if only very slightly off.

The nicest thing has been the number of W/K hams who have written to thank us for our *patience. No doubt at all, we find it difficult to clear our consciences of all those worthy chaps who called and were heard but could not all be QSOed due to "pressure of business."*

Tina and Ronnie will be going again. It has been proved that a charter plane is the answer for quick trips over from Dar-es-Salaam and it may be depended upon that those of us with the opportunity will not fail to go. For this show VQ1TW, VQ1ET and VQ1HE are QSL-ing individually according to each own log book.

That seems to be about all the story that bears repetition. I hope it helps to explain what we tried to do. Please thank all for the QSOs, their patience, courtesy and their IRCs. We'll be seeing you in VQ1 again.

73,

John Sainsbury
VQ1HE, VQ3HE, VQ4HE, VQ5HE
(ex-G8HV, G2CYW, ZE6JS)"

AC4 Tibet—John, W6YY, forwarded the following letter which he received from AC4-AX. I know all will be glad to know that he is well and interested in knowing he is still in Tibet.

"10th August 1959

My dear John:

Thank you much for yours of 9th March which I received only last month.

Thank you ever so much for magazines you sent to me which I received on 25th July but I did not yet receive those tuning units for BC610 you sent to me long ago. Hope will receive very soon. As regards conversion of those tuning units to higher than 18 Mc/s I shall be much obliged if you please obtain the gen in details from Tan, 9M2DW or you can tell him my address so that he can send me direct. He knows me well and I think he will send me the necessary gen.

Zanzibar Island from the air. In the distance is Pemba Island also VQ1. (Thanks VQ3HE)

Regarding Technical Manual of BC610 I shall be much grateful if you kindly send the same along with some Television engineering hand book. Now I am going to instal my BC-610 very soon and I am interested to errect one Rombic aerial for the above transmitter. Would you be kind enough to send me a detailed sketch of Rombic aerial along with transmission line (feeder) and aerial tuner.

As regards our QSO I regret to say that it is not possible for the present and I will let you know when I will be on the amateur bands. We are all quite well here. Please convey my best 73s to all my well wishers and friends. Please contact me by writing me frequently and I will also do the same.

Hope you are all keeping well and in happiness. May God bless you and yours.

Best of 73s,
Yours sincerely
/s/SEAL"

Before you all rush out to buy instruction manuals for BC610's, that part of it has already been taken care of, hi!

AC5 Bhutan—W6YY was also the recipient of this communication from AC5PN.

"Dear Friend:

I am so glad to receive your QSL for our phone QSO and your very kind letter. It is very very nice of you to offer the rig of W2-KUW for QSO used on a loan basis. I am so grateful to you for this and your intentions are so very highly appreciated. At the same time I am sorry to tell you and how can I explain to you the difficulty in bringing the rig here. They are liable to break down in transit. Suppose they arrived at Calcutta, it has to go by air to nearest airport of India to Bhutan, from there it will have to go on ponies or man-carriers for at least 12 days and by the time you will get back the set will be one or one and one half year. If the set is so kindly presented to Bhutan for always used, then there is no worry —all arrangements will be done at government expenses. I am a government servant, directly connected to the King. I can do arrangement in my official capacity.

AC3SQ became AC5SQ. I requested the government to have him here as we need good technicians here. He is preparing his station and will soon be on the air. I have informed him about you accordingly.

So please forgive everything if I did something which you don't like. We don't like war and we are peaceful country and know all of you are the same.

Karl, UR2BU, and his very impressive shack. Karl was recently awarded WAZ and awaits only one card for phone WAZ.

Please convey our very best wishes to all of you from this country.

Your very sincere friend
/s/ CHHAWNA AC5PN"

Memo from W6YY:

Above letter received 7/25/59 for a 7/1/59 QSO.

The offer was made from Ted, W2KUW to lend AC5PN the KWM-1 rig which Ted sent over to FD8DZ and to EA9DE/PX1DE.

Anybody have any inside path to any of the manufacturers to get some large publicity for their firm by presenting an SSB transmitter to the King of Bhutan? (If so, I will make the necessary arrangements for transportation.)

CR5 Sao Thome—CR5AR is currently very active on 21055 kc around 2100 GMT. (Thanks Ether Waves)

CT2 Azores—K6MPJ advises that operation for all other except Portuguese Nationals is prohibited from the Azores. CS3AC is no more and if this call is heard on the air he is definitely a bootlegger. Many cards have been received for QSO's with a CS3AC causing the boys there great embarrassment.

ET2 Eritrea—W4EJX, the chief operator of ET2US advises that only 20 meters is operated there with preference being given to SSB. They are on the air almost nightly, starting at 2200 GMT.

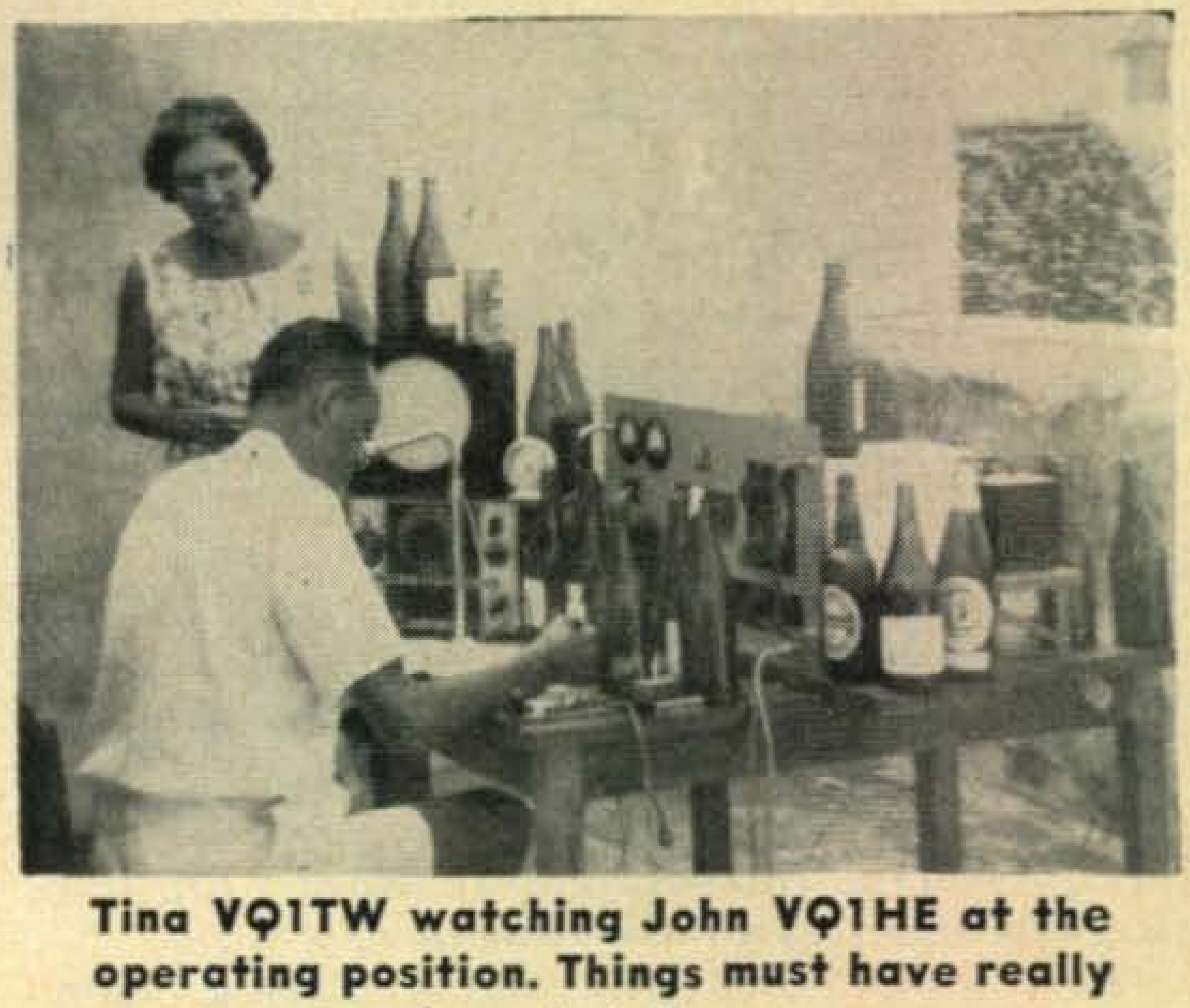
FP8 St. Pierre—Jeff, K4RSD, spent an enjoyable 5 days as FP8BF. In 49 hours of operating time, Jeff knocked off 1021 QSO's. W1AW was copied 599 on 160 meters but no antenna available. Jeff claims the fone operators are on 15 meters while the best CW operators are on 20 meters. QSL via Jeff May, 5054 Springhill Drive, Pensacola, Florida.

FR7 Reunion Island—FR7ZD has been very active of late on both 14 *mc* fone and CW. A *vfo* is used with operating times around 1200 GMT and 0300 GMT.

KA Japan—Jerry has shut down KA8KW after two years of operation. He is now being transferred to the Hawaiian Islands and soon will be operating with a new KH6 call. He wants to thank all for their many kindnesses and patience. Anyone missing a QSL card may reach him at Col. Jerry Branch, 6920th Security Wing, USAF, APO 915, San Francisco, California.

KAØ Iwo Jima—In the very near future, possibly by the time you are reading this, all KAØ calls will be changed to KG61 calls. KAØIJ becomes KJG1J, etc.

PYØ Fernando de Noronha—PY7SC is now operating on 14302 *kc* SSB starting at 0000



Tina VQ1TW watching John VQ1HE at the operating position. Things must have really been hot there.

UB5CK's 150-watt home brew rig. Eugene is waiting for cards for his WAS and WAZ. A quad helped him to work 125 countries.

GMT on nights that electricity is available. PY4TK handles the pileups and should be contacted first. PY4TK is also handling the QSL's. (Thanks Ether Waves)

VR6 Pitcairn Island—The following was received from W5OLG: "When Tom Christian, VR6TC, was taken to New Zealand last fall (1958) for an emergency appendectomy, he sold his receiver to pay part of the hospital expenses. He must remain away from Pitcairn until all bills are paid. At present he is working as radio operator aboard a coastal vessel and hopes to get home in Feb. or March of next year. It will be a long time before he can get on the air with VR6TC unless we help him out. A good second-hand receiver is needed and donations are being accepted by W4TAJ and W5OLG. If you wish to contribute, send a dollar to either and when VR6TC is on the air again a schedule will be arranged for you. W4TAJ has the QSLs. Skeds will be arranged on the first come basis." (Thanks W5OLG)

Yasme—Dick, VP2UB, etc., has a new boat lined up and should be getting under way on his new expedition about six weeks after you read this bit.

ZS7 Swaziland—ZS6ASW will be operating from ZS7 land on 10, 15 and 20 meters for about 20 days from the 1st of December.

ZS8 Bechuanaland—ZS81 will be operated by ZS6IF and will be operated for one full week in November. Don't know what week but he says he will be on the air operating for "25 hours a day." ZS81 is presently on 75 meters fone and operates no CW. (Thanks Northern California DX Club)

9N1 Nepal—There have been several 9N1 stations operating of late but none appear to be legitimate. We are still waiting for the big pileup to start.

Certificates

Diplome de L'AAEM—The Association of Amateur Radio Operators of Morocco (AAEM) created the "Diplome De L'AAEM" in the interest of furthering friendship with amateurs of the rest of the world.

This diploma of undeniable artistic value, will be granted to licensed amateur radio operators of whatever country they belong under the following conditions: ARTICLE NO. 1. For the following countries:

GERMANY, ANDORRA, AUSTRIA, BELGIUM, SPAIN (EA1 to EA9 INCLUSIVE) FRANCE (COMPRISING OF ALGIERS, TUNIS, CORSICA, SENEGAL AND FRENCH WEST AFRICA), GREAT BRITAIN, ITALY (COMPRISING OF SICILY AND SARDINIA), LUXEMBOURG, MONACO, PORTUGAL (COMPRISING OF AZORES AND MADERIA ISLANDS), and SWITZERLAND.

They must contact 30 Moroccan stations of the following prefixes: CN8 A, B, C, D, E, M, CN2 and CN9 after 1 January 1957. Only the CN2 and CN9 stations need to be contacted after 1 January 1957 on 1 band; 25 stations on 2 bands, 20 on 3 bands; and 15 on more than 3 bands. For all other countries not listed above they must have contacted 15 Moroccan stations on 1 band; 12 stations on 2 bands; and 8 stations on 3 or more bands.

TRANSLATORS NOTE: Notice that the call letters prefixed above *do not* include CN8 prefixes for calls issued to American Military and civilian personnel in Morocco. This was necessary to prevent the document from becoming as easy to "win" as "RCC" and similar "Awards." Since the majority of American amateurs are only in Morocco for a short time this ruling seems to be very sound.

NOTE NO. 2: CN8AR could be contacted on 4 different bands and would therefore be considered 4 different stations worked for the purpose of winning this award. Four contacts with the same station on only one band would, of course, only count as 1 station worked for the purpose of this award.

ARTICLE NO. 2: The contacts must be made on either fone or CW on whatever band is being used.

ARTICLE NO. 3: The starting point for the granting of this award has been established as 1 January 1954.

ARTICLE NO. 4: Each year on 31 December a list of diplomas issued will be compiled and the 5 Moroccan stations having been contacted the greatest number of times for the "Diplome de L'AAEM" during the preceding calendar year will each be given a "DIPLOME D'HONNEUR." This diploma will be issued during the general meeting which follows the preceding period.

ARTICLE NO. 5: Requests for the Diplome de L'AAEM must be forwarded to the Association Des Amateurs Emetteurs Du Maroc, P. O. Box 2060, Casablanca, Maroc, together with 3 international reply coupons. A letter of transmittal and supporting QSL's confirming the contacts must be forwarded at this time.

Worked All Netherlands Antilles Award

The Worked All Netherlands Antilles award,

[*Continued on page* 162]

VHF

50mc. 144mc. 220mc. 420mc. and above

Sam Harris, W1FZJ
P. O. Box 334 Medfield, Mass.

Technicians

The FCC has seen fit to give the technicians a special frequency assignment in the two meter band. Some techs feel that this represents an affront to their technical ability. Some feel that this proves that "the FCC feels that the two meter band needs to be 'saved.'" Sober amateurs feel that both thoughts are, to some extent at least, tenable.

Experience with technician occupancy of six meters has brought to light some interesting facts about this new facet of hamdom. The most important facet is that they are old hams in the strictest ham interpretation of the word. They are all sincerely interested in the amateur radio traditions. They all feel that they are making, each in his own way, their best effort to promulgate the species. Anyone who thinks that they are different in their behavior from ordinary hams is obviously not closely associated with ham radio. They fight among themselves. They feud with each other. They damn others who do not believe that their kind of operation is the only way. (They haven't really come to grips with the SSB question yet, but they will.) In short they are hams as you will find them on all bands.

The FCC decision to restrict technician activities to a special part of the two meter band is, in effect, an incentive action. The so-called serious two meter man is an ardent cw operator. Local phone rag-chewing is a thing of the past. The greatest rewards are in working a new state, and if you have your initial 20 or so, you had better be on cw. Technicians (in theory at least) differ from the rest of us only in their rather mediocre cw ability. What better way to spur them on to getting their general than to deny them the opportunity to work dx? Of course the fact that no self respecting tech cum general would waste on time on the *vhf* has apparently been overlooked. The facts are that no sincere *vhf*er restricts himself to only the *vhf* bands. Naturally any tech who proves his 13 *wpm* ability will immediately move to twenty meter phone. (Or possibly to 75 phone for a brief encounter with William two Oscar Yoke.) Or at least to some L.F. amateur holding.

Old John, W8LPD, receiving permanent possession of the Microwave Associates VHF Trophy. Kay Brandenberg, K8IYW, makes the presentation at the first annual "Puevom" meeting. (Dayton Hamvention naturally.)

On the other hand a genuine dyed in the wool technician isn't looking for incentive. He is trying to pursue *his* hobby to the best of his ability and he didn't see anything in the rules about bettering himself. As a matter of fact, he thought the technician license was designed to allow him to pursue his hobby in the best way he knows how. Nobody mentioned anything about 13 words a minuter or any such.

This technician has a problem on two meters. He wants to contribute to the welfare of the two meter band but he can only do it by starting a new center of activity. He can listen in the low end and hear the type of activity which has made two meters so popular. He will have a hard time talking to them, however, because anybody knows that a two meter DX man can only tune the low end.

Now the technician complement on two meters might as well get the news now as later. The fact is that any receiver capable of copying a weak signal must have a large amount of bandspread. This same bandspread which makes it possible to use the selectivity necessary to copy weak signals makes it impossible to cover a large part of any band in a short time. I normally spend five minutes tuning the first 300 *kc* on two meters. The signals I am accustomed to looking for are grouped in the first 300 *kc*. No conscious effort is made to ignore the rest of the band. It just isn't possible to

BE APPRECIATED!

YOU probably have several very near and dear friends who are also Hams . . .

for whom expensive and elaborate Christmas gifts this year are out of the question.

IF SO, you're not alone! Thousands of Christmas shoppers face the problem of what to get these friends . . . while holding expenses within their budgets.

A SUBSCRIPTION to CQ will be appreciated by anyone who receives it and each month will be a reminder of your thoughtfulness.

SAVE MONEY on your subscription as well as your gifts.

CHECK our Subscription envelope and rates on the opposite page.

tune the whole band effectively. The one thing that will make people tune the second megacycle is the presence of some good top notch signals on a regular basis. The way to win the game is to make your part of the band more desirable than the verboten part. If there is anything to tune for, you can be sure that anybody worth while will be tuning for it. Don't waste your time worrying about the guys on the low end. With your background of success on six meters, you can make your own low end. And if they behave themselves you can even talk to the generals. (Provided they move up to where your receivers will cover.)

2 Meter Moonbounce?

A last minute rumor received from the west coast tells of a record shattering contact between the University of Wellington in New Zealand and members of an unnamed VHF Society in Southern California. Particulars were just not available at the time of writing. In any event the "Rhododendron Swamp" boys are oiling up the old moonbounce beam and champing at the bit for schedules.

Visit to the Station of the Month

When we first started playing with *vhf* most of the ideas we played with were fresh out of the "Jones Radio Handbook." That was well over twenty years ago. Today the latest information on *vhf* gear still carries the Jones byline.

We finally got a chance to visit the old master in his lair at Sonoma, California. A tour through his laboratory and workshop is an educational thing. The most important thing you learn is that all those ideas of Franks' are the result of working at his hobby. His equipment covers all bands from the low frequencies to as high as they go. And the equipment is ready to go *now*. It is true that I found a couple of pieces of commercial gear in his shack but they were hidden away behind the operating position and operating gear where they wouldn't interfere with good equipment. Most of the gear in use at W6AJF is the forerunner of what you and I will be using in a year or so.

Frank has been active in radio since 1921. His list of "Firsts" is long and impressive. The prime thing you can depend on from Frank is conscientious effort to better the equipment in use on the *vhf* and up bands. His most valuable asset in pursuit of his hobby is his XYL. I can vouch for her coffee and cooking. No wonder old Frank is so well preserved.

Contest Comments (August)

Dave Still, K2VTX/VE2—"I've never seen such a rat race before on any VHF band." (144 *mc*)

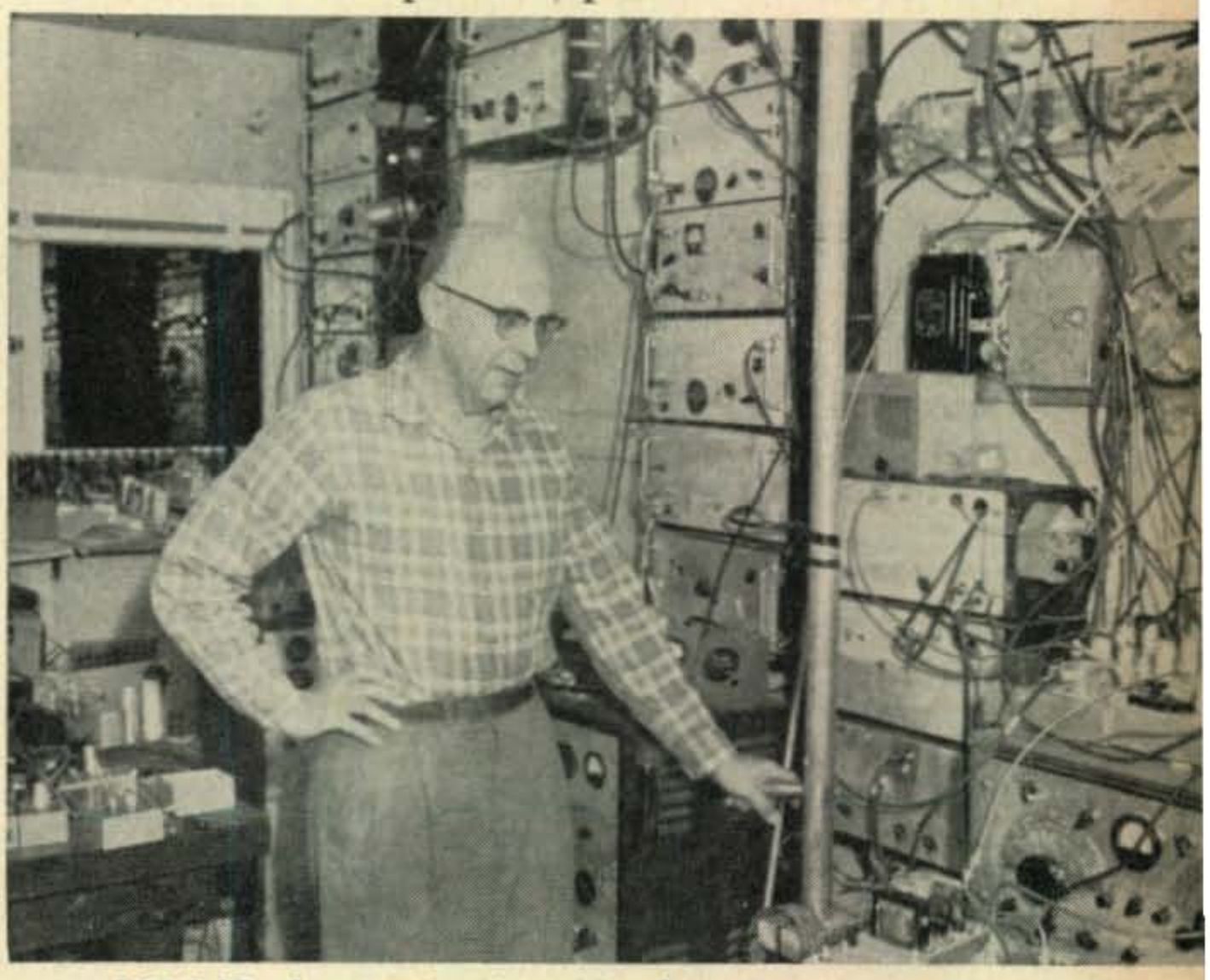
Bob Curtis, W1EXZ—VERMONT—"Enjoyed August VHF Contest, but hard work netted very few contacts. Why don't——?

1. More stations use cw?
2. More stations point beams north?
3. Look for the weak distant signals in spite of the S9 locals?"

"And then the band opened up to W9 land half an hour after close of contest!!"

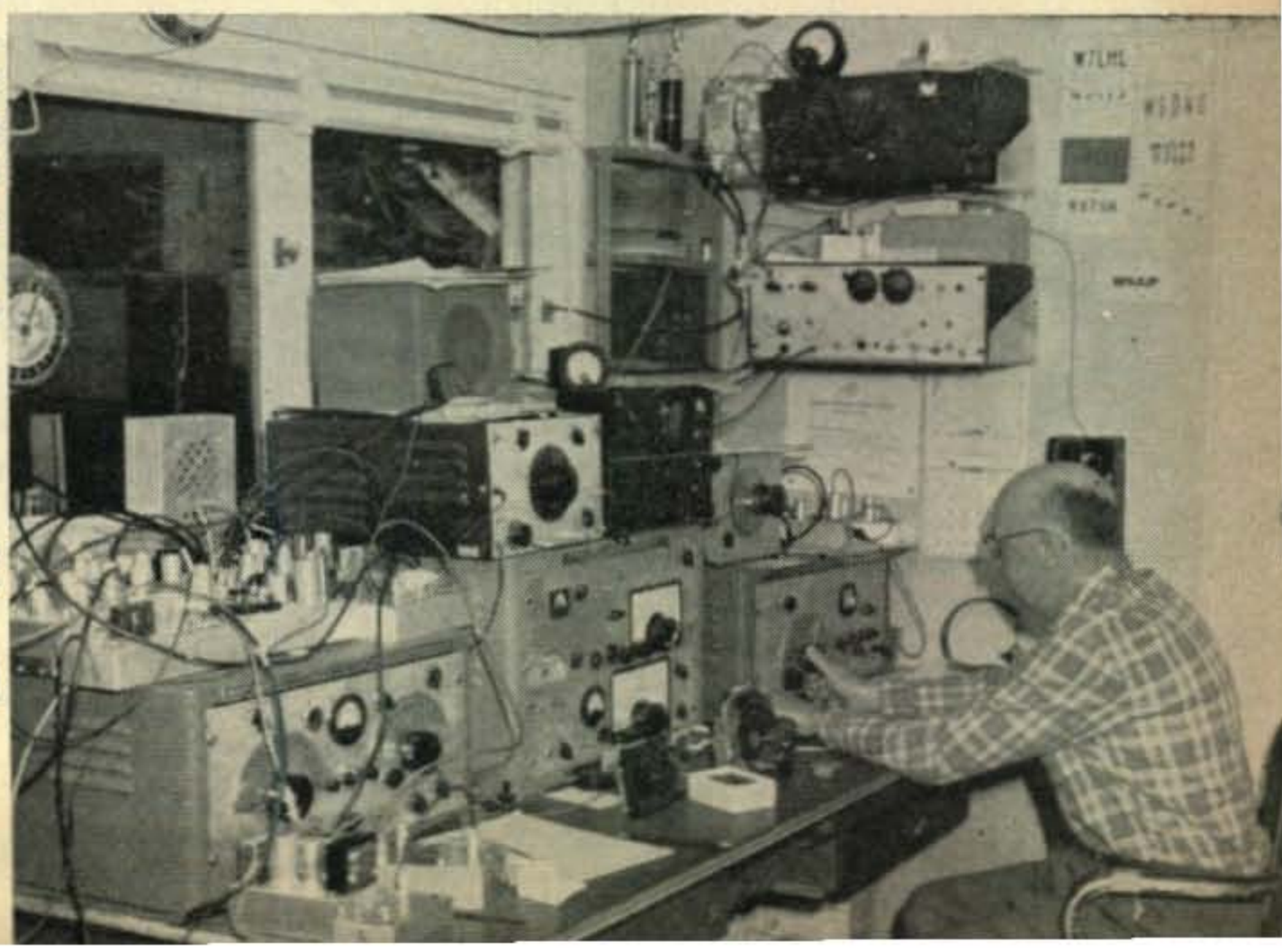
Bob Brown, K2ZSQ—"Sure had a swell time during the contest! Really terrific! More activity during those eventful 24 hours than ever before."

"We were sure we qualified for the power multiplier of 10, but, before submitting score we checked our power input and found it to



W6AJF demonstrating his Armstrong rotator in his shack at Sonoma, California. In the background is evidence of his handiwork. Frank has all bands available at the flip of a switch. Transmitters are mounted on the wall. Blown from the other side to minimize noise.

Frank (W6AJF) at his operating position. Even the receivers are home-made. (Note BC348's in standby monitoring positions.) Gadgets on left front of desk are 432 mc params used in his schedules with KH6UK.



be 25 watts instead of the 12 we had assumed. Only multiplier of 5. Oh well!"

"Roughest competition in New Jersey area seemed to be K2USA. K2GLI was within a few contacts of our own for the first 16 hours but then had to pull out. Most outstanding signals were K2VIX, K2YNB, K3GMM/3, K1IZM/1, K3ATX, K2USA and K2GLI."

"Again, a real terrific contest! Let's do it again soon!"

John Booker, K2SKB—"Am still convalescing from my sojourn up Blackburn Hill for the contest but I guess I can wake up long enough to tell you that this recent contest (August) will probably stand as one of the best and biggest for many years to come."

"At times six meters sounded more like 75 during the SS, with stations rolling in from New Hampshire to Virginia with up to S9+ signals. In fact just about the time my rig bit the dust, I was being frantically called by a station in West Virginia! The best heard on ground wave here was northern Tennessee, with the best worked being Virginia."

Hammond, Indiana A bit of 220 *mc* news from Ben Hall (W9OVL): "We have been transmitting West for some time in openings on 220 *mc*, and were picked up by Dick Eilers, WØYZV, Omaha, Nebraska on July 5th at 0900 CST, 5-9 for half an hour. Dick was using an NC303 & Converter and 15 element Telerex 40 feet up."

Courageous, enterprising, ambitious, helpful, busy editor of "Channel A" bulletin, Bob Brown, K2ZSQ, shown at operating position although he probably never gets time to actually operate. At right, O. M., Red, K2ZSP, who probably would like to get a chance at the rig too.

"Transmitter here is 3E29, 125 watts, 10 over 10 Yagi 40 feet up. We are looking for good 220 *mc* signals out of Nebraska or other western states. September '59 will be our 7th year on crystal controlled 220 in the Chicago area and believe an article on 220 techniques is absolutely necessary for an operator to get power out of the antenna." *I'm with you Ben. You write a good one, we'll print it. Glad to hear of your long activity on* 220 mc *and nice to know it pays off with Nebraska, etc., every once in a while.*

Cold Springs, New York Activity concerning 220 *mc* and above reported from this area by "Doc" Nichols (2LBK): Just thought you might like to know that your calls for more *vhf* activity have not fallen on deaf ears, not in the Poughkeepsie area anyway! In fact I am about to go out and pick up ten ARR/2 surplus rigs for the recent 220 *mc* conversion. We have a good gang of *vhf* operators in the radio club, K2CXP; I'm picking up the ARR/2's for them. By the way, K2GXJ is going up on 1296 (me too, with luck)."

"I had a BC645 fired up during the June *vhf* party. I worked K2USA from Troy on 220, first time on that band too. With luck we'll be on 220 with a 44 element quad by the end of September. We also hope to operate from the IBM Country Club soon with some 420 *mc* gear." *Sounds very, very good Doc, and very encouraging too, to a lot of the gang who are always looking for more contacts on those frequencies. I'm sure we'll be hearing a lot about your group on those higher frequencies.*

Dallas, Texas A short report from Leroy May (W5AJG) concerning his meteor shower skeds: "Had five skeds and worked two. However am happy to work them during this shower. It appeared that the bursts were so very few compared to last year. No pings pinging in like last year. Nil until a burst came along which was of good duration but not tremendously loud. Just above the noise but fairly steady. Then one would wait for minutes before anything happened."

"Worked WØIC and W4LTU for two new states. This brings me up to 25 on 144 *mc*. I just can't get going on those states. We ain't got no aurora and no tropo down here to speak of, so this MS business is our only means, and boy, that's a hard way to make a living." *Just keep with it Leroy, that's all we ask. No one else out your way seems to have the 'stick-to-it-iveness,' so no one else to get reports from.*

"Am curious to know if anyone else reports such a condition. It might seem that no shower was in progress—signals sounding like forward scatter or something, without the tremendous peaks usually present." *No one else told me anyway.*

"I believe one of the reflecting satellites with square corner reflectors is due to be put in orbit. I'm wondering if this gizmo might reflect a frequency as low as 144 *mc*. If so that would be a real deal figuring out the proper time and

angle to use to work the state you need, in fact it would be lots of fun I believe and something that would put a shot in the arm type of thing to some of us old blow hards." *Fer hevin's sakes Leroy, it might give us a shot in the arm but puleeze don't class us as blow hards. We're just the experimentin' type.*

Alexandria, Virginia—KN4ERA speaks from Alexandria: "I am new to two meters but enjoy it very much. I have the receiver from an SCR 522, without *bfo*. Transmitter is an ARC 5/T 23. The rig is connected to a ground plane. It isn't the 'DXiest' rig, but I am planning to erect a ten element beam and may make a converter with a 416B."

"Heard some SSB August 16th at the low end but could not read nor raise him. Not too many on two meters in this area." *Welcome to two meters OM. Let us know how things come along down there after the additions you mentioned.*

Brandon, Manitoba, Canada—Sy Kenny (VE4-YW), one of the few VE4's on six meters, lets us know a bit concerning his activity.

"From May 10th, 1959 including August 16th, 1959, I heard a total of twenty-one openings. During these openings I worked one hundred and ninety-one skip stations and have received QSLs from one hundred and four. July 12th was the best opening of all and I worked forty-two stations on that day."

"I am running about 50 watts input to a Globe Scout 680A with a Power Booster. The antenna is a coax vertical for transmitting. Receiving is an R9ner 152A, SX25, and a three element beam. I just purchased a Hy-gain 8 element but do not expect to have it up before fall."

"I monitor six meters every night with the *bfo* on. Hear lots of W5 and W8's late at night but have only two rocks so cannot QSY to their frequency." *All right gang, start listening again. It is coming to that time of the year anyway when anything or nothing is liable to happen, so you might as well be in on it. Sy, I've found that the W1's seem to hear VE4's when the band is open to Wisconsin and Minnesota only. Then suddenly there are a couple of VE4's.*

Anchorage, Alaska Jack Reich (KL7AUV), the voice from Alaska, is back home and on the air once more. He sez: "This summer has been a busy one, what with my trip to Towson, Maryland in the spring and then a month's vacation on the west coast. Worked numerous Bay Area, Fresno, Lancaster, L. A. and San Diego stations while in those areas."

"Have really enjoyed watching for and working Bob, KG1FN, who was at 71 Deg. 18 North 133 Deg. 38 West about the time of our first contact. That is roughly 620 miles from Anchorage, and slightly East of North—about 30 miles north of Barter Island."

"Not much luck, with all my agitating, getting more activity on six. That is, not until Jim Tvrdy, KL7CDG, finally got a house to his liking, moved in a couple of weeks ago, and got on the air Wednesday night, August 6th to work KG1FN in the best opening of the bunch. Dick, KL7CJN, is watching more closely now, but I believe he is returning to Seattle soon. Jack White, KL7AH, is too busy to be active and has disposed of most of his gear. Have talked to KL7CUR on 75 phone, but haven't heard a signal from him on six."

"I'm planning on the coming F2 season, if we have one, and will be on 50.080 cw almost exclusively. Am looking for my last four states —New Hampshire, Delaware, South Carolina and Louisiana. Also hope to do more toward the Z1-VK area if possible."

"I'm still fighting the battle of Channel 12's lower sideband, and there just isn't any cure other than moving out of town. (*WELL?*) This restricts my operation to before 0200 GMT and after 1000 GMT, 4:00 P.M. to Midnight, local time." *Always good to receive your news Jack, the gang likes to know what gives in your area. They'll all be glad to know that you'll be in there again this season, trying like mad.*

Excerpts from letter written by Richard Giesen, KØGRP (Estelline, South Dakota) to Jack Wilson, W1QXX.

"I sympathize with the efforts of some of you in trying to work South Dakota on six meters. It is not easy because there is seldom anyone on the air. Most of our openings into W1 land are in the late morning in the spring. There are usually only one or two short evening openings late in the summer. This summer I missed all the big openings because I had converter trouble. I don't think that I worked anyone on six until the end of July."

"Most of the six meter group are near here at a town calling Brookings; but they are only on in the evenings and seldom get in on any openings. Last summer there was a station on in Sioux Falls, but I have not heard of him this year. There are one or two on at the airbase in Rapid City, S.D. but that is too far for single hop (500 miles west of here) and a little close for double hop. There used to be three serious six meter men: WØBJV—who is too busy; WØCJS—who has passed away and WØORE who moved to New Mexico."

"I have sworn off high power! I got rid of all my high voltage power supplies too. I have so many Injuns that I don't dare stay on six for very long at a time. I get blamed for every power leak; and there are *seven* bullet holes in the windows. You just don't appreciate how friendly people are in small towns!" *But I thought that no one had any neighbors in South Dakota!*

"I have a National converter on two meters and an elaborate improvement on the National for six meters."

"There are no stations active above 144 *mc*

[*Continued on page* 168]

PROPAGATION

George Jacobs, W3ASK
607 Beacon Road, Silver Springs, Md.

Last Minute Forecast

Seasonally normal shortwave radio propagation conditions are forecast for the Contest Period Nov. 28-30. A severe radio storm is likely to occur between Nov. 21-26, with sub-normal conditions also forecast for Nov. 5-7.

CQ DX Contest Special

Part 2

The CW Section of the 1959 CQ World Wide DX Contest will take place from 0200 GMT November 28th to 0200 GMT November 30th.

Last month's column was devoted to a discussion of propagation conditions, and a special forecast, for the Phone Section of the Contest. This month's column is devoted to a special analysis for the CW Section.

Providing no radio storms develop during the Contest period (see "last minute forecast") world-wide DX during the daylight and early evening hours are expected to be excellent on *10-meters*. Excellent DX propagation is also forecast for *15-meters* from dawn through early evening. *Twenty-meters* is expected to open to one part of the world or another almost around the clock, peaking just after dawn, and during the late afternoon and evening hours. DX propagation conditions are improving on *40-meters* as the winter season nears. Fairly good DX openings to many parts of the world are forecast for this band from early evening through the night hours, and until shortly after dawn. Some DX should also be possible during the night time hours on *80-meters*, but at best signals are not expected to be very strong, and the band is likely to be noisy. If static levels are low, some DX openings may also be possible on *160-meters* during the hours of darkness.

While not part of the Contest, the *6-meter* band is very likely to open to many areas of the world on several days of the month.

Refer to this month's special *CQ Propagation Charts* on the following page for detailed information concerning band openings for the world's major radio paths.

