JUNE
1956
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CQ

RADIO AMATEURS' JOURNAL

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it's easier than you think

This could easily be a picture of *your* rig, and — just as easily — you could be enjoying the top performance in Amateur history *now*.

Collins Time Payment Plan makes it both easy and smart to work the finest SSB while taking up to 18 months to pay small monthly installments. With Collins consistently top trade-in value, your cost per day is also surprisingly low, making this a *sound* investment.

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Collins CREATIVE LEADER

IN COMMUNICATION COLLINS

There's a PR for every Service!

AMATEUR

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, permanently sealed.....**$2.95 Net**

20 Meters, PR Type Z-3

Harmonic oscillator. Low drift. High activity. Can be keyed in most circuits. Stable as fundamental oscillators. Fine for doubling to 10 and 11 meters or "straight through" 20 meter operation.....**$3.95 Net**

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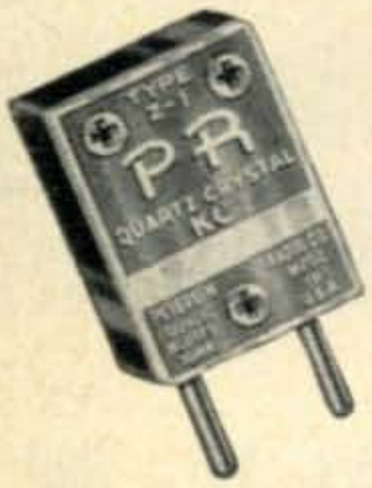

COMMERCIAL, PR Type Z-1

Designed for rigors of all types of commercial service. Calibrated .005 per cent of specified frequency. Weight less than ¾ ounce. Sealed against moisture and contamination. Meets FCC requirements for all types of service.

SPECIAL TYPES

Type Z-1, AIRCRAFT

3023.5 Kc., .005%.....$3.45 Net

Type Z-1, MARS and CAP

Official assigned transmitter frequencies in the range.

Calibrated to .005%. 1500 to 10000 Kc. $3.45 Net

Type Z-6A FREQUENCY STANDARD

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

100 Kc. . . . . $6.95 Net

Type 2XP

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

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For Lear, Narco and similar equipment operating in the 121 Mc. region, requiring crystals in 30 Mc. range.

Each . . . . . $4.95 Net

Type Z-9A RADIO CONTROLLED OBJECTS

27.255 Mc., .04% . . . $3.95 Net

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Channels 2 through 13 . . . . . $6.45 Net

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

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

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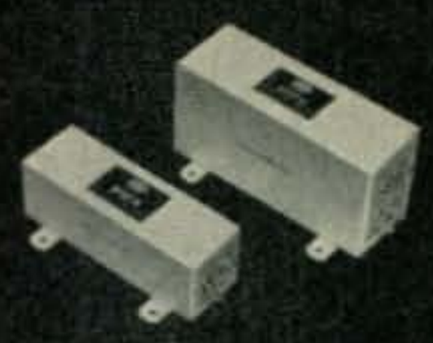
medium powered pi-network inductor



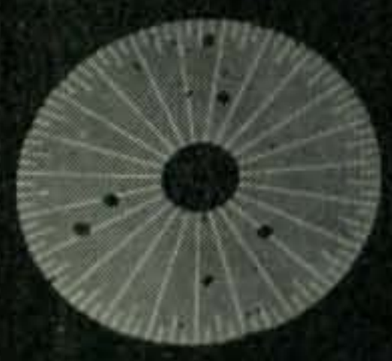
filament choke

r-f plate choke—transmitting type

insulated flexible universal shaft coupling

microphone adapter unit

tuning knobs



incremental dial plates

frequency marked dial plates

8 new quality products from B&W

MODEL 851 Medium Powered Bandswitched Pi-Network Inductor Assembly

An ultra-compact, highly efficient, integrally bandswitched pi-network inductor assembly for single or parallel tube operation 80 through 10 meters. Rated for 2000 VDC at 250 ma input SSB-CW . . . 1250 VDC at 200 ma input for AM. Minimum measured "Q" of 300.

Filament Chokes For Grounded Grid Amplifier

Broadband characteristics 80 through 10 meters. Requiring no tuning. Used with standard type filament transformers. Model FC-15 is for use with one or two tubes drawing not more than 15 amps total filament current. Model FC-30 is for one or two tubes requiring not more than 30 amps total filament current.

R-F Plate Choke—Transmitting Type

Ideal for parallel or series fed circuits. High quality grooved steatite form. Operates 80 through 10 meters. Rated for 2500 VDC at 500 ma.

Insulated Flexible Universal Shaft Coupling

Model 5300 permits a maximum of 30° angular as well as $\frac{1}{8}$" axial misalignment of two opposing shafts. One shaft may be above ground potential. 15,000 volt silicone glass insulation.

Microphone Adapter Unit

Provides all necessary circuitry for switching a single microphone and push-to-talk features on transmitter-SSB generator combinations.

Use Model 51MCA with B&W 5100-5/51SB-B
Use Model 51MCA-B with B&W 5100/51SB
Use Model 51MCA-C with Collins 32V/B&W 51SB

Tuning Knobs

Satin-etched, machined aluminum knobs dress up any piece of equipment . . . give it a professional appearance. Four sizes available, one plain, three skirted. Models 900-903.

Incremental Dial Plate

Just right for indexing any rotating knob. Highly attractive. Marked with white lines over soft grey finish. $3\frac{1}{4}$" diameter. Model 3828.

Frequency Marked Dial Plates

Ideal for use with B&W turret assemblies and other bandswitched assemblies. Measuring $2\frac{1}{4}$" in diameter, each is marked with five band positions.

Model 3818 is marked 3.5—7—14—21—28
Model 3819 is marked 160—80—40—20—10
Model 3829 ($3\frac{1}{2}$" diameter) is marked 3.5—7—14—21—28

Write for literature, or see these fine products on display at your distributor's

B&W

BARKER & WILLIAMSON, INC.
237 Fairfield Avenue, Upper Darby, Pa.

Vol. 12, No. 6 **CQ, The Radio Amateurs' Journal** June, 1956

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HEATHKIT

DX-100

PHONE AND CW

transmitter

KIT

FEATURES

Design proven through actual signal reports.

★

Only top-quality components used throughout.

★

5-point TVI suppression, and pi network output to match 50 to 600 ohms.

★

Detailed construction manual for simplified assembly.

★

100 watts output on 160, 80, 40, 20, 15, 11, and 10 meters.

★

Attractive and functional physical design.

The Heathkit Model DX-100 Transmitter is rapidly becoming the "standard" ham rig in its power class. The high quality and outstanding performance it offers can be matched only in equipment costing many dollars more. It features a built-in VFO, modulator, and power supplies, and is bandswitching for phone or CW operation on 160, 80, 40, 20, 15, 11, and 10 meters. The kit includes a detailed construction manual, the cabinet, all tubes, prewound coils, and all other parts necessary for construction.

Push-pull 1625 tubes are used to modulate parallel 6164 tubes for RF output in excess of 100 watts on phone, and 120 watts on CW. May be excited from the built-in VFO or from crystals. Features pi network output circuit, illuminated VFO dial and meter face, and 5-point TVI suppression. High grade, well-rated parts supplied. Schematic diagram and technical specifications on request.

MODEL DX-100

$189.50

Shpg. Wt. 107 Lbs.

Shipped Motor Freight unless otherwise specified. $50.00 deposit required on all C.O.D. orders.

HEATHKIT

antenna coupler

KIT

MODEL AC-1

$14.50

Shpg. Wt. 4 Lbs.

In addition to matching a low power transmitter to an end-fed long wire antenna, this antenna coupler incorporates a 3-section low-pass filter, to attenuate output above 36 mc and reduce TVI. Handles up to 75 watts, 10 through 80 meters. 52 ohm coaxial input—tapped inductor and variable capacitor—neon RF indicator. Ideal for use with the Heathkit AT-1 Transmitter.

HEATHKIT

grid dip meter KIT

The Model GD-1B is a time-proven instrument. It will enable you to accomplish literally hundreds of jobs on all types of equipment. Frequency range is from 2 mc to 250 mc. A 500 ua meter is employed for indication, and a sensitivity control and headphone jack are provided. Includes pre-wound coils and rack. Indispensable for the ham, serviceman, and engineer. Extra coils available to extend frequency down to 350 kc.

MODEL GD-1B

$19.50

Shpg. Wt. 4 Lbs.

HEATHKIT

antenna impedance meter KIT

Used with an RF signal source, the AM-1 will enable you to match your antenna-receiver-transmitter system for optimum operation. Will double as a phone monitor or relative field strength meter. Uses 100 ua meter, and covers 0 to 600 ohms. Frequency to 150 mc.

MODEL AM-1

$14.50

Shpg. Wt. 2 Lbs.

HEATH COMPANY

A Subsidiary of Daystrom, Inc.

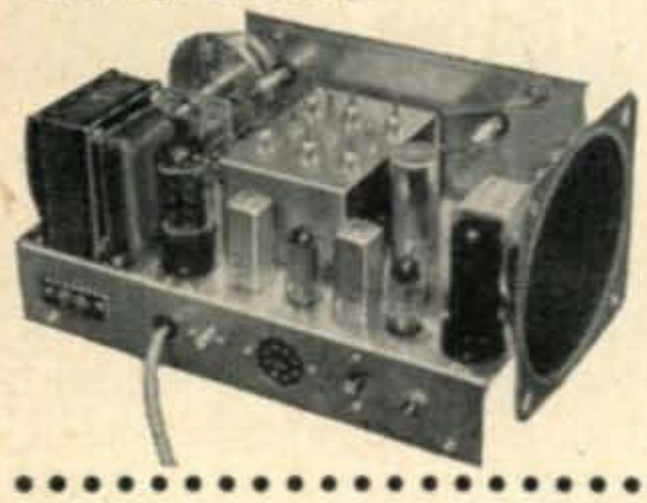
BENTON HARBOR 12, MICHIGAN

HEATHKIT communications-type all band receiver KIT

Slide-rule dial —electrical bandspread—ham bands marked.

Slug-tuned coils and efficient IF transformers for good sensitivity and selectivity.

Transformer-operated power supply for safety and high efficiency.



The Model AR-3 receiver features new high-Q slug-tuned coils, new layout, and new-type IF transformers. The result is high sensitivity and selectivity and better image rejection on all bands.

Transformer-type power supply, electrical bandspread, RF and AF gain controls, antenna trimmer, AGC, BFO, headphone jacks, socket for Q multiplier, 5½" PM speaker and illuminated dial.

SPECIFICATIONS:

Frequency Range—550 kc to 30 mc on four bands.
Tube Complement—1—12BE6 oscillator and mixer • 1—12BA6 IF amplifier • 1—12BA6 second detector, AVC, first audio amplifier and reflex BFO • 1—12A6 beam power output • 1—5Y3 full wave rectifier

$27.95 *(Less Cabinet)*
• MODEL AR-3
Shpg. Wt. 12 Lbs.

CABINET: Fabric-covered cabinet available. Includes aluminum panel, speaker grille, and protective rubber feet. Measures 12¼" W. x 6¾" H. x 7¾" D. No. 91-15. Shpg. Wt. 5 Lbs. **$4.50.**

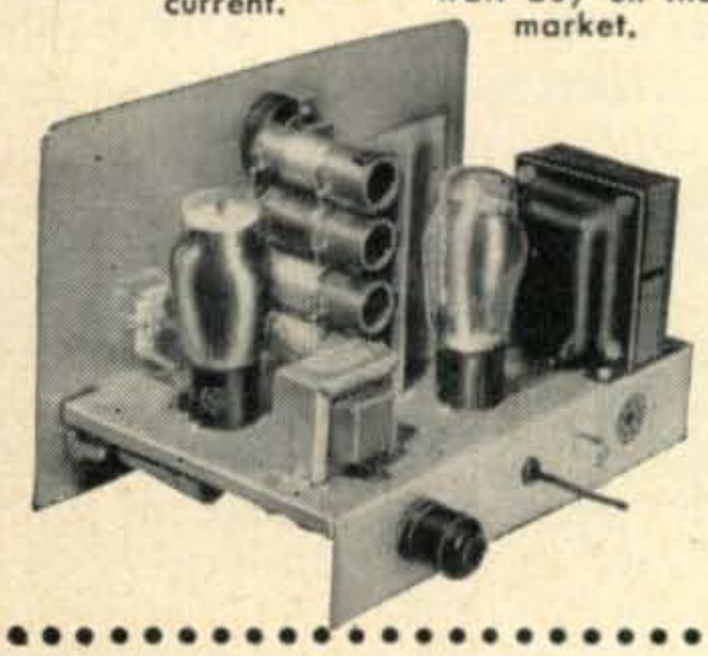
HEATHKIT CW amateur transmitter KIT

Single-knob bandswitching for 80, 40, 20, 15, 11, and 10 meters.

Panel meter monitors final grid or plate current.

Plate power input 25-30 watts.

Best dollar-per-watt buy on the market.



The AT-1 is complete with its own power supply, and covers 80, 40, 20, 15, 11, and 10 meters with single-knob bandswitching. Designed for crystal or external VFO excitation. Incorporates key-click filter, line filter, copper plated chassis, pre-wound coils, 52-ohm coaxial output, panel meter, and high quality components throughout. Easy to build, even for the beginner. Employs 6AG7 oscillator and 6L6 final. Up to 30 watts power input.

$29.50
• MODEL AT-1
Shpg. Wt. 15 Lbs.

SPECIFICATIONS:

RF Amplifier Power Input	25-30 watts
Output Connection	52 ohms
Band Coverage	80, 40, 20, 15, 11, 10 Meters
Tube Complement:	
5U4G	Rectifier
6AG7	Oscillator—Multiplier
6L6	Amplifier—Doubler

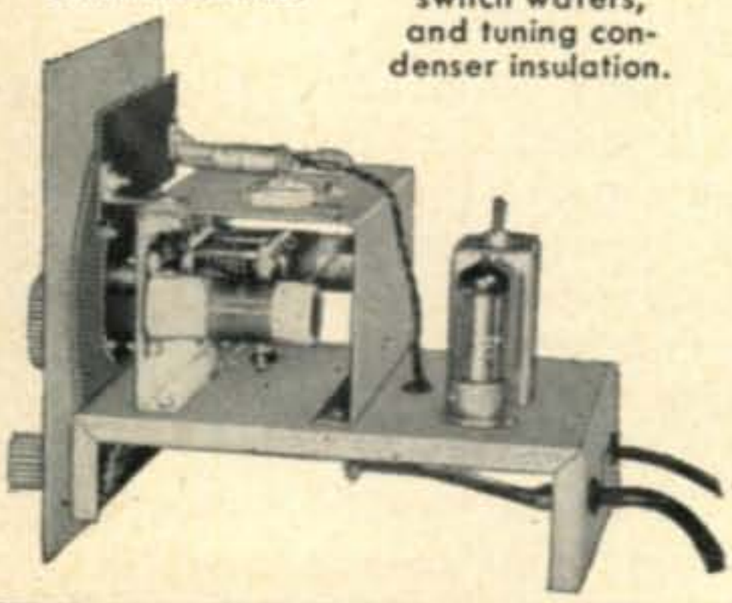
OA2 voltage regulator tube for stability.

Covers 160-80-40-20-15-11-10 meters.

Smooth-acting, illuminated and pre-calibrated dial.

6AU6 electron-coupled Clapp oscillator.

Copper plated chassis—aluminum case—profuse shielding—ceramic coil forms, switch wafers, and tuning condenser insulation.



HEATHKIT vfo KIT

The Model VF-1 features illuminated and pre-calibrated dial scale. Cable and plug provided to fit the crystal socket of any modern transmitter. Covers 160-80-40-20-15-11 and 10 meters with 3 basic oscillator frequencies. Better than 10 volt average RF output on fundamentals. Derives operating power from transmitter power supply. Has VR tube for stability. Go VFO for more operating enjoyment.

MODEL VF-1

$19.50

Shpg. Wt. 7 Lbs.

SPECIFICATIONS:

Output Frequencies—1750-2000 kc, 7000-7425 kc, 6740-6808 kc. **Calibrated Bands**—160-80-40-20-15-11-10 meters. **Tube Compliment**—6AU6 Oscillator OA2 Voltage Regulator. **Power Requirements**—250-350 VDC @ 15-20 ma. and 6.3 VAC @ .45 A.

ORDER DIRECT FROM THIS AD . . . OR WRITE FOR FREE CATALOG. Describes more than 65 interesting "build-it-yourself" projects. Amateur equipment, hi fi amplifiers, and the complete Heathkit line of test instruments. Get yours today!

HEATH COMPANY
A Subsidiary of Daystrom, Inc.
BENTON HARBOR 12, MICHIGAN

Feenix, Ariz.

Deer Hon. Ed:

Cupple weeks ago Scratchi are opening big mouth and putting Hon. Foots in it. Natchy-ourally I are sorry that I not coming out on top, but also hole thing are making me a little sad. It are reely the story of the O.T. versus the Y.F.—the Old Timer versus the Yung Fellers.

It all getting started one evening at amchoor club meeting. Scratchi been sitting there, taking it all in. Heering talk from some brite yung geenyus from local communicayshun lab who telling how Hon. Tran Sisters going to making it easy to having Arizona Kilowhat rigs in vest pocket.

Also having yung feller there from univer-sity who explaneing all abouts new develop-ments in reseever designs, and according to him, in another few yeers anybuddys can re-seeving any kind signals from almost any-wheres.

Next item of busyness are discussion on How to Getting More Answers to Our Call and How to Working More Dee-X. This are point where Scratchi desiding that enuf are enuf, so I asking for floor.

Boy oh boys, are I telling them. I pointing out that yung amchoors these days aren't in-trusted in knowing how to working more stayshuns, even tho they saying they are. All these yung fellers doing is trying to add every newfangled idea that coming along to there rigs and reseevers.

Everytime sumbuddy riting artickle on how to getting another two-tenths dee-b better noise figyour on reseever, they ripping out reseever front ends and re-wiring reseever sircut. I tell-ing them that if they spending less times trying to re-bild there equipment, and more time try-ing to lerning how to being good operators, then they having good chance to getting more answers to there calls, and much better chance also to working more dee-x.

I even going so far as to telling them that a reel good amchoor operator could taking old-time amchoor geer and running rings around the average yung amchoor with all his fancy cromeplated reseevers and sooper-doop-er xmitters. It are at this point that all the

NOW... MODEL SX-100
SELECTABLE SIDE BAND RECEIVER
BUILT TO THE SPECIFICATIONS OF 1,000,000 FIELD EXPERTS
See it at Your Jobber—only $295.00

Hallicrafters 22 years of production know-how, the engineering experience of developing over 100 different major receiver designs, plus the advice of over 1,000,000 field experts operating Hallicrafters receivers all are combined to bring you this outstanding new receiver—the SX-100! Hallicrafters alone, long recognized as the leading designer and manufacturer of quality communications equipment, can offer you the dependability and performance of this great new SX-100 at the amazingly low price of just $295.00.

Look at these features you enjoy with the SX-100 . . . before, they were available only on receivers costing a great deal more!

1. SELECTABLE SIDE BAND OPERATION.
2. "TEE-NOTCH" FILTER—This new development provides a stable non-regenerative system for the rejection of unwanted hetrodyne. The "Tee-Notch" also produces an effective steepening of the already excellent 50 KC i.f. pass band (made famous in the SX-96) and further increases the effectiveness of the advanced exalted carrier type reception.
3. NOTCH DEPTH CONTROL for maximum null adjustment.
4. ANTENNA TRIMMER.
5. PLUG IN LABORATORY TYPE EVACUATED 100 KC QUARTZ CRYSTAL CALIBRATOR—included in price.
6. LOGGING DIALS FOR BOTH TUNING CONTROLS.
7. FULL PRECISION GEAR DRIVE DIAL SYSTEM.
8. SECOND CONVERSION OSCILLATOR CRYSTAL CONTROLLED—greater stability through crystal control and additional temperature compensation of high frequency oscillator circuits.

Controls

Pitch Control
Reception
Standby
Phone Jack
Response control (upper and lower side band selector)
Antenna Trimmer
Notch Frequency
Notch depth
Calibrator on/off
Sensitivity
Band Selector
Volume
Tuning
AVC on/off
Noise limiter on/off
Bandspread
Selectivity

hallicrafters
CHICAGO 24, ILLINOIS

Model SX-100. *Amateur Net* $295.00
Matching R-46B Speaker $17.95
***Frequency Range* 538kc-1580 kc**
1720 kc-34 mc

[*from page 6*]

yung fellers are jumping on me. They telling me that they will taking me up on my statement.

So, I find myself appointed as champeen of the old-time operator. Are having to bild old-time amchoor stayshun and then having contest with new amchoor using all the latest geer. Not one to be outdone by a bunch of yung fellers, Scratchi are starting off in high speerits.

First thing I doing is digging deep into junk-pile and unerthing old favorite see-w reseever of mine. Hon. Ed., are you recalling old FB-7 reseever. Man, some of sweetest see-w signals I ever heering coming out of that reseever. I getting it all cleaned up, dusting off plug-in coils, testing toobs to make sure they good, and putting it together.

The xmitter and antenna are harder. I having to bild them. The rig are copy of one I having long time ago. It are crisstal-controlled, though. Using tipe 53 ossilator and dobbler, with first triode secshun as ossilator. It are driving a tipe 76 newtralized buffer, which are driving pair push-pull 42's, also newtralized. Remembering how we twisting wires together, then snipping them off, a little at a time, to newtralizing? Well, that's how I doing it.

Hole rig are mounted on piece of wood, with cathode meter and key jack and all tooning condensers mounted on little metal brackets. After spending one hole evening tooning it up, it putting out reel slicky signal.

For antenna I deciding to using a Zepp. In case you not remembering it, Hon. Ed., you just have to looking it up in book. Only trubble having are finding six-inch long insulators, but finally making them from wood and boiling them in parrafeen. That weekend I getting shorting bar on feeder and tapping above it with a-c line, which bringing into shack and cuppling to link on final coil. Seeming to load up hunky-dunky.

Contest are starting next day, on Munday, from 7 p.m. until midnites every nite for a week. First nite I doing pretty good, and not paying much attenshun to other fellow I working aganst. I using cupple diffrunt crisstals, and moving around band, working peeples in one spot, and then another. After working one spot awhile, howsumever, I finding that can't working amchoors more than few kaycees away from that spot.

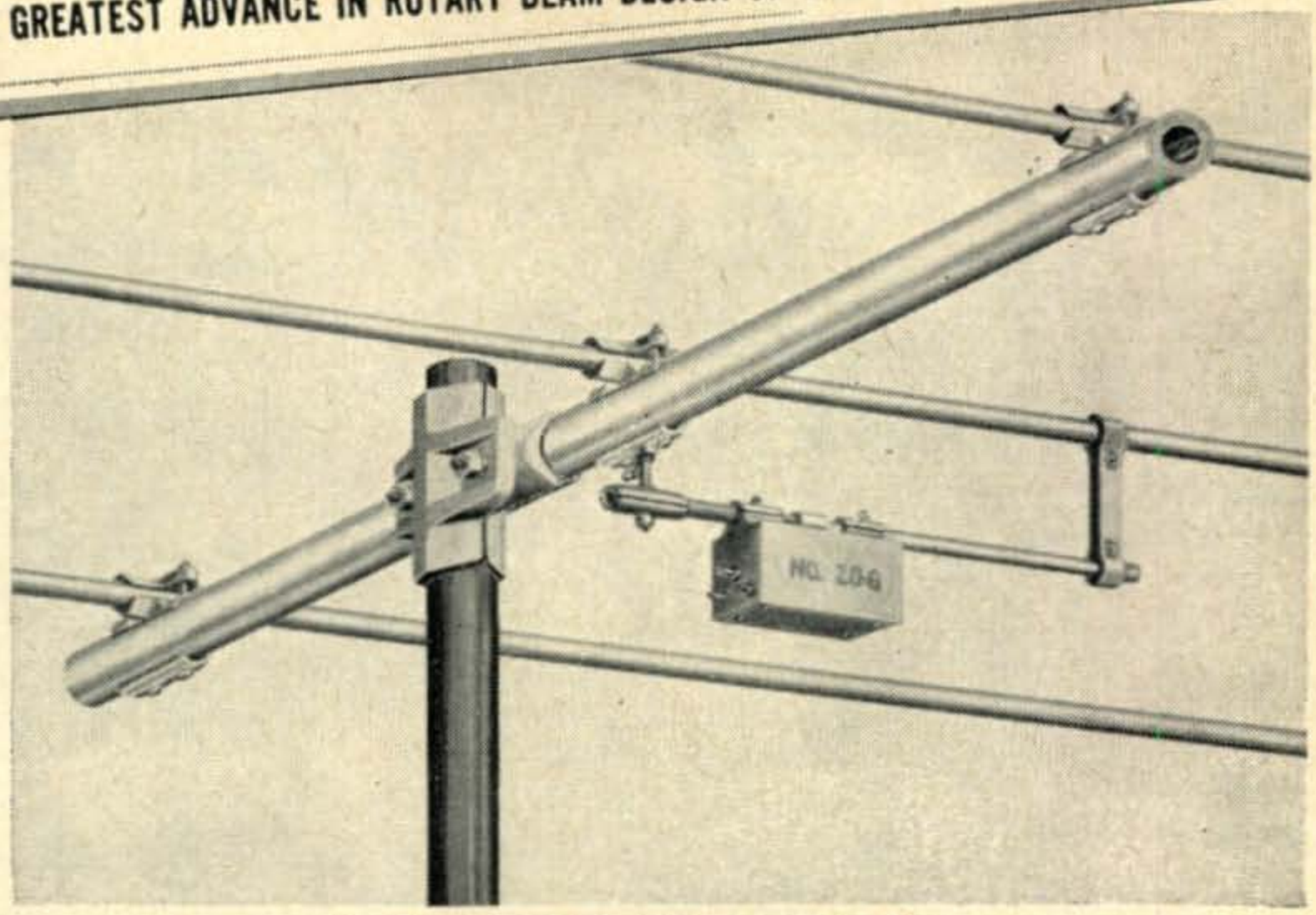
It are middle of next nite I reelizing that the jig are up. It are when I heering the yung feller with his sooper-dooper VFO moving up and down band, working stayshuns like crazy. It weren't that he were particqyoularly a good operator. It were just that he could putting signal where other amchoor was listening. When I getting chance I braking in on him and telling him he can stop using up the am-

[*continued on page 127*]

1956

FACTORY TUNED
PLYTUBULAR BEAMS

THE GREATEST ADVANCE IN ROTARY BEAM DESIGN OF THE PAST 20 YEARS



PLYTUBULAR CONSTRUCTION is a process developed by TENNALAB whereby close tolerance 61ST aluminum tubing of telescoping sizes are fabricated together into booms and elements having multi-ply walls for greater strength, less vibration and smaller size.

- GREATER STRENGTH
- LESS WEIGHT
- LESS VIBRATION
- LESS ICE LOADING
- LESS WIND DRAG
- UNITY MATCH (72 or 52 OHM COAX)
- HIGH GAIN
- HIGH FRONT TO BACK
- SHARP PATTERN

Full Size Beams for Full Size Signals!

PRICES, WEIGHTS, BOOM LENGTHS
*(Other Spacings Custom Built)

	Boom* Length	Actual Weight Lbs.	Shipping Weight Lbs.	AMATEUR NET
SINGLE BAND— With One No. 20G Reactance Tuned Coax Gamma				
No. 2L-20RG—2 Element 14 megacycle beam	12'-0"	27	38	$ 67 50
No. 3L-6RG —3 Element 50 megacycle beam	4'-10¾"	12	17	37.50
No. 3L-10RG—3 Element 28 megacycle beam	8'-6½"	18	22	55.00
No. 3L-15RG—3 Element 21 megacycle beam	11'-5½"	24	35	65.00
No. 3L-20RG—3 Element 14 megacycle beam	17'-½"	43	55	107.50
No. 5L-6RG —5 Element 50 megacycle beam	8'-6¾	17	23	65.00
No. 5L-10RG—5 Element 28 megacycle beam	15'-1"	29	40	107.50
No. 5L-15RG—5 Element 21 megacycle beam	20'-4¾"	39	58	157.50
No. 5L-20RG—5 Element 14 megacycle beam	28'-0"	82	100	225.00
TWO BAND—Interlaced On One Boom With Two No. 20G Reactance Tuned Coax Gammas				
No. 6L-1015RG—6 Element Beam—3/28 mc - 3/21 mc	11'-5½"	34	50	105.00
No. 6L-1020RG—6 Element Beam—3/28 mc - 3/14 mc	17'-½"	54	72	157.50
No. 6L-1520RG—6 Element Beam—3/21 mc - 3/14 mc	17'-½"	57	75	165 00
THREE BAND—Interlaced On One Boom With Three No. 20G Reactance Tuned Coax Gammas				
No. 9L-101520RG—9 Element Beam 3/28 mc - 3/21 mc - 3/14 mc	17'-½"	67	86	217.50
No 20G—Reactance Tuned Coax Gamma With Insulator and Universal Element Clamp		2	4	14.95

(Specify Band as No 20G-14, No. 20G-21, No. 20G-28 or No. 20G-50)

PLYTUBULAR BEAMS ARE ALSO AVAILABLE FOR COMMUNITY SYSTEM TV AND OTHER COMMUNICATION SERVICES

GAIN—F/B—PATTERN—When properly installed results as shown below may be expected at the average installation varying slightly with height above ground, surrounding objects, etc.:

ELEMENTS	GAIN	F/B	PATTERN
2	5 db	15 db	48°
3*	8 db	24 db	30°
5	12 db	28 db	28°

*Interlaced models for 2-band and 3-band operation will differ slightly from these figures but interaction will be less than if separate beams were installed on separate towers on an average city lot.

VIBRATION—More beams are weakened by vibration than from any other cause. The dampening effect of PLYTUBULAR CONSTRUCTION reduces vibration and the resultant crystallization to a minimum.

SWR—ALL TYPE RG TENNALAB PLYTUBULAR BEAMS are equipped with the No. 20G Reactance Tuned Gamma for unity matching of coax line to powers up to 1 kw phone.—See above if No. 20G is desired separately for your present beam. Tuner is sealed in cast aluminum weatherproof case, complete with insulator and universal gamma to element clamp. Either 52 ohm or 72 ohm coax may be used but 72 ohm line is recommended.

TUNING—No element tuning is required. The half wave elements are factory tuned for operation over the entire band. PLYTUBULAR BEAMS are finished products. Just set the match, adjust the reactance tuner and QSO!

TENNAKITS

COMPLETE WITH T/GAMMA FOR 300, 72 or 52 OHM MATCH

Although TENNALAB'S principal function is the building of complete antennas of the very highest quality, we also desire to be of service to the amateur who desires to build his own beam.

In capable hands a TENNAKIT can be finished into a fine Standard quality beam excelled only by TENNALAB'S PLYTUBULAR CONSTRUCTION.

TENNAKITS are complete with aluminum castings, bolts, nuts, insulator, etc. No cutting - - - just telescope to length, drill, fasten and assemble.

	AMATEUR NET
No. 302 3 Element 2 Meter	$ 5.25
No. 502 5 Element 2 Meter	7.50
No. 306 3 Element 6 Meter	17.50
No. 506 5 Element 6 Meter	27.50
No. 310 3 Element 10 Meter	29.95
No. 510 5 Element 10 Meter	49.95
No. 315 3 Element 15 Meter	34.50
No. 515 5 Element 15 Meter	59.95
No. 220 2 Element 20 Meter	59.95
No. 320 3 Element 20 Meter	74.50

.058 61ST6 telescoping tubing 1⅛" to ½"-in stock, prices upon request.

A COMPLETE LINE OF VERTICALS READY SOON!

SEE YOUR DISTRIBUTOR OR WRITE

TENNALAB - QUINCY, ILLINOIS

EDITORIAL
WAYNE GREEN

. . . de W2NSD

NEVER SAY DIE

July Behemoth CQ

Since July is normally a rather slack month, what better time to put out a monster December issue of *CQ*? While this whim may in some degree stem from a natural tendency to grab people by the short hair whenever they are at a disadvantage, it also will get me out from under quite a load of manuscripts that are backing up for publication. You've had your warning, at any rate. Get that soldering iron in hand and open up the parts box for you have only thirty days left to get prepared for the massive jumbo behemoth gigantic 128-page July *CQ* (wow!)

Slave Laborers Needed

Hardly a week goes by that some sort of project doesn't raise its ugly head and require the services of a development engineer. If there happen to be any experienced hams reading this obscure paragraph, and they

John Fulmer, W4HAV, corners Bill Halligan, W9AC, during the Dayton SSB Dinner.

happen to live within walking distance of New York I might be able to steer a few rasbuckniks their way plus all sorts of fame and recognition (A reference to your latest article in *CQ* makes a terrific conversational opening). We have all sorts of dirty work available, from the testing of new products to the construction of absurd gadgets. Who will be the first to run tests on the new Heath do-it-yourself Electric Chair kit?

The Dayton Hamvention

Hamfest managers and convention planners had best drop everything and get in touch with the Dayton group. The yearly gathering in this Ohio town of about 300,000 pop. runs to about 2000, making it one of the biggest

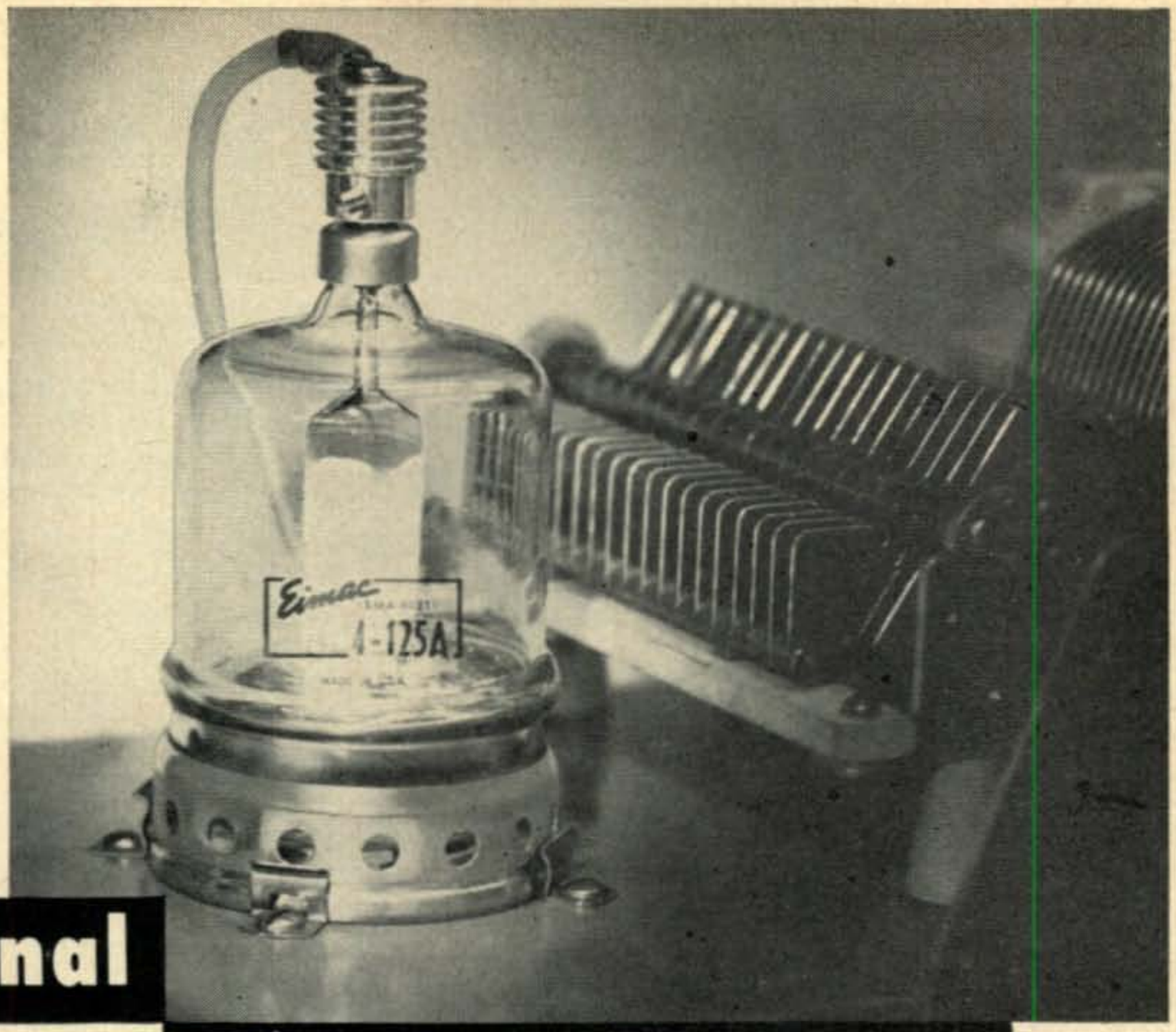
Walt, W8ZCV, with his ten and twenty meter rotary beams.

conventions in the country hamwise.

Doings started Friday afternoon with the arrival of *CQ's* first line shock troops, Jim and myself, to spellbound weakwilled country boys into long-term subscriptions to *CQ*. Just as the last stages of starvation were weakening my sales pitch the SSB Dinner set in. The natural ringing in my ears demodulates the upper sideband just fine so I was able to talk with a few of the twenty-meter gang. Seating for the dinner was apparently arranged with the important people in the middle, the well known further out, and the rest of us in the fringe area.

Most everything happened on Saturday. There were technical talks, hidden transmitter hunts, demonstrations of new equipment, and prizes (neither Jim nor I won any prizes, thereby maintaining our excellent past record in this matter). The *Drake* six-meter filter got

W2NSD high pressuring for subscriptions.



A Big Signal The Easy Way...

Eimac 4-125A
Radial Beam Power Tetrode

TYPICAL OPERATING CONDITIONS

	CW	AM	SSB
Plate Voltage	2500v	2500v	3000v
Driving Power	3.8w	3.3w	0w
Power Input	500w	380w	315w

It takes a big signal to get out consistently. At 500 watts CW, an Eimac 4-125A handles the kind of power required to stay in there when the going gets rough.

No need for special or tricky circuits. If you prefer a transmitter stripped of ornaments, an oscillator will drive an Eimac 4-125A in one of the easiest and simplest amplifiers that can be built. And, your Eimac 4-125A will reward you with more watt-hours per dollar — year after year.

If you're having trouble cutting through the big signals, there's only one thing to do — don't fight 'em, join 'em. Buy an Eimac 4-125A.

For more information on the 4-125A, see your distributor or write to our Amateurs' Service Bureau.

Be sure to visit the ARRL National Convention at San Francisco, July 6-7-8.

Eimac

EITEL-McCULLOUGH, INC.
SAN BRUNO, CALIFORNIA
The World's Largest Manufacturer of Transmitting Tubes

me all excited and looks like *the* answer to our 6M TVI miseries. W4HHK gave an interesting talk and showed slides of some of the fancier VHF antennas around the country. W1FZJ managed to get himself banged up a bit while plowing out his driveway (about ½ mile long) and had to stay home. W1RUD subbed for him and explained what is in the wind as far as moon bounce two-meter work is concerned. Read the VHF column for more on that.

The climax of the meet was the Banquet. Imagine 1000 hams all eating soup at one time! Afterward there were the usual veddy formal speeches, with a sparkling and humorous keynoter by John Reinartz. I get stage fright when I talk to any number over six people so you can imagine how paralyzed I was when I was called upon for a few (please keep it short) words.

On Sunday Jim and I drove down to Waynesville to visit Walt Burdine, W8ZCV, our Novice Editor. When we arrived Six Meters was wide open with stations pouring in from all over the east coast, a really fantastic opening. I've heard and worked a lot of six-meter openings, but I've never heard anything like *that* before. By the time I got back home to Brooklyn that night there was nothing left but a few locals bragging about all the DX they had worked. Wonder if Six will ever do *that* again?

CQ VHF Contest

With high hopes and trepidations I waited our first try at running a VHF contest. Would the fellows support it? Would our new scoring system work out? Would we have good conditions? And a thousand other worries. If only we could have had that six-meter band opening one week later! When the contest finally got started I was surprised and pleased to observe all the heated activity. By the time the contest was over, several of the gang around the New York area had run up remarkable scores, some with over 200 contacts. This was particularly remarkable since band conditions were absolutely terrible. With even a slight band opening we normally hear Hartford and Rhode Island. Not a peep!

The one great saving event was several hours of pretty good aurora. Using this great umbrella I was able to work Maine, Vermont, Massachusetts, Rhode Island (Sam—portable), Maryland, Western New York, Ontario, Ohio, Michigan, and Illinois. Some of the gang with better equipment hooked Wisconsin and Indiana too. This was my first brush with aurora on Two Meters and I found it very exciting. I imagine that a lot of the fellows out in the midwest managed to work more than my 46 counties; we shall see.

[*continued on page 127*]

Small, highly efficient

MOBILE RECEIVER

—full fledged, 12 tube, all-band, mobile or fixed station

Power Packs Available:

6-12 VDC
12 VDC
*** 110 VAC**

** (includes speaker and "S" meter all in one matching package)*

KE-93

now delivering
5" High, 6" Wide, 9" Deep

- Field performance fully comparable to big table models.
- 7-band turret, 10 meters thru broadcast.
- New, advanced noise elimination circuits.
- Dual conversion, crystal controlled.
- Pulls in and holds weak stations.
- 3 KC selectivity, under 1 microvolt sensitivity.

You asked for it . . . here it is:

New MARS frequency coverage on all standard amateur models— at no additional cost

Band #1	550	—	1650 KC
Band #2	1650	—	3500 KC
Band #3	3500	—	4030 KC
Band #4	6990	—	7310 KC
Band #5	13970	—	14360 KC
Band #6	20990	—	21450 KC
Band #7	27950	—	30000 KC

Watch for announcement of our new matching transmitter — REVOLUTIONARY!!

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Write for literature

Letters . . . to the editor

Novice Q'5er

Sirs:

My introduction to *CQ* Magazine was through the article on building a Q'5er, by Donald L. Stoner, in your January issue.

This type of article I want—so here's a subscription for 2 years.

The Q'5er article contained an error* which caused me to do some studying and inquiring before I wound up with a really fine receiver. This is good for me because I learned more about radio from this one thing than from any other activity so far. This Q'5er is even better than you claim! !

Now if I can overcome the stage fright whenever someone answers *my* CQ I'll have it made, hi.

A Green New Ham
M. C. Robinson

**March '56, p. 36.*

Dear Ed:

I recently completed the Novice Q5'er (*CQ* January, 1956) and would like to pass along an idea that may help others interested in this converter.

As this xtal converter was described by W6TNS an RF stage and a Mixer were fed into a BC-453 to make a very stable receiver for 80 and 40 Meters. Separate crystals were used for each band. I discovered that by using an active 3500-kc crystal that I could cover the phone portions of not only 80 and 40 but 20 Meters as well. To accomplish this the RF and Mixer coils were hand wound and grid dipped so that 20 Meters tuned at minimum capacity of the variable condenser. 40 Meters will be found at about half capacity and 80 Meters at approximately full capacity. The coils used here were wound on ½" forms of old IF transformers and comprised 20 turns of 26 wire. The crystal evidently doubles to 7000 kc for 40 Meters and quadruples to 14000 kc for 20 Meters.

The frequencies covered by my conversion are as follows:

	3500	plus 190— 3690 kc	}	for 80
	3500	plus 550— 4050 kc	}	
3500 x 2	7000	plus 190— 7190 kc	}	for 40
	7000	plus 550— 7550 kc	}	
3500 x 4	14000	plus 190—14190 kc	}	for 20
	14000	plus 550—14550 kc	}	

As you can see I am interested in only the phone bands. An antenna condenser of 100 $\mu\mu$fd (Variable) was connected in series with the grounded end of the antenna coil.

Thus we have a 3-band receiver without a band switch and with stability that will enable single-sideband reception on even the 20-meter band. In the conversion here, AVC, Audio control and RF controls were added to the BC-453. Not only is this a fine receiving set up for the fixed station but an excellent receiver for mobile use.

Fred Nazar, W8RNA
14424 Camden, Detroit 13, Mich.

Separate Power-Supply Fusing

Dear Mr. Green:

This is being sent in the desire to help others avoid the troubles encountered in regard to the following experience.

This information particularly should be a real service to the thousands of owners of Viking I, II and DX-100's.

The transmitter of a friend of mine and my own went up in smoke within six days of each other. Although both were different makes they met their demise though, strangely enough, through the same chain of circumstances. A fore-warning can save others of a similar fate. Believe me, that seeing your favorite piece of gear go up in smoke is no fun. Briefly, here is the reason for the trouble and a simple and inexpensive way of preventing it.

Both transmitters are adequately fused during the actual time on the air, however, during standby periods,

[*continued on page 16*]

Introducing another NEW Viking transmitter the... **"Valiant"**

Bandswitching 160 through 10 meters . . . 275 watts input CW and SSB* . . . 200 watts AM!

*with auxiliary SSB exciter

HERE'S EXCITING NEWS! Another new Viking . . . the "Valiant." This compact transmitter gives you outstanding flexibility and performance . . . power to punch through terrific QRM! The "Valiant" may be operated by built-in VFO or crystal control . . . VFO is temperature compensated and extremely stable — operates in the 1.75 to 2.0 mc and 7.0 to 7.45 mc ranges.

High efficiency pi-network tank circuit matches antenna loads from 50 to 600 ohms . . . tunes out large amounts of reactance — final tank coil is silver plated. Other features: complete TVI suppression; timed sequence (grid block) keying; high gain push-to-talk audio system; low level audio clipping; built-in low pass audio filter; self-contained power supplies and single control mode switching.

As an exciter, the "Valiant" will drive any of the popular kilowatt level tubes and will provide a high quality speech driver system for high power modulators. A nine pin receptacle on the rear of the transmitter permits the "Valiant" to be used as a filament and plate power source, and also as a modulator for auxiliary equipment such as a VHF transmitter.

The Viking "Valiant" is available completely wired and tested or as an easy-to-assemble kit. Cabinet is finished in attractive maroon and grey with green nomenclature. Complete kit includes assembly instructions, tubes and all necessary hardware. Dimensions: 11⅝" x 21⅛" x 17⅜". Shipping weight: 83 lbs.

Cat. No. 240-104 — Viking "Valiant" Kit with tubes, less crystals, key and microphone.

$349.50 Amateur Net

Cat. No. 240-104-2 — Viking "Valiant" wired and tested with tubes, less crystals, key and microphone. **$439.50** Amateur Net

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Capacitors • Inductors • Knobs • Dials • Sockets • Insulators • Plugs • Jacks • Pilot Lights

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[from page 14]

which ordinarily run many times greater than the on-the-air times, you will find that they are still protected by the same fuse while drawing 150 watts as when fully loaded on phone and drawing up to 500 or 600 watts ! ! ! This can sure lead to some very messy work.

The usual chain of events consists of a low voltage supply input filter condenser developing enough leakage to overload the 5V4 rectifier to the point of shortage and thus placing a real overload on the low voltage and filament supply transformer. Once the rectifier shorts only a few seconds are necessary to really cook the transformer. Three of us were in the shack at the time and all power was removed within seconds after a faint odor of burning varnish was noticed. Although the power transformer was checked and no apparent overheating considered existent, less than ten minutes later the transformer was again checked and found too hot to handle. In the meantime varnish had boiled all through the wiring harness, tube sockets, etc., even though no more power had been on it.

Get busy before it is too late and install a suitable fusing system. It will be considerably more economical than replacing a fairly expensive power transformer, 5V4 rectifier tube, filter condenser and then putting in the new system of fusing. A 2-amp fuse should take care of the low voltage and filament supply, a 3-amp for the high voltage supply. Look over the diagram for your transmitter and check the method of fusing the primaries of these two transformers. Correct the situation before it is too late.

George S. Woods, W2SWN
Rome, New York

This is the first report we have had of this trouble, and our experience with the Viking and the DX-100 indicate that both use components of high quality in the circuits mentioned. This idea of separate fusing for power supply circuits is a good one, and the investment in an extra fuse and a few minutes' work is cheap enough insurance against the sorrowful occurrence above described.

Visual Comparison Wattmeter

Dear Mr. Green:

I am writing to you to offer a few comments on an article which appeared in the January issure of *CQ;* French, *A Visual Comparison Wattmeter*, page 42.

1) The possible accuracy of the balance of the two light-bulb-luminosities may be increased by means of simple comparison devices known as photo-meters—the Count Rumford, Bunsen, and Lummer-Brodhun photometers being described in most Sophomore College Physics books. (Perkins, *College Physics*, Prentice-Hall, contains a discussion of the theory of operation of these devices). All that is needed for the Bunsen method is a piece of thick paper with a grease spot at the center and two pieces of mirror placed in a "V" to one side of the paper so as to enable the viewing of both sides of the paper without obstructing the light. If the paper is placed at the midpoint between the two lamps—the lamps being set up as in the French article—and the two lamps are operating at identical power levels, are physically and electrically identical, and are operating under otherwise identical conditions; then, the brightness will be the same on both sides of the paper as seen in the mirror reflections.

2) The "visual comparison method" is of little value when used at the higher frequencies. In comparisons made with a Bird R. F. wattmeter, the bulb method was found to be as much as 30% in error at 100 Mcs. and at higher frequencies a sort of gas discharge was observed to take place within the bulb. At 1,000 Mcs., for example, it is possible to burn out a 500-watt bulb with as little as 100 watts of R. F. power—due, apparently, to the occurrence of "hot-spots" on the bulb filament.

Richard F. Burns, W9OBU/W9NVC
Beloit Research and Development Company
Beloit, Wisconsin

Poof! Poly Tubing

Dear W2 Not So Dumb:

Mighty nice magazine you are turning out these days, son. Keep it up! I like your style!

Here's a little wee nugget of thrift for the build-it-yourself clan—if you ever have need for 4½" of polyethelene insulating tubing about 3/16" in diameter. just take a hacksaw and cut open a discarded spray net or deodorizing container and there it is—for free! I knew there must be something worthwhile inside those cans!

Harry H. Heinrich, W9KPG

That February Cover

Dear Wayne:

I receive my CQ a bit later than some people, of course —boat mail, you know—but I cannot resist enquiring how many other subscribers opened their February copy, muttered something profane about careless wrapping, and scratched at the edge of the "torn" cover to see what was underneath?

73 from the land of coffee, bananas and "senoritas bonitas."

Ted, TI2BX
San Jose, Costa Rica

Sam's Identity Revealed

Dear Ed:

Your F. S. Harris was introduced some months ago by a picture of a beavered character, together with a more benign and harmless looking one—with no caption as to which was which. And so for months I had to worry about what this man Harris looked like. Woke me up in the middle of the night, sometimes. All I know yet is that he writes real purty. And finally I have got him tagged as W1HOY's husband, and that's good enough identity for me.

Glad to hear you dropped in to see how KV4AA pushes traffic. Always nice to have a phone man see what a REAL operator can do.

Fred C. Hall, W1MZE
SS Archers Hope, KCQG
Off Cape Hatteras

V V V

Gentlemen:

We enjoy *CQ* very much. My husband and I are both novices, KN6PXB and KN6QCS.

We are wondering if a precautionary word could be said regarding those people who, in order to obtain the air, resort to test, V V V or hold their thumbs on the key for 20 to 25 minutes at a stretch. This is done without identification. There seems to be a great deal of this going on in our area and it is very wearying particularly when you have Hawaii or Alaska or the Virgin Islands and cannot complete the call. Thank you.

Mr. & Mrs. Mahurin
Long Beach, Calif.

Code Signal Source

Dear Sir:

Wanting to get some code practice for myself and my oldest son, I found I had no tubes on hand to make an oscillator (battery type) so I hit on the idea of using my Heath Signal Generator as a signal source, the modulation being about 400 cycles. I hooked a pair of phones, key and plug in series and then plugged into the output for AF and found that it worked quite satisfactorily. Also found that by connecting this arrangement into my signal tracer it will give a much louder signal, amplified by the tracer so as to use the speaker.

George B. Martin, W2JHL
Campbell Hall, N. Y.

How Many Ham Ministers?

Dear Sirs:

I have talked to three other hams who are ministers. I would like to know just how many ministers in the U.S. are hams. Could you ask all ministers who are hams to notify your magazine? This would be of great interest to us.

I would like to tell you just how much CQ has meant to me since taking up our great hobby. I anxiously await its arrival each month and get much pleasure and help from all the articles.

Since getting on the air in December I have had over 250 QSOs on 40 Meters, using only one crystal. To date I have worked 32 states.

Thanks again for your wonderful contribution to our hobby.

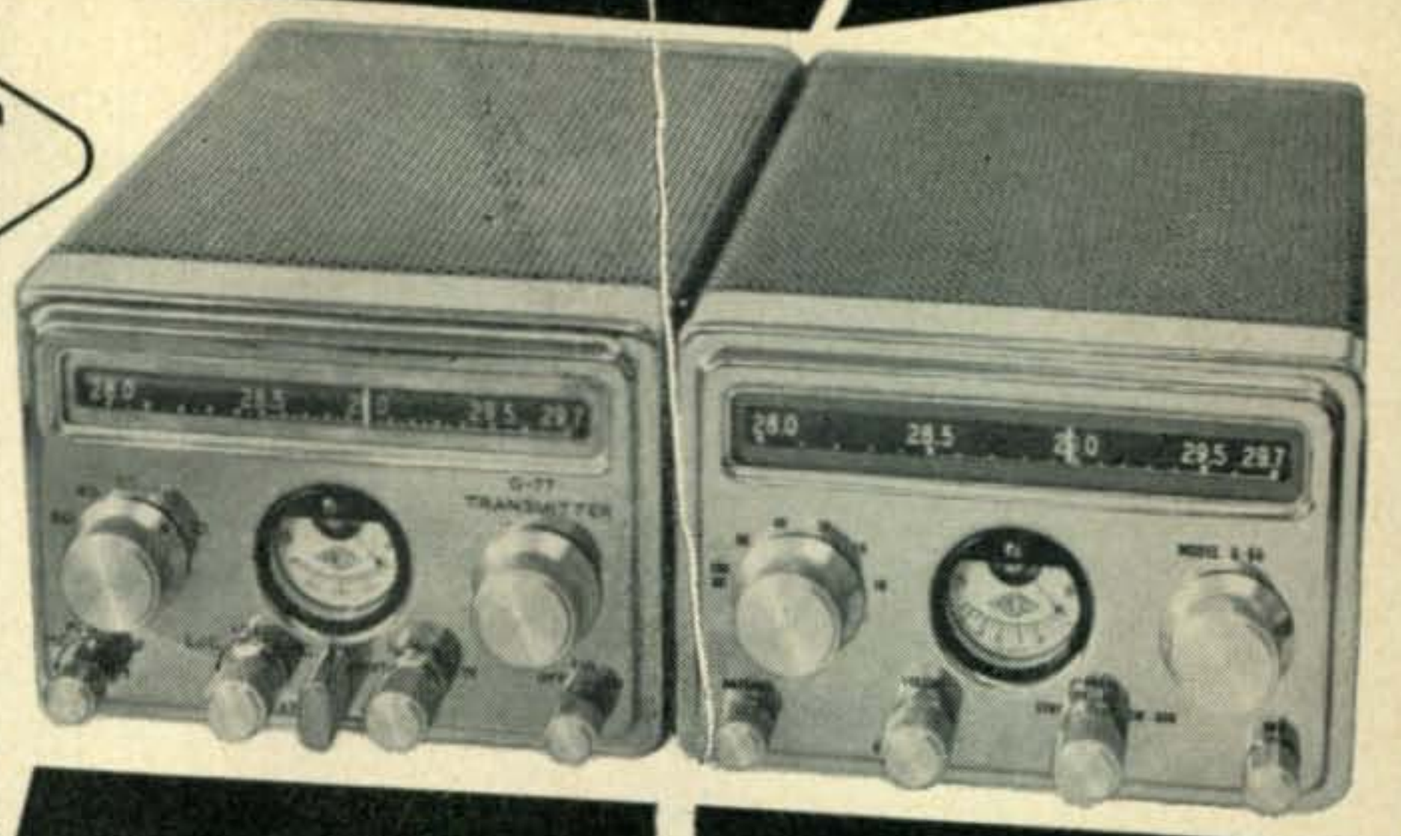
James M. Demott, KN5DED
Chaplain, USAF

Missouri Hamfest

At Sedalia, Mo., June the 10th, the Central Missouri ARC sponsors a real midwest style hamfest at the Missouri State Fair Grounds. Admission $1. Basket lunch, free hot coffee and cold soft drinks. Swap Shop, drawings for OM's, XYL's, YL's. Write Mrs. Jessie M. Goist, WØNUY, 108 W. 5th St., Sedalia, Missouri.

GONSET

MOBILE TWINS



G-77 MOBILE TRANSMITTER

G-66 MOBILE RECEIVER

Gonset's new Mobile Twins, G-66 Receiver and G-77 transmitter, represent the perfect mobile combination. Outstanding multi-band performance—beauty of appearance—finger-tip control—6 and 12 volt operation—compactness without compromise! Typical Gonset dollar-for-dollar value—real "owner satisfaction".

G-66 RECEIVER

6 BANDS: 540-2000 kcs. 3500-4000 kcs. 7000-7300 kcs. 14,000,14,350 kcs. 21,000-21,450 kcs. 28,000-29,700 kcs.

AM, CW, SSB RECEPTION. Highly stabilized HF and BF oscillators and xtl controlled 2nd conversion oscillator.

STEEP SKIRT SELECTIVITY: 265 kc 2nd I.F. 8 high Q tuned circuits. 3.5 kc I.F. bandwidth at 6 db down.

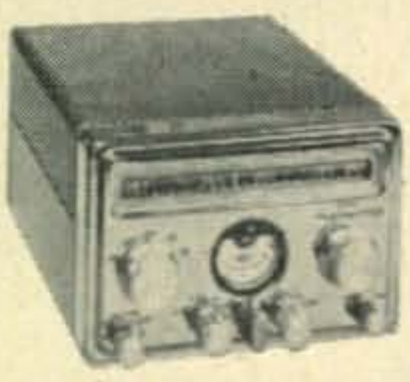
DOUBLE CONVERSION ALL BANDS: 2050 kc ist I.F. Double input tuning (3 tuned circuits) on high bands for high image rejection.

AVC—Noise limiter—Panel S meter—antenna trimmer—BFO pitch—Audio-RF gain control—slide rule dial—3 watts audio.

G66 RECEIVER...(less power supply).....(#3046).....net 169.50

"3 way" (6V-12V-115V AC) Universal power supply/speaker..net 39.95

G-77 TRANSMITTER



FREQUENCY RANGE: 80-40-20-15-10 meters. VFO or xtal, switchable. Highly stable VFO, each band spread over most of slide rule dial.

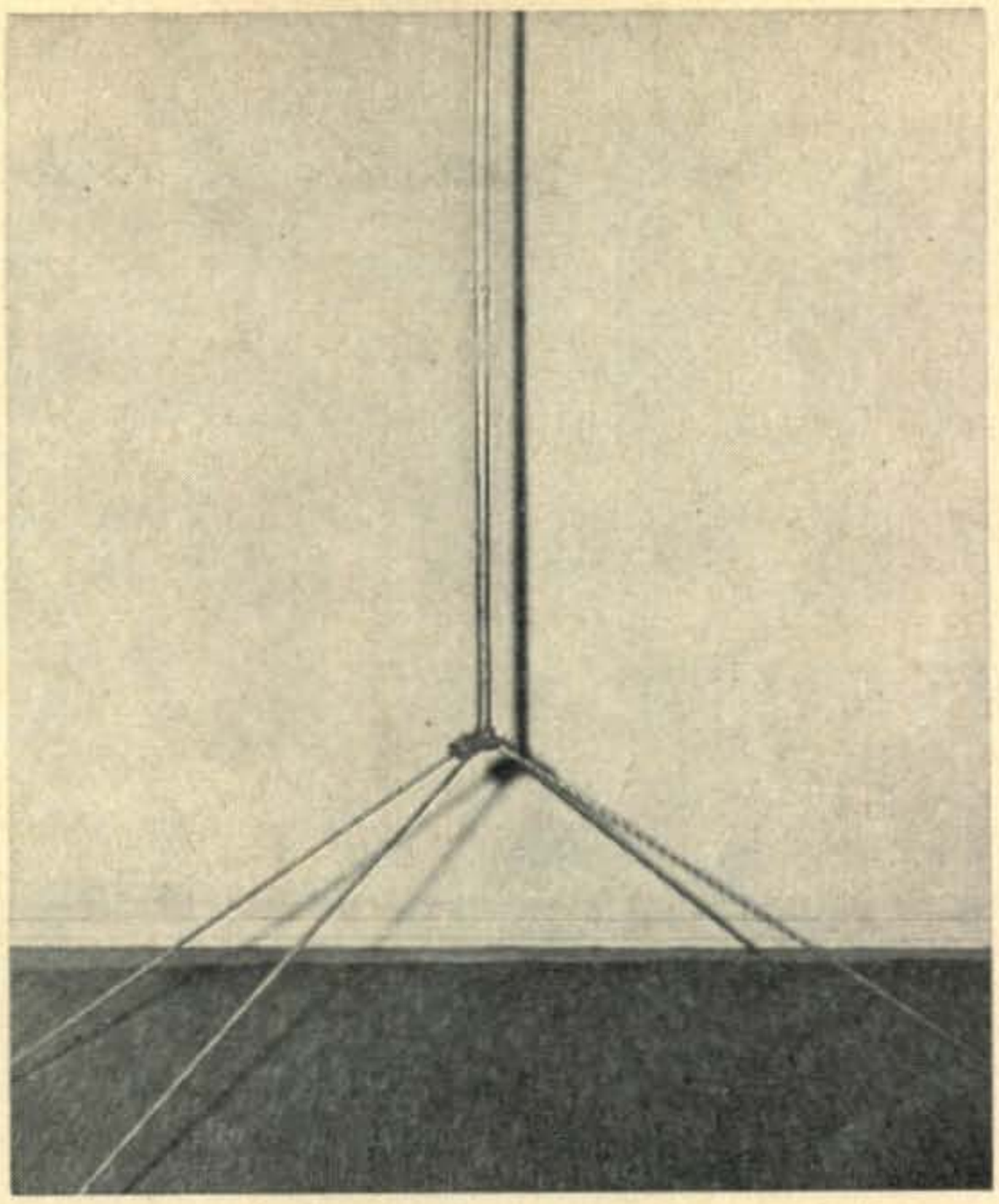
FULL BANDSWITCHING: Exciter ganged with VFO, pi network output.

POWER INPUT: 50-60 watts, modulated. CW provisions, 6146 tube in output. New modulator has integral speech clipping. High gain speech for PA-type dynamic, reluctance, ceramic or xtl mikes.

POWER SUPPLY: Heavy-duty, vibrator, 6 and 12V DC. Output voltage 500-600V full load, Selenium rectifier, low drain both on standby and transmit. Power supply is a separate compact unit.

GONSET CO. 801 SOUTH MAIN STREET, BURBANK, CALIF.

A stroke of genius



Using a TV Antenna for Six Meters

Pete Maloney, K6HBY
1427 Guadalajara Place
Claremont, California

When Six opened for Technician operation and activity started perking up I decided to get in there too. The age old argument of horizontal vs vertical came out vertical for me when I considered that my main interests were local rag chewing and working mobiles.

The next point was to get that vertical up there with a minimum of expense. It sounded like too much work to start with the raw materials and make the whole thing. Besides that, a completely finished TV antenna doesn't cost much more than the same amount of aluminum bought retail. The TV conical antennas cost less than $5.00 and can be simply worked into a fine six meter vertical.

My method is to use the TV boom for the radiator and use the TV reflectors for a ground plane. This means that you will have to extend the boom a bit and make it about 55″ long to resonate low in the six meter band. This can be done by fitting a 24″ to 30″ piece of tubing on the end of the boom to extend it after sawing off the reflector end of the boom. The extension can be the same size as the boom if a short smaller piece is used inside to make a rigid and conductive joint. A smaller or larger piece of tubing could also be used, but keep in mind that good electrical contact is important. I used a 12″ tube inside and bolted the works together with eight screws.

The ground plane radial elements are the TV reflectors (the longer tubing) and are fastened in the insulator in the normal way. A piece of braid (from coax cable) is used to bond the four radials together. This will connect to the braid on the coax from the transmitter.

A hole is drilled in the insulator so the coax center conductor can pass through and connect to the end of the boom.

A mounting bracket can be made from a piece of steel bent to fasten to the bolts holding the radials and arranged to clamp to the mast with "U" bolts. Do it any way you want, but leave the boom alone.

Tuning

A small loop of wire between the radials and the driven element will enable you to couple in a grid dip meter. You can then adjust the length of the driven element to the frequency you desire. The loading of this antenna is quite broad due to the large diameter of the driven element. Remove the wire loop and connect the RG-8/U to the shack.

This ground plane will give you a good signal report all over town and the whole thing costs less than five dollars. See you on Six? ■

Lt. C. E. Donaldson III,
U. S. Navy, W4VXD/1,
38 Toppa Blvd.,
Newport, R. I.

a few field-tested emergency-power schemes well worth perusing: on noise reduction, using motors as generators, methods of regulation—

for Outdoorsmen:

for Emergencies:

A-C Generators

With the approach of another summer season, the thoughts of many hams turn to outdoor operation of their rigs, encompassing among other incentives the annual Field Day contest and the hurricane season (Heaven forbid that we will need to operate under such conditions again, but we must always be prepared).

Operation under these conditions involves one common denominator about which much is taken for granted—the small, electric power generator in any of several forms, as an independent source of power. This is not intended to be a college-level lecture in the mysteries of electric machinery, but rather an explanation of a few fundamentals of generator operation plus some practical suggestions for improved or novel generating schemes, utilizing these fundamentals.

Eminently Useful Data

First, let's stow just a small portion of elementary theory under our belts so that we may share a few common terms. We all know that an electric current is generated whenever a magnetic field "cuts" a conductor, or vice versa. This means that if a simple straight wire is placed in the field between the poles of a simple horseshoe magnet, then moved rapidly out of the field, a feeble electric current will be generated in the wire. Here we have the rudiments of an electric generator.

Generators Basically A-C

All we need do to make a practical producer of usable power is to rearrange both the magnetic element and the conductor for maximum efficiency and connect the beast to a gasoline engine, or, to use the general term, a prime mover.

It should be noted that the simplest generator is a loop of wire rotating within a magnetic field, producing an alternating current output. It is necessary to provide a means for connecting the two ends of our movable wire loop to the "load." In smaller machines, say 10,000 watts or less in capacity, the magnet, or *field* is generally fixed, while the wire loop, or *armature* is rotated within it, the rotating member being fitted with *slip rings,* each of which is connected to one end of the winding, and upon which ride stationary brushes to collect the current.

D-C-ing Schemes

Now, to produce a d-c, or direct-current output, we must rectify the a.c. This can be done with selenium or vacuum-tube rectifiers, or as is commonly done, by the use of the *commutator,* which is nothing but a mechanical rectifier. Here is a fundamental principle to bear in mind: except for one notable case[1], the current generated within the armature of *all* ordinary generators is a.c. If the machine is a d-c machine, the commutator mechanically rectifies this generated a.c. and the output at the machine terminals is d.c. A more detailed discussion of electrical machinery may be found in an electrical handbook, or in any standard electrical engineering textbook.

Practical A-C Machines

Since most of our radio equipment is a-c operated, any operation of equipment designed for other than mobile use presupposes a suitable supply of 115-volt, 60-cycle a.c. For Field Day and emergency operation, this "house current" is usually obtained from gasoline

1. The homopolar, or unipolar, d-c generator actually generates true d.c. internally.

engine-driven generators in various sizes up to about 10 kw. These generators are almost without exception of the tapped d-c armature variety.

Recall that the current generated within the armature of all ordinary generators is a.c. All we have to do is get this a.c. out of the armature *without* rectifying it, and we are in business. Thus, the tapped d-c armature generator

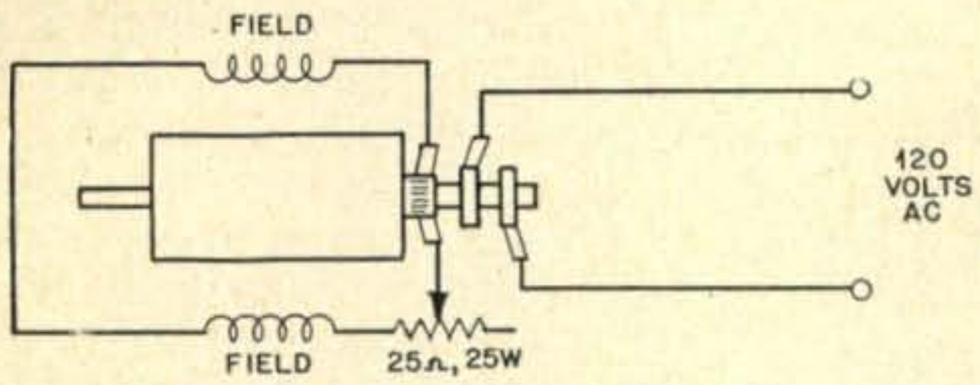


Fig. 1a.

is simply an ordinary d-c generator, complete with shunt field coils and an armature with commutator, plus two slip-rings for picking off the a-c power. Brushes are provided to ride on the commutator to provide d.c. to excite the field coils, and another set of brushes rides the slip rings to collect the a.c. for delivery to the load. These slip rings are simply connected to any two directly opposite commutator segments. *Figure 1-a* illustrates this construction. If three slip rings were provided, connected to commutator segments 120° apart, three-phase a.c. would be the resulting output.

Drawbacks

These machines perform very well, with these exceptions: They do not produce a very pure sine wave of voltage (inconsequential in most applications). But they are usually prolific r-f noise generators, to which any Field Day advocate will readily attest! Most of the noise is generated by the brushes riding across the many make-and-break contacts on the commutator, and it covers the majority of the r-f spectrum. It happens that very little noise is produced by the other brushes riding on the a-c slip rings (continuous contact). But the

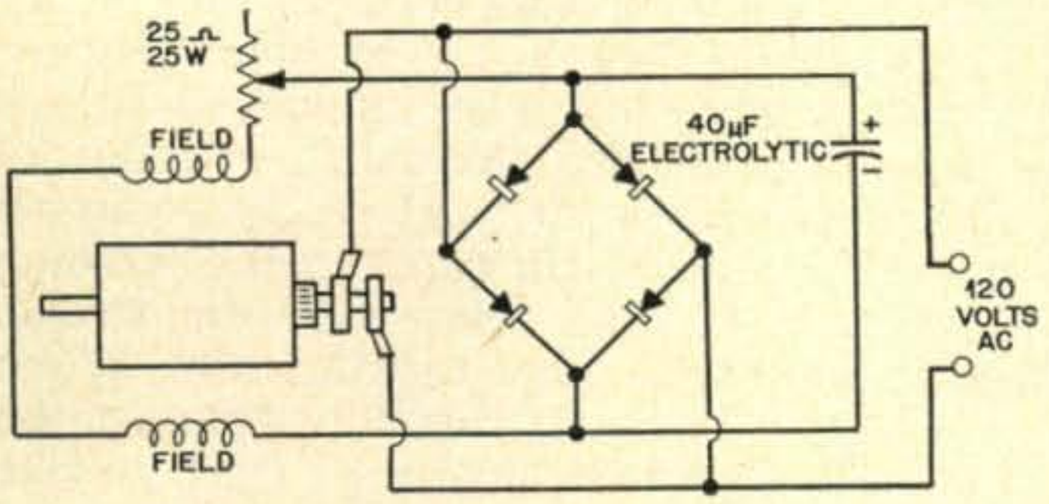


Fig. 1b.

noise produced at the commutator is passed on to the load through the slip rings, and though this noise responds to treatment, such as the use of *Hypass* coaxial capacitors, it is usually difficult or impossible to eliminate or even to reduce to negligible proportions.

Removing Commutator Noise

One obvious means of eliminating this noise is simply to lift the brushes off the commutator and discard them, thus eliminating the source of the noise. If the shunt field, now without excitation, is disconnected from the unused brush holders and reconnected to a suitable selenium rectifier, as shown in *Fig. 1-b*, it will be found that the generator will satisfactorily excite itself from the a-c or slip-ring terminals, and the electrical noise problem will be nearly licked. We still have the problem of ignition noise in the gasoline engine, but judicious use of shielding is usually successful here.

Thus all we have done is to substitute a selenium rectifier for our efficient but noisy mechanical rectifier, the commutator. A full-wave or bridge rectifier should be used, as the half-wave arrangement will not give sufficient excitation. The selenium rectifier rating may be computed using Ohm's law: Measure the resistance of the generator shunt field with the commutator brushes lifted. Divide this into 120, which is the assumed field voltage rating,

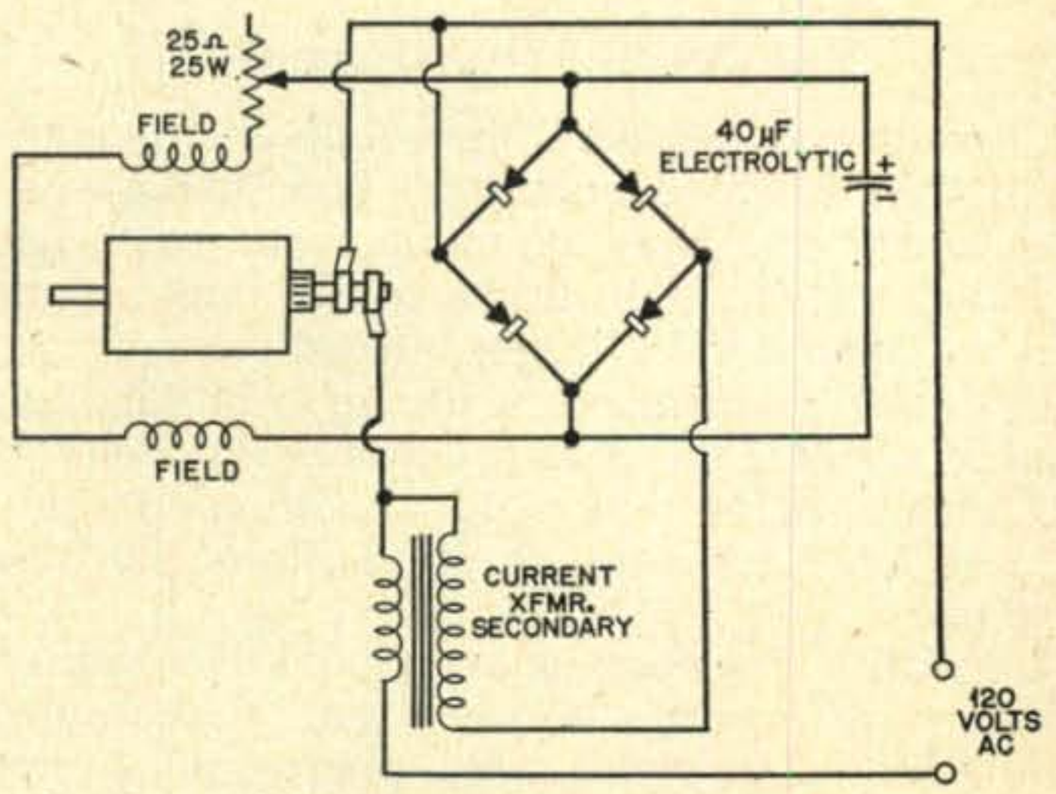


Fig. 2. Bridge rectified generator with current transformer.

and this gives the normal, full-load current rating of the field. Noting that the r-m-s voltage being handled will not exceed 135 volts, and that in a bridge rectifier, each rectifier handles half the load current, selenium rectifiers with ratings in the range of 135 volts at 500 milliamperes will probably be found to suffice.

Voltage Control

The addition of the capacitor and rheostat as shown will provide a wide range of voltage adjustment. Like any self-excited, shunt-wound machine, this type of generator, whether excited from brushes and commutator or from external rectifiers, will have a drooping voltage characteristic. That is, as the load increases, the terminal voltage will gradually drop, so that with changing load, adjustments must be made in the field rheostat setting to maintain near-constant voltage at the terminals.

"Compounding"

As a d-c generator may be "compounded" to give it a flat voltage characteristic, so may this type of a-c generator be compounded. If a current transformer is inserted with its primary in series with the load and its secondary in series with the a.c. to the field rectifier leads, the effects of compounding are realized. Note that as the load increases, so does the secondary voltage of the current transformer, and this secondary voltage adds to the generator

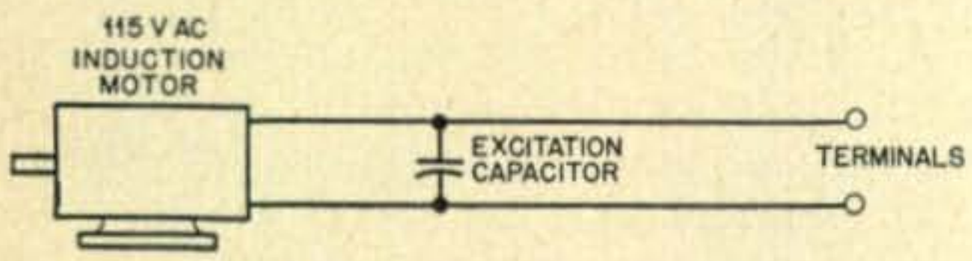


Fig. 3a. "Induction" generator.

terminal voltage to give an increased voltage on the field—just the regulating effect we needed to counteract our voltage drop. If the voltage drops severely with the addition of the current transformer, simply reverse the leads to either the secondary winding or the primary (not both).

The Current Transformer

Current transformers are relatively unavailable in the average ham junk box, but a very satisfactory one may be built from materials at hand. A stack of transformer laminations must be available. A large, burned-out receiver type power transformer with an original high voltage winding of perhaps 360-0-360 volts at 120 milliamperes will yield a laminated stack or core of large enough dimensions for our purposes.

Generally the easiest way to disassemble such a transformer is to grasp one of the outer laminations with long nose pliers and firmly pull it out of the winding. Then, if the additional laminations are carefully separated with

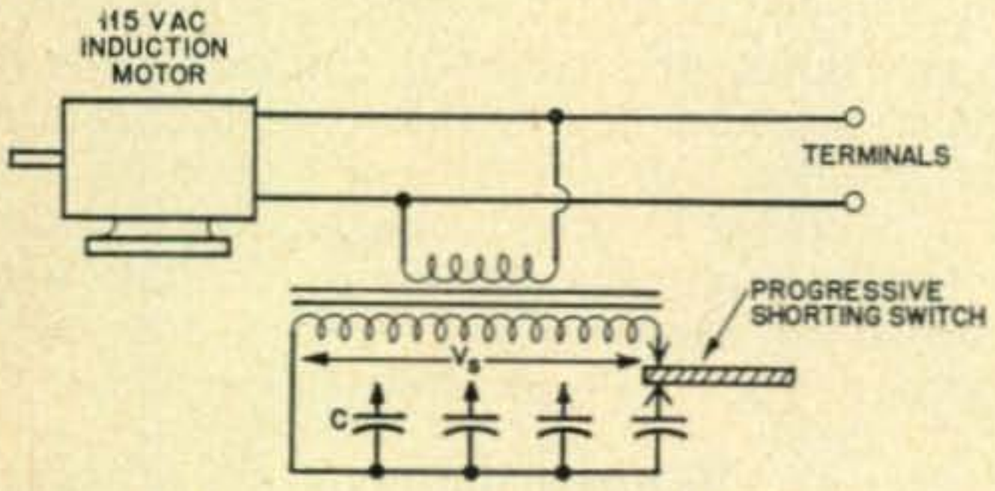


Fig. 3b. —with "ufd amplifier"

a knife, they may be removed one at a time. Take care to note the way in which they are stacked, as we should duplicate this arrangement when we restack the core in our current transformer.

Now the cross-sectional area of the core is measured by measuring the dimensions of the open space in the center of the winding left by removal of the iron. A winding form of the same size as this is made by folding a layer of cardboard, or heavy paper to the dimensions of this inner "window." This form is coated with a couple of coats of shellac to give it stiffness.

Now we are ready to wind the current transformer, and for lack of more specific winding instructions, we will find that about 15 turns will be adequate for the primary. This wire should be large enough to carry safely the full rated current of our generator as stamped on the nameplate. The usual rule of thumb is to allow about 1,000 circular mils of wire for each ampere of current. If our generator is a 1-kw. unit rated at about 9 amperes, we should wind the primary of our current transformer with wire of at least 9,000 circular mils cross section, or 10-gage B & S wire size, which has a cross section of 10,380 circular mils. The extra size will give a slight factor of safety. Regular magnet wire, coated with enamel (*Formvar* or *Formex*) should be used, and the winding should be wound directly on the cardboard form.

Over this simple primary winding the secondary is wound directly. It should have 10 times as many turns. For flexibility of final

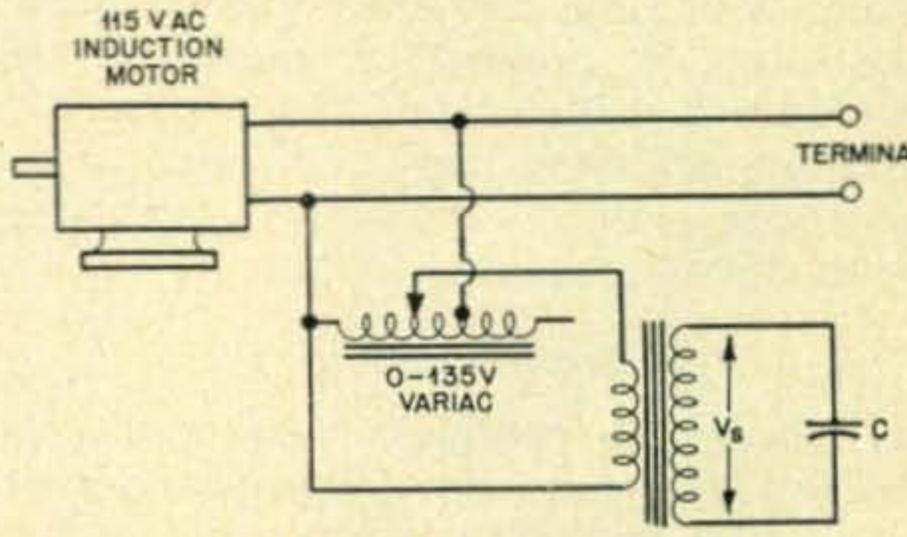


Fig. 3c. —alternate method.

adjustment, we may tap it at 100, 110, 120, 130, and 140 turns, but this is not mandatory. Use of wire smaller than number 18 B & S gage should be avoided, as it will introduce too much resistance in the field circuit. Within the limitations imposed by the core window area, we should use the largest wire size feasible.

After the windings have been secured on the cardboard form with a bit of strong twine, the entire winding may be dipped in shellac and hung up to dry. Actually, commercial practice is to dip such winding in electrical baking varnish and then to bake the winding until the varnish dries. However, the shellac treatment will work quite satisfactorily. When the winding is dry, we carefully reinsert the laminations, bring out the leads and replace the transformer case. The leads are connected as shown in *Fig. 2*. Caution: *Do not leave the primary of the current transformer connected in series with the load without leaving the secondary connected to some sort of load, or else short-circuited.*

If for any reason the secondary is to be disconnected from the remainder of the field cir-

cuit, the primary should first either be disconnected or shorted out. If the primary terminals are not shorted, the secondary terminals should be shorted. If the secondary is ever entirely disconnected, the voltage can, under certain conditions, rise to a maximum value of about 10 times generator terminal voltage, or about 1,200 volts. That this could be dangerous is obvious, particularly when we consider that the 1,200 volts would appear where least expected. Actually the current transformer is quite safe to use . . . just obey the cardinal rule: Either have some definite, closed circuit connected across its secondary, or short-circuit the secondary. A shorting switch across the secondary provides a convenient means for accomplishing this. Short-circuiting it won't hurt it at all because its primary is in series with the load, and not tied across the line.

The "Sears & Roebuck" Special

Next we come to an interesting little generator which can be used to advantage for powering ham gear, lights, and other loads which do not draw current at a lagging power factor. Many of us have heard that any electric motor becomes a generator if driven by a prime mover, but few of us ever thought of the handy little half-horsepower induction motor down in the cellar driving the local bench saw for the "do-it-yourself" contingent of the family.

Just as the synchronous a-c generator (by far the most common variety—this includes our tapped d-c armature type) is excited by means of a d-c electromagnetic field, the induction generator is excited by capacitors. *Figure 3-a* illustrates the utter simplicity of the basic circuit. If a capacitor of sufficient size is connected directly to the terminals of the plain, garden variety squirrel-cage induction motor, and the motor shaft turned by an engine at a few r.p.m. faster than the nameplate rating[2], it will generate a.c. that is of the finest sinusoidal waveshape, utterly devoid of electrical noise, since there are no sliding brushes of any kind.

No Motors, Please

There are, of course, drawbacks to this system which are serious but not insurmountable.

The principal reasons for its lack of popularity are these: It will not run electric motors. The voltage regulation is relatively inflexible. It requires a rather large capacitor for excitation per kw. delivered.

Immediately following the great hurricane of 1954, however, when commercial power was out for several days, the author, for lack of a better generator successfully operated half the lights in the house, the TV set and the large ham station receiver by using a half-horsepower induction motor as a generator, driven by one rear wheel of the family car. But as soon as an attempt is made to start an electric motor on this system, the generator voltage decreases radically and erratically, and continues in this unsteady state until the motor is disconnected from the system.

This unfortunate characteristic of the simple induction generator limits its popularity. However, it will successfully operate radio equipment and lights, and so should be of immediate interest to the average ham. The problem of the capacitor is not too difficult to solve. Note that since we are handling a.c. we cannot use an electrolytic, or polarized capacitor, but must use a paper or oil-filled, non-polarized type. Experience has shown that for a 120-volt induction generator of ½-horsepower size, about 160 μfd is required to cut the mustard. This figure may be up to 30 μfd or so in error either way, depending on the particular motor and the load. This is a rather large capacitor to expect from the average ham junk box, so we will not even consider it.

To solve this dilemma, we can cleverly employ another transformer. First we observe the equation for energy storage in a capacitor: Energy $= \frac{1}{2}$ C V^2, or, put another way, for a capacitor of given capacity, the energy storage is proportional to the voltage squared. Thus, if we double the voltage of the induction generator, we can get the same output with a capacitor of ¼ the capacity required at 120 volts, so for 240-volt operation, we require a capacitor of only 40 μfd.

Doubling the voltage again to 480, the capacitor required is ¼ of 40 or 10 μfd. This process can be continued as far as we like. Our formula for this particular case works out to be $K = C\ V^2$ where K is 1,600,000, C is in μfd and V is in volts. Now suppose we connect a transformer across our generator terminals, and suppose the turns ratio is 4 to 1. If the low-voltage side is then rated at 120 volts and the high side at 480, we can connect a 10 μfd capacitor to the 480 volt side, and the transformer will effect a 16-to-1 impedance transfer to the generator terminals; that is, the generator will "see" the 10 μfd capacitor, through the transformer, as a 160 μfd capacitor at 120 volts, which is what we required in the first place. It all boils down to a matter of *what have you.*

The author happened to have an old surplus 1-kw. power transformer with a voltage rating of 450 to 115. This was used in conjunction with a 10 μfd, 600-volt oil-filled capacitor to excite the half horsepower

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2. Theoretical or ideal 60-cycle induction motor speeds are 3600, 1800, 1200, etc. rpm. *Actual motor* speeds are slightly less, e.g., 3450, 1725, 1150 rpm, etc. The induction *generator*, on the other hand, must be turned *faster* than the ideal, e.g., 3750 rpm for a motor of 3450 rpm rating, 1875 rpm for a motor of 1725 rpm rating, etc. This is accounted for by a phenomenon known as "slip."

[*Continued on page 104*]

The Sunspot Story: Cycle 19

by George Jacobs, W3ASK

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Latest reports of sunspot activity continue to confirm the fact that the present sunspot cycle, cycle 19, is rising at an unprecedented rate. Because of the direct correlation between sunspot activity and ionospheric characteristics, shortwave radio conditions during the next few years may be *better than they have ever been in the history of radio.*

The origin of sunspots, the effects of solar radiation upon the ionosphere, and the trend of the present sunspot cycle have been discussed in Part 1 of this article appearing in the March issue of CQ. In Part 2 of this timely article, W3ASK, CQ's Radio Propagation Editor, discusses the effects of the rapid rise in sunspot activity upon ionospheric propagation conditions in each amateur high frequency band 10 through 160 meters as well as the possibility of *once in a lifetime conditions* on the 6 meter band. The effects of the rapid rise in sunspot activity upon ionospheric propagation conditions in the VHF spectrum, with the possibility of long distance reception of TV transmissions, and other phenomena believed to be associated with the sunspot cycle are also discussed.

PART 2

In the three months that have elapsed since the publication of Part 1 of this article, additional evidence from the Swiss Federal Solar Observatory at Zurich continues to confirm the fact that the present sunspot cycle will be one of outstanding intensity, reaching a maximum higher than any previously observed. Sunspot activity during the past three months has been greater than predicted a short time ago and the latest forecast of the Swiss Observatory is for the maximum of cycle 19 to occur as early as February, 1957, with a record breaking smoothed sunspot number of 170. *Figure 1* shows the trend of cycle 19 compared to the previous cycle which reached a maximum smoothed sunspot number of 152 during June, 1947. The previous cycle was the highest recorded since 1778, and the present cycle is rising at even a faster rate.

The *predicted* smoothed sunspot numbers shown on *Figure 1* are based upon empirical calculations taking into account the latest Swiss predictions as well as other statistical data. These predictions are slightly lower than the Swiss forecast and indicate that the peak of

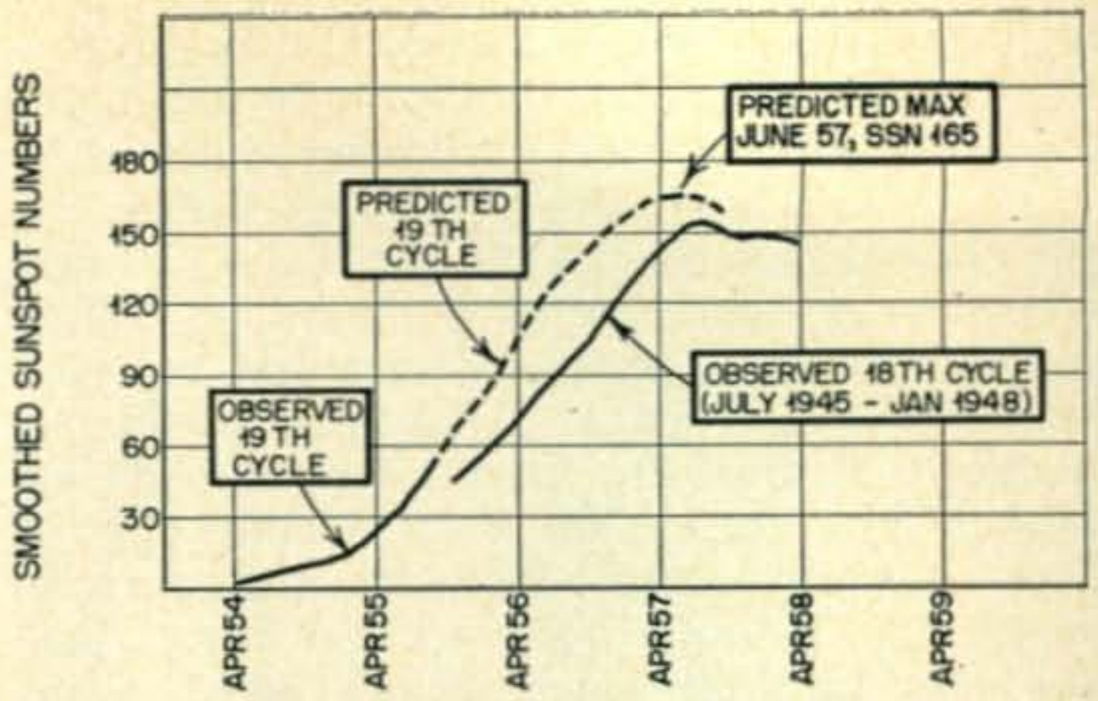

Fig. 1. Progress of Present Sunspot Cycle (19)

cycle 19 can be expected between March and August of 1957, and that the highest smoothed sunspot number will exceed 165.

Abnormal Ionospheric Variations

Ultraviolet radiation from the sun is believed to be responsible for the formation of the regular electrified layers of the ionosphere. Normal ionospheric variations have been discussed at length in Part 1 of this article. To review briefly, these consist of *daily variations,* which are a result of the twenty-four hour rotation of the earth about its axis, *seasonal variations* as a result of the earth's relative angular position and distance with respect to the sun, and the *sunspot cycle variation* as a result of the approximate 11 year variation in sunspot activity on the face of the sun. There also occur, however, *abnormal variations* in the ionosphere that cannot be explained in accordance with known solar relationships. Among these abnormal characteristics of the ionosphere are *ionospheric disturbances, auroral displays,* and the formation of *Sporadic-E layers.* It is necessary to investigate the behavior of these abnormal characteristics of the ionophere as well as the normal variations since both play an important part in the overall propagation of a shortwave signal.

Ionospheric Disturbances

There are two distinctly different types of ionospheric disturbances. One is termed *sudden ionospheric disturbance,* usually abbreviated SID. SIDs occur suddenly, and generally last for short periods of time upwards to two hours or so. The other type of disturbance is the *ionospheric storm* which develops over a period of a day or so and generally continues for several days.

SIDs are believed to be produced by solar flares. A solar flare is a bright, visible eruption occurring from time to time on the face of the sun and is usually associated with a large group of sunspots. The flares rarely last more than an hour before burning out. Excessive ultraviolet radiation believed to be emitted from the flare penetrates the upper layers of the ionosphere and forms a region of heavy absorption

just under the E-layer. This absorption region is generally referred to as the D-layer of the ionosphere and is enhanced almost instantaneously with the visual observation of the flare. D-layer absorption is greater on the lower frequencies (i.e., 80, 40 and 20 meters) than on the higher frequencies (i.e., 15 and 10 meters). At times absorption is great enough to prevent *any* high frequency wave from penetrating the D-layer, and therefore reflection can not take place from the regular layers of the ionosphere and a *radio blackout* occurs. If the SID is of low intensity, a partial fadeout will occur, and transmission will continue to be possible on the higher frequencies less affected by the absorption. Since the sudden

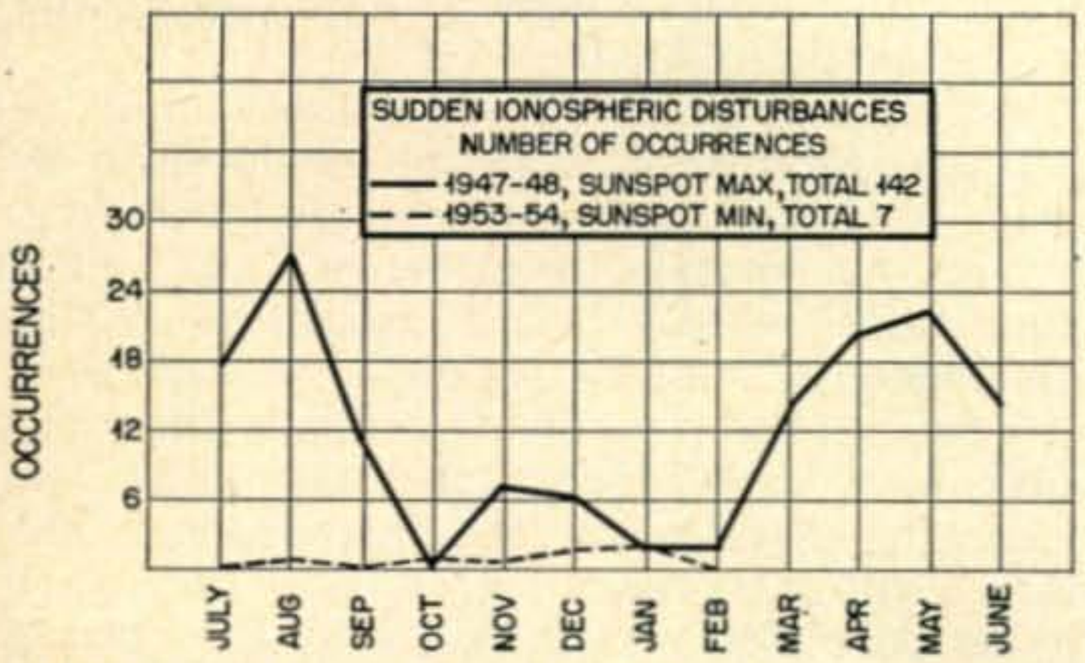

Fig. 2. Sudden Ionospheric Disturbances, Washington, D. C.

ionospheric disturbance is caused by excessive ultraviolet radiation from the sun, SIDs influence only transmission paths completely or partially in daylight areas of the world. The SID ends as the solar flare dies out.

Figure 2 shows the correlation that exists between the number of occurrences of SIDs and the sunspot cycle. During the peak of the last cycle, 1947-48, 148 SIDs were reported by the National Bureau of Standards in a twelve month period at Washington, D. C. During the minimum of the past cycle, 1953-54, a twelve month total of 7 SIDs was reported. As we approach sunspot maximum again we can expect the occurrence rate of SIDs to increase rapidly, and several very intense ones have already been reported during early 1956.