This month's Charts are based upon a CW *effective radiated power* (ERP) of 200 watts at low radiation angles (less than 15 degrees). The ERP is equivalent to the power output of your transmitter multiplied by the power gain of your antenna over that of a dipole. For example, a transmitter with a CW power output of 50 watts being used with an antenna having a 6 *db* gain (a power gain of 4) at low radiation angles, has an ERP of 200 watts. In this example, the ERP is the same for which this month's Charts are based upon (200 watts). To use these Charts for other values of ERP, increase the symbol shown for "the number of days band expected to open" by 1 for each 6 *db greater* then 200 watts, decrease by 1 for each 6 *db less* than 200 watts.

The forecasts shown in the Charts are based upon normal propagation conditions expected during November with the present level of sunspot activity. Refer to last month's column for advice in the event a radio storm should develop during the Contest period. Last month's column also contains a schedule of WWV propagation transmissions, as well as information concerning Voice Of America propagation broadcasts, both of which should be helpful during the CW Contest period.

This month's special propagation forecast is based upon a predicted smoothed sunspot number of 135.

Good Luck during the CW period of this Contest. Any comments readers of this column may have concerning observations during the Contest period would be appreciated, and will be used in conducting the usual Post Mortem study of propagation conditions.

73, George, W3ASK/HB9

NOVEMBER, 1959

ALL TIMES IN E. S. T.

EASTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	9A-11A (2)* 7A-10A (3) 10A-1P (4) 1P-3P (2)	6A-12N (3) 12N-3P (4) 3P-6P (3) 6P-8P (2)	8A-1P (3) 1P-6P (4) 6P-9P (3) 9P-8A (2)	5P-7P (3) 7P-4A (4) 7P-3A (2)**
Central Europe	8A-10A (1)* 6A-8A (2) 8A-11A (3) 11A-2P (2)	5A-10A (2) 10A-1P (3) 1P-4P (2)	1A-5A (1) 5A-7A (2) 7A-11A (1) 11A-4P (3) 4P-9P (2)	5P-7P (2) 7P-1A (3) 9P-11P (1)**
Southern Europe & North Africa	8A-12N (1)* 6A-8A (2) 8A-12N (4) 12N-2P (3) 2P-5P (2)	5A-11A (3) 11A-2P (4) 2P-4P (3) 4P-8P (2)	3A-8A (3) 8A-12N (2) 12N-5P (4) 5P-11P (3) 11P-3A (2)	6P-3A (3) 9P-2A (2)**
Central & South Africa	9A-1P (1)* 6A-11A (2) 11A-2P (4) 2P-5P (3) 5P-7P (2)	5A-10A (1) 10A-12N (2) 12N-5P (3) 5P-9P (2)	11A-1P (1) 1P-3P (2) 3P-9P (3) 9P-4A (2)	9P-1A (1)

Central America	9A-11A (2)* 2P-7P (1)* 7A-3P (4) 3P-6P (3) 6P-9P (2)	5A-8A (3) 8A-1P (2) 1P-7P (4) 7P-9P (3) 9P-5A (2)	5A-9A (3) 9A-3P (2) 3P-11P (5) 11P-5A (2)	5P-6A (4) 6A-8A (2) 9P-4A (2)**
South America	9A-12N (2)* 3P-7P (1)* 7A-1P (2) 1P-5P (4) 5P-11P (2)	6A-10A (3) 10A-2P (2) 2P-8P (4) 8P-10P (2) 10P-3A (1)	5A-8A (2) 8A-3P (1) 3P-6P (2) 6P-1A (5) 1A-5A (2)	5P-8P (2) 8P-2A (3) 2A-6A (2) 8P-3A (2)**
Eastern Mediterranean	7A-9A (2) 9A-11A (3) 11A-1P (2) 1P-3P (1)	6A-11A (1) 11A-2P (3) 2P-4P (2) 4P-6P (1)	12N-3P (1) 3P-5P (2) 5P-9P (3) 9P-4A (1)	6P-1A (2) 8P-12M (1)**
Central Asia	7A-9A (1) 6P-9P (1)	7A-8A (1) 8A-10A (2) 10A-12N (1) 5P-9P (2)	7A-9A (2) 9A-12N (1) 6P-10P (1)	Nil
Southeast Asia	10A-3P (2) 5P-8P (1)	7A-9A (2) 9A-4P (1) 4P-7P (2) 7P-9P (1)	5A-9A (2) 9A-12N (1) 6P-12M (2)	Nil
Philippines & East Indies	7A-10A (1) 5P-7P (2)	7A-10A (2) 5P-9P (2)	12M-5A (1) 5A-9A (2) 9A-12N (1) 5P-8P (1)	Nil
Japan & Far East	4P-6P (3) 6P-8P (1)	4P-6P (2) 6P-8P (3) 8P-10P (2)	12M-6A (2) 6A-9A (3) 9A-12N (2) 12N-12M (1)	2A-8A (1)
Australasia	9A-12N (2) 12N-5P (1) 5P-7P (3) 7P-10P (2)	9A-12N (2) 12N-5P (1) 5P-10P (3) 10P-1A (2)	12N-10P (1) 10P-4A (3) 4A-6A (2) 6A-9A (3) 9A-12N (2)	4A-8A (2) 5A-7A (1)
Guam & Pacific	4P-6P (1)* 9A-11A (1) 4P-7P (3) 7P-9P (1)	8A-11A (2) 4P-6P (2) 6P-9P (3) 9P-11P (2)	11P-2A (1) 2A-7A (2) 7A-9A (3) 9A-12N (2)	4A-8A (1)

ALL TIMES IN C. S. T.

CENTRAL USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Southern Europe	8A-10A (1)* 6A-9A (3) 9A-1P (4) 1P-3P (2) 3P-5P (1)	6A-8A (3) 8A-11A (2) 11A-1P (4) 1P-4P (3) 4P-6P (2)	11A-2P (3) 2P-5P (4) 5P-11P (3) 11P-11A (2)	5P-2A (3) 7P-1A (2)**
Central & Eastern Europe	7A-9A (2) 9A-11A (3) 11A-1P (2)	6A-8A (2) 8A-1P (3) 1P-3P (2) 3P-7P (1)	12M-6A (2) 6A-12N (1) 12N-3P (3) 3P-7P (2) 7P-12M (1)	6P-12M (1) 8P-11P (1)**
Central & South Africa	10A-1P (1)* 7A-11A (2) 11A-2P (4) 2P-5P (3) 5P-7P (1)	5A-11A (1) 11A-2P (2) 2P-5P (3) 5P-9P (2)	1P-4P (2) 4P-9P (3) 9P-2A (2)	5P-7P (1) 7P-12M (2) 8P-11P (1)**
Central America	9A-12N (2)* 3P-7P (1)* 7A-3P (4) 3P-8P (3) 8P-10P (2)	4A-8A (2) 8A-2P (4) 2P-7P (5) 7P-9P (4) 9P-4A (3)	1A-6A (3) 6A-9A (4) 9A-6P (3) 6P-10P (5) 10P-1A (4)	7P-5A (4) 5A-7A (2) 8P-4A (2)**
South America	9A-12N (2)* 3P-7P (1)* 6A-1P (3) 1P-4P (4) 4P-7P (3) 7P-10P (2)	5A-9A (3) 9A-2P (2) 2P-6P (4) 6P-2A (3)	4A-6A (3) 6A-9A (2) 9A-5P (1) 5P-11P (5) 11P-1A (4) 1A-4A (2)	5P-8P (2) 8P-2A (3) 2A-5A (2) 9P-2A (2)**
Southeast Asia	10A-3P (2) 3P-5P (1) 5P-7P (2) 7P-9P (1)	8A-1P (1) 1P-5P (2) 5P-7P (3) 7P-9P (2)	7A-9A (3) 9A-12N (2) 12N-5P (1) 5P-11P (2)	Nil
Philippines & East Indies	7A-9A (1) 5P-7P (2) 7P-9P (1)	7A-10A (2) 5P-9P (2)	12M-6A (1) 6A-9A (2) 9A-2P (1) 5P-8P (1)	Nil
Japan & Far East	3P-6P (1)* 2P-4P (2) 4P-7P (3) 7P-9P (2)	9A-2P (1) 2P-4P (2) 4P-8P (3) 8P-10P (2)	12N-9P (1) 9P-6A (2) 6A-9A (3) 9A-12N (2)	12M-7A (1)
Australasia	8A-11A (2) 11A-3P (1) 3P-7P (3) 7P-9P (2)	8A-1P (3) 1P-8P (2) 8P-12M (3) 12M-3A (2)	9P-12M (2) 12M-4A (4) 4A-9A (3) 9A-12N (2) 12N-9P (1)	2A-8A (3) 4A-7A (2)**
Guam & Pacific	4P-6P (1)* 8A-11A (1) 4P-8P (3) 8P-10P (2)	8A-11A (2) 11A-4P (1) 4P-6P (2) 6P-9P (3) 9P-11P (2)	7P-10P (2) 10P-3A (3) 3A-5A (2) 5A-9A (3) 9A-12N (2)	3A-8A (1)
Hawaii	11A-5P (1)* 10A-12N (3) 12N-6P (4) 6P-8P (3) 8P-10P (1)	10A-4P (3) 4P-9P (4) 9P-12M (3) 12M-2A (2)	10A-4P (2) 4P-6P (3) 6P-2A (4) 2A-5A (3) 5A-10A (1)	10P-7A (4) 11P-6A (3)*

Central Asia	7A-9A (1) 6P-9P (1)	7A-10A (2) 10A-2P (1) 5P-9P (1)	8A-11A (2) 11A-2P (1) 5P-9P (2)	Nil
Antarctica	7A-9A (1) 6P-10P (1)	7A-9A (2) 9A-2P (1) 2P-10P (3) 10P-12M (2)	3P-7P (1) 7P-9P (2) 9P-3A (3) 3A-8A (2)	11P-4A (2)

ALL TIMES IN P. S. T.

WESTERN USA TO:

	10 Meters	15 Meters	20 Meters	40/80 Meters
Western & Central Europe	6A-8A (2) 8A-10A (3) 10A-12N (2) 12N-2P (1)	6A-9A (2) 9A-11A (3) 11A-2P (2) 2P-4P (1)	1A-4A (2) 4A-10A (1) 10A-2P (3) 2P-1A (1)	5P-11P (1) 8P-10P (1)**
Southern Europe & North Africa	8A-11A (1)* 7A-9A (2) 9A-11A (3) 11A-2P (2)	7A-10A (2) 10A-12N (4) 12N-2P (3) 2P-4P (2) 4P-6P (1)	5A-11A (1) 11A-4P (2) 4P-7P (3) 7P-5A (2)	4P-1A (2) 9P-11P (1)**
Central & South Africa	6A-9A (1) 9A-1P (3) 1P-3P (4) 4P-7P (1)	8A-11A (1) 11A-2P (2) 2P-6P (3) 6P-10P (1)	6A-8A (2) 8A-12N (1) 12N-5P (2) 5P-10P (3) 10P-12M (1)	6P-10P (1)
South America	9A-2P (2)* 5P-8P (1)* 5A-7A (2) 7A-12N (3) 12N-4P (4) 4P-6P (3) 6P-8P (2) 8P-10P (1)	5A-8A (3) 8A-1P (2) 1P-6P (3) 6P-9P (2) 9P-5A (1)	2P-5P (2) 5P-2A (4) 2A-6A (3) 6A-9A (2) 9A-2P (2)	6P-8P (2) 8P-11P (3) 11P-6A (2) 9P-1A (2)**
Central Asia	4P-7P (2)	3P-6P (3) 6P-9P (2) 7A-11A (1)	7A-9A (2) 9A-3P (1) 3P-6P (2) 6P-10P (1)	2A-8A (1)
Southeast Asia	9A-11A (2) 11A-2P (1) 2P-4P (2) 4P-6P (3) 6P-8P (2)	7A-11A (3) 11A-2P (2) 2P-5P (1) 5P-10P (2) 10P-12M (1)	12M-6A (1) 6A-10A (3) 10A-1P (2) 1P-9P (1) 9P-12M (2)	4A-8A (1)
Philippines & East Indies	3P-6P (1)* 8A-10A (2) 10A-2P (1) 2P-5P (3) 5P-7P (1)	8A-2P (3) 2P-6P (1) 6P-10P (2) 10P-12M (1)	11P-3A (2) 3A-6A (1) 6A-10A (3) 10A-12N (2)	3A-7A (1)
Hong Kong, China & Formosa	3P-5P (1)* 2P-3P (2) 3P-6P (3) 6P-8P (2) 8P-9P (1)	1P-6P (2) 6P-8P (3) 8P-10P (2)	8A-1P (2) 1P-6P (1) 6P-8P (2) 8P-12M (3) 12M-8A (1)	1A-6A (2) 1A-3A (1)**
Japan & Far East	3P-5P (2)* 1P-4P (3) 4P-6P (4) 6P-8P (3) 8P-10P (1)	7A-12N (1) 12N-6P (2) 6P-8P (4) 8P-10P (2)	7A-12N (3) 12N-7P (2) 7P-9P (4) 9P-1A (2) 1A-7A (1)	10P-8A (3) 11P-6A (2)**
Australia	2P-5P (1)* 8A-2P (2) 2P-6P (4) 6P-8P (2)	7A-12N (3) 12N-6P (1) 6P-8P (3) 8P-10P (2)	7P-10P (2) 10P-1A (4) 1A-7A (2)	2A-6A (3) 6A-8A (2) 3A-6A (2)**
New Zealand	2P-6P (1)* 10A-5P (3) 5P-7P (4) 7P-9P (3) 9P-10P (1)	7A-11A (3) 11A-6P (1) 6P-10P (3) 10P-12M (2)	7A-9A (3) 9A-8P (1) 8P-12M (3) 12M-3A (2)	10P-6A (3) 12M-2A (2)** 2A-6A (1)**
Guam & Pacific Islands	2P-5P (1)* 12N-2P (2) 2P-6P (4) 6P-9P (2) 9P-10P (1)	8A-12N (2) 12N-2P (3) 2P-6P (2) 6P-9P (3) 9P-12M (2)	7A-12N (3) 12N-7P (1) 7P-11P (4) 11P-7A (2)	12M-8A (3) 2A-7A (2)**
Siberia	2P-5P (1)* 12N-2P (3) 2P-6P (4) 6P-8P (2)	9A-12N (1) 12N-5P (2) 5P-8P (4) 8P-10P (2) 10P-12M (1)	8A-12N (2) 12N-6P (1) 6P-9P (3) 9P-11P (4) 11P-3A (3)	9P-8A (3) 11P-6A (2)**

SYMBOLS INDICATING NUMBER OF DAYS CIRCUIT IS FORECAST TO OPEN DURING NOVEMBER, 1959

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days

* Indicates probable time for six-meter openings

**Indicates probable time for eighty-meter openings.

The 160-meter band is likely to open approximately 10% of the nights during November during those times for which 80-meter openings are shown in the Charts with a symbol of (2) or higher.

This month's special CW Contest propagation forecast is based upon basic radio propagation data published by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado. The forecast is valid through December 15, 1959. Refer to the text for a discussion of the radiated power parameters used for this month's special forecast.

ham clinic

CHARLES J. SCHAUERS, F7FE/W6QLV
CQ Magazine, 300 West 43rd St., New York 36, N. Y.

On Beam Rotaters

The ham who is serious about DX will usually employ a beam that is rotated electrically. There is no denying that this is the most efficient way to do it—unless of course, you have enough room (like Don Wallace) for acres of rhombics, curtains etc.

Many hams have made up their own rotors from surplus components, and although heavy, really work very fine. But putting together a rotor that is windproof, ice proof and moisture proof (and that does not drift when once turned and set) is not easy!

With the new lightweight single band beams now on the market, it is not difficult to mount them on and turn them with a good heavy TV antenna rotator. But the three band (10-15-20 meters) beam is another story.

Very few tri-band beams weigh under 50 pounds. To turn these requires more than just an ordinary rotor—even *if* it is equipped with a very sturdy thrust bearing.

Remember: a rotor must not only take lateral thrust (sometimes as great as 3000 inch-pounds) but it must also have a motor capable of "picking up" the load and turning it through 360°!

Some hams have designed their beam antenna installations so that the *total* weight of antenna and mast rests on a revolving bearing plate; a motor is then "off-side coupled" to this plate and turns the whole structure.

Those who employ aluminum or steel towers will usually mount the rotor on top of these and secure the antenna to it via a 1½ or 2" diameter pipe anywhere from 1 to 3 or more feet long.

The new "tip-over" type masts by *Rohn* of Peoria, Ill., are terrific—no tower climbing with these.

Choosing a rotor for ham use is not difficult if one keeps a few points in mind.

First, be sure that the rotor you buy contains a heavy gear train with good torque and a sturdy motor with at least 250 inch-pounds torque—anything less, and one day you'll wonder why that antenna doesn't move!

Check the manufacturer's specs to see that the *whole* assembly is water-proof. (I always add my own extra protection for this, especially near an ocean site where the salt ladened air can really raise havoc with operation). Again check the manufacturer's specs for "end loading" or lateral thrust—for the average beam installation figure about 2100 inch-pounds. Check for a foolproof locking system too. Ever see gears after they've been stripped by an antenna turning in a 50 *mph* wind?! (No teeth!) Look for heavy electrical connection terminals.

If the rotor you buy contains ball bearings and solenoid operated electric brakes, consider yourself fortunate.

Suit yourself on the type of control unit and direction indicator. But be sure that the rotor you purchase will mount what *you* have in mind—then you'll have no modification worries.

For small beams as used in the 2 or 6 meter bands, a good TV rotor will work fine. Suggested rotors are the *CD* AR 22 or TR 16.

Last but not least—ask the ham who owns one.

In the inexpensive class of rotors ($90 to $125.00), I rate the *CD* Ham "M" Rotor and the *Telrex* R100S as *tops*. Both operate on 110-120 V. 60 cycle *ac* and are made by very reliable manufacturers. You cannot go wrong on either one.

Observations of the Month

From the hundreds of letters that pour into HAM CLINIC every month, it is not difficult for me to get a very good idea of the average ham's thoughts and problems. Keeping track of the various problems and letter contents during the last 6 months has not been easy; but I did it to let you know that your problems or thoughts are not "unusual." So here is a tabulation of these which might be of interest to you: troubleshooting ham gear—30%; equipment buying recommendations—20%; design and construction—20%; tech literature and books—5%; test instruments—4.5%; equipment modifications—3%; surplus (all kinds)—3%; theory—3%; school recommendations—1.9%; gripes about many subjects—½ of 1%; helpful hints (submitted by readers) 1.6%; operating—2% and miscellaneous—5.5%.

Observed: the average ham is a great guy—a go-getter; of above average intelligence; human; friendly; patriotic; modest, and quite capable technically. Above all, his burning desire is to have his station operating at peak efficiency.

However, there is improvement indicated in a number of areas. I'd like to see more of you send the editor more articles—especially of the short "technical twist" variety. Now how about that? How about helping out your fellow hams and gaining favorable publicity for yourself and call?

Let's cater to a free ham press and preserve the democratic balance so necessary to get things done properly in this very wonderful country of ours! WRITE!

Questions

Surplus Book

"Can you lead me to a book or booklet commercially available which has most of the diagrams of surplus receivers in which most hams are interested?"

For 47 diagrams and pictures, JAN and VT tube cross index info and color code info, I recommend the book by W6NJV and W6NJE. Volume I, entitled, *The Surplus Handbook* is spiral bound with heavy cover and is obtainable from *Western Radio Amateur* Magazine 10517 Haverly St., El Monte, California for $3.00.

KWM-1 and Johnson Courier

Thanks and 75 to Walt Henry, W4HIM/KL7 for the following info on using a KWM-1 driving a *Johnson* Courier modified for grounded grid operation. (For space reasons his letter is condensed).

Starting off, he disagreed with me on *not* swamping a GG amplifier. Without swamping, because of improper impedance match the rig tended to oscillate at high frequencies. He figured that the input impedance of a pair of 811As was about 142 ohms and that 25 watts of driving power *could be used*, of which 20 watts was fed through. So he swamped the cathode by using 150 ohms of Ohmite non-inductive resistors (10-1500 ohm 2 watt resistors in parallel), and these worked just fine. By swamping he accomplished (a) better stabilization; (b) normal KWM-1 drive (before, he had to keep the gain way down) and (c), better input impedance match (50 ohms).

He runs about 700 watts input to the 811As and gets out close to 400 watts of clean power. Reminding me that a GG stage can *also* be overdriven, he says he is very happy that he didn't stick to theory and tried the system he is now using.

Again Walt, thanks loads!

DX 40 Changes

I'm in the throes of trying a 6 meter conversion on the DX 40 in response to many requests. If successful, the results will appear in HAM CLINIC.

Now then—if you DX 40 owners experience audio oscillation on the 10 meter band, do this —add a ground lug under the socket retaining nut on the 12AX7 SA and solder the lug to pin #9.

To correct any chirp caused by low voltage to the VF-1 VFO, change the 20K 10 watt resistor going to accessory socket pin #4 to a 15K 10 watt resistor.

If you experience oscillator die out (and receiver blocking) when switching from *phone* to *standby*, disconnect the ground from the lower 40 mf condenser (on the diagram) and connect the disconnected end of the condenser (which is tied to the bottom of a 20K 10 watt resistor) to terminal #5 (which is grounded) on the switch shown opposite (left of the lower 40 mf condenser—on the diagram).

Battery Storage

"I have the opportunity to buy a lot of dry batteries very cheaply. What I'd like to know is, what's the best way to store them for longer shelf-life."

Easy. Wrap them up good in waxed paper, then aluminum foil and refrigerate them . . . . put them in your freezer. Local action is arrested by the cold and shelf-life may be increased four or more times. *Best* storage is *not* below +10°F., so check freezer temp.

The average *dry* battery has a shelf-life of about a year at between 70° and 78°F. With cold storage, you can add at least three years (depending upon temperature).

Before using the batteries, be sure to let them thaw out slowly at room temperature for about 24 hours.

Mercury batteries (like those *Mallory* makes) need no cold storage.

Voltage Reduction With a Condenser

"What size condenser must I place in series with 115 *Vac* 60 cycles to obtain 12.6 V for a 12AD6 tube filament?"

Use only a *non-electrolytic* condenser of about 4 mf. This will work with any tube needing 12.6 V at 150 mils.

Lamps (a reply)

In the August issue of CQ page 24, I. Matelsky rebutted my piece on the danger of fluorescent lamps . . . . very well. However, there are a couple of points he OVERLOOKED.

First, there ARE lamps still in use containing phosphor/beryllium; and second, I'd like to see him grab hold of one end of a lamp whose other end is touching a final tank in which 3000 volts is lurking (not really!). If you're well grounded when doing this, you COULD get knocked for a loop!!

Maybe today's lamps *are* non-toxic—maybe they won't explode—but I still discourage *any* ham using them as rf indicators! Until you

know a lamp is of the "new" type—I still say, observe the precautions I have suggested. Better safe than being *unable* to be sorry!

Hearing Aid "I"

"Listen, don't laugh at my problem, to me it's serious. Some people may think it's funny and in a way it is, but I'd like your help.

"My old uncle who lives with us has to wear a hearing aid and for fear of missing a thing that goes on in the house he has it on all the time. When I operate my 2 meter Communicator he hears everything I'm saying—yep, you guessed it, off the air I go!

"The other day he was down town and he was hearing radio taxi calls.

"What's the solution to this knotty problem?"

Well Jim, HAM CLINIC never, never laughs at anyone's problem, but you must admit this IS a little funny! We do have a sense of humor and feel that CQ's readers do too—so think nothing of it.

Right off, I'd suggest that your uncle take his HA to a reputable service shop and ask them to put a small *rf* choke in series with the headphone cord (in the amplifier). This can be by-passed to ground with an .001 mf ceramic (tiny) condenser. This *should* do the trick. Another way is to obtain a shielded cord and tie it to the HA ground circuit. These measures should work.

By the way—keep us posted on any unusual HA DX, will you? (Just kidding!) Let us know how you make out—and 75.

Freq. Meter

"I enjoyed your little piece on freq meters. Can you recommend a commercially available low cost one to me?"

Yes, the *Bud Gimix* for $9.29. It can be used as a wavemeter, field strength indicator as well as a carrier shift indicator. You can get one of these from WRL, Council Bluffs, Iowa. Ask for #22AO37. Incidentally, it covers 10 to 80 meters.

Product Detector Worth

"I'm planning on installing a product detector in my old receiver. How does the PD compare to the regular detector in a receiver used with a bfo for SSB?"

All the difference in the world . . . . if it is designed and installed properly and the voltages to it are regulated (*bfo* portion); if the receiver is stable-otherwise you'll have little retuning, no manipulating of *af* and *rf* gain controls—just pleasant listening with *no* "Donald Duck" effect. However, *some* hams (according to letters received) do *not* know that the PD is really a *mixer;* without *bfo* injection you get *nothing.*

Amperex 6360

"Will you recommend a small twin tetrode tube with about 10 watts plate dissipation for a *vhf* rig?"

Yes. Try *Amperex's* 6360. It is a miniature *vfh* tube with a plate dissipation of about 14 watts. Look for some design info in subsequent columns using this and other special *vhf* tubes.

Scope Trouble

"I just put together a scope from items I obtained from surplus. I wish to use it to check my modulation (*am*). I followed the diagram given in one of the handbooks, but no matter how I try, I cannot seem to get the thing to focus properly or the trace centered on the screen. Any info.?"

(Included with this reader's long letter was a parts placement drawing showing the high voltage and filament transformer (unshielded) mounted right under the neck of the unshielded 2" cathode ray tube (CRT).)

There is little doubt in my mind that the location of your HV transformer is the "culprit." First, obtain a *Millen* 2" Nicoloi shield (#80042) and install the CRT in it—try out the set. If not much better, then remove the transformer and mount it to the rear of the CRT and shield it. Recheck all voltages and pots.

In ESD (electro-statically deflected) cathode ray tubes remember that magnetic shielding is a *must*. Hope you get a copy of my Ham-Scope Book when it is published—it covers scope troubleshooting too.

Q Multiplier vs Crystals

"I'd like to improve my old receiver's selectivity and I can't decide between a crystal filter or Q Multiplier. I'm not too good at modifications and want to know which is easier to install and what you recommend."

Take the Q Multiplier.

VHF Antenna

"I don't want DX. I just want to be able to talk to guys around town on two meters without having to turn my antenna. What type do you suggest for broad area coverage? I'm running 50 watts."

Try the Turnstile.

Tunnel Diode

"Any amplifying device for *shf* having lower noise figures than the Maser or Parametaric Amplifier?"

Not yet, but the new tunnel diode comes close. See August 1959 ELECTRONICS Magazine page 61 for more info.

Transistorized Auto Ignition

A number of letters have been received relative to transistorizing auto ignition systems. HAM CLINIC made a number of inquiries and received many vague answers. (We're interested from a *noise* standpoint.)

The big problem is H-E-A-T. Transistors do not like it. A *special* HT coil IS needed in the transistorized system. There will still be radio interference but it will be *easier* to curb.

The system which will eventually be used (I believe) is one where a transistor (s) is used as a HV generator and another (s) is used for switching. If we get some good *reliable* info, we'll pass it on to you ham sportscar enthusiasts.

SSB Linear

"Besides stabilizing voltages, proper loading, etc., can anything else be done to improve linearity and lower distortion in a SSB linear amplifier?"

Yes; *rf* feedback. This not only provides higher power gain but also reduces adjacent speech channel noise. *Collins* pioneered this. It is not designed into an *rf* amplifier as is done with a high fidelity *af* amplifier. There are many technical considerations which enter into *rf* feedback design.

6 Meter VFO

"Where can I get a diagram of a 6 meter *vfo* that *works?*"

Write the editor of QSO—67 Russell Av., Rahway, N. J. This little *vhf* newspaper contains a lot of info on *vhf* equipment from time to time. One issue contained a 6 meter *vfo* using a 6AG7. I tried it and it *works*.

SB 10 Modifications

By now many hams throughout the world have had an opportunity to build and try out the little SB 10 (*Heath*) SSB adaptor. From the reports I have received, it is indeed well worth the money and enables just about everyone to give SSB a whirl at minimum expense.

Like any new piece of equipment, the SB 10 has had to go through a "shakedown" period in the hands of ham users. I believe that this is the *shortest* shakedown for a piece of equipment in my experience.

The modification suggestions I now make have been made to the one I *purchased*. The reports have been "glowing" thus far.

So here they are: to prevent "carrier drift-through" (necessitating constant adjustment of pots), *replace* the two 1000 ohm pots in the two 12AT7 balanced modulators with two *wirewound* pots of the same value.

Secondly: for better audio response in the speech circuits *replace* the two .001 mf coupling condensers between the 12AX7 sections (SA) and the 12AT7 feeding T4, with .01 mf ceramics. Bypass the 680 ohm resistor in the cathode of the 12AT7 feeding T4 with a 2mf condenser (50 v) . . . . electrolytic.

Check out these changes—you may be satisfied. If not, connect a .005 mf ceramic or small paper condenser across the primary of T4. Check your quality again. If you're still not satisfied do this: install the filter described in Don Stoner's *Single Sideband Handbook* diagrammed on page 89. (See ad in this issue for the book—you should have one.)

The filter is installed in the secondary of T4 and provides for a cut-off frequency of about 3000 cycles. Now try the SB 10! Brother, you'll be amazed! (I was!)

Now if you run into a little instability *rf*-wise, do this: (it works with the TX-1, DX-100 etc., but there is no guarantee that it will work on anything else—because I have not tried it on any other transmitters)—*change* the .005 mf mica coupling condenser in the plate circuit of the output stage (6BQ5) to a .01 mf ceramic condenser. This will load the output stages more heavily and tend to stabilize operation. A small amount of distortion may be encountered when this change is made if you are using other than the transmitters mentioned above.

If you have trouble getting good carrier suppression do this: *replace* the 550 ohm audio balance pot in the cathodes of the 12AT7 feeding T3 with a 1000 ohm (wirewound) pot and *change* the two 220 ohm resistors in series with it to 100 ohm ½ watt resistors. Also (*try only*), a silver mica .0001 mf condenser across the 500 ohm ratio balance control. You *may* improve suppression—and you may *not*—but try it.

Another thing, if you are using an Apache TX-1 with the SSB adaptor, I would advise *disconnecting* the relay in the TX-1 if you plan to stay on SSB for long periods. This relay does get hot and this does not do any good at *all*.

Please remember this about the SB 10, the better voltage regulation you have, the better it will sound. If you build up your own power supply for it use LOTS of output capacity—I suggest at least 100 mfds. Do not try to squeeze the *last* "drop" of *rf* out of it or you'll run into linearity problems. Heavier loading does not mean using *all* of the *rf* output—you *can* flat top an exciter as well as a final linear.

Good luck on the changes. Shoot your questions to me if you are confused. Let's give the Tech Consultants at *Heath* a little rest—75 for their patience and assistance.

NC 300 and NC 303

"I have enough money to buy an NC 300 outright but I like the NC 303 too. What do you suggest I do?"

[*Continued on page 168*]

CONTEST CALENDAR

Trophies and Plaque awarded in the 1958 CQ World Wide DX Contest.

CQ Magazine Award
Plaque awarded for the highest club score.
Won by the North Jersey DX Association.

The W2SKE, Bill Leonard Trophy, for All Band Phone, Single Operator. Won by F8PI, Paul Mandeville.

The W6AM, Don Wallace Trophy, for Single Band Phone, Single Operator. Won by OH5NW, Axel Tigerstedt, on 28 mc.

The K2GL, Buzz Reeves Trophy, for All Band Phone, Multi-Operator. Won by Station W3AOH (Tony Susen).

The W9IOP, Larry LeKashman Trophy, for All Band CW, Single Operator. Won by CN8JX, Glenn H. Luse.

The W7KVU, John D. Ryan Trophy, for Single Band CW, Single Operator. Won by W2AIW, Charles W. Rogers on 14 mc.

The K2AAA, Don Merten Trophy, for All Band CW, Multi-Operator. Won by Station K2GL (Buzz Reeves).

These same awards are being made this year. Who will be the fortunate winners?

Just before we lost the 11 meter band, CQ held a contest to promote activity on that band. Here is Charlie O'Brien, W2EQS, accepting his reward from W1WY for his efforts on CW in a lost cause. Win Goddard, W6RCD also received a Cup for having highest score in the Phone Section.

October	24-26	CQ WW DX Phone
November	7-8	ARRL SS
November	11-12	YLRL Phone
November	14-15	ARRL SS
November	18-19	YLRL CW
November	21-22	RSGB 21/28 Phone
November	28-30	CQ WW DX CW

WW DX

CW GMT—02:00 Saturday, November 28th to 02:00 Monday, November 30th.
EST—9:00 PM Friday, November 27th to 9:00 PM Sunday November 29th.
PST—6:00 PM Friday, November 27th to 6:00 PM Sunday, November 29th.

The Phone Section should be over about the time you read this. Hope conditions were favorable and everyone had a good time.

The CW men are still making last-minute preparations and keeping their fingers crossed that George Jacobs, W3ASK will predict some good openings for the last week-end in November.

A final reminder! Be sure to send us your log, large or small. It is important that you sign the declaration on the report sheet. A sample will be found with the rules in the August issue of CQ. Also make sure that your address is clearly printed. You fellows in the Services who are on the move, keep in mind that awards will not be made for another 6 to 8 months.

Make it easy for yourself and keep a carbon copy of your contest log. A clear carbon copy is acceptable if you sign a declaration that it is a true copy of the original. And as a word of caution, it would be advisable to sign each contest log sheet. This will meet FCC requirements if you are retaining it as a station record.

ARRL SS

If it's code practice you want, this is the contest for you. Plenty of activity and competition but it's strictly a local affair.

YLRL

Phone Starts: 12:00 EST Wednesday, November 11th.
Ends: 24:00 EST Thursday, November 12th.

CW Starts: 12:00 EST Wednesday, November 18th.
Ends: 24:00 EST Thursday, November 19th.

Check Louisa Sando's YL column for details. This one is for YLs only.

RSGB 21/28

Starts: 07:00 GMT Saturday, November 21st.
Ends: 19:00 GMT Sunday, November 22nd.

This is a Phone only contest with the world working the British Isles. Refer to last month's Calendar for a complete rundown on the rules and other details.

Your logs should be sent to the R. S. G. B., Contest Committee, New Ruskin House, Little Russell St., London, W. C. 1, England.

[*Continued on page 170*]

Novice

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

From time to time, I bring to your attention awards that the Novice operator can earn. A new one has popped up in the file this month, and by golly I'll bet you can't find it even in the Certificate Seekers Directory.

When Novice-Warren Anderson (KN8-EOC), of Garden City, Michigan, had a QSO on May 16 with Elliot (KN4DMZ) of Hopkinsville, Ky., the name of the town sounded familiar to him. Then he remembered another QSO about three weeks earlier with Sam (KN4DMW) also of Hopkinsville. Warren mentioned this on his QSL card and wondered if they might know each other. A few days later his question was answered when he received a very impressive multi-colored WAK Award! It seems that Warren had snagged father-Sam Koerner and his married son Elliot, who had worked out this very clever "Worked All Koerners" award for those who might be lucky enough to work them both!

Last call for those KG1CK QSL cards. Bud Lafferty-ex KG1CK will be leaving for a new assignment in Turkey soon, but still has a few blank QSL's left. Bud's new QTH will be S/Sgt. B. W. Lafferty-2006th AACS Sqd. APO 289, c/o Postmaster, N. Y., N. Y. Unfortunately Bud will not be able to do any hamming in TA land because of the current ban on American hams. The ban is an outgrowth of the screwy reciprocal licensing agreement (or lack of it).

For those of you not familiar with this term, it means that no one other than an American citizen can get a license to operate in this country, not even the friendly Canadians or Mexicans! We do have a mobile license agreement with these countries, however, and can operate portable or mobile in XE and VE land (yes, even Novices). But if an Englishman came over here, he could not obtain a license for any kind of operation. Needless-to-say these countries retaliate by not issuing Americans licenses overseas (all except occupied countries). One day, when the Government discovers that ham radio is no threat to security, all this may be changed. Let's hope so.

Introducing the Grants Pass High School Radio Club (Cavemen Brass Pounders). From left to right, James McKenty, Bob Walstrom, Mark Landis (KN7IWJ), Frank Sprinkle, Robert Farrand (advisor — W7TLK), and Gary Johnson (W7GAJ). The club has 20 members several of whom are about to go for the Novice exam. The club station, located in Room 20 uses an S-53A, SX-71, Johnson Viking, a homebrew 60-watter, and lots of war surplus.

Have you snagged the coveted WAK award? Warren Anderson, KN8OEC, did for working all Koerners (Sam, KN4DMW, and Elliot, KN4DMZ).

Net News

KN3JHT and KN3JLW, are starting a Novice Net for teenage Novice operators called the *Lehigh Valley Novice Net*. It will be held on Tuesdays and Saturdays at 4:00 PM. EST or EDST, whichever is used at the time. The frequency is 7164 *kc*. To join, please contact either John Buchignahi, KN3JHT, 221 White St., Weissport, Pa., or Ian Reich, KN3JLW, N. 10th St., Lehighton, Pa.

Who's DX?

Tim Soxman, CN8GV, is rotating to England and will be looking for Novice stations on the 15 meter band. He reports working the following fellows from Morocco: WV2DXA, KN4BRX, FWJ, KN8PTM, KN9PNV. If you gents want a QSL, it can be obtained by writing Francis J. Soxman, AF 13599258, 603 Communications Sqd., APO 125, New York, N. Y.

Richard Stec, KN1JUR, 287 High St., Medford 55, Mass., has snagged a WAS of 39/35 with this "lash-up" in six months. He would like skeds with W7's, N. and S. Dakota, and Okla., on 15 meters and will sked anyone. The VFO is a paper weight.