The second type of ionospheric disturbance, the *ionospheric storm,* constitutes a more serious problem to shortwave communication because of its much greater duration. While the SID lasts for an hour or so, most ionospheric storms last for several days. Ionospheric storms are believed to have their origin in the vicinity of certain types of sunspots which appear to be associated with violent solar eruptions. These sunspots are called *active sunspots* to distinguish them from the regular ones that are believed to be responsible for the normal ultraviolet radiation from the sun. The active sunspots are believed to emit *corpuscular radiation* which travels at a slower speed and contains a much higher energy level than ultraviolet radiation. On reaching the earth's atmosphere the corpuscular radiation is influenced by the magnetic field that surrounds the earth and is directed towards the magnetic poles of the earth. As a result, the effects of this radiation are more intense in areas around the magnetic poles. The high energy particles contained in the corpuscular radiation saturate the ionosphere, considerably increasing ionospheric absorption thus resulting in weaker-than-normal signal strengths. This radiation also sets up a turbulence in the ionosphere, reducing the ionization density of the layers so that waves which are normally reflected begin to penetrate and do not return to earth. During storms, the highest frequency which the F-layer will reflect may be reduced by as much as 50% below normal, and excessive fading may also be present. Under extreme conditions, the combination of a weaker ionosphere and increased absorption results in a *radio blackout* during which times long distance shortwave communication to various parts of the world becomes impossible, especially on those circuits that pass near the magnetic poles.

Unlike SIDs, and because it is caused by corpuscular radiation rather than ultraviolet, the ionospheric storm affects circuits both in the daylight and dark parts of the world. The storm is world-wide in character, lasting for several days, and is most intense in areas near the earth's magnetic poles, becoming less intense in more southern latitudes.

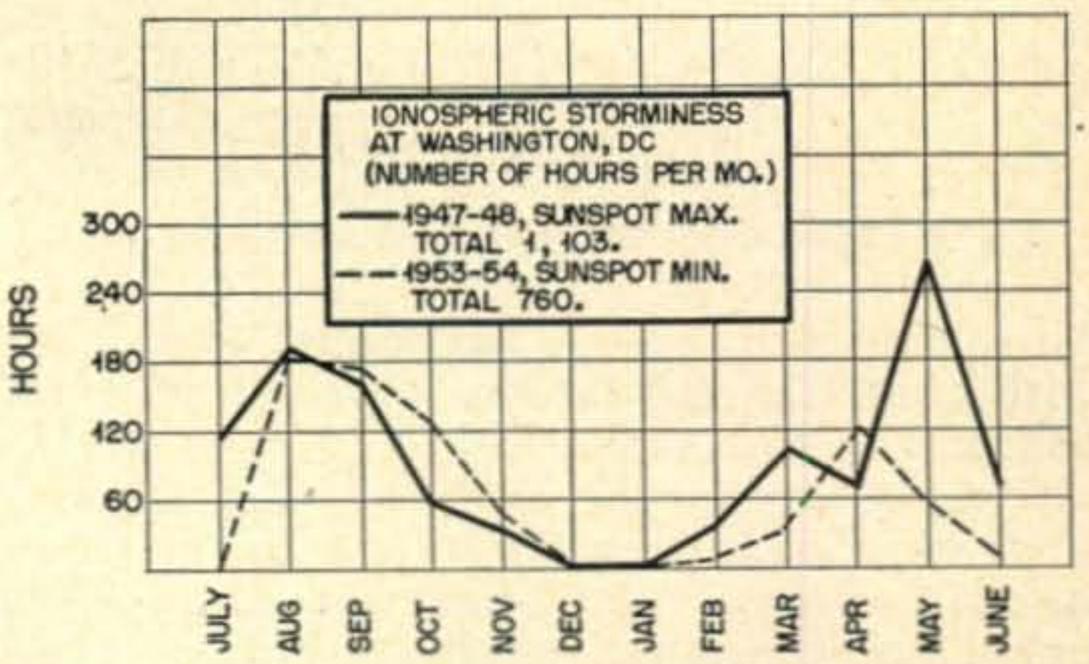

Fig. 3. Ionospheric Storminess at Washington, D.C.

Figure 3 shows the co-incidence that exists between the sunspot cycle and ionospheric storms. During the peak of the last cycle, over 1200 hours were reported as disturbed at Washington, D. C., in a twelve month period. During the minimum of the last cycle, 1953-54, less than 800 hours were reported as disturbed. As we approach the maximum of the present cycle, we can expect a considerable increase in the number of ionospheric storms. However, this is not as serious as it may seem since the *effects* of an ionospheric storm during sunspot maximum are not as drastic upon communications as during sunspot minimum. For example, if a serious storm lowers the MUF on

a trans-Atlantic circuit by 50%, this results in a reduction in MUF from 40 to 20 Mc during maximum sunspot activity, still leaving considerable spectrum space for communications. During the minimum of the sunspot cycle, when the normal MUF on the same circuit may be about 20 Mc, the 50% reduction reduces the MUF to 10 Mc leaving very little, if any usable spectrum space.

Aurora

Corpuscular radiation from the sun, responsible for producing the ionospheric storm, also bombards the atoms and molecules of the gases present in the rarified atmosphere at the extremities of the earth, causing them to ignite forming an aurora.

Of all natural phenomena, the aurora is probably the most breathtaking and spectacular. Usually called "northern" or "southern" lights, the aurora arcs across the night time skies at the extremities of the earth as weird, yellowish-green, dancing ribbons, violently throbbing rays and as great draperies folding and unfolding. They occur at E level height in

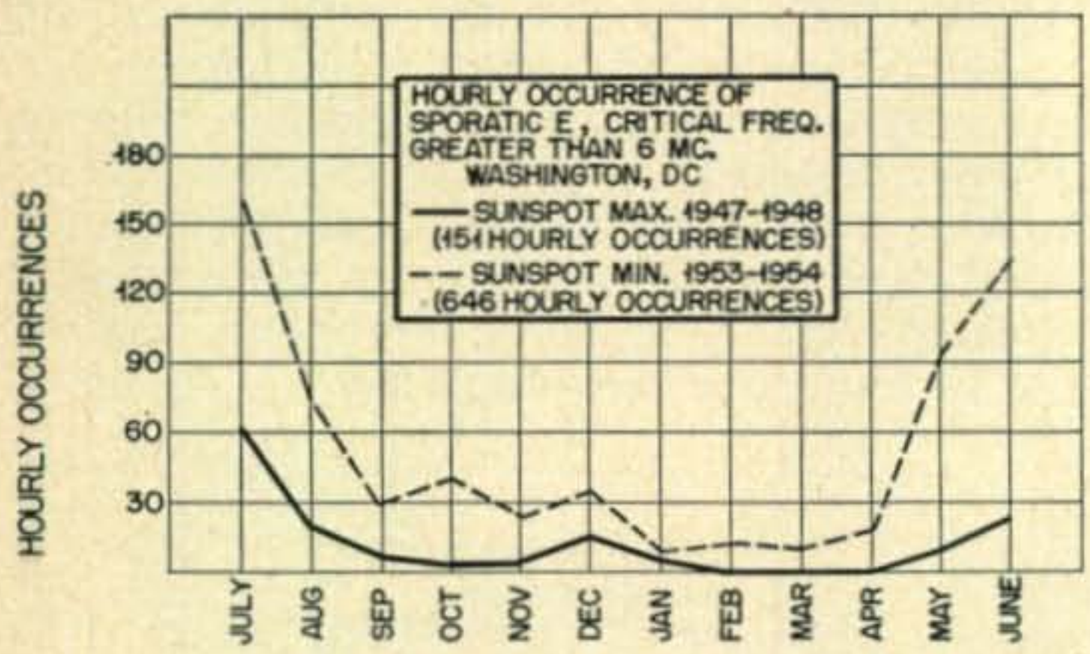

Fig. 4. Sporadic-E Occurrence, Washington, D.C.

the ionosphere, about 60 miles above the earth's surface and can be seen obliquely for distances up to 600 miles.

Observations made over the past hundred years have defined areas of the world where the auroras occur most frequently. The zone of maximum occurrence, where the aurora occurs for approximately 250 nights a year, is a belt about 23 degrees centered around the magnetic pole in each hemisphere. The earth's magnetic poles do not coincide with the geographic poles. In the Northern Hemisphere, the magnetic pole is located on the northwestern tip of Greenland, and the zone of maximum auroral occurrence, called the Northern Auroral Zone, swings across northern Alaska, central Canada, the southern tip of Greenland, Iceland, over the northern tip of Norway and off the northern coast of Russia and Siberia. Auroras are seen less frequently as one proceeds south of this zone. In the northern areas of the USA, auroras are seen between 10 and 40 nights per year, while in southern areas of the USA, several years may pass before an aurora is seen.

Visible aurora plays havoc with shortwave radio communication. The excessive ionization believed to exist in the Auroral Zones results in severe absorption of any shortwave signal that passes through or near this region. As a result, the Auroral Zones act as a screen, shielding shortwave transmissions from passing through. For this reason trans-polar communication from the United States is extremely difficult and unreliable. Besides excessive absorption, the aurora contributes a unique fading component to signals passing through the region. The fading is usually referred to as "flutter fading" and consists of a low frequency audio component, between 20 and 200 cps, superimposed on the carrier. The fading component is usually severe enough to render modulation unintelligible.

Shortwave transmissions passing south of the Northern Auroral Zone are not usually affected by this excessive absorption or fading. However, as certain disturbances take place in the earth's magnetic field, usually associated with abnormal sunspot activity, the region of excessive auroral absorption spreads out, and visible aurora will occur further south. The greater the disturbance, the further south the influence of the aurora is felt, and shortwave circuits generally not bothered by the aurora now become seriously disrupted. There is a tendency for auroras to spread southward during the spring and fall months, and *more often* in years of high sunspot activity. During 1947, when solar activity was at a maximum, 20 overhead auroras were observed in northern N.Y. State. During 1953, when the sunspot cycle was at a minimum, 10 auroras were observed at the same location. We can expect a considerable increase in auroral activity as the sunspot numbers continue to climb towards a maximum.

Sporadic-E

There frequently forms within the normal E-layer region of the ionosphere, "clouds" or "patches" of abnormally dense ionization, which are capable of reflecting radio waves of frequencies much higher than those reflected by any of the regular layers. These patches usually take the form of thinly ionized areas covering a rather small geographical region. They occur more or less at random and are relatively short lived, nevertheless they do appear to display seasonal, and possibly sunspot cycle variation at any one particular geographical location. Because of the intermittent nature of this type ionization it is usually referred to as *Sporadic-E* ionization. Electronic clouds of this nature are capable of reflecting radio waves, at oblique incidence, on frequencies exceeding 30 Mc and on remote occasions extending up to, and possibly somewhat beyond, 100 Mc. Exceptionally long distance propagation does not often occur by way of Sporadic-E because of the remote possibility of the

clouds being present over such a large area necessary for multi-hop propagation. Occasionally two-hop Sporadic-E propagation will occur for distances up to about 2400 miles, and from time to time the combination of regular F-2 layer reflection and Sporadic-E reflection will result in communication being possible over long distances during periods of time when F-2 regular propagation alone could not be possible. For the most part however, Sporadic-E propagation is limited to a one-hop distance not exceeding 1400 miles, and for this reason it is often referred to as "short-skip" propagation.

The occurrence of Sporadic-E propagation has been studied for some time but its cause is still unknown. Since it occurs more often during the daylight hours, it appears that ultraviolet radiation from the sun might play a part in its formation. On the other hand, since it also occurs quite frequently at night, some other source of ionization must also be responsible for its formation and recent suggestions point towards ionization from meteor trails and from auroral displays as other sources.

Figure 4 shows the number of hourly periods during which Sporadic-E exceeded a critical frequency of 6 Mc at Washington, D.C. This would support propagation at frequencies above 29 Mc over oblique path distances of approximately 1200 miles. The occurrence of Sporadic-E rises sharply during the late spring and summer months, and occurs very little during the late fall, winter and early spring months. It is interesting to note that Sporadic-E at Washington, D. C. occurred *far less* during sunspot maximum than during the minimum of the previous cycle, further indicating that its formation may be independent of ultraviolet radiation from the sun. As we approach another sunspot maximum we can expect a decrease in the occurrence of Sporadic-E in the United States.

Propagation Analysis

Both the normal and abnormal characteristics of the ionosphere are influenced by the variation in sunspot activity. As solar activity increases, there is a corresponding increase in the intensity of ionization of the regular reflecting layers, resulting in the reflection of considerably higher frequencies and somewhat increased ionospheric absorption. The occurrence rate of auroral displays, sudden ionospheric disturbances and ionospheric storms also increase with rising sunspot numbers. On the other hand the formation of Sporadic-E clouds in the ionosphere appears to decrease as solar activity increases. While these characteristics of the ionosphere are of direct concern to the upper atmosphere scientist, the radio engineer and communicator are also concerned with the effect of these characteristics upon shortwave transmission.

During the past twenty years or so, procedures have been developed for applying basic ionospheric data in the determination of shortwave transmission parameters*. *Figures 5-8* are examples of *circuit analysis curves* derived from this procedure. The upper contour on the circuit analysis curve is the *Maximum Usable Frequency*, or MUF. The MUF, discussed at some length in Part 1 of this article, is the highest frequency that will be reflected by the ionosphere on 50% of the days of the month at the time indicated. The lower contour on the circuit analysis curve is the *Lowest Useful Frequency*, or LUF. The LUF is the lower limiting frequency for communications for a particular circuit and takes into account the radiated power of the transmitter, ionospheric absorption, the signal strength of the transmission at the receiver, atmospheric noise, and the necessary signal to atmospheric noise ratio to maintain intelligible reception on at least 50% of the days of the month. The LUF, in

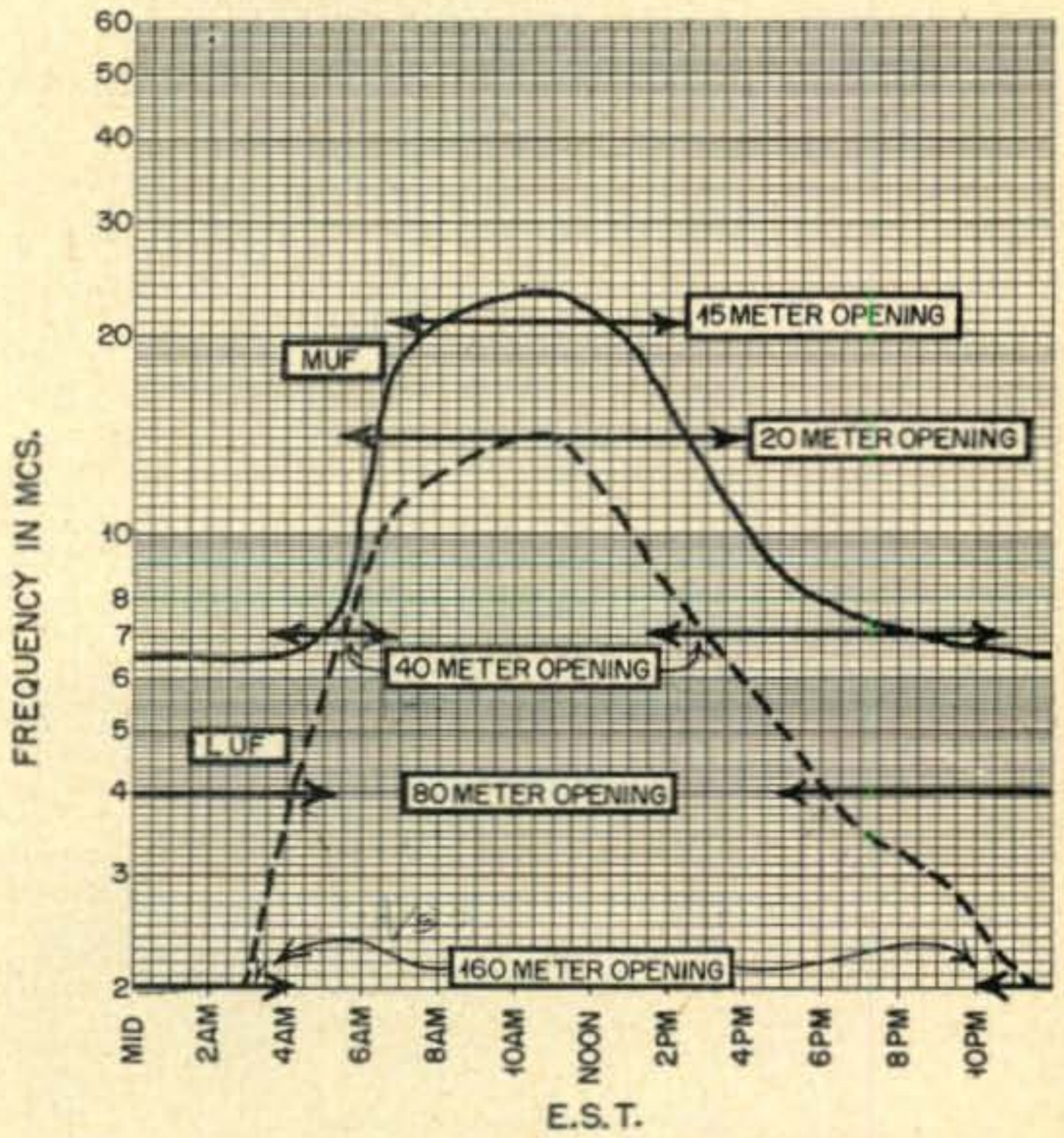

Fig. 5. Circuit Analysis Curve, East Coast USA-Western Europe. Winter, Sunspot Low (1953-54). Horizontal arrows indicate time particular amateur band is usable.

this particular study, is based upon a radiated power of 250 watts. In general the LUF will not vary more than a few megacycles up or down throughout the range of power permitted for amateur operation. The LUF contour in *Figures 5-8* indicates the lowest frequency that will enable a signal to atmospheric noise ratio of 3 to 1 to be maintained.

Between the limiting contours of the LUF and MUF lies the range of frequencies useful for communications on a particular circuit.

Frequencies above the MUF will pierce the

*Ionospheric Radio Propagation, National Bureau of Standards Circular 462, Supt. of Documents, Washington 25, D.C.

ionosphere and will not be returned to earth, while frequencies below the LUF will be so weakened by ionospheric absorption that signals will be below the atmospheric noise level at the receiver.

By utilizing basic ionospheric data observed during the last sunspot cycle, modified to take into account the rapid rise of the present cycle, it is possible to construct circuit analysis curves for determining the range of frequencies that will probably be useful during the next few years of maximum sunspot activity. In preparation for this article, over three hundred such circuit analysis curves have been calculated for nearly fifty long distance circuits in all directions from the United States. Space does not permit the publication of each curve, but pertinent data has been summarized and will be discussed in reference to each amateur band in which ionospheric propagation takes place. *Figures 5-8* are typical examples of circuit analysis curves and can be used for a comparison of the range of usable frequencies between sunspot minimum and sunspot maximum on winter circuits from the East Coast to Europe and from the West Coast to Australasia.

The period of maximum solar activity is assumed to take place when the smoothed sunspot numbers exceed 130. From data appearing in *Figure 1*, this period is expected to begin September 1956 and last through the spring of 1958.

The following is a band by band summary of propagation conditions expected during the period of maximum solar activity, September 1956 through April 1958. The spectrum from 10 through 160 meters is discussed first, followed by a summary for 6 meters and the VHF

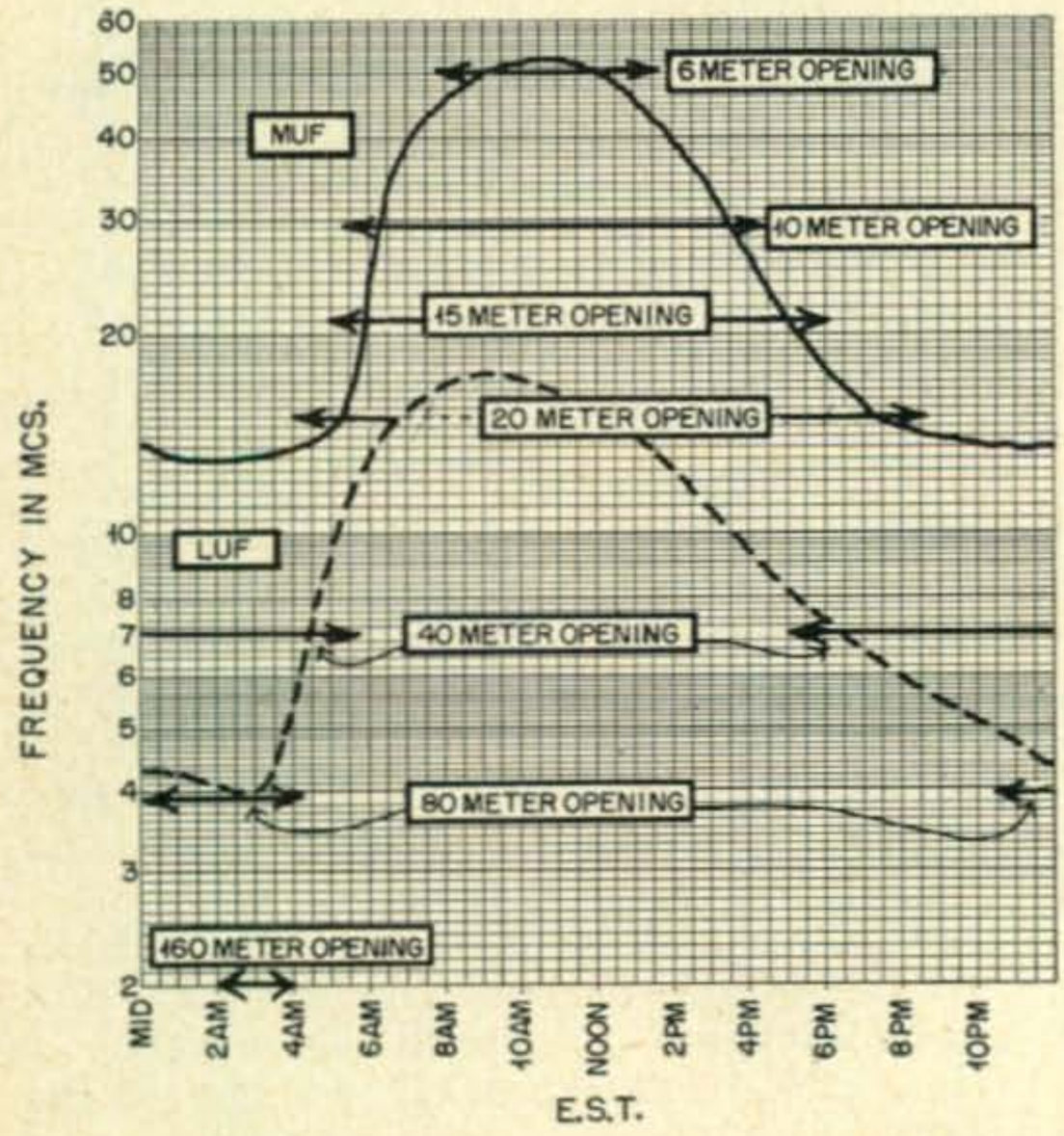

Fig. 6. Circuit Analysis Curve, East Coast USA-Western Europe. Winter, Sunspot High (1956-57)

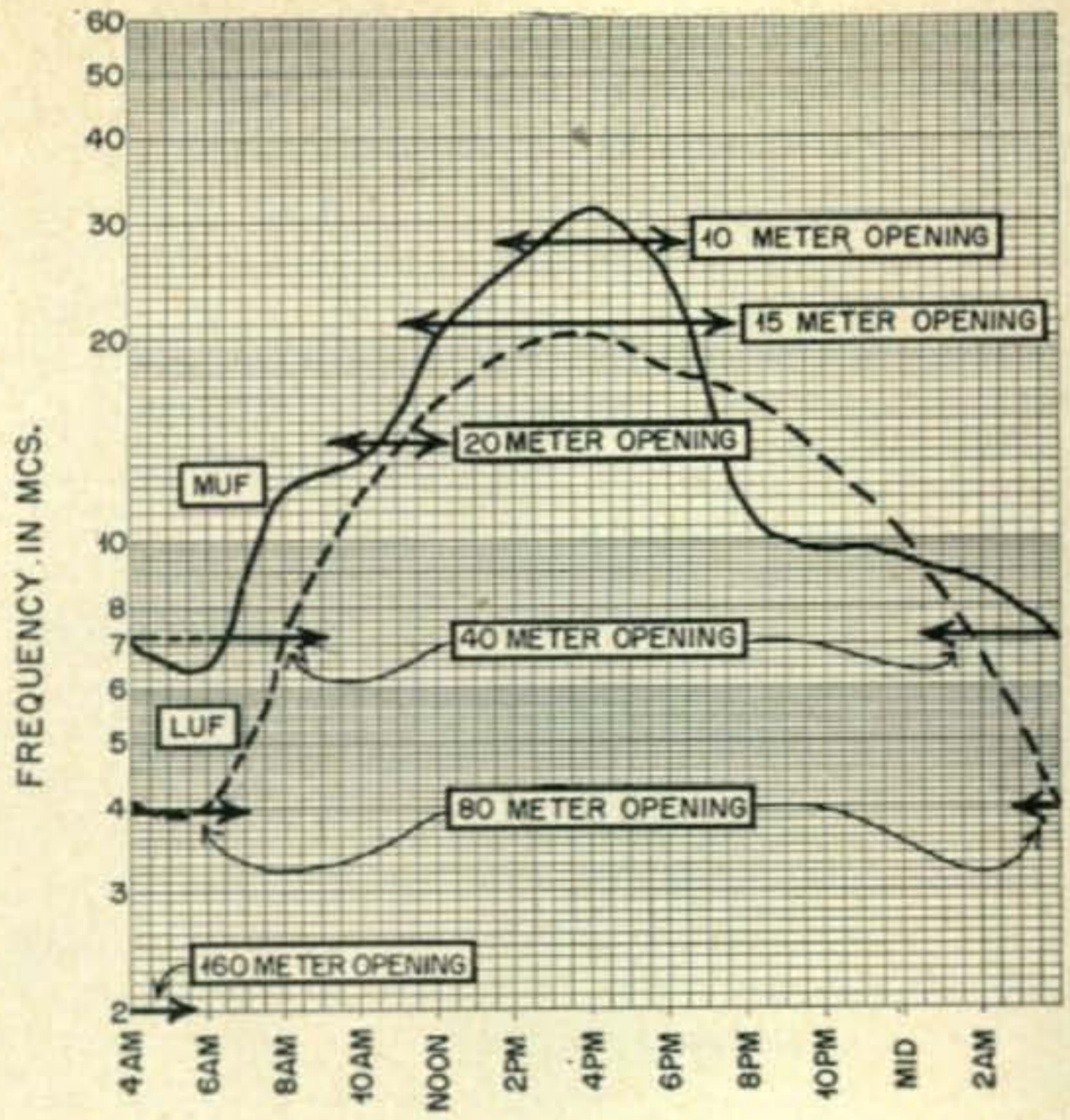

Fig. 7. Circuit Analysis Curve, West Coast, USA-Australasia. Winter, Sunspot Low (1953-54). Horizontal arrows indicate time particular amateur band is usable.

range. All times referred to in the following summary are given in *Local Standard Time*.

10 Meters:

The 10 meter band, practically in hibernation during the low sunspot years of 1952 through 1955, awoke during the fall of 1955 as the smoothed sunspot numbers passed 60. As the sunspot cycle continues to climb, long-distance propagation conditions are expected to improve considerably on 10 meters. Beginning with this coming September, and lasting at least through the early spring of 1958, propagation conditions are expected to be excellent from the United States *to all areas of the world*. During the fall, winter and spring months it should be possible to work all continents in a matter of a day, and more likely in a matter of just a few hours. Because of low ionospheric absorption in this frequency range, signals are expected to be exceptionally strong even with relatively low power transmitters. The band is expected to open from shortly after sunrise and remain open on most undisturbed days until early evening. Peak conditions should occur during the late afternoon and early evening hours. During the late spring and summer months, the normal sea-

sonal trend of lower MUF's will result in fewer 10 meter openings than during other seasons, but propagation conditions are expected to be good enough to permit a considerable amount of world-wide DX almost daily through the summer months. During the summer months, conditions peak later in the day than during the other seasons, and propagation will favor north-south paths. Except during ionospheric storms, auroral absorption is considerably less intense in this frequency range and trans-polar propagation to Asia and parts of Europe should be possible on a good number of days, especially during the early morning and early evening hours of the fall and spring months. A typical example of the improvement in 10 meter propagation conditions during the period of maximum solar activity can be seen from *Figures 5-8*. During the winter months of 1953-54, when the previous sunspot cycle was approaching a minimum, *no* 10 meter openings were possible between the United States and Europe, and only an occasional opening occurred between the West Coast and Australasia during a two hour period in the late afternoon. During this coming winter, the 10 meter band is expected to open to Europe almost daily between 6 AM and 3 PM EST and between the West Coast and Australasia between 9 AM and 8 PM PST.

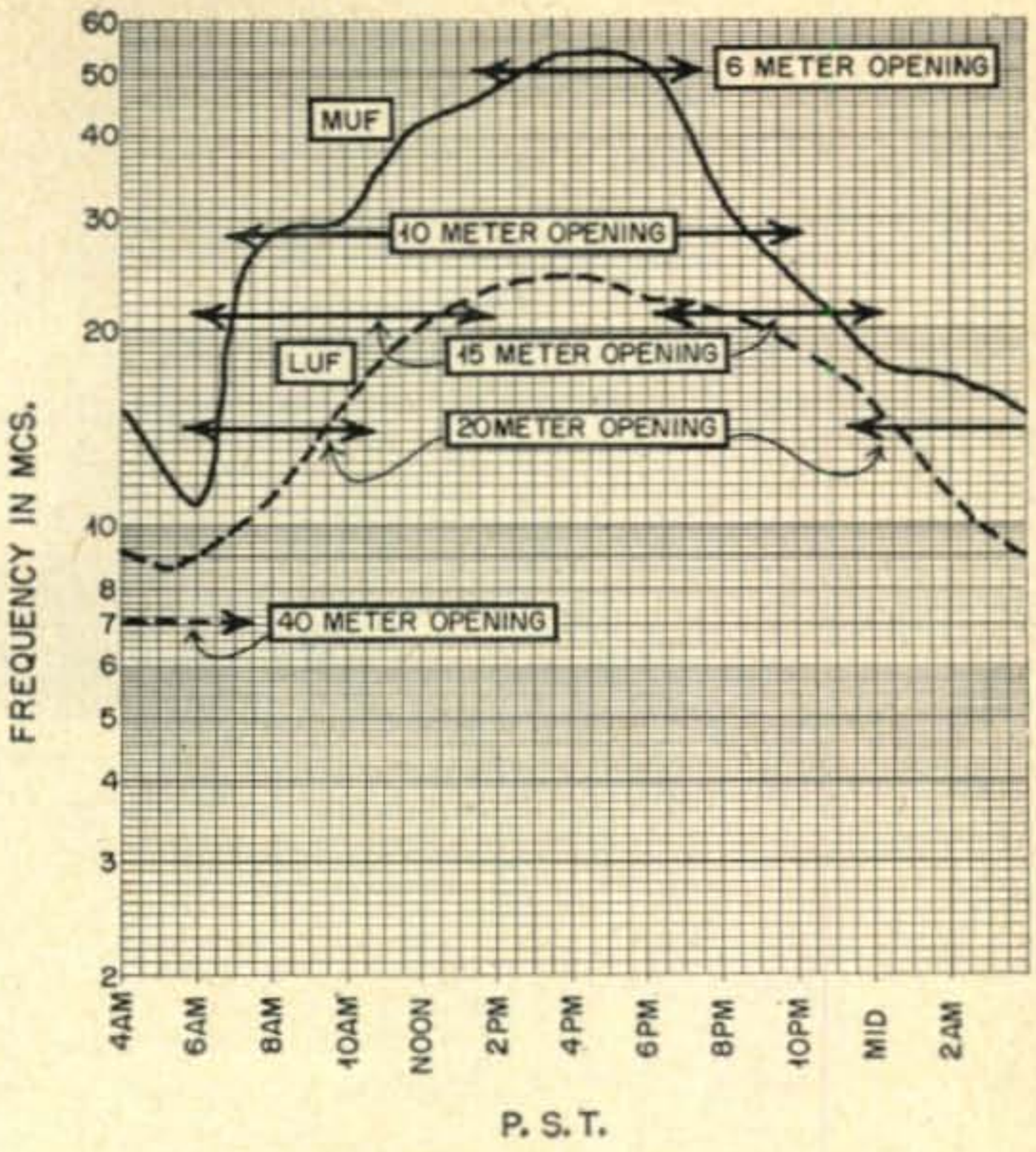

Fig. 8. Circuit Analysis Curve, West Coast, USA-Australasia, Sunspot Maximum (1956-57).

15 Meters:

While world-wide propagation conditions were fairly good on the 15 meter band for at least a few hours a day on most days during the years of minimum solar activity, conditions on this band are expected to improve considerably during the next few years of maximum solar activity. Beginning with September, the band is expected to be open to *all areas of the world* between the hours of dawn and late evening. On many circuits, especially those to Central and South America, the band will remain open around the clock on many days. Daytime absorption will be somewhat higher, especially during the summer months, and signal strengths will dip during the late morning and early afternoon hours. Peak propagation conditions will occur during the late afternoon and evening hours when ionospheric absorption decreases, and signal levels are expected to be exceptionally high, even for relatively low power transmitters. Trans-polar propagation to Asia and parts of Europe should be possible on most undisturbed days, especially during the early morning and early evening hours of the fall and spring months.

20 Meters:

While long distance propagation remains good on 20 meters throughout the sunspot cycle, the propagation pattern on this band changes considerably between the years of minimum and maximum sunspot activity. During the years when sunspot activity is low the 20 meter band is predominately a *daytime* band, opening shortly after dawn, and remaining open until around sunset. As solar activity increases, the 20 meter band remains open for longer periods of time. Beginning with September, and lasting until at least the spring of 1958, the 20 meter band is expected to open from shortly after dawn and remain open to about midnight. For a high percentage of time, propagation conditions will be good enough to permit the band to re-

main open around the clock on many long distance circuits. Daytime absorption increases on 20 meters by about 6 DB, on the average, during sunspot maximum. This will cause signals to become considerably weaker during the late morning and early afternoon hours, especially during the summer months. Long circuits, especially those in a north-south direction, may fade out altogether during this period. Conditions on 20 meters can be expected to be optimum during the late afternoon and evening hours when ionospheric absorption is minimum. During this period of optimum conditions, signal levels are expected to be exceptionally strong, and it should be possible to work all Continents without much difficulty. QRM is expected to increase considerably on 20 meters since short-skip propagation conditions will also be optimum during much of the same time that the band will be open for DX. During the late

[*continued on page 107*]

G. D. O. doubles as Crystal Oscillator

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The grid-dip oscillator has become a universal piece of equipment, and nearly every serious amateur and experimenter has one. Most experimenters do not realize, however, that by adding a simple adapter, they will have a fine crystal-controlled utility oscillator at almost no additional expense.

Most grid-dip oscillators, both "home-built" and commercial, use the basic Colpitts oscillator circuit. By making a simple adapter to

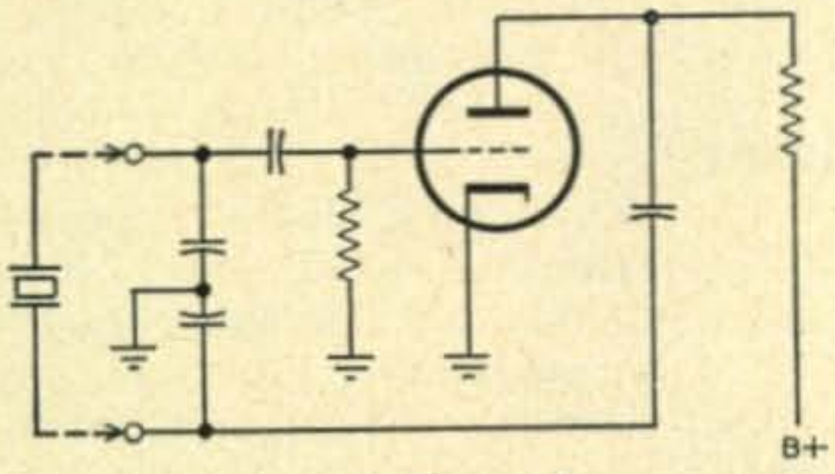

Figure 1.

allow the crystal to be connected across the coil terminals, the grid-dip oscillator now becomes a crystal-controlled oscillator, having more r-f output than is usually obtained with a high-Q coil (*Fig. 1*). The G.D.O. tuning capacitor can be used to slightly adjust the crystal frequency, in those cases where the oscillator is to be used for a secondary frequency standard, etc.

The crystal-controlled G.D.O. makes an excellent signal source for use in aligning receivers. Most G.D.O.'s will oscillate easily with any good crystal between the frequency ranges of 455 kc to 10 Mc.

When making the adapter, it is a good idea to use polystyrene instead of bakelite, etc. By using a 5-prong steatite tube socket for the crystal socket, both the FT-243 and the standard ¾" spaced crystals can be used with the same adapter. (*Fig. 2*). Use a short length of 1¼" plastic tubing to make a neat assembly of this adapter.

The signal radiated from the crystal is adequate for all receiver alignment purposes, and where it is necessary to couple an output voltage direct into a circuit or a standard capaci-

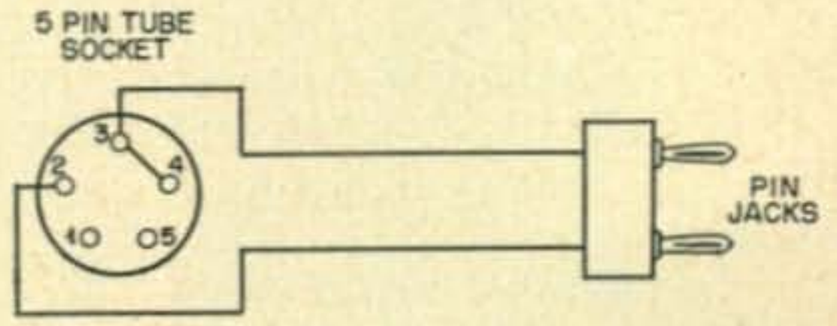

Figure 2. FT-243 type crystals plug in between pins #2 and #3 and standard crystals between pins #2 and #4.

tor, the voltage should be taken from the terminal of the crystal which is in the *plate* circuit of the G.D.O., through a 50 or 100 $\mu\mu$fd. fixed capacitor.

Editors note: The Heathkit GD-1B works just fine as an xtal oscillator. Further, by turning up the sensitivity to maximum you can get a good indication of the activity of the crystal by the reading on the meter. A good crystal will put the meter off scale. Any reading from half scale up should be satisfactory, but lower readings point to a need for cleaning of the crystal. ■

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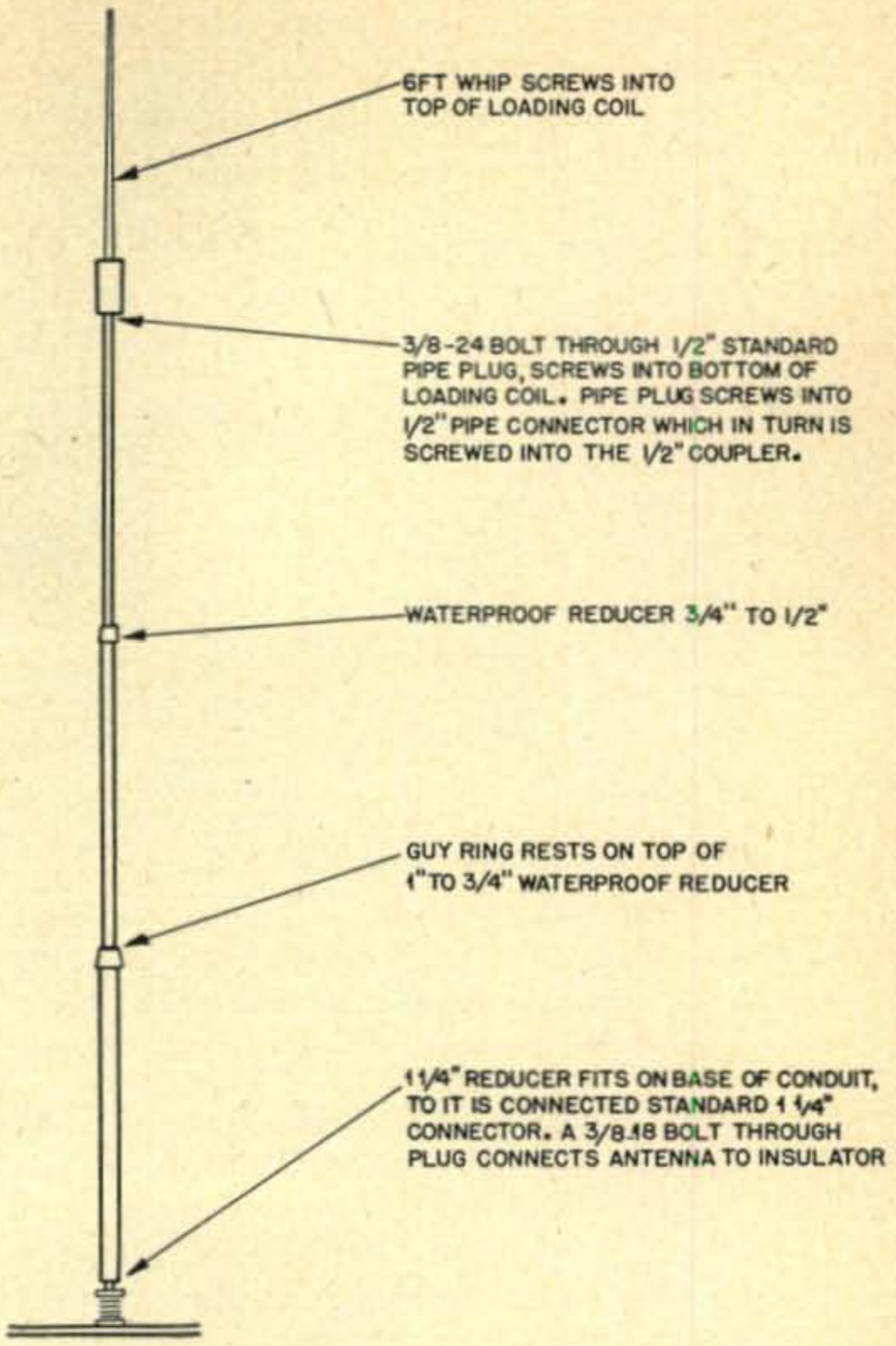


Fig. 1. The Top Loaded Ground Plane for 75 Meters stands 35 feet. 10 foot sections of thin-wall conduit, a loading coil and a 6 foot whip make up the vertical radiator.

a "shorty" Ground Plane

A Top Loaded Ground Plane Antenna for 75 Meters

Three ten foot sections of thin wall electrical conduit, a high Q loading coil and a six foot whip antenna can be easily made into a very effective vertical radiator. When worked against an array of quarterwave radials it becomes an efficient ground plane antenna.

There are a number of advantages to vertical antennas and a number of disadvantages as well. This configuration affords all of the advantages and eliminates one of the main disadvantages. While the advantages are well known they might be reviewed before getting into constructional details. They are:

1—Low angle of radiation with a substantial concentration of radiated signal equivalent to several db gain at an angle approximating 45°

2—Ease of feeding. Readily available coaxial cable need only be connected to the base as described later. No elaborate networks, balun coils or the like are required

3—Little space is required in which to erect the antenna.

4—Excellent efficiency is possible. Broadcast station vertical antennas have demonstrated efficiencies in excess of 90%

The main disadvantage to a vertical radiator is that it must work against a good ground system if reasonable efficiency is to be expected. As a rule, this implies an elaborate radial ground system. The latter, in turn, usually means digging small trenches in the lawn, flower bed and tunnelling under sidewalks and driveways, all of which is nothing but hard

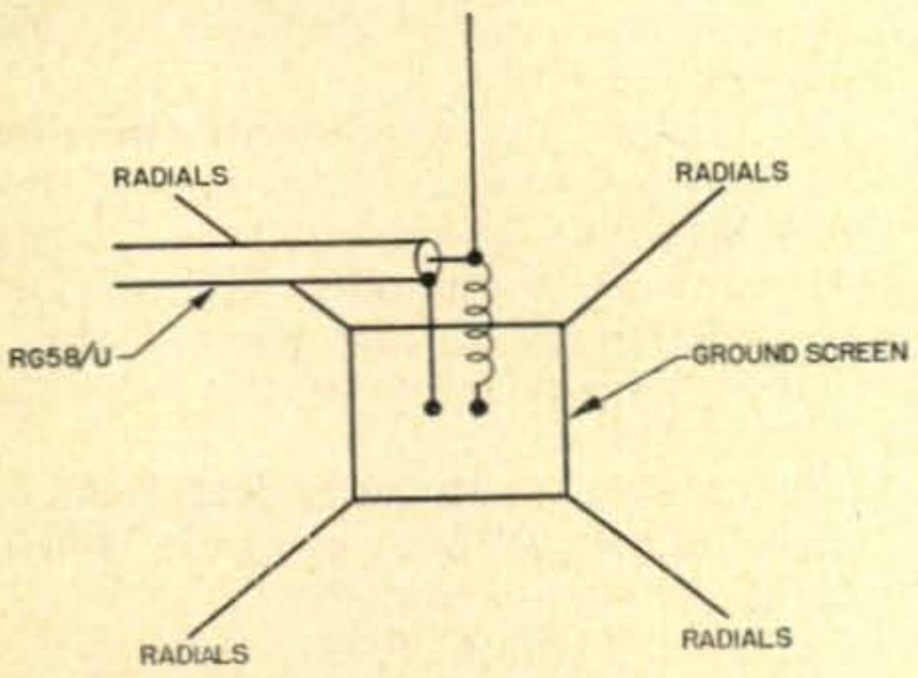
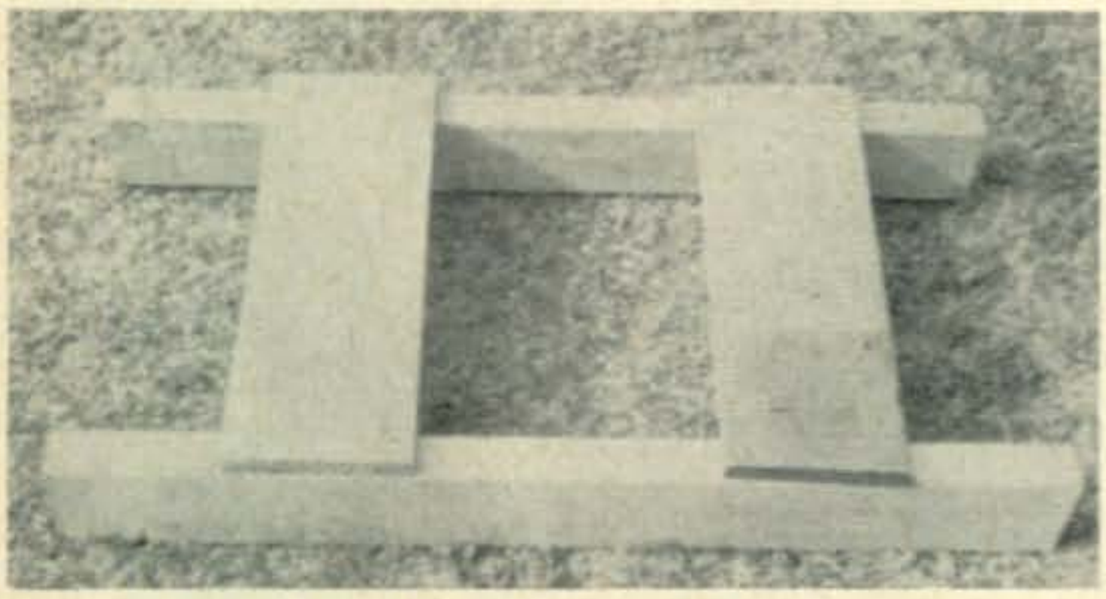


Fig. 2. A 6 turn coil shunted across the coaxial cable assures proper termination at the antenna base. Coil is 3 inches in diameter, of 16 wire.

work. By use of ground plane radials, as described herein, a good ground system is obtained with a very minimum of effort.

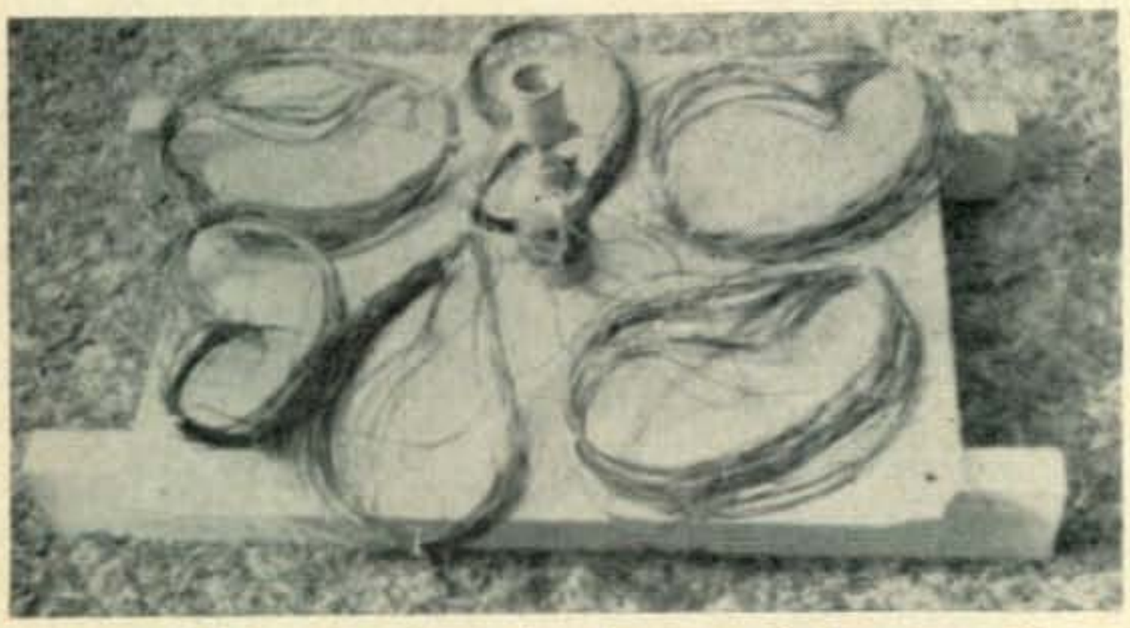
Figure 1 tells the story of the vertical radiator itself. A base section made of 1″ thin wall electrical conduit supports a ¾″ section which in turn supports a ½″ section. Each section is telescoped into the other, 12″. Telescoped ends



Frame which holds the ground screen and base insulator, made of scrap lumber. 2x4's serve as feet which straddle the garage roof peak. Wood screws hold the ground screen on the frame.

are peened to the inside diameter of their lower section to reduce vibration in high winds.

Atop the ½″ section is mounted a coil normally used for loading mobile antennas. While waterproof reducers couple the section of conduit together, a ½″ coupler that takes a standard ½″ pipe connector is used to mount the coil onto the conduit. A standard ½″ pipe plug is drilled to take a ⅜ 24 bolt through its center. The connector is screwed onto the coupler. The ⅜ 24 bolt is fed through the plug up into the base of the coil and then the plug



Ground screen, base insulator and frame, with 62 foot radials cut and rolled into coils await hoisting atop garage roof. Ground screen is scrap dural 20x24 inches.

is screwed into the pipe connector. The whip screws into the top of the loading coil to complete the antenna.

At the base is connected a 1-¼″ reducer to which a standard 1-¼″ pipe connector is attached. A 1-¼″ standard pipe plug fits into the connector, after having been drilled through its center to take the ⅜ 18 bolt that holds the antenna onto the base insulator.

While a porcelain insulator is shown, the type of insulator used at the base is not critical. At even maximum legal power, voltage at this point will be quite low. Ordinary hardwood impregnated with paraffin, coil dope or other dielectric material to keep it dry will do a good job.

Feeding the antenna is accomplished as shown in the schematic of *Figure 2*. Fifty ohm coaxial cable shunted by a small coil connects to the base. The coil which consists of 6 turns of No. 16 wire space wound three inches in diameter cancels the capacitive reactance of the line and effectively keeps the line out of the antenna system.

The ground system consists of a ground screen and six quarterwave radials. Size of the ground screen is not too important. The one shown just happened to be 20 inches by 24 inches, but obviously the larger the screen the better. Radials were cut to measurement, however. Each one was pruned to a length of 62 feet.

After radials were cut to length they were assembled on the ground screen. The latter is supported by a frame (see photo), which straddles the peak of the garage roof upon

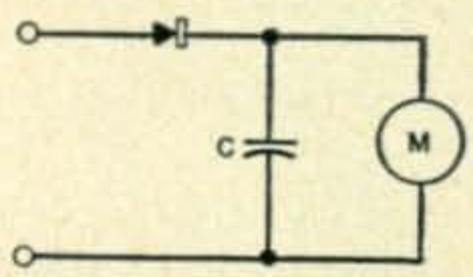


Fig. 3. This simple field strength meter consists of a germanium diode such as a 1N34, a .005 condenser and a 0-5 milliampere movement meter. More sensitive meters can be used, but since readings are only comparative, in this usage, a more common movement will suffice. Many surplus meters that read low DC voltages have 0-5 ma. movements and can be bought quite inexpensively.

which the radiating system has been erected. However, the radiator was 'rough tuned' before being hoisted to the garage as follows:

1—Coax was connected to antenna as shown in Figure 2

2—The opposite end of the coax was terminated with a 50 ohm ½ w. carbon resistor

3—The transmitter was set on the desired frequency and a random length of wire was attached to its antenna connection

4—A simple field strength meter, Figure 3, was connected to the end of the coax that is terminated with the 50 ohm resistor

5—Input to the transmitter was then set to where about a quarter scale deflection appeared on the meter

6—Antenna was lowered and turns of the coil were shorted out a few at a time until optimum reading was achieved on the meter

The whole system was then hoisted to the

roof. The ground screen was put in place and radials were strung out as far as possible in straight lines and then bent around until they were extended to their full length. While it would be nice if radials could be laid out as though they were spokes of a wheel this is seldom practical for the amateur. Therefore it is necessary to string radials around in several directions. Even though radials might run through trees, shrubs, down sides of buildings and along fences, they are considerably better than no radials at all.

The antenna was then hoisted into position and guyed loosely. Impregnated rope serves as guys although that new plastic clothesline with the nylon tire cord core is even better. The latter does not stretch while the rope has stretched for several months, requiring frequent trips to the roof to take up slack.

With the antenna in position the same procedure as outlined previously was gone through. The coil was tapped down until optimum reading was obtained. This requires raising and lowering the antenna a number or times, but it is time well spent.

Since the meter is attached to the far end of the coax, it was brought up to the roof of the garage. There readings were available as fast as the antenna could be lowered and raised. As a result the coil pruning process took less time than it might first appear. The whole job was done by one man, but two makes life so much simpler!

At W6GEG this top loaded ground plane has worked out even better than expected. While rag chewing is preferred to DX, contacts have been made as far West as Midway Island, as far North as Kodiak, Alaska and up and down the East coast of the United States with excellent reports.

The transmitter is a single sideband transmitter with a pair of grounded grid 6L6's in the output stage. Despite this modest tube array 50 db over S9 reports have been obtained from San Francisco, 30 db over S9 from Denver, Colorado and 40 db over S9 from Seattle during rag chews! No such reports were received before a conventional half wave dipole was replaced by the top loaded ground plane. ■

2 On Two

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Hicksville, New York

Just a few years ago if one wanted to use crystal control on two-meters it would have meant a l.f. crystal and four or five doubler stages. In addition, the h.f. performance of the old high-inter-electrode capacity tubes would be poor. Now with the new harmonic-crystals, and h.f. tubes at low prices, a crystal-controlled two-meter transmitter can be constructed with just two *Amperex 6360* miniature tubes. This transmitter will run 17 w. input on phone or 30 w. input on CW.

The *Amperex 6360* is similar to its big brother, the *Amperex 9903/5894*, but is of the 9-pin miniature type and sells for about four dollars. The tube is a dual-tetrode with a common cathode, common screen and dual-filaments that can be used in parallel for 6 v. operation or in series for 12 v. operation. This allows the tube to be used for mobile work in either the older 6 v. cars or the newer 12 v. ones. The tube is designed with short leads and a button stem for full ratings up to 200 mc.

The transmitter is constructed on a 4″ x 6″ aluminum bottom plate in order that a *Bud AC-430* 4″ x 6″ x 3″ aluminum chassis can be used for a base and cover. This small size makes the transmitter useful for mobile work since it can be clamped to the steering wheel post, or kept in the glove compartment.

From the picture of the top of the transmit-

ter, starting from the left is the crystal, *6360* harmonic crystal-oscillator and trippler (*V1*), *L1* is in front of *V1*, *C2*, push-pull *6360* amplifier (*V2*), *C3*, coax output, and *C4* in front of coax output.

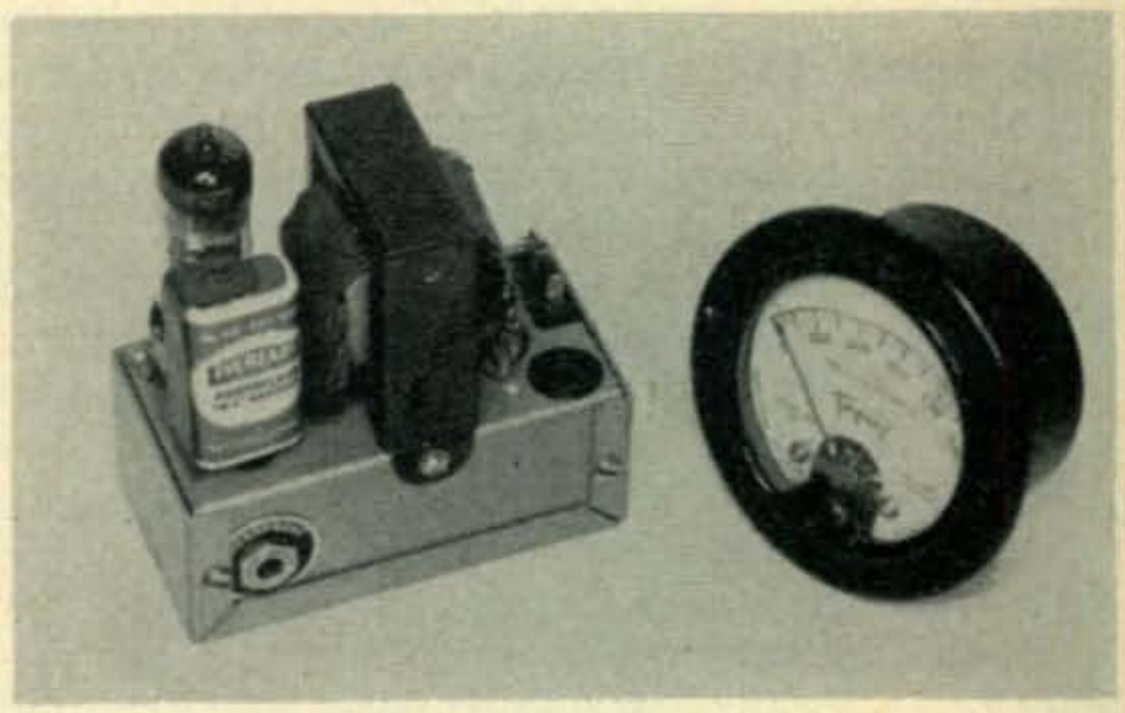
In the schematic diagram all leads are shown metered, but some of these meters could be eliminated or a single meter and switching arrangement used at the discretion of the builder. The schematic shows the transmitter set for phone operation: for *CW* operation the plate-voltage may be increased to 300 v.

The first section of *V1* is a harmonic crystal-oscillator and is used with a fifth harmonic crystal (48.666 Mc.). *C5* and *C6* form the feedback circuit. The amount of feedback is fairly critical. Making *C5* smaller increases the feedback and making it larger decreases the feedback. With different make crystals the feedback may have to be adjusted. The feedback should be adjusted so that the crystal oscillates on its harmonic readily, but too much feedback will cause the oscillator to oscillate without the crystal plugged in. *L1* should always be tuned for the harmonic frequency. (48.666 Mc.) because when *LI* is off resonance the circuit acts as a Pierce oscillator and oscillates on the crystal fundamental frequency.

The second half of *V1* is a tripler to 146 mc. This feeds a balanced tank circuit to provide balanced drive to *V2*, the push-pull amplifier.

R6 and *R7* in the screen circuit of *V2* are such as to provide the correct ratio of audio to appear on the screen for 100% plate modulation.

L3 is made up of two coils, each being 2 turns of *Air Dux* #416T or *B&W* #3003* coil stock and spaced ¼" apart to allow *L4* to swing in and out.



Tiny modulator for the "2 on Two."

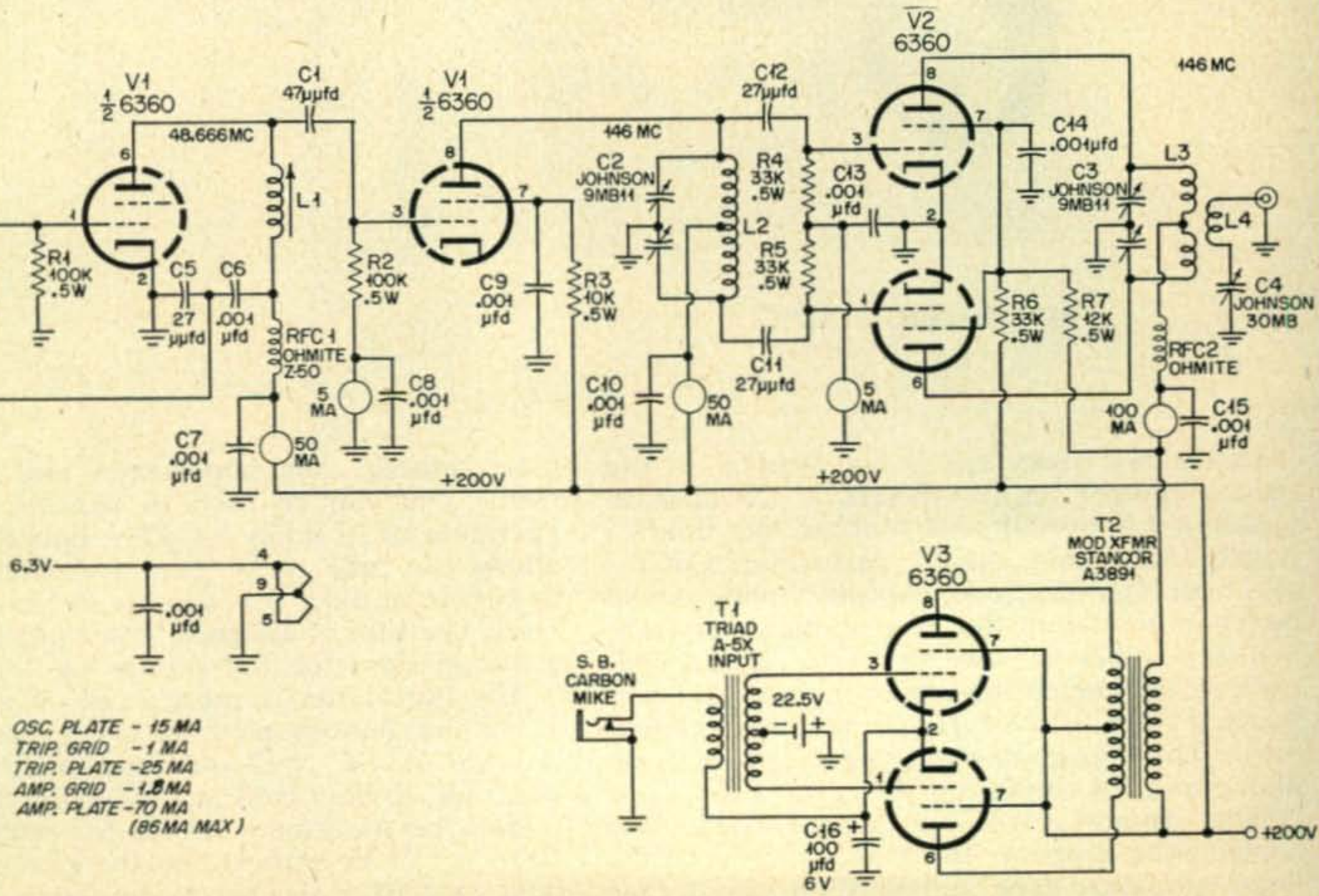
The meter readings are approximately as follows using a 200 v. power supply:

Osc. Plate—15 ma.
Trip. Grid—1 ma.
Trip. Plate—25 ma.
Amp. Grid—1.8 ma.
Amp. Plate—70-86 ma.

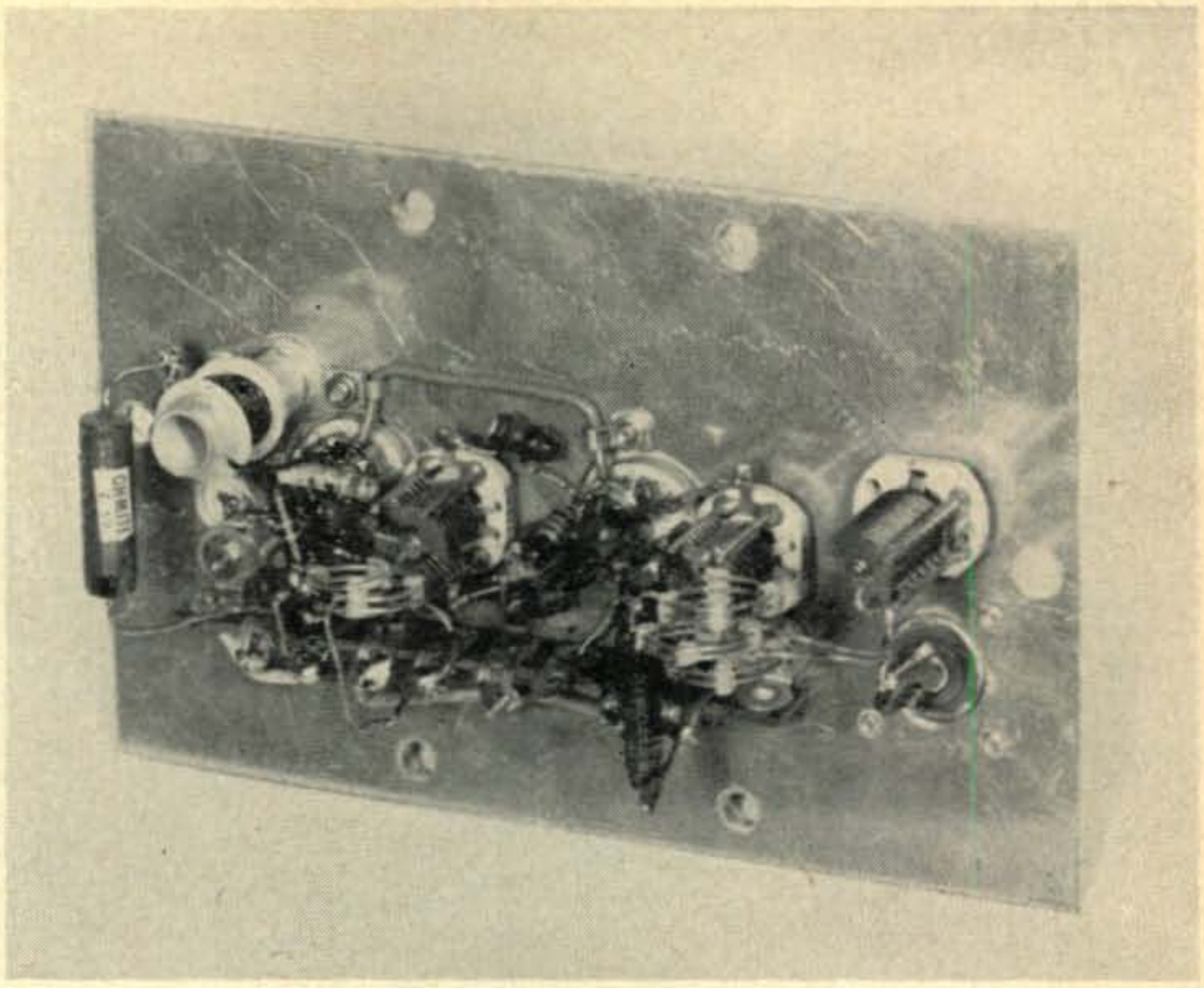
No trouble was experienced with parasitics or self-oscillation in the final due to the fact that these tubes are internally neutralized.

After building the transmitter I looked

*16 Turns per inch, ½" diameter.



Schematic for the "2 on Two", with optional modulator shown



Bottom view of the "2 on Two" r-f chassis.

around for a modulator and decided to keep it simple and use the same tube, so that only one spare would have to be carried. I came up with a unit that only used a *6360*, a condenser, a battery and two transformers. When completed it fit into the palm of my hand. The modulator delivers about 7 w. of audio with 200 v. on the plates and screen, but this can be increased to 12 w. if the plate voltage is increased to 300 v.

Looking at the picture of the top view, the *6360* is at the rear left corner with the 22½ v. bias battery just in front. In the center is the modulation transformer. To the right rear is the power plug and just in front is the output plug. The jack on the front is for the single button carbon mike.

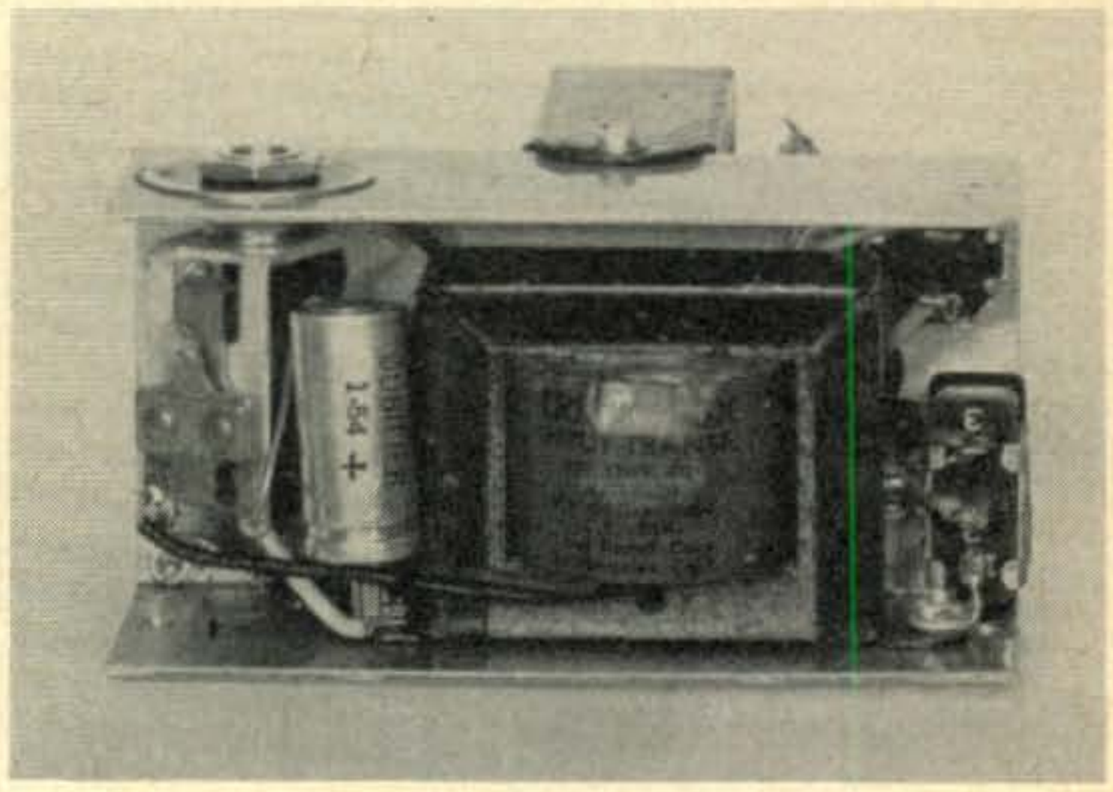
Looking at the photograph of the bottom view we see *C14* and the mike transformer (*T1*).

Parts List

C1—47 μμfd. tubular ceramic Erie
C2, C3—8 μμfd. butterfly Johnson 9MB11
C4 — 32 μμfd. variable Johnson 3OM8
C5—27 μμfd. tubular ceramic Erie
C6, C13, C14, C15—.001 ufd. tubular ceramic Centralab
C16—100 μfd. 6 v. electrolytic C.D. #BBR-100-6
R1, R2 — 100K ½ w. Ohmite
R3—10K ½ w. Ohmite
R4, R5, R6—33K ½ w. Ohmite
R7—12K ½ w. Ohmite
RFC1—Ohmite Z-50 R.F. choke
RFC2—Ohmite Z144 R.F. choke
T1—High gain carbon mike trans. Triad A-5X
T2 — Multi-Tap modulation trans. Stancore A-3891
V1, V2, V3 — Amperex 6360
Xtal—48.666 Mc. International Crystal
Bat.—22½ v. Eveready #412
L1—9½ turns #20 enam. wire on National XR91 coil form
L2—2½ turns Air-Dux #416T or B&W #3003 tapped at center (16T/in-½" dia.)
L3—4 turns Air-Dux #416T or B&W #3003 ¼" spacing at center
L4—2 turns Air-Dux #416T or B&W #3003

In the schematic diagram it will be seen that the mike is in the cathode of *V3*. This eliminates the use of a mike-battery with its constant replacement problems. However, a 22½ v. battery is used for grid bias, but the life of this battery is practically equal to its shelf-life as no grid current is drawn since *V3* is operated class *AB1*. *T1* is a very high gain type in order to supply the necessary grid to grid voltage.

The modulator is built on the cover of a *Premier PMC-1002* miniature aluminum case

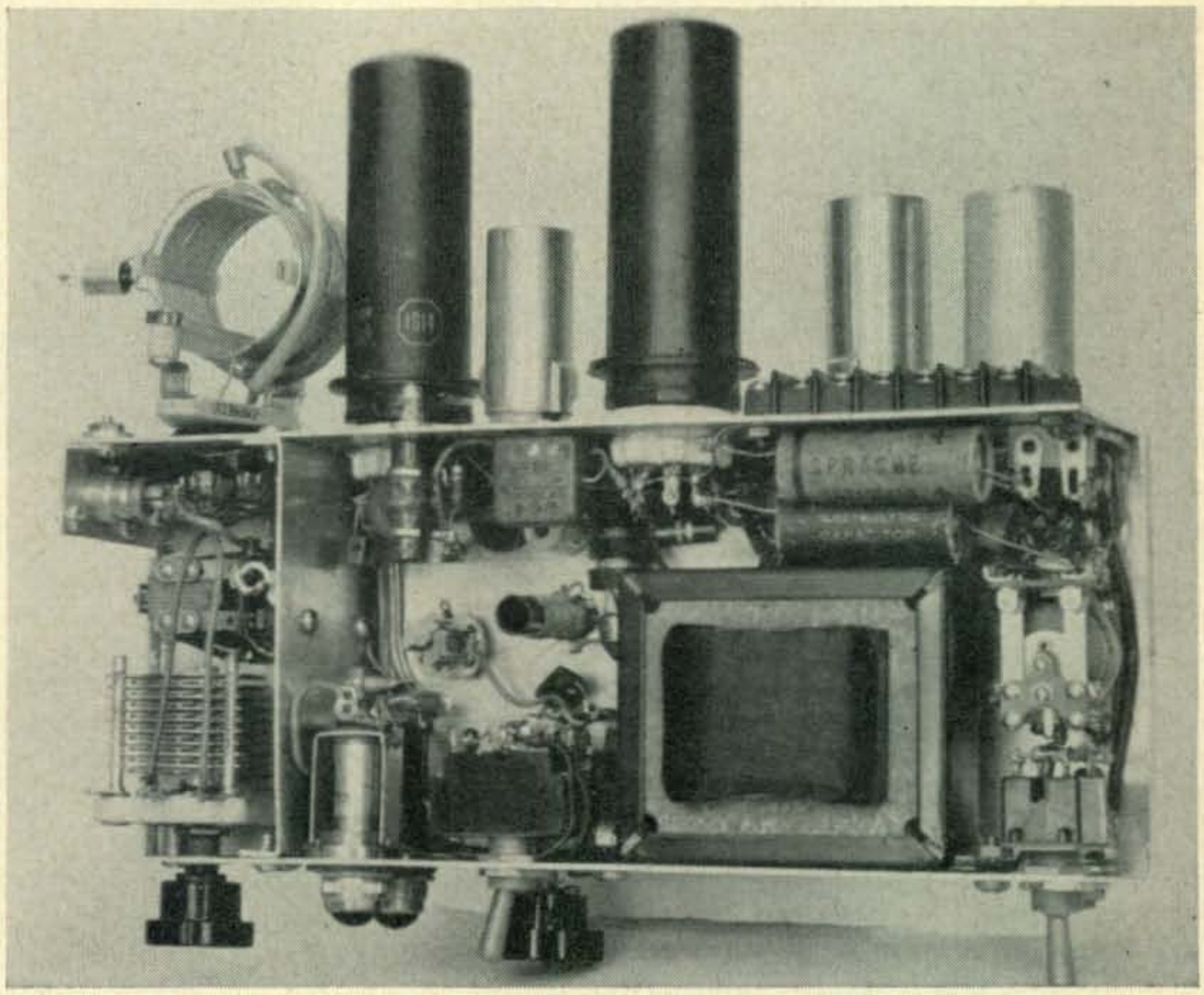


Modulator, bottom view.

4" x 2⅛" x 1⅝". The mike jack is a closed circuit type in order to prevent the voltage across *C14* from exceeding its voltage rating when the mike is removed from the jack. Since there is no mike-battery the mike may be left in the jack at all times.

For mobile use the 200 v. at 60 to 70 ma. for the modulator may be obtained from the car receiver by inserting a S.P.D.T. toggle switch in the B+ lead of the receiver. ■

Mobile Reference-Shift Modulator



The author's reference-shift-modulated mobile rig. The modulator (right to left) uses a 12AX7, 12AU7, and 1614 (or 6L6) with modulation choke mounted inside the chassis. Input to final is 35 watts.

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Inglewood, Calif.

In the design of both mobile and fixed-station rigs, the modulation transformer is an eternal headache. Unless you pay extra for a multimatch transformer, you're limited to only one final-amplifier load impedance. This is especially notable in the case of the mobile rig which will seldom load according to your expectations.

To avoid the transformer problem you can use screen modulation (frequently used in mobile rigs), but this method provides a carrier efficiency of only about 30 per cent. No ordinary efficiency-modulation system can offer the psychological boost to be obtained from a plate-modulation carrier efficiency of 60—80 per cent.

One solution is Heising, or choke-coupled, plate modulation. With Heising plate modulation the final operates at the usual 60—80 per cent class-C efficiency. In this system an ordinary filter choke replaces the modulation transformer. A choke is a common junk-box item; or, if you don't have a choke with suitable characteristics, you can buy one at half the cost of a comparable modulation transformer.

However, the class-A_1 amplifier used in a conventional Heising modulator has two serious shortcomings: First, since the maximum modulator plate dissipation occurs with no audio input the permissible modulator plate-power input is therefore limited to the rated plate dissipation of the tube even though the actual plate dissipation drops below this value with audio input. In other words, you can't take full advantage of the tube's capabilities. Suppose, for example, you use a 6L6 in a conventional class-A_1 modulator. The rated plate dissipation of this tube is about 20 watts; therefore you're limited to 20 watts input to the modulator. But with maximum audio input,

A transformerless plate modulator for a 35-watt mobile rig

the actual plate dissipation drops to 13 watts or less. This leaves 7 watts or more of potential plate dissipation that goes unused.

Second, the maximum plate-current swing is severely limited; hence, maximum modulator plate efficiency is usually only about 30 per cent.

Both of these objections can be overcome by a circuit in which modulator plate current is reduced in the absence of audio input. By this means, the full plate-dissipation capability of the tube can be utilized and the power input thereby increased. Also, the greater plate-current swing increases efficiency. In fact, if linearity can be maintained, the theoretical maximum efficiency of 50 per cent can be obtained.

Two systems which fulfill these requirements have recently appeared in *CQ:* The first, and by far the oldest, is bias-shift modulation, rejuvenated in 1950 by M. H. Kronenberg[1] and modernized in 1954 by Bill Orr[2]. In this system, the modulator tube is operated class-A_1 and control-grid bias is varied according to the audio level. An increasing audio level decreases the bias and consequently increases modulator plate current.

The other variable-plate-current Heising system is called "class-K" modulation and was developed by the author[3,4] in 1953. In the class-K system, the modulator (*not* the r-f final) is fitted with an audio-controlled clamp tube. An increasing audio level increases the audio-clamp-tube bias and thereby increases the modulator screen voltage. The modulator is operated at zero bias so that a high plate-current swing can be obtained within a reasonable screen-voltage excursion.

Both systems provide a high modulation level, good efficiency, and excellent linearity. However, each has its drawbacks. The bias-shift system requires the use of a fixed-bias supply and one or two bias-control tubes, which contribute to physical size, complexity, and cost. These factors are particularly important in the design of a mobile modulator.

The class-K system, while requiring no fixed-bias supply, does use a power-consuming audio clamp tube. And because this modulator is operated at zero bias, it requires considerable driving power, which means that the driver consumes appreciable d-c input power. Power-supply drain is of course another important consideration in the mobile modulator.

Reference-shift plate modulation combines the better features of the bias-shift and class-K systems and avoids the disadvantages of both. No fixed-bias supply is needed, no unwieldy clamp tube is used, and the driver requires very little input power. This modulation system is therefore particularly well suited to the mobile rig.

Reference-Shift Modulation

Reference-shift plate modulation is basically bias-shift modulation with positive bias. Don't be alarmed: Positive bias has no ill effect since the modulator tube is operated as a zero-bias triode.

The unique cathode-follower driver circuit which makes a practical reference-shift modulator possible was suggested to me by Henry S. Keen, W2CTK. Mr. Keen had devised a controlled-carrier screen-modulation system in which the d-c output level of the modulator is a function of the audio input voltage[5]. Mr. Keen suggested that his modulator might be an excellent *driver* for a variable-plate-current Heising plate modulator. He was quite right.

Detailed operation of the reference-shift plate modulator is described in the April issue of Radio & Television News[6]. However, here is a brief circuit analysis:

The basic reference-shift circuit is shown in *Fig. 1*. The output of cathode-follower driver *V1* is an audio voltage impressed on a positive d-c voltage equal to the peak audio voltage. The average plate current of modulator *V2* is therefore proportional to the audio input voltage.

Voltage divider *R3* and *R4* applies a fraction of the cathode voltage to the anode of rectifier *CR1*. Output from *CR1* is filtered by *C2* and applied as a positive d-c reference level to the grid through grid-return resistor *R1*.

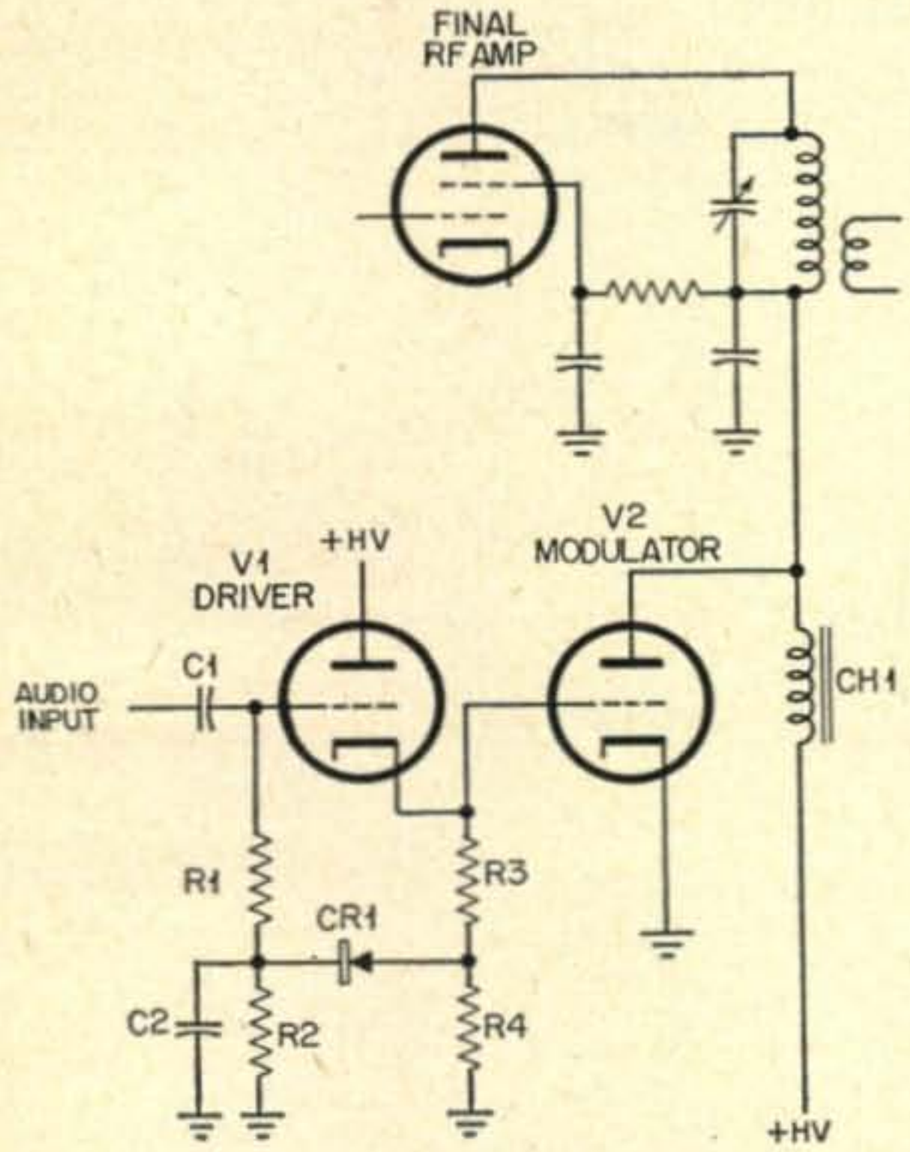


Fig. 1. Basic reference-shift modulator. Choice of values is discussed in the text.

1. M. H. Kronenberg, "Low Cost Modulator for the KW Final," *CQ*, Oct., 1950, p. 34.
2. Orr, "The Bias-Shift Modulator," *CQ*, April, 1954, p. 33.
3. Hileman, "Class K Modulator," *CQ*, Oct., 1953, p. 37.
4. Hileman, "Class K Mobile Modulator," *CQ*, Sept., 1954, p. 16.
5. A similar system is described in *CQ:* Thomas E. Beling, "The Midget Budget Modulator," *CQ*, September, 1955, p. 45.
6. Hileman, "A Reference-Shift Modulator," Radio & Television News, April, 1955, p. 46.

Resistor *R2* permits *C2* to discharge at a syllabic rate but not an audio rate. The reference voltage is therefore a function of the average audio level.

With no audio input, *V1* is biased by the voltage developed across *R3*. This voltage is high enough that the plate current of *V1*, and therefore the cathode voltage, is relatively low. But audio voltage applied to the grid through *C1* causes an audio voltage to be added to the already-existing d-c voltage at the junction of *R3* and *R4*. The resulting increase in reference voltage increases the average cathode current, which in turn increases the d-c cathode level. The d-c output level of *V1* thus increases as its audio output level increases.

Modulator *V2* is a zero-bias triode operated with positive bias; this bias is the d-c output level of *V1*. Since the d-c output level of *V1* is a function of the audio level, the average plate current of *V2* is also a function of the audio level.

With no audio input, therefore, the plate current of *V2* is at its minimum value. With maximum audio input, the plate current is at its maximum average value, swinging between cutoff and saturation. This plate-current swing provides a plate efficiency of 50 per cent or more.

Compared with the characteristics of a conventional class-A_1 modulator, the increased efficiency of a reference-shift plate modulator and the increase in permissible power input *almost triple the obtainable power output*. Thus where a 6L6 normally provides a power output of 7 watts, in a reference-shift circuit it delivers an output of almost 21 watts.

The 6L6 is of course not a zero-bias triode; it is a tetrode. However, any tetrode can be made to operate as a zero-bias triode, as explained later.

Choice of Values

Driver *V1* should have a relatively low plate resistance so that a low source impedance is presented to the grid of *V2*. And the maximum rated cathode-to-heater voltage of *V1* must be high enough to permit a relatively high peak-positive output voltage. Among the tubes that fulfill these requirements for low- or medium-power applications are the 6BF5 (triode connected), 6C4, 6S4, 12AU7, and 12BH7.

Resistors *R3* and *R4* should be equal in value. The mathematical proof of this statement is somewhat involved; however, experimental evidence bears it out.

These resistors are simply a voltage divider, loaded by a relatively high impedance, and should not present an appreciable load to *V1* compared to the grid-to-cathode resistance of *V2*. The total resistance of *R3* and *R4* should be 5 to 10 times the load presented by the grid of *V2*.

Rectifier *CR1* must have a maximum rated back voltage equal to or higher than the maximum reference voltage. A 1N38 will tolerate a back voltage of about 100 volts; for a higher voltage, a thermionic rectifier (such as the 6AL5) is most practical. Crystal diodes in series are not recommended; two cost more than one 6AL5 and cannot be depended on to have equal back resistances.

The time constant of components in the cathode circuit of *CR1* is not at all critical but

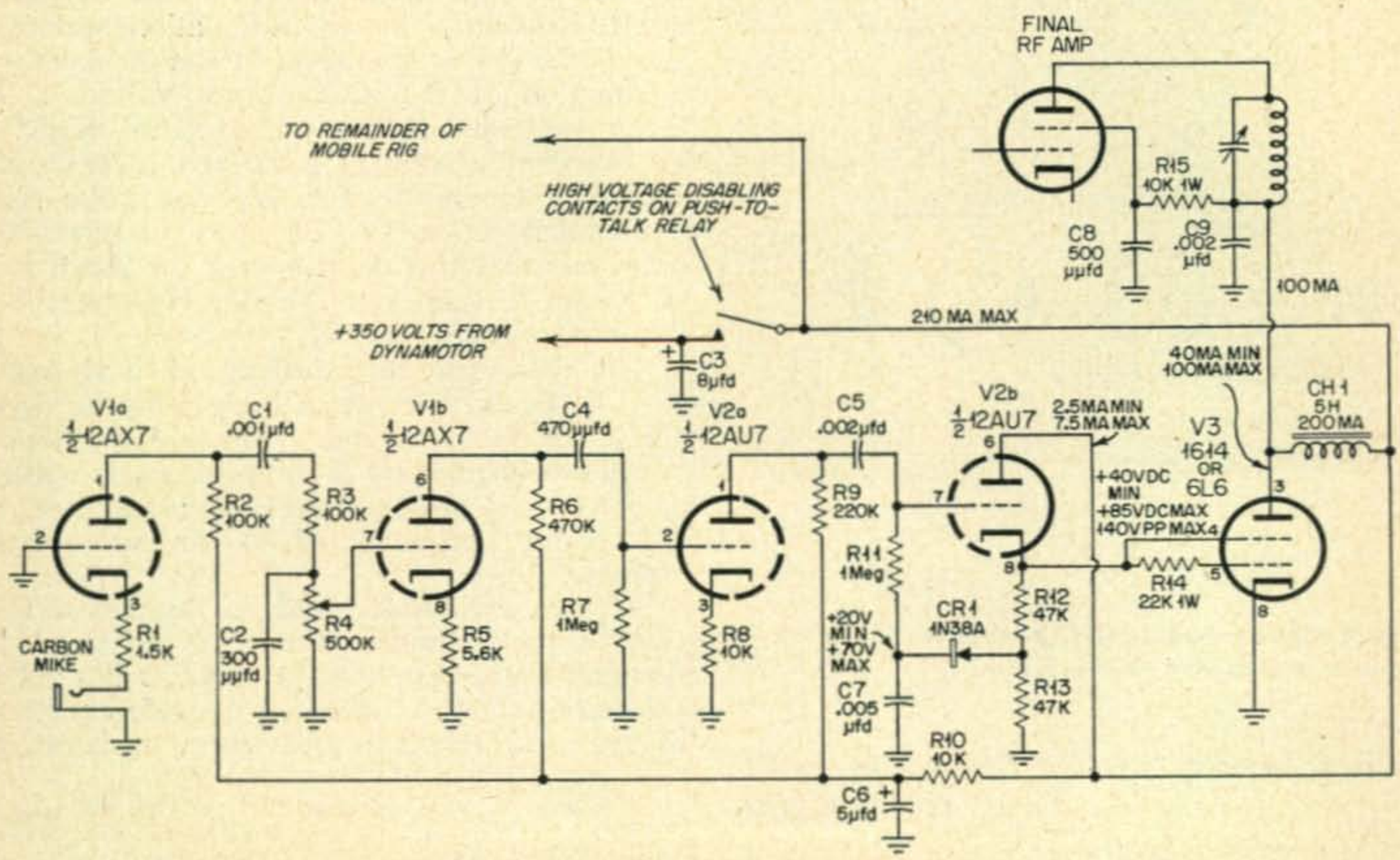


Fig. 2. Complete schematic diagram for the mobile reference-shift modulator.

Parts List

C1—0.001 μfd., 500 v.
C2—330 μμfd., 500 v.
C3—8 μfd., 450 v. electrolytic
C4—470 μμfd., 500 v.
C5—0.002 μfd., 500 v.
C6—5 μfd., 450 v. electrolytic
C7—0.005 μfd., 500 v.
C8—500 μμfd., 1000 v. (see text)
C9—0.002 μfd., 1000 v. (see text)
CH1—5 henries, 200 ma
CR1—1N38A diode
J1—microphone jack, as required
R1—1500 ohms, ½ w.
R2, R3—100,000 ohms, ½ w.
R4—500,000-ohm potentiometer
R5—5600 ohms, ½ w.
R6—470,000 ohms, ½ w.
R7, R11—1 meg., ½ w.
R8, R10—10,000 ohms, ½ w.
R9—220,000 ohms, ½ w.
R12, R13—47,000 ohms, ½ w. (5%)
R14—22,000 ohms, 1 w.
R15—10,000 ohms, 1 w. (see text)
V1—12AX7 tube
V2—12AU7 tube (do not
V2—12AU7 tube (do *not* use 12AX7 for *V2*)
V3—1614 or 6L6 tube (1614 preferred)

should be as small as will permit full reference voltage for the lowest audio frequencies involved. Experimental data indicate that a time constant of 0.005 to 0.05 sec is satisfactory.

The reactance of *C2* at audio frequencies should be 2 to 5 times the resistance of *R3* or *R4* so that it charges quickly as the audio level increases. With a given value for *C2*, therefore, the time constant is determined primarily by the resistance across *C2*. So if *CR1* is a thermionic rectifier having an almost infinite back resistance, the time constant is determined by the value of *R2*. But if *CR1* is a crystal rectifier, then its back resistance may determine the time constant, making *R2* unnecessary.

The resistance of *R1* is the normal grid-return value for *V1*. Coupling capacitor *C1*, however, should be as small as practicable to that it has negligible effect on the time constant.

I have referred to modulator *V2* as a zero-bias triode; actually a triode has probably never been used as a reference-shift modulator. Instead, tetrodes have been used. Modulator input voltage is applied directly to the screen grid and to the control grid through a current-limiting resistor, a method commonly used in class-B zero-bias modulators using tetrodes.

Experiments with several tetrodes indicate that a tetrode reference-shift modulator requires a maximum d-c screen-voltage input level equal to one-third the value necessary for class-C operation.

The reactance of modulation choke *CH1* (at about 200 cps) should be equal to or higher than the power-amplifier plate impedance. Its current capacity should be about equal to the sum of the modulator and final plate currents. The lower its d-c resistance, the better.

For a high modulation level, the modulator must deliver an output power equal to half the input power to the final r-f amplifier. The maximum plate efficiency of a reference-shift moduator is 50 per cent; therefore, maximum modulator power input is equal to final r-f amplifier power input. For the same reasons, the modulator should have a rated plate dissipation equal to at least half the final power input.

In a conventional class-A_1 Heising plate modulator, a d-c voltage-dropping network is required between the modulator plate and the final to produce 100 per cent modulation. However, in a reference-shift circuit, the modulator plate-current swing is great enough that a voltage-dropping network is unnecessary. This system provides a modulation level which for all practical purposes is equivalent to that of a conventional class-B modulator.

A Mobile Modulator

A schematic of the mobile reference-shift modulator is shown in *Fig. 2*. The speech amplifier uses three triode sections; *V1a*, *V1b*, and *V2a*. Section *V2b* is a cathode-follower driver for modulator *V2*.

Input amplifier *V1a* is a grounded-grid stage, eliminating the need for an expensive and bulky microphone transformer; sections *V1b* and *V2a* are conventional cascaded triodes. These three stages provide enough gain to make cathode-bypass capacitors unnecessary.

Frequency response of the modulator is determined by circuit constants in the speech amplifier. Low-frequency response is limited by the low values of coupling capacitors *C1* and *C4;* high-frequency response is limited by *R3* and *C2* in the grid circuit of *V1b*. Values for these components are so chosen that response is 1 db down at 500 cps and 2500 cps, limits customarily recommended for amateur modulators. However, many operators prefer more high-frequency response in a mobile rig. Therefore, to boost high frequencies, simply exclude *R3* and *C2*.