The pipe-line in the direction of Australia is working, as evidenced by the report from Ivor Stafford, 16 Byron St., Box Hill South, E11, Victoria. VK3XB reports on the following stations. Italicized calls were worked:

July 18, *KN4ZUG*, KNØAHE. July 19, KN3IDQ, *KN4FNH*, FQP, GXS, KN5UPX, WV6EHQ, KN7IOT/7, KN8OIH, KNØPFI, UIM. July 20, KN4FQP, KN5SZV, UGN, KN8OIH, KN9 TCO. July 21, KN4FQP, KN5SUI, *KN8LWC*. July 22, KN1KOG, KN4FQP, WV6HHL. July 23, WV6EFR. July 24, WV2HGL, KN3JCD, JWL, *KN4FQP*, ISF, KN5VNK, WV6HHL, KN7INE/7, KN8MNF, OIH. July 26, KN1LOE, WV2HGL, KN3IPV, KN4AFI, *KN5UTN*, VIJ, *VZR*, WJB. WV6DAV, GPP, HHL, KN9SCM, SKR, KNØTKN, UIC. July 27, *WV2FNP*, HGL, KN3ARC, WV6HHL, KN7INE/7, KN8MNF. July 28, KN4GLL, KN4GXS, KN5HSF, UGD, UKH, *WL7KKL*, KN8MNF, KNØQXP, RUV, TKN, UIC. July 29, KN4ESF, JPD, KNØUUE. July 30, WV2FNP, KN4FJF, KN5UAT, UKH, WV6HHL. Aug. 1, KN9TDM, KNØRKY, TKN, Aug. 4, KN4JPD, KN9QMJ. Aug. 6, WV2HGL, KN4JYJ, KN9PXC, TCO, KNØVMZ. Aug. 7, KN4ISN, JPD, KN9TCO, TKN, TKO, VMZ. Aug. 10, WV2HGL, KN3IWK, *KN4FQP*, KBW, KN5UQI, URC, UGD, WH6DDZ, DJK, WV6HHL, KN8MWL, ORC, KN9TCO, KNØUUE, VGD. Aug. 11, KN4FQP, FZM, KN5SUZ, TTX, WTI, WV6CRX, DSI, EFL, FTX, GWM, KN7IND/7, KN8OIH, KN9JXV, TCO, KNØTEH. Aug. 12, WV2HGL, *WV2EFU/1*, KN4EFT, KDD, KN5VZR, WV6DOS. Aug. 13, KN4GGY, FQX/KH6, KN4IYS, KN5UAL, VAI, VRC, KN7HZN, KNØRWA, SXV, UUE. Aug. 14, KN4JMP, WV6HHL, KN9RIN, TCO, TLW. Aug. 16, KN1KOG, WV2HCL, *WV2HGL*, (finally!) *KN3IRM*, N4EFR, KN5UGD, UTN, *WV6FEK*, FHI, HHL, KN8MNF, *MPB*, KNØTKN, VMZ. Aug. 17, KN4KDD, KN5WTJ, KN7HLR, *KN8MNF* (after weeks of calling!) KNØUUE, *VMZ*. Aug. 18, *KN8QBN*, *KN9PXW*, KNØTKO, VBV. Aug. 21, *KN4IAF*, *KN5VNJ*, *KNØTKN*. Aug. 22, *KNØTKO*.

Don Jordan, KN8OBP (ole brass pounder?) 232 Crawford St., Marietta, Ohio, has 31/28 on WAS out of 209 QSO's on 7178 kc. Don would like skeds with anyone needing Ohio.

So ends Ivor's list of calls. WV6HHL, if you are with us, tune your receiver down to 7150 —VK3XB is calling you!

Ted Wilds, KZ5SW, Canal Zone, has several squawks regarding Novice operation. Number one on the totem pole is the QTH dangler. Ted sends, during his first transmission, that he QSL's 100% via the bureaus to all cards received. On Sam Novices' first transmission he repeats his QTH several times along with the oft-heard Pse QSL. Because of this the average contact lasts 10 minutes or so, and several Novices miss the chance to work Ted due to band changes etc. KZ5SW's other comment is of a more serious nature. He says a surprising number of stations (Novices) zero him with a vfo, particularly one chap with the suffix JNO. Not only is this illegal, but Ted parks his QRP'ed Viking Valiant on 21.090 *mc*. Obviously this is outside the Novice band! Nobody should be that hard up for a contact, even with a DX station.

Ted reports working the following stations recently: WV2DRK, FWE, KN3ILF, GCS, KN4GLU, CSN, FLP, EPT, ZKX, FIG/2, BKZ, ZRU, YKZ, WP4ARR, KN5RNO, SVR, UKN, ODR, RQI, WV6BXG, KN8MXI, NEI, OT?, OHG, ONW (YL-nice fist), KN9-RII, KNØSFF. If you chaps would like a QSL, send your card to the KZ5 bureau, Box 407, Balboa, C. Z. Then send an envelope to your

Looking for the 50th State? Keep an ear pealed for Mike Pioso, WH6CZZ, 3 Palmyra St., Honolulu 18, Hawaii. He would like skeds with K1, K2, K3, K4, K8 and KL7. Mike has a rousing 46/41 for WAS and 34/28 for DXCC.

bureau and presto-KZ5 confirmed. Tnx for the nice letter, Ted.*

Helping Ham

The Tri-County ARC, Pomona, Calif., is starting code practice classes for anyone in the area. If interested, contact Hillis Hauck, K6D-QA, 794 Glen Eagles, Pomona. Phone NA-28993.

The following persons would like assistance with their Novice tickets: W7-Tom Mullin, 1612 Boylston Ave., Seattle 22, Washington. W9-David M. Kimbrel, 435 E. 4th St., Flora Ill. Phone 2-5162. WØ-Guy L. Tullis, 312 N. 4th St., Oskaloosa, Iowa. Phone OR 3-7209.

Letters

Chips Hart, VK5ZCN, 16 Nunyah Avenue, Parkholme, South Australia, is looking for Novice pen-pals. He would prefer to write to someone his own age-22 years. Chip is only active on the VK-288 *mc* band.

KNØVPP will be on the air with KG1CK's old Greenland equipment by the time you read this. He will run 65 watts to a dipole and copy on a NC-46.

John Champa, KN8OCL, 1542 Wayndotte Rd., Columbus 12, Ohio, has a 65' dipole and inverted V antenna for use with his Globe Scout 680A and SX-99 receiver. He is on 80 and 40 meters and has filled three ARRL logs! John offers help to beginners. His phone is HU 8-1698.

Larry Lloyd, KNØVMZ, Box 338, Winona, Mo., has picked off 33 states with 28 confirmed in only four weeks of operation with his DX-40 and NC-183D. He would like skeds with 7's and 1's.

Ross Chappell, KN4KWE, Tomkinsville, Ky., operates a DX-40 and SW-54 combination with a homebrew Q Multiplier and preselector. Ross has 14 states, with 7 confirmed, on 80 and 40. He would like skeds for any reason.

T/Sgt. Virgil L. Kessinger, KN1KAK, 148 Hickam Dr., Loring AFB, Me., expects to transfer to KP4 land soon and will be active by Nov. 1. Virg operates with a Harvey Wells T-90 and an HQ-110. He will sked.

Albert Garcia, K8MHB/7, c/o Lt. Col. Bino F. Garcia, Utah General Depot, Ogden, Utah, wound up his Novice career with a WAS of 31/28 plus four countries using a Challenger and a Super Skyrider into a dipole. If you need Utah, drop him a line. He will gladly comply.

Thomas Whiteley, WV6FCO, 4637 18th St., San Francisco 14, Calif. runs a 6AG7/1614 rig with about 28 watts to the antenna. Since April, Tom has worked eight states on 80 meters, and likes the way his Marconi loads up on 40. He will sked anyone for any reason. Also look for Tom's brother WV6HZA, Bill, on 80.

Bob John, K8ITO, 1930 Harrisburg Rd., N. E., Canton 5, Ohio, is working on six with an International FCV-1 into a homebrew 15 tube super, and a hb transmitter. Bob says the local McKinley HSRC is giving code and theory classes.

"West" Verlander, KN5VQR, P. O. Box 338, Cut Off (biased to?), Louisana, has an antenna farm consisting of a 40 meter folded dipole and a quad for 15 and 10. The hearing aids are NC-183D and Collins 75A4. With these "goodies," West has snagged 35 states (27 conf.), a CO7 and two KP4's. He would like skeds with S. Carolina, N. Mex., both Dakotas, and all N. England states.

George DeMille, WV6HAE, 1925 98th Ave., Oakland 3, Calif. cranks on with a DX-40 and NC-300, with dipoles for 40-51 and a three element beam for 15, which has produced a WAS of 23/13. George is enthusiastic about the hobby and offers to help any prospective Novice.

From the beautiful island of Puerto Rico, comes the words of Ramon F. Gandia, KP4-AQY, 754 Jose Marti, Santurce, P. R., who operates on 40 with a modified AT-1, HQ-110 and folded dipole. Ramon would like skeds on 40, but can work 80 if requested.

Lloyd Simon, WV2GHD, 32 Amherst Ct., Rockville, Center, L. I., N. Y., uses the RME 4300 with his Viking Ranger and so far they have piled up 26 states plus G4 and an LU5 in the dx dept. Lloyd will make skeds with anyone for any reason.

California again, this time Jim Alley, WV6-EPM, 2359 Rainbow Ave., Sacramento writes to say his mighty DX 20 and S-2OR have gotten him into 28 states, VE7, WH6, and WL7 land. He would like skeds with the 1st and 4th call areas, plus N. J. and Del.

Paul Roach, KN9RIY, Rt. 1, Junction City, Wisconsin, has been on 2 months operating 80 and 40, with 19 states under his belt, using an S-76 and ? transmitter. Paul wonders who has had the longest Novice QSO. Could be

[*Continued on page 170*]

Citizens Radio

Lee Aurick, W2QEX

Every so often some manufacturer invents or develops something that fills so wide a gap that you wonder why no one ever made the item available previously. The item we're musing about, of course, is the Heath CB-1 Citizen's Band Transceiver Kit; the chief topic for this month. You fellows who are only mildly interested in C/R might keep your eyes peeled too, for here is something ham radio has needed for a long time.

While everyone admires the frills of present-day communications equipment (most of them helpful on today's crowded bands) it is nevertheless refreshing to see a piece of gear that *dares* to provide only the necessary features (at a very attractive price) and let it go at that. After all, everyone doesn't require a receiver with the sensitivity needed by the DX-hound or the selectivity desired by the traffic-merchant.

Preliminary

The two transceiver kits provided by the manufacturer were unpacked and the parts lists carefully checked to determine that all components were on hand. The lists checked right down to the last lock washer. It took a few days to find the time to begin the project of putting both units together, and the interim was spent in looking over the assembly and operating instructions.

The circuits for both receiver and transmitter looked straightforward, and the receiver proved to be a well-designed superregenerative detector with a stage of *rf* amplification preceding. But where was the double conversion, Xtal filter, Q-multiplier, Xtal calibrator, and the host of other operating aids now become commonplace? Well, this may come as a shock to those who have cut their teeth on such items, but it *is* possible to enjoy good communications with just such simple gear, providing your requirements are more modest than those of the DX or traffic specialist.

It has been many years since we'd tuned a superregenerative receiver, and the project began to look more and more inviting.

Construction

Came the day when nothing else could stall us, and both units were begun simultaneously. Lee Jr., who had never exhibited a rousing interest in radio, offered to assemble one unit. Here was to be a real test of the manufacturers' ability to anticipate the needs of the uninitiated.

A few instructions on soldering, and we were off to a flying start.

Working a connection or two ahead provided ample time to check the progress of the jr. op, who never needed checking. Some twenty hours later we came down to the finish line solder-to-solder, and gingerly applied the power. Nothing happened!

The regeneration control was cautiously advanced, and the receiver jumped into action with the hiss characteristic of the superregenerative detector. This hiss, we hasten to add, disappears in the presence of a received signal. The stronger the signal the less the hiss, though surprisingly weak signals may be clearly copied.

The same high-quality parts, engineering, and construction techniques that made this supplier famous, have been used in the CB-1.

Circuit

The CB-1 has a self-contained, 117-volt 50/60 cycle *ac* power supply, and maybe conveniently operated from 6- or 12-volt external power supplies, also available from the supplier. Two silicon diodes nicely perform the job of rectification.

In the oscillator, the triode section of a 6AU8 employs a third overtone crystal that gets right down to business and eliminates unnecessary

circuitry. The plate is tuned to the overtone frequency, and the signal is then applied to the grid of the pentode half of the 6AU8, the final amplifier. Complete transmitter section: one tube.

Received signals are amplified by the pentode section of a 6AN8 and then applied to the tuned circuit in the grid of the triode section of this tube which functions as the superregenerative detector. Once adjusted, the regeneration control on the rear chassis apron requires no further attention. Complete receiver section: one tube.

The audio section consists of two tubes, a 12AX7 and a 6AQ5. In the receive position the detected audio signal is applied to ½ of the 12AX7. Here it is amplified before going on to the 6AQ5 where it is further amplified before coupling into the combination modulation/output transformer.

In the transmit position there is only one slight difference. The voltage developed by the ceramic microphone (which comes with the kit) is amplified by the first section of the 12AX7 before going to the second section and then to the 6AQ5, which in this position acts as the modulator.

Several interesting features have been incorporated in this extremely low-priced station. In addition to one NE-2 lamp which serves as a visible reminder that power is applied to the receiver, a second NE-2 indicates relative power output and modulation level. The transmit/receive switch, normally in the receive position, may be activated in either of two positions to transmit. In one position the switch will stay fixed in the normal manner. In the other position, when released, it will spring back to the receive position, thereby permitting push-to-talk operation.

An adjustable *rf* trap is located in the antenna circuit and provides effective 2nd harmonic attenuation. This was demonstrated within the first few minutes the transmitter was on the air, and quickly eliminated the TVI in the next room.

A small liberty was taken during construction. Personal preference dictates the use of coaxial fittings and one was substituted on the rear apron in lieu of the phono plug provided as an antenna connector.

On Air Tests

No time was lost in putting the CB-1 to the real test. The first contact was more than 10 miles away and subsequent contacts have ranged up to 20 miles with excellent reports both as to strength and quality. To be honest, the receiver tunes broadly, but the 10 *kc* separation between citizen channels appears to be sufficient to offer no real problem except when two nearby adjacent-channel stations may be transmitting. In practice this is a remote possibility.

A base-loaded portable whip, model CBU-1, also is available from Heath. Range with this antenna clipped onto a bracket mounted on the cabinet has been clocked at 2 miles in most directions.

10-Meters Too

As if this complete station, measuring 9¾ inches wide, 8 inches high (including handle), and 6 inches deep (including knobs) weren't a big enough bargain for C/B's, your conductor began wondering, during the construction stage, how this unit might work on the ten meter band. Rather, if it would work without digging into the innards and thus impair its usefulness when it was desired to put it back on the C/B. All of which helped to heighten our frenzy to complete both units quickly.

Preliminary tests with a grid-dipper showed that the coils in both receiver and transmitter sections would have no trouble in resonating as far up as 32 *mc*. The big question was whether the detector would superregenerate smoothly over the entire band without modification. The band is a large one, and remember, the regeneration control is not located for convenient adjustment. Our fears were put down when the *rf* and detector slugs were turned out about 3 turns and 10 meter signals were heard loud and clear. A 28.735 *mc* rock was slipped into the oscillator and the oscillator and amplifier slugs also were turned out about 3 turns. We were on ten!

One unit was immediately installed in the family station wagon and has given reliable 5- to 10-mile coverage. On one occasion, a mobile-to-mobile contact was established over a 20-mile path.

One slight change extends the range of the receiver which normally covers only 300 *kc*. A 20 mmf ceramic capacitor was installed in parallel with a 4.7 mmf capacitor in the detector grid circuit. This resulted in a tuning range of approximately 28.4 *mc* to 30.0 *mc*.

As for stations heard in that 100 *kc* portion of the DX band, here are just a few: HH, IS, YN, G, PY, XE, I, YV, HP, and OA. The 5th, 6th, and 7th districts as well as KZ5's and KP4's roll in regularly.

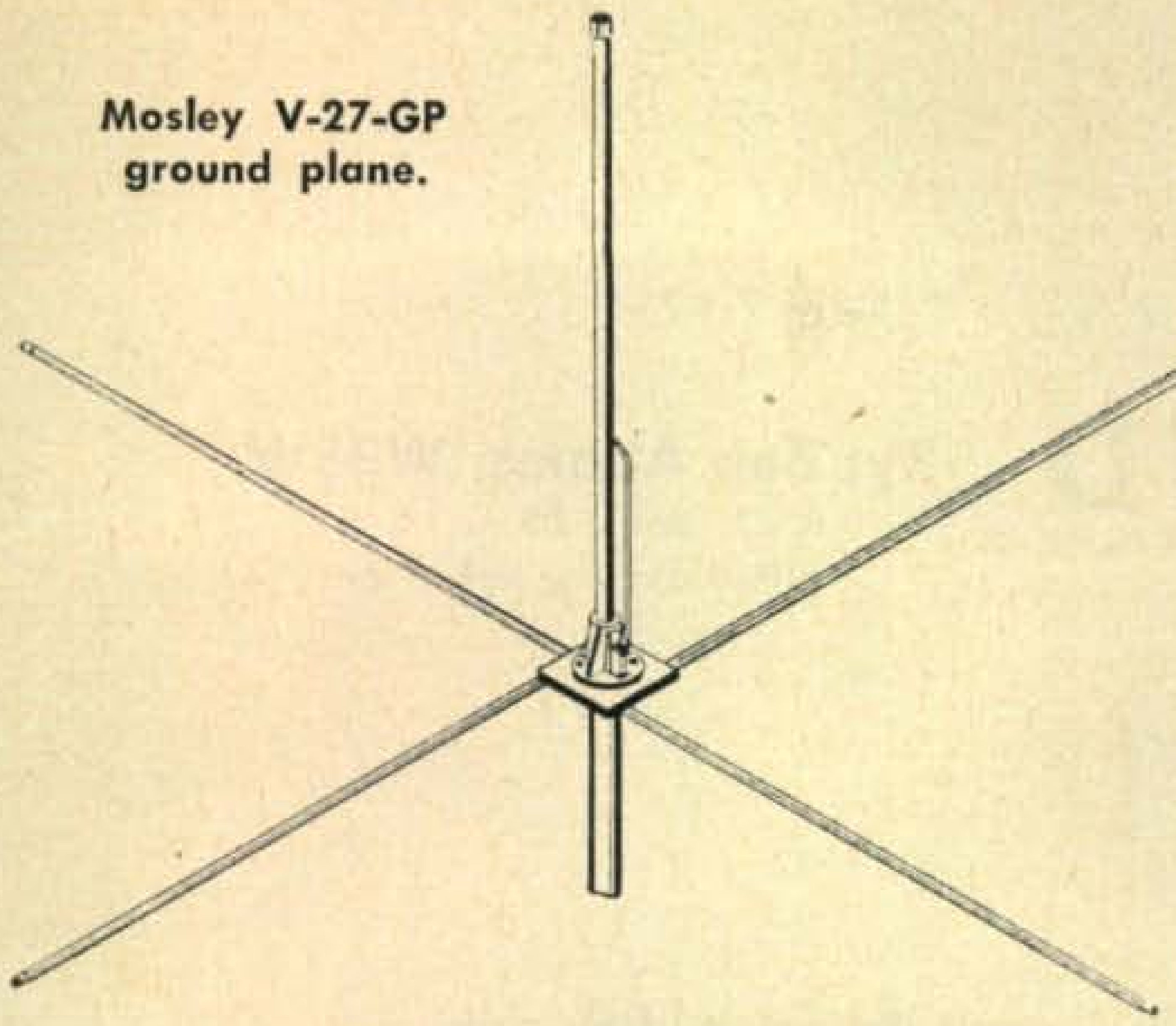
For mobileers, the Heath VP-1-6 or VP-1-12 kits are the easy answer to powering this unit. Both units have been examined and tested and found reliable.

Here's the most economical way we've seen to get on 10- or 11-meters, mobile or fixed, and 6-meters is a distinct possibility. We may get to try this before too long.

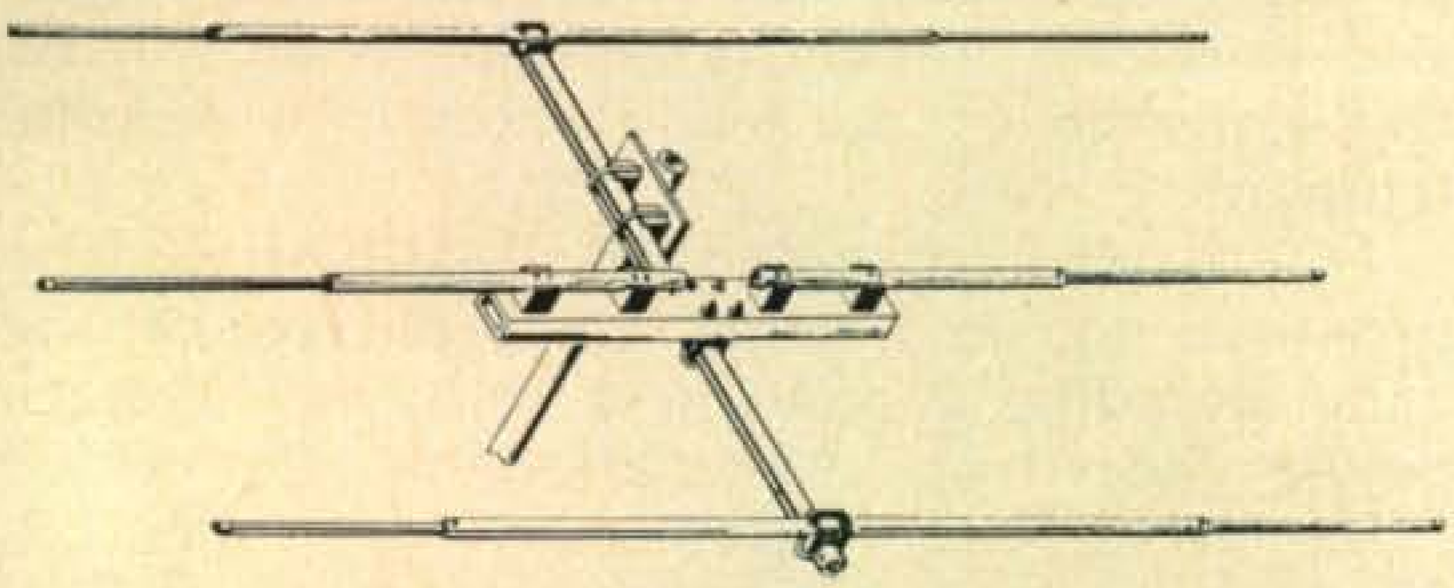
C/B Antennas

In early July the installation of two 11-meter commercial antennas was made. The first one up was a Mosley V-27-GP ground plane. This antenna lays down a very effective omni-directional (circular) pattern. It is ideally suited for

Mosley V-27-GP ground plane.



C/B base station use where mobile units may be ranging in all directions. Extremely rugged in construction, the base mount is designed to fit on a mast with a maximum diameter of 1 11/16 inches. Two set screws in the base securely lock the base to the mast. It is safe to say that the V-27-GP may be mounted on its mast and forgotten, while providing years of trouble-free service. An internal coaxial fitting is provided and simple instructions reduce assembly to a matter of minutes.



Mosley A-311, 3 element beam.

The next antenna erected was the Mosley A-311, 3-element beam. The 18-feet-long elements somewhat complicated our mounting arrangement while trying to keep the top-most part of the antenna under the 20-foot limit imposed by C/R regulations. Normal procedure would have been simply to guy the mast. However, this was impractical since the antenna was to be mounted in a vertical position to take advantage of uniform polarization and was to be rotated with a TV rotator. The guys, of course, would have prevented rotation, but would offer no problem if the antenna were intended solely for fixed point-to-point communication. In that event it could simply be mounted on a guyed 10-foot mast.

The problem was solved by a mast extending from the ground up to the peak of the house and bracketed there. This mast extends 7 feet above the roof peak and the TV rotator is mounted here. A 3-foot mast mounted in the rotator supports the beam whose bottom-most part just clears the roof while the top-most part meets the mounting restriction previously mentioned.

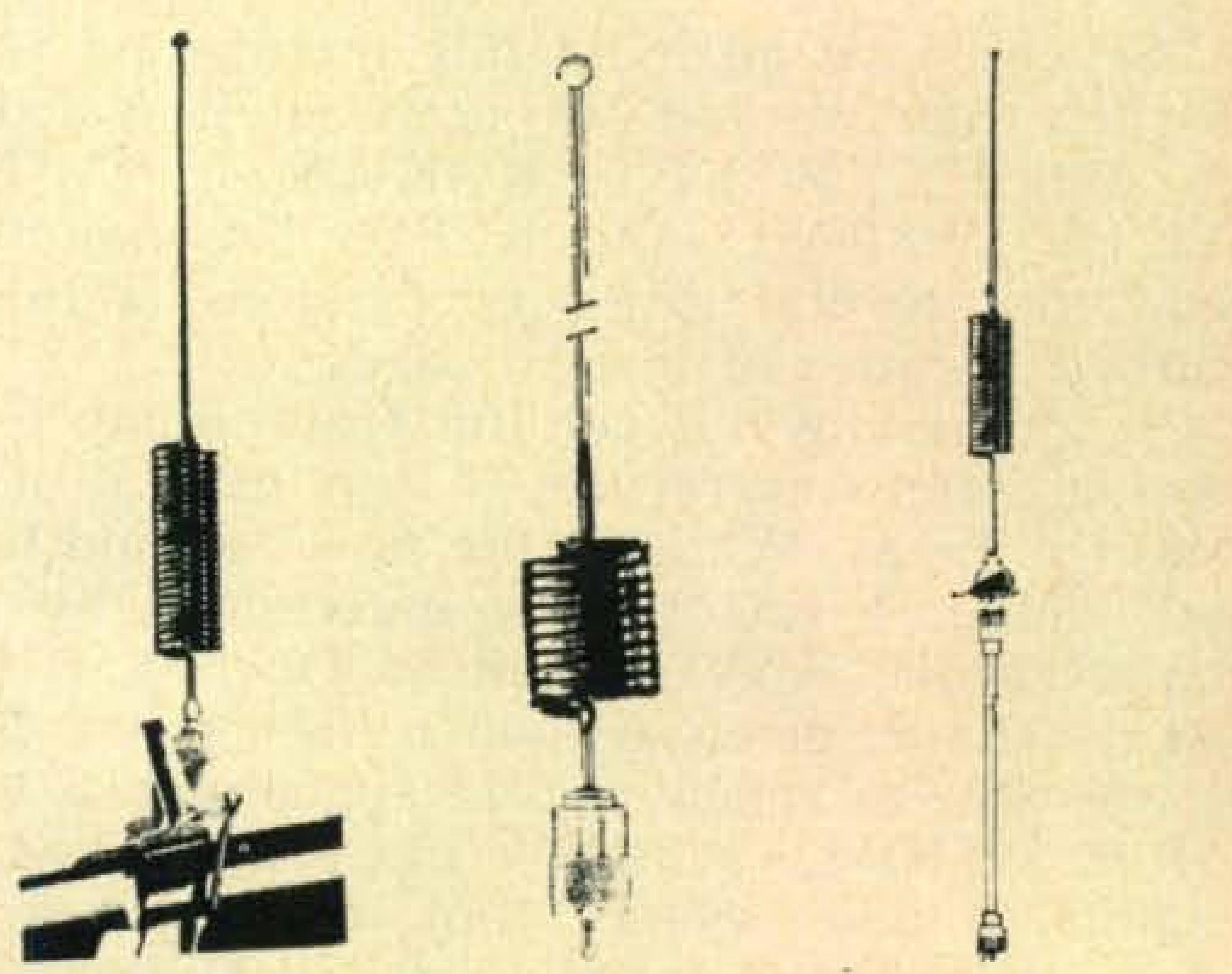
Results with this beam have been exciting, and serve to bring home the importance of a good antenna, regardless of power. Numerous trans-continental contacts have been made and ground-wave communication at 25 miles is commonplace.

While the ground plane provides a 360-degree pattern, the beam concentrates the radiated power in the desired direction. Good front-to-back signal ratio has been observed though no measurements have been made to determine the exact figure, or to confirm the manufacturers' claim of 9.3 db gain over a reference dipole. The antenna exhibits marked nulls on either side of the beam heading which can be very useful in countering interference.

After using the beam for several months, the gain figure appears to be a reasonable one, and affords the same punch that you'd expect from approximately 8 times the power—or 40 watts! This gain, or signal increase, is also present on receiving, and gives incoming signals a corresponding boost.

We've developed the practice of tuning the band with the ground plane connected to the C/R rig, and after locating a station, swinging the beam on him for a very pleasant increase in signal strength.

Both antennas are thoroughly engineered, as you'd expect from one of the leading suppliers of ham beams. The beam elements are color-coded for fool-proof assembly, and holes are drilled for the insertion of sheet-metal screws at the correct points, thereby eliminating element measurement and adjustment.



ASP 185 ASP 63 ASP 189

Some Antenna Specialists Co. C/B products.

The Antenna Specialists Company of 12435 Euclid Avenue, Cleveland 6, Ohio, has an interesting line of three shortened C/B antennas. All are 42 inches long, exclusive of the mounting arrangement, and this is where each differs. The shortening is accomplished by means of a loading coil at the base of the antenna. The ASP-185 has a clamp designed for mount-

[*Continued on page 170*]

sideband sideband sideband

SIDEBAND

By: Bob Adams, W3SW
P. O. Box 625
Silver Spring, Md.

Worked 100 Countries

Two-Way SSB
((In order of award)

W6UOU	K2MGE	W4INL	W2OTZ	K4HXF
W2JXH	W2OQO	W8YIN	W5BGP	K2EWB
F7AF	W2VZV	TG9AD	W6WNE	K2HUK
K6GMA	W6IAL	W3NKM	W6TNS	VE3ES
W3SW	K2JFV	W6QFE	W4HIM	MP4BBW
W4IYC	W1ADM	W8MG	HB9TL	W1DCE
TI2HP	TI2RC	PY4TK	K2HEA	W2ATJ
W8QNF	W2CFT	K9EAB	W7VEU	KZ5WZ
W6ITH	KØABH	W7AA	W4CDY	HB9IE
VE3MR	ZL3IA	VQ4ERR	W6TOT	W6ZEN
W8GCN	W6BAF	W8MPW	W9HP	W5KFT
W8EAP	W2TP	W3MAC	W5DA	KØKWY/4
W8YBZ	W6RKP	W1GR	W7GIE	YV5FK
WØQVZ	PY2JU	W8JXM	W1LHZ	TI2EV
WØFUH	W6UPP	W1EQ	W2MA	W8DMB
W8PQQ	W6PXH	W5FDZ	W6BAY	K2FW
ZL3PJ	WØCVU	W8JXY	W5RHW	

Seven more qualified this month and were mailed their worked 100 certificates. Welcome to W6ZEN, W5KFT, KØKWY/4, YV5FK, TI2EV, W8DMD and K2FW. We regret to add that several other applications were returned because of altered cards.

I am writing this column from sunny California, after several days' stop over in Fort Worth, Texas. While in the now "second largest" State, I was royally entertained by my buddy Luke, W5VGE and by Doc, W5RHW. At the dinner given by Doc at his country club, I was able to renew an old acquaintance with Mort, W5KAU. W5RHW has just finished installing a new seventy foot tower and a six element twenty meter wide-spaced Telrex beam which can be seen for miles on the Texas prairies surrounding his home.

This afternoon I visited Ted Henry, W6UOU and Cy, W6PXH and saw an excellent picture of the "Little Jargonaut" which has done such wonderful work in many remote countries. It is now at I5GN, and will shortly go to VQ2. It was regretful to learn that Meridith, W6-WNE, Ted's XYL was in the hospital. We all wish her a speedy recovery. Real bad news was uncovered in Los Angeles namely that Walt, K6GMA, number four "Worked-100" and QSL manager for many SSB DX stations, has QRT and is selling his entire station. Walt will be sorely missed on the air. Hope it will only be temporary, Walt.

Had a pleasant talk with Ted, K6FH, who promised to send some good photos of the gang attending annual meeting of the Western Single Side-Band Association at the Hotel Miramar in Santa Barbara on September 25-27. Sure sorry I cannot stay out here and attend. At the recent Executive Committee meeting of the Association in San Diego on June 6, the following officers were elected: President-W6ZHH, Vice-President-W6QJV and Secretary-Treasurer-K6AM. The following were elected to the Board of Directors: W6-ECP, K6AM, W6FOP, K6BVZ, W6HKF, W6NOO, W6QJV, W6BM and W6ZHH.

Perhaps one of the best examples of how much our amateur hobby means to us is illustrated in the following story of one of our own "Worked-100" members, Mickey, W8YIN. As most of us know, Mickey who has always been

Jere and Pat of I5GN.

Rolf—SM5DW

a real SSB booster, lost a leg due to cancer, and even while recuperating in a hospital, was on the air with a KWM-1. While learning to use his artificial leg Mickey contracted hepatitis which put him back in bed for another two months. In a letter from Mickey he advises as follows; "It is my hope that you will begin hearing from me regularly with DX news that I may be able to pick up. I want to thank you and all of the fellows who remembered me during my illness, many of whom wrote me very encouraging letters and cards. I have managed to total up my present count on SSB and it stands at 140 worked with 126 confirmed. As you can see, I have plenty of catching up to do."

When we work Mickey on the air let's remember what a courageous and spunky guy is at the other end, and take your hat off to him. Ham radio is sure safe when we have such wonderful examples of its members.

John, 5A1TK now K4YJM writes to say that all those who contacted his station in Libya will receive QSLs. His logs and QSL cards were shipped Stateside with his household goods to New Orleans in error. The good old Armed Services, hi.

From Jere and Pat, I5GN whose picture we are pleased to show this month we are advised that a new SB-10 side-band kit has been ordered for their DX-100B. Jere hopes to be on the air permanently on SSB after November 1st. He has shipped the W6UOU transmitter he has been using, and liked side-band so much he decided to buy his own rig.

Dale, KR6MD sent a news clipping from the Third Marine Division paper, the "Triad" about the activities of the Okinawa SSB gang. It seems that the entire division thinks very highly of the SSB Hams who are handling thousands of phone-patches to the home folks. Dale writes: *"We are fortunate that the powers that be in the Division realize the importance of the Amateur Radio program out here as they back us 100%. Best wishes from the gang out here and keep up the good work in CQ."* Thanks Dale.

Thirty-three "Worked-150" endorsements were mailed out this month, as were six "Worked-175."

The number 1 volume of the "YASME

Walter—W4HIM/KL7

NEWS" was mailed out to the more than 3500 contributers to Danny Weil's dx/peditions and it was quite an interesting issue. Ed, W4QDZ in Tampa, Florida is the Editor and is to be congratulated for his efforts. It seems that Danny has found a satisfactory boat in Clearwater, Florida, and it will be purchased at a cost of twenty thousand dollars. The money will be obtained from publishing of the YASME Foundation News, and from contributions of the members of the foundation. To avoid the disasters experienced by YASME I and II, a crew will be carried including Joe, W2HQL who is a member of the DXCC. It is hoped to have the YASME III, south of Panama by Christmas, enroute to the remote DX spots in the South Pacific. Your contribution will be appreciated. Send it to the Yasme Foundation, Box 13165 Tampa 11, Florida and receive your copies of the News.

Thanks to Cliff, KØKWY/4 we are able to show a picture of Alek, of UA1DG. His full name is Alekseew, and he has two sons who are active hams; Albert, UA1FE and Anatol, UA1FT. Their QTH is Leningrad.

Nothing definite yet on the next SSB DX Contest. We are sorting thru many suggestions which arrived as a result of our requests. We will definitely have an announcement in the next issue.

73-Bob, W3SW

Alekseew—UA1DG

Mike—W3YDF

Distributor Survey Report

The returns are all collated on the survey taken in the June issue of CQ. While many of the answers from this questionnaire came out much as we had expected them to, it was encouraging to learn that our marketing staff's projection was quite accurate.

According to our survey report, the average CQ reader invested about $250 in the purchase of new amateur radio equipment during the past year. More than 40% of CQ readers invested more than $250, 32% spent between $100 and $250, and 21% spent from $50 to $100. Less than 8% bought less than $50 worth of ham gear this year.

It was encouraging to note that the distributor is still a key factor in amateur equipment sales, but while the number of hams is growing and the dollar volume expanding, the number of distributors involved in the market has been diminishing rapidly. Upwards of seven hundred electronics part distributors sell ham gear of various types. Yet, less than 100 distributors do more than 75% of the total volume in ham sales, and less than a dozen major ones get almost 45% of the business. Ham business, by the way, will reach the $25 million mark as CQ predicted last year, and will probably grow by another $5 million in 1960. Our survey indicates that top five ham distributors by dollar volume (ham equipment only) are ALLIED RADIO, WORLD RADIO LABS, RADIO SHACK CORPORATION, HENRY RADIO, and HARRISON RADIO. It must be noted that the difference between first and fifth place is less than 1% total volume business, and that these positions could possibly swing back and forth a dozen times during the year. Our survey indicates that mail order buying has become a major factor in ham sales. Approximately 51% of those readers who answered our questionnaire indicated buying by direct visit to the dealer's store, while 47% bought through mail-order. 2% did not indicate what method of purchase was used. It was interesting to note what effect advertising had on the buying habits of the average CQ reader. 56% indicated that a *manufacturer's* ad influenced their buying of a specific piece of equipment, 43% that the manufacturer's ad had little or no effect, and 1% did not answer this question. On the other hand, readers indicated that a specific *distributor's* was the cause of sale in less than 35% of the time. However, it curiously turns out that those distributors who did the largest volume of ham business (see ranking above and additional listing below) are the major advertising distributors in CQ and other national publications. This is also a curious phenomenon in view of the fact that 47% of these readers *did* buy through mail-order. Our conclusion is that distributor ads have *almost* as much effect on buying habits as *manufacturers'* ads, but that most of this effect is not a conscious result in the mind of the buyer.