Reserve gain is sacrificed to eliminate cathode-bypass capacitors. However, any of the speech-amplifier cathode resistors may be bypassed if more gain is needed.

Capacitors *C3* and *C6* and resistor *R10* are a dynamotor hash filter. They are not necessary if the mobile-power-supply output is well filtered.

Values in the driver circuit were chosen in accordance with the principles described under "Design Considerations." Rectifier *CR1* is a 1N38A; any diode having a rated back voltage of 100 volts or more and a nominal back resistance greater than 0.5 meg. is satisfactory. However, if you use a thermonic rectifier or a diode having a back resistance exceeding 3 meg., connect a 1.5-meg. resistor across *C7*.

A 6L6 operates satisfactorily for modulator *V2*. A 1614, however, is a better choice since it offers a higher plate-dissipation rating at no increase in physical size.

Choke *CH1* should have an inductance of

[*continued on page 100*]

New Radioteletype Frequency Shift Converter

Arthur A. Usner, W5QHB
4167-D Alabama Ave.
Los Alamos, New Mexico

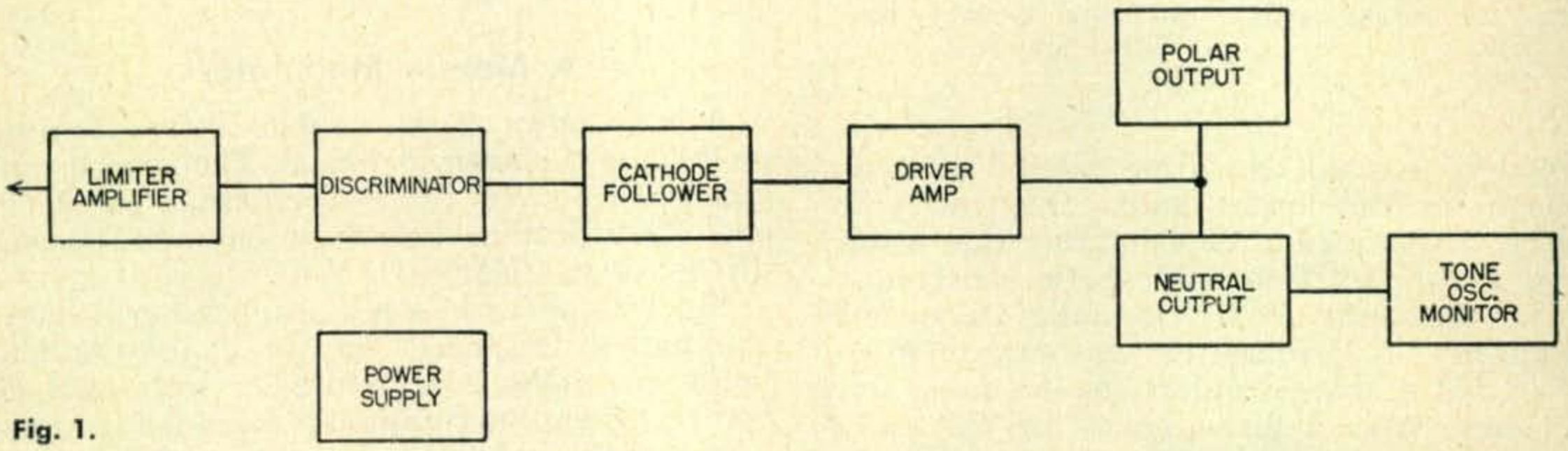


Fig. 1.

Nowhere has amateur radio technical advance been more rapid than in the field of radioteletype. In the short space of 10 years the earnest group of several thousand printing telegraph enthusiasts have demonstrated that no complex commercial developments exist that will not yield to simplification and a great decrease in cost. As is generally the case, radio amateur interest in new methods of communication results in worthwhile improvements which commercial concerns are quick to recognize and make use of.

Radioteletype signals may be transmitted over systems using CW, FSK, AFSK, multitone and pulse techniques. They may be single channel or several simultaneous channels (multiplex). CW, known as "Make-and-Break" keying to RTTY men, has proven impractical for amateurs and professionals alike since it requires signals from 10 to 1000 times greater than those which will reproduce "solid" copy with FSK and AFSK. Multitone methods of reducing printing errors caused by fading and weak signals find no application in the restricted space of the narrow amateur bands. Pulse systems are limited, by federal regulation, to the UHF range, leaving only the two frequency shift techniques.

FSK is a form of very narrow-band frequency modulation in which the modulating intelligence, a square keying wave with a frequency of about 22 cycles at typing speeds of 60 to 65 WPM, causes the radio carrier frequency to vary a few cycles in time with the opening and closing of the contacts in the teletypewriter sending mechanism. AFSK is used exclusively on VHF and UHF bands and on 11 meters where the ultimate in spectrum economy is not required and lack of receiver and transmitter stability may cause problems. In AFSK the r.f. carrier frequency is not shifted but, instead, the shift is applied to the frequency of an audio tone (sub-carrier) modulated onto the carrier. Amplitude modulation is customarily used but FM is also possible and has seen some application on the 6 and 2 meter bands. AFSK is peculiarly well-suited for VHF operation but would be prohibitively wasteful of space in the lower frequency amateur bands.

For reasons of economy it has been common practice, hitherto, for radio amateurs to design their receiving equipment to take care of both FSK and AFSK emissions. This has necessitated the conversion of shift-signal to teletype impulses at audio frequencies. Most of the circuits thus far published in *CQ* have been of the audio frequency variety of converter because of the great predominance of VHF operation. The number of stations employing FSK only has more than doubled since the frequencies below 27 mc have become available. Many of these low frequency RTTY stations are located in areas where VHF communications do not exist or are impractical. For these amateurs a radioteletype converter obtaining its discrimination at i.f. rather than at audio frequencies may have certain advantages. A substantial advantage is the fact that tuned circuits with adequate "Q" are easily achieved in the i.f. range. AVC may be used in the receiver since the BFO is switched off

with this system. With 40 or 50 db of instantaneous "limiting" in the converter, in addition to an equal amount of compression by AVC, almost any degree of fading can be tolerated.

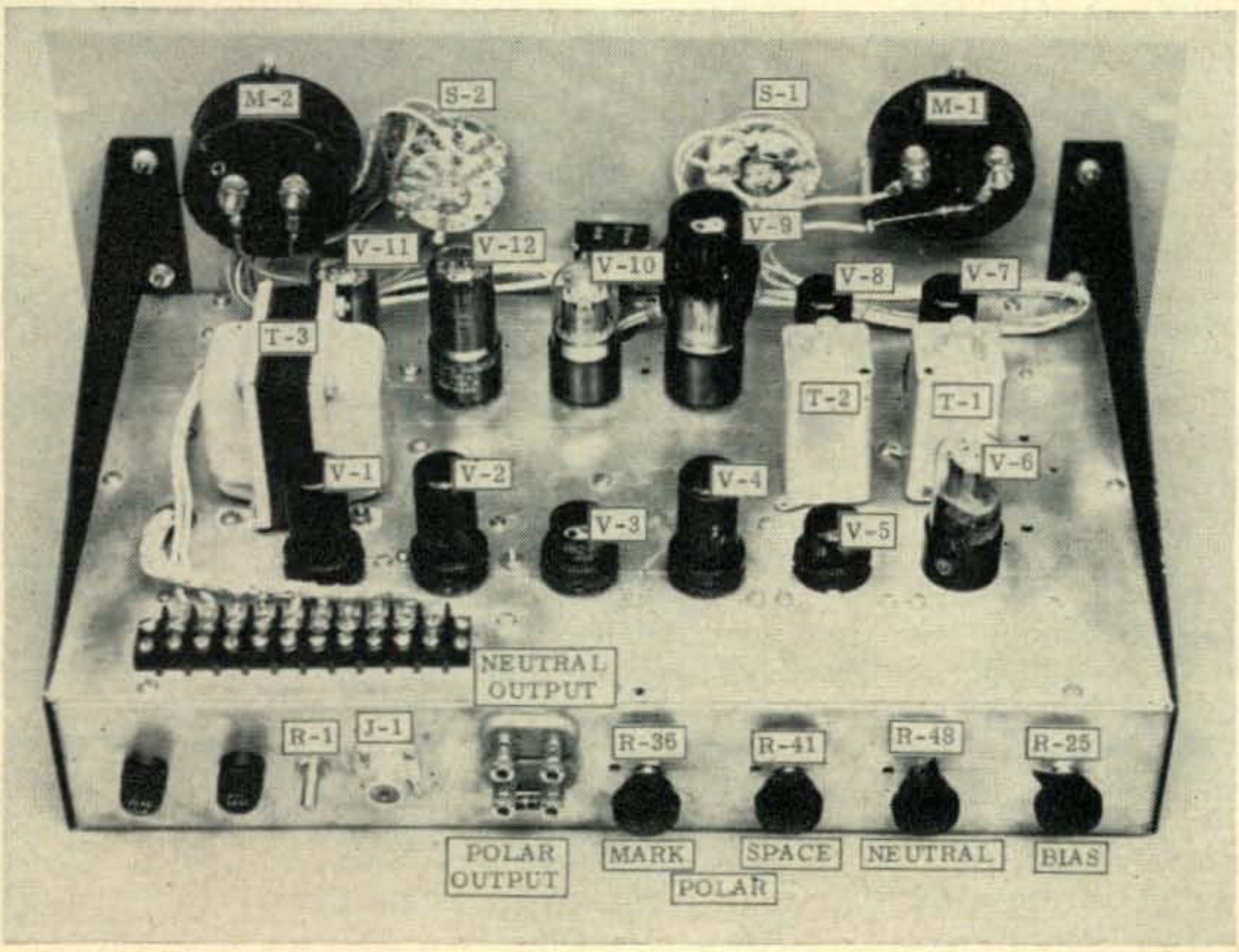
A large number of commercial and military circuits have been developed which secure their discrimination between the *mark* and *space* signals at intermediate frequencies. The circuit of the unit illustrated was derived from the military CV31/A and adapted to better suit radio amateur needs by the elimination of the dual-diversity, drift-compensator and mark-hold circuitry. Since the radio receiver in the writer's station makes use of a low frequency receiver fed from the last intermediate stage of the h-f receiver as a *Q5'er*, a very popular combination among RTTY men,* it was decided to tap off some of the 85 kc i.f. of the *Q5'er* and construct the teletype converter to make use of this low i.f. frequency. At 85 kc it is easy to secure adequate discrimination of the 850 cycle shift in carrier frequency from *mark* to *space* which is the commercial, military and amateur standard. Narrower shift can be easily accommodated by a slight retuning of the discriminator coils. Or, separate trimmers could be employed with a switch having its two positions marked "narrow" and "wide".

The block diagram of *Fig. 1* gives a general idea of the converter and the main diagram may be better comprehended by the following stage-by-stage description.

The limiter-amplifier serves as a straight amplifier for weak signals and as a limiter for strong signals. The first tube, *V1*, behaves as a class A amplifier on low-level signals and passes them to the next stage, *V2*, where they will be strong enough to produce some limiting action. If the incoming signal is very strong the grid of the input tube will draw current. Because of the series grid resistor the voltage at the grid cannot rise above the point at which the grid begins to draw current. The plate voltage is quite low on this tube and produces an additional limiting effect above a certain value of plate current. The next two limiter stages operate in the same manner as the first, with the exception that the grid circuits are provided with negatively biased shunt diodes. These diodes act to clamp the negative excursions of the signal waveform, the positive excursions being clamped by the rectifying action of the amplifier tube grids. As a consequence of the successive stages of amplification and limiting the discriminator will receive a constant amplitude signal even though the 85 kc input to the converter is varying over a very wide range. From almost minimum to maximum gain of the *Q5'er* the oscilloscope shows that the limiter-amplifier produces relatively square waves of constant amplitude. To the large amount of limiting this converter owes its ability to print a signal way down in the noise or to print perfect copy without readjustment when the signal has climbed to 50 db over nine.

The purpose of the discriminator is to transform the frequency shifts into positive and negative d.c. voltages which, through the d.c. amplifier stages, key the teletypewriter machine. By making use of the double-tuned arrangement there was no need for a special discriminator-type i.f. transformer which might be difficult and expensive to obtain for the 85 kc frequency. All that is required are two 85

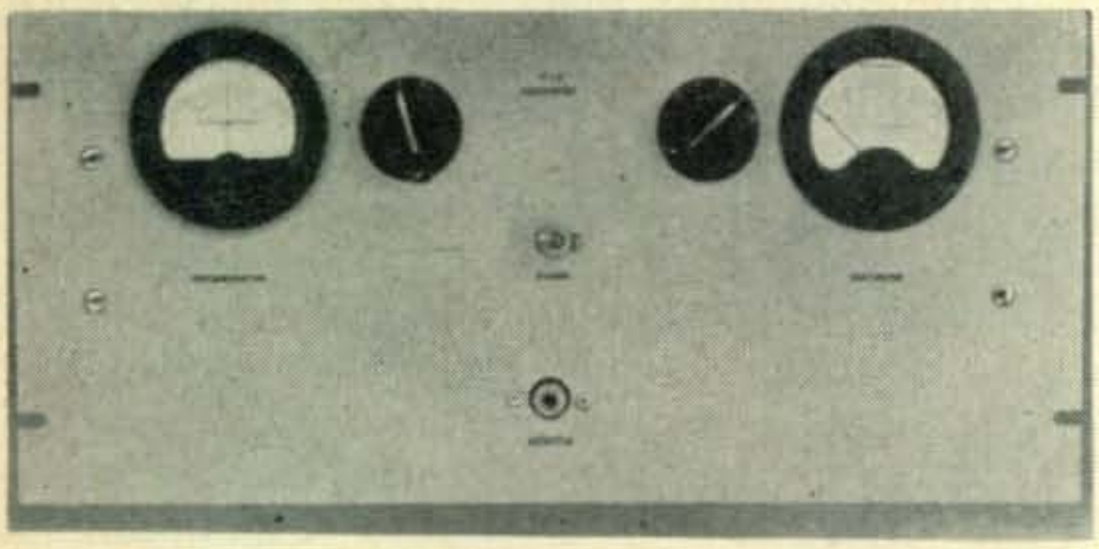
*See July 1953 *CQ*, P25



Rear view, Converter chassis

kc i.f. transformers from a *Q5'er*. These are tuned about a kilocycle above and below the 85 kc i.f. frequency. When the discriminator stage has been properly adjusted it will produce, just as in any other FM discriminator, zero output voltage when the signal input is at the 85 kc center frequency and positive and negative output voltages when the signal varies above and below this frequency.

The next stage is a cathode follower triode serving to isolate the load of the driver from



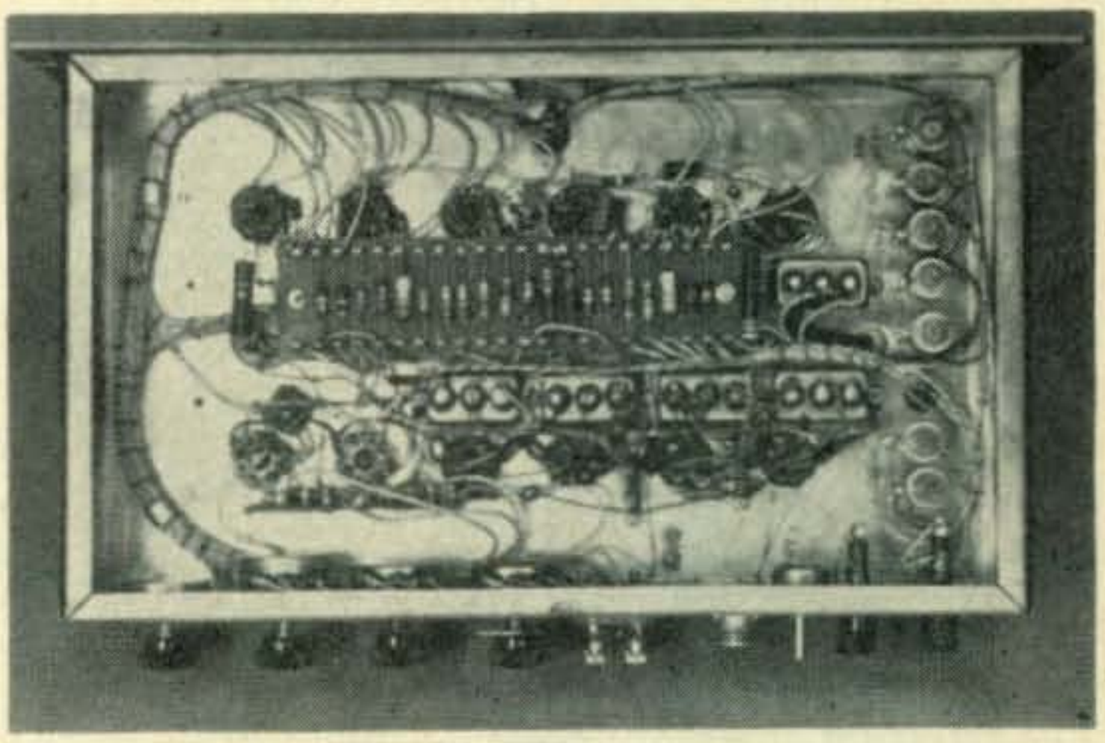
Panel, RTTY FSK Converter

the discriminator. The driver, with its bias control and its plate circuit voltage-divider, furnishes a means of correcting for lop-sided keying signals, whether caused by unsymmetrical conditions in the converter itself or originating at the transmitter through faulty adjustment. The drive for the output stages is picked off the driver plate voltage divider at a point at which approximately equal positive and negative voltage swing is observed with respect to the driver cathode. The location of this point may be determined with a voltmeter while alternate *mark* and *space* signals or the repeated letters "RYRYRYRY" are being received.

Two output circuits are provided, making the unit very flexible. The circuit providing polarized DC output can be utilized to operate a printer of the style having a polarized selector magnet without a retracting spring or a standard Model 12 teletypewriter. The Model 12 is normally used in conjunction with a polarized relay. The polar output, derived from *V11* and *V12* may also be connected directly to a polar telegraph line in emergency relaying of teletype traffic into wire-line circuits such as Western Union, Civil Defense, Red Cross, etc. The neutral output from *V8* and *V9* provides a "make and break" d-c current which may be used to energize other styles of teletypewriters such as the Model 400, 100, 26, 14, 15, etc. It may also be fed to a neutral Teletype line. Neutral lines are used where only a short distance is to be spanned. Both outputs may be used simultaneously, making it possible to operate several printers at the same time, key a wire line while monitoring the traffic on a local printer, or retransmit an incoming teleprinter signal on another frequency or another band. When only one of the outputs is to be used the other should be shunted with a 200-ohm 1-watt resistor to maintain proper operation of the output amplifiers.

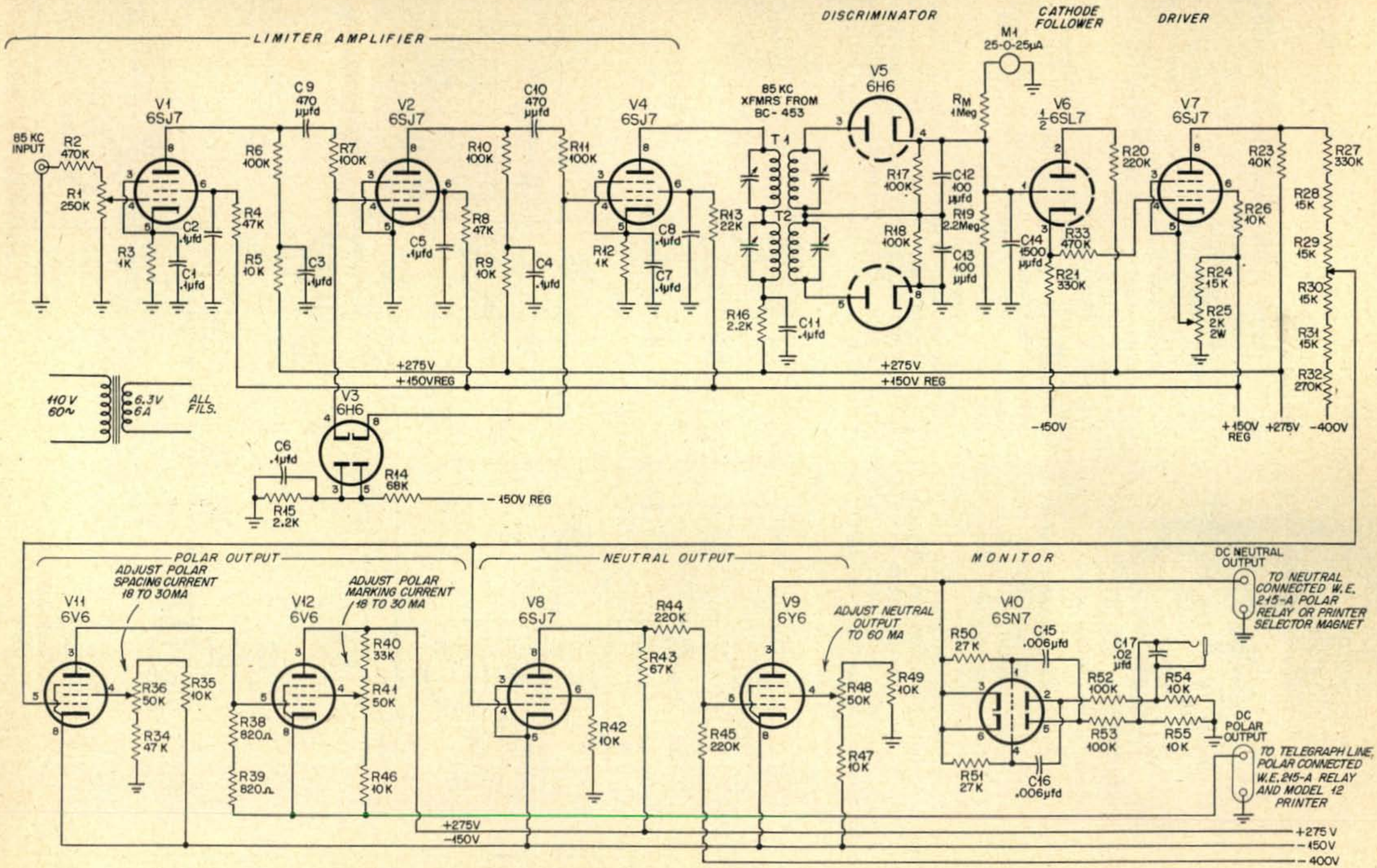
The polar output stage is arranged in such a way that when one tube is conducting, the other is cut off and vice versa. When a *mark* signal is being received *V11* will receive a negative signal voltage on its control grid of sufficient magnitude to cut it off. This causes *V12* to conduct positive current through the polar output terminals. When a *space* signal is received *V11* will be driven into conduction through a positive grid and pass current from its –150 volt cathode to its plate to the polar output terminals through the two 820-ohm resistors. The voltage drop across the two resistors furnishes cut-off bias for *V12*. The direction of current flow is the reverse of that caused by a *mark* signal. Separate control of current flow in the two directions is enabled by the individual 6V6 screen potentiometers. The two currents should be equal and within the range of 18 to 30 milliamperes.

The neutral output circuit is somewhat similar to the one just described. *V8* will be driven negative when a *mark* signal is received, just as *V11* was, since their grids are connected together. *V8*, then, will cut off on a *mark* input. The plate of *V8* and the grid of *V9* are tied to different points on a voltage divider extending from the minus 400-volt supply to the plus 275-volt supply. These points, or voltages, are selected so that when *V8* is cut off the grid of *V9* will go more positive with respect to its minus 150-volt cathode and will conduct. This permits current to pass from the cathode to plate, through the printer selector

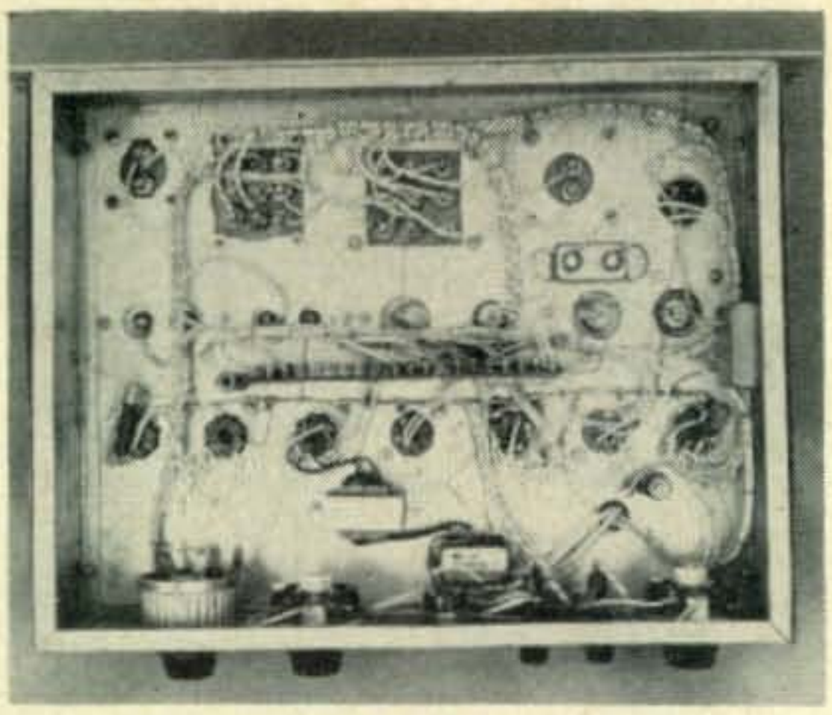


Converter chassis, bottom view

magnet or polar relay winding, to ground return. During a *spacing* signal *V8* will conduct, causing the grid of *V9* to go less positive than its *mark* value and, thus, to cut off. The neutral output current will be on for *mark* and off for *space*. This "make and break" current can also be used to operate printers of the Model 12 and 21-A variety through a polar relay wired for neutral operation. The screen potentiometer of *V9* is used to adjust the output current to the standard value of 60 milliamperes.



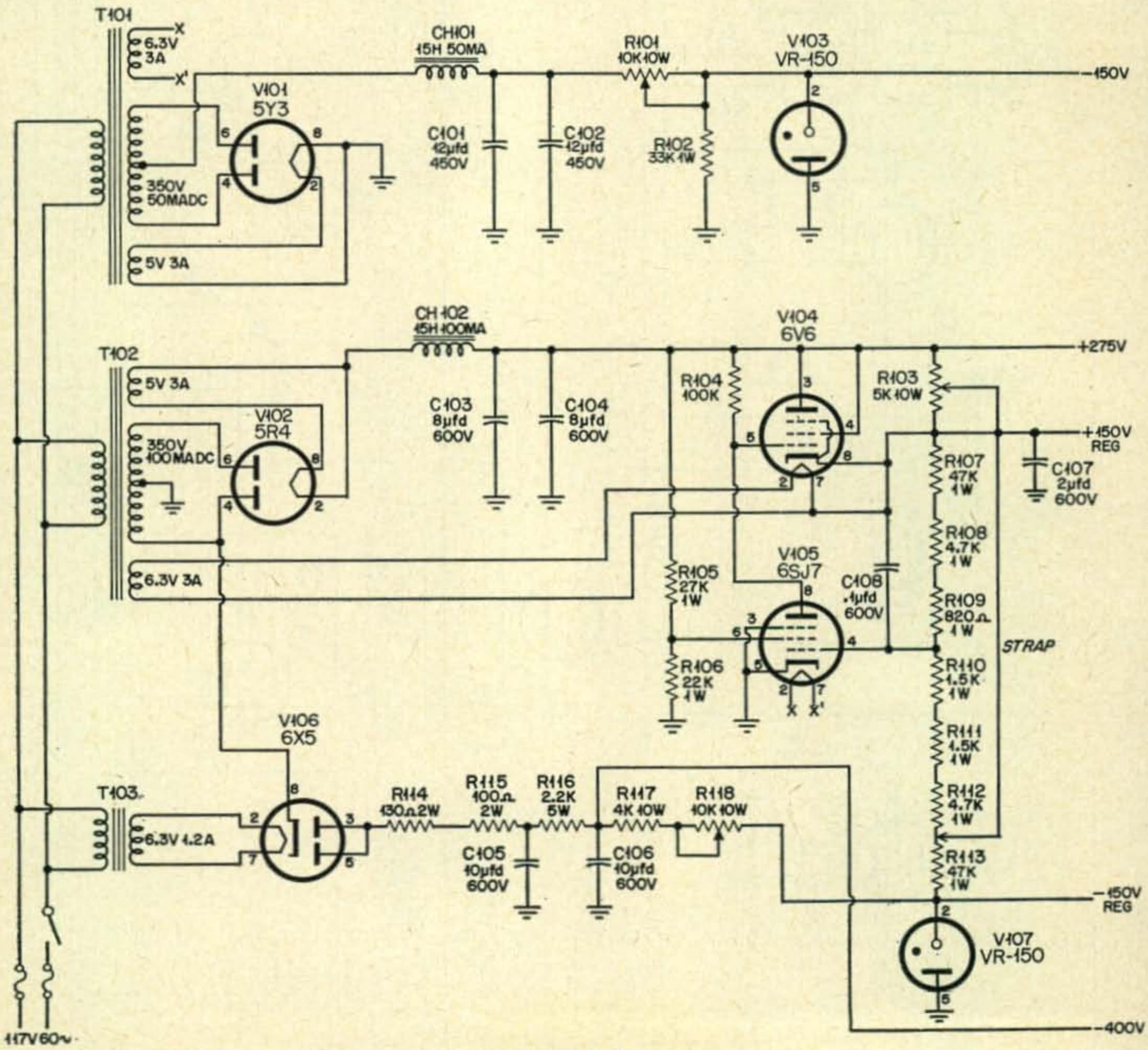
FSK Converter schematic



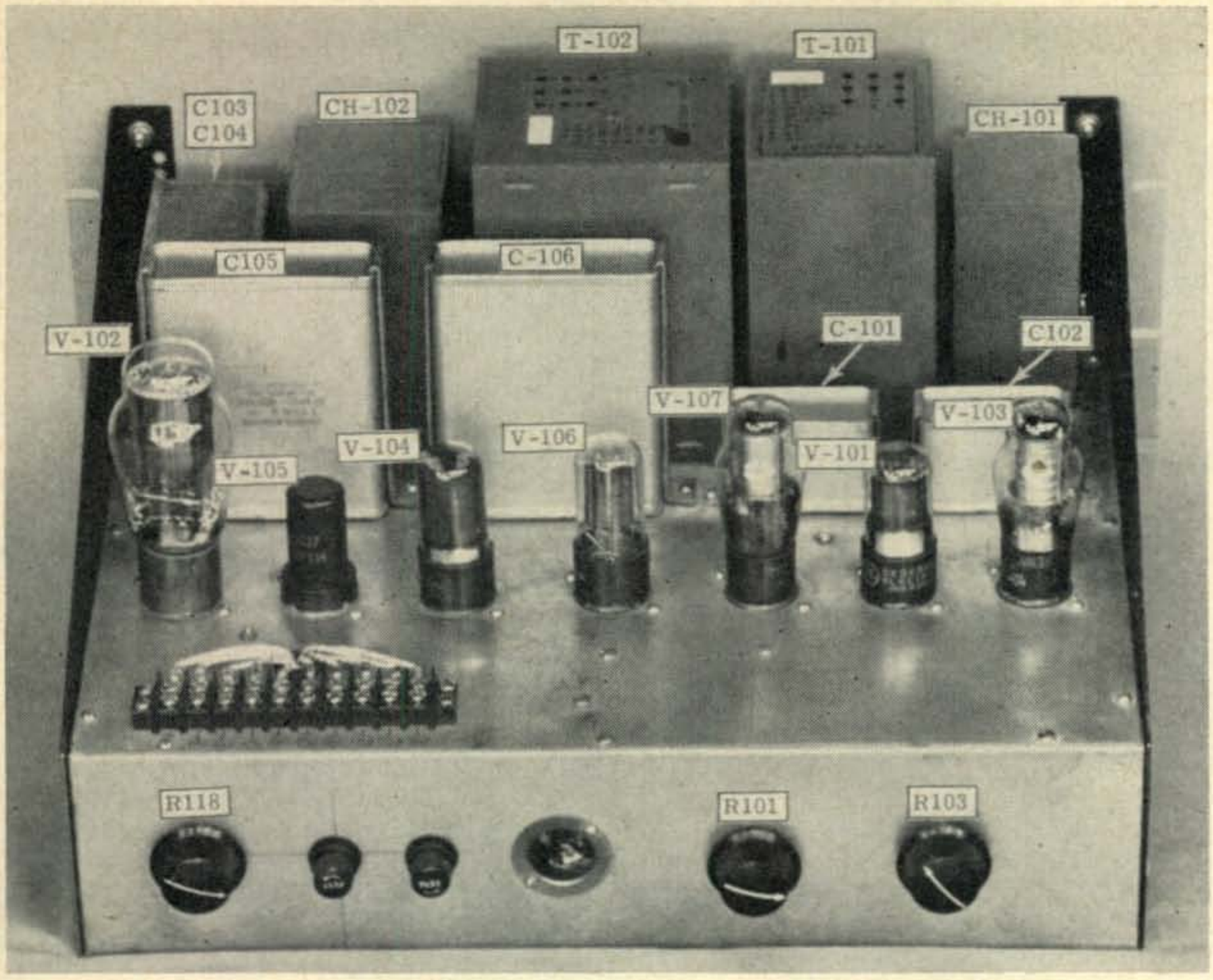
Power supply, bottom view

The tuning of the discriminator should be performed only after all the power supply voltages have been adjusted to the indicated values and the limiter-amplifier has been checked. Being a double-tuned type no particular difficulty should be encountered. One may first tune both primaries and secondaries to exactly 85 kc and then tune one secondary to 84 kc and the other to 86 kc. The writer found this circuit easy to tune and very tolerant of adjustment with the transformers used. Of course an attempt should be made to secure balanced output symmetrical with respect to the 85 kc center frequency. It is definitely not critical.

The output of the discriminator should be plus or minus 10 or 15 volts for proper operation of the d-c amplifiers. This is indicated on the panel meter at all times and serves as a constant check of signal strength, limiting action, tuning and discriminator operation. The same meter functions as the tuning indicator. Next the output currents should be checked and set at their correct values and then, while receiving signals, the driver bias should be adjusted with the potentiometer. The bias potentiometer should be turned in the negative direction until the printer locks up and stands idle without printing even though a strong signal is being received. This point should be noted or marked on the chassis and the control should be turned in the reverse direction until the printer runs open or wild, also unaffected by the signal. The permanent bias control setting is midway between these two extremes.



Power supply schematic



Rear view, power supply

After careful alignment and tuning, operation of the unit is very simple. The FSK signal is located by means of the BFO, which is then switched off so that it will not interfere with the converter's proper functioning. From there on all tuning can be done by watching the discriminator voltmeter. Tune back and forth across the desired signal until the meter reading averages zero. Then turn on the printer motor and get that thrill that only an RTTY fan can get when he reads the results of a man's typing on a typewriter, perhaps on the other side of the world! By watching the meter, drifting of the receiver tuning can be compensated before it becomes serious enough to cause misprinting.

The power supply is straightforward, consisting of an arrangement of standard circuits to obtain the necessary output voltages. The two unregulated and three regulated voltages are obtained from only two power transformers, one a 100 ma. unit and the other a 50 ma. job. The potentiometers permit setting of three of the voltages to the exact values. The plus 275 and minus 400 are not critical.

Addition of a switch to connect the discriminator output to an external audio amplifier allows the converter to be used as an excellent NBFM adaptor.

(photos by Bob Sturgess, W7AKW) ■

BOOKS

Synchro Book

What do you know about synchros? Just as we thought, you are staggering along in the dark ages without a complete understanding of these amazing devices. They are available surplus for ridiculous prices and can do all sorts of things, "Synchros, Self-Synchronous Devices and Electrical Servo-Mechanisms" by Leonard R. Crow will repair this oversight on your part. It costs $4.20 postpaid from the Scientific Book Publishing Company. Vincennes, Indiana. 222 pages, 171 illustrations, etc.

BOOKS

New Radio Handbook

Editors and Engineers have just brought out the fourteenth edition of their Radio Handbook. This 766 page book is a must for every ham shack. Edited by Bill Orr, W6SAI, it covers just about every phase of ham radio. A monumental work. This is not a run of the mill "handbook" built out of reprints of magazine articles. Like construction articles? There are hundreds in this book. Grab it from your local dealer for $7.50 or send to Editors and Engineers, Summerland, California (add 10% for direct orders).

Free Swap & Shop Table, partial view. Hamfesters bring gear for sale or trade, display it here.

Good Day at Starved Rock

Wow! We knew that if people are having hamfests all over the country, somewhere someone must be staging a Super-Hamfest, and it looks like this might be the one. For the tenth year running, the Illinois' Starved Rock Radio Club will hold forth, this year at the C.I.O. grounds at Ottawa, Illinois, where last year's attendance exceeded all previous years with about 4000 guests, of whom 1500 were licensed amateurs! Hams from 9 states and Nova Scotia showed up for the biggest, fun-havingest hamfest in Starved Rock history.

The secret of the tremendous popularity of the Starved Rock Hamfest? Who knows? Maybe just the right combination of club spirit, location, experience, and people remembering what a good time they had last year coming back, bringing friends. Anyhow it's off the ground now and flying high, with this year's 'fest scheduled for Sunday, June 3, with the usual games and entertainment for the whole family plus technical sessions on Beams, SSB, RTTY, etc. with a goodly group of well-known hams presiding. And Door Prizes, of a quality and quantity to hoist many an eyebrow.

From 9 a.m. registration til darkness breaks things up about 9 p.m. Picnic style, or food and refreshments available on grounds, with free coffee and doughnuts for early comers, til 10 a.m. Unboredom guaranteed. Go see. Find out. Or, if you're too far off, why not see what your club can do to match the success of the Starved Rock gang? ■

Non-Cinerama view shows only a part of the picnic area, playground facilities.

Stunning mobile rig belongs to W7VUR, Arizona visitor in '55.

SSB

Bob Adams, K2DW
245 Revere Road,
Roslyn Heights, N. Y.

This month we inaugurate our SINGLE-SIDE BAND column. SSB popularity, world wide, has rapidly increased to a point where we believe it warrants this recognition. There are now FIFTY countries with SSB operation. We welcome the following newcomers: JA1ACB, VS6CW, CP5EK, OA4CL, ELØA, KX6NB, VR2CG, VS6CW, VS6BJ, VS6BE, VU2RC, AP2CR and CX5AF. Quite a juicy list, eh? 'Empty' of ZS6KD made it 40 countries when he contacted CX5AF.

Many old timers who had lost interest in "the battle of the heterodynes" have found renewed interest in SSB. Among these are Bill Halligan W9AC, Fred Schnell W9FZ, Ronnie Durham W5ATB, Tom Davis WØSW, George Bailey W2KH, Bill McGuire W1IF, and Harvey Sampson W2IJL. The huge success of the Sixth Annual Single-Side Band Dinner, held March 20th in New York attested to the popularity of SSB. From Cyril, VK3AEE we learn that the following 'sidebanders' are active on 20 down-under: VK2 VA, DQ, ZF, AC, IU, BP, VK3WR, AEE, VK4VJ, CC, AB, ZL2KW, GL, AG, IA, ZL3IA, AR, and ZL4FO. We welcome Joe ZD4BF with his big signal, from a new QTH on the Gold Coast.

We are happy to see South American activity increasing. For a long time 'Corny' YV5FL was the only station in South America for WAC-SSB. Peter of OZ3EA reports over 30 SSB stations active in Denmark, mostly on 75. SVØWA, PAØIF, HB9FU, I1BAO, F8RQ, AP2BP, and KT1DD are keeping their respective countries active. It is amazing to hear so many "bare" exciters of 10 to 20 watts making 'Q5' DX contacts. Reggie Tibbets of W6ITH flew a kilowatt side-band rig from California to Marigot, French St. Martin, and operating as FS7RT gave hundreds of hams a new country. His QSL is a beauty. Side Band is showing its superiority in the hundreds of phone patches placed through KC4USA at the South Pole. Art Collins WØCXX installed a SSB rig in an Army plane and flew across the Pacific to Japan, maintaining reliable and consistent contacts with his home base. QSOs were made with hundreds of hams while enroute.

Germany is well represented with fine signals from DL4RM, MW, WX, SX, EW, ZM, CX, YU and DL6WL.

Harry, W2JXH who was first SSB to WAC now has 38 countries without a beam. To really appreciate SSB one should listen to mobile W8DLD, W2EWL, W2ICA and W2ALZ 'breaking' kilowatts in South Africa while in motion.

Many fine QSOs are being made on 15 meters and ZS6KD reports a 5 continent round-table. He anticipates a WAC round table is only a matter of time.

The 75 meter gang continues to grow, and while many are moving to 20 for the Summer period, one never is lonesome on 75. One point of concern by your conductor is why the SSB activity is confined to a relatively few KC on the band edges. We hope you liked this first attempt and that you will send along news and information for our future columns.

73, Bob, K2DW

Helen Hargreaves, fresh out of radio school in 1929. She obtained first-hand experience operating aboard ferries crossing Lake Michigan during 7-hour run between the radio school and her home. Now Helen Cloutier, she is W8GJX.

man's job—that of radio operator, or "sparks."

From the time the first "sparkette" sailed in 1910 to the present day, fewer than thirty women have held this job on ships flying the United States flag—and half that number were WAC's on wartime duty. To all these girl operators goes credit for being real pioneers in a field traditionally masculine.

Pioneer Girl Marine Operators

In one chapter of his book "SOS to the Rescue,"* Karl Baarslag has recorded experiences of some of the earliest girl marine radio operators during the years 1910-1929. Some of the following details are from this book.

In the year 1910 Miss Graynella Packer became America's first woman marine operator. She had some Western Union experience, and applied for a position as wireless operator with the United Wireless Co. Officials were skeptical —a woman operator was unheard of. But an

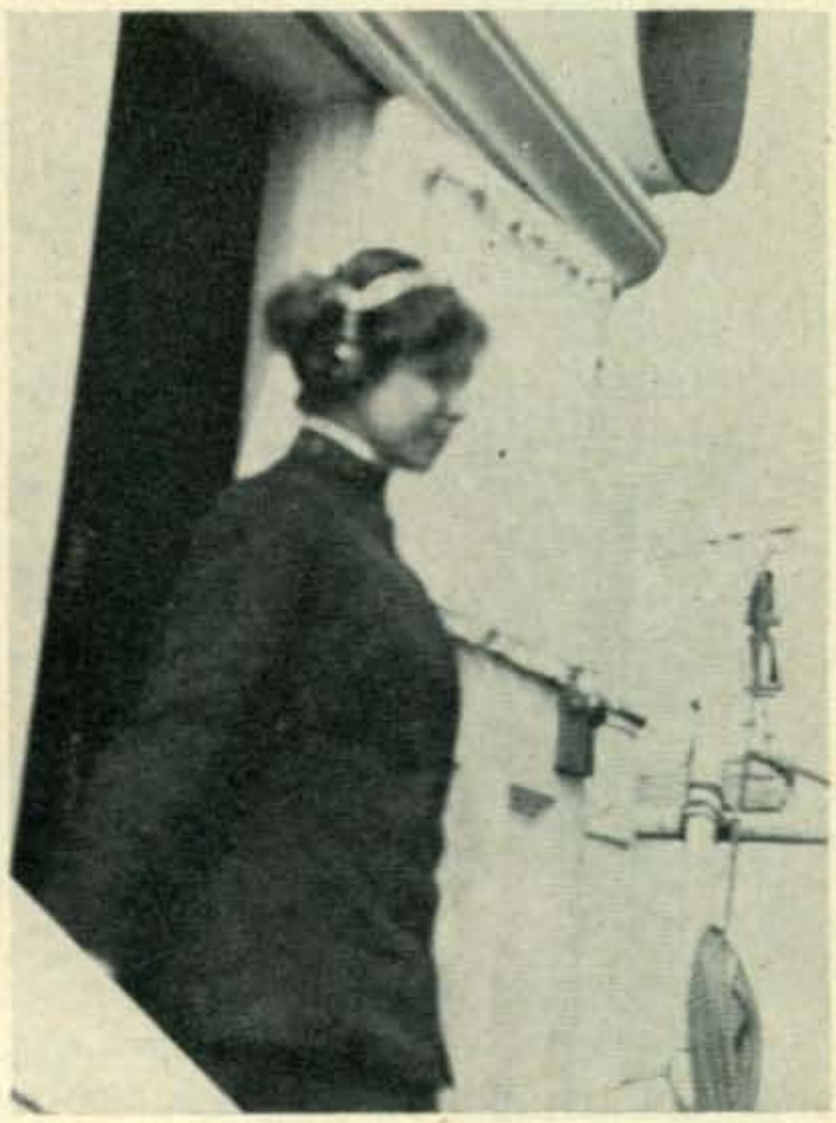
YL Marine Radio Operators

Louisa B. Sando, W5RZJ
Jicarilla Apache Indian School
Dulce, New Mexico

One evening not long after World War II had ended in the Pacific, the U.S. Army Hospital Ship *Chateau Thierry* slipped quietly into the lagoon at Eniwetok. As she took her place among the many warships, the radio operator on duty contacted the shore station by blinker. After completing the ship's business the shore operator queried by blinker, "Are you WAC's?"

"Yes," came the blinker reply from the *Chateau Thierry*. Instantly 150 ships moored in the lagoon, whose operators had been "reading the mail" were furiously blinking for a contact. The three WAC operators aboard the *Chateau Thierry* spent the remainder of the night at three blinker stations in QSO with the OM ops on other ships moored in the area. Some of the fellows had been in the Pacific nearly two years. After establishing home state and city, the next question from the lonely GIs inevitably was, "Are you blonde or brunette?"

Such is the reception that has been met by the girls who have gone down to the sea in a



Mabelle Kelso wearing headphones outside the radio room aboard the S. S. Mariposa, on which she was radio operator during the summer of 1912.

*This book is out of print but copies may be obtained on inter-library loan. Another maritime book available from your State Library Extension Service is "'CQ,' or in the Wireless House," by Arthur Train, published in 1912. The author had little regard for Hams, but nonetheless it's quite a fascinating novel of the high seas.

Billie L. Adels, W4CJV, ex-W6HBO, veteran YL maritime radio operator, in eight years at sea served aboard two Norwegian vessels and several flying the U.S. flag.

Atlantic coastwise passenger line felt that a "wireless woman" might be good publicity. As yet no government license was required and after short training with the chief operator at old station "NY" atop 42 Broadway in New York, Miss Packer got the job of "sparks" on the S.S. *Mohawk* in Nov. 1910.

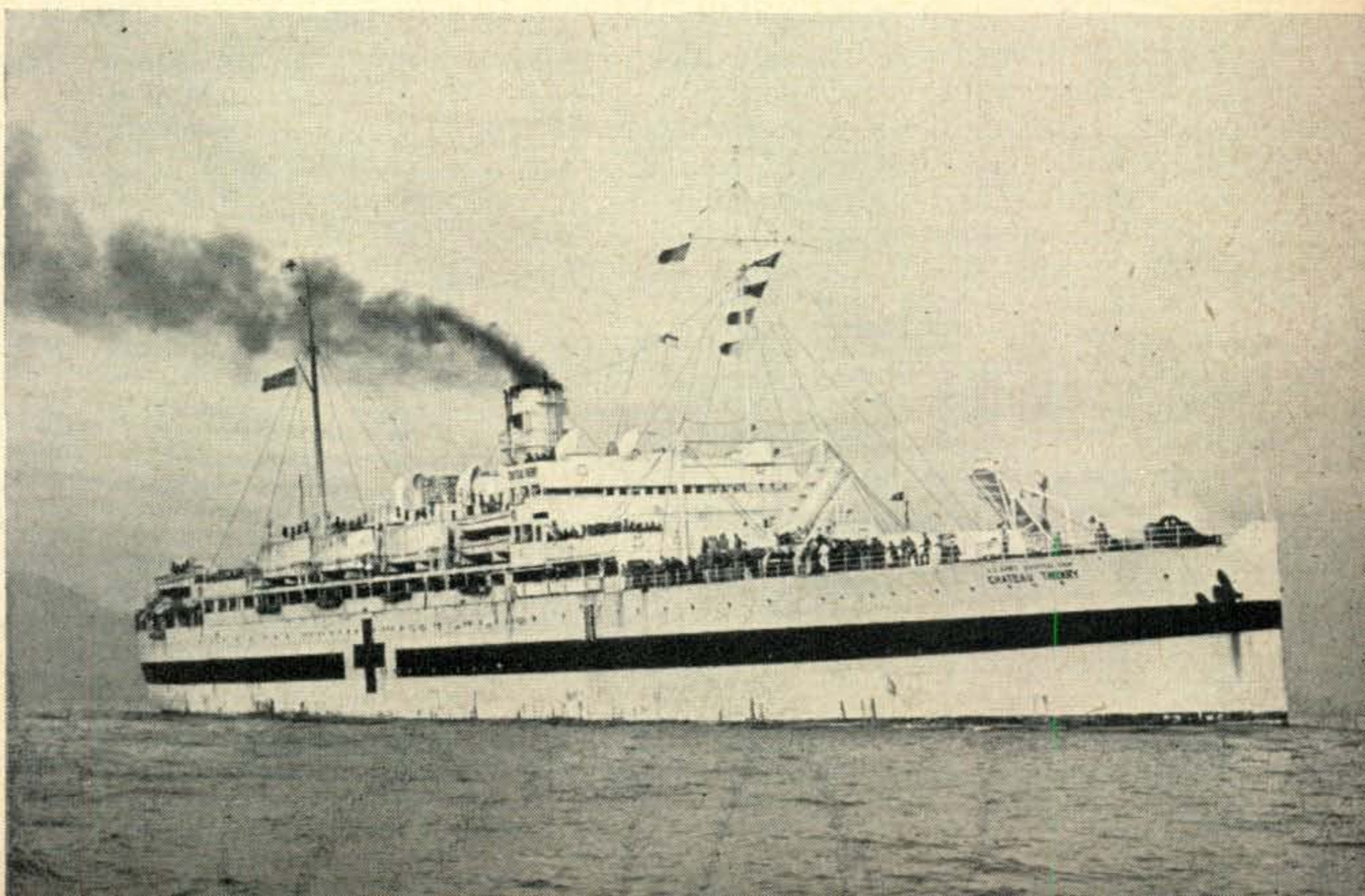
Men operators aboard other ships accepted her graciously and helped her in every way they could. But the news spread fast—a woman wireless operator—and Graynella was in her glory. Newspaper reporters and writers besieged her and Graynella was a bit incautious in endorsing radio as a profession for women offering travel, good pay with light work, romance. The old marine ops didn't like this. Women had already taken over many of their jobs when the telegraph operators had been out on strike. The men had taken to the sea—and now girls were going after even these jobs. The men who had been so willing to assist her in the beginning became indifferent. Others when transmitting to her "burned up the key" at speeds she couldn't copy, and profanity over the air became thicker than ever. Graynella left the sea in April 1911.

Out on the Pacific coast the first woman to go to sea as ship's operator was a Miss Tucker who in 1911 sailed out of Seattle on the S.S. *Indianapolis*. Also in 1911 Miss Edith Coombs was in charge of the S.S. *Roanoke's* radio on the Pacific. At this time Congress was drafting legislation to force all U.S. passenger ships to carry radio equipment. The question arose whether a woman operator should stick to her key, while a vessel sank, or hold out for the old rule of the sea—women and children first. Edith said to just give her a chance, she would stick to the ship, but she had no occasion to prove it while she served.

In June 1912 Miss Mabelle Kelso shipped as radio operator aboard the S.S. *Mariposa,* an excursion boat plying between Seattle and Alaska. Mabelle had studied Morse at the Pittsburgh Technical College in 1908 and after graduation had worked in a Western Union branch office for six months and later for Postal Telegraph.

On the Pacific Coast she found United Wireless had decided to accept two girls to study wireless. They had many applications but no others had Morse experience so they put Mabelle in the class with the men. There she learned the Continental code and studied

U.S.A.H.S. Chateau Thierry, one of four U.S. Army hospital ships on which WAC radio operators served during World War II.



These Norwegian girls were pupils in the radio class graduating in June 1954 from the Bergen Sjomannskole (Bergen Nautical School). The one at the right was only 17. Their instructor comments all of them are sweet girls.

the apparatus sufficiently to be able to make minor repairs at sea. On graduation Mabelle went to the Bremerton Navy Yard, where a lieutenant of the U.S. Navy gave her the usual examination. At that time no formal licenses were issued, only a Certificate of Skill in Radiocommunication. Mabelle was told at the time that *her certificate (dated June 6, 1912) was the first license ever issued by any Government to any woman to operate wireless.*

Mabelle served on the *Mariposa* until Sept. 1912 when Marconi bought United Wireless and refused to allow women to operate aboard ship. Marconi took her into their land office in Seattle where she handled all messages from all their ships, transmitted from the station in the University District to the downtown office over a buzzer, kept the books, and did stenographic work. She stayed with them for a year, but they did not pay the salary she could make in other fields.

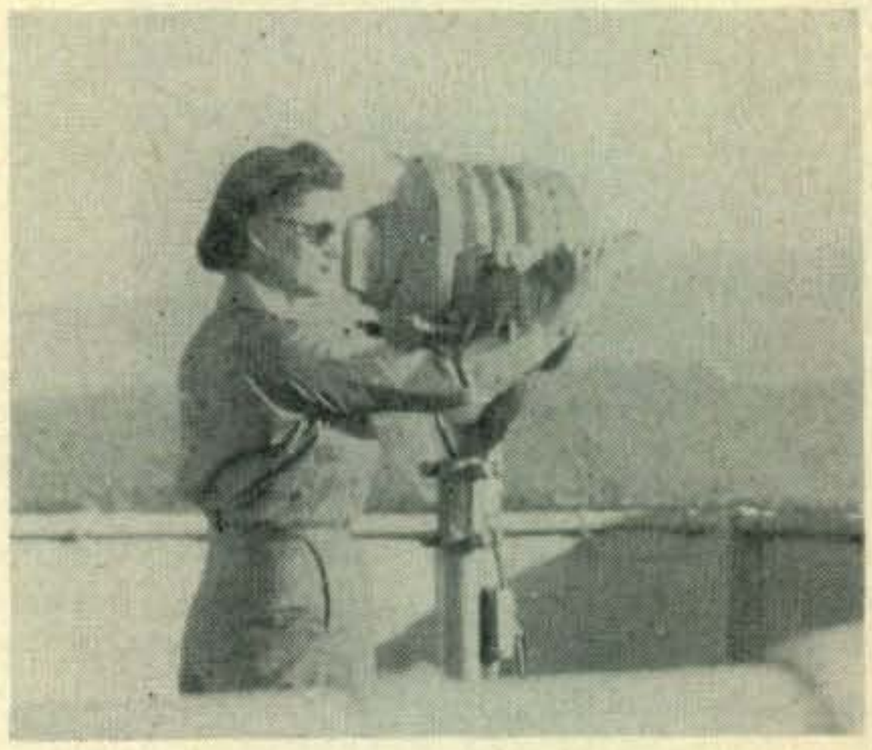
Mabelle says she enjoyed the wireless work very much and intended to make it her life work, until Marconi ended her dream. Shortly after she left the *Mariposa,* the Titanic disaster occurred in the Atlantic. As a result of the investigation which followed, all radio operators certificates were cancelled and 1st, 2nd and 3rd grade licenses issued.

She at that time was in the Marconi land office and rather than be left without a license, she returned to Bremerton Navy Yard, took another examination and in Feb. 1913 obtained a First Grade License, one of the very first women to hold such a license. (This was issued by the Department of Commerce and Labor.) In 1917 Mabelle married Lt. James Shaw and since 1924 she has worked as a doctor of chiropractic.

In 1912 Mrs. H. E. Soule, wife of the master of the S.S. *Windber,* acted as radio operator on that ship after attending radio school for three months and securing her license. The *Windber* was in the Alaska canning trade and carried passengers, so radio equipment was required.

Several girls have seen service on the Great Lakes. In 1913 Miss Margaret King spent some time on the S.S. *Eastland* (this steamer two years later overturned with a loss of 815 lives). A Miss Mason was on a Lake Michigan ship in 1918 and in 1919 a Miss Welch was operator on the passenger vessel *Seeandbee.*

Back on the East Coast there was a Mrs. Frank Chambers who went to sea in the early days from the Port of Philadelphia aboard the old Merchant & Miners Line ships. W2ZI adds that her OM Frank made some of the prettiest spark gear of that time down on 7th St. in Philly—this was about 1910.



One of fourteen WACs who served on U.S. Army hospital ships during World War II, Sgt. Alice Loree is shown in blinker contact in Avonmouth River area, British Isles.

In 1917 a Miss Du Val obtained a commercial license and her ambition was to work in a Navy Coast station. Unable to get this position she was given a trial on the S.S. *Howard.* War came, however, the Government started taking over the ships and commercial operators were replaced by Navy men, forcing Miss DuVal to leave the sea.

First Girl to Send SOS

One girl, at least, stayed with her ship as radio operator during World War I. Miss Lena Michelson shipped out of New Orleans in March 1918 on the tanker *Tamesi,* which her father commanded. Seven months later, on Sept. 16, 1918 the *Tamesi* went aground on a bar off Texas in a heavy fog. As it was being ground to bits on the rocks Lena's dad gave her the order to send an SOS—so Lena Michelson became the first woman to send out the sea's call for help. Her SOS was picked up by station NBK at Galveston, but by dumping their oil in the Gulf, the *Tamesi* washed free and made shore under her own power.

Lena stayed on her dad's ship throughout the war and later transferred with him to another tanker, the *Eugene V. R. Thayer,* where she worked for five years. This gave her a total of eight years as a seagoing radio operator! Well liked by the marine ops, Lena was

a skilled operator and knew all the facets of her trade. When she came ashore in 1926 she became assignment clerk with the Radiomarine Corp.

In 1929 on the Atlantic Coast Mrs. Elizabeth White served for three months on the S.S. *Trimountain,* of which her husband was master.

In this same year Helen Hargreaves (now Mrs. Cloutier) was attending radio school in Frankfort, Michigan, across the Lake from Manistique, her home town. The chief of the radio school also was chief radio operator at the main land station for the Ann Arbor Carferrys and all students going to his school got first-hand experience. Most of the radio operators aboard the fleet of ships were students and graduates of this school. On weekends, when Helen went home—a seven-hour run across the lake—she helped the fellows with their work, reports and ship-to-shore traffic. This was the era of "blue bottles" that lit the entire room when one closed the key. Helen did not make radio her lifetime profession, but she went on the air as an amateur at the same time and has been on the air ever since 1929, her present station call being W8GJX.

The only other girl to have been assigned as radio operator on Great Lakes vessels was an Alice Joyce who served in 1942.

World War II Operators

The feminine radio ops who found such an enthusiastic welcome among the operators on warships at Eniwetok were three of fourteen WACs who sailed as marine radio operators on Army hospital ships during World War II.

Toward the end of 1944 the U.S. Army picked a group of WAC radio operators to be trained for duty aboard Army hospital ships. Since the women's services were on non-combat status, WACs were ideally suited to serve aboard hospital ships because there were other women aboard (Army nurses), the ships travelled under the Geneva Treaty as neutral vessels and were therefore unarmed and fully lighted at night.

In order to qualify for this assignment a WAC had to attend a special Army school in Brooklyn, N.Y. where she unlearned all of the procedures in which she had been trained as an Army operator, and learned regular peacetime commercial procedures. She also had to attain a code speed of 35 words per minute and be able to send and receive blinker signals at 12 WPM. In addition she was trained in servicing batteries, the use of lifeboat emergency equipment and other duties peculiar to ships at sea.

Radio operators on Army ships during the war were all enlisted personnel, most of them held ratings of Technician Fourth Grade or better. The fourteen WACs who sailed as marine radio operators on Army hospital ships were: Lucy Alter, Elaine Corrum, Katheryn Barnes, Lillian Browning, Del Kumnick, Terry Mezzanotti, Paula Sanborn, Bernadine Kurtz, Esther Given, Alice Loree, Lorraine Hand, Regina Rice, Rose Landrey and Virginia Kidd.

The first group of three girls sailed in Dec. 1944 from Charleston, S.C., aboard the U.S. Army Hospital Ship *Louise A. Milne.* Other ships on which the girls served were the U.S.A.H.S. *Ernestine Koranda, Jarrett M. Huddleston,* and the *Larkspur.*

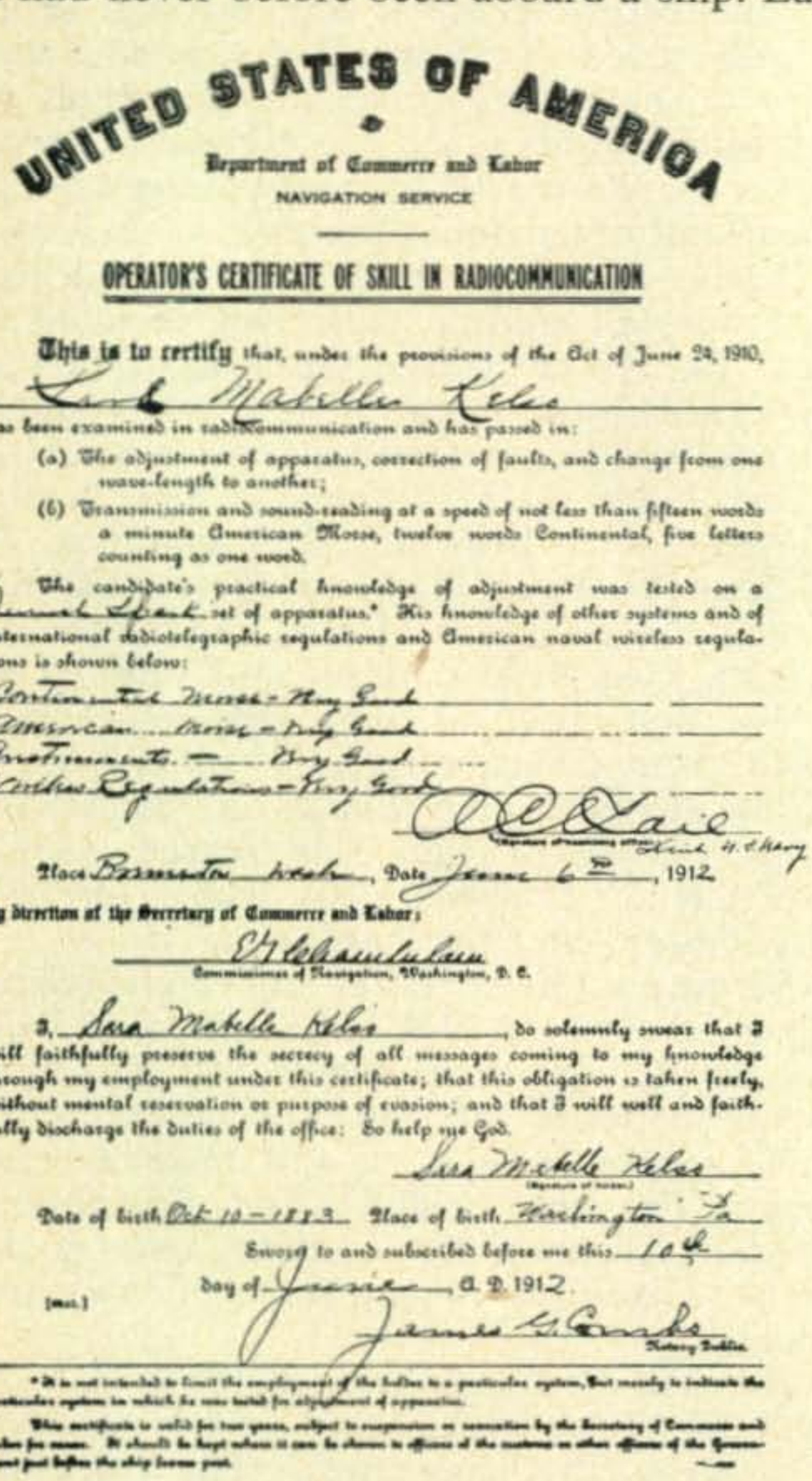
Sergeants Given, Loree and Hand were assigned aboard the U.S.A.H.S. *Chateau Thierry,* a converted transport which was equipped to handle between 480 and 500 patients in addition to some 400 crew and medical compliment. The ship sailed from Charleston to Bristol (Avonmouth), England, early in 1945. Esther Given has related some of their experiences.

For this first trip, two of the former ships operators remained aboard to act in advisory capacity to the "sparkettes." The chief operator's first official statement to the girls was that a "spark" stood his/her four-hour watch regardless of mal-de-mer and that he and the other operator were just going along for the ride on this trip. The girls were expected to take over fully; however, the men would be there in case of dire emergency. (It was later discovered that the two men had worked out a schedule between them so that they would be able to stand 24-hour watch when the ex-

At the close of World War II, with a shortage of men, Sgts. Given, Loree and Hand received discharges from the WAC and then signed aboard their same ship, the Chateau Thierry, as lieutenants in the Army Transport Service. Here Lt. Alice Loree (left) and Lt. Esther Given (W6BDE) wear their new uniforms in their Civil Service status.

periment of having women as radio operators failed!) Much to the credit of the gals, they proved to be equally as capable as the men operators in their assignments.

No indoctrination could be more wicked than that of landing on a new job assignment in entirely foreign surroundings as G.I. guinea pigs (with two strikes against them for being girls), plus the added feature of the elements brewing up a juicy North Atlantic storm for the event. The first two days were pure misery for the girls, two of whom were prairie raised and had never before been aboard a ship. Each



UNITED STATES OF AMERICA

Department of Commerce and Labor
NAVIGATION SERVICE

OPERATOR'S CERTIFICATE OF SKILL IN RADIOCOMMUNICATION

This is to certify that, under the provisions of the Act of June 24, 1910,

Sara Mabelle Kelso

has been examined in radiocommunication and has passed in:

(a) The adjustment of apparatus, correction of faults, and change from one wave-length to another;

(b) Transmission and sound-reading at a speed of not less than fifteen words a minute American Morse, twelve words Continental, five letters counting as one word.

The candidate's practical knowledge of adjustment was tested on a Quenched Spark set of apparatus.* His knowledge of other systems and of international radiotelegraphic regulations and American naval wireless regulations is shown below:

Continental Morse — Very Good
American Morse — Very Good
Instruments — Very Good
Written Regulations — Very Good

Chief Operator

Place Barnegat, N.J., Date June 6th, 1912.

By direction of the Secretary of Commerce and Labor:

E. H. Chamberlain
Commissioner of Navigation, Washington, D. C.

I, Sara Mabelle Kelso, do solemnly swear that I will faithfully preserve the secrecy of all messages coming to my knowledge through my employment under this certificate; that this obligation is taken freely, without mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties of the office: So help me God.

Sara Mabelle Kelso
(Signature of holder)

Date of birth Oct 10 — 1893 Place of birth Washington D.C.

Sworn to and subscribed before me this 10th day of January, A. D. 1912.

James G. Combs
Notary Public.

[SEAL.]

* It is not intended to limit the employment of the holder to a particular system, but merely to indicate the particular system on which he was tested for adjustment of apparatus.

This certificate is valid for two years, subject to suspension or revocation by the Secretary of Commerce and Labor for cause. It should be kept where it can be shown to officers of the customs or other officers of the Government just before the ship leaves port.

Copy of operator's Certificate of Skill in Radiocommunication issued to Mabelle Kelso June 6, 1912. Mabelle was told that this was the first license ever issued by any government to any woman to operate wireless.

4-hour watch was an eon of sitting with "cans" on the ears copying press at 30 WPM for the skipper's morning news, with a bucket clamped tightly betwixt the knees. By the second day it was obvious that something had to give, and it was not about to be the girl guinea pigs, so it would have to be the bucket. Thus ended the mal-de-mer session.

Among duties of a radio operator aboard ship is the care of batteries and emergency distress equipment in the lifeboats. Probably the most tedious job for the gals on hospital ships was this particular duty. On the *Chateau Thierry* two lifeboats containing such equipment were slung some 30 feet above the deck and had to be serviced each week. A long extension ladder was placed against a boom which ran parallel to the swinging lifeboat. The operator climbed to the top of the ladder, straddled the boom and waited till a list of the ship swung the lifeboat near enough to jump in. All the time the op was holding a can of distilled water and a hydrometer. The only change in the descent was that the hydrometer and water can could be lowered to the deck by means of a rope, but the problem of getting back on the ladder was greater than that of getting into the boat in the first place. It was no help when a full audience of ambulatory patients was on the deck below giving advice and yelling "Woops!" and "Look out!" at tense moments.

On one trip from England en route to Charleston, with all the lights ablaze, as required by the Geneva Treaty on a neutral ship, a voice came booming out of the depths of night, "Turn off your lights and stand by or we'll blow you out of the water!" The hospital ship had sailed straight into the center of a Canadian convey and was silhouetting each of their ships to any enemy who might be scouting about. Needless to say the lights were turned out and the ship stood by. Next morning when light came the hospital ship stood alone in the middle of the Atlantic with no sign of the hundreds of ships she had unknowingly jeopardized the night before.

During the War radar was considered a "weapon" so hospital ships could not be "armed" with such navigational aids. As soon as the War ended, however, all these ships were immediately fitted with radar equipment.

At the close of World War II Army operators were replaced by civilians on Army ships as quickly as possible. When the *Chateau Thierry* came into port in San Francisco in Dec. 1945 the WAC operators were informed they were to be replaced. At this time each of the girls had sufficient points for discharge from the Army and the San Francisco port of embarkation was having a hard time finding enough civilian operators to fill these vacated posts. After several contacts between the Signal Corps, Water Division and the powers in Washington, it was arranged that the three girls could sail as civilian operators if they sailed together on the same ship and were the full radio complement aboard. Next day the WAC's went to Camp Bealle, Calif., received their honorable discharges from the WAC as sergeants, came back to San Francisco and signed aboard their same ship as lieutenants in the Army Transport Service as civilian operators on Civil Service status.

No uniform had been designed for women in this capacity. A quick trip was made to purchase Navy nurse uniforms, Army Transport insignia and white shirts. Being Army

veterans with ribbons from many theatres of occupation, these gals made quite an impressive sight. Once in Honolulu a shore patrolman had to be shown Army discharge papers, ship's papers, Coast Guard identification, et al, before he was convinced they were not impersonating officers of the U.S. forces!

Most of the fourteen girls have married and contacts have been lost, but none of them will ever quite lose the feeling of challenge and service that was theirs as liaison between a mercy ship and the rest of the world. One at least, Esther Given, so enjoyed the radio work that she obtained her amateur license and since 1946 has been on the air as W6BDE.

Another YL, Gladys Goff, W9EKS, served aboard two ships on the East Coast. She was lined up to go aboard her third ship when a strike delayed the sailing. Then she chose a coastal station, WPG in Norfolk (no longer in existence), in order to get more experience. W5MET ex-MM, who worked her, credits Gladys with swinging a "mean bug" on 500 kc.

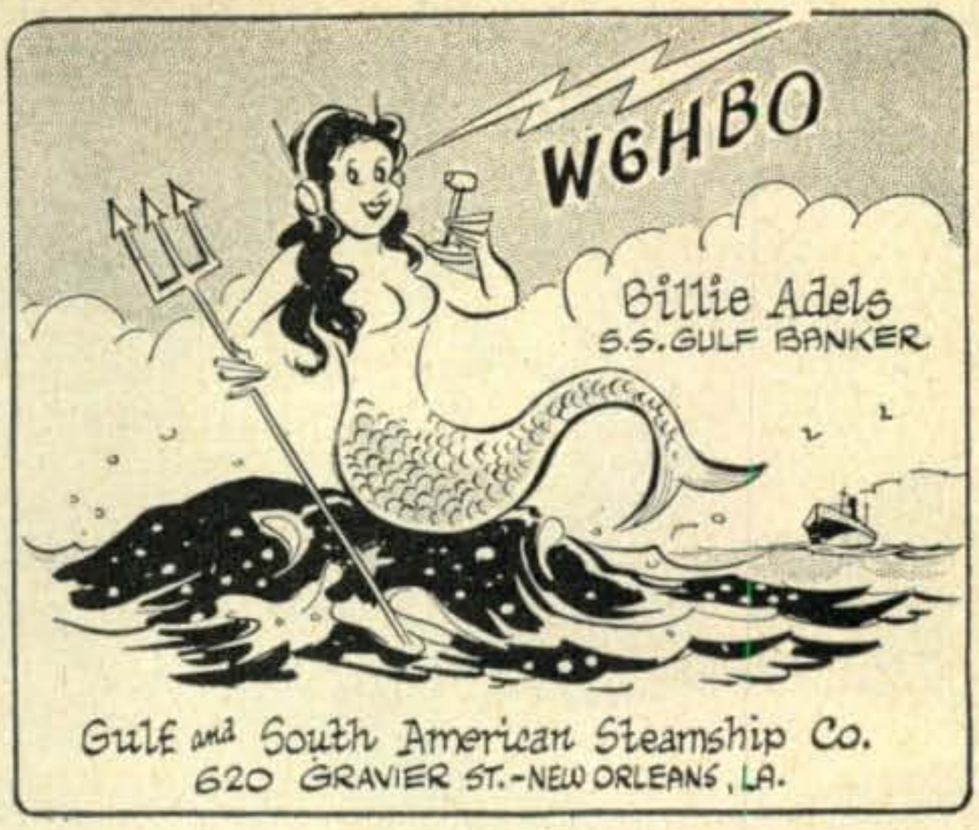
W6HBO/MM

Although Lena Michelsen holds the record for women marine operators on U.S. ships with her eight years at sea, Miss Billie L. Adels is a close runner up.

It all started for Billie by accident during World War II. At this time she was taking a pre-medical course at the University of New Mexico, but her eyesight would not permit her to continue her intensive studies. Returning to her home in San Francisco, Hawaiian-born Billie (she also has spent several years in Australia) decided to work in a war industry. While waiting at an employment office she noticed an opening for a stewardess on a Norwegian ship, and got the position.

At this time on Norwegian ships girls were beginning to take over the work of radio operators, so the skipper talked to Billie about it. Back at the Pacific Radio School for three months Billie obtained her license and in Dec. 1945 sailed as radio operator on the Norwegian ship M/S *General Ruge*. In 1946 she operated aboard another Norwegian ship, the M/S *Hoyanger*.

The S.S. Gulf Banker was home to Billie Adels for 4½ years on voyages through the Caribbean.



QSL card used by Billie Adels, W6HBO/MM, while aboard the S.S. Gulf Banker.

Billie's first American ship was the S.S. *Edward J. Berwin,* and at this time she was the only American woman to serve as a regular seaman on a U.S.-flag freighter.

In 1948 Billie sailed on the Liberty ship S.S. *John Gibbon*. The ship left Philadelphia the day after New Year's and, as Billie tells it, hit a whiz bang of a storm, which washed two men overboard. Both men were rescued, one being washed back on the ship and the other was finally pulled back after they found they could not launch the one lifeboat left (the other was mashed by a good-sized wave), this one being frozen in the blocks and immovable. Then the cargo shifted, an all-coal cargo for Antwerp. They got into Falmouth, England, with a 14-degree list.

Billie describes the *John Gibbon* as having no "belly band" and on the way back it developed more and more cracks. In the Bay of Biscay they hit a 75-mph gale, the telemotor went out, and the ship rolled helplessly. By 11 p.m. Billie was called to stand watch. Souping up the main transmitter as high as it would go, Billie waited with bated breath for instructions to send an SOS. Lifeboats would have been useless. Luck was with them; the steering gear was fixed and they battled their way through the storm.

On Sept. 7, 1948, Billie hit the front page of Hong Kong's *China Mail* with the headlines "Pretty Blonde Does Work of Two Men." As radio operator and purser of the 2,127-ton freighter *Union Carrier,* Billie was the first American girl to visit the colony in her capacity. This ship, formerly the *Hickory Ghyll,* was one of seven Victories which the U.S. had transferred to the Chinese National government. American crews sailed all the ships to Chinese ports.

Billie had some novel experiences on this ship. On the first pay day the 22 men in the motley crew crowded her office, peeping over each other's shoulders to have a look at their new purser. Billie shooed the men down the

[*Continued on page 101*]

Walt, W8ZCV, listens as John Reinartz explains some of the finer points during Novice-Tech forum.

Ed Bonnet, W8OVG
414 Oxford Ave.,
Dayton 7, Ohio

The 1956 Hamvention

The fifth annual Dayton "Hamvention" was held on April 14 at the Biltmore Hotel in Dayton, Ohio, with a larger-than-ever attendance and many interesting speakers and exhibits dealing with all phases of amateur radio.

Capt. John L. Reinartz, U.S.N. (ret.), K6BJ, was the main speaker at the evening banquet, which also featured a prize drawing at which W8GVE, Howard Reichle, Bedford, O., captured the headline prize of a Hammarlund PRO-310.

Now, these two paragraphs might be said to be a report on the Dayton "Hamvention"—but let's explore and examine.

Actually here is a one-day meeting of hams that brings together more than two thousand licensed amateurs and their friends, whose list of exhibitors reads like a Who's Who of the manufacturers and wholesalers, and whose speakers really do come from the top names in communications, electronics and the associated fields. The registration lists hams from every state, Canada and Alaska, and often real DX calls appear.

To make such an affair possible, the Dayton Amateur Radio Association begins work on each succeeding Hamvention almost as soon as the last prize is distributed at the big banquet (in fact, even before, for the dates for these meetings must be established a year or more in advance). The General Chairman is chosen within six weeks after the yearly event, and he in turn chooses his committee heads within a short time, and the wheels begin to turn.

Leading the parade is the Arrangements committee, which is the actual liaison between all Hamventon committees, functions, and the hotel staff. This group is hard at work months before many other groups swing into action. Perhaps the next most important factor is the setting up of the program theme for the affair, and choosing representative speakers. Here again, the Program chairman and his cohorts begin their efforts long in advance, and after comprehensive meetings with the committee as a whole.

In succeeding sessions, the committee carefully screens all phases of the operation, and since each chairman is picked for a particular job, (there are no overlapping or dual appointments made), in due time the Hamvention takes shape.

The effect of all this preparation and planning can best be realized by a comparison of the first Hamvention in 1951, and the '56 Hamvention just concluded. From an attendance of approximately a thousand, the registration has shown a steady growth to twice that number, and probably several hundred could be added if the attendance in the hotel were limited to ticket holders only. In looking at the

Editor of obscure amateur journal addresses multitudes assembled at the Hamvention Banquet.

banquet, we see a gain of from around six hundred to a crowd of more than a thousand which taxes to its utmost the capacity of the two ballrooms used as the banquet site.

Also witness the expansion to a registration and gabfest on the evening preceding the affair, at which time most of the convention's

This shot during the early hours as the registration desk was in full swing.

exhibits are on display, thus permitting extra time for visitors to meet old friends, see the newer gear, and have a clear slate for the sessions which begin in the early morning and continue until late afternoon.

Nor have the ladies, XYL's and YL's, been forgotten. It has been the custom to provide entertainment for those hardy souls who are beset by the rigors of our hobby, but with the 1956 Hamvention came a program planned especially for them, and a YL forum moderated by our own Betty Hall, WN8AXA which had as speakers several of the leading YL operators from the area of Ohio and neighboring states.

The morning sessions heard Merten, K2AAA, tell about the new rig, the world's smallest KW; W8HOX was moderator for the session that enjoyed Wes Schum, W9DYV,

Hamvention Chairman Rudy Plak confers with committee heads Gunston, McNutt, Rineer, and Inman.

and Ernest Pappenfus, WØSYF, expounding on those ideas which make SSB "more better," as it were. And while the SSB lads were enjoying their session, Walt, W8ZCV, held forth with a forum at which John Reinartz, K6BJ, in his inimitable manner, spoke of Instrumentation in the Hamshack. This was scheduled as a Novice-Technician meeting, but seen leaving the session were many, many holders of the higher class tickets.

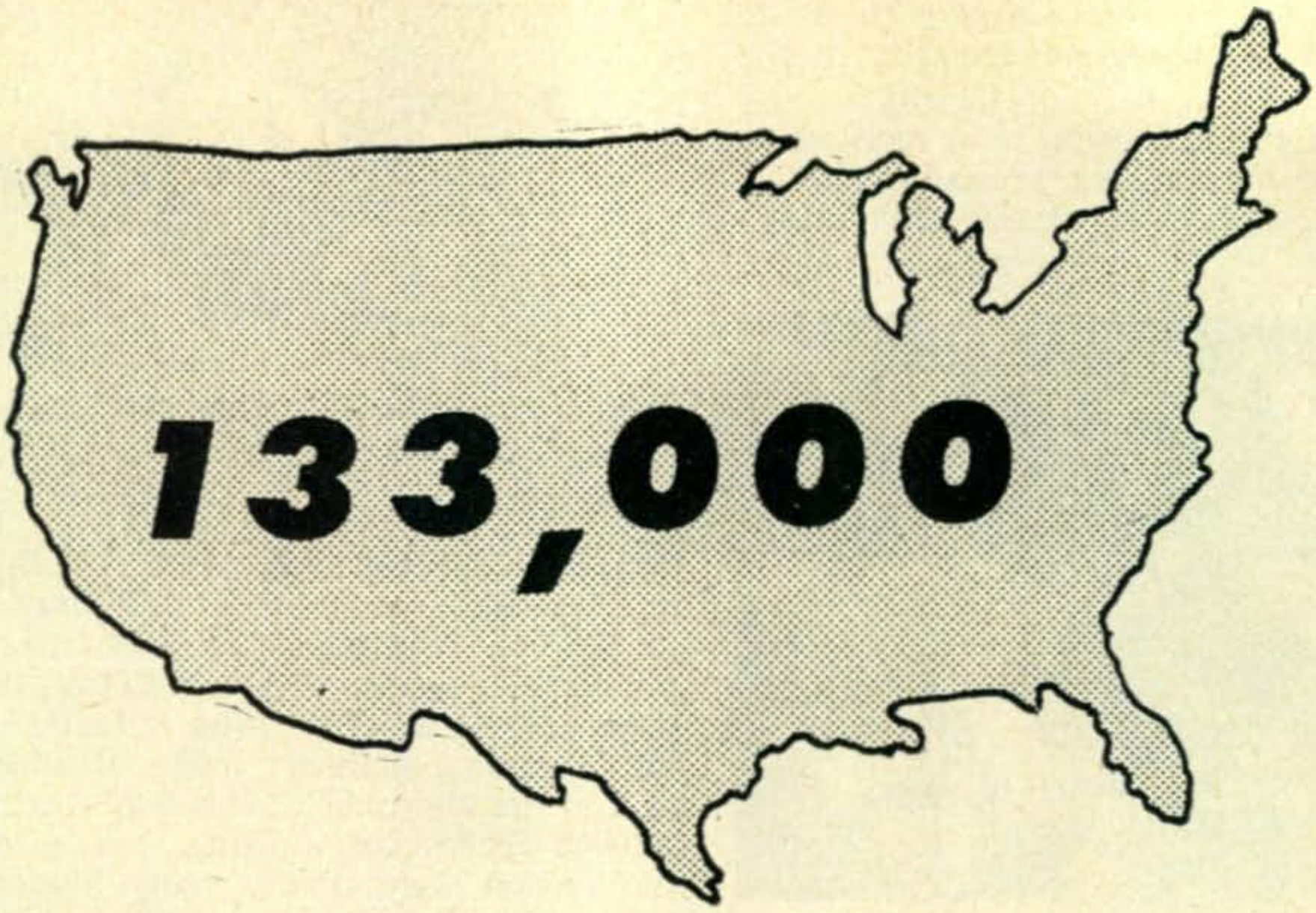
Following the lunch break, Hamventioneers first heard Fritz Franke's talk on modern receiver design, then followed Lew McCoy with "Causes and Cures of TVI." To round out the afternoon, W8SVI, Bill Ingling, conducted a well attended VHF forum with Paul Wilson, W4HHK, and Bob Rafuse, W1RUD, sharing the speaker's rostrum.

The final session was the ARRL forum led by Jack Brabb, W8SPF, at which League affairs were taken up by Bob Davis, W8EYE, Dana Cartwright, W8UPS, and Wilson Weckel, W8AL.

The program for the day began for the ladies at 8 in the morning with a coffee hour, followed by conducted tours of the Hamvention, and a musical program produced by one of the Dayton Junior Achievement groups. Following the noon luncheon, the ladies heard a talk on "History and Romance of Lace." Then entertainment of various types was pro-

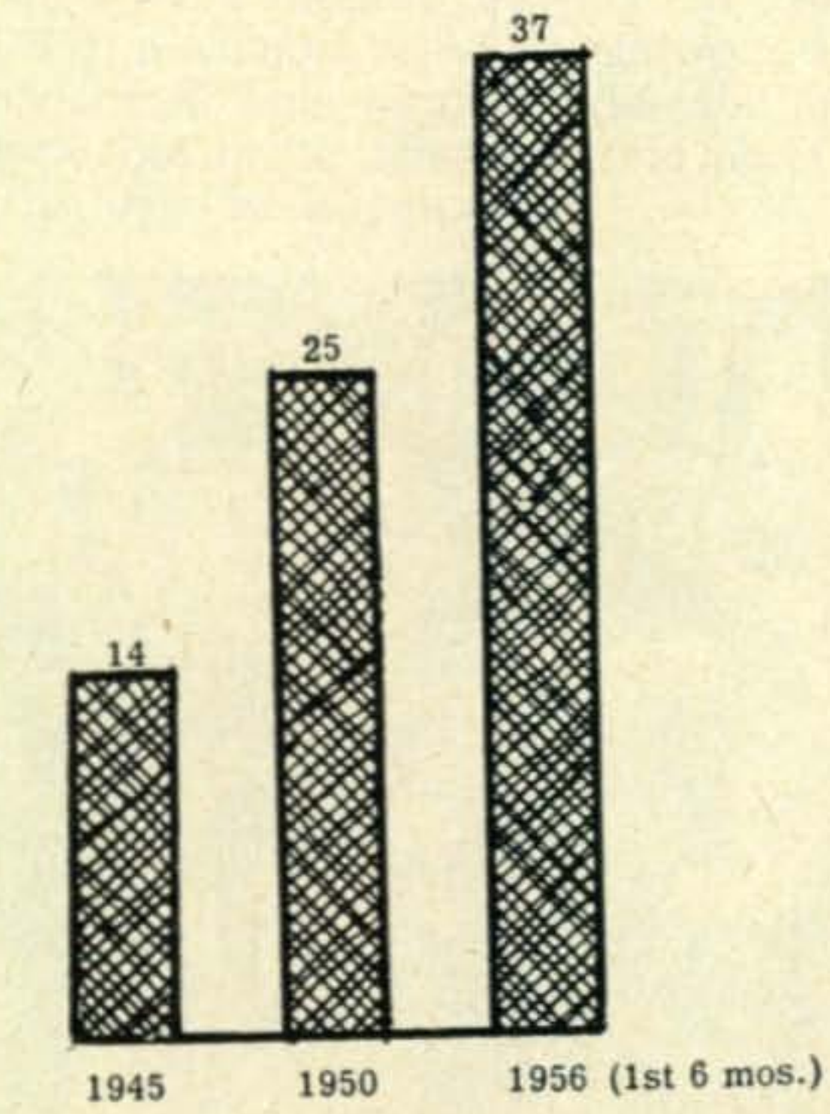
[*Continued on page 120*]

Scene at prize booth during the day. Winning numbers were drawn after each session, then returned for main prize drawing in the evening.

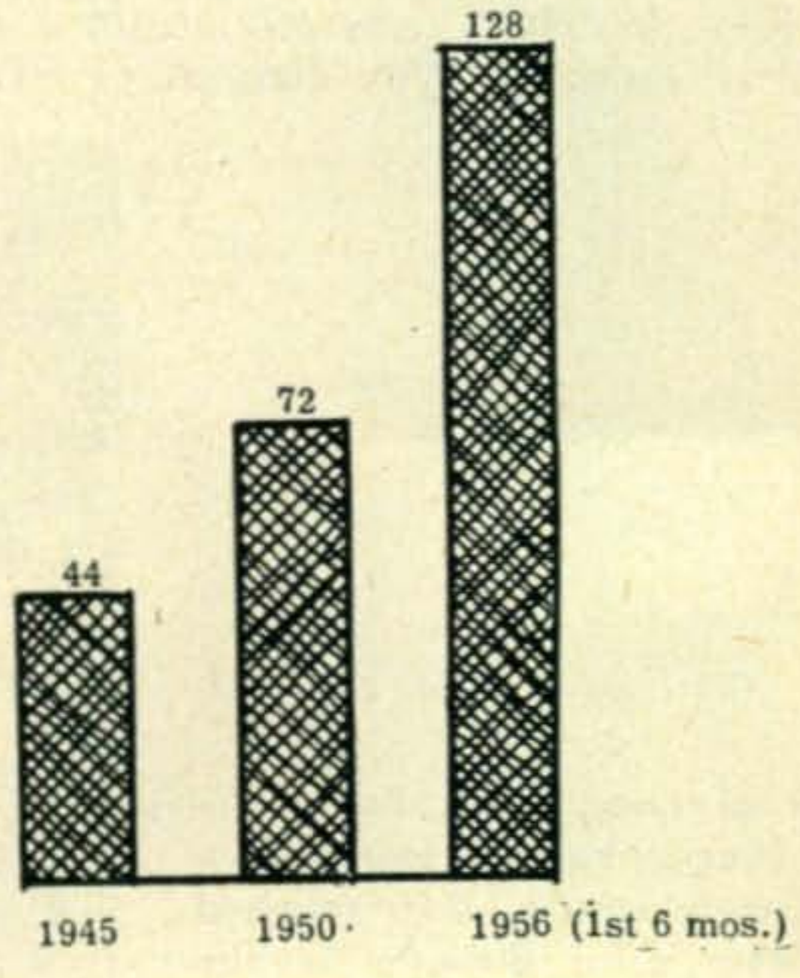


licensed hams...

CQ's growth tells the story



PAGES OF ADVERTISING IN CQ PER MONTH
(Average for 12 month period)



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CQ, the Radio Amateurs' Journal

Antennas Are Easy

Wayne Green, W2NSD
Editor CQ

Being lazy, that is, wishing to accomplish each purpose with a minimum expenditure of energy and money, I have been using folded dipoles on most bands ever since the advent of twin-lead. Little brown ribbons cut for two, six, ten, twenty, and seventy-five meters have been draped all around the house and environs off and on for over ten years.

A wee mite of sales talk might be in order in case you are inclined to sneer at the old dipole. Granted that for permanent use a beam is a valuable asset, however, even on the VHF bands the folded dipole can be made and hung up in a few moments and well serves as a first antenna for tooling up on a new band. It will do a pretty good job for you too, as I found out many times on two meters and six meters (where I worked California with only 10 watts). On ten and twenty meters you can (with reasonable power) work about anything on the band except during the DX Contest when it is best to plan for a short vacation.

On seventy-five meters your folded dipole will give you a better than even start with the majority of stations since they tend to try to load up plain dipoles and various lengths of wire. Beams are seldom found on this band (WIFZJ excepted). Operating from the middle of Flatbush, Brooklyn, using 75 watts on 75 meter phone I have worked all states and twelve countries. With higher power this has been raised to a total of 40 countries on 75 meter phone, including Japan, South Africa, and New Zealand.

Neglecting for a moment the fine performance of the folded dipole let's examine some of the other factors that are important in the selection of an antenna: cost, ease of erection, directivity, ease of feeding, and ease of adjustment. Perhaps I loaded that list unfairly for as it stands the folded dipole wins hands down. Costwise you can generally figure that the antenna will cost about 5½¢ per meter wavelength plus $2 for the feeder. The whole thing shouldn't take over a half hour to measure, cut, erect, and test. Allow one more half hour for tuning it exactly. It is by far the easiest antenna to feed from the transmitter since it requires no antenna tuning network and can be linked directly to the final tank coil. Pi-networks work well too. The adjustment procedure, a very simple process, will be covered later.

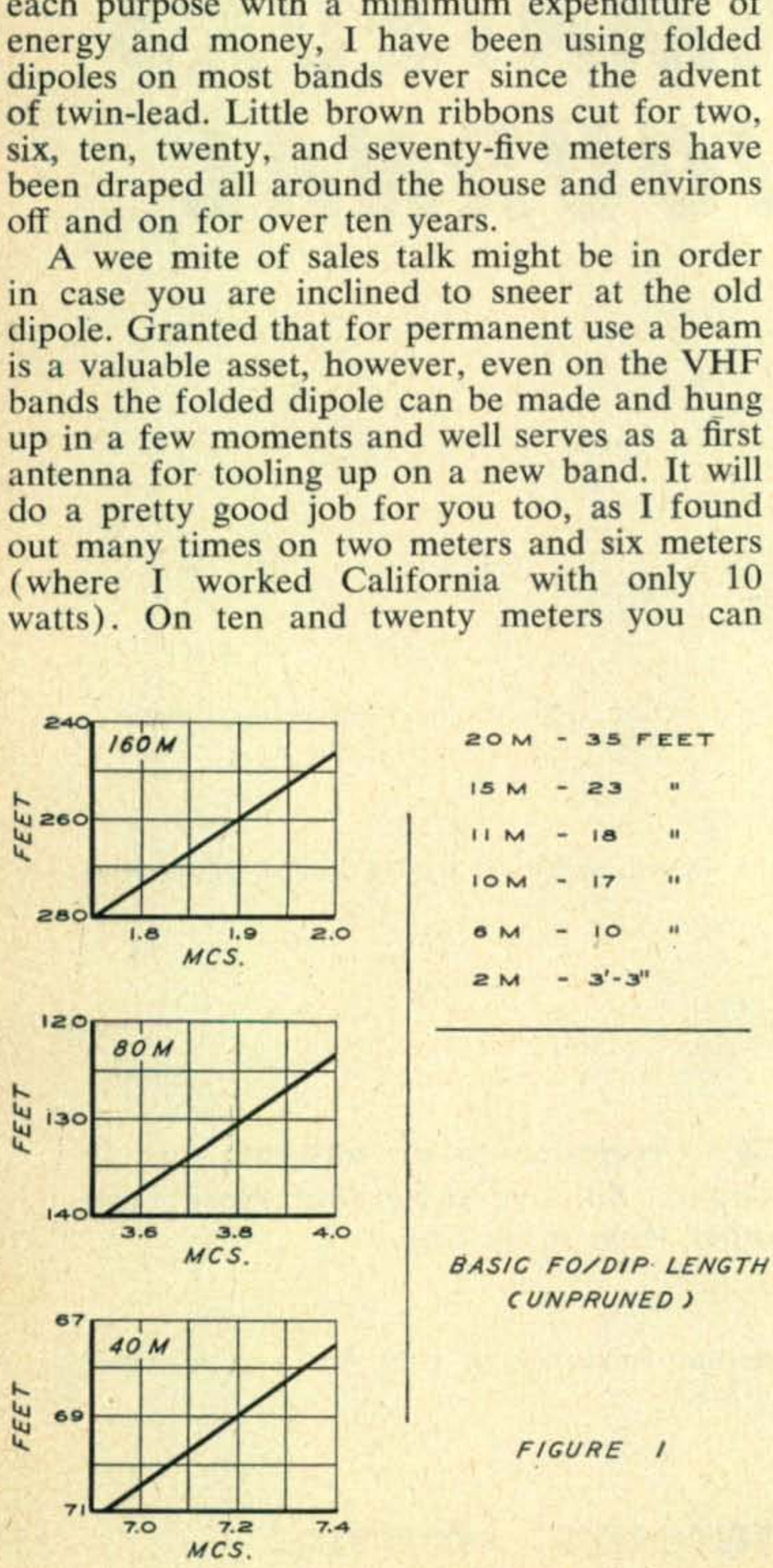


FIGURE 1

Figure 1

The First Step

Since the folded dipole works well only on the band it is cut for it is well to make some sort of decision as to the bands you want to use and put up a separate antenna for each band. A second antenna frequently comes in handy if you want to operate the receiver while transmitting. *Figure 1* will give you the approximate lengths of the antenna for the various bands so that you can go out and survey your house and trees for likely antenna hanging places. The ideal is two trees suitably

far apart, though it is possible to hang the antenna from a tree to the house. Try to have the center of the antenna as near to the radio shack as possible so as to keep the feeder short. This saves both money and r.f. If you look hard enough you will generally find at least one good antenna location. I have operated 75 meters from nine different locations and in every one been able to put up a folded dipole in a matter of minutes. There is almost always a way if you really want to put one up.

Pace off the distance between the trees and estimate the height of the trees so that you can make a good estimate of how much rope will be necessary for the ends of the antenna. Estimate too the length of the feeder from the center of the antenna to the shack.

Buying the Materials

Add the length given in *Figure 1* to the estimated length of the feeder, being generous to make sure you will have enough feed line. Buy a good grade of 300 ohm television receiving line, being careful not to get any of the 1¢ a foot stuff or twin-lead with the solid wire conductors. The wire should cost about 3 cents a foot. Other materials that will be needed are two antenna insulators for the ends of the antenna; these should cost from five to ten cents each and may be of porcelain or glass. The center insulator is the *Mosley* type 261 Dipole Connector and costs about 35¢. Unless you are well insured it is a good idea to invest in a lightning arrester which will cost a bit over a dollar. Buy some plastic television line standoffs to hold the feeder in place: 5¢ each. The only remaining item is the rope for the ends of the antenna. If you have some extra clothesline around that will do a good job. Lighter line will do though, just be sure that it looks strong. I prefer ¼" sisal line which sells for as little as 1¢ a foot in some places. Buy plenty of line so that the rope can be passed over one of the top branches of the tree and then brought down and tied near the ground. In one of my locations there was no nearby handy tree so it was necessary to run about a hundred feet of rope to one end of the antenna. In addition to the rope for the antenna buy a roll of light twine which will serve as a throwing line to start the heavier rope over the tree.