Getting back to specific distributors, several other names showed up quite well as major factors in hams sales; among these are BURGHARDT RADIO, EVANS RADIO, BURSTEIN-APPLEBEE, WALTER ASHE, FORT ORANGE, HARVEY, OLSON, KEN-ELS and ADIRONDACK RADIO. Many other fine names, too numerous to include, are getting their share of ham sales; most of these, however, are getting local trade rather than national mail-order volume.

We don't want to underemphasize the importance of the local distributor. He does account for more than half of all the ham gear sold, and he's quite an important factor in working towards the encouragement of new hams and the continued satisfaction of oldtimers. Code courses run by many distributors have done much to further the interests of ham radio. Personal attention is still the most important single factor in determining amateur sales. The second ranking factor is trade-in consideration. The good distributor can offer a ham a fair price for his old rig and still make his legitimate markup.

Incidentally, we threw a couple of loaded questions into our questionnaire just to see what would happen. "Do you use CQ as a buying guide as to what equipment is available on

[Continued on page 146]

Distributor Index

One problem that faces the amateur when he reads about something that interests him is, "Where Do I Get It?" This can be pretty frustrating at times. The handy list on the following pages will tell you where you can buy what you want. We suggest you stick a book mark in this section so you can pull it off the shelf and use it for reference all year 'round.

Alphabetical

List of Distributors

1 Adirondack Electronics, Inc.
712 Broadway
Schenectady, New York

2 Adirondack Radio Supply
185 W. Main Street
Amsterdam, New York

3 Aikins Electronic Supplies, Inc.
531 Broad Street
New London, Conn.

4 Alco Electronics
3 Wolcott Avenue
Lawrence, Mass.

5 Alpha Aracon Radio Company Limited
555 Wilson Avenue
Downsview, Ontario, Can.

6 Arrow Electronics, Inc.
525 Jericho Turnpike
Mineola, L. I., N. Y.

7 Arrow Electronics, Inc.
65 Cortlandt Street
New York 7, New York

8 Barry Electronics Corp.
512 Broadway
New York 12, New York

9 Lew Bonn Company
67 So. 12th Street
Minneapolis,3, Minn.

10 Busacker Electronic Systems, Inc.
1216 West Clay
Houston 19, Texas

11 James W. Clary
1713 2nd Avenue, South
Birmingham, Alabama

12 Curle Radio Supply Co.
106 Winston Avenue
Huntsville, Alabama

13 Curle Radio Supply Co.
710 North Hamilton
Dalton, Georgia

14 Curle Radio Supply Co.
439 Broad Street
Chattanooga 2, Tenn.

15 Dow Radio, Inc.
1759 E. Colorado Blvd.
Pasadena, California

16 W. H. Edwards Co., Inc.
94 Broadway
Providence 3, R. I.

17 Electronic Distributors, Inc.
1845 Peck Street
Muskegon, Michigan

18 Electronic Supply
909 Morningside Drive
Melbourne, Florida

19 Electronic Supply
61 N. E. 9th Street
Miami 32, Florida

20 Electronic Supply Co.
41-08 Greenpoint Avenue
Long Island City 4, N.Y.

21 Elliott Electronics, Inc.
418 North Fourth Ave.
Tucson, Arizona

22 Evans Radio, Inc.
Rt. 3A Bow Jct.
Concord, New Hampshire

23 Fort Orange Radio Dist Co.
904-916 Broadway
Albany, New York

24 George's Electronic Supplies
320 West Superior St.
Kokomo, Indiana

25 Golla Engineering Laboratory & Sales
1173 Orr Avenue
1200 North Grant Avenue
Kittanning, Penn.

26 Graham Company
505 Main Street
Reading, Mass.

27 H & H Electronic Supply, Inc.
506-510 Kishwaukee St.
Rockford, Illinois

28 Hargis-Austin, Inc.
410 Baylor
Austin, Texas

29 Hargis Company, Inc.
1205 Washington
Waco, Texas

30 Henry Radio Company
Butler, Missouri

31 Henry Radio Company
11240 W. Olympic Blvd
Los Angeles 64, Calif.

32 Kaimuki Radio Co., Ltd.
3620 Waialae Avenue
Honolulu 16, Hawiali

33 Key Electronics
11254 Triangle Lane
Wheaton, Maryland

34 Key Electronics
122-126 S. Wayne St
Arlington 4, Va.

35 Kierulff Sound Corporation
820 W. Olympic Blvd. at Figueroa
Los Angeles 15, Calif.

36 Klaus Radio & Electric Co.
1055 1st Street
La Salle, Illinois

37 Klaus Radio & Electric Co.
403 E. Lake Street
Peoria, Ilinois

38 Knox Electronic Supply, Inc.
67 N. Cherry Street
Galesburg, Illinois

39 Modern Equipment Co.
113 Central Avenue
Great Falls, Montana

40 Nidisco-Cliff, Inc.
484 Bergen Blvd.
Ridgefield, New Jersey

41 Nidisco-Hack, Inc.
55 State Street
Hackensack, N. J.

42 Nidisco-Jersey City, Inc.
713 Newark Ave.
Jersey City 6, N. J.

43 Nidisco-Pass, Inc.
294 Passaic Street
Passaic, New Jersey

44 Nidisco-Trenton, Inc.
985 Princeton Avenue
Princeton, New Jersey

45 Northwest Electronics, Inc.
East 730 First Avenue
Spokane 3, Washington

46 Payette Radio Limited
730 St. James West
Montreal 3, Canada

47 Pioneer Electronic Supply Co.
2103 East 21st Street
Cleveland 15, Ohio

48 Pioneer Electronic Supply Co.
1648 Broadway
Lorain, Ohio

49 Pioneer Electronic Supply Co.
17011 Broadway
Maple Heights, Ohio

50 Pioneer Electronic Supply Co.
317 Perry Street
Sandusky, Ohio

51 Radio and Electronic Parts Corp.
3235 Prospect Avenue
Cleveland 15, Ohio

52 Radio Products Sales, Inc.
1501 So. Hill Street
Los Angeles 15, Calif

53 Radio Product Sales Co.
1237 16th Street
Denver, Colorado

54 Selectronic Supplies, Inc.
803 So. Adams Street
Peoria, Illinois

55 Selectronic Supplies, Inc.
3185 Bellevue Road
Toledo, Ohio

56 Stark Radio Supply Co.
154 University Avenue (West)
Saint Paul 3, Minn.

57 Tydings Company
933 Liberty Avenue
Pittsburg 22, Pa.

58 Valley Electronic Supply Co.
1302 W. Magnolia
Burbank, California

59 Valley Electronic Supply Co.
17647 Sherman Way
Van Nuys, California

60 Valley Engineering, Inc.
625 East Main
Farmington, New Mexico

61 Valley Engineering, Inc.
601 Cedar Street
Los Alamos, New Mexico

62 Valley Engineering,
241 West Alameda
Santa Fe, New Mexico

63 Variety Electronics Corp.
Bloomfield Ave. at State Street
Bloomfield, New Jersey

64 W & W Distributing Co.
644 Madison Avenue
Memphis, Tenn.

65 Verl G. Walker Company
P. O. Box 1586
205 West Jackson
Medford, Oregon

66 Eugene G. Wile
218-220 South 11th St.
Phildelphia 7, Pa.

67 Wireless Radio Co., Inc.
713 12th Street, N.E.
Canton 4, Ohio

68 World Radio Laboratories
3415 W. Broadway
Council Bluffs, Iowa

Geographical

List of Distributors

James W. Clary Company 11
1713 2nd Avenue, South
Birmingham, Alabama

Curle Radio Supply Co. 12
106 Winston Avenue
Huntsville, Alabama

Elliott Electronics, Inc. 21
418 North Fourth Avenue
Tucson, Arizona

Valley Electronic Supply Co. 58
1302 W. Magnolia
Burbank, California

Henry Radio Company 31
11240 W. Olympic Blvd.
Los Angeles 64, Calif.

Klerulff Sound Corporation 35
820 W. Olympic Blvd. at Figueroa
Los Angeles 15, Calif.

Radio Products Sales Inc. 52
1501 So. Hill Street
Los Angeles 15, Calif.

Dow Radio, Inc. 15
1759 E. Colorado Blvd.
Pasadena, California

Valley Electronic Supply Co. 59
17647 Sherman Way
Van Nuys, California

Radio Products Sales Co. 53
1237 16th Street
Denver, Colorado

Aikins Electronic Supplies, Inc.. 3
431 Broad Street
New London Connecticut

Electronic Supply 18
909 Morningside Drive
Melbourne, Florida

Electronic Supply 19
61 N. E. 9th St.
Miami 32, Florida

Curle Radio Supply Co. 13
710 North Hamilton
Dalton,Georgia

Kaimuki Radio Co., Ltd. 32
3620 Waialae Avenue
Honolulu 16, Hawaii

Knox Electronic Supply Inc. 38
67 North Cherry Street
Galesburg, Illinois

Klaus Radio & Electric Co. 36
1055 1st Street
La Salle, Illinois

Klaus Radio & Electric Co. 37
403 E. Lake Street
Peoria, Illinois

Selectronic Supplies, Inc. 54
803 So. Adams Street
Peoria, Illinois

H & H Electronic Supply, Inc. 27
506-510 Kishwaukee St.
Rockford, Illinois

George's Electronic Supplies 24
320 West Superior St.
Kokomo, Indiana

World Radio Laboratories 68
3415 W. Broadway
Council Bluffs, Iowa

Key Electronics 33
11254 Triangle Lane
Wheaton, Maryland

Alco Electronics 4
3 Wolcott Avenue
Lawrence, Mass.

Graham Company 26
505 Main Street
Reading, Mass.

Electronic Distributors, Inc. 17
1845 Peck Street
Muskegon, Michigan

Lew Bonn Company 9
67. So. 12th Street
Minneapolis 3, Minn.

Stark Radio Supply Co. 56
154 University Avenue (West)
Saint Paul 3, Minn.

Henry Radio Company 30
Butler, Missouri

Modern Equipment Co. 39
113 Central Avenue
Great Falls, Montana

Evans Radio, Inc. 22
Rt. 3A Bow Jct.
Concord, New Hampshire

Variety Electronics Corp. 63
Bloomfield Ave. at State St.
Bloomfield, New Jersey

Nidisco-Hack, Inc. 41
55 State Street
Hackensack, New Jersey

Nidisco-Jersey City, Inc. 42
713 Newark Avenue
Jersey City 6, N. J.

Nidisco-Pass, Inc. 43
294 Passaic Street
Passaic, New Jersey

Nidisco-Trenton, Inc. 44
985 Princeton Avenue
Princeton, New Jersey

Nidisco-Cliff, Inc. 40
484 Bergen Blvd.
Ridgefield, New Jersey

Valley Engineering, Inc. 60
625 East Main
Farmington, New Mexico

Valley Engineering, Inc. 61
601 Cedar Street
Los Alamos, New Mexico

Valley Engineering, Inc. 62
241 West Alameda
Santa Fe, New Mexico

Fort Orange Radio Dist. Co. 23
904-916 Broadway
Albany, New York

Adirondack Radio Supply 2
185 W. Main Street
Amsterdam, New York

Electronic Supply Corp. 20
41-08 Greenpoint Avenue
Long Island City 4, N.Y.

Arrow Electronics, Inc. 6
525 Jericho Turnpike
Mineola, L. I., N. Y.

Arrow Electronics, Inc. 7
65 Cortlandt Street
New York 7, New York

Barry Electronics Corp. 8
512 Broadway
New York 12, New York

Adirondack Electronics, Inc. 1
712 Broadway
Schenectady, New York

Wireless Radio Co., Inc. 67
713 12th Street, N. E.
Canton 4, Ohio

Pioneer Electronic Supply Co. 47
2103 East 21st Street
Cleveland 15, Ohio

Radio and Electronic Parts Corp. 51
3235 Prospect Avenue
Cleveland 15, Ohio

Pioneer Electronic Supply Co. 48
1648 Broadway
Lorain, Ohio

Pioneer Electronic Supply Co. 49
17011 Broadway
Maple Heights, Ohio

Pioneer Electronic Supply Co. 50
317 Perry Street
Sandusky, Ohio

Selectronic Supplies, Inc. 55
3185 Bellevue Rd.
Toledo, Ohio

Verl G. Walker Co. 65
P. O. Box 1586
205 West Jackson
Medford, Oregon

Golla Engineering Laboratory & Sales 25
1173 Orr Avenue
1200 North Grant Avenue
Kittanning, Penn.

Engene G. Wile 66
218-220 South 11th St.
Philadelphia 7, Penn.

Tydings Company 57
933 Liberty Avenue
Pittsburgh 22, Penn.

W. H. Edwards Co., Inc. 16
94 Broadway
Providence 3, R. I.

Curle Radio Supply Co. 14
439 Broad Street
Chattanooga 2, Tenn.

W & W Distributing Co. 64
644 Madison Avenue
Memphis, Tenn.

Hargis-Austin, Inc. 28
410 Baylor
Austin, Texas

Busacker Electronic Systems, Inc. 10
1216 West Clay
Houston 19, Texas

Hargis Company, Inc. 29
1205 Washington
Waco, Texas

Key Electronics 34
122-126 S. Wayne St.
Arlington 4, Va.

Northwest Electronics, Inc. 45
East 730 First Avenue
Spokane 3, Washington

Alpha Aracon Radio Company Limited 5
555 Wilson Avenue
Downsview, Ontario, Can.

Payette Radio Limited 46
730 St. James West
Montreal 3, Canada

ALPHABETICAL LIST OF MANUFACTURERS

KEY NUMBERS INDICATE DISTRIBUTORS HANDLING THEIR PRODUCTS

AMERICAN GELOSO ELECTRONICS, INC.

312 Seventh Avenue
New York 1, New York

Receivers, Transmitters

4, 6, 7, 8, 9, 10, 17, 23, 28 29, 36, 37, 39, 45, 52, 54, 55, 65, 67.

AMPEREX ELECTRONIC CORP.

230 Duffy Avenue
Hicksville, New York

Electron Tubes

4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 18, 19, 20, 22, 28, 29, 30, 31, 35, 36, 37, 38, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 60, 61, 62, 63, 64, 65, 67, 68.

ANTENNA SPECIALISTS CO.

12437 Euclid Avenue
Cleveland 6, Ohio

Mobile Communication Antennas

1, 2, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 23, 24, 26, 27, 28, 29, 30, 31, 33, 34, 36, 37, 38, 40, 41, 42, 43, 44, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 64, 65, 67, 68.

ASTATIC CORP.

Conneaut, Ohio

Microphones

1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 63, 64, 65, 67, 68,

AUTOMATION ELECTRONICS, INC.

1500 F. Vertugo Avenue
Burbank, California

Mobile Communications Receivers

9, 10, 12, 13, 14, 15, 21, 30, 31, 45, 52, 53, 58, 59, 65, 68.

BARKER & WILLIAMSON, INC.

Canal Street & Beaver Dam Road
Bristol, Pennsylvania

Transmitter, Amplifiers, Baluns, & Components

1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 36, 37, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 68.

BASSETT, REX, INC.

Ft. Lauderdale, Florida

Mobile Antennas, Coils and Mounts

1, 2, 17, 18, 19, 21, 22, 23, 26, 28, 29, 46, 47, 48, 50, 53, 56, 65.

BENDIX AVIATION CORP.

Eatontown, New Jersey

Semiconductor Devices

22, 36, 37, 40, 41, 42, 43, 44, 47, 48, 49, 50, 52.

BUD RADIO, INC.

2118 E. 55th Street
Cleveland 3, Ohio

Code Practice Devices, Metal Cabinets and Racks

1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 22, 23, 24, 27, 28, 29, 30, 31, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 58, 59, 63, 64, 65, 66, 67, 68.

CENTRAL ELECTRONICS, INC.

1247 W. Belmont Avenue
Chicago 13, Illinois

Transmitters, Amplifiers, and Test Equipment

1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 45, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 59, 64, 67, 68.

CENTRALAB

954K E. Keefe Avenue
Milwaukee 1, Wisconsin

Switches, Components, Transistors, Amplifiers

1, 2, 3, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 27, 28, 29, 30, 31, 32, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45,

46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 67, 68.

COLLINS RADIO CO.

855 35th Street, N. E.
Cedar Rapids, Iowa

Receivers, Transmitters

1, 2, 9, 10, 15, 16, 18, 19, 21, 22, 23, 28, 29, 30, 31, 32, 36, 37, 38, 39, 46, 47, 48, 49, 50, 52, 53, 54, 55, 56, 58, 59, 64, 68.

COLUMBUS ELECTRONICS

1010 Saw Mill River Road
Yonkers, New York

Semiconductor Devices

10, 18, 19.

CONTINENTAL ELECTRONICS & SOUND CO. (CESCO)

711 Liscum Drive
Dayton 7, Ohio

Antenna Hardware, Accessories and Phone Patches

1, 2, 4, 6, 7, 12, 13, 14, 18, 19, 23, 28, 29, 30, 31, 36, 37, 47, 48, 49, 50, 52, 53, 54, 55, 57, 64, 65, 67, 68.

COLUMBIA PRODUCTS CO.

P. O. Box 5207
Columbia, South Carolina

Mobile Antennas

4, 9, 18, 19, 21, 22, 23, 24, 26, 33, 34, 36, 37, 39, 40, 41, 42, 43, 44, 45, 52, 68.

CORNELL-DUBILIER ELECTRONIC CORP.

333 Hamilton Boulevard
S. Plainfield, New Jersey

Rotators, Power Supplies and Components

1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 18, 19, 20, 21, 22, 23, 24, 26, 28, 29, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 52, 54, 55, 56, 60, 61, 62, 63, 65, 66, 67, 68.

COSMOS INDUSTRIES, INC.

3128 Queens Boulevard
Long Island City, New York

Transceivers

4, 6, 7, 10, 18, 19, 20, 22, 23, 28, 29, 30, 31.

DOW KEY CO., INC.

Warren, Minnesota

Keys, Coaxial Relays, Switches and Connectors

1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68.

DUNLAP ELECTRONICS, INC.

764 Ninth Street
Des Moines, Iowa

Citizen Band Transceivers

25, 27, 54, 55.

E-Z WAY TOWERS, INC.

5901 East Broadway
Tampa 5, Florida

Towers

1, 2, 4, 5, 6, 7, 9, 15, 16, 18, 19, 23, 28, 29, 32, 33, 34, 47, 48, 49, 50, 56, 57, 66, 68.

ELECTRONIC INSTRUMENT CO., INC.

33-00 Northern Boulevard
Long Island City, New York

Transmitters, Test Equipment

1, 2, 3, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30, 31, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68.

EITEL-McCULLOUGH, INC.

798 San Mateo Avenue
San Bruno, California

Electron Tubes

1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 27, 28, 29, 30, 31, 35, 36, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 68.

ELDICO ELECTRONICS

72 East 2nd Street
Mineola, New York

Transmitters, Phone Patches, Keyers

1, 2, 4, 5, 10, 16, 17, 18, 19, 22, 23, 28, 29, 30, 31, 33, 34, 36, 37, 47, 48, 49, 50, 53, 54, 55, 58, 59, 64, 68.

FAIRCHILD SEMICONDUCTOR CORP.

844 Charleston Road
Palo Alto, California

Semiconductor Devices

18, 19.

GENERAL ELECTRONIC SV. CORP.
(General Crystal Co.)

372 Wilmot Avenue
Burlington, Wisconsin

Crystals

25.

GENERAL ELECTRIC CO.
(Semiconductor Dept.)

Electronics Park
Syracuse, New York

Semiconductor Devices

1, 2, 3, 6, 7, 9, 12, 13, 14, 15, 16, 18, 19, 22, 23, 24, 28, 29, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 68.

GENERAL ELECTRIC CO.
(Electronics Components Div.)

Owensboro, Kentucky

Electron Tubes

1, 2, 3, 6, 7, 9, 11, 12, 13, 14, 15, 16, 18, 19, 22, 23, 24, 27, 28, 29, 30, 31, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 56, 57, 58, 59, 60, 61, 62, 64, 65, 68.

GENERAL INSTRUMENTS, INC.

65 Gouverneur Street
Newark 4, New Jersey

Semiconductor Devices

12, 13, 14, 16, 18, 19, 36, 37, 58, 59.

GLAS-LINE CO

P. O. Box 2
New York 71, New York

Transmission Line, Guy Line, Insulators

1, 2, 5, 6, 7, 8, 9, 10, 18, 19, 23, 28, 29, 30, 31, 36, 37, 47, 48, 49, 50.

GLOBE ELECTRONICS, INC.
(Formerly WRL)

3415 West Broadway
Council Bluffs, Iowa

Transmitters, Amplifiers, and Test Equipment

1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 35, 36, 37, 38, 39, 45, 47, 48, 49, 50, 52, 54, 55, 57, 58, 59, 64, 68.

GLOBE INDUSTRIES, INC.
(Electronics Division)

525 Main Street
Belleville, New Jersey

Power Supplies

1, 2, 3, 4, 5, 6, 7, 9, 10, 15, 17, 18, 19, 22, 23, 24, 27, 28, 29, 30, 31, 36, 37, 38, 39, 45, 46, 47, 48, 49, 50, 52, 53, 54, 55, 58, 59, 64.

GONSET COMPANY

801 S. Main Street
Burbank, California

Receivers, Transmitters, Amplifiers, Antennas and Accessories

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 63, 64, 65, 67, 68.

GREENLEE TOOL CO.

2371 Columbia Avenue
Rockford, Illinois

Hole Punching Tools

1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 27, 28, 29, 35, 36, 37, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 53, 54, 55, 56, 57, 58, 59, 64, 66, 67.

HALLICRAFTERS CO.

4401 W. 5th Avenue
Chicago 24, Illinois

Receivers, Transmitters and Amplifiers

1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68.

HAMMARLUND MFG. CO., INC.

460 West 34th Street
New York 1, New York

Receivers and Components Parts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 68.

HEATH COMPANY

Benton Harbor, Michigan

Transmitters, Receivers and Accessories

5, 6, 7, 9, 23, 33, 34, 35, 47, 48, 49, 50, 53, 65.

HOFFMAN ELECTRONICS

930 Pitner Avenue
Evanston, Illinois

Semiconductor Devices

35, 52, 56.

HUGHES AIRCRAFT COMPANY

Culver City, California

Semiconductor Devices

6, 7, 25, 64.

HY-GAIN ANTENNA PRODUCTS CO.

1828 North Street
Lincoln, Nebraska

Antennas, Rotators, Mounts and Accessories

1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 60, 61, 62, 64, 65, 68.

INTERNATIONAL CRYSTAL MFG. CO., INC.

18 North Lee Street
Oklahoma City 2, Oklahoma

Transmitters, Crystals, and Accessories, Printed Circuit Amplifiers, Test Equipment

4, 5, 16, 28, 29, 36, 37, 47, 48, 49, 50, 52, 58, 59.

INTERNATIONAL RECTIFIER CORP.

1521 E. Grand Avenue
El Segundo, California

Semiconductor Devices

4, 6, 7, 9, 10, 12, 13, 14, 15, 17, 18, 19, 20, 22, 23, 24, 27, 28, 29, 35, 37, 38, 45, 52, 56, 58, 59, 64, 65, 67.

JOHNSON, E. F. CO.

Weseca, Minnesota

Transmitters, Amplifiers, Antennas Rotators and Components

1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68.

KTV TOWER & COMMUNICATION CO.

5520 South Shore Drive
Chicago 37, Illinois

Towers

4, 9, 28, 29, 32, 40, 41, 42, 43, 44, 54, 55, 68.

KUPFRIAN MANUFACTURING CORP.

159 Prospect Avenue
Binghamton, New York

Power Supplies

30, 31, 36, 37, 68.

L W ELECTRONIC LABS

Route 2
Jackson, Michigan

Transmitters, Converters

4, 10, 51.

LAKESHORE INDUSTRIES

Manitowoc, Wisconsin

Transmitters, Amplifiers

6, 7, 9, 10, 18, 19, 22, 23, 30, 31, 36, 37, 38, 40, 41, 42, 43, 44, 47, 48, 49, 50, 52, 56, 57, 68.

MARK MOBILE, INC.

6416 W. Lincoln Avenue
Morton Grove, Illinois

Mobile Antennas

1, 2, 6, 7, 10, 17, 18, 19, 22, 23, 26, 30, 31, 36, 37, 47, 48, 49, 50, 51, 54, 55, 60, 61, 62.

MASTER MOBILE MOUNTS, INC.

1306 Bond Street
Los Angeles 15, California

Mobile Antennas, Mounts, and Coils, Field Strength Meters, Crystals

1, 2, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 63, 64, 65, 66, 67, 68.

MICROWAVE ASSOCIATES, INC.

Burlington, Massachusetts

MA-H Varactor Diodes

MILLEN MFG. CO., INC., JAMES

150 Exchange Street
Malden 48, Massachusetts

Transmitters, Amplifiers, Power Supplies Component Parts, Test Equipment

4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 21, 22, 23, 26, 28, 29, 30, 31, 32, 36. 37, 38, 46, 51, 52, 53, 56, 64, 66, 68.

MORROW RADIO MFG. CO.

2794 Market Street
Salem, Oregon

Receivers, Transmitters, Power Supplies

1, 2, 4, 6, 7, 8, 10, 11, 15, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 33,

34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 52, 53, 56, 57, 58, 59, 60, 61, 62, 64, 65, 67, 68.

MOSLEY ELECTRONICS, INC.

8622 St. Charles Rock Road
St. Louis 14, Missouri

Antennas and Accessories

3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68.

MULTI-PRODUCTS CO.

21470 Coolidge Highway
Oak Park 37, Michigan

Citizen Band Transceivers

1, 2, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 36, 37, 39, 45, 47, 48, 49, 50, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 67, 68.

NATIONAL CO., INC.

61 Sherman Street
Malden, Massachusetts

Receivers, Component Parts

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 66, 67, 68.

NORTH AMERICAN ELECTRONICS, INC.

212 Broad Street
Lynn, Massachusetts

Semiconductor Devices

28, 29.

P & H ELECTRONICS, INC.

424 Columbia
Lafayette, Indiana

Transmitters, Amplifiers, Test Equipment

1, 2, 4, 6, 7, 9, 10, 12, 13, 14, 22, 27, 30, 31, 36, 37, 38, 47, 48, 49, 50, 57, 58, 59, 64, 68.

PALCO ENGINEERING

355 N. Columbia Street
Frankfort, Indiana

Transmitters, Power Supplies

1, 2, 10, 23, 36, 37, 64, 68.

PHILCO CORP., LANSDALE TUBE DIV.

Lansdale, Pennsylvania

Semiconductor Devices

18, 19, 28, 29, 35, 47, 48, 49, 50, 52, 56.

RCA ELECTRON TUBE DIV.

Harrison, New Jersey

Electron Tubes

1, 2, 3, 6, 7, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 28, 29, 35, 36, 37, 40, 41, 42, 43, 44, 46, 51, 52, 64, 66, 68.

RCA SEMICONDUCTOR & MATERIALS DIV.

Somerville, *New Jersey*

Semiconductor Devices

1, 2, 6, 7, 9, 10, 12, 13, 14, 16, 17, 18, 19, 28, 29, 35, 36, 37, 40, 41, 42, 43, 44, 46, 51, 52, 54, 55, 64, 66, 68.

RADIO PUBLICATIONS, INC.

Danbury Road
Wilson, Connecticut

Books

4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 18, 19, 20, 21, 22, 23, 26, 27, 30, 31, 33, 34, 36, 37, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 52, 54, 55, 57, 58, 59, 65, 68.

RAYTHEON COMPANY

Newton, Massachusetts

Semiconductor Devices

6 7, 9, 10, 12, 13, 14, 15, 22, 23, 24, 27, 28, 29, 35, 46, 47, 48, 49, 50, 54, 55, 58, 59, 65, 66, 67.

REGENCY DIV. OF IDEA, INC.

7900 Pendleton Pike
Indianapolis 26, Indiana

Receivers and Converters

1, 2, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 59, 60, 61, 62, 64, 65, 67, 68.

RIDER PUBLISHING, INC., JOHN F.

116 W. 14th Street
New York 11, New York

Books

3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68.

ROHN MFG. COMPANY

116 Limestone
Bellevue, Peoria 5, Illinois

Towers and Accessories

4, 5, 6, 7, 10, 11, 12, 13, 14, 17, 18, 19, 22, 23, 24, 26, 27, 28, 29, 36, 37, 38, 45, 47, 48, 49, 50, 51, 53, 56, 57, 60, 61, 62, 64.

SARKES TARZIAN, INC.

415 No. College Avenue
Bloomington, Indiana

Semiconductor Devices

1, 2, 3, 4, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 27, 28, 29, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 56, 58, 59, 60, 61, 62, 64, 67, 68.

SHELL ELECTRONIC MFG. CORP.

1688 Utica Avenue
Brooklyn, New York

Field Strength Meters, Test Equipment

4, 5, 6, 7, 12, 13, 14, 16, 17, 18, 19, 20, 22, 23, 36, 37, 67, 68.

SHURE BROTHERS, INC.

222 Hartrey Avenue
Evanston, Illinois

Microphones

1, 2, 3, 5, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 27, 28, 29, 30, 31, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68.

SPRAGUE ELECTRIC CO.

467 Marshall Street
North Adams, Massachusetts

Semiconductor Devices

1, 2, 6, 7, 16, 17, 23, 27, 28, 29, 36, 37, 38, 56, 58, 59, 64, 66.

TAPETONE, INC.

10 Ardlock Place
Webster, Massachusetts

Transmitters and Converters

4, 5, 6, 7, 10, 15 17, 22, 23, 26, 30, 31, 33, 34, 36, 37, 47, 48, 49, 50, 52, 53, 54, 55, 57, 64, 68.

TECHNICAL MATERIAL CORP.

700 Fenimore Road
Mamaroneck, New York

Receivers and Transmitters

1, 2, 4, 6, 7, 8, 9, 10, 12, 13, 14, 18, 19, 22, 23, 28, 29, 30, 31, 32, 36, 37, 47, 48, 49, 50, 52, 63, 64, 65, 67, 68.

TELREX, INC.

Asbury Park 2, New Jersey

Antennas, Rotators and Accessories

1, 2, 6, 7, 9, 10, 11, 16, 17, 18, 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 36, 37, 38, 39, 40, 41, 42, 43, 44, 52, 52, 56, 57, 60, 61, 62, 63, 64, 67, 68.

TELEX, INC.

1633 Eustis Street
St. Paul 1, Minnesota

Head Sets

1, 2, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 17, 18, 19, 21, 22, 27, 28, 29, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 68.

TEXAS INSTRUMENTS, INC.

13500 N. Central Expressway
P. O. Box 312
Dallas, Texas

Semiconductor Devices

18, 19, 24, 28, 29, 47, 48, 49, 50, 52, 56, 67.

TRANSITRON ELECTRONIC CORP.

Wakefield, Massachusetts

Semiconductor Devices

4, 5, 10, 36, 37, 51.

TRIAD TRANSFORMER CORP.

4055 Redwood Avenue
Venice, California

Transformers and Chokes

11, 12, 13, 14, 16, 18, 19, 22, 23, 24, 28, 29, 33, 34, 35, 36 37, 45, 46, 47, 48, 49, 50, 52, 58, 59, 60, 61, 62, 64, 65, 67.

TRI-EX TOWER CORP.

127 E. Inyo Street
Tulare, California

Towers and Accessories

4 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 28, 29, 30, 31, 32, 36, 37, 45, 52, 58, 59, 65.

VIBROPLEX CO., INC., THE

833 Broadway
New York 3, New York

Keys

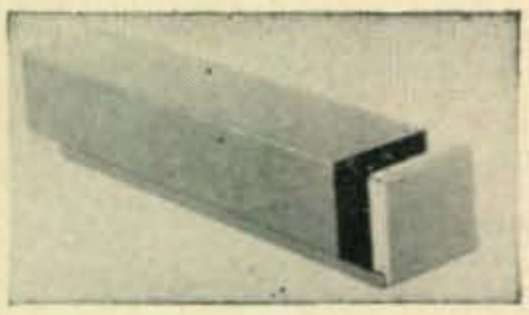
1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 27, 28, 29. 30, 31, 32, 36, 37, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50, 52, 54, 55, 56, 57, 58, 59, 63, 64, 65, 67, 68.

NEW

Amateur Products

New Heath XC-2 2 Meter Converter

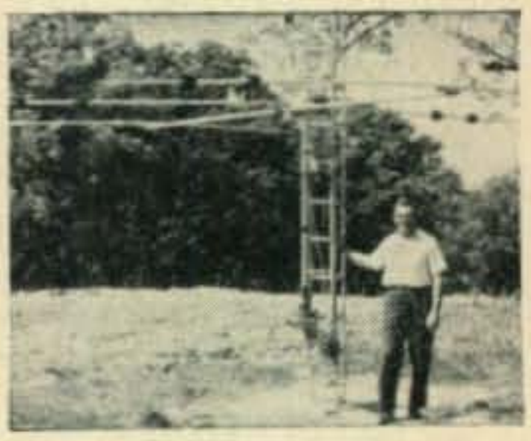
The Heath Company has a new two meter converter for use with the Heath Mohawk or any other receiver. The XC-2 is available, of course, in kit form. A matching power supply, designated the UT-1, is also available and supplies all power for the converter. For mailbox full of data, obliterate F on page 190.



New, Improved, Construction for the Bud Minibox Line

Bud Miniboxes offer, for the first time, both snap-lock and screw-type fastening through a new mechanical principle. The design of these new Miniboxes permits the installation of more components than is possible with boxes of other design. For more of the straight scoop, circle H on page 190.

KTV Hy Track



The KTV Tower and Communication Equipment Company has a new tower dubbed "The KTV Hy Track." With this unit, an amateur can raise or lower his beam antenna without having to crank down or tilt over the tower to reach the antenna. See the photo for details. Should you want more data, gash G on page 190.

Mix-Amp

Switchcraft, Inc., has a new and interesting device called a "Mix-Amp." This is a miniaturized transistorized amplifier which when used as a straight amplifier (without a mixer) has a 200,000 ohm input and provides a gain of 6 *db*. When the selector switch is in the "LO" position, the unit has a gain of 25 *db* with an input impedance of 5000 ohms. The output is high impedance regardless of the input selection. When the Mix-Amp is used with a mixer (Switchcraft Mini-Mix or equivalent) the unit will overcome the losses customarily attributed to mixers, in fact it will provide a 3 *db* gain. The Mix-Amp is self-powered (9v battery) and completely self-contained. For a great deal of very descriptive literature, gash I on page 190 and warn the postman.

Need Some Commercial Gear Repaired?

Empire State Electronics Service has been designated warranty station for the following makes of commercial amateur gear: Heath, Globe, Morrow, WRL, RME, Pierson, Lakeshore, Johnson and Hammurland. If you have a new piece of gear (still under warranty) that has gone astray in some manner, these boys will take care of the problem. We understand they have facilities for repairing *any* type of equipment, with a nominal charge for parts and services rendered.

late William Randolph Hearst. To lapse into constructive criticism at this point the only addition I would suggest is that more articles be found describing surplus conversions, startling European circuitry, ferrite antenna developments and similar malpractice. Back to the negative: omit all mathematics above and beyond Ohm's law. Complex calculation is a dirty habit and undoubtedly what drives mad scientists mad. Incunabulae, pictographs and medieval tapestries provide clear evidence that man was happy sowing, plowing, reaping and eating before the creative intellect turned from arts to the deviltry of science. If we can't go back, let's not go forward.

Thank you for your attention, and all seriousness aside, please accept the compliments of one reader on the very fine job you are doing. The magazine shows the influence of your personality and I'm sure what kudos you receive you are entitled to as an individual, and that "teamwork" and similar baloney in this respect are terms of immoderate diffidence best left to General Motors et al.

Incidentally, I don't enjoy seeing anything I've written in print, and while I'm sure this letter will lead you to agree with me I would ask that you not print it, perhaps as an example of what you have to put up with, or for any other mischievous reason. Long ago Larry LeKashman paid me for an article and I haven't overcome the humiliation I felt on reading it.

With you I most enjoy flying, foreign cars, controversy and the human-contact aspect of ham radio—may you continue in your pleasures and your articulate facility in sharing them with us. To demonstrate your acceptance of this small commendation will you please take the dollar I make bold to enclose and go out and buy yourself a snort?

73, Edwin K. Cole, W7IDF KL7ABC

P. S. If this sounds stuffy, that's from reading QST to find out what you are talking about when you refer to something those people have done. A necessary evil.

E. K. C.

Each month, by some incredible twist of fate, all of the completely insurmountable obstacles are momentarily overcome and we have another issue of CQ ready for the post office to run through their shredding machines and warehouse for a few days before letting you have it. It brings a tear of happiness to an editor's eye and a tug at his heart to get an occasional letter of sympathy in amongst the brick-bats.

If reader Cole is so unsophisticated as to think that I would fail to publish a letter which goes to such lengths to tell me how great I am just because he requests it, he now can indulge in some second thoughts.

And one more thing . . . when did we go in for anything as deep as Ohm's Law in CQ? None of that signtiffik stuff for us.