Let's add that up for the 80 meter antenna and see what the total cost will be:

Antenna wire	4.20	140 feet
End Insulators	.20	2
Center Insulator	.35	1
End Rope	2.00	200 feet
Throwing Twine	.50	200 feet
Feeder Wire	1.80	60 feet
Feeder Standoffs	.20	4
Lightning Arrester	1.00	1
Total	$10.25	

Hoisting the Antenna

The length of time that your antenna will stay up depends upon your care in putting it together and the neighbors' kids. A surveyors tape is handy to have around for measuring the antenna length, but who has one? Next best is to measure off, say, three feet on the side of the house to use as a measuring stick. Measure one half of the antenna and then use that half to measure the other half. Cut off the excess twin-lead and use it for the feeder. To attach the insulators to the ends of the antenna split each end for about three inches and strip the insulation for ¾". Feed the two split ends through the hole in the insulator in opposite directions, cross the stripped wires and twist them. Later, when you have the antenna cut exactly to length, you should Solder the twisted end quickly so that the insulation does not get too hot and peel back from the wire. This makes an end connection that will last for years. Next put in the center insulator and connect the feeder.

Tie a weight to the end of the twine and pay out the twine on the ground, keeping the end in your hand or under your foot. Most

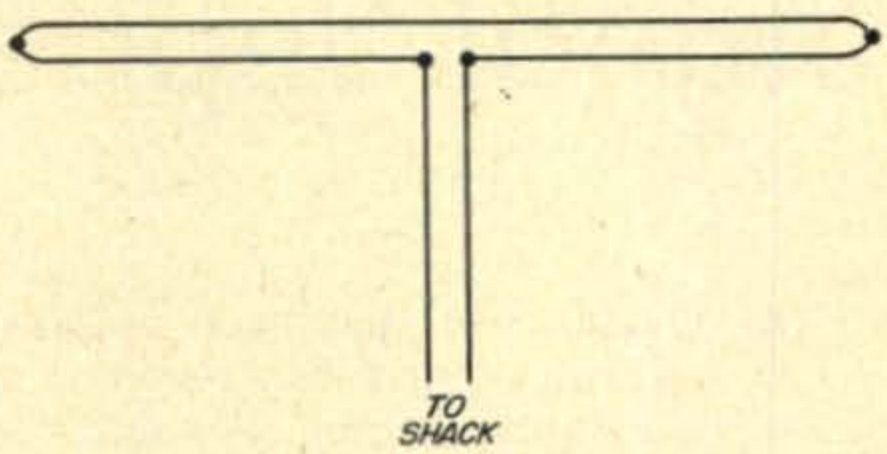


Figure 2

normal size trees can be conquered in this way, taller trees may require special equipment such as a bow and arrow or a gas filled balloon and .22 gun. On most trees it is best to pick a good sturdy branch and swing the weight over that. Two or three trys should do it, if not, call your son, you're getting old. With real thick trees it will be simpler to just throw the weight completely over the tree and let the rope do the branch finding. Tie the rope to the twine and pull it through. Allow enough rope on each end of the antenna so you will be able to lower the antenna to the ground for tuning. If you cut it off short when the antenna is up in place you will have to splice to it later when you want to work on it. Put up the other end of the antenna in the same way and pull the antenna up into the operating position.

Several factors influence the resonant frequency of an antenna. Such items as height and ground coefficient make the exact calculation of the length of an antenna impossible without a test in its actual operating position. All of the lengths in *Figure 1* were made a

[*continued on page 92*]

Guy Slaughter, K9AZG
P. O. Box 192, Crown Point, Indiana

Signal-Separation

for us peasant types

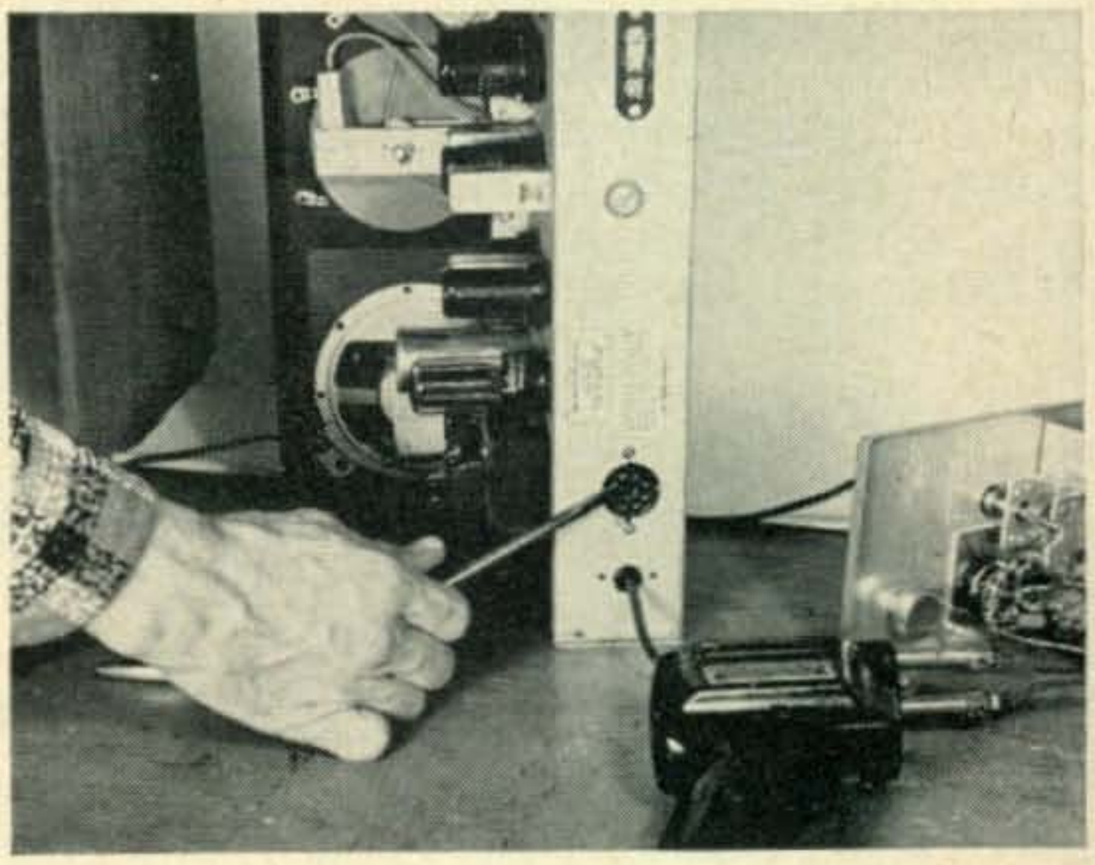
While the Q-Multiplier has been around for quite a few years now, and has received a bit of publicity from time to time, it doesn't seem to be particularly well-known in ham circles. And that's a shame. Because it is capable of converting a so-so receiver into a really good performer.

So far as the average ham is concerned, there are two kinds of receivers: those he'd like to own, and those he can afford. The experienced ham knows, and the novice soon learns, that while sensitivity, stability, adequate bandspread, conveniently-grouped controls, and relative freedom from drift aren't necessarily expensive items in today's receivers, selectivity is.

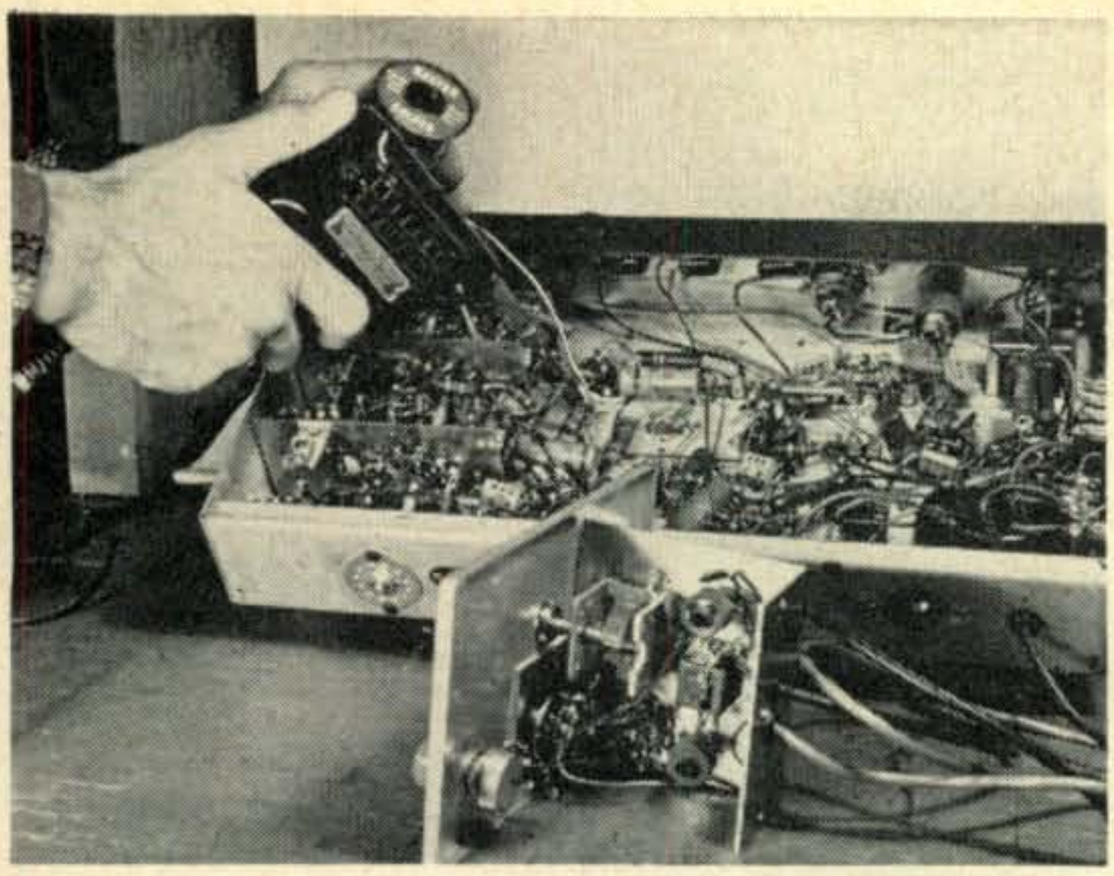
Particularly to the novice trying to work his crowded bands with his hundred-bucks-special, this one shortcoming of inadequate selectivity is enough to condemn a moderately-priced receiver as unusable. (A *Novice,* for the record, may be here defined as an amateur operator who is currently considering hocking the family furniture in order to buy more radio gear; a *General* is one who already has.) But by the simple and inexpensive expedient of adding a Q-Multiplier, that hundred-bucker can be transformed into a competent signal-separator.

Until recently, a commercial Q-Multiplier cost somewhere in the twenty-five to fifty buck region. Now one can be had, in kit form, for a hair under ten. So for a sawbuck and an evening's work, we peasants with our poor-man's receiving gear, can henceforth tune the bands with nearly the same QRM-lessness as can our aristocratic brothers sporting their Super-Meteor-Specials.

Here at K9AZG, our problem was typical of our poverty-stricken peers; we had invested $75.00 in a second-hand Hallicrafters S-40B, and found we had a good hot receiver, stable, sensitive, and easy to tune. But there was the usual catch: any two signals of comparable S



The first phase of surgery calls for installation of a socket to feed filament and B voltage to the multiplier.



The second and final phase of surgery. An RCA type phono jack is installed on the receiver chassis, close to the mixer tube, and connected to the high side of the input IF transformer.

value within one dial division of each other would sneak through the i.f. bandpass together like Siamese twins. And, like Siamese twins, the signals would prove inseparable.

Since we couldn't hock the family furniture for enough cash to buy a 75A4 or an NC300, we looked for ways to strengthen our position without bending our budget. And we found it. The Heath company came through with one of their QF-1 kits for ten bucks, and Voila! We haven't lost a contact because of QRM since.

The Q-Multiplier is, of course, a simple gadget. It utilizes an iron core coil of extremely high Q in a tuned circuit which, shunted across the primary of a receiver's input i-f transformer, narrows the bandpass of that stage by an amount which is proportional to the Q of the circuit itself. While the basic Q of the iron core coil approximates 200 in the QF-1, this figure is increased by a simple triode positive-feedback circuit to a value of around 4000. The selectivity curve of the input i-f stage, therefore, becomes extremely steep-skirted, and any signal falling to either side of the sharp peak is shunted to ground and greatly attenuated, while a signal falling exactly on the peak of the curve is actually boosted. Because the tuned circuit includes a variable condenser, the peak can be moved across the bandpass of the receiver's i-f system, and can be tuned to boost any desired signal, while attenuating all others. The gain of the triode, and hence the sharpness of the selectivity curve, is variable, so that the bandpass can be changed from broad to extremely sharp at the twist of a knob.

The QF-1 can also be used as a nulling device. A second triode amplifier, this time switched into a negative feedback arrangement while the high-Q circuit is switched to a series-resonant condition, provides a narrow notch at resonance, allowing an undesired heterodyne or signal to be shunted to ground, while adjacent signals are unattenuated.

Since installing the Q multiplier, we have been repeatedly asked the same questions concerning it, on the air, by brother peasants interested in improving the signal-separating powers of their own receivers. These questions fall into three categories: how does the QF-1 compare with a crystal filter; how great is the insertion loss; and does its installation require tearing into the receiver? We answer thusly:

(1) In our experience, the QF-1 is approximately equal to the average crystal filter in degree of selectivity, and has a couple of advantages of its own; it doesn't "ping" or "ring" quite so badly as does a crystal at maximum selectivity; it is tunable across the i.f. bandpass and allows desired signals to be hunted for and peaked with its own control, thus minimizing the possibility of losing the signal as sometimes happens when the receiver tuning is varied to "center" a weak one; it can be used, by itself or in conjunction with a crystal filter, to null out an undesired signal without affecting the one being copied.

(2) There is *no* insertion loss. Rather, there is an actual *gain* of one to three S units of a

(*continued on page 121*)

The octal plug in the foreground feeds power to the QF-1, while the phono plug (between the IF transformer and the filter condenser) connects the high-Q circuit into the IF amplifier through the co-ax cable. Alignment can be done entirely by ear, no instruments being required.

DX

Gathered and reported by
R. C. "Dick" Spenceley, KV4AA
Box 403, St. Thomas, Virgin Islands.

We welcome the following newcomers to the HONOR ROLL:

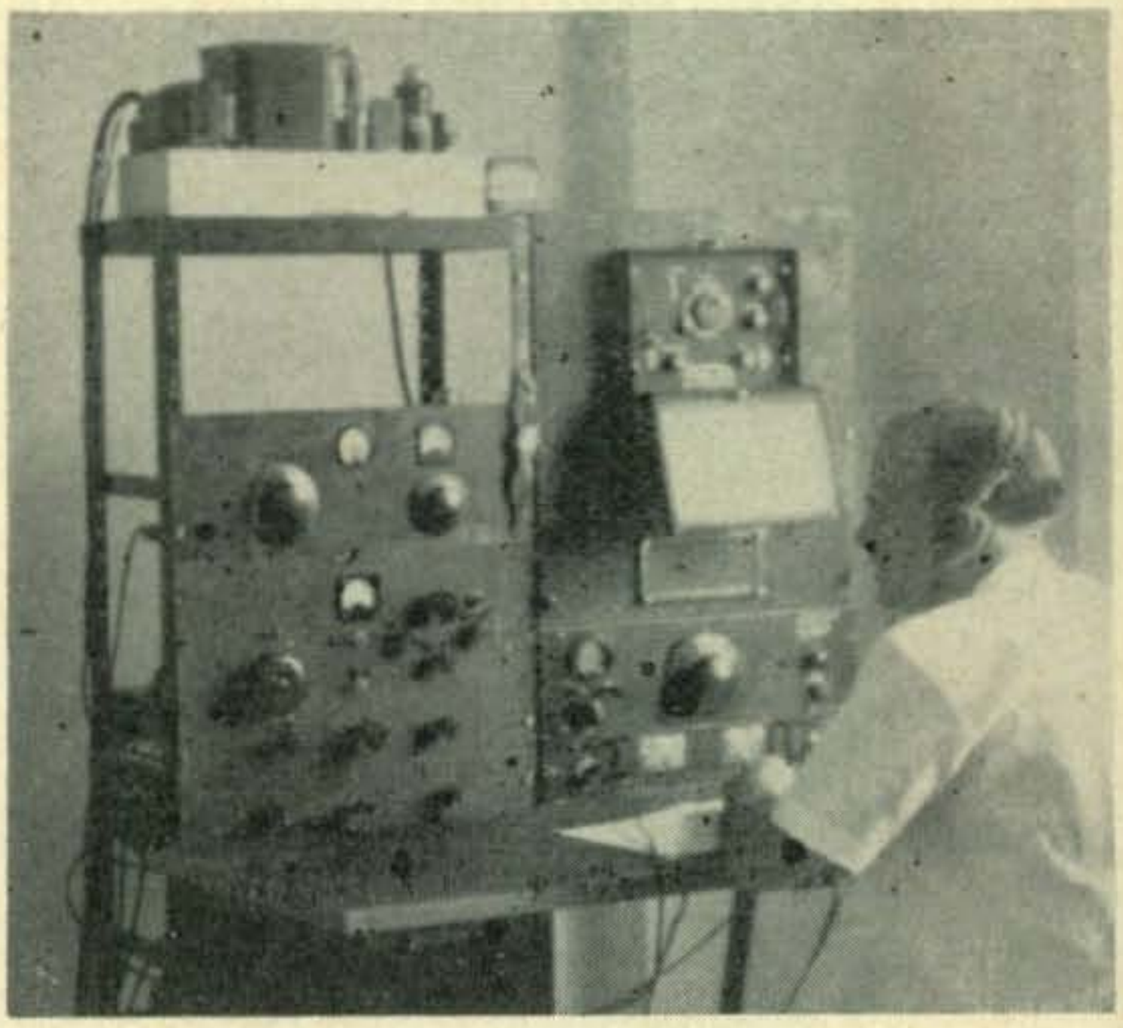
W8CED	39-180	W1DSF	35-157
W1JNV	37-181	W9NN	35-157
W8PUD	37-166	K2QQO	35-110
K6JQJ	36-121		

PORTUGUESE TIMOR, CR1ØAA: This station has been appearing near 14082 around 1400 GMT with a T7C QRI. Beam headings on him from W6 seem satisfactory.

AVES ISLAND, YVØ: Things continue to look good for the appearance of this expedition between July first and eighth. Venezuelan President, General Perez Jimenez, with staff, made a holiday visit to Aves on the destroyer Zulia on March 25th. A new metal flag and bronze plaque were placed on the island to commemorate the visit. President Jimenez has expressed interest in the proposed radio expedition.

COMORO ISLANDS, FB8BR/FB: Hubert was unable to make this trip on April 13th as he had to attend an air erash inquiry. Next trip to this QTH was due in early May.

CANTON ISLAND, BRITISH PHOENIX, VR1B: At time of writing Danny, of the "YASME" expedition, has done much to justify all the effort and contributions put into this venture. His contacts on phone and CW now number well over 2000 and he will not leave until sometime in June. Sideband devotees will be interested to know that a move is being made to augment his present gear with an SSB rig which he may have by the time this is read. First contacts from VR1B, March 27, 28, were: KV4AA, FO8AB (A3), W8DAW, W5ABY, W6ALQ, W6TXL, W5ADZ, W9NDA, W6CYV, W9YFV, W9QLH, W7KVU, W6NHA, W1TYQ, W6MX, W6EFV, W8TMA, K6GUZ, W7TML, W4TO, W8OCT, W2AGW, W6WB, W7HXG, W5FXN, W5BZ, W6KSF, W9JUV, W8DMD etc. in that order. Some time in July Danny should reach Nauru Island where he has been assigned the call of VK9TW. Next in line are VR4, CR1Ø and VU5.



VS1GX, Bill Savage, Singapore, runs PP 807's on all bands. Receiver is an HRO. Bill has worked 120 countries and 34 zones since July '55. VS1GX is most active on 14 and 21.

SIKKIM, AC3SQ: Saja now sports a BC-610 rig and has been heard on phone, 14090, around 1300 GMT. We hope this presages a return to normal activity.

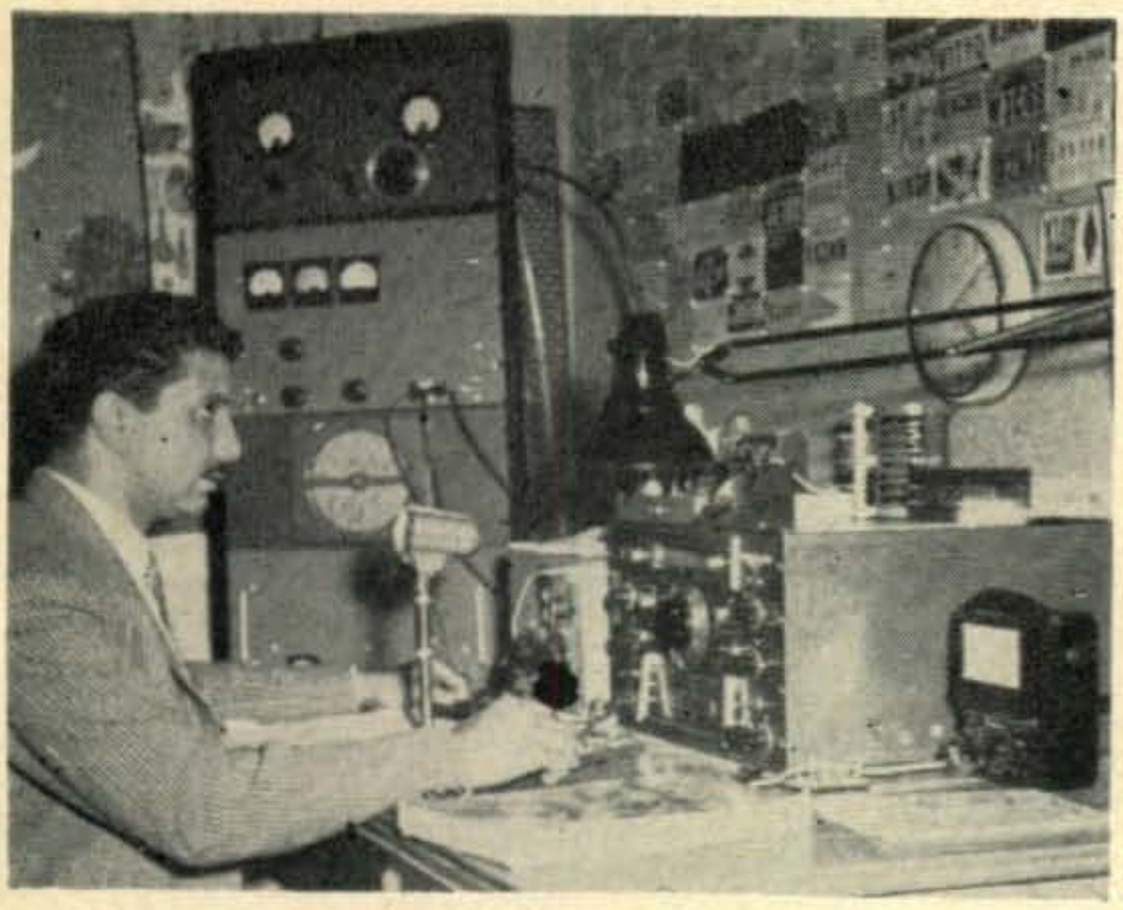
LITTLE AMERICA, KC4USA: Considerable activity has been reported from this station mostly on SSB, 14295, between 0700 and 1200 GMT. Also some CW near 14315.

GATTI EXPEDITION: Commander Attilio Gatti has launched his 13th African expedition for the purpose of making TV films for the ABC network. Radio gear will consist of a B and W 5100 transmitter with 51SSB generator, easy-way tower and full sized telrex beam. This equipment will be truck mounted and manned by Jimmy Chapman, ZS6HG, who goes along as chief op. Activity will be mainly on 14 Mc. SSB altho some AM and CW is promised. The expedition should be on the air from mid-April and, with a brief return home in June, continue from six to nine months. Countries to be visited are: Kenya VQ4, Nyasaland ZD6, Tanganyika VQ3, Belgian Congo OQ5, Ruanda-Urundi OQØ, Uganda VQ5, French Equatorial Africa FQ8, Rhodesia VQ2/ZE, South Africa ZS1-6, Swaziland ZS7 and possibly two or three other countries. (Thanks W2AOX)

UGANDA, VQ5GC: Neville writes that it has always been his ambition to operate from VQ1 or VQ9. He is definitely going to spend a week or two operating from Zanzibar, later in the year, when enough money to cover the trip is accumulated. A trip to the Seychelles is more difficult as it presents a transport problem. It is not so hard to get there but the boat does not call back there for several weeks. In the meantime Nev is going to Ruanda-Urundi, OQØ, for a few days and probably will have been heard from this spot as this is read. VQ5GC continues to be very active from Uganda, all bands phone and CW with 150 watts, and QSL's 100%. Former calls have been VS6AC, VS6CE, G3IAD and VQ4GC. (Ed—We will see what can be done about the VQ9 trip on a "dollar-per-QSL" basis. This idea has worked very satisfactorily in the case of VR1B and the DX fraternity has been most cooperative. Expected squawks, especially from the "millionaries", have not materialized!)

FRENCH TOGOLAND, FE8AC: According to F9RS a station signing this call will be on from Togoland shortly.

IFNI EXPEDITION, KT1UX/KT1EXO: Efforts to break through the red tape and obtain a license for this jaunt have apparently not jelled. Another effort will be made when KT1EXO returns from the states in August. The 2½ day drive to Ifni from Tangier will be made with a jeep hauling a trailer full of radio gear. A 75A-2 and 32V-2 will be used. Five days of 24 hour operation is planned.



ET3TRC, is the Amateur Radio Exhibit at the Haile Selassie first silver Jubilee Fair in Addis Ababa. At the throttle is Leon, ET3LF.

(Photo courtesy W6BIL)

COCOS-KEELING, ZC2PJ: This station was active from this QTH for two or three days April 11th to 14th. Name was "Dean".

IWO JIMA, KAØ: Rod, W7YBX, now operating at KA7HH, advises that he plans to go to this spot for two weeks around the time of the next *CQ* International DX contest (October/November). He wishes to know, however, if this spot is rare enough to warrant such a trip (We think so). Should you think so, please drop Rod an airmail letter. The volume of letters received will do much towards his getting the necessary permission. In fact your letters might result in having a permanent "ham" stationed at Iwo. Ham gear is available for Iwo but the op isn't! Letters go to: A/1C Rod Linkous, AF 19496651, 37 Troop Carrier Sqdn (m), APO 75, PM, San Francisco, Calif.

LUXEMBOURG, LX: Bob, QN4QX, advises that a Belgian expedition to this spot is planned for June 9th and 10th. QTH will be Bhoey, near Wiltz, in Luxembourg. The following ON4's will make the trip and appear on their special bands as follows: 14 Mc CW ON4QX, ON4TQ and ON4FU. 14 Mc. phone ON4LJ. 7 and 3.5 Mc ON4AB and ON4CC. 2 meters ON4DE and ON4RB. Authorization is expected to come through shortly.

DUTCH SAINT MARTIN, PJ2MA: We hear from Bill, W6SAI, that negotiations are progressing towards permission to operate from this rare QTH and that he, accompanied by George, PJ2AA, should appear from there some time this Summer.

FANNING ISLAND, VR3: VE7ASL/VR3 was recently heard from this QTH on 28414 kc phone, 0230 GMT, QSL's go via South Pacific Airways, International Airport, Honolulu, Hawaii.

Luis, CE3AG, says that lack of interest on the part of the present officer stationed at Easter Island's CEØAD is keeping that station off the air on the ham bands. It is hoped that his relief, next year, will be more interested in amateur communications . . . AC4LP, claiming to be in Lhasa, Tibet, has made quite a number of contacts and claims to be running a KW. We understand he is now QRT. . . . YJ1AA holds forth, most nights, from 0700 to 0900 GMT, near 14050 . . . VQ1EQ may be OK but he wouldn't give his QTH to VQ5GC! . . . A station signing AC5PN was worked on April 17th at 2015 GMT. He put a 579 signal into the east coast and gave the right name "Chhawna". Outside of that he didn't recognize KV4AA (Which he should have. We have QSO'ed and corresponded) and said he was on every night when, at the time, it was 2 AM in Bhutan! The beam here was on Europe . . . Bulgarian hams have now been permitted to operate their own stations. Licenses have been issued to LZ1AF, LZ1AX, LZ1SR, LZ1VK, LZ1AL, LZ2PA and others. LZ1SR and LZ2PA are already on the air . . . We are advised that LZ1DX/ZA, 9B3AA etc

Bill, MP4KAC, (center) was snapped during a recent visit to Tangier where the DX situation was re-hashed with Jim, KT1EXO (left), and Carl, KT1UX.

(Photo courtesy W9HUZ)

Myint, XZ2OM, Rangoon, Burma, is seen here with attractive XYL, Sein, and (very ditto) YL, Shiela.

(Photo courtesy W6EFV)

are NG! . . . In addition to the Norwegian prefixes, given in the May issue, the prefix "LJ" is used for military school stations . . . VP7NG, Glenn, now QRT's from the Bahamas and goes to Puerto Rico as W4PDZ/KP4 . . . Leny, VQ8CB, leaves Chagos in August and possibly will settle in ZL . . . Via F9RS we hear: FB8XX will not be on the ham bands this season. FB8AX, Terre Adelie (Antarctica), may be active from May. Activity is also expected from FD4BD by now on phone and CW with new station. F8EX says St. Martin is NG for DUF. FU8AA is active with 350 watts and 600 foot long wire. FD8AM will be heard on phone. F3UR/MM is on the MV ARAMIS. FF8BH and FF8BM have returned to France for good . . . W8FGX reports KC6AL is on Eastern Carolines, 14070 . . . W8AUS nabbed FU8AC, on phone, 0700 GMT . . . SVØWA was QSO'd, SSB, 14310, 0010 GMT . . . UP2KBC says QSL via Box 547, Sofia, Bulgaria . . . W3JTK ponders one YZ2KAB who said he was in Nepal with a Yugoslav expedition to the Himalayas. Said, QSL via VU2RU . . . Fergus, MP4QAL, is now equipped to dispense phone contacts from Qatar . . . BV1US now belongs to the Taipeh Radio Club and QSL's are being printed . . . W6NTR received UQ2AN card via the YO bureau . . . Bill, ex-JA2KW/K6DGB and 7th op at XE2NF in '56 ARRL test will soon be heard from KR6-land using a Viking Ranger 160 through 28 CW (A3 in contests only) . . . VK1IJ is consistently on from Macquarie Island, CW and phone around 1600 GMT. KP6AK, Palmyra Island, is infrequently on 14217, A3, with most contacts being KH6's (So. Cal. Bulletin) . . . 3W8AK is active from South Viet-Nam on phone . . . XW8AB has dropped out of sight. If he is still alive we are sure that missing QSL's will eventually come through . . . EA9DF, Rio de Oro, says he will go to Ifni this summer . . . W6HNX will be VP5SH on Grand Turks Island. Rig is a Ranger and A3 most likely (North Cal. DX'er) . . . VS1EW (ex-VS5EW) is building 250 watt SSB rig . . .

VQ Certificate

The radio Society of East Africa, Box 264, Nakuru, Kenya, has made available a new award to be known as "WAVQA", Worked all VQ areas. Appli-

Last Minute Items

FE8AE is now active from French Cameroons, Frequency 14106 CW and time 1930 GMT. QSL's should go to Box 408, Duala . . . Latest reports say that Hubert, FB8BR, will again visit the Comoro Islands in late May or early June . . . Activity should be expected from FB8BC on the Glorious Islands in June. This may (or may not) be a separate one . . . There is no present activity from Tromelin Island (FB8BK) but we trust that he will be on in the near future . . . CN8MM advises that the call FB8PP, used by a station claiming to be on St. Paul Island, has not been issued . . . A new ham in French Morocco is CN8MH. This is none other than H.R.H. Prince Moulay Hassan, son of the reigning Sultan . . . We hear that the calls of the British Antarctic Expedition are VP8AO and VP8BO . . . The DX'-pedition to Aves Island seems to be all set for the first week of July. It does not look like KV4BB will go along as the group will sail directly from YV to YVØ . . . VQ5GC plans a radio expedition to the Seychelles in mid-July. A two weeks stay will be made. This trip will be made possible on a dollar-per-QSL basis which, via our experience with VR1B, has the approval of the DX fraternity. QSL's for contacts between VQ9 and W/VE will be handled by KV4AA. Also, a trip to IFNI, by EA9DF, on a similar basis, is very likely this Summer. Possible call at VQ9 will be VQ9AA or VQ9GC . . . W2HQL advises that new calls are in effect in Surinam as follows: PZ1PA is PZ1AA, PZ1BS is PZ1AH, PZ1LM is PZ1AJ, PZ1LL is PZ1AI, PZ1CD is PZ1AP, PZ1RM is PZ1AC and PZ1AM is a new ham . . . AC3SQ put on an appearance on April 23rd, 14080, 1300/1430 GMT, and among the lucky recipients of contacts were W9NDA, W9KOK, W9ABA, W9YFV, W8ZY, W8NBK, W8DUY, W8FGX, W6NNV and W3CRA. We understand that QSL's go via W9KOK . . . W5CFG plans to operate from KS4 this Summer . . . VR1B should leave Canton in early June. He will not stop at Wallis, FW8, but proceed directly to NAURU where the call, VK9TH, will be used . . . YV4AU is ex-I1ARA . . . Many reports have come through that Russian hams may now contact USA. While this may be true we have not received any definite confirmation of the fact . . . KC4USV has been on 14057 CW around 1200 GMT . . . AP2M is W5LAK and was worked on 14083 around 2200 GMT. QSL via AP bureau . . . 9S4BN has new 3 element mini-beam . . . DJ2PQ will obtain a LX license and may have been heard on the air by now.

73, Dick, KV4AA

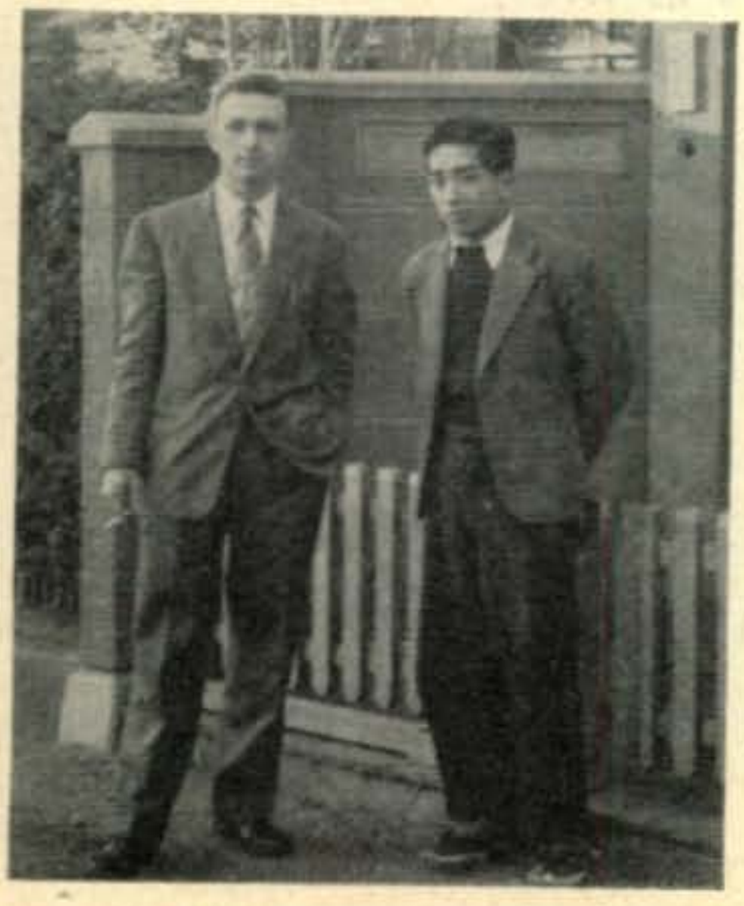
cants must submit confirmations of contacts as follow:

a. One VQ1 contact.
b. Ten VQ2 contacts.
c. Five VQ3 contacts.
d. Twenty VQ4 contacts.
e. Five VQ5 contacts.
f. One VQ6 contact.
g. One VQ8 contact (Mauritius).
h. One VQ8 contact (Chagos).
i. One VQ9 contact. (45 cards in all).

Five extra confirmations from any VQ call area may be submitted as a substitution for any one missing card. Remittance of one dollar or 20 IRC's must accompany list. List may be submitted in place of QSL's if countersigned and checked by the Secretary of a recognized Radio Club. Certificates are issued Phone to Phone or CW to CW. Minimum reports RST 338. Contacts after November 1st 1945. (Looks like a toughie!)

D X'ploits

Frank, W6SYG, leads off this month with the addition of AC5PN which gives him 261 . . . Howie, W2AGW, upped to 257 with FS7RT and VS4RO while Jim, G6ZO, made it 256 with VR3B . . . Glenn, W8KIA, made VR1B his No. 256 as Jim, W8JIN, hit 254 with AC5PN . . . Oscar, W3JNN, submitted revised list giving him 253 while Roger, W3EVW, reached 252 thanks to FS7RT . . . Ed, W6DZZ, rose to 251 with FS7RT and FB8BR/FB as Ozzie, W9VND, added YJ1AA and VR1B for 251 . . . Gene, W6EBG, made it 248 with EA9DF while Ed, W6TS, also hit 248 with YA1AM, FB8BR/FB, HI8EC, ZD3BFC, FB8XX, XW8AB, FW8AB, YJ1DL, FS7RT, PJ2MA and LU3ZY . . . Bill, W6SAI, reached 247 with FS7RT, YJ1DL and FB8BR/FB as Horace, W6TI, rested at 239 with FW8AB, HI8FR, YI2AM and YA1AM . . . Vince, W5KC, went to 239 with VR1B and FS7RT while Luis, CE3AG, also hit 239 with ZD8AA, LU3ZY and 3W8AA . . . George, W1GKK, keyed with VR1B and FB8BR/FB for 238 as John, W7GUV, also upped to 238 with ZS8I, FB8BR/FB, FB8ZZ, LU3ZY and FS7RT . . . Maxine, W6UHA, comes up to date with EA6AF, FB8BR/FB, ZD3A, XW8AB, ZS2MI, YJ1DL, FS7RT, PJ2MA, and LU3ZY to reach 232 as Guy, W6DLY, snagged ZD1DR and LU2ZY for 229 . . . George, W7GBW, submitted new list raising him from 127 to 226 while Ed, W6LDD, upped to 216 with FB8BR/FB, FS7RT, YI2AM, ZS2MI, VR6AC, LU3ZY, ZS8L, MP4QAL, XW8AB and VK9OQ . . . Burt, W6EHV, nipped VR1B, MP4QAL and EA9AP for a 215 total as Thor, W6LN, hit 213 thanks to MP4QAL, LU3ZY, VP2SX, YI2AM and FP8AK/VP2 . . . Don, W6LRU, moved to 212 with 3A2AN, ZD3A and VR1B while Bob, W6NGA, made it 205 with FS7RT, LZ1KAA, LU3ZY, VP2GW, FB8ZZ, VQ6LQ etc . . . Wally, W7ENW, rose to 204 with Y12AM and VR1B as Don, W6BVM, broke through the double century barrier with F9YP/FC, FQ8AY, VR1B, YI2AM and AP2RH for 201 . . . Shelley, W6BAM, sent in 23 additions to reach 193 while Hal, W6JK, upped to 190 with VR1B, VR3B, FB8ZZ, YJ1AA, VQ6LQ, VQ5GC etc . . . Norm, W9YNB, added LZ2KSK, VQ6LQ, VR2BA, VR3B, VR1B, VQ5GC and EAØAB for 189 as Buck, W4RBQ, nailed ZS9G to reach 207



Henry, W4JVJ, with Takeo, JA1CR, snapped in front of Takeo's, Tokyo, QTH. Operating position at JA1CR with Takeosan. 100 watts is the present power but new rig, left, will put 200 watts on all bands.

FO8AN, on the YASME, departing Papeete for Canton Island and VR1B.

. . . Dan, W6PH, goes to 181 with VP8BS, VR3B, ZK1BS and YI2AM while Vip, W6ID, hit 180 with FP8AK/VP2, MP4QAL and VQ6LQ . . . Hal, W6BUO, added such as 3V8AN, FS7RT, LU3ZY, VP8BK, VQ6LQ, ZD6BX, PZ1BS and FB8ZZ for 179 as Dick, W6ATO, added 11 in--cluding ZD3A, VQ6LQ, FS7RT and FB8BR to hit 178 . . . George, W6BIL, rose to 164 with HZ1HZ, FY7YF, PZ1BS, YI2AM and FB8ZZ while Dick, KV4AA, made it 252 with VR1B . . . Al, W2WZ, nabbed FS7RT for 248 as Stan, W1CLX, pulled in Danny, VR1B, for No. 246 . . . Art, W9LNM, added FS7RT, YJ1AA, MP4KAC and VR1B to reach 243 while Bob, W3EPV, rests on 243 with ZA1KAD, LU3ZY, YA1AM, PJ2MA, XW8AB, ZC5CT, KC6CG etc. . . . John, W1BIH, goes to 240 with FS7AA, VR1B, FD4BD and LU3ZY as Van, W9HUZ, hauled in VR1B for No. 237 . . . Howie, W2QHH, slid to 236 with VS1GX and VR1B while Norm, W1HX, nicked VP8BT, FS7RT and VR1B for 246 . . . Joe, W8UAS, keyed with SVØWN and VR1B for 233 as Bob, W4GG, upped to 232 with YA1AM, FB8ZZ, FS7RT and HI8FR . . . George, W2HZY, goes to 228 with YA1AM and MP4QAL while Chuck, W4LVV, pulled in FS7RT and VR1B for 218 . . . Chas., W3DKT, made it 217 with FS7AA as Clif, WØAZT, went to 212 with FB8BR/FB, 4S7MG, FS7RT, CR4AG, VR1B and VQ8CB . . . Bob, W1KFV, hits 209 with VR3B, SVØWN, VR1B, VQ8CB and 4S7MG while Pat, W2GVZ, goes to 205 with MP4BAU, VU2RC, VR3B, VR1B and FS7RT . . . Vern, W7CNM, makes it 193 with 22 additions which include VQ6LQ, LU3ZY, YA1AM and VR1B as Bob, WØQVZ, snagged FB8ZZ, VP8BD and 4S7MG for 188 . . . Paul, K2GFQ, reaches 186 thanks to VR1A, VR1B, HI8FR, VK9RM and FB8ZZ while Bob, W6DBP, rounded up VQ5GC, IS1FIC, FB8ZZ, MP4QAL, VR1B, Y12AM, MP4BBE and LU3ZY for a 180 total . . . Gus, W2HMJ, rises to 227 with VR1B as Eric, OZ8BG, adds a new zone with XE2KW plus KB6BA and OA4AI for 206 . . . Floyd, W9FNR, reaches 189 with such as YJ1AA, ZD1DR, KB6BA, FG7XB, FS7RT, KW6WU, VQ5GC, FB8ZZ and ZD3D while Sam, W3AXT, hits 181 with UC2AA, UB5KAA and VR1B . . . Jim, W9LI, nipped FB8ZZ and VP8BK for a 179 total as John, W9WCE, adds UC2AA, YK1AB, VK9DB and VS1GX to reach 175 . . . Paul, W4LQN, goes to 175 thanks to KR6LJ, ZS9G, VR3B, FC7RT and ET3LF as Merle, VE6MN, comes up to date with such as VQ5GC, SVØWT, FB8BX, ET2AB, LU7ZK and PZ1PA for 143 . . . John, W4HA, makes it 211 (195 A3) with AC5PN, ZK1BS, FB8ZZ, FS7RT, EA9DF, ZK1BL, FK8AO, VR1B and VP8BK while Fred, W8KML, goes to 205 (195 A3) with 3A2BH, EAØAB, CR5JB, FB8ZZ, YJ1AA and FK8AO . . . Doug, W9FDX, upped to 202 with YJ1DL, LU2ZY, ZD6RM, ET3LF, MP4QAL, VP8BK, VR3B, FS7RT, CR9AH, VS9AS, VR2CS, FB8ZZ, VR1B, VQ8CB and CR5AC as Glenn, W7ADS, went to 194 with CR4AG, FB8BR/FB, FS7RT,, ZS2MI and VQ8AG . . . Harry, WØANF, upped his total to 188 with FS7RT, FB8ZZ, CR4AG, ZD2JHP, 3V8FA and ZK1BS while Wilson, W3WU, hit 178 thanks to ZC4VP, LU3ZY, VR3B, ZB1BS and VR1B . . . Gil W1APA, evened it up at 160 with 5A1TZ as Dixie, W2ZVS, now in the

Reception committee for Pepe, TI2PP, and XYL upon their arrival at the Quito (Ecuador) airport. Left to right are: Len HC1PM, Luis HC1OR and XYL, Judy XYL of HC1FG, Sofie XYL of XE1JK, XYL TI2PP, Ruth XYL of HC1RA, Nila XYL of HC1RY, Luis HC1RA, Isabel XYL HC1HN, Fred HC1FS, Inez XYL of HC1PM, Hilda XYL of HC1FR, (head only), Ricardo HC1RY, Eric Bob HC1CF (head only), Ricardo HC1RY, Eric HC1ES, Graciela HC1SR, Luis HC1LE, Carlos (President of A.R.E.) HC1FG, Jose TI2PP, Frank HC1FR, Humberto HC1HM and Pat, 2nd op of HC1OR.

KA8AB. That's W1TTA at the Mic. who with W6DUS made Top Five both on Fone and CW in the Multi-Operator section of the recent CQ World Wide DX Contest. The photo shows a BC 610 Xmtr, 75A4 Rcvr, DB 22 and other equipment. Antennas include an assortment of a Rotary, Ground Plane and Rhombic for 14., 21., and 28. mcs. KA's are not allowed to use the 3.5, 7. or 27. mcs. bands. Alan, W1TTA, will be returning to the States this summer and would like to work more W1's before leaving, especially on 10 and 15. Bands are usually open between 20:00 to 03:00 GMT.

service, nabbed FB8BB for No. 182 . . . Bob, W6YMH, went to 137 with VR1B, 4S7MG and VU2JG while Mickey, W8YIN, was making it 195 with LU3ZY, 4S7MG, VR1B, FS7RT, W4IKC/KW6 and YA1AM . . . Duke, W6HJ, upped to 129 with ZD3A, TG9WB, HA5KBA and ZD1DR . . . On the "phone only" side Guy, W6DI, made it 218 with SP5CC. Paul, W9NDA added ZD8AA for 225. Willard, W1NWO, miked with FB8ZZ for No. 213 and John, W4HA, went to 195 with such as ZK1BL and FS7RT . . . John W4AUL reaches 152 with VK9RM while VR1B was 132 for Phil, W3SOH . . . Contacts and multipliers for leading KH6 stations in the recent brawl are as follows: KH6IJ 2915-104, KH6AYG 2500-90 (app), KH6MG 2149-88 and KH6PM 1850-86 (app) . . . W6LWB, with a DX-100 has added such as TG9AD, FB8ZZ, CR6AI and ZD2ROC . . . Milt, W4LHT, ex-W8FGA/W3IQC snagged his first Jap, JA4AF, for No. 97 . . . Marvin, W4ENI, is up to 127 with VS1GX. He recently knocked off a 57 minute WAC with FF8AP, VK2ACN, I1ZHE, JA4AF, VE7WL and LU3CW . . . Joe, W9JUV, is up to 140 with such as VR1B, YI2AM, YJ1DL, FS7RT and ZK1BS. His phone total is 130 . . . Lloyd, DL4ZC, picked up 3A2•AG on 7 CW, MP4KAC on 21 A3, JA1CO, VU2HF, KL7BKF and VE8WN on 21 CW and AP2RH, FY7YE, GM3GZA (Outer Hebrides until June 1st), VS9RO (First VS9RO QSO), JA2AT and VU2KM on 14 CW . . . Ernie, W3MDO, goes to 142 with KR6SC, VK9RM, VR1B and ZK1BS while VR1B was No. 171 for W6KSM . . . Dave, WØMHS, got bit by the DX bug and is up to 32 mainly from efforts on 21 C W . . . Sax, W2SAW, hits 174 with such as FS7RT, 4S7WP, VR2A, W4IKC/KW6, ZK1BS and VR1B as Bill, W2SDB, makes it 115 with VR1B, YI2AM and OY2Z . . . W1WLW goes to 157 with FK8AH while the same station was No. 182 for SM5AQW . . . W1WAI ups to 132 with YI2AM, VP1SD etc. as W9OBV goes to 96 with VR1B, VR2CV, LU6ZI, VQ6LQ, EA9AB, CR9AH and FB8BC . . . Dave, PAØUN, made it 250, before moving to South Africa, with VR1B . . . KV4AA was no. 99 for VE8WN in three months operating time . . . K4BYN, Louis, goes to 72 with such as CN2AY, PZ1BS, VP7NG, CT3AB, FY7YF, HP1ZZ and ZE5JA . . . Frank, VK2QL, nabbed EA9DF for No. 214 while Charlie, KV4BK, hit 115 with VR3B and ZP5AY . . . The 2E26 at WØQGI went to 148 with ZK1BS, ZS9G, ZD1DR, FB8BR, 3V8FA, FS7RT and ZD2DCP . . .