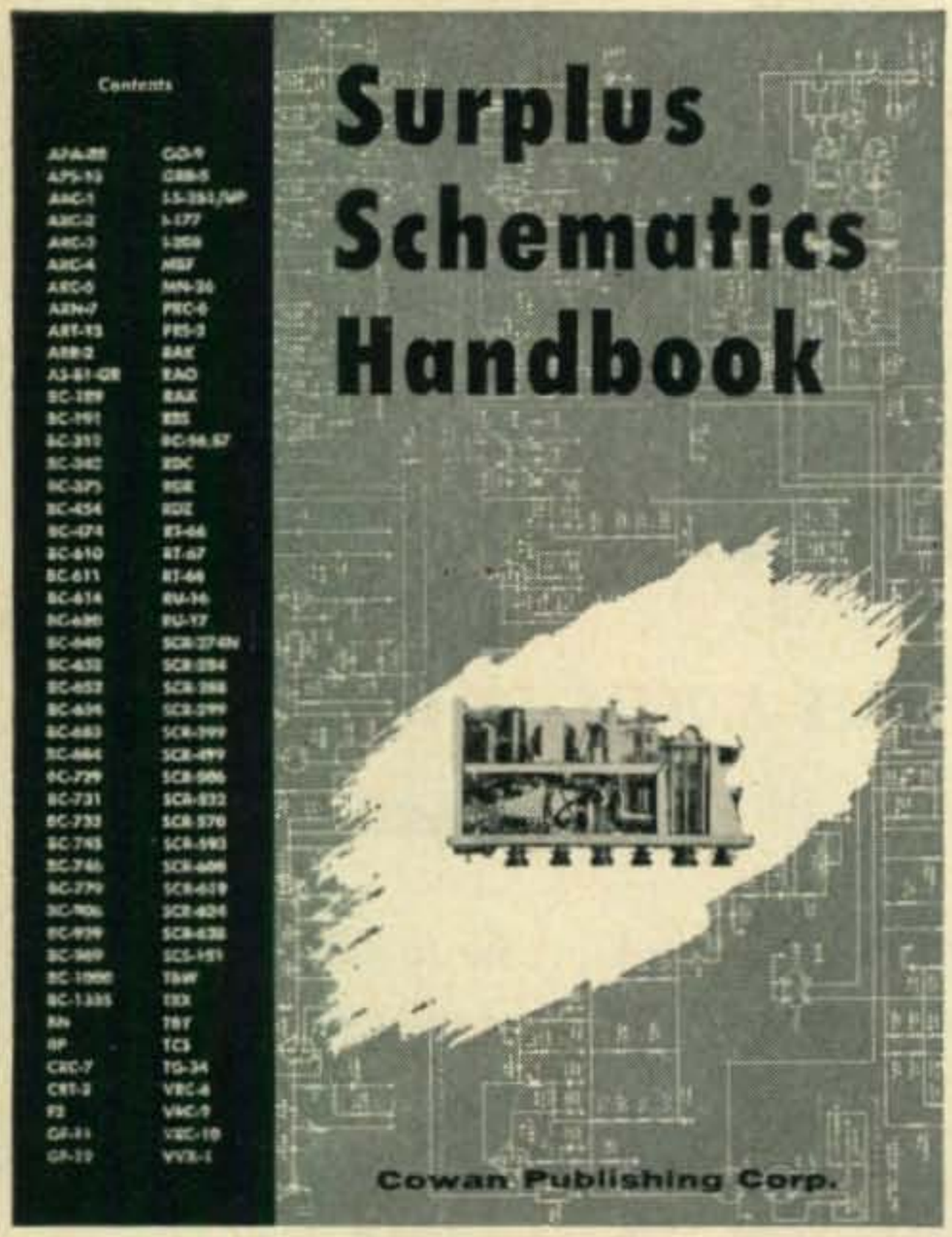
Self-Bleeding Circuit

Dear Editor,

I've seen many safety precautions printed in CQ, but I think that I've stumbled upon one that I wish I had heard about. I believe that this reminder may help a few fellows. A few days ago I killed the power in the rig and proceeded to reach into the rig to swing the coupling link a little, and ZAP. My only comment was %#¼≈/*! what went wrong now!!!! It so happened that the final tuning capacitor stored a bit of a charge which discharged as I took hold of the link. An adequate solution to the situation was to have a grounding clip connected to an appropriate place on the rig which could be attached to the final coil before any changes in the link or in the coil was to be made. It may be wise to employ this in our equipment.

Milt Nevrenchan/K9ATM
Blue Island, Ilinois

COMING SOON!



This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many times more difficult than the most involved puzzle, and purchasing a single instruction book can run as high as $3.50. Why knock yourself out when you can have a book with complete coverage on hand in your library? All this for only $2.50.

Including . . .

APA 38
ARC 1
ARC 3
ARC 5
ARN 7
ART 13
BC 189
BC 344
BC 610A
BC 640
BC 728
BC 969
CRC 7
F 3
GRR 5
JT 350A
MN 26 AC
PRS 3
RAX
RBS
RC 56
RC 57A
RDC
RDZ
SCR 274
SCR 284
SCR 506
SCR 608A
SPR 2
TBW

Use coupon on opposite page →

Land Line

W2NSD de W6OEB,

My compliments to W8CFW on his fine article "Small Talk on the Landline" in your June issue. This will help to dispel much of the fog that has enveloped this subject as a result of very little info in the amateur press over the years. I would like to mention an excellent article describing the current set (500 series) which is in the Bell System Technical Journal for April 1951 in case some members of the fraternity may wish to go deeper into the subject. Since the 500 set also contains an "automatic transmission equalizer" (AGC) not found in the 300 and earlier sets this reference is of considerable value.

Keep up the good work.

D. F. Babcock W6OEB
Portola Valley, Calif.

Power Corrupts

Dear Wayne,

It is often said that power corrupts. A few trips to a conference of some type, and the Great White Father complex sets in.

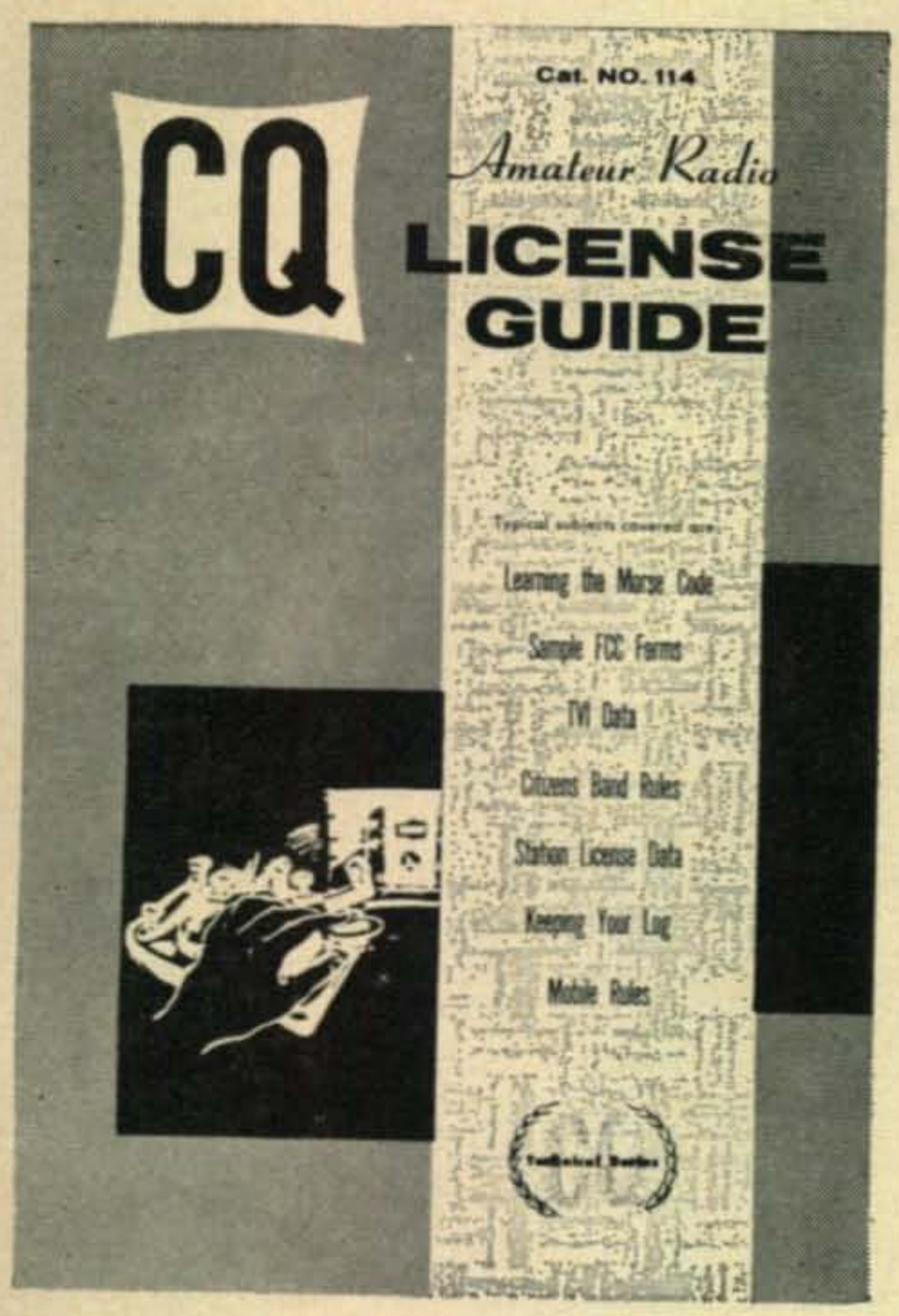
A suggestion I heard recently has considerable merit. I suggest you consider it carefully, and publicize it. It would take the form of an ARRL constitutional amendment; ruling that after being twice elected to an office as SCM or Director, that person would be declared ineligible for listing as a candidate in future elections for that office. In short, like Federal presidents, two terms and out.

Lester Sade, 652 Second
San Bruno, Calif.

HAM HINTS

Holster

A tin can, screw-fastened to one end of your bench makes a handy "holster" for your soldering gun. It keeps the gun handy for a quick draw and there is no danger of accidentally knocking it off the bench onto the floor to break. This could easily happen if you were to keep it on the bench top among other tools and test cords.



COMING SOON!

Over 192 pages of everything the Amateur must have to get his license and progress toward the general class ticket. Plus many additional pages of vital information for the ham operator.

ONLY **$2.50**

RESERVE YOUR BOOKS TODAY!

CONTENTS . . .

Learning the code

Study material for the Novice class license, for technician and general class licenses

The FCC and the Amateur

Portable and Mobile stations

Charts showing FCC examining points and schedules

Charts showing Frequency allocations

Sample log sheets

Section on TVI, What it is and how to cure it

Section on QSL's and QSLing

Charts showing great circle bearings from LA, Chicago and NYC

Complete list of amateur "Q" Signals

C11

COWAN PUBLISHING CORP.
BOOK DIVISION
300 WEST 43rd STREET
NEW YORK 36, N. Y.

SIRS:

I enclose $_____. Please send me _____ copies of the CQ LICENSE GUIDE.

I enclose $_____. Please send me _____ copies of the SURPLUS SCHEMATICS HANDBOOK.

NAME_____

ADDRESS_____

CITY_____ STATE_____

SIGNATURE_____

New York City residents add 3% sales tax.

SURVEY *[from page 132]*

the market?" was one of these. The results were quite gratifying; 91% answered yes; 7% said no; 1½% said sometimes; ½% had no answer. It was actually a pleasure to find that a few sharp readers (probably with tongue in cheek) also added, "but I also use QST."

What was important however, was that more than 80% of CQ readers answered that they rely on distributors' catalogs as an important source of information. One item of concern to our marketing staff also showed its effects in our survey returns. This is the tremendous quantity of good used equipment that now exists on the open market. We realize that hams require a reasonable offer on used gear on trades for the fine new equipment that the industry has been producing. In an effort to make trades, many distributors have become loaded with an excess of good used gear. To help ease the pressure of this situation and help the distributors convert this gear into working capital, and also to provide our readers with a quick source of this available equipment, CQ instituted the Trading Post section some months ago. We're a bit disappointed that more distributors haven't taken advantage of this section, especially since we run it *at a loss* for the welfare of the ham fraternity.

On the whole, our survey indicates that ham business is booming, and that hams in general are quite pleased with the industry that serves their hobby. We want to take our hats off to the many fine dealers who have seen to it that ham radio is the clean, honest business that it is.

SUMMER RIG *[from page 92]*

for such service. The final result is diagrammed in fig. 2 and proved very successful.

Adjustment

The driver should be loaded with a Christmas tree lamp or something similar. In our case the driver had about 7 or 8 watts output. The final should be somewhat more heavily loaded than for maximum efficiency as the efficiency must nearly double on positive modulation peaks. Adjusting the cathode bias resistor on the 6AS7G also adjusts the bias on the amplifier. In our case we adjusted for 100 mils when a 4 turn link was connected to the dipole antenna. Audio was applied and a quite linear wave form appeared on the scope.

Thus, with a single tube modulator and no transformer you get upwards of 50 watts of modulated *rf*. The power supply uses a garden variety replacement transformer. If you have an old TV set replacement transformer there are enough filament windings so that with a

IT'S SMART TO ORDER FROM

"the house the hams built!"

ONLY 10% DOWN

Easy payment plan with only 10% down and up to two years to pay makes it easy to own the world's best Amateur Gear while paying. Your present equipment often is more than enough for down payment.

HIGHEST TRADE-INS

Our reputation in the field of Reconditioned Equipment makes the turnover in this department so great that we're continually in need of trade-ins. This allows us to offer you the best price for your old gear on the purchase of new. Try us! See why our Reconditioned List is termed "the bible of the industry."

PERSONALIZED SERVICE

There are 23 hams here to serve you. That, and our "customer is always right" policy have helped build World Radio to what we are today; — a large enough organization to serve your needs in every possible way, yet small enough to serve you as an individual. That's why we're known as "the house the hams built!"

BIG FREE 1960 CATALOG

Thousands of real bargains here for the novice as well as the advanced amateur — for the hi-fi enthusiast — for the dealer serviceman. Hundreds of pictures. Send for yours today.

National NC-303

Dozens of top features including front panel DSB, SSB selector, IF shift, eliminating retuning or detuning, "Q" Multiplier, 5-position IF selector, separate ANL for AM, exclusive WWV converter provision, hi-speed 40-1 ratio tuning dial with logging scale, antenna trimmer and optimum selectivity for DSB, SSB, CW, Phone, Phone Net and VHF. 15 tube receiver with 1.5 mv sensitivity. Image Rejection: 50-80db, all bands. Black and grey enamel finish.

Amateur Net: $449.00

$44.90 Down — $25.50 per mo.

Matching Speaker: $21.95

National HRO-60

Dual conversion all frequencies above 7 mc. High frequency oscillator and first mixer have current regulated filament circuits. Edge lighted direct frequency reading scale, 3-IF stages at 456 kc plus 1-IF stage at 2010 kc on all frequencies above 7 mc. Built-in power supply, sensitivity 1 mv or better for 6 db signal/noise ratio. S-meter amplifier. Separate BFO switch. Socket for NBFM adapter. 17 tube receiver plus voltage regulator. Standard coils supplied cover 1.7-30 mc continuous and bandspread 80-40-20-10 meters.

Amateur Net: $745.00

$74.50 Down — $32.30 per mo.

Matching Speaker: $19.95

We Carry the Complete National Line In Stock!

Like New National Reconditioned Eqpt.

HRO-60	$385.00
NC-183D	309.00
NC-300	269.00
NC-125	139.50
NC-98	114.00
NC-109	135.00
NC-57	69.00
SW-54	39.95

SEND FOR LATEST COMPLETE LISTS

FREE **FREE**

C-11 Rush me your new ☐ FREE CATALOG . . . and complete information on the following National Receiver_____

NAME: _____

ADDRESS: _____

CITY & STATE: _____

Send your latest free Reconditioned Equipment List: ☐

For further information, check number 29, on page 190.

little finagling, you can get 10 volts for the amplifier filament too.

This arrangement served us very well all summer. Several reliable hams reported the audio quality as excellent. While there is nothing new basically in this setup, it is a combination of the unusual and caused considerable comment from a number of interested hams. It is hoped that the ideas herein will be of interest to others who like to build up "odd ball" rigs. ■

MONITOR *[from page 91]*

at the key. Make up a second pair of leads with a phono plug on one end and a phone plug on the other, again being sure to observe polarity (ground-to-ground connection between the two plugs). The phono plug goes into J3 on the monitor and the phone plug into the headphone jack on the receiver. This completes the installation of the monitor except for the *ac* line connection. This you will discover in short order without my mentioning it.

Operation

Turn on the receiver and tune in an average strength signal with the receiver audio gain set somewhere near where you normally run it. Now adjust R6 for desired speaker volume. Turn the receiver audio gain to zero and close the key. (The transmitter need not be on for this test.) When the key is closed the monitor tone should be heard. Without touching R6 adjust R1 for desired tone volume. This procedure sets the relative volume of receiver audio and keying tone in the monitor output. In other words R6 controls the volume of both the tone and receiver audio while R1 affects only the tone level.

By turning the monitor on alone it may be used as a code practice oscillator. When on phone just don't turn the monitor on; it need not be disconnected from the transmitter, although the lead to the receiver phone jack should be pulled to restore normal receiver operation. On CW the monitor speaker or headphones may be used. When using this unit as a source of audio for test purposes, the audio level at J2 may be varied continuously with R1 and a 20 *db* change may be made with S2. ■

6AG7 GG *[from page 89]*

and consequently the amplifier was built very simply, soldering the final coil to the condenser. In place of soldering in the coil a plug type coil could be used. The driver stage to the four 6AG7's, being lower power, a coil form type was used. With 800 volts at 160 *ma* meter reading, the output is probably much more than indicated because the meter does not follow the peak current. If the needle flicks to 160 *ma*

"the house the hams built!"

During 23 years of amateur radio business, we've built up an enviable reputation of maximum service at minimum cost on a personalized basis. We invite you to join the thousands of amateurs that are currently doing business with "the World's Largest Distributor of Amateur Radio Equipment!". We finance our own paper, so terms are the easiest. Our reconditioning department allows the best trades on new equipment, as well as the best buy in used gear. We handle the nation's leading lines with large stocks to continually offer you what you want. Try us the next time you buy, won't you?

Leo. E. Meyerson WØGFQ

- Only 10% Down; Up to 24 Mos. to Pay
- Top Trade Values. Get a Quote From Us
- More Than 1000 Reconditioned Items
- Latest Serial Numbers
- Fast Shipment From the Center of the U. S.
- Personalized Service

WE CARRY IN STOCK: RECOMMEND

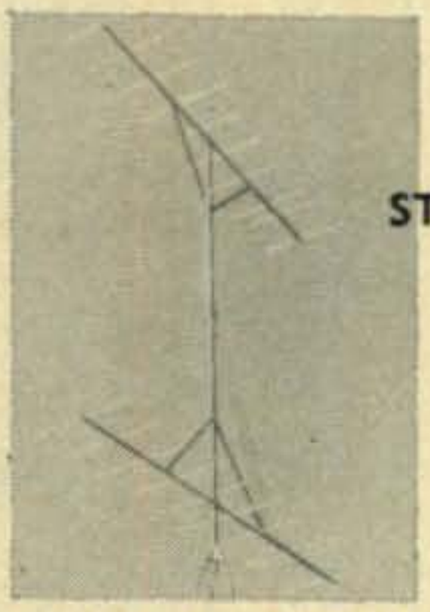
hy-gain's VHF YAGI'S

FOR 2M, 1¼M & ¾M

These Hy-Gain VHF Antennas are OPTIMUM SPACED for maximum forward gain. Parasitic elements are constructed from solid 6061T6 alloy aluminum rod for High Q, resulting in tremendous efficiency. The booms are large diameter heavy wall aluminum tubing. All hardware is hot dipped galvanized & iridite treated for maximum weather ability. Guaranteed for 1 full year.

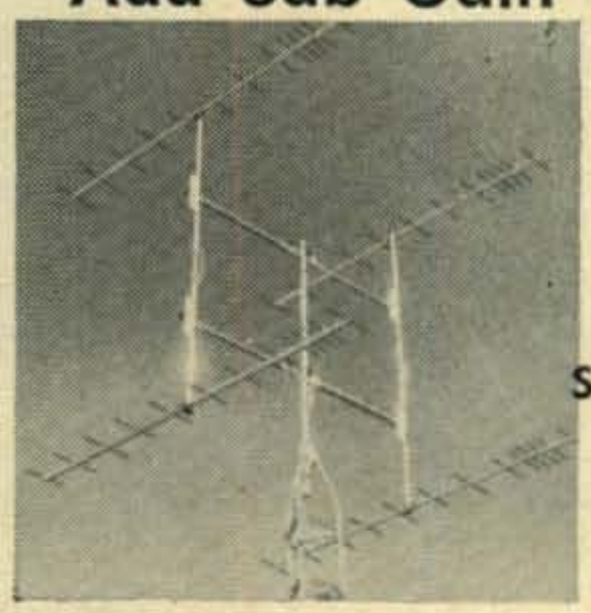
STACKING KITS

STACK 2 OF 'EM
Add 3db Gain



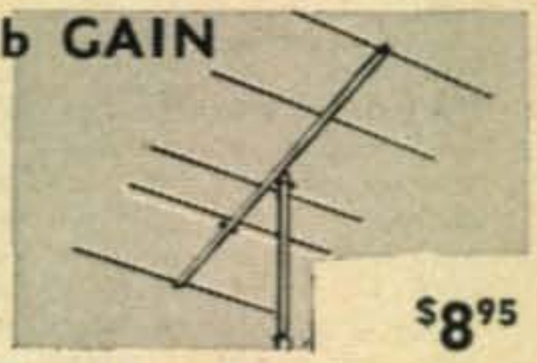
STACKING KITS
$4.95 Net

STACK 4 OF 'EM
Add 6db Gain



STACKING KITS
$15.95 Net

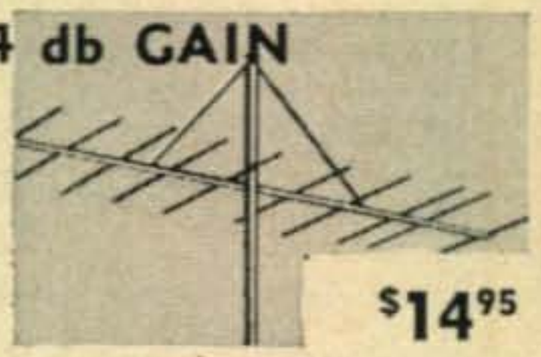
9 db GAIN



$8.95

Model No. 25
2M, 5 Element

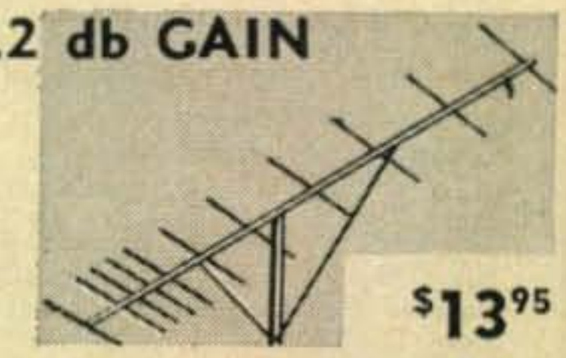
13.4 db GAIN



$14.95

Model No. 210
2M, 10 Element

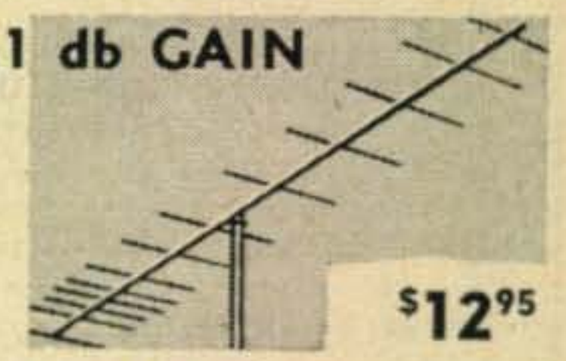
14.2 db GAIN



$13.95

Model No. 111
1¼M, 11 Element

16.1 db GAIN



$12.95

Model No. 313
¾M, 13 Element

SEND FOR COMPLETE INFORMATION

FREE 1960 CATALOG

JUST OFF THE PRESS! THOUSANDS OF HAM - HI-FI - SERVICE BARGAINS

Rush me your new 1960 Catalog ☐. Enclosed is my check (money order) for_____ for the _____Send your latest Reconditioned Equipment List ☐.

C-11

NAME: _____

ADDRESS: _____

CITY & STATE: _____

WORLD'S MOST PERSONALIZED ELECTRONIC SUPPLY HOUSE

World Radio LABORATORIES

PH. 2-0277

ELECTRONIC HEADQUARTERS

3415 W. BROADWAY COUNCIL BLUFFS, IOWA

For further information, check number 31, on page 190.

you can add 30% current reading to figure your actual peak current. This would indicate the amplifier's input should be around 160 watts.

Now take a look at the photographs. Where else can you pack this much power in such a small package, have neatness of wiring, no bias or screen voltages to worry about and at a very low cost?

Construction

Note a heavy piece of #12 wire was bent around the tube socket and the tube pins bent down over this wire and soldered. The amplifier can be put together in a few hours and you do not have to make any adjustments. Tune up procedure may be short-cut by setting a field strength meter on the table with a short piece of wire and tuning the 10B and two GG controls to maximum output by feeding in just enough excitation to obtain a reading. Remember, drive these tubes to 200 *ma* only on peaks and not in a key-down position. Believe me this little beast puts out a terrific wallop, try it and see for yourself. ■

SIG GEN *[from page 88]*

cause beats to be obtained with each of the two broadcast stations which are separated by 100 *kc*. With 100 *kc* beats, no harmonic signals should be heard between the two stations. If this condition is obtained the signal generator is tuned to 100 *kc* and the dial may be marked accordingly.

This same procedure should be followed in determining the setting of the signal generator dial which will tune the oscillator to 50 *kc*. The only difference will be that a harmonic carrier of 50 *kc* will appear midway between the two broadcast stations being used as check points.

The chart shown in Table I will be helpful in determining which harmonics of the fundamental frequencies falling within the broadcast band will be useful for establishing the signal generator oscillator frequency. Frequencies not shown fall between assigned broadcast channels.

As indicated, there is only one harmonic of 50.5 *kc* which will fall on an assigned broadcast channel. The 20th harmonic falls on 1010 *kc*. At the author's location, several stations are received on this frequency; however, the strongest signal is the one from KLRA in Little Rock, Arkansas. To set the signal generator to 50.5 *kc* the author establishes the 50 *kc* dial setting on the generator and then tunes his broadcast receiver to 1010 *kc*. The signal generator is tuned slightly higher in frequency until a beat is heard with the station on 1010 *kc*. When a zero-beat occurs, the generator is tuned to 50.5 *kc*.

Address FOR Economy

3415 W. BROADWAY • COUNCIL BLUFFS, IOWA

- Up to 50% savings in cost over new gear
- More than 1000 items continually in stock
- As many as 500 new listings each month
- Ninety-day, 100% return value on trades
- Ten-day free trial after purchase
- Double-checked, 90-day Warranty
- Finest quality test equipment used
- Operating instructions included with all current equipment

RECONDITIONED EQPT. HEADQUARTERS

You can buy with confidence when you buy from World Radio. Our reconditioned equipment lists, new each month, are so extensive and all-inclusive, that they are considered "the bible" of the Used Equipment Industry. Practically every name manufacturer is included. Seven trained technicians with an aggregate of nearly a hundred years' experience recreate perfection in operation with each piece of reconditioned equipment before it reaches our shelves. Send for our free current reconditioned equipment lists today. There's no obligation whatsoever.

World Radio LABORATORIES

3415 W. BROADWAY
COUNCIL BLUFFS, IOWA

SEND FOR CURRENT FREE LISTINGS . . .

EACH ITEM CARRIES THIS WARRANTY TAG, CERTIFYING THAT IT HAS BEEN

- CLEANED
- ALIGNED
- AND CHECKED FOR
  1) Sensitivity
  2) Voltage
  3) Stability
  4) Electrical, Mechanical and Tube Operation

For further information, check number 33, on page 190.

On the unit constructed, 100 *kc* was tuned with the oscillator tuning capacitor, C3, approximately 120 degrees open, 85 *kc* at approximately 100 degrees open and 50 *kc* at approximately 30 degrees open. The slug adjustment of the oscillator coil proper (Winding A-F) can be used to shift the oscillator frequency or adjust the amount of spread available with the coil and capacitor combination shown.

Operation

Operation of the unit is no problem at all. As in the case of the usual signal generator, a warm-up time is desirable before performing any alignment procedure. Regardless of the signal generator used, the author prefers to disregard the dial setting except for approximating the correct frequency, and make whatever calibration is required after sufficient warm-up time has elapsed. The calibration procedure is simple enough to be performed each time the signal generator is used in order to insure greater accuracy and better results. In aligning low frequency *if* amplifiers it is usually best to follow the receiver manufacturer's instructions regarding which adjustments to make first. Regardless of whether one is aligning a commercially built receiver, a home built selective *if* amplifier or kit type receiver, it is a good practice to use the minimum signal required to do the job. Excessive signal input can result in a poor alignment job.

Construction of this signal generator will provide you with a useful piece of test equipment that will not only enable you to keep your low frequency *if* amplifiers in alignment but will provide signals suitable for calibrating your broacast or all-band receiver. ■

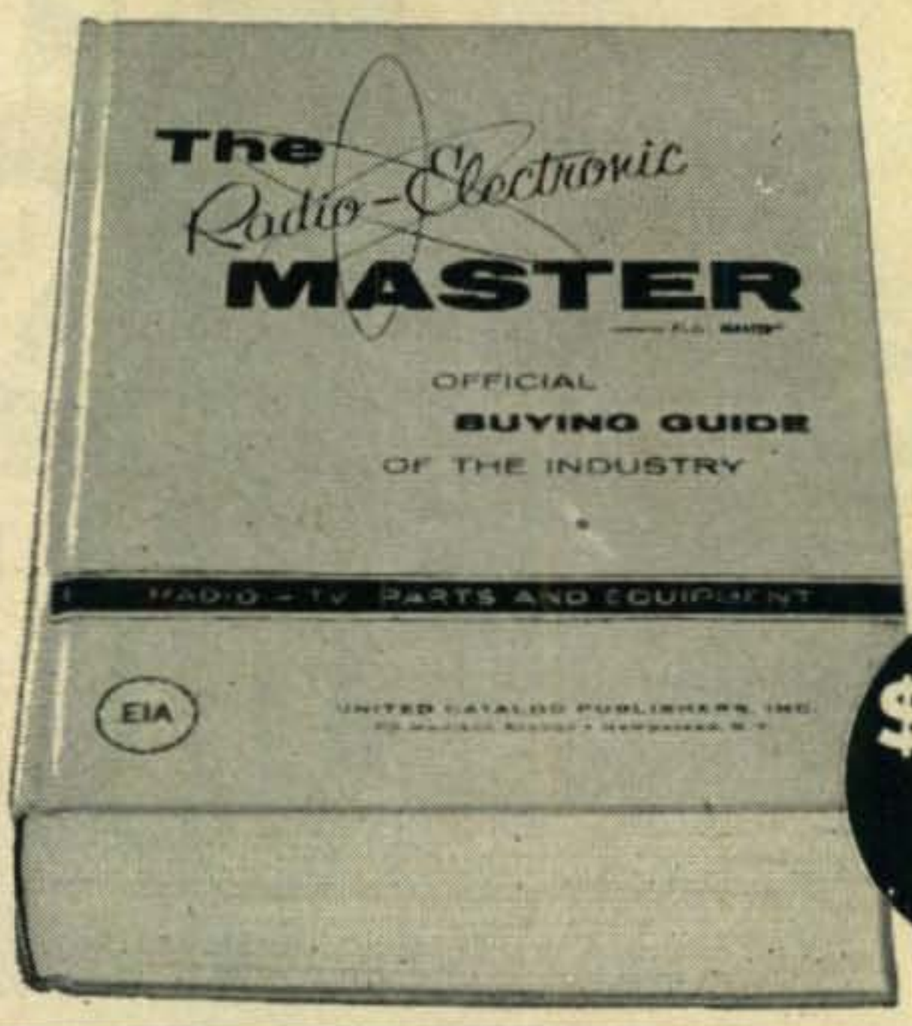
NETS *[from page 83]*

civic groups, such as Boy Scouts or fraternal organizations will be very pleased to have the net volunteer to give a demonstration of amateur radio. After you have given a few such demonstrations, you will be able to convert a mobile into a temporary base station in a matter of ten minutes or less! Another useful project is to send mobiles out on scouting expeditions on a pleasant weekend afternoon to determine the mobile and base station coverage of the entire area.

A TVI committee might be established to further promote interest and understanding of the amateurs and their emergency net in the community. Social activities should also be promoted. "All work and no play—" and there's no place in an emergency net for a dull boy! During all possible emergencies net members should make a practice of monitoring the primary net channel to see what is developing.

[more on page 156]

NOW AVAILABLE
at your local distributor



1,536 pages

$3.50 At parts distributors
$4.50 in Canada

1959 RADIO-ELECTRONIC MASTER

WORLD'S LARGEST BUYING GUIDE OF TV-RADIO-ELECTRONIC-AUDIO PRODUCTS

1536 pages of complete descriptions, specs, illustrations, prices for **150,000** items including all latest products of **350** manufacturers systematically arranged in **18** product sections for easy reference

SAVES TIME AND MONEY FOR AMATEURS AND EXPERIMENTERS

When you buy, repair or assemble, you're sure to get the right products to do the job because you are shopping in the electronic supermarket – The MASTER. Shows complete descriptions, specs, illustrations and prices of receivers, transmitters, hi-fi components, cabinets, racks and many hard-to-locate items not usually found in smaller incomplete catalogs. All latest SSB and mobile ham gear included.

No matter what ham gear or component you require . . .
YOU'LL FIND IT FASTER IN THE '59 MASTER
At your local parts distributor, or write for list.

FREE...*Valuable 24-page panel lamp chart at your MASTER distributor, or write direct enclosing 10¢ for handling.*

The Radio-Electronic Master • 60B Madison Avenue, Hempstead, N. Y.

☐ *Here's my $3.50. Please rush me the 1959 MASTER, Official Buying Guide of the Electronic Parts and Equipment Industry*

☐ *Please send me your 24-page Panel Lamp Chart. Enclosed is 10c for handling. (Free with order)*

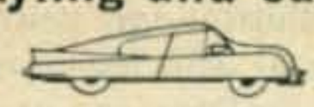
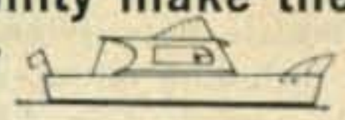
Name.....

Address.....

City.....**Zone**.....**State**.....

HERE IT IS AT HARVEY

THE NEW COLLINS KWM-2 TRANSCEIVER

Distinctive modern styling and easy mobility make the lightweight KWM-2 an attractive unit for the CAR  **BOAT**  **AIRPLANE**  **or fixed station.**

Featuring operation on all bands between 3.4 mc and 30 mc on either voice or CW, the KWM-2 has the quality and performance of the time-proven KWM-1 and famous Collins S/Line.

Filter type SSB generation and crystal-controlled double conversion also are features of the KWM-2, in addition to VOX and speaker anti-trip circuits. ALC keeps the signal adjusted to its rated PEP resulting in an increased average talk power.

The KWM-2 is easily moved between mobile and fixed station installations. For mobile use, the transceiver slides into the mount and the power, antenna, selector and car radio speaker plugs connect automatically. These same four connectors are used in a fixed station installation.

The KWM-2 mobile transceiver transmits on SSB or CW with a nominal output of 100 watts for complete coverage on all amateur bands. Any of fourteen 200 kc segments of the 3.4-30.0 mc frequency range may be utilized except the 5.0-6.5 mc range on transmitting. Other frequencies (such as MARS) outside the amateur bands may be obtained by inserting the proper crystals.

PRICE — **$1095.00**

Type/Description		Net Price
516E-1	DC Power Supply	$262.00
351D-2	Mobile Mount	$110.00
351E-4	Mounting Tray	$14.45
516F-2	AC Power Supply	$105.00
SC-301	Antenna Control Console	TBA
312-B5	Speaker Console	$333.00
30S-1	Linear Amplifier	$1470.00
136B-2	Noise Blanker	$120.00

For complete versatility in either fixed station or mobile use, Harvey has a full line of Collins accessories for the KWM-2.

hrc **HARVEY** Estab. 1927 **RADIO CO., INC.**

103 West 43rd Street, New York 36, N. Y. **JU 2-1500**

HARVEY is known the world over, as a reliable source for Ham Equipment. All orders shipped same day received. If you want to talk SWAPS and DEALS write or call **W2DIO.**

NEW RME

a division of Electro-Voice, Inc.

PORTABLE CITIZEN BAND RADIO

Completely transistorized, the RME 4303 Transceiver employs a super-heterodyne receiver with input sensitivity of better than 2 microvolts and sufficient selectivity to permit single channel reception. Receiver frequency coverage is tunable over the range of 29.96 to 27.27 mc, which includes all 23 of the Class D Citizens' Channels. Receiver tuning may be locked for fixed frequency operation. It operates with loudspeaker volume.

The transmitter is crystal controlled on Class D Citizens' Channels between 26.98 and 27.26 mc. Power input for transmitter is 90 milliwatts. It employs 7 high gain transistors and 2 diodes. Controls: On/Off and Audio Gain, Receiver Tuning, Push To Talk. Battery complement: 2 Burgess Z 4 batteries (not supplied). Average battery life: 60 hours.

34" whip antenna retracts into case. Dimensions: 2" x 3" x 9".

Weight: less than 2½ lbs. with batteries. Net price: $99.50

Two Z4 batteries: 1.26

HERE IT IS AT HARVEY

NEW RME

a division of Electro-Voice, Inc.

SSB COMMUNICATIONS RECEIVER

The RME 6900 is the product of almost 30 years of high frequency communications receiver engineering. Designed specifically for the serious amateur engaged in SSB AM and/or CW operation, the RME 6900 covers five amateur bands: 80, 40, 20, 15 and 10, plus a 10 to 11 mc band. Slide rule dial presents only band in use, 11½" scale length.

Model 6900 employs a noise limiter which is very effective on both SSB and CW. The receiver employs a separate detector for reception of SSB signals. Its sensitivity is 1 microvolt and drift is confined to 0.01%. Greater selectivity is achieved through a Q Multiplier which operates at 62.5 kc. IF frequencies operate at 2195 kc and 62.5 kc.

Other features include an improved AVC circuit and an S Meter calibrated in 6 db steps. It has an internal 100 kc crystal (hermetically sealed) calibrator. Also, selectable sideband at the flip of a switch. Weight: approximately 28 lbs. Net Price: **$349.00**

(Price subject to change without notice)

hrc **HARVEY** Estab. 1927 **RADIO CO., INC.**

103 West 43rd Street, New York 36, N.Y. JU 2-1500

HARVEY is known the world over, as a reliable source for Ham Equipment. All orders shipped same day received. If you want to talk SWAPS and DEALS write or call **W2DIO.**

For further information, check number 35, on page 190.

A publicity committee is another very usetul idea. The local papers, radio stations, national radio magazines are all interested in what your group is doing. Let them know. You will gain the good will of the community and the addition of other interested amateurs to the net. Indicate your services other than actual emergency services and be sure to mention whom to contact. Soon you will find yourself busy every week in the year. And this is an excellent way to keep a healthy happy emergency net. ■

New Amateur Equipment

The Delta Products Ham Operating Desk

Delta Products Company has a new operating desk. Supplied in kit form, the desk may be simply assembled and finished with varnish, paint, stain or just about any furniture finish. The Delta desk measures 48" in width, about 42" high and 30" deep, 15½ inches of which is a large flat surface which is ideal for writing with elbow room to spare. The back 14½ inches of depth is fashioned into a tilt-back equipment shelf for adequate dial access and simplified meter reading. A height of 12¼ inches from the equipment shelf to the top shelf of the desk gives ample room for most commercial gear about the size of a typical communications receiver.

Other features worthy of mention are a slide out typewriter shelf and a large amount of foot room. This unit will assemble easily in a matter of minutes. The only tool required is a screwdriver. It comes complete with step by step assembly instructions and all hardware, and weighs 90 lbs. (Shpg. Wt.).

The Delta operating desk kit is available at an inexpensive $39.95, F.O.B. from Delta Products Company. For more data, mangle E on page 190.

TUNNEL DIODE *[from page 99]*

Figures 5 and 6 represent the conduction and valence bands in the vicinity of a junction at different values of applied bias. One can see that as the bias is increased the bands which overlap each other at zero bias become uncrossed. Since tunneling is represented by a horizontal transition on this picture, the current decreases as the bands become uncrossed.

To follow is a table of comparisons in which tunnel diodes are compared with more familiar devices as to characteristics.

Maximum Oscillation Frequency
(In Kilomegacycles)

Tunnel Diode—2 kmc (10+kmc in a few years; 100+kmc is conceivable)
Transistor—2kmc
Parametric Amplifier—6 kmc
Vaccuum Triode—10 kmc
Maser—10 kmc
Close Space Triode—10 kmc
Traveling Wave Tube—60 kmc
Klystron—75 kmc
Magnetron—100 kmc

Minimum Power Requirements

Tunnel Diode—one-millionth of a watt
Transistor—one-thousandth of a watt
Vacuum Triode—one-tenth of a watt
Klystron—10 watts
Traveling Wave Tube—10 watts
Parametric Amplifier—10 watts
Magnetron—20 watts
Maser—400 watts

Low Noise Amplification

Noise Temperatures (at a frequency of 1000 megacycles)

Noise Temperature (proportional to noise level)

Maser*—20°K
Parametric Amplifier*—35°K at room temperature; 20° Kwhen cooled with liquid nitrogen
Tunnel Diode*—100°K to 300°K
Traveling Wave Tube—300°K
Klystron—300°K
Vacuum Triode—900°K
Transistor—3000°K

***Note:** In the area of low noise amplification, only parametric amplifiers and masers compete closely with tunnel diodes. The tunnel diode is the only one of these three devices capable of operating directly from a battery. The parametric amplifier and the maser require an additional source of radio frequency power, and the maser requires an additional cryostat for cooling, and a magnet for bias.

Summary

All in all, it appears that as the state of the art advances, tunnel diodes will begin to find great application to various phases of the electronics industry. CQ will try to keep you up to date on new developments in this field, and it is very likely, that before too long, we'll see applications of this new device to amateur communications equipment.

We wish to thank General Electric for their cooperation. ■

SEMI-COND *[from page 104]*

The new RCA mesa transistors, 2N1300 and 1301 are intended for high-speed data processing equipment and have gain band width products of 40 and 60 *mc* respectively. Several RCA transistors have passed the rigid military specs and have been assigned JAN numbers. Among them are the JAN-2N 220, and USA-2N274.

A new series of drift transistors are available in JEDEC TO-33 outline through RCA's efforts to bring about standardization. The 2N1224 is the same as the 2N274, the 2N1225 is the same as the 2N384, and the 2N1226 is similar to the 2N274 except for package and 60-volt collector rating.

If you haven't seen RCA's booklet "RCA Semiconductor Products," shell out 30 cents to the local RCA distributor. It's terrific! This book, and information on other RCA products can be obtained from the Semiconductor Division, Somerville, N. J.

Speaking of booklets, Sylvania has two new ones at the distributors. "Entertainment Transistors for Every Design Approach," a booklet on diodes can be obtained by writing to Sylvania Electric, 1100 Main St., Buffalo 9, N. Y.

Texas Instruments, Box 312, Dallas Texas, has a new *pnpn*-controlled rectifier series. The four-layer device, requiring a 5 *ma* firing current, is available with piv's between 50 and 400 volts.

The big news from TI is their new all-glass header manufacturing process. This advancement means that the transistors can be made less expensive. Ten new entertainment types will be available in the $0.50 to $1.25 range shortly. These types include the 2N1273, 1274, 1370, 1371, 1382, 1383, and new PNP MESA types TI360 and TI361. Information is available.

The August 1959 TI Application Notes features a slick transistorized hi-fi preamplifier.

If you want to keep posted on latest developments in Texas Instrument's line, get on the mailing list of Radio Products Sales, Inc., 1501 S. Hill St., Los Angeles 15, Calif.

Does anyone have substitution information on the Japanese Toshiba transistors, types 2S52, 2S45, 2S44, 2S56, and transistor 8601?

73, de, Don-W6TNS

MINIBEAM *[from page 67]*

average Swr over the whole band is maintained at a much more satisfactory level.

This desirable condition is achieved by making the impedance of the beam at band center *lower* than the feeder impedance. For optimum *swr* bandwidth the impedance of a beam should *not* be equal to the feeder impedance but should be some thirty to forty per cent lower. For example with 52 ohm feeder cable the optimum beam impedance at resonance would be approximately 30-35 ohms.[1]

Turning now to the structure of a complete beam fig. 7 shows a simple arrangement based upon the design given in 'CQ' Magazine, July 1958.

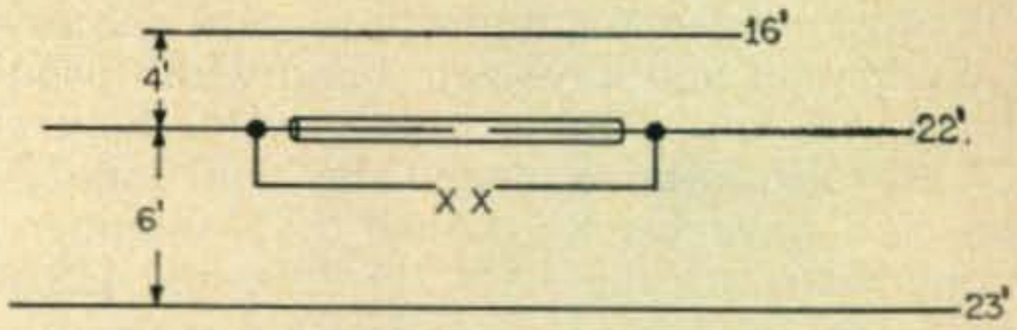


Fig. 7—Simple beam described in CQ 1958 modified to accept the coaxial arrangement.

A slightly more complex design using a hairpin loop and stub on the director is shown in fig. 8.

The hairpin loop approach eliminates the cost and weight of the twin boom used in the original design. The dimensions shown are for 10

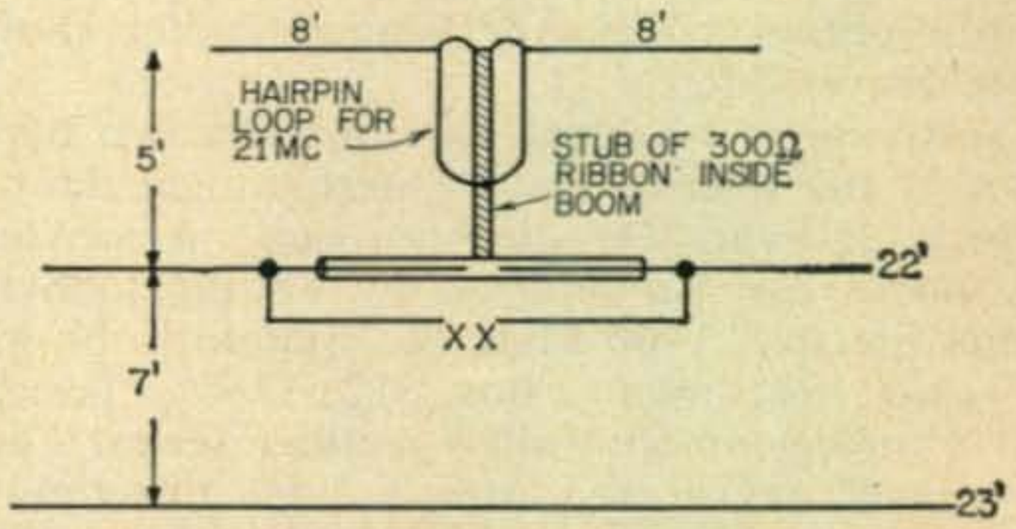
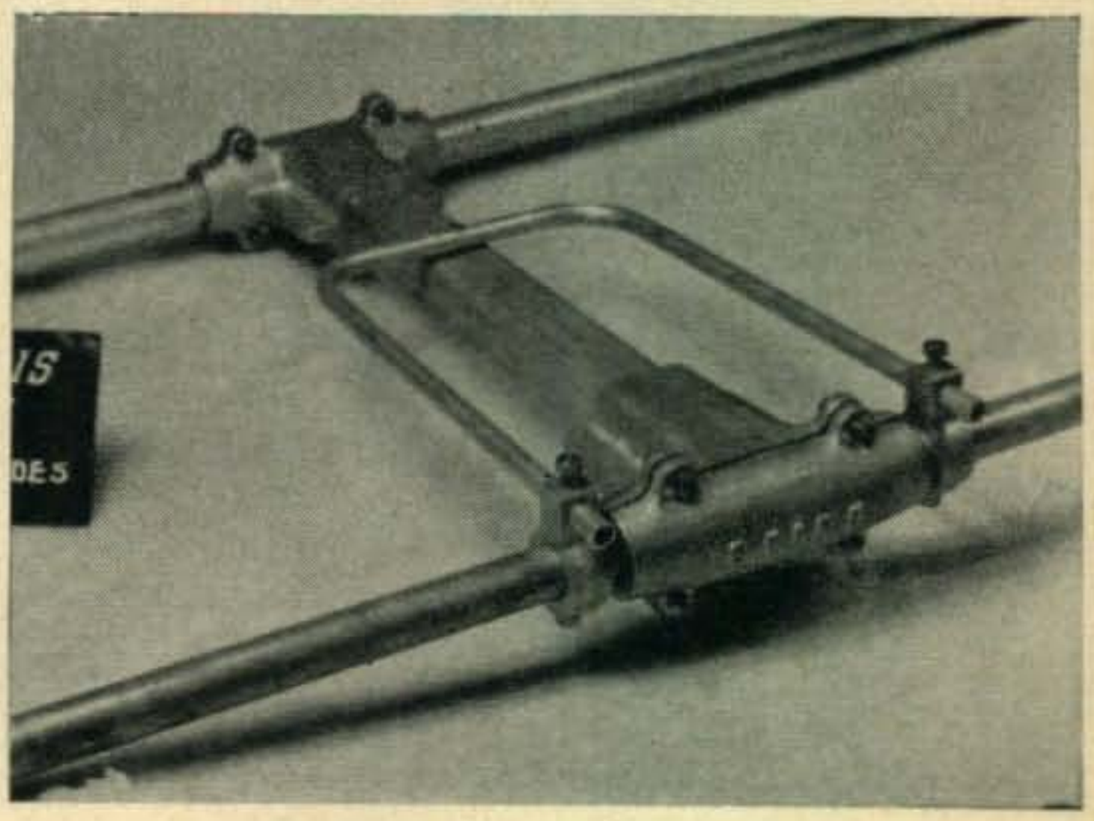


Fig. 8—Beam using a hairpin loop and a stub along with the coax device.



1. Bandwidth of 2 and 3 El. Yagis, QST

For further information, check number 40, on page 190.

and 15 meters but it is of course, quite a simple matter to re-scale the beam for 15 and 20 meters where available space permits a somewhat larger structure.

Users of the 10/15 design often report that it loads up and seems to work quite well on 20 meters also. The *swr* under such conditions will naturally be somewhat higher and it would be best to restrict such use to transmitters running not more than 300 watts. On 10 and 15 the beam is quite happy at power levels of several kilowatts and a number designed for commercial frequencies are in fact working on circuits using transmitters of 5 *kw* or more.

Technical Appendix

The capacity required in the coaxial section of the resonator lies between 25 and 35 mmf according to the spacing of the matching rods (normally 3 *cm*).

To calculate the capacity of a co-axial condenser the following formula may be used:

$$C = \frac{K \times 7.35}{\log_{10} D/d}$$

K for most grades of polytheme = 2.5. It will be clear that by keeping the inner and outer metal tubes in fixed relative positions and moving the polythene sleeves outwards the effective K can be made to approach the figure for air i.e. 1

This provides for a variation in effective capacity of at least 2 to 1 which is ample to take up all normal tolerances which may be encountered in practice.

Shorting stub for two band director-Use 300 ohm ribbon and resonate at 29.7 *mc* (Normal length approximately 1.9M).

Total length of tubing in hairpin loop approximately 75 cms. (resonate with stub and element connected at 21.5 mc.)

Approximate length of feeder rods 90 cms. ■

LEGAL NOTES *[from page 105]*

law with reference to the field of regulation of radio transmissions might conceivably have been different from what it has developed. For those who may be interested in actually reading the Court's decision on this case, the name of the case is *U.S.A. vs. Gregg,* and the case is cited as 5 *Fed. Supp. 848.*

This case is particularly important insofar as Amateur Radio is concerned because it was one of the first cases which declared the exclusive regulatory powers of the Federal Radio Commission, now called the "Federal Communications Commission," to regulate all phases of radio communication. There has been a tug of war of considerable magnitude between the state (and also local) governments and the Federal Government over regulatory

powers. Numerous states have, from time to time, by the enactment of state laws attempted to get a foothold in the field of radio. The Court decisions holding that radio is basically under the control of the Federal Government, and not the state governments, has given strength and life to our hobby since the amateur has historically fared better under Federal regulation than under the regulations of the states.

As will be pointed out in other articles, from time to time, the struggle for power between the individual states and the Federal Government over regulation of radio did not end with the *Gregg case*. It has, in some respects, continued right down to the present date. But, the *Gregg case* did go a long way in setting up a beacon guide in the development of Amateur Radio. ■

DX *[from page 110]*

sponsored by the Aruba Amateur Radio Club is available to all radio amateurs throughout the world. The award is issued to those amateurs who have worked and confirmed contacts with the following:

(a) Ten (10) different amateur radio stations on the island of Aruba.
(b) Five (5) different amateur radio stations on the island of Curacao.
(c) One (1) amateur radio station on the island of Bonaire.
(d) One (1) amateur radio station on one of the Windward Islands which consist of Saba, St. Martin and St. Eustastius.

In addition to the above requirements, the following rules shall govern the qualification for and awarding of this Certificate.

1. The award will be made for phone, CW or single side-band contacts or for any combination of these. These contacts may be made on any band.

2. The award will be granted either to fixed, mobile, maritime mobile or portable stations, or to any combination of these.

3. Only one contact with any one Netherlands Antilles station in the same call area will be recognized for this award; i.e., if PJ2A is worked four times, on both phone and CW, at his fixed QTH and again as a portable station, only one of these contacts will count for the WANA award. However, if PJ2A goes on a DXpedition to Bonaire, Neth. Ant., and is assigned the call PJ2A/B then *one* contact with PJ2A/B will also count for the WANA award. (Assignment of a call such as PJ2A/B normally will not occur, but, instead a PJ2B call would be assigned.)

4. The award will be made for contacts over any period of years from January 1, 1959.

5. All contacts must be made with amateur stations working in authorized amateur bands.

6. Contacts made during contests will qual-

ify for this award.

7. In case of any questions regarding the validity of any contact, the confirmation of the contacts may be requested by the Committee. Such confirmations must be accompanied by three international reply coupons.

8. The decision of the Awards Committee of the Aruba Amateur Radio Club regarding the interpretation of the rules and regulations and granting of the awards shall be final.

9. Application for the award must be accompanied only by a list of the stations worked. This list shall include the station worked, date, time and signal reports both sent and received.

10. Address the application and the list of contacts to the Awards Chairman, Aruba Amateur Radio Club, P. O. Box 43, Seroe Colorado, Aruba, Netherlands Antilles.

Revised: July 9, 1959

Aruba Amateur Radio Club

VA-JF

Jamestown Festival Award

Due to the difficulty DX stations have had in obtaining QSL's from Virginia Stations, the Richmond Amateur Radio Club announces that effective August 1st, the rules for VA-JF have been modified.

Fifteen QSL's, together with a list of 10 WSO's, making a total of 25 Virginia QSO's during 1957 will now be accepted from all stations other than W/VE stations. W/VE stations must continue to submit 25 QSL's as originally announced.

VA-JF, is the award known as the Jamestown Festival Award which is offered by the Richmond (Virginia) Amateur Radio Club, P. O. Box 1985, Richmond 16, Virginia, for submitting proof of having had 25 QSO's with different Virginia stations *during the Jamestown Festival Year of 1957.*

The Award will be continued as long as QSL's and lists are received.

As of August 1959, 690 awards have been issued to 38 states, D.C., four Provinces of Canada and 15 foreign countries.

The Central Club of Hungarian Radioamateurs establishes and issues the diplom of W. H. D., "Worked Hungarian Districts" for all the licensed amateurs.

To obtain the diploma the connections being established after the 1st of January 1958 will be considered effective.

To obtain the diploma one has to certify:

1. For licensed DX stations at least 1—1 effective connection being established with 5 different HA call districts.

2. European stations at least 2—2 effective connections being established with 8 different HA call districts.

3. Connections at any length of licensed bands of CW and at phone sets shall be con-

sidered effective for obtaining the diploma.

4. The fulfilment of the diploma requirements shall have to be certified by sending in a note which shall contain the following data: date and time, call, band received RST or RS.

5. According to the aforesaid, the established connections have not to be certified by HA QSL cards.

6. One has to attach to the note the QSL cards meant for the Hungarian stations as listed in the note and 5 IRC.

7. Applications for obtaining the diploma have to be sent to: Central Club of the Hungarian Radioamateurs, POB 185, Budapest 4.

QTH's

Thanks to W8KBT, K6TAY, K5DCO, W5CPW, W6KG, Ether Waves, N. California DX Club, S. California DX Club, Radio Society of East Africa, and the DX'er for the following:

BV1USC Navy 3840 FPO San Francisco, California
EL2AD via K6UYC
FP8BG via VE2ABE
HC2IU Box 5200 Guayaquil, Ecuador
HH2AE P. O. Box 1183 Port-Au-Prince, Haiti
HP1AC P. O. Box 354 Panama City, Panama
I5KN Box 16 Mogadiscio, Italian Somaliland
KC6JA Joe, Koror Island, West Carolines, U. S. Trust Territory
PX1CH via W6AWT
VQ6LQ via K6KII
VQ9AIW via DX-QSL Co-op Box 5938 Westport Station, Kansas City, Mo.
VQ9ERR via W4IYC
VS1GL via W6BAF
ex VS5JL 33 Graham Ave., TeAtatu Auckland, New Zealand
VU2CE A. R. Venkatesan Police Radio Officer, Madras 4, India
ZC3AC now VK9MV via VK9 Bureau
ZC4BE via W8DPF/4 Box 13154 Tampa, Fla.
ZE8JN via K5DCO
3A2AE via RSGB
8J1AA via JARL

The RSEA informs the following are the official VQ3, VQ4, and VQ5 QSL Bureau's

VQ4 Box 30077 Nairobi, Kenya
VQ3 Box 2387 Dar es Salaam, Tanganyika
VQ5 Box 1803 Kampala, Uganda

Jack W2CTN, the one man QSL service is now handling cards for the following: ZD2-DCP, OX3RH, VQ3CF, VK2FR, JZØHA, VK9BW, VR2DA, VR2DK, VK9NT, FK8AT, KW6CH, 9GIBQ, CR4AV, VQ4AQ, TI2WD, VK9GK, FK8AW, FK8AI, FM7WP, ZS7M, OQ5IG, VQ2EW, VQ3HH, ZB2I, VP2PJ, VK2AYY/LH, JZØDA, KW6CP, CR4AH, CR4AX.

Don't forget SASE for QSL managers.

K8BLK offers his service as a QSL manager to any DX station that would like assistance. Ned may be reached at 1791 Ferris Rd. Columbus 24, Ohio.

That's about it, CU next month.

73 es DX
Urb W2DEC

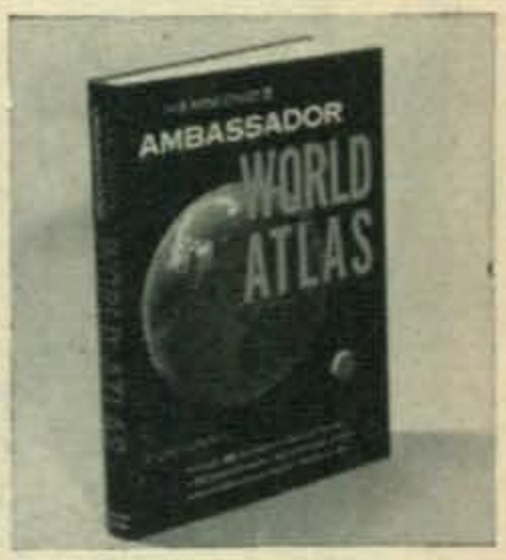
THE HAM SHOP

19" GLOBE

Here is a chance to preserve your breath for posterity! This beautiful World Globe, made by Hammond, is a must for every hamshack. Plain for $19.95 or lighted for $24.95. The first 10,000 people who jump at this bargain will get a year of CQ at no extra charge.

ATLAS

What! You don't know where Nicobar Island is? Incredible! And with the CQ deal on the Hammond Atlas so reasonable too. This is a reference book that will get good usage around your house if you have any kids. 7 lbs. of colored maps and a gazetteer for only $12.50... and you get a year of CQ.



COMMAND SETS

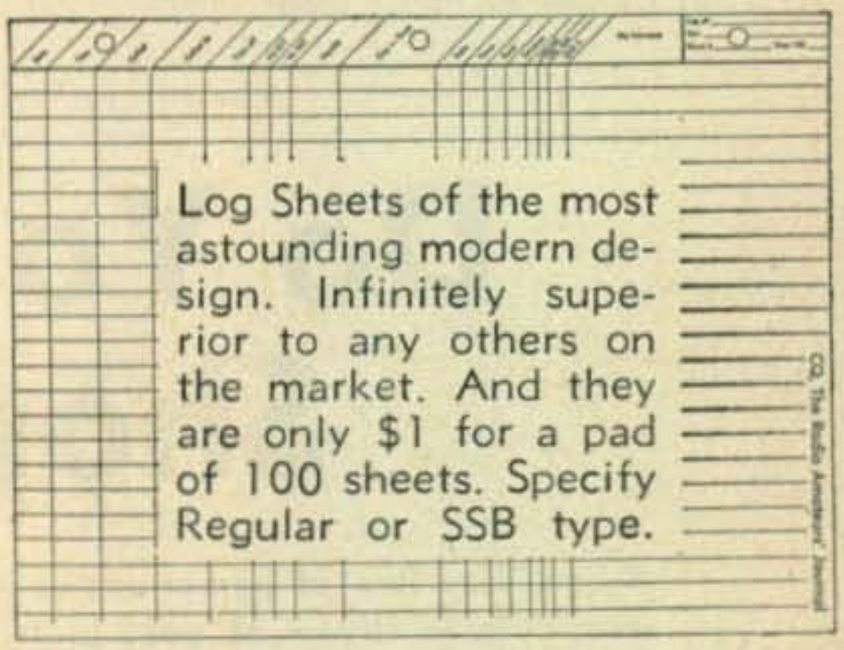
This IS a collection of reprints, containing all of the available information on the conversion of the popular "Command" transmitters and receivers into good ham transmitters and receivers. Invaluable for Novice, Technician, General, Advanced and Extra class operators. 136 fabulous, amazing terrific pages for only $1.50 postpaid.

MOBILE HANDBOOK

Anyone who tries to go mobile without getting this book should register for a sanity hearing. Bill Orr, W6SAI has put everything you need to know in this book ...it is NOT a collection of reprints like some other mobile handbooks we could mention. Build-its by the dozen... solutions to ignition problems, keeping the battery charged, noise... only $2.95 postpaid.

CODE RECORD

Learning code is a snap with this record. Speeds from 3 to 16 WPM, depending upon turntable speed. This 12" LP record has on it all you need to learn the code for both the Novice and General License. $3.50 each.



HAM'S INTERPRETER

Now you can talk in broken French, Spanish, Italian, German, Swedish and Finnish. This handy little book gives all the popular ham conversation in seven languages, including letters and numbers. Only $1.50 postpaid.

TVI HANDBOOK

WIDBM's newly written TVI book (nn reprints) covers all aspects of curing TVI from both the Ham's viewpoint and that of the TV viewer or the TV serviceman. It includes 2- and 6-meter TVI as well as Industrial, Medical and Utility TVI. Profusely illustrated with diagrams, photos, charts, tables and FCC regulations pertaining to radio and television interference. Price $1.75 postpaid, USA, $2.00 Foreign.

BINDER

There is no other good way to keep your back issues. Make 'em neat. We supply the binder, with the year embossed in gold, not merely a sticker which will come off later. Specify what year you want stamped on your binder. $3.50 each.

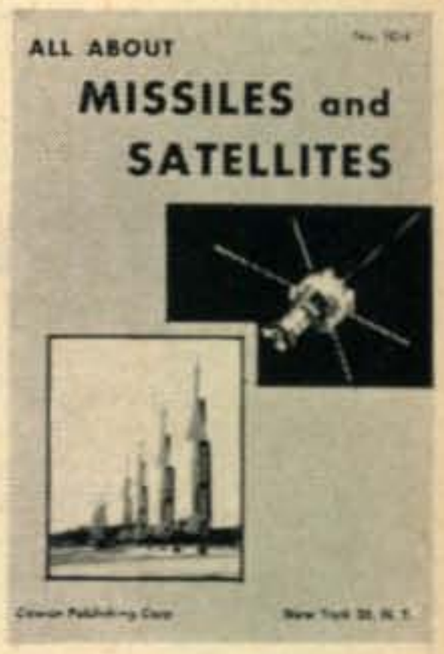
BOUND VOLUME

By far the handiest way to keep your library. Why not go first-class? This impressive volume is only $10.00. We only made a few of them this year, so don't expect to get one later.

CQ ANTHOLOGY

Most amateurs do not have a good file of back issues of CQ. So we've looked back through the years 1945-52 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out. The price is a paltry $2.00.

ALL ABOUT MISSILES & SATELLITES



Here's a book, written in down-to-earth language, which answers questions on missile maintenance, fire control, flight control tracking, testing, fuels, payload and many other achievements in rocketry and space for both scientific and military applications. Also, featuring the most up-to-date "Directory of 38 Most Popular Missiles and Their Photos," (supplied by Department of Defense) as well as a "Glossary of Missile Terms." $1.50 per copy.

TV SCHEMATIC PACKET

96 pages of 45 representative TV schematics, covering the most prominent TV manufacturers. Factory authorized, crystal clear and accurate. $3.00

HI-FI BOOK

This nifty volume contains the latest dope on amplifiers, preamplifiers and equalizers plus a buyer's quide of component manufacturers! Over 150 — 5½" x 8½" pages of heavily illustrated descriptions covering Hi Fi Audio Components—the greatest publication value in its field today. Only $2.50 per copy.

SIDEBAND HANDBOOK

Written by Don Stoner, W6TNS, was almost one full year in the preparation of this terrific volume. This is not a *technical* book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers. Price, only $3.00.

CQ 11

COWAN PUBLISHING CORP.
Book Division
300 West 43rd Street
New York 36, N. Y.

LIGHTED GLOBE	$24.95	☐
UNLIGHTED GLOBE	19.95	☐
ATLAS	12.50	☐
COMMAND SETS	1.50	☐
MOBILE HANDBOOK	2.95	☐
CODE RECORD	3.50	☐
REGULAR LOG SHEETS (100)	1.00	☐
SSB LOG SHEETS (100)	1.00	☐
HAM'S INTERPRETER	1.50	☐
TVI HANDBOOK	1.75	☐
BINDER—YEAR WANTED	3.50	☐
BOUND VOLUME	10.00	☐
CQ ANTHOLOGY	2.00	☐
MISSILES & SATELLITES	1.50	☐
TV SCHEMATICS	3.00	☐
HI-FI BOOK	2.50	☐
SIDEBAND HANDBOOK	3.00	☐

SIRS: My check (money order) for $_____ is enclosed. Please send the following items to:

Name_____

Address_____

City_____ Zone_____ State_____

New York City Residents Add 3% Sales Tax

VHF *[from page 115]*

in this part of the country for reasons of distance."

"I have a four element home made beam about ten feet above the garage roof. I used to use the sixteen element collinear that most everyone used for two meters, but then got a wild notion this spring and put up a Gonset Big-bertha for two meters, so then I had to put up a separate six meter beam. Actually though, the two meter collinear will out-perform the yagi on openings, but is not so good for ground wave." *Many, many thanks Dick for a very interesting letter; and to Jack for permitting us to have the use of it. SEVEN BULLET HOLES!!!! What courage that man has.*

73, Sam, W1FZJ

HAM CLINIC *[from page 121]*

I like the NC 300 very much and it is worth the money (they're selling for less now than they originally were), but I like the NC 303. With its separate noise limiters, detectors (for SSB etc.), I guess this is the reason I added one to my collection. Suggest you plunk down the money you now have for an NC 300 and buy the NC 303 on time—it is worth the difference.

Tech Twist

If one of the tubes in your transmitter seems to heat up a little too much, *Bircher* makes a fine heat sink shield for nearly any tube—and IF you can get them they are *the* thing to use. But lacking one of these I tried using a small glass jar (the kind you get coffee, cheese, olives etc. in) over the hot tube—it worked. As a temporary measure it is okeh, but I'd still like to know *where* I can obtain some *Bircher* heat shields for some miniature tubes—especially a 5776!

Thirty

I hope that the readers of HAM CLINIC will remember that Xmas comes next month. I'd sure like to spend some of my time enjoying the season, and I'd like to request that you put off any questions until after the first of the New Year. If you'll do this I'll appreciate it. However, if you are *pressed* for info, write AIRMAIL anyway, and I'll do my best to answer you as quickly as I can.

Helping you, the active radio amateur, is another "hobby" with me—a very serious one, and I sincerely get a lot of satisfaction doing all I can toward that end.

A very happy and joyful Thanksgiving to all of you, wherever you may be.

72, 73 & 75 Chuck F7FE—W6QLV

CONTEST CAL. [*from page 123*]

Ed. Note

The delay on the mailing of some of the certificates has been corrected and all awards have been mailed at this writing. So if you have not received yours it has been delayed in route or lost in transit. Drop me card and I will check it for you.

73, Frank, W1WY

NOVICE [*from page 126*]

we're starting something again.

Speaking of starting something, remember my wondering who was the first Novice to work KC4, Antarctica? The latest letter on the subject comes from Ed C. Lips, W3BWU, 3302 Hazelhurst Ave., Pittsburgh, Pa. He says "On Dec. 12, 1955, I worked and have confirmed VP8AQ, then located at Admiralty Bay. He was 579 and I 559, rig was 50 watts to 6146, homebrew three element beam." Was WN3BWU the first?

Jerry Flesher, KØTNC, 1844 Randolph, Topeka, Kansas, is 14 and passed his General July 30. He operates with a homebrew 40 watt rig and an old Silvertone receiver with Heath QF-1 attached and fed to a 40 meter dipole. Jerry is open for skeds.

Guess "dis must be da place" like the man says for I have run out of letters for another month. Keep them coming, and we'll hook up for our sked next month on the pages of CQ.

73, De, Don, W6TNS

C/R [*from page 129*]

ing on a car roof gutter, and is identical, except for the coaxial termination, to the type sold by Heath for use with their CB-1 transceiver. The ASP-63 is terminated in a coaxial fitting and is identical with the unit provided with the International Crystal Company transceiver. The antenna mates directly with a female coaxial receptacle. This company apparently supplies the antennas used by both manufacturers. The ASP-189 is designed for car cowl mounting and, like the ASP-185, comes with a generous supply of RG-58/U cable terminated in a coaxial plug. The loading coils are very well protected with a heavy lacquer coating and should withstand plenty of abuse. Where portability rather than maximum range is desired these antennas should be justly popular.

Next month, in addition to finally getting to say something about C/R regulations and operation, we plan to review another type of antenna, a coaxial, as well as the Globe transceiver.

73, Lee, W2QEX/2W2870

A NEW ONE ON SSB

[from page 65]

miles around and had a few scattered trees. The scenery was almost breathtaking. In a very short time we had the equipment unpacked, generator going, a long wire up for the Ranger, a 20-meter doublet for the 20A, and the houseboy cooking supper.

It was about this time that we began to feel the curse of all DX-peditions and field days since the beginning of time. It is the curse of ATSBABA. For the un-initiated ATSBABA stands for "Articles That Should Be Along But Ain't." ATSBABA has managed to go on every DX-pedition and has many times successfully kept expeditions off the air.

High on our ATSBABA list were electric light bulbs and kerosene. We had a kerosene lantern but ATSBABA managed to get the kerosene. That night we managed to keep the log by the light of the receiver pilot bulbs. The heat in the daytime was very high and the flies were almost unbearable. ATSBABA managed to get the fly spray. Unlike his relatively timid cousin in the United States, the Ethiopian fly is very brave and very persistent. So persistent, in fact, that most of the natives long ago have given up swatting him, but are content to let him crawl around on their faces. ATSBABA also managed to get our hose used for siphoning gasoline out of the drums.

The first contacts were made on 20 cw with the 20A. The first station worked was SVØWR. The first SSB station was ZS5DW. The first U.S. sideband station was W2GBX followed by W1GR.

Trans-Atlantic conditions were poor this weekend with WWV reporting U-4 on their propagation reports. Stateside contacts on SSB were relatively few the first night while the Ranger managed to work just about every amateur in Belgian Congo, South Africa, and Israel.

While we sweated during the day, we nearly froze at night. When the Ethiopian sun goes down, it really gets cold. Two of the operators managed to alternate QSO's with the "off-duty" operator getting to stand by the camp fire.

The second day we had a visit by the heads of the local village of Adi Aboun. Through our houseboy interpreter and my few words of broken Arabic, we managed to explain that this was a military radio exercise. They asked us if we wanted police guards. Having heard stories of some policemen being part-time "shifties" we declined their offer. Throughout the night we kept constant watch and each operating position had a loaded weapon nearby. One operator even slept with a .357 magnum strapped to his side.

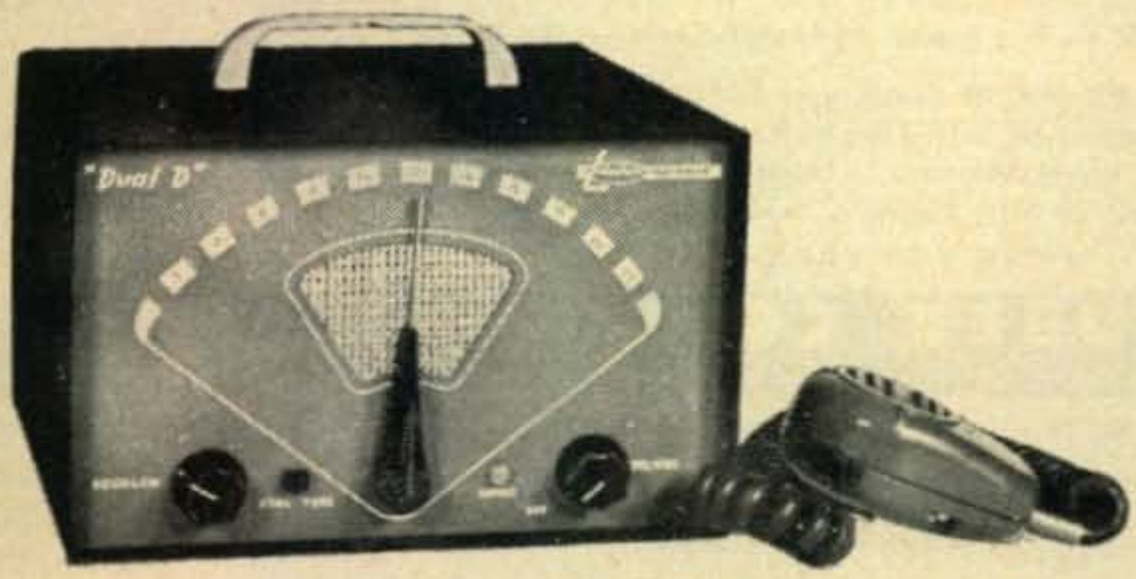
To increase the signal strength of the 20A,

[Continued on page 176]

The "DUAL D" by LAKESHORE

* Receive on Fixed Frequency Crystal Controlled Receiving Channel

or



CLASS "D" CITIZENS BAND
TWO-WAY RADIO

- Receive on any of 23 Channels with variable Frequency receiver.
- Transmit on either of 2 preselected Channels. Covers all Channels with proper Crystals.
- Push to talk operation with Control button on Microphone
- Squelch Control Mutes receiver for Stand-by operation
- Automatic noise Limiter
- Power input 5 watts AM Modulated
- 11 tubes for top Performance
- Meets all F. C. C. Requirements
- No license Exam required — Any Citizen 18 years or older may obtain license by submitting Form 505 to F. C. C.
- May be used for Personal or Business purposes.

FOR PRICE AND MORE DETAILS WRITE TO
LAKESHORE INDUSTRIES

Lakeshore INDUSTRIES
MANITOWOC, WISCONSIN
MANUFACTURERS OF PRECISION ELECTRONIC EQUIPMENT

For further information, check number 59, on page 190.

60 WATTS ON 6 METERS

THE NEIL *BETA 6* SIX METER PHONE TRANSMITTER

- Two Tuning Meters Eliminate Bothersome Meter Switching
- Exceptionally Clean Modulation
- Ideal for Mobile or Fixed Station - only 3 inches high
  B+ requires 600v @ 100ma; 350v @ 200ma (approx.)

20 WATTS ON 6 METERS

THE NEIL *ALPHA 6* SIX METER PHONE TRANSMITTER

ALL ABOVE FEATURES PLUS BUILT-IN 3-POSITION CRYSTAL SWITCH

B+ requires 300v @ 200ma (approx.). Specify 6 or 12v filament.

BUILT-IN TRANSISTOR POWER SUPPLY

THE NEIL *MOBILEER* SIX METER PHONE TRANSMITTER

***STRICTLY FOR MOBILE 12v OPERATION* • No External B+ Supply Needed**

All features of the Alpha 6, 20 watt transmitter, but requires 12v DC *only*.

Beta 6, wired, complete with tubes and crystal	$125.00	Alpha 6, kit, complete with tubes, crystal, construction book	$58.50	Neil Mobileer	$159.00
Beta 6, kit, complete with tubes, crystal and construction book	$98.00	Fixed power supply, Alpha 6	$39.50	Neil Mobileer, kit	$134.00
Alpha 6, wired, complete with tubes and crystal	$78.50	As above, kit	$32.00		
		Fixed power supply, Beta 6	$79.00		
		As above, kit	$68.00		

All transmitters available for 6 or 10 meters and 6 or 12v filament.
• Please Specify •

See Your Dealer or Order From: **THE NEIL CO. • 1336 Calkins Road • ROCHESTER 23, NEW YORK**

For further information, check number 60, on page 190.

ANNOUNCE. *[from page 18]*

Malvern, Arkansas

A new Amateur Radio Club, the Dixie VHF Club for amateur radio operators, has been organized at Malvern, Arkansas. Officers were elected as follows: Isaac H. Roland of Malvern, president; Jake P. Lowman of Cabot, vice-president; and Miss Betty R. Anderson of Pine Bluff, secretary-treasurer.

With members coming from many Arkansas cities and towns, a committee was chosen to write the new club's by-laws. Members are: Herman Heard of Arkadelphia, Elbert H. Anderson of Pine Bluff, George N. Jewett of Little Rock, and Jake P. Lowman of Cabot.

Mr. Lowman has announced that members of this club will have four meetings every year. The next meeting will be at Malvern, Jan. 20. Membership in the newly organized club includes operators from Arkadelphia, Benton, Cabot, Fouke, Hope, Little Rock, Nashville and North Little Rock.

[from page 172]

the second day we put up a vee-beam pointed to the States. Since we had no spreaders for the transmission line (ATSBABA again) we used short sticks. The first SSB station worked on the Vee was VK6RU and the first U.S. station was W4TO. By this time the contest had been going for some time and ET2US/ ET3 was passing out zone 37 to hams all over the globe.

Even with the "Vee," contacts on SSB were difficult to make. Our signal strength was low and many of the fellows had to really hunt for us. Since we were operating from the DX portion of the band, many of the stateside fellows could only hear those stations that were working us and had no idea where to listen for us. I think more fellows would have been able to work ET3 if more of the state-side stations talking to us had announced what frequency they were listening on. Regardless of how "rare" a station is, he still has to have enough signal output for the fellows to hear him.

The contacts the second night went fairly well. They seemed to run in "spurts" of five or six contacts in ten minutes then twenty or thirty minutes without a contact. We were worried for a while that Cliff, W8GCN would not be worked, especially since he helped instigate the trip, but he came through fine during the wee hours of the second night of operation.

Due to the presence of bandit tribes it was necessary to maintain 24-hour vigil. Here W40WW takes his turn at the guard post.

One of our "non-ham" members, Chuck, was quite glad to leave ET3 on the scheduled

day. It seems that the natives were more impressed with his red hair than they were with the expedition. They wanted him to cut it off and give it to them. Chuck apparently had visions of his scalp swinging from one of their belts.

During the morning of the third day, as we were getting ready to leave, we had a visit by the heads of what would be called the state government in the U.S.A. They came from Mekele, the capital of Tigre. We repeated our story about "military radio exercise" and they seemed satisfied. Their guard seemed impressed with our weapons and we gave him a few rounds of our 30-06 ammunition for his rifle. This made everybody happy and they soon left us.

Since the Army provided the vehicles and gasoline, we had practically no expenses except food. The total expense for food, wages for the houseboy, ammunition, and a few miscellaneous items came to less than thirty dollars, so this was definitely *not* a "buck-a-QSL" expedition. Special QSL cards are being printed and already there is talk of a second expedition for the fellows that did not manage to work us this time.

Does anybody know where we can get a row boat capable of hauling a rig across the Red Sea? We're quite sure that ATSBABA is ready. ■

DC RELAYS *[from page 59]*

If your car has the negative side of the battery connected to the chassis, connect the anode lead of the rectifier to the voltage source and the cathode lead is connected to the relay coil. The positive side of the electrolytic capacitor is connected to the cathode lead of the rectifier and the negative lead of the capacitor goes to the chassis. If your car has the positive side of the battery connected to the chassis, then the opposite is true. The cathode lead of the rectifier is connected to the voltage source and the anode is connected to the coil. The negative side of the electrolytic capacitor is connected to the anode of the rectifier and the positive side goes to the chassis.

With the rectifier and the capacitor connected in this manner, operation on *ac* is automatically correct.

The placement of these components—the capacitor and the rectifier—is not at all critical. Anywhere at all is acceptable. This is strictly a *dc* control circuit and lead length has no effect. It is usually possible to find space where these components can be mounted, even on the outside of the transmitter case. Common practice would dictate that the rectifier be placed away from any component, such as bleeder resistors, that produce a great deal of heat.

The higher the capacitance used for the filter capacitor, C1, the higher the *dc* voltage avail-

able under load. With 500 mf the *dc* voltage obtained under the load of a Potter Brumfield type KT 11D relay—120 *ma*—is approximately 14 volts. This is slightly higher than the voltage obtained with battery operation. It will not harm the relay coil and serves to insure positive action of the relay.

The incorporation of this modification in your mobile gear will greatly increase the versatility of the equipment and simplify its utilization for fixed station operation. ■

IN THE BEGINNING *[from page 55]*

gets. The top appears so peaceful and safe. Soon you just can't believe danger lurks beneath its surface. You're going for a swim.

Usually someone talks some sense into you before you get over the side. Sometimes they convince you with a fishing line. Generally, this provides a meaningful example because within minutes they have a pilot fish wriggling on the line. Pilot fish are about nine inches long with a suction arrangement on the back of their heads. With this they attach themselves to sharks and hitch-hike to food.

Everyone doesn't agree that where there are pilot fish there are sharks. The cabin boy was one of these. While a number of the crew stared at the tantalizing water longing for a swim, his body flashed past them in a graceful dive. He struck the water with scarcely a splash. With legs still together and toes pointed, his body disappeared beneath the surface.

His daring stunned the small group of witnesses. Then tensely they poised watching for his reappearance. Five seconds; ten seconds; a minute. Nothing. Slowly a patch of red appeared on the water. Blood!

Five minutes later davits swung outward and manned lifeboats dropped into the water. They circled and circled watching for his body. But nothing ever appeared. After an hour of fruitless searching, they accepted the inevitable and hauled the boats back on deck. Next day the depressed crew pulled up anchor and slowly proceeded up the river to their dock.

[to be continued]

CHATHAM *[from page 47]*

1842 were they proclaimed part of New Zealand. The last full-blooded Moriori *Tommy Solomon* died in March 1934, at the age of 50. He weighed a mere 34 stone! The present population now stands at about 480, composed of 27 Nationalities. Most of these are engaged in either fishing or farming and appear to be quite prosperous.

The return trip was quite rough; for two days we ran into heavy seas and were confined below decks. I was quite happy to step ashore at Wellington and get my land-legs once again.

That night, I travelled South to Christchurch on the Inter-Island Steamer *"Hinemoa"* and reached home at eight in the morning. I was worn out, but pleased to have accomplished what I set out to do. I look forward to receiving some thousand or more QSL's and reading the messages of goodwill contained therein. ■

RK 65 [*from page 43*]

for the driver, and the high driver power is not wasted, for most of it passes on through to the load as useful power output. Tuning and adjustment is very simple. It should first be done on a 50 ohm dummy load. With the plate supply switch thrown to the low power tap on the plate transformer primary, some carrier is injected from the exciter, and the power amplifier is tuned to resonance and loaded. Then carrier injection can be increased, and the plate voltage increased, to give full power output, and the loading and tuning should not be materially different. When the antenna is substituted, one must be careful not to test with full carrier power as the legal limit would be exceeded. When on the antenna, adjustment should be done with low plate voltage, with care to be sure that the sum of the driver input and final input does not exceed 1 kw. Full plate voltage should be applied for voice operation only, when on the antenna.

By running the exciter carrier injection control up and down, and plotting driver plate current versus final plate current, a perfect straight line was obtained, which speaks well for the linearity of this amplifier. Checking with an oscilloscope and the familiar two-tone input on a dummy load confirms this.

Many satisfactory contacts have resulted from the careful and hard work we put into this amplifier unit, and we feel we can be justly proud of the signal that this single sideband transmitter radiates. This transmitter is good for all bands, from 75 to 10 meters. It can be used on cw at reduced combined power input not exceeding 1 kw, providing the exciter voice control is disabled and antenna relay switching is done manually, as there is provision for keying the exciter. Also, for those who have not yet learned how to receive SSB, we can inject carrier and run with carrier and one sideband. The power amplifier unit is integrated into the desk-top console. The whole station thus presents a very neat appearance, and it can be dismantled into small units when moving. It occupies only the desk top, plus a small amount of floor space beneath the desk for the power supply, and there is no unsightly wiring nor open racks to cause violent objections from the "chief of staff."

Many thanks again to W6CAB, for providing us with the idea of going single sideband, and with the impetus in the form of a good buy! See you on single sideband, fellow! ■

The Ham Shop

RATES: 25¢ per word per insertion for commercial business organizations.
10¢ per word per insertion for individuals on a non-commercial basis. *Full payment must accompany order.*

MINIMUM CHARGE $1.00

CLOSING DATE: 20th of the 2nd month preceding date of issue.

MAIL: Your typewritten copy with full remittance should be sent to CQ Magazine, 300 West 43rd Street, New York 36, N. Y.
Attention: Classified Ad Dept.

NOTE: The products and services advertised in this section are not guaranteed by the publisher of CQ. Telephone orders not accepted.

FOR SALE

ATTENTION MOBILEERS!! Leece Neville 6 volt 100 amp. system alternator, regulator, and rectifier, $45.00. Also Leece Neville 50 amp. system, $50.00. 12 volt 100 amp. system, $85.00. Guaranteed no ex-police car units. Herbert A. Zimmerman, Jr., 115 Willow Street, Brooklyn 1, N. Y. K2PAT, ULster 2-3472 or JAckson 2-2158.

HANDSOME WESTERN belt with your call letters or name hand-carved on back. Send call, waist size, $5.00 Postpaid. W50UH, Box 914, Pearsall, Texas.

80-40-20-15-10-Antenna. $21.95. Patented, Write W4JRW, Lattin Radio Laboratories, Owensboro, Kentucky.

HAMS! In central Illinois it's KNOX ELECTRONIC SUPPLY, INC., where your trade-in is always worth more. 67 North Cherry St., Galesburg, Illinois.

JOHNSON KW good condition. No desk—$895.00. WØTVE, Fenton, Iowa.

DECORATE YOUR CAR WINDSHIELD WITH YOUR CALL LETTERS. Attractive 1½" letters and numbers available in gold. Complete single set 75¢, two sets for $1.25. Include name, call, address. (Larger sizes available, prices sent upon request.) Money refunded upon return of unused decals if not satisfied. All orders must be prepaid. Send to Box CC, c/o CQ Magazine, 300 W. 43 St., N. Y. 36, N. Y.

TUBES FOR SALE: new Eimac 4-400's $25. New 250 TH's $15.00, 829 B's, $5.00, New and used 304 TL's and TH's price on request. J. H. Sales, 5408 Stratford Road, Los Angeles 42, Calif.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 PP. DePaul, 101 Starview, San Francisco.

FOR SALE: Schematics for all military-surplus units $1.00 each. Dave Rumph Co., P. O. Box 7167, Ft. Worth, Texas.

FRA Frequency shift receiver converter $50, Dumont 208 scope $45, tech manuals for surplus $1.00. S. Consalvo, 4905 Roanne Drive, Washington 21, D. C.

FILL THOSE PEAKS: Capacitors 3000V 120 mfd, GE Pyronol used in very good condition. $35.00 packing $3.00. W8LTF, 831 Antoine, Wyandotte, Mich.

MOON BOUNCE? Claim your own acre of the Moon's surface! Choice acreage left in the Mare Imbrum, the Moon's largest known crater. Authentic-looking, two-color gag certificates with gold seal only $1.00 each with name and call inscribed free. Six for $5.00. Check or M. O. to Box CG, 1738-201 St., Bayside 60, New York.

MOBILE HAMS: "BUG-KETCHER COIL"—Mobile antenna loading coil—80 thru 10 meters. Ruggedly built utilizing Micarta. $14.50 postpaid U. S. only. Mfg. by: C. V. Bednar, W5UMC, 1235 North Shepherd Drive, Houston 8, Texas.

ANTENNA ROTATOR—Famous JFD Roto King factory rebuilt & guaranteed for 90 days only rotator in its price class with continuous 360 degree control, original price, $59.95. SPECIAL $27.50. Ivory or Ebony cabinets limited quantity. Audio Visual Equip. Co., 2516 Avenue U, Brooklyn 29, N. Y.

BC-312 RECEIVER exceptionally clean, complete with built-in RA-20 power supply. Heathkit AT-1 Transistor and AC-1 Antenna Coupler. All in excellent condition. $75. Charlie Gerrard, K1MAV, 939 West Street, Gardner, Mass.

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1, in stamps or cash for each item that you want preserved. 24-hour service. Send to Dept. HW, CQ Magazine, 300 West 43rd St., N. Y. 36, N. Y.

KWM-1 #770 FOR SALE: $550. Leece-Neville 12V. 50A. system. 1 year old. Not surplus. $50. Glen Sneary, W5RYB, 307 S. Burdick St., Stillwater, Okla.

CLEANING HOUSE: TR switch, AC Freq Meter Lakeshore Timemaster Pillow speaker, D104 Mike, Drake Phone Patch, Permoflux headphones, Eldico low pass filter, 600DL Mobile Mike, 2 Dow Coax relays, RK4D32 tube, AC line filter, Miller AM tuner, 11-inch table rack, 3-foot rack with operating 12-inch GE TV, assorted cables and connectors. SACRIFICE—BEST OFFER—K2GLG, 1 Adams St., East Rockaway, N. Y. LY 9-1057.

FOR SALE: complete Novice Station: Globe Scout 65B Transmitter with five Novice crystals $45; Hallicrafter S-53 receiver $45. All in new condition. Jac Holzman, 115 West 16th St., New York City. AL 5-3958.

HEATH SB10 (expertly wired) $99, SX62 wi spkr (gud cond) $195, Viking II wi VFO (Factory wired) $190. Col. Sears, K6QQI 4725 Bridle Trail, Santa Rosa, Calif.

Hallicrafters SX99 and R4GB speaker, excellent condition, $95. Dorlon Sheets, 340 East Pleasant St., Long Beach 5, California.

NC183D receiver with matching speaker—also built-in 100KG BFO Best offer. Write Mrs. Liszczak, 3115 Ridge, Highland, Indiana.

SALE: SX-42 with R42 Base reflex spkr, 0.55 to 109 mcs cont tuning, AM/FM, $125.00, will ship. Bill Bettis, 2808 N. John Marshall Dr., Arlington 7, Va.

DX-100 In excellent condition, 1½ years old. $160. Will not ship. Nelson Riedel, 2606 North Spaulding Ave., Chicago 47, Ill.

TOWER—sell 40-foot steel tower, home-made 20 meter beam, and Hy-Gain 15 meter beam and indicating servos, $150. Nelson A. Riedel, 41 High St., Seville, Ohio. Phone PO 9-4452.

FOR SALE: VIKING II Good condition . . . $170, GPR90 Receiver w/spkr. new Mar 59 excellent condx, very stable good for SSB $440. Must sell, lack of space. Write wire or Indian runner to KØVOZ, Robinson, 1419 Fifth Ave. SE, Cedar Rapids, Iowa. EM 3-4195.

WASHINGTON D. C. AREA—Largest stock Radio Surplus all types. RITCO (behind Bank of Annandale, Virginia) JE 2-58-5.

For further information, check number 68, on page 190.

FOR SALE *[continued]*

NC 109 Receiver new. Make offer. Will consider trade. A. R. Thomas, Box 1041, San Antonio 6, Texas.

KIT 106A, Fabulous Assortment of widely used electronic parts, ten pounds, 100 items, unbeatable value, Price $5.00, MDC, 944 W. Tioga Street, Philadelphia 40, Pa.

MOBILE RIG ELMAC A54 Xmtr, Elmac PMR 6A rcvr, Web whip covering 10, 15, 20, 40, 80 mtrs. 6-12 V dynamotor, mic, relay, mount, control box. Complete installation $200 or will trade for Gonset 6 mtr xmtr—rcvr. Local only W2CMI Little Falls, N. J. CI 6-2539.

SELL: Going to college: NC-300 $260, National 6 meter converter (4 tube) $30, pp. 4-125 50Mc Final with driver —uses 8Mc xtals—800 watts $50 with tubes. Jim Cessna, WØSMJ; Indianola, Iowa.

20-A, QT-1 $150.00 New Bandhopper VFO $80.00. John Mansheim, WØJCS, 1311 Avenue B, Ft. Madison, Iowa.

FOR SALE DX40 with VFO and Plate Modulator $70.00 cash. H. Paskin, 6304 Forest Ave., Ridgewood 27, N. Y.

FOR SALE: HT-33 Used less than 60 hours. Has been completely checked by professional. Shipped prepaid for $450. Will arrange terms. Contact: James R. Howerton, M.D., P. O. Box 86, Columbia, North Carolina.

CRANK-up, Tilt-over, 40-foot tower, like new, painted silver, $79.00 FOB or trade for transmitter, receiver, linear. Jim, P. O. Box 6073, New Orleans 14, Louisiana.

FOR SALE: Complete KWM-1 installation, with independent receiver and transmitter tuning. Worked 116 countries on SSB. Includes 516-1 AC supply, 312B-2 console, 3510-1 mobile rack, DX adapter, transistor mobile supply, Mark tri-band whip and bumper mount. Best offer. Will consider 75S1, SX-101, or Volkswagen in trade. Don Stoner, Box 137, Ontario, California.

Collins 75S-1, used 5 hours, new condition, $475. Postage paid in U. S. Gerald E. Pugh, 30 Grove St., Lexington, Mass.

FOR SALE: Hallicrafters S-76 receiver and matching speaker—excellent condition. (Asking $125. or best offer.) 54-foot antenna tower ($275. Value). Best offer accepted. Perfect Heath transmitter AT-1 (30 watts) $20. Cibik, W3ZDH; Box 516; Leechburg, Penna.

VHF NEWS BULLETIN! Columns on 50mc, 144mc, 220mc, 432mc and above.—10 issues, $1.00 . . . "QSO," 67 Russell, Rahway, N. J.

RECONDITIONED EQUIPMENT! TERMS—TRIALS—TRADES! New Guarantee! *Transmitters*: 5100 $299.00; 5100-B $379.00; 32V-3 $485.00; SSB-100 $395.00; Elenco 77 $369.00; Gonset 500W Linear $199.50; SR34AC $325.00; TBS-50 (80-2M) $59.95; APS-50 $19.95; DX-35 $49.95; SB-10 $89.00; VF-1 $19.95; Pacemaker $385.00; 6N2 $129.00; Phasemaster II $199.00; LW-50 $39.50; Lysco 600 $69.00; AF-67 $139.00; dozens of Globe Scouts, Chiefs, Champs, Kings, etc. *RECEIVERS*: S-53A $69.95; SX-88 $429.00; SX-96 $189.00; SX-101 $319.00; HQ-129X $149.00; HQ-140X $179.00; HQ-150 $229.00; PRO-310 $449.00; Q Mult, $7.95; SW-54 $39.95; HRO-60T $385.00; NC-98 $114.00; NC-125 $139.50; NC183D $309.00; NC-300 $269.00; RME-4350A $185.00. Leo, WØGFQ, Box 811, Council Bluffs, Iowa.

FOR SALE: Hallicrafters S-85 in ery good cond. $80. Frank Hungerford, Glasgow, West Virginia.

TRANSISTORIZED SIX METER CONVERTER. Small, compact, sensitive, easy installation. Crystal controlled. $29.95. Also limited quantity VHF transistors at experimenters prices. Guaranteed minimum alpha cut-off 100 megacycles. Oscillates much higher. Perfect for converters, dippers, etc. $2.65 each. Robin Radio Co., 13229 Red Fern Lane, Dallas, Texas.

FOR SALE: Panoramic Adapter 455kc, Like New, $85.00. Late Serial 75A3 Rcvr $375.00, DX Hound 20 meter short beam, boxed, new, $35.00. New R-28 rcvr, $15.00, BC-659 $15.00, Gonset G66-B rcvr, $160.00, Carter Genemotor, 12V gives 600VDC at 400 ma, $25.00, Home Brew Xsitor Pwr Supply gives 600VDC at 350 ma, perfect condx, (12v input) $40.00, EV 600D Mike, $15.00 and National XCU-50 xtal Calibrator, $20.00. Box BB, CQ, 300 West 43rd St., New York, N. Y.

FOR SALE: Hallicrafters SX-62A receiver; complete coverage, 55c kc. to 108 mc. In very good condition only one year old. Hallicrafters R-468, 12-inch speaker included $300 plus postage. Richard Wirkkanen; Rte #1, Box 199; Ely, Minnesota.

Brilliant new HALLICRAFTERS HT-37

$450.00

$10 down at Radio Shack!

NOW! for the first time . . . high performance SSB minus the high cost! AND YOU CAN HAVE IT . . . ON OUR NEW PAY-PLAN . . . FOR $10 DOWN.

*Same careful engineering — plus similar performance characteristics — as the world-famed Hallicrafters HT-32A!

*Look at the specs . . . look at the price! "Moderate" is an understatement!

Here's a new transmitter that *really* puts SSB within everybody's reach! You asked for it, Hallicrafters made it, and we're stocking it to the hilt for immediate shipment — anywhere! Same power, same rugged VFO and VOX as the HT-32A . . . and essentially the same performance characteristics! Power: 70-100 Watts (P.E.P.) CW and SSB. 17-25 Watts, AM carrier. High stability VFO with double reduction disc drive and fixed temperature control. Sideband suppression: 40 db @ 1000 cps. Carrier suppression: 40 db or better. Features instant CW calibrated signal from any mode of transmission. Output stage: 2-6146's. 3rd and 5th order distortion products down 30 db. Convection cooling with final operating at low plate dissipation in standby position. Many more features! Size 18¼" W x 9½" H x 16¾" D. Ship. wt. 69 lbs.

MATCHING SPEAKER R-48
$19.95 $2 DOWN

NEW HALLICRAFTERS 5-BAND SX-101A "IDEAL" RECEIVER

All the precision features you've come to expect of Hallicrafters — PLUS! PLUS, for example, a new-type product detector . . . 2-position AVC . . . full bandspread on 10 meter band . . . band-to-band equalization. Complete coverage of five ham bands: 80, 40, 20, 15, 10 meters plus counterband calibrated for 2 and 6 meters. 20" W x 10½" H x 16" D. Weight approx. 74 lbs.

$399.50
$10.00 DOWN

NEW HALLICRAFTERS SX-110 RECEIVER SCOOP!

Value! Broadcast band 540-1600 kc plus 3 short-wave bands covers 1550 kc — 34 mc. Slide rule dial; calibrated electrical bandspread over the 10, 15, 20, 40 and 80 meter amateur bands. Separate band-spread tuning condenser, crystal filter, antenna trimmer, new-type "S" meter, one RF and two IF stages. Seven tubes plus rectifier. Power output 2 Watts. 18¾" W x 8" H x 10¼" D. Gray steel, brushed chrome trim. Ship. wt. approx. 32 lbs. 105/125 V, 50/60 cycle AC.

$159.95
$5 DOWN

BIG "PLUS-20%" TRADE-INS. SEND COUPON NOW.

FREE!
12-MONTHS SUBSCRIPTION
RADIO SHACK
BARGAIN BULLETINS. Write!

JUST OUT!
312-page fact-filled catalog-handbook
1960 ELECTRONIC BUYING GUIDE. Price 35c

RADIO SHACK Corporation
DEPT. 11C, 730 COMMONWEALTH AVENUE, BOSTON 17, MASS.

Please quote an **extra** 20% allowance on my model_____
I would like to trade for the following HALLICRAFTERS:

( ) Hallicrafters HT-37 Transmitter @ $450.00 (No. 45DX349)
( ) Hallicrafters SX-101A Receiver @ $399.50 (No. 45DX303)
( ) Hallicrafters SX-110 Receiver @ $159.95 (No. 45DX324)
( ) Hallicrafters Matching Speaker R-48 @ $19.95 (No. 45DX385)

( ) Send FREE Bargain Bulletins
( ) 1960 Electronic Buying Guide @ 35c
( ) Check ( ) Money Order ( ) C.O.D.

Name_____
Address_____
City_____ Zone_____ State_____

For further information, check number 69, on page 190.

FOR SALE: 6M Communicator, $165; ARC-4 2 Meter transmitter/receiver, $50; miscellaneous. J. Alexander, 14 Buswell, Apt. 313, Boston 15, Mass.

SSB men: CE 20A exciter, run 'B,' with QT-1, and CE 458 VFO, all in First-class condition, only $175. Prepaid upon receipt of MO or Cashier's check. W4BXV, Tom Rozier, Box 123, Quitman, Georgia.

FOR SALE: Collins KW-1 excellent cond. original owner. $2500.00. Collins KWS-1 like new, used 6 months. $1300.00. W6NX, Frank Quement, 2030 Hurst Ave., Jan Jose, Calif.

SELL OR TRADE Citizens Banders have two Globe CB-100 new units. Want 75A1 or 75A2 or what have you? WØBNF, Box 105 Kearney, Nebr.

75S1 new condition trade for 75A4. KWS1 like new serial 981 $1400 take Collins gear or HT32 in trade. 75A2 mint condition want best offer. WØBNF, Box 105, Kearney, Nebr.

WANTED

WANTED: TELETYPE TG-7 and Model 15 and parts, printers and reperforators, etc.; COMM'NS REC'V'RS AND XMTRS, e.g. BC-610-E, -I, BC-939A, Collins 51J, 17L3, -4; R-388 and R-390/URR; 18S-2, -3; ARN-14 and -30; APR-9, -10, ARC-21, 27, etc.; APS-31, -33; and TEST EQP'T, with TS- or 1- prefix. We pay freight. AMBER INDUSTRIAL CORP., 75 Varick St., N. Y. 13, N. Y.

WANTED: All types of communications receivers, transmitters, test equipment, teletype equipment, factory built amateur gear. Cash or trade for NEW HT-32, Valiant, Thunderbolt, SX-101, NC-303, Fisher HI-FI, etc. Write Tom W1AFN, Alltronics-Howard Co., Box 19, Boston 1, Mass. (RIchmond 2-0048) Store; 60 Spring St., Newport, R. I. (VIking 7-3435, Fred W1JFF).

WANTED: Military and Commercial laboratory test and measuring equipment. Electronicraft, Box 399, Mount Kisco, N. Y.

WANTED: Echophon Model EC-1A, EC-1. Fred Haines, Rual Ave., Lewisburg, Penna.

INSTRUCTOGRAPHS WANTED: used, A. C. models, complete with tapes. For use in Amateur Radio class. State age, condition, and price. G. E. Taylor, VE3EDG, 2835 Isabella St., Ft. William, Ont., Canada.

WANTED: Surplus measurement Model 78 or 80 signal generators. Also Federal 804. State quantity, price and condition. Communications Service, Inc., 3209 Canton Street, Dallas, Texas.

WANTED: TS-488 echo box. W2KUW, Box 55, Arlington, New Jersey.

WANTED: Tubes—special purpose and receiving. Top prices for Klystrons, Power Tubes, Thyratrons, T. V. and Receiving Tubes. Tubes must be unused. Also communication equipment—aircraft and ground, Omnireceivers, Loran, VHF, Marker Beacon, Transceivers, Lab grade Test Equipment, Signal Generators, Oscillographs, Recorders or what have you. Bob Sanett, W6REX, V. & H. Radio & Electronics, 2053 Venice Blvd., Los Angeles 6, Calif.

WANTED: Collins 30K-1 or Viking KW in excellent condition. State price in letter. Cannot pick up if more than 50 miles from New York City. Cash or trade for new SSB equipment. Box BB, CQ Magazine, 300 West 43rd St., New York, N. Y.

WANTED TRADES NEW AND USED: KWS-1 $1250.00, 32S-1 $590.00, 75S1 $495.00, 32V2 $350.00, HQ100 $149.50, HQ110 $209.00, HQ129 $129.00, HQ145 $269.00, HQ160 $379.00, HQ170 $359.00. Johnson Mobile $75.00, Thunderbolt $589.50, Valiant $439.50, Johnson Citizen Messenter $139.75, Courier $289.50, Hallicrafters 101 Mark III $395.00, HT33 new $495.00, SX99 $119.00, SX100 $295.00, HT32A $695.00, S107 $94.95, NC125 $139.00, NC183D $319.50, NC173 $139.50, NC57 $69.00, SW54 $35.00, CB100 Citizen $125.95, Globe King 500A $425.00, 90 Chief $49.50, 90A $54.95, 680 $94.95, 680A $97.95, DSB100 $129.95, VFO755 $42.95, NC300 $299.95, NC2400 $169.50, CE20A $195.00, 10B $139.50, CE Slicer $37.50, WQ Multiplier $59.95, Heath DX35 54.95, AT-1 $23.50, DX20 $34.50. Easy terms. Ken-Els Radio Supply, 428 Central Avenue, Fort Dodge, Iowa, or 128 31st Street NE, Cedar Rapids, Iowa.

WANTED: High Voltage Power Supplies, 115 or 220 VAC anything above 3000 volts DC at 500 ma ccs. Also want Plate Modulator, 500 watts audio with 810's and power supply. Modulation Xfmr must be multitap type. KW power amplifiers, 4-400A's, 4-1000A, PL-172A must be very well built and in excellent condition. State price and give phone number. Will pick up within 75 miles of N. Y. Box BB, CQ, 300 West 43rd St., New York, N. Y.

QSL

QSL's-SWL's, samples 10¢. Malgo Press, 1937 Glendale Avenue, Toledo 14, Ohio.

QSL's—"Brownie" W3CJI, 3110 Lehigh, Allentown, Pa. Samples, 10¢, with catalogue, 25¢.

QLS's: Samples Free. Phillips, W7HRG, 1708 Bridge St., The Dallas, Oregon.

QSL-SWL: $1.00 per 100. Samples dime. Riesland, W6HTN, Del Mar, Calif.

QSL's-SWL's: High quality, reasonable prices. Samples. Bob Teachout, W1FSV, 204 Adams St., Rutland, Vermont.

CREATIVE QSL CARDS. Personal attention given. Free samples and catalogue. Bob Wilkins, Jr., Box 1064-2, Atascadero, California.

QSL's SWL's, VHF's, XYL-OM's. (Sample assortment approx. 9¾¢.) Covering designing, planning, printing, arranging, mailing, eye-catching, comic, sedate, fatabulous. DX-attracting, prototypal, snazzy, unparagoned, cards. Rogers, KØAAB, 737 Lincoln Ave., St. Paul 5, Minn. Also glamorous, pulsating, super-passionate. (Wow!)

QSL-SWL: 100 4-color $3.50. Others less. Glossy cards. Nice selection. Samples 10¢. Dick, W8VXK, 1018 Arthur, Mt. Pleasant, Michigan.

QSL's. Samples 15¢. Sims, 3227 Missouri Ave., St. Louis 18, Mo.

QSL's: Samples, dime. Print Shop, Corwith, Iowa.

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.

GLOSSY 3-color QSL cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, New Brunswick, N. J.

QSL's-SWL's: That are different, colored, embossed card stock, and "Kromekote." Samples 10¢. K8AIA, Box 953, Hamilton, Ohio.

QSL's? Samples 25¢ (refundable). W6CMN, 6707 Beck Ave., North Hollywood, Calif.

QSL's—3-day service—samples 10¢. Don, K5OWT, 738 Gardenia, Ada, Oklahoma.

QSL's???? LARGEST variety samples 25¢ (refundable). CALLBOOKS (latest) $5.00. Religious QSL samples 10¢. "Rus" Sackers, W8DED, Holland, Michigan.

QSL's Modern designs, catalogue. Paye, W4ZKK, 824 Avondale, Cocoa, Florida.

QSL's, SWL's. Samples 10¢. Onondaga Press. Onondaga, Michigan.

SWAP OR SELL

RADIO MAGAZINES. Buy, sell, trade. Bob Farmer, Plainview, Texas.

MISCELLANEOUS

PRESERVE YOUR HAM TICKET, Social Security Card, small photo, passes and anything else of value that is wallet-size. We will laminate it in clear plastic, guaranteed for life. Lamination will prevent it from getting torn, soiled or frayed. Send your ticket or anything of value with $1 in stamps or cash for each item that you want preserved. 24-hour service. Send to Dept. HW, CQ Magazine, 300 West 43rd St., New York 36, N. Y.

TWO-COLOR CERTIFICATE. Attests to tongue-in-cheek ownership of one acre of the moon. Ideal gift or for wall of club, shack, bar or room. Name and call inscribed free. $1.00 each, 6 for $5.00. Box G, 1738 201 St., Bayside 60, N. Y. Check or M. O. only.

HAMS: Learn Calculus or algebra. Powerful modern mathematics. Easy practical lessons, first four $1. Mathco, 4256-5 Minmor, Cincinnati 17, Ohio.

MUSIC APPRECIATION: Pre-recorded stereophonic tapes available. Prices sent upon request. All types, classical, popular, show music, etc. State titles and code numbers if known. Send to Box 088, CQ Magazine, 300 West 43rd St., New York 36, N. Y.

MISC. (Cont'd.)

ATTENTION CATHOLIC HAMS. The Franciscan Brothers who run Morris School for Boys in Searcy, Arkansas, are looking for usable Ham gear. All donations welcomed. Ad donated by K5CHV.

NEED MONEY FOR COLLEGE. Will wire kits, modify surplus or what have you? Moderate rates. Tested work. Inquiries invited. Mickey Groh, WV2CKY, 92 Brooklawn Drive, Rochester, N. Y.

T.V.I.

DRY EYES [*from page 39*]

COUNTRY. So any enterprising ham that could not cash them in his postoffice could send them to some other country for use. Even at a 50% discount he could make four cents on each coupon. On top of this the rare ones sometimes receive stamps of their own country and even cash.

A rare DX station gets plenty of coupons. Even common DX stations get them. Remember how important your first G was to you and how you sent him a coupon? In issuing the SOS AWARD here in Wichita, KØACC, WØGPR, WØZSZ and myself find that we seldom get IRCs (even from ordinary DX) that were actually purchased by the applicants for the certificate. They were originally purchased in such rare faraway places as Cleveland, Dallas, Miami, etc. and were dispatched overseas by the US boys. Remember, our mythical DX brother will need only about TWO DOZEN PER YEAR to ship his entire QSL crop to the ISWL.

Brother hounds, leave us face it, money is not the real reason. The reason is the secretarial work involved. This task should not be minimized. But there are ways to lighten this burden. Participating in ARRL contests and sending in a log would cost practically nothing. Getting someone in the states to help with the chores would be another way out. Some do just that. But I know personally one USA ham who volunteered to help *five* confirmed non-confirmers—and not a single one took him up on it.

I realize there are exceptions to the above.

By and large most of the boys do a great job with neat cards. Also, let it be understood by all, that I am not mad at anybody. But let us be honest—those birds who refuse to QSL in any way, shape or form deserve no salty tears. Next time you are about to buy the old dose about how impossible it is for DX to QSL just remember the facts.

When this article gets around my call may go on a black list or two. Oh well, chess anyone? ■

XTAL SYNTHESIZER *[from page 38]*

At this point a few pleasant evenings may be spent grinding crystals right on as explained in several crystal grinding articles, such as "How to Grind Crystals" by WØHKF in the November 1957 issue of CQ. It's really quite easy and what a delightful feeling to know your frequency is exactly what you tell people.

Operation

The Crystal Synthesizer is temporarily driving the 1939 transmitter of W2JKH which is soon to be scrapped. An 802 is the first stage originally used as an *eco*. The plug-in grid coil now has a jumper on it so that the input circuit is a parallel LC tuned circuit. A ten foot coax cable connects from the Synthesizer to the grid tank circuit of the *eco* and normal transmitter operation follows.

The unit has been in operation on the 3.5 to 4.0 *mc* band since February 1958 on both cw and am phone. It has been a real pleasure to push the band selector button which energizes the whole thing, and then push in the desired frequency buttons and there you are. When someone says, "QRM ole man, please move up 5 *kc*," I just reach over to the 1 *kc* step switch and go up 5 with no trouble at all. Once you get proficient with the key board, you can play it blind.

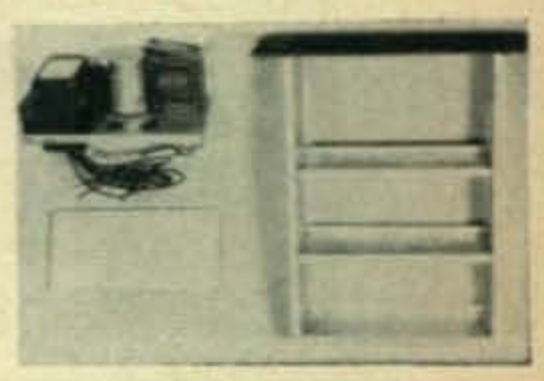
Now and then when I tell people I'm crystal controlled on say 3905 *kc*, the answer comes back, "Well you're 3905.5 on my receiver." I always go back with the answer, "Thanks for the frequency check, glad to hear the ole crystal's that close," because maybe he's right, but anyhow I'll be there day in and day out whenever I push the 3905 buttons and I won't drift, even from a cold start.

For AM work, I've found that an integral *kc* selection of a frequency has been very satisfactory, but for getting into a SSB frequency or nets, the rubber crystal is tops. The dial for the rubber crystal is marked with a zero center so that it can be returned to that position to keep the calibration of the decade switches positive.

Credit must be given to my non-amateur but sympathetic friend Fred Schneider, who gave needed assistance in the mechanical construction of the units. ■

New Amateur Equipment

New Chassis Assembly



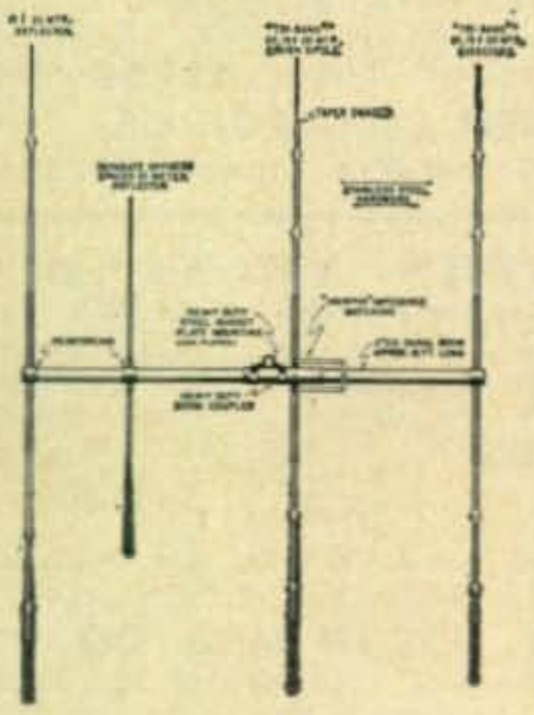
Instrumentation Devices, New York City, has hit the market with a rather versatile chassis-panel assembly. The unit shown at the left of the photograph is intended to simplify the construction of electronic equipment by amateurs and experimenters. In the upper right of the photograph is a sub-chassis which, because of its design, can be easily punched and drilled. In the lower right is a sub-chassis with components mounted, ready for wiring. After the sub-chassis are fastened into place, the front panel can be removed in order to drill holes for dials and controls. For more information, Circle D on page 190.

Citizens Band Transceiver Kit

Behold the CB-1, a new kit from Heath designed to get anyone, *but anyone* on the new 27 *mc* Citizens Band. The CB-1, is a 5-watt xtal controlled transmitter (plate modulated) and a superregenerative receiver featuring an *rf* stage. The unit is easily constructed, even by inexperienced persons and provides an economical transmitter and receiver combination. As supplied, the CB-1 operates from 115 volts *ac* 60 cycles, but Heath also manufactures two vibrator supplies which permit either 6- or 12-volt *dc* operation for mobile purposes. For more information, mash A on page 190.

Cesco Fieldometers

Cesco of Dayton, Ohio has a new line of sensitive field-strength indicators called Fieldometers. These are units for detecting radio frequency featuring either capacitive or electrostatic sensing wands. The capacitive types are non-inductive, are not frequency critical, and usable over a wide spectrum. The electrostatic units incorporate a resonant wand available for any required frequency. All models employ a sensitive microamp meter with divisional scales calibrated in 0 to 100 in relative field-strength units. Each model is supplied with sensing rods which plug into wand ends for increased sensitivity, and are equipped with shunt type sensitivity controls to prevent off-scale readings and meter damage in strong *rf* fields. For the full scoop, mangle C on page 190.



Tri-Banders by Telrex

Telrex, Inc., Asbury Park, New Jersey, has added three new beam antennas to their already famous line. These Tri-Banders permit operation on 20, 15 and 10 meters with a single array and feedline and are nominally priced for the quality and performance they give. For a greater bunch of facts, we suggest that you stab B on page 190 and we'll get the additional dope out to you.

BOOK REVIEWS

Ham Radio Handbook

Electronics Illustrated has just come out with a 144-page offset printed picture book about ham radio by Robert Hertzberg, W2DJJ. Essentially it is a catalog of commercial equipment available to the amateur, with prices and basic specifications. There are also pictures of many of our better known hams and their shacks. This is a fine book for the newcomer who wants to know about commercial equipment or for the average ham to have around the shack to show visitors who want to know what this ham radio hobby is all about. $2.50.

Basic Electronic Test Procedures

This is a darned good introduction to all of the usual pieces of test equipment that will be found around a lab. It not only gives the data on the test equipment, but goes into details on techniques for using each unit. Published by Rinehart, 316 pages, $6.50. Learning the function and use of different kinds of equipment is part of learning electronics. This should be a popular school text.

"HAM HEADQUARTERS, USA®"

is National HEADQUARTERS, USA for several mighty good reasons!

Where else in the whole wide world can you . . .

- See so much of the latest National gear on live display!
- Buy it on such easy, most flexible terms!
- Get so high a trade-in allowance!
- Be given such sincere, friendly interest and help!
- Receive so favorable a deal!
- Select from such a large, fresh inventory, and take it right home with you!

COME ON IN AND BE PLEASURABLY CONVINCED!

(Bring along your old gear, for the deal of your lifetime.)

73,

Bil Harrison

W2AVA

SAVE $70.00!

ON THE NC-300

Regular Amateur Net-$399.00. Brand new, factory sealed, fully guaranteed—for only $329! Act fast—limited offer! Yours for as little as **$12 A MONTH** for 24 months, after payment of $41 down and low carrying charge.

latching Speaker **$21.95**; Plug in rystal calibrator **$23.95**; Plug in UHF onverters: 6 Meter Band **$41.95**; Meter Band **$43.95**; 1¼ Meter and **$45.95**. (Easy terms on acces-ories, too!)

SAVE $20.00!

NATIONAL 6 *and* 2 METER VFO

Don't be rock-bound! Plug the output of this self-powered VFO into your crystal socket, and you can QSY to any frequency in the 144 to 150 and 50 to 54 Mc bands. Replaces 8 to 9 Mc (and 25 to 27 Mc overtone) crystals.

- Large, smooth vernier dial, with direct frequency calibration.
- For spot freq operation, simply plug desired crystal into socket on panel.
- Plug 1 Mc crystal into socket, and internal oscillator gives calibration marker points.
- Headphone jack for direct detection of marker points.
- Provision for remote control.
- Compact! Only 6½" x 5¼" x 5½".

~~$69.95~~ **$49.95**

DO YOU LIKE BARGAINS?

Of course, there's **always** plenty of true bargains at HARRISON's. But right now we're having a

BIG EXPANSION CLEARANCE SALE!

Lots more close-outs, mark-downs, and sensational bargains in equipment and parts. Come on in, and save plenty! **LOOK FOR THE YELLOW TAGS.**

SAVE $30.00!

NATIONAL NC-109

In all the catalogs at $199.95, we can give it to you now for only **$169.95!**

Yours for as little as **$13 A MONTH** for 12 months, after 10% down payment and low carrying charge. Matching Speaker **$17.50**; Crystal Calibrator **$20.95.**

SAVE $20.00!

NATIONAL NC-188

Outstanding value at $159.95, we have them brand new, latest production, for only $139.95. Fully guaranteed!

NO MONEY DOWN! Just CHARGE IT!

further information, check number 72, on page 190.

n your Harrison Charge Account, and pay as little as one-tenth f each reduced monthly balance.

DO YOU HAVE THE NEW HARRISON AMATEUR EQUIPMENT CATALOG?

Ask for it, today!

"Ham Headquarters, USA" . . . Since 1925

HARRISON

225 GREENWICH STREET

NEW YORK 7, N. Y.

• **PHONE: BARCLAY 7-7777**

[LONG ISLAND—144-24 HILLSIDE, JAMAICA]

Advertising Index

READER SERVICE

CQ Magazine, Dept. RS

300 WEST 43rd STREET
New York 36, N. Y.

Coupon K
Void after
Nov. 25, 1959

Please send me information on your ads in the November 1959 CQ keyed as follows:

1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53	54
55	56	57	58	59	60	61	62	63
64	65	66	67	68	69	70	71	72
73	74	75						

A B
C D
E F
G H
I

NAME _____
(Please Print)

Call _____ Engineer ☐

Type of work (specify) _____

ADDRESS _____

CITY _____

ZONE _____ STATE _____

New Silicon 500Ma Rectifiers, *Working Range RMS-ACV Input!

rms/piv	rms/piv	rms/piv	rms/piv
35/50 30¢	70/100 45¢	140/200 50¢	210/300 65¢
rms/piv	rms/piv	rms/piv	rms/piv
280/400 78¢	350/500 $1.00	420/600 $1.26	490/700 $1.50
rms/piv	rms/piv	rms/piv	rms/piv
560/800 $1.59	630/900 $1.89	700/1000 $2.58	770/1100 $3.12

Use in Bridge or C.T. up to 750ma dc

**Postpaid 48 States order $10*

RECTIFIERS 130V/RMS HALF-WAVE

75Ma 49c, 5 for $2; 100Ma 59c, 6 for $3
150Ma 70c, 8 for $5; 250Ma 79c, 6 for $4
300Ma 88c, 5 for $4; 350Ma $1.00, 8 for $7
400Ma $1.10, 5 for $5; 500Ma $1.35, 5 for $5

Postpaid 48 states orders $10.

SELENIUM F.W. BRIDGE RECTIFIERS

One Year Gtd! DC AMP	18VAC 14VDC	36VAC 28VDC	72VAC 54VDC	130VAC 100VDC
½	$1.00	$1.90	$3.85	$5.00
1	1.30	2.00	4.90	8.15
2	2.15	3.00	6.25	11.10
3	2.90	4.00	8.60	13.45
6	4.15	8.00	18.75	31.90
10	6.10	12.15	26.30	41.60
12	7.75	14.90	30.95	43.45
20	12.85	24.60	49.90	76.75
24	15.00	29.45	57.50	81.15

New "TABTRAN" Rectifier Xfmrs

Sec'd Volts (DUAL†) 0-9-15-18-&-0-9-15-18. Series Sec'ds 0-3-6-9-12-15-18-21-24-27-30-33-36 Volts.

Write for Rectifier Catalog

TR4001 @ 1 Amp† ea/sec/winding $5.15
TR4002 @@ 2 Amp† ea/sec/winding $7.15
TR4003 @ 5 Amp† ea/sec/winding 9.90
†Wndgs in Series at Ratings shown: Parallel 2X Current. Voltage output. 0-9-15-18

*Silicon 360P. I. V. at 250 Ma Rectifiers H-Temp 106°C at 252V/RMS. Special 2 for $1; 25 for $10.
**Postpaid 48 States*

"TAB"—THAT'S A BUY!—BARGAINS!!

IRISH/MYLAR Tape 2400 ft 3/$12
CONDSR Oil/W.E. 2mfd@600WVDC 6/$1
SNOOPERSCOPE TUBE 2" $5@ 2/$9
MINI-FAN 6 or 12VAC/60Cys $2@, 3/$5
NEW PRINT CKT-PANEL, 11x12x.062" $2
IRISH TAPE 1200' HiQlty, 3 for $5
BANDPASS 60 or 90 or 150 Cys each $2
1N34A 45¢@, 15/$5; 1N35 $1; IN38 70¢@;
XTAL OVEN—115V&Thermostat $2
Blower 24VDC/100CFM $3.98
Blower AC/Miniature 6&12VAC $1.00
Xmitting Mica's .006 @ 2500V, 5 for $1.00
Miller 2.5MH/2.5&5Mtr Chokes 8/$1.00
Vibrators 6 or 12VDC $1.49@; 4/ $5.00
New Variacs/or equiv 0-135V/7.5A $15.30
New Variacs/or equiv 0-135V/3 Amp $10.65
New Variacs/or equiv 0-132V/1.25A $7.25
RF-MTR 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-MTR Weston 750Ma/TC $4@, 2/$6
DC MTR 100Ma/2½" $3@, 2/$5
BC696/3 to 4 mc's good condition $5.95
AN-ARR2/RCVR less tubes A-1 cndtn $1.95
RDZ/USN 200-400 Mcs Rcvrs As Is $25
RAX/MPN rcvr covers 4 bands 1.5 to 9 mc's 8 tubes has BFO Vernier $24.00
G.E./YRS-1 Side Band Selector $45
829B Socket 85¢, 2/$1.50, 813 Socket $1
4x150 Ceramic/LOKTAL 2 for $1.00

TRANSFORMERS all 115V/60cy/1Ø

6V @ 8A, 5V @ 3A & 1200VCT@200ma $5
TPF/540VCT @ 30ma/6.3V @ 2A $2
TPF61/500VCT @ 70ma & 6.3V @ 4A $3
TPF62/550VCT @ 250ma & 6.3VCT @ 2.5A & 12.6V @ 3.5A. & 5V @ 2A $5
TF02/2.5VCT @ 10A/5KV $4
TR400R/2x16V @ 1A ea. $3.45
TF30/10VCT@10A, 680VCT@40MA $4.95
TF31/10VCT@10A, Pri 105/15/25V $4.00
TF35/2x5V@10A each or 10VCT/10A $4.50
TFM35/6.3VCT@15.5A&6.3VCT@2A $3.50

H.V. Silicon 866A Tube Replacement Rectifier Rated 250 Ma at 4500V-RMS or 6400PIV. Operates —65 to + 165°C. Max 12.5 VDC Drop 150Ma "VACDAC" ST866. **Each $16.**

Send 25¢ for Catalog

"TAB" THAT'S A BUY

"TAB" Tubes Tested, Inspected, Boxed

Six Months Guaranteed!! No Rejects!

GOVT & MFGRS Surplus! New & Used

0A2	.70	6BZ7	1.25	*We Buy & Sell*	
0A3	.80	6C4	.45	43	.75
0B2	.65	6C5	.69	45	.49
0C3	.70	6C6	1.08	50L6	.69
0D3	.50	6C8	1.08	RK59	1.39
0Z4	.60	*We Trade!*		RK60	1.17
1A7	.90	6CB6	.89	HY69	2.20
1B3	.78	6CD6	1.49	75	.81
1L4	.82	6CF6	.85	HY75	5.00
1R4	5/$1	6CL6	1.40	83	.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	4X150A	2/$9
1T4	.85	6CS6	.70	4X250B	41.00
1T5	.95	6CU6	1.29	4-400A	41.75
1U4	6/$1	6D6	.99	4E27A	39.00
1U5	.75	6E5	.79	250TL	19.45
1X2	.99	6F4	2.49	307A	2/$1
2C39A	9.00	6F5	.63	316A	5/$1
2C40	5.50	6F6	.99	VR92	5/$1
Send 25¢ for Catalog!					
2C43	6.50	6F7	.99	388A	3/$1
2C51	2.00	6F8	1.39	350A	2.45
2D21	.65	6H6	.59	350B	1.75
2E22	1.75	6J4	1.72	371B	.95
2E24	1.90	6J5	.59	5146	3.90
2E25	2.50	6J6	.59	416B	16.00
2E26	2.75	6J7	.99	450TH	43.00
2E30	1.70	6J8	1.39	450TL	43.00
2E35	1.60	6K6	.59	460	11.50
2K25	9.75	6K7	.79		
Wanted Receivers and XMTRS					
2K26	34.00	6K8	.99	703A	2.00
2K28	30.00	6L6	1.19	707B	3.50
2V3	2/$1	6SN7	.72	715C	10.00
2X2	.48	6T8	.98	717A	5/$1
3A4	.70	6V6GT	.90	723AB	5.00
3A5	1.00	6X5	.49	725A	2.75
3API	5.95	12AT6	.59	803	3.50
3BPI	3.99	12AT7	.89	804	8.85
3C24	3.50	12AU6	.63	805	6.00
3D23	3.95	12AU7	.69	*We Trade!*	
We Buy!		*We Sell!*			
3E29	6.00	12AX7	.79	807	1.10
3Q4	.68	12AY7	1.29	5/$5, 10/$12	
3Q5	.86	12B4	.95		
4-65A	13.50	12BA6	.65	811	3.45
4-125A	27.50	12BA7	.99	811A	4.41
4-250A	34.00	12BD6	.59	812	3.30
4X150A	7.00	12BE6	.59	813	8.00
4X250	36.00	12BH6	.79	815	3.15
4X500	37.00	12BH7	.99	826	.59
5API	2.95	12BY7	1.00		
Wanted Test Sets and Equipment					
5BPI	5.02	12BZ7	.99	828	9.00
5BP4	5.00	12H6	.75	829B	8.00
5CPI	4.99	12J5	.69	832A	6.00
5CP7	9.00	12J7	.69	833A	36.00
5R4	1.00	12J8	1.35	837	2/$2
5T4	.90	12K8	.89	866A	2.45
5U4	.75	12SA7	.69	954	10/$1
5V4	.89	12SC7	.89	955	3/$1
5Y3	.60	12SF5	.69	957	3/$1
5Z3	.89	12SG7	.89	958A	2/$1
Send 25¢ for Catalog!					
15GP22	89.00	12SH7	.89	991	5/$1
6A7	1.00	12SJ7	.75	1614	2.75
6A8	.99	12SK7	.75	1619	5/$1
6AB4	.59	12SL7	.79	1620	2.00
6AC7	.72	12SN7	.69	1625	5/$1
6AG5	.65	12SQ7	.69	1626	5/$1
6AG7	.75	12SR7	.69	1629	4/$1
6AK5	.69	15E	1.19	2050	1.25
6AL5	.59	15R	4/$1	5517	1.25
6AQ5	.66	FG17	3.49	5608	3.95
Top $$$ Paid for 304TL tubes					
6AR6	1.95	19T8	1.16	5618	3.25
6AS7	3.49	24G	3.50	5651	1.35
6AT6	2/$1	25A6	1.19	5654	1.20
6AU6	.79	25A7	2.19	5656	4.25
6B8	1.35	25C5	.81	5663	1.15
6BA6	.59	25L6	.72	5670	.90
6BE6	.59	25T	4.00	5686	1.75
6BG6	1.49	25Z5	.72	5687	1.15
6BH6	.79	25Z6	.75	5691	4.70
6BJ6	.72	26A7	3.69	5725	1.95
Top $$$ Paid for XMTTR Tubes!					
6BK7	.99	FG27	8.28	5732	2.00
6BL7	1.35	HV27	19.39	5736	85.00
6BN4	.69	28D7	.89	5749	1.95
6BN6	1.08	FG33	15.00	5750	2.75
6BN7	1.99	EL34	3.49	5751	1.25
6BQ6	1.19	35A5	.69	5814	1.20
6BQ7	.99	35L6	.59	5879	1.20
6BX7	1.11	35T	4.49	5894	$12.00
6BY5	1.19	35Z5	.89		
6BZ6	.91	RK39	2.99	No See—Write!	

"TAB" TERMS: Min Order $3—25% with order F.O.B. New York. Ten day guarantee, price of mdse. only. Our 14th year.

Prices shown are subject to change.

111CX Liberty St., N. Y. 6, N. Y. RE 2-6245

"TAB" FOR THE BEST KITS!

Kit 5 Mycalex Glass/HF Strips	Kit 6 AN Plugs & cnnctrs
Kit 35 Precision Resistors	Kit 5 Sub-Min Tubes
Kit 10 Switches	Kit 40 Standoff Insulators
Kit 75 Resistors ½/1/2W	Kit 35 Power Resistors
Kit 150 Carbon Resistors	Kit 75 Mica Condensers
Kit 25 Panel Lamps	Kit 5 Crystal Diodes
Kit 12 Electrolytic Cond's	Kit 200ft Hook Up Wire. 4 Rolls, 50ft/ea. Asstd. Color
Kit 15 Volume Controls	Kit 100 Fuses, assorted types
Kit 56 Tube Sockets	Kit 100 Ceramic Condensers
Kit 65 Tubular Condensers	Kit 5 FT243 Xtal Holders
Kit 500 Lugs & Eyelets	Kit 5 Microswitches
Kit 10 Bathtub Oil Cond's	Kit 10 Wheat Lamps
Kit 5 lbs. Surprise Package	Kit 3 Transistor Xtmrs
Kit 10 Transmit Mica Cond's	Kit 8 Xtal Osc-Blanks
Kit Glyptal & Cement	Kit 4 Asstd Rectifiers
Kit 3 Phone/Patch Xfmrs	Kit 12 Alligator Clips Astd
Kit 3 Searchlights	Kit 5 UG/Connectors
Kit 4 AN/Reflector Lites	Kit 100 Self/Tap Screws
Kit 6 Instld Tuning Tools	

KITS! *Each "TAB" Kit Contains The Finest Selection!!!!*

Kit Adj Wire Striper & Cut	Kit 20 ft RG59U Coax Cable
Kit 2 Bakelite Panels 6x12"	Kit 15 ft RG11U Coax Cable
Kit 5 pcs Wrench Set	Kit 2 pair SO239 & PL59
Kit 8 pcs Nut Driver Set	Kit 12 Binding Posts Asstd
Kit Hi Gain Xtal Mike	Kit 5 Phone Jacks Asstd
Kit 6 ea Phonoplugs & Jacks	Kit 3 Phone Plugs Asstd
Kit 25 ft Lo-Cap Mike Cable	Kit Long Nose Plier
Kit 18' Lo-Cap 2 Cond M-Cable	Kit Side Cutter Plier
	Kit 2 Xmttr Variables
	Kit 5 of 2mfd @ 600wvdc/oil

Order Ten Kits We Ship Eleven!!!

ONE EACH ABOVE KIT ONLY **99c**

TRANSISTORIZED DC POWER! HI-EFFICIENCY DC to DC to 450 VDC "TABSTAT" KIT or BUILT!

Output 450 & TAP 250VDC at up to 150 MA/Up to **70 Watts** 80% efficiency: ripple 0.2%; low idle current one amp silicon rectifiers, oil condensers, toroid transf. fused & short circuit proof. Regulation 5% at 20 to 100% load!! **Small in size! Quiet! Light wgt! Lo-priced gtd** "TABSTAT" TR1245CB built $35. **Pre-Assembled U-Build kit TR1245CK Only $30. Six V Inpt-TR645CB $35 or Kit TR645CK $30.** "TABSTAT" 250VDC @ 100MA/12V in TR1225CB **$27. Kit TR1225CK $24.** 6V inpt TR625CB **$27. Kit TR625CK $24.**

Wanted 304TL Tubes & ALL TYPES!!!

***"TAB" for NEW TRANSISTORS!**

2N38	$.98	2N442	$5.00	2N441	$3.00
2N155	3.25	2N256	1.45	2N234A	1.36
2N156	4.45	2N277	4.50	2N422	5.00
2N174	12.00	2N278	5.50	CK722	.95

**Postpaid 48 States Orders $10*

W.E. 416B Microwave Triode up to 4000 Mcs. **High Transconductance 25 to 50000 mhos** use as pre-amp. mixer or oscillator HiMu—Low Noise. (Gvt Cost $58) Tubes removed from Equipment & Tested! SPECIAL **$4 ea.**
Closing out below cost!

EIMAC SK400/403 SOCKET & CHIMNEY for 4-250, 5D22, 5D24, 4-400A (Reg. $18) **SPECIAL $9.95.**
SK500/506 SOCKET ONLY for 4-1000, 4X1000 **SPECIAL $9.**
JOHNSON 122-275 SOCKET for 4-125A/250A/400 RK48 **SPECIAL $1.60.**

***"TAB" GUARANTEED XTALS!**

HAM BAND 80 or 40Mtrs $1@
NOVICE BAND $1@
CITIZENS BAND $3@
Include 1st, 2nd, 3rd & 4th choice!
Buy Qtys Deduct 20% on $10 Orders
XTALS!
**Postpaid 48 States on $10 orders*

WE BUY! SELL & TRADE
Send 25¢ for Bonus Catalog!

it's SSB Bonus* Month at ALLIED

* this is the time to go SSB, because it's the month we give that BIG EXTRA ALLOWANCE on your old equipment toward the purchase of any hallicrafters SSB gear

HALLICRAFTERS HT-32A
Transmitter/Exciter
$695.00 *Only $10 down*

HALLICRAFTERS HT-33A
Linear Amplifier
$795.00 *Only $10 down*

HALLICRAFTERS HT-37
Transmitter/Exciter
$450.00 *Only $10 down*

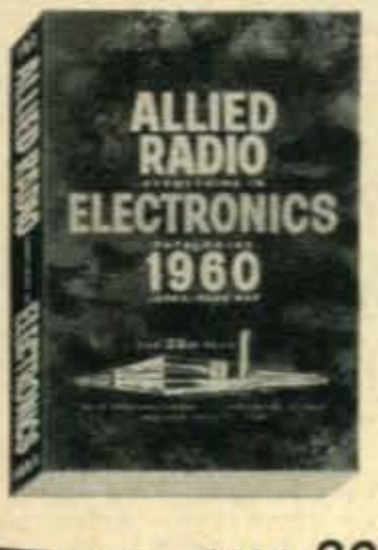
HALLICRAFTERS SX-101A
Receiver
$399.50 *Only $10 down*

15 DAY TRIAL PRIVILEGE • 90 DAY WARRANTY

EASIEST PAYMENT PLAN
on all orders over $20: only $2 down up to $50; $5 down from $51-200; only $10 from $201 up; up to 24 months to pay . . .

FOR THAT BEST DEAL
on the SSB or other equipment you want, write to Jim Sommerville, W9WHF, c/o Allied, or stop in at our ham shack and meet Joe Huffman, W9BHD, Joe Gizzi, W9HLA, Jack Schneider, W8CZE . . .

See the complete selection of SSB gear in your 1960 Allied Catalog. If you haven't a copy, write for it today.

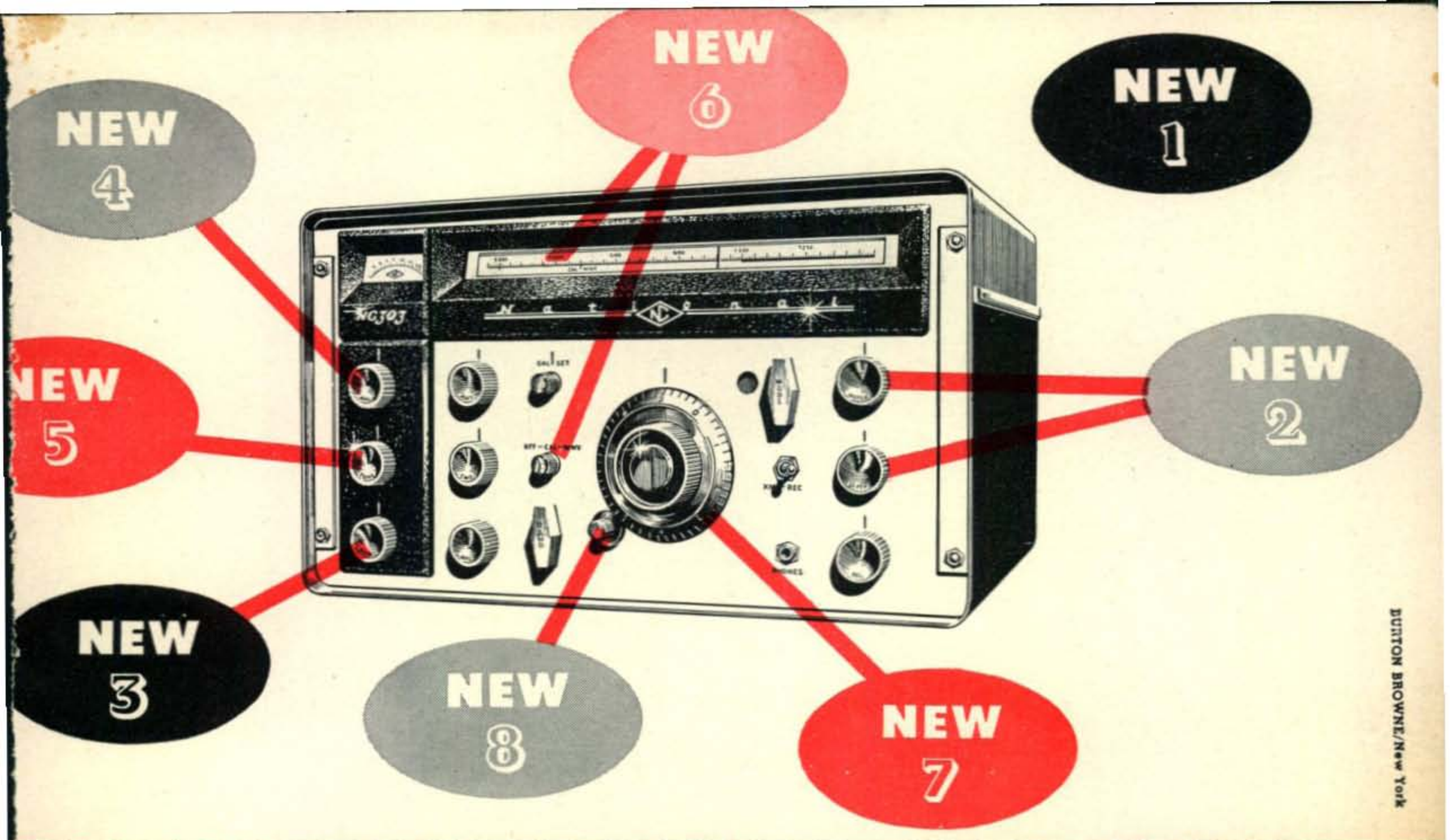


ALLIED RADIO

100 N. WESTERN AVE.,
CHICAGO 80, ILL.

our 39th year of service to Amateurs

For further information, check number 74, on page 190.



BURTON BROWNE/New York

NEW NATIONAL NC-303

NEW front panel SSB selector with exclusive, new "IF SHIFT" for instant sideband choice . . . eliminates retuning or detuning.

NEW "Q" Multiplier provides razor-sharp rejection notch (more than 60 db deep). May be tuned continuously across entire receiver passband. Separate notch frequency and notch depth controls.

NEW 5-position IF selector provides sharp, SSB-1, SSB-2, medium and broad selectivity. .5 Kc, 2 Kc, 4 Kc and 8 Kc bandwidths provide optimum selectivity for SSB, CW, phone, phone net and VHF plus sideband selection.

NEW dual noise limiters. Separate automatic noise limiters for AM. Separate double-ended manual limiter for CW and SSB.

NEW tone switch provides for attenuation of highs, lows, or both for maximum readability.

NEW exclusive WWV converter provision. No interference with dial calibration or frequency coverage. Accessory calibrator provides one microvolt sensitivity on 10 mc WWV frequency.

NEW hi-speed, 40-1 tuning dial with logging scale.

NEW fine tuning vernier dial drive provides super-precision for CW and SSB tuning.

ADDITIONAL FEATURES:

Dual conversion on all bands. Crystal controlled 2nd converter oscillator. Giant, slide-rule dial with ten dial scales covers 160 to 1¼ meters, easily readable to 2 kc without interpolation up to 21.5 mc. Exclusive converter provision for 6, 2 and 1¼ meters. Separate linear detector for SSB, will not block with RF gain full open. Giant "S" meter. Provision for external control of RF gain automatically during transmitting periods. Muting provision for CW break-in operation. Calibration reset adjustable from front panel. Socket for plug-in crystal and WWV calibrator. Accessory socket for powering converters and future accessories. Fifteen tubes including rectifier.

For further information, check number 2 on page 190.

Only $44.99 down*

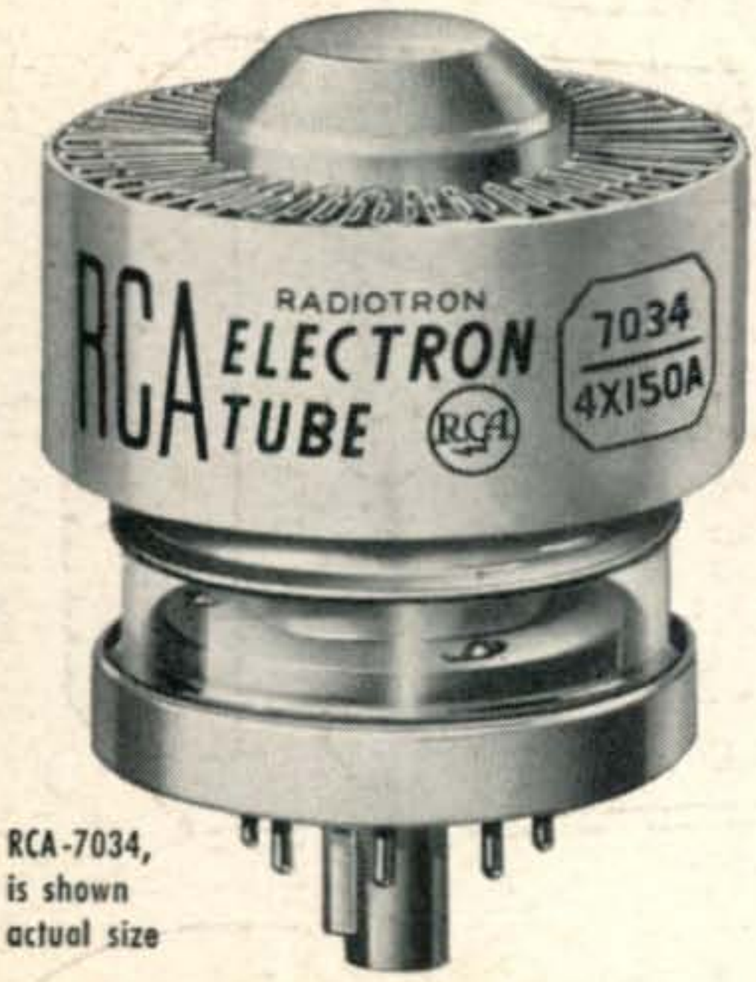
Suggested cash price: $449.00
(slightly higher west of the Rockies)
(and outside the U.S.A.)

*Most National Distributors Offer Budget Terms and Trade-In Allowances.

National

NATIONAL RADIO CO., INC.
MELROSE 76, MASS.

A wholly owned subsidiary of National Company, Inc.



RCA-7034, is shown actual size

VIKING "6N2 THUNDERBOLT"

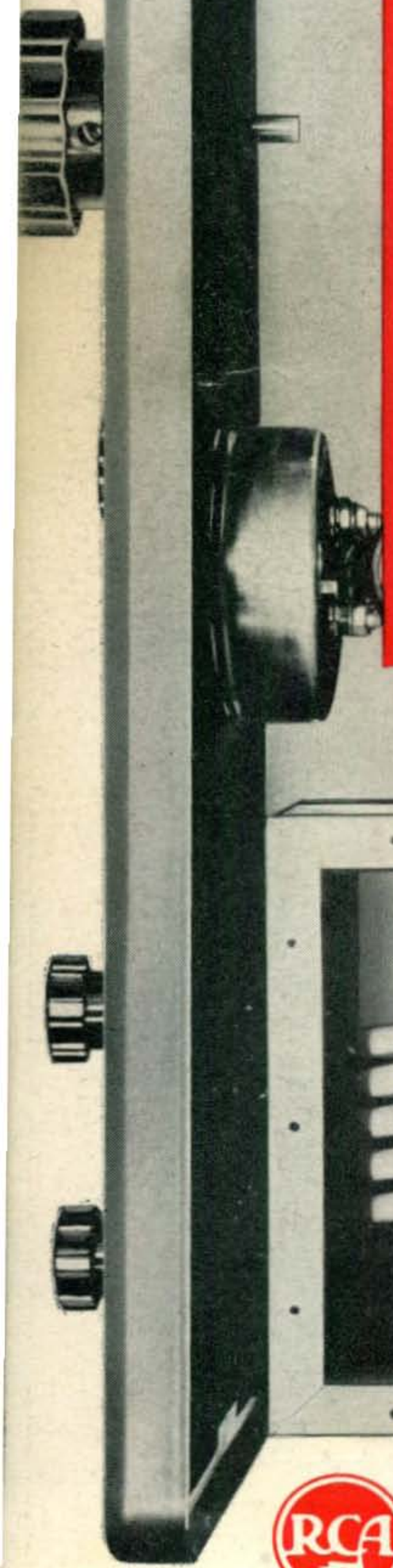
USES 2 RCA-7034 BEAM POWER TUBES

Designed by Johnson specifically for bandswitched coverage on 6 and 2 meters, the "6N2 Thunderbolt" breaks the VHF power barrier. For improved efficiency and stability in this outstanding PA, Johnson designers specified RCA-7034 coaxial-type beam power tubes.

Most powerful RCA beam power tube for its size, the RCA-7034 can take plate inputs up to 500 watts on CW, and 600 watts on SSB at frequencies as high as 150 Mc. Plate dissipation rating is 100 watts higher than for type 4X150A.

RCA-7034 is the smart choice for that new, compact rig—if you want a high power tube that can really "take it". And it's the logical replacement in that present power amplifier running 4X150A's—if you want longer "mileage" for your tube dollar (no circuit changes needed when you "switch").

RCA-7034's are available at your RCA Industrial Tube Distributor. Write RCA, Commercial Engineering, Section K-15 M Harrison, N. J., for the technical bulletin on this type.



"6N2 Thunderbolt" power amplifier showing 2 RCA-7034's in position.

Beam Power Tubes—Another RCA contribution to Amateur Communications

RCA®

RADIO CORPORATION OF AMERICA

Electron Tube Division **Harrison, N. J.**

For the name o
nearest RCA Ind
Tube Distributo
Western Union by 'phon
ber and ask for me, Opera