The Gang at YI2AM. Left to right.—Derek, Nab, Malcolm, Dick, Tom, Dave and Ros. However there are only three active members at present; Derek, Nab and Ros. YI2AM is the only active station in Iraq at present. The Iraqi Authorities have discontinued issuing calls to individuals because of lack of facilities to monitor them. The boys are still struggling for WAS and need Vermont, Idaho, Nevada, Utah, Miss. and North and South Dakota.

FLASH! Alfredo, LU3EX, has established what may be a new distance record on 50 Mcs. when JA6FR was worked on phone, 0450 GMT, March 24th. He goes on to say that CP5EK, CE1AH, XE1GE, TG9JW and PZ1AE are like locals. On March 31st he worked his first W's when K6EJO, W6ANN, K6GMV and K6OBO were contacted. W5FXN and W5EXZ have also been worked on phone and CW. LU3EX runs 90 watts to an 829 with a 3 element beam 30 feet up!

160 METERS

(Via W1BB)

February 26th "TEST"—Weather windy/rainy. ARRL DX test on. G5JU, G8IL and HB9CM came through from Europe with G5JU's signal being especially good. Scarcity of signals has coincided with the great snow and cold wave all over Europe. W/VE participants were W1AW, W1BB, W1BIL, W1VDB, W2EQS, W3RGQ, W3FNF, W3MSK, W4SGV, K4CDK/4, W8AQ, W8PXK, W8ANO, W8JVA, W9NH, W9PNE, W4VNE. NA/DX-KV4AA, XE20K. DX—G5JU, G5RI, G3GIL, G3PU, G3IGW, G3ETP, G8IL, G8FW, G8JR, HB9CM, DL1IX, DL1OO, DL3FF, M3KHJ. Temporary authorization to use 160 has been granted to DL1IX, DL1FF, DL1YA, DL3OO, DL1BZ, DL7CZ, DL1DA and DL1SO according to HB9CM. DL1DA uses an abandoned power line for an antenna! . . . W9PNE keeps skeds with ZL1BY, KH6IJ and KH6MG.

March 4th "TEST"—WWV/W4, sunspot storm. No European stations heard. YN1AA came through 559x. Later W6KIP/6 put a 339 signal through to the east coast.

March 11th "TEST"—WWV/N6. Loran QRM seemed to spread more widely than usual. YN1AA and KZ5FA were heard working W8ANO. W6KIP and W7KVU came through weakly.

March 18th "TEST"—Band very noisy. No DX whatsoever. W6KIP/6 and W5SOT were 339 around 0730 GMT.

March 25th "TEST"—WWV/N7. High noise level. W1BB QSO'd G3FPQ who came through weakly between 0545 and 0630 GMT. Second half of ARRL DX test in progress. KV4AA completed all W districts with W7KVU and W6AM (plus VE3IR) for contest QSO's.

This concludes the 1955/1956 top band tests. Although conditions were generally poor the tests were well attended with the following participants logged at one time or another: 16 W1's, 24 W2's, 16 W3's, 17 W4's, 6 W5's, 3 W6's, 2 W7's, 23 W8's 15 W9's 8 WØ's, one each VE1, 2 and 3, 26 G3's, 3 G2's, 5 G5's, 4 G6's, 1 G8, 4 VP's, 3 KZ5's, 4 KP4's, 2 GM's, 2 HB's, 3 ZL's, 3 GI', 9 DL's, 3 XE's, 2 YN's, 5 OK's, 2KV4's, 2 HR's, 2 GC's, 2 KH6's and one each: TI, EI, LU, OA, GD, SP and HE.

1850 KC LORAN—We owe many thanks to W1BUD for his kindness in checking into the Loran QRM which, when active, made 160 DX an impossibility for the east coast. It was found that the QRM was caused by a temporary gimmick known as "EPI," Electronic Position Indicator, which had been operated in the Boston and Nantucket areas. EPI also caused QRM to the U.S. Coast Guard and its future operation will be restricted as possible to minimize that interference. We are most happy to know that this is not a PERMANENT situation!

ADDRESSES

FB8X ..... Box 38, Pointe a Pitre, Guadloupe, F.W.I.
FB8B ..... Box 587, Tananarive, Madagascar.
FY7YE ..... (Now) Via W5JLU.
HI8FR ..... Martinez, Estacion de Radio Aficionado de la Feria, de la Paz, Cuidad Trujillo, Dominican Rep.
HZ2AEH ..... SFC W. A. Brewster, RA 14296401 8688 DU USA Section, MAAG, APO 616, PM, N. Y.
I5RAM ..... Box 179, Mogadiscio, Italian Somaliland.
K2HGU/KW6 ..... Roger, c/o C.A.A. Wake Island.
K4CUB/KL7 ..... Capt. Calvin M. Preston, 745 TCS, FPO 230, Seattle, Wash.
KA2EC ..... R. H. Mitchell, H&MS-11 (Metc) MAG-11, FPO, San Francisco, Calif.
KA9MF ..... Field Stn 8612 AAU, APO 181, PM, San Francisco, Calif.
KL7BSR ..... Box 219, Anchorage, Alaska.
ex-TF2WAY ..... G. S. Fly, K4AZC, Box 4155, Mobile, Ala.
VE4AR/VE8 ..... Geoff. via VE8NK.
VP3AD ..... Don Daly, 208 Almond St., Georgetown, British Guiana.
VP5SH ..... (W6HNX) RCA Mtr, Grand Turks Is. via Patrick AFB, Cocoa, Fla.
VP8BL ..... Box 182, Port Stanley, Falkland Is.
VQ8CB ..... (Chagos Is.) Leny Mazery, Box 155, Mauritius.
VR1B ..... (YASME, Canton Is., British Phoenix) via KV4AA.
VR2BC ..... G. B. Gregory, Dept. of Agriculture, Koronivia, Nausori P.O., Fiji Is.
VS2DZ ..... Via VS2 Bureau, Box 600, Penang, Malaya.
VU2HF ..... Harry Fox, Methani Colliery, Sitapampur P.O., Burdwan Dist., Bengal, India.
W3UIF/KG6 ..... Bill, Box 70, Navy 943, FPO, San Francisco, Calif.
W8EBK/KL7 ..... (ex-KL7PIV) E. W. Goodhue, 2201 Sunrise Dr. Anchorage, Alaska.
W8EBM/KL7 ..... (ex-KL7BHE) Sheila F. Goodhue, 2201 Sunrise Dr., Anchorage, Alaska.
XE3AR ..... Napoleon Correa, 1-A Ave Norte-5, Apartado 57, Tapachula, Chiapas, Mexico.
ZB2Q ..... Stan Williams, Room B-20, RAF, New Camp, Gibraltar.
ZD4CC ..... Signals, Gifford Camp, Accra, Gold Coast.
5A2CO ..... Cable and Wireless, Benghazi, Libya.

Thanks to West Gulf Bulletin, No. Calif. DX'er, W2HQL, K6DNH, W4ML, WØQGI, K6IYJ, W1ODW, W4LHT and W7GBW.

HERE AND THERE

Beda, OK1MB, wishes to thank all for letters and messages received during his recent illness. He is slowly recovering but will not be on the air for quite some time . . . Dave, YJ1DL, is in FO8-land for a month. Ed, W6LDD, has his logs covering the period between April 11 and October 21st 1955 and all cards are going out via Bureaus. W6LDD does not want YJ1DL cards sent to him as no arrangements were made for this . . . Expedition minded are W6NJU, W5CFG, W9OWZ, W9ASB and W9ZTD (let's get together) . . . Larry, WØANY/VO4, advises that he will be in VO4 until June 1959. They are on the air daily from 1200 GMT on 21350 to 21425 and 28.4 to 28.5. They will be glad to handle any Newfoundland or Greenland traffic. QSL QTH is: A1C Loren Bump, 52nd Air Rescue Sqdn. Ernest Harmon AFB, Stephenville, NFLD . . . W4LVV has contest logs from FG7XB . . . W3CHH still has a few QSL's available for his W3CHH/IWO activity if any are missing . . . W6LJQ is now K2RMW . . . W8PXP is now K9CLO in Indianapolis . . . W6NIF/4 received big batch of SU1REC cards and will send direct to those who include self-addressed, stamped, envelope. Otherwise via bureaus . . . We recommend W6SAI's Beam Antenna Book for the real low-down on beam operation. . . . W2AIW just hired a new technician whose call, of all things, was K2AIW! . . . Congrats to Stan, W7TML, on the fine Willamette Valley DX Bulletin . . . KA8GH goes QRT during the first of March and, for QSL purposes, may now be found at the following address: Capt. G. L. Heller, 81st Air Rescue Sqdn, APO 130, PM, N. Y. . . . W4JVJ, stationed in JA, advises that there are about 3100 2nd class ham stations (up to 100 watts) and 310 first class stations (up to 500 watts) in Japan. 20% are located in the Tokyo area. Low voltage, down to 75 volts, is often a problem. Jap ops must pass a test which, besides theory, calls for a code speed of 60 letters per minute, regular morse, and 50 LPM in Jap code which, incidentally, has 51 characters or letters. Conditions towards JA may be checked by listening to JJY on 4 and 8 Mcs. JJY is a standard frequency station with time signals . . . Joe, W2JME, ex-W3COP, is now W1GET in Plaistow, N. H. . . . The Ohio Valley Club will hold its annual picnic on June 10th at the usual place in Evendale, Ohio. Further details may be obtained from W4OMW . . . KV4AA had the plesaure of logging visits from WØNLY, W9EUJ, VP9BM, K2GFQ, VEØNA, VE3ZC (VE1FB), K2CIQ and W3EUP/4 . . . DL4UM, USAF, is the Dad of F7DI. . . .

73, Dick, KV4AA

Operating position at G3AWZ. AR 88 receiver.

Belgian Award

The Antwerp Group of the U.B.A. offer the "WOSA" certificate for any amateur station submitting logs which show contacts with Antwerp stations as follows:

1. **A—5 Antwerp Stations on Phone or CW for all countries outside of Europe.**
   B—6 Antwerp stations on Phone or CW for all European countries.
   C—8 Antwerp stations on Phone or CW for the Benelux countries.
   D—10 Antwerp stations on Phone or CW for all listeners (HOSA Award).
2. **Contacts shall date after January 1st 1954. Minimum reports CW 448, Phone 45.**
3. **QSL cards not necessary. Just a list giving QSO data.**
4. **Your QSL must be in the possession of the Antwerp stations listed.**
5. **5 IRC Coupons must accompany application.**
6. **Applications are sent to ON4QX. Dr. L. Th. Berge, 33, Everdystreet, Antwerp, Belgium. (There are over 50 Antwerp stations)**

Honor Roll (To April 15th 1956)

Last complete HONOR ROLL appeared in the May issue.

Next complete HONOR ROLL appears in the September issue.

W6SYG	40-261	W6LRU	40-212	W4GG	39-232	W8KML	37-205
W2AGW	40-257	W6RLN	40-206	W2HZY	39-228	W9FDX	37-202
G6ZO	40-256	W6NGA	40-205	W4LVV	39-218	W7ADS	37-194
W8KIA	40-256	W7ENW	40-204	W3DKT	39-217	WØANF	37-188
W8JIN	40-254	W6BVM	40-201	WØAZT	39-212	W1JNV	37-181
W3JNN	40-253	W6BAM	40-193	W1KFV	39-209	W3WU	37-178
W3EVW	40-252	W6JK	40-190	W4RBQ	39-207	W8PUD	37-166
W6DZZ	40-251	W9YNB	40-189	W2GVZ	39-205	W1APA	37-160
W9VND	40-251	W6PH	40-181	W7CNM	39-193	W1TYQ	36-185
W6EBG	40-248	W6ID	40-180	WØQVZ	39-188	W2ZVS	36-182
W6TS	40-248	W6BUO	40-179	K2GFQ	39-186	W6YMH	36-137
W6SAI	40-247	W6ATO	40-178	W6DBP	39-180	K6JQJ	36-121
W6TI	40-239	W6BIL	40-164	W8CED	39-180	W8YIN	35-195
W5KC	40-239	KV4AA	39-252	W8AE	39-145	W1DSF	35-157
CE3AG	40-239	W2WZ	39-248	W2HMJ	38-227	W9NN	35-157
W1GKK	40-238	W1CLX	39-246	OZ7BG	38-206	W6HJ	35-129
W7GUV	40-238	W9LNM	39-243	W9FNR	38-189	K2QQO	35-110
W6UHA	40-232	W3EPV	39-243	W3AXT	38-181		
W6DLY	40-229	W1BIH	39-240	W9LI	38-179	PHONE ONLY	
W7GBW	40-226	W9HUZ	39-237	W9WCE	38-175	W6DI	39-218
W6LDD	40-216	W2QHH	39-236	W4LQN	38-175	W9NDA	38-225
W6EHV	40-215	W1HX	39-236	VE6MN	38-143	W8KML	37-197
W6LN	40-213	W8UAS	39-233	W4HA	37-211	W1NWO	36-213
						W4HA	36-195

V H F

Reported by

Sam Harris, W1FZJ

P.O. Box 2502, Medfield, Mass.

Six Meters

Activity on the six-meter band has been increasing so rapidly that it is hard to keep up with developments. Information received from all over the world indicates that the predictions are not excessively optimistic. Big news from LU3EX. Alfredo says: "First QSO between LU and JA on the 24th of March, LU9MA—JA6FR at 0420 GMT and with my station LU3EX-JA6FR at 0450 GMT; with fair signals on fone on 50.350 kc.

"Finished the QSO I had with LU9MA, Mendoza, 1000 km from here, we heard a station calling us, result: JA6FR. At first, we believed it was a joke but the direction of our beams were right on Japan. He had a flutter, QSB, usually heard on the band on stations of DX. The band was open till 0530 GMT. LU2EW also tried a contact but signals were down and no confirmation of contact were established. The time of opening here for JA6FR is late in the night, or better said early in the morning, 0120 LU time. It was a big surprise to make this first JA-LU QSO.

"When I receive the QSL card it will mean a new *DX Record on 50 Mc JA-LU*.

"My rig is crystal controlled 6Y6, 6V6, 829 with 70-100 watts input. Antenna, 3 element beam thirty feet high. Receiver: crystal controlled converter with cascode input and an HRO tuning 3,300—5 Mc. QTH is ten miles north of Buenos Aires City, place named Villa Adelina."

Since the letter from LU3EX arrived, we got one from W5FXN. His log shows contacts with LU3EX on the first of April (1609 local) and just to prove that it wasn't an April fool joke his entries for the fourth of April show contacts with LU3EX, XE1GE, LU9MA. On the seventh he snagged LU7DDG and LU8AE. The following quote from his letter is of interest to any dx minded six-meter operator:

"Band was open intermittently all day, 4-8-56, but sigs too weak. Please impress on the gang the importance of being able to work c.w. on V.H.F.—could have worked several South Americans yesterday (8th) if they had tried c.w., as their phone was ruined by QSB. Hear several Spanish speaking stations but couldn't identify them due to QSB. South American signals peaked a bit west of true path."

W4HHK, W1RUD, W8SVI. Hamvention VHF Forum.

From Mexico Jeff (XE1GE) send information on both the foregoing openings, plus a few of his own. "This year the path to Argentine opened up somewhere towards the end of February or the beginning of March, I did not get back on the air due to illness until March 11th. Starting at 1640 CST worked LU7DDG and LU9MA and at 1700 worked my first CE stations on six. CE3TB and CE3CC and continued to work LU stations until the band went out at about 1730. Since the 11th of March I have worked the LU stations practically every day starting in with the Buenos Aires district around 1500 CST and on through up to about 2100. LU9MA in western Argentine usually comes through on an average about 2000. As you have

Early Scores, April VHF Contest

Here are the top 14 turned in so far:

W3TDF	8050	K2IEJ	3960
K2CMB	6727	W1FZJ/1	3745
W1RUD	5896	WØETJ/2	3690
W2NSD	5244	W2FBZ	3564
W1FOS	4386	W8SFG	3431
W2OIB	4350	W9BRN	3420
K2BKU/2	4219.5	W1HOY	3390

probably heard by now what appears to be a new record for Six Meters was set up between LU9MA and JA6FR. This took place at 0115 Argentine time Saturday the 24th of March. (2215 CST Friday the 23rd.) Up to this date the LU's had only been working PY, PZ, CP, OA, TG and XE. What appears to be one of the first W-LU contacts of this 19th cycle took place on March 28th at about 1900 Argentine time between K6OBO and two or three LU's. My first W5 opening of this year took place on April 4th. I started working the LU's as early as 1350 CST and at 1900 CST, W5FXN and other Texas stations were worked (these were approximately 1600 kilometers from this location). Although I turned m ybeam to the North, I continued to work the LU's during this one hour and a half opening to W5 land. To date this year no other six meter stations have been heard or worked outside the LU's, CE's and W5's."

And last but not least we hear from Major (VK2RU).

"I wish to advise that I have worked four JA Districts on 50 mc on 1/4/56. Stations worked include JA3NE, JA1AND, JA1GP, JA1ID, JA3JJ, JA2QR, JA4GJ, JA3EK, JA1APQ and JA3FA. On the following day, 2/4/56, some of the above stations were worked again in addition to JA1NF.

"The gear here is 100 watts, push pull HF100's, Class B TZ40 Mods. RX double conversion with two RF stages, 4 element beam, fifty feet high.

"What about some W Contacts?"

Meanwhile back at the ranch we enjoyed what (to date at least) was probably the most widespread six-meter opening on record. At W1HOY signals were heard from every state east of the Mississippi and many on the western side. Helen made contact with twenty-nine different states (twenty of them were new ones for her). From nine o'clock Sunday morning until nine o'clock Sunday night, April 15th, signals were coming in from all points. A really prodigious band opening which defies description. You just had to be there to believe it.

The Dayton Hamfest
VHF Section W1RUD

Well, we started from Cambridge, Massachusetts with a *Gonset* in the car, very grateful to Norm (WN1FMW) for so good naturedly loaning us his rig for the weekend, and we arrived at the top of the Taconic Trail in Petersburg, New York to spend the evening. Worked several W2's in the Albany area with our peanut whistle and 4 element beam before going to bed. Finally hit the real long trail the next morning at 6:00 a.m. and finally made it to Dayton at midnight the same day.

Really didn't find much in the way of activity on the way until we hit the Dayton area. Boy, then we had QRM several layers deep.

We were talked into town by W8FPZ, Art, and finally managed to get to bed in the room reserved for Sam, who, as everyone now knows, unfortunately was not able to make it.

Before we went to bed, however, we put the Gonset with its whip up on the bed table. Worked enough stations to qualify for the WADH award (for the uninitiated, "Worked All Dayton Hotels").

Next day Paul and I met practically everyone who is, was, or will be on Two in W8 (which explains why we didn't work a soul all the way down Route 42 from Cleveland to Route 40 and Route 40 into Springfield.) The band was so dead that even the ignition noise sounded lonely. The picture of some of the gang really doesn't even begin to include everybody. (Couldn't fit them all into one spot anyway.) (*Ed. note: wasn't good enough to print either, so don't make a frantic search for it.*) At the V. H. F. talk Saturday afternoon, Paul, W4HHK, gave an interesting talk on meteor scatter work, past and proposed, and I blew the whistle on a few points on the moon bounce project and my own pet project on power which has been discussed previously in the column. By the way, several people told me afterward that they agreed with me but hadn't written. *Please* write fellows, and let us know your opinions, even if they are negative!

Paul, W4HHK, and John, W9WOK, are designing a new i.f. strip to use after V.H.F. converters. This should be the i.f. to end all i.f.'s. Hope they finish it soon.

W8HOH, Whitey, plans to put his 64 back up soon (after the aurora season, of course) and W8SVI, Bill, (who by the way, very ably directed the V.H.F. activities at the Dayton Hamfest) was going to put his antenna back up the Sunday after the Hamvention. (Didn't see him working on it though, as we drove by his place at 1000 Sunday on the way home. Hi!) Al, W8WXV, will be on as soon as he figures

One of the greatest living two-meter DX men, Al Burson, W8WXV. DB standing next to Al is probably best known as the XYL of W4HHK. She is one of the reasons why Paul is a 28 state man on Two.

VHF men assembled to talk over the contest. Left to right: W1VXW, W1PYM, W1RUD, W1WID, W1OOP and W1EGE.

out a way to put his antenna up without using a tower. So, it looks like we will have some more big signal W8's before long.

Found out why Claude, W8SDJ, and Hank, W8IFX, were on that famous morning of February 25th. They were up checking crystal frequencies because Claude found out how to etch crystals and went out and got 60 odd crystals to move into the two-meter band.

Well, after the best time we have had at a Hamfest, Paul, W1PYM, and myself left for home. From what we heard when we got home, we realized why there was hardly any two-meter activity on the way. Too bad we didn't have a six-meter communicator along, Hi!

So we're home now, recuperating from that 900 mile marathon drive and I'm back on the air. (I put my 32 back up again for the third time after a windstorm, with the help of Sam and son, Pat.) So we'll be looking west again. Hope we have our 128 elements up before the summer is over.

Well, guess I'll close now and see about buying some stock in an aluminum company so I can start getting materials for the big baby.

Letters

Dallas, Texas: We hear again from the "Lone Star" state and Bruno (W5ZUL), who says:

"As the 'Ft. Worth-Dallas Six-Meter' net grew larger, we decided to change the net to 'North Texas Six-Meter Net' as this name was more rpresentative of the net area. Our last net night showed twenty-seven stations checking in, which I think is a fine showing. *I do too Bruno. How long did it take to get them all checked in?*

"The majority of the members have not been idle during the winter but have been working on higher powered transmitters, converters, beam antennas and other projects. Included in this list is a 750 watt, and a 200 watt transmitter. So-oo-o when the band opens up soon, we all hope to be there, providing contacts to all who need Texas for a WAS on 'SIX'." *I'll be a-listenin' O.M.—Signed, Helen, W1HOY.* Bruno also listed thirty-three active six-meter stations in the net, W5's and K5's, ten of which are also mobile.

W4HHK (center) discusses meteor propagation with interested VHF'ers at Dayton

Ashton, Illinois: The "Prairie" state and Denny (W9JDJ) contributes thusly:

"The band used here is six meters. I run fifty watts input to a *Harvey Wells* TBS 50D. The antenna is a three element rotary beam about twenty-five feet high. I use a *Tecraft* converter with a BC455 as a variable i.f. stage. Frequencies are 50.25 and 50.4.

"I've heard that VS6DE has heard W1's, W3's and WØ's on Six Meters. If this is true, good dx should be worked this year." *You're not kiddin' about that Denny, surely should be good dx.*

Euclid, Ohio: A note from Dave (W8OZF/9) and the good old "Buckeye" state:

"How about some mention of activity in and around Cleveland, Ohio. *Glad to Dave. Glad to.* Here are some triodes that are being used, VT 127, 100TH's, 35TG and 826. My little 'Rock Crusher' #2 uses a TU-75A to drive a pair of 100TH's at 700 watts input (2500 V. 280 Ma.) with 50 ma. of drive. The rack is a 6.5 *open* frame without any shielding. The home rig will be off the air until April. In the meantime, I will be on with 20 watts from Angola, Indiana. I forgot to say that all of this is Six Meters." *Hurrah, for you Dave, good to hear from the Cleveland territory again.*

Dayton, Ohio: Another "Buckeye" in the form of Amos (W8INQ) comes forth with:

"Would like to sked any station in Michigan that is using about same set-up. *Miller* 90810 Transmitter, 829B final, 4 element beam, crystal converter to an NC240 D. Power is 45 watts because of Channel 2. Have skeds on Tuesdays and Thursdays of each week with the following stations: 2150 EST with W8EVH, Ernie in Columbus, Ohio; 2200 with W9MHP, Don in Indianapolis, Indiana; and at 2215 the above two stations have a sked to try to make contact." *How about a sked with Massachusetts, Amos. I'm ready any old time. Signed—W1HOY.*

Stamford, Connecticut: The "Nutmeg" state and John (W1BOM) say:

"Have a five over five beam to go up fifty feet when the weather is warmer. *Haven't you ever heard John, that the worse the weather, the more antennas go up?* Also have a *Tecraft* converter working into a 75A3. Hope to have a fifty watt rig on when the beam goes up." *Hope you do John, we'll surely see you on.*

Portland, Oregon: Floyd (W7RGS) from the "Sunset" state emits with:

"We have done quite a little work on 50 mc and have some big beams coming up for next summer. *Yeh, man!* We've heard some bursts on Six and some good S9 signals from W6 land around 9:00 p.m., and we all think that more power and big beams will help greatly. Have 18 states on Six Meters." *Agree with you on the beams and power, Floyd. Hope to see you on the band soon.*

Rensselaer, Indiana: A "Hoosier," Bill (W9KLR) comes forth with:

"I don't claim to be much of a c.w. operator, but at least I have made aurora contact with W2CXY, W2WFB, W2RXG, W2CCR, K2IXJ, etc. *I don't either Bill. You don't have to be a forty words a minute man for aurora.* Those were on the aurora sessions of January 24th and 27th. There were several W1's coming through on February 28th including Rhode Island, Connecticut and Massachusetts."

Jackson Heights, New York: Make what you can or what you wish from the following short, but graphic note from Fred (W2AMB) resident of the "Empire" state:

"Hi, Sam! Yea Boy, SSB on V.H.F.! 73 and cu there!" *Golly, wonder what he could mean.*

Oil City, Pennsylvania: The "Keystone" state says by way of Joe (W3LST):

"A few lines to let you know it is very likely that I will be on the air with my new rig with a small change of plans. Instead of 600 watts to 4X150, it is now a KW to 4X250's. However, I will not be able to run that much power input until I rewire my shack." *Funny thing how something like rewiring a shack or something like it always seems to interfere at the wrong moment. Get with it Joe. Lots of aurora.*

Elizabethtown, Kentucky: Our old standby Shelby (W4WNH) from the "Blue Grass" country comes through again:

"About 0800 Saturday, February 25, my rotor tore in two, pitching the beam 30 feet to the ground. In falling, it caught my ten meter doublet and pulled it across two sets of power wires. So I had to go out while the wind was still blowing about 40 miles per hour and shoot the insulators in two. *A relative of Dan'l Boone maybe?*

"I set a 5 element yagi upstairs to work Tom (W4HJQ), but a few days later he lost his beam. *Welcome to the clan, Tom.* His beam was hanging upside down by its feeder, fifty feet up. *Eureka! Someone is ready for Moon Bounce.* Also about this time, the beam of K4ESD bent over. Now it looks at the ground toward the north and looks at the moon toward the south.

"I now have a new rotor and new beam but they aren't up yet. March 24th, Tom took his beam and 50 foot crank-up tower down and put up a 50 foot windmill tower. The reason—he very soon hopes to have a 96 element beam on it. Just a 'little' one.

"Received a letter from W4PCT/Ø, who is in Iowa now. He doesn't expect to get back on two until later this year." *Antennas, beams, guys, etc., sure can make ham radio interesting (?). How about a "Two-meter Beam is Down" club?*

Fairfield, Connecticut: Another epistle from the "Nutmeg" state, this time via Ray (W1REZ):

"Since we're running high power now we have given first Connecticut contacts to quite a few stations in Western Pennsylvania, Western New York, Ohio, Michigan and Indiana. The big beam is going up this month (April) at sixty feet, when we will start skeds for scatter tests. Anyone interested?" *Hope there will be lots of takers on that Ray and good luck with the big beam.*

Ontario, California: The "Golden" state contributes the following, via Don Stoner:

"As you know, the 416 is an expensive jug, but I think that I have found a good substitute. There are quite a few of those UHF radio sonode balloon transmitters floating around the west coast (no pun intended). I pulled out the cavity oscillator and dismantled same. The cavity contains a 5794 pencil triode that is hotter than a spark gap. I installed it in our two-meter converter and obtained a noise figure of 3.2 after diddling the input coil. Thought your readers might be interested." *Thanks Don, our readers are interested in anything and everything concerning VHF so I know they'll be glad to know about this.*

Sacramento, California: A fellow "Goldhunter" Lloyd Lane (W6APE) sez:

"I have an NC24OD and would be very happy if you would give me the details on just how you accomplished the installation of the low-noise figure front end." *Lloyd, to you and the many others who have inquired about this modification; there will be an article in the near future in "CQ" concerning same.*

Tarpon Springs, Florida: Dick Barry (K4DMB) from the "Flower" state relates the following tale:

"As of this writing, I have nothing but a long line of C.Q.'s in my log. What happened to the six-meter operation at Leesburg and Lakeland, Florida. *Hope you boys have a good excuse.*

"I have a four element beam, *Tecraft* converter and an S-77A receiver. Later on intend to go about 500 watts.

"Does anyone have any actual operating characteristics of the WE-701A. Would appreciate hearing from anyone. Also interested in hearing from anyone in this area who might be getting on 220 Mc." *Don't know how activity usually is on six meters down there Dick, but it surely was there for the band-opening on the fifteenth of April.*

The operating position at K4DMB. Dick is working on a 500 watt final to make it easier to work Florida.

Langhorne, Pennsylvania: Another "Pennanite" heard from by the name of Ray and the call W3TDF:

"My letter which you reprinted brought to light some activity in Charleston, South Carolina. However, still no news of activity between there and Orlando, Florida. Also am trying to locate W1GJO who is now in Ft. Myers, Florida, to fill in the gap to Miami. For these reasons the East Coast Relay will have to be postponed possibly until June or July." *Hope you find that fill-in station Ray.*

Maryville, Tennessee: From the "Volunteer" state and W. J. Huffstetler (W4BXG) comes:

"This has been a very progressive month (March) for the two-meter activity in East Tennessee. On the 17th of March, several of the stations here made thir first Georgia contact with W4ZXA/4 just north of Dahlonega. KN4IBS is now on the air with a new 32 element colinear beam and there are eight more such antenna's scheduled to go up here in the very near future. *Yeah man!* W4UVU in Athens is now on Two Meters with a good signal. W4LNB has a new thirty-two element antenna that is sixty feet up in the air. Needless to say he also puts out a good signal. *O.K., we won't say it then.* W4LNB reports that there is to be a two meter station located on top of the mountain at Chattanooga with an antenna approximately 200 feet above the top of the mountain.

"The Smoky Mountain Amateur Radio Club will be operating from a 6000 foot Field Day location in the Great Smoky Mountain National Park and using a Gonset Communicator and feeding a thirty-two element horizontal beam. We will be using the club call W4OLB/4." *Glad to hear of the progress in Tennessee, O.M., and also to hear about the Field Day location.*

Salt Lake City, Utah: Ken (W7WLV) from the "Land of the Mormons" comes forth with the following:

"Looks like kind of a dead season for six-meter openings around here. Have not heard any so far." *Think you will have by the time this is in print Ken. We've had several beautiful openings to the west, and expect more.* Now have my four element beam up.

Shelley, Idaho: We hear the following from Louie (W7ACD) and the home of the "Idaho Potato":

"I have been active on the 50 mc band for some years now and have worked forty-four states. Starting May 15th of this year I will be monitoring 50 mc most of the time and will be on 50.100 and 50.156 most of the time. If the band is wide open and lots of QRM I'll be on 50.580.

"I am using a four element beam with a pair of 75TL's, 400 watts. I have two receivers, a VHF 152A and *Tecraft* converter.

"I am especially watching for Rhode Island, Vermont, Utah and Montana. Am afraid it will be mighty hard to work Utah and Montana although there is more activity in Utah this year. But Montana is inactive. *O.K. You Montana boys, let's hear some howls of negation.*

[*Continued on page 98*]

Last Minute Forecast

Most probable periods of ionospheric disturbances during June are June 15-17 (moderate) and 19-21 (severe) with a good possibility of extensive aurora occurring during the latter period. Exceptionally good short wave radio conditions are forecast for the period June 3-9.

ALL TIMES IN EST

EASTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1300-1700 (1)	0700-1300 (2) 1300-1800 (4) 1800-2000 (2)	1400-2200 (4) 2000-0200 (3) 0200-1400 (2)	1830-2000 (2) 2000-0100 (4) 0100-0300 (3) 2030-0000 (2)*
Southern Europe & North Africa	1200-1500 (1) 1500-1700 (2) 1700-1830 (1)	0700-1300 (2) 1300-1800 (4) 1800-2000 (2)	0300-0600 (2) 0600-1300 (2) 1300-1600 (3) 1600-2200 (4) 2200-0300 (3)	1800-2100 (3) 2100-0000 (4) 0000-0200 (2) 2100-0100 (2)*
Near & Middle East	1400-1700 (1)	0900-1300 (1) 1300-1600 (3) 1600-1800 (2)	1300-1700 (2) 1700-2100 (4) 2100-2300 (3) 2300-0300 (2)	1900-2300 (2) 2000-2200 (1)*
Antarctica	1300-1500 (1)	1300-1500 (2) 1500-1700 (3)	1500-1630 (2) 1630-1730 (3) 1730-1900 (1)	2200-0500 (2)
South America	0900-1200 (2) 1200-1400 (3) 1400-1800 (4) 1800-2100 (2)	0500-0900 (3) 0900-1500 (2) 1500-1700 (3) 1700-2100 (4) 2100-0100 (3)	0200-0600 (3) 0600-1600 (2) 1600-1900 (3) 1900-0200 (5)	1900-2200 (2) 2200-0500 (3) 2000-0400 (2)*
South East Asia	NIL	0600-0800 (1) 1700-2100 (2)	0600-0900 (2) 1700-2100 (1) 2100-0000 (2)	NIL
Australasia	1900-2300 (1)	0700-0930 (2) 1700-1900 (2) 1900-2130 (3) 2130-2300 (2)	0000-0300 (4) 0300-0600 (2) 0600-0800 (3) 0800-0900 (2) 1800-0000 (3)	0200-0500 (2) 0230-0400 (1)*
Guam & Pacific	NIL	1600-1900 (2) 1900-2100 (3) 2100-2300 (2)	0100-0530 (2) 0530-0800 (3) 0800-0930 (2) 1800-2100 (2) 2100-0100 (3)	2300-0300 (1)
Japan & Far East	NIL	1700-2100 (2)	0000-0600 (2) 0600-0830 (3) 1700-2100 (2) 2100-0000 (3)	2100-0100 (1)
Greenland	NIL	0900-1300 (1) 1300-1730 (3) 1730-1900 (2)	0600-1500 (3) 1500-2100 (4) 2100-0600 (2)	1700-1900 (2) 1900-0300 (3) 0300-0500 (2) 2100-0200 (1)*

ALL TIMES IN CST

CENTRAL USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Western Europe	1200-1400 (1)	0700-1000 (2) 1000-1500 (4) 1500-2000 (2)	0400-0600 (2) 0600-1400 (1) 1400-1700 (2) 1700-2200 (4) 2200-0400 (2)	1800-0100 (2) 1930-0000 (1)*
Southern Europe & North Africa	1200-1700 (2)	0700-1200 (2) 1200-1800 (4) 1800-2000 (2)	0300-0500 (3) 0500-1300 (2) 1300-1500 (3) 1500-2000 (4) 2000-0300 (2)	1800-0100 (3) 2000-2230 (2)*
Central & South Africa	0800-1200 (2) 1200-1500 (1) 1500-1800 (3)	1300-1500 (2) 1500-2000 (3) 2000-0000 (2)	1300-1500 (2) 1500-1700 (3) 1700-2100 (4) 2100-0300 (2)	1900-0000 (2) 2000-2200 (1)*
Central America & Northern S. America	1200-1400 (2) 1400-1700 (4) 1700-1900 (2)	0600-0900 (4) 0900-1400 (3) 1400-1600 (4) 1600-2000 (5) 2000-0200 (3)	0000-0500 (3) 0500-0800 (4) 0800-1400 (3) 1400-0000 (5)	1900-2200 (2) 2200-0400 (3) 0400-0630 (2) 2000-0300 (2)*
South America	0800-1100 (2) 1100-1800 (4) 1800-2000 (2)	0600-0800 (4) 0800-1400 (3) 1400-2100 (5) 2100-0100 (4) 0100-0600 (1)	0800-1400 (1) 1400-1800 (3) 1800-0100 (5) 0100-0800 (3)	2000-0400 (3) 0400-0630 (2) 2030-0400 (2)
Japan & Far East	NIL	1600-1800 (2) 1800-2100 (3)	0600-0830 (3) 1700-1900 (2) 1900-0200 (3)	0000-0530 (1)

ALL TIMES IN CST

CENTRAL USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
South East Asia	NIL	1700-2200 (2)	1600-0000 (2) 0600-0900 (2)	NIL
Hawaii	1800-0000 (2)	0000-0200 (2) 1000-1500 (3) 1500-0000 (4)	0000-0300 (4) 0300-0800 (3) 0800-1900 (2) 1900-0000 (5)	2200-0630 (4) 2300-0530 (3)*
Australasia	1800-2200 (1)	1600-1800 (2) 1800-2200 (3) 2200-0000 (2)	0200-0400 (3) 0400-1000 (2) 1800-2200 (3) 2200-0200 (4)	0200-0600 (3) 0230-0500 (2)*

ALL TIMES IN PST

WESTERN USA TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Europe & North Africa	NIL	0800-1300 (2) 1300-1800 (3) 1800-1930 (2)	1400-1600 (2) 1600-1800 (3) 1800-2100 (4) 2100-0100 (3)	1800-2100 (1) 1830-2030 (1)*
Central & South Africa	NIL	2100-0000 (2) 0900-1100 (2) 1100-1400 (3)	2100-0000 (3) 1400-1600 (2) 1600-1900 (3)	1900-2300 (2) 1930-2200 (1)*
South America	1000-1200 (3) 1200-1700 (4) 1700-1900 (2)	0500-0700 (3) 0700-1300 (2) 1300-1600 (4) 1600-1900 (5) 1900-0000 (2)	0700-1400 (2) 1400-1600 (3) 1600-2300 (5) 2300-0700 (3)	1800-0200 (3) 2000-0100 (2)*
Guam & Mariana Islands	1600-1900 (2) 1900-2300 (3)	0800-1200 (3) 1200-1900 (2) 1900-2300 (4) 2300-0200 (2)	0600-0900 (4) 0900-1200 (2) 2000-2300 (3) 2300-0200 (4) 0200-0600 (3)	0100-0500 (3) 0200-0400 (2)*
Australasia	1200-1500 (2) 1500-1800 (3) 1800-2000 (4) 2000-2200 (2)	1100-1800 (2) 1800-2000 (3) 2000-2300 (4) 2300-0200 (2)	0200-0800 (3) 0800-1100 (2) 1900-2100 (2) 2100-0200 (4)	2300-0630 (3) 0000-0400 (1)*
Japan, Okinawa & Far East	NIL	0700-1200 (3) 1200-1800 (2) 1800-2200 (4) 2200-0100 (2)	0000-0600 (3) 0600-1000 (4) 1000-2000 (3) 2000-0000 (4)	0100-0500 (3) 0200-0400 (2)*
Philippine Islands & East Indies	0900-1100 (1) 1400-1600 (1) 1900-2300 (2)	0800-1100 (3) 1100-1500 (2) 2200-0000 (1)	0000-0200 (1) 0200-0800 (2) 0800-1100 (3) 1100-1300 (1)	0400-0600 (1)
Malaya & South East Asia	1800-2200 (1)	0900-1400 (3) 1400-2200 (1) 2200-0000 (2)	0100-0400 (1) 0400-0800 (2) 0800-1200 (3)	0400-0700 (1)
Hong Kong, Macao & Formosa	0700-0900 (1) 1900-2300 (1)	0700-1000 (4) 1000-1500 (3) 1500-2200 (1) 2200-0200 (3)	0000-0300 (2) 0300-0600 (3) 0600-1400 (2)	0200-0600 (2) 0300-0500 (1)*

SYMBOLS FOR NUMBER OF DAYS CIRCUIT PREDICTED TO OPEN:

(1) 1-4 days (2) 5-11 days (3) 12-18 days (4) 19-26 days (5) over 26 days

* Indicates time of possible 80-meter openings.

The CQ Propagation Charts are based upon a CW radiated power of 150 watts and are centered on Washington, D. C., St. Louis, Mo., and Sacramento, California. These forecasts are calculated from basic ionospheric data published by the CRPL of the National Bureau of Standards and are valid through July 15, 1956.

PROPAGATION

Forecasts By:
George Jacobs, W3ASK/W2PAJ
607 Beacon Road
Silver Spring, Md.

General Propagation Conditions, June:

On June 21st the *summer solstice* will occur. This is the day that the sun reaches the most northern point on its apparent travel from southern to northern skies. This phenomenon marks the beginning of the summer season in the Northern Hemisphere and also has a seasonal effect upon shortwave propagation conditions.

Because the sun is more directly overhead, heat radiated from the sun during the summer months strikes the earth more directly than during the winter months. This direct, and therefore more intense heat radiation causes the gases that exist in the region of the ionosphere to expand. As a result of this expansion the electronic density of the ionosphere, or the degree of ionization per unit volume of the ionosphere, decreases. This reduction in electron density means a weaker F-2 layer in the ionosphere during the daylight hours of the summer months as compared to the stronger ionized daytime layer of the winter months. During June and the summer months, the seasonal trend in the Northern Hemisphere is for *lower* daytime maximum usable frequencies. This will be particularly noticeable on the 10 meter band where fewer DX openings are expected to occur than did during the winter and spring months.

On the other hand, during June and the summer months, the hours of daylight are considerably increased. This permits ionization of the various layers of the ionosphere to occur for a much longer period of time than possible during the shorter hours of daylight of the winter months. Since there are also fewer hours of darkness during the summer months, there is less time for the reflecting layers of the ionosphere to de-ionize. This combination results in a considerably stronger ionized layer during the late afternoon and evening hours of June and the summer months than during the winter months and frequencies as high as the 20 meter band will be reflected during the entire period of darkness and around the clock. The 15 meter band should be usable from dawn until past midnight, *local standard time*.

During June and the summer months, atmospheric noise and static levels continue to increase and will be most noticeable on the 160 and 80 meter bands and to some extent on the 40 meter band. Ionospheric absorption also tends to increase somewhat during June and the summer months, and signal levels during the daytime hours may be weaker than during the winter months.

June and July are the most active months of the entire year for short-skip Sporadic-E propagation and frequent openings, up to about 1400 miles, are expected on the 6, 10 and 15 meter bands.

The following is an overall picture of band conditions forecast for June, 1956, with a brief discussion of the qualitative changes in each amateur high frequency band from month to month. For specific times of band openings for a particular DX circuit, refer to the *CQ Propagation Charts* appearing on the opposite page.

6 Meters:

A considerable number of openings are expected between skip distances of approximately 1000 and 1400 miles as a result of the seasonal increase in sporadic-E type propagation. For a small percentage of time two-hop sporadic-E propagation may also be possible between most areas of the United States and Central America. The geometry of propagation is such that as the short-skip distances *decrease* on the 10 and 15 meter bands, the frequency that will be reflected by the sporadic-E cloud is *increasing*. When the skip distance on 10 meters is observed to be less than 500 miles, chances are very good that 6 meters will open in the same general direction, with the skip distance out beyond 1000 miles.

10 Meters:

World-wide DX conditions remain fairly good despite the fact that the band will open on fewer days than during the winter and spring months. Conditions are expected to be optimum from shortly before noon to shortly after sundown, *local standard time*. Sporadic-E, short-skip propagation between skip distances of 750 and 1400 miles should be possible for at least 25% of the time during June. Late afternoon and early evening regular layer F-2 propagation, between skip distances of 1300 and 2400 miles, is also expected on several days.

15 Meters:

Exceptionally good world-wide DX is expected daily from shortly after sunrise to midnight. During periods of exceptionally good propagation conditions, the band may remain open *around the clock* on north-south circuits to Central and South America. Optimum DX conditions will occur from shortly after noon through the early evening hours. A considerable increase in sporadic-E, short-skip, propagation will occur with skip distances between 250 and 1300 miles. Regular layer short-skip propagation, with skip distances between 1300 and 2400 miles, is expected from about noon to midnight, peaking in the late afternoon and early evening hours.

20 Meters:

As a result of the seasonal propagation trend, and the rapid rise in solar activity, the 20 meter band will be exceptionally good for world-wide DX *around the clock*. Conditions will be optimum from late afternoon until midnight, but DX from some area of the world should be coming through at all hours. Short-skip propagation will also be possible around the clock, with the skip distance as short as 250 miles at noon time, and extending beyond 2400 miles during the late afternoon and evening hours.

40 Meters:

Despite higher ionospheric absorption and static levels, fairly good DX propagation is expected from shortly before sunset to about sunrise, *local standard time*. Short-skip propagation will be possible around the clock, with the skip distance as short as 50 miles during the late afternoon hours. During the daytime hours, ionospheric absorption will limit the maximum range on this band to about 750 miles, with the skip increasing to beyond 2400 miles as the hours of darkness approach.

80 Meters:

DX conditions will be no better than fair, and in general rather poor on this band during the summer months. Static levels will be considerably higher and signal levels considerably weaker. During the daylight hours, absorption will limit maximum range to about 200 miles or less, increasing to beyond 2400 miles during the hours of darkness.

160 Meters:

During the daylight hours skywave propagation will not be possible because of excessive ionospheric absorption, and maximum range will be limited to about 25 miles or so from the transmitter. During the hours of darkness, when ionospheric absorption is minimum, skywave propagation up to distances of 1300 miles should be possible, and when static levels are exceptionally low, the skip may extend upwards to 2400 miles.

Sunspot Data

The Swiss Federal Solar Observatory reports that the monthly Zurich sunspot number for March, 1956 was 116. This results in a provisional 12-month smoothed sunspot number of 55 centered on September, 1955. All propagation data utilized for this month's forecast are based upon a predicted smoothed sunspot number of 120 centered on June, 1956.

Latest reports from the Swiss Observatory continue to confirm the fact that the coming sunspot maximum will be one of *outstanding intensity*. According to the latest predictions of the Swiss Observatory, the maximum of the present sunspot cycle may occur as early as February, 1957, and will be higher than any one previously recorded, with the maximum smoothed sunspot number forecast to be on the order of 170. Because of the direct correlation between sunspot activity and ionospheric characteristics, shortwave radio conditions during the next few years may be *better than they have ever been in the history of radio*.

A considerable amount of favorable

comment has been received regarding Part 1 of *"The Sunspot Story: Cycle 19"* which appeared in the *March* issue of CQ. In this article, of timely interest to all amateurs, the effects of this unprecedented rise in sunspot activity upon ionospheric propagation is discussed. Part 1 reviewed the origin of sunspots and the effects of solar radiation upon the ionosphere and discussed the present sunspot cycle trend and the trend expected over the next few years. Part 2 of this timely article appears in *this month's* issue of CQ. It further discusses the effects of increased sunspot activity in relation to ionospheric propagation conditions in each amateur high frequency band 10 through 160 meters. Possible once in a lifetime conditions on the 6 meter band is also discussed as well as the effects of the rapid rise in sunspot activity in the VHF spectrum and the possibility of long distance, world-wide TV. Other phenomena believed to be associated with the sunspot cycle are also briefly discussed. *Don't miss it, it appears elsewhere in this month's copy of CQ.*

Solar Eclipse

As mentioned last month, a total eclipse of the sun will occur on June 8, 1956. It will be visible, clouds permitting, over vast areas of the South Pacific. While not visible in the United States, its influence upon shortwave radio will no doubt be noticed here on signals passing through the area of eclipse. Since the ionosphere is cut off from the sun during the period of total eclipse, we can expect that signals passing through this area will exhibit a *night time* effect, that is we would expect an improvement in reception on the night time wavelengths of 40 and 80 meters, and a decrease in signal levels on the daytime 10, 15 and 20 meter bands. This effect has been found to exist during previous eclipses and was quite noticeable during the eclipse of June, 1954, which occurred over the United States. I would be very interested in hearing from readers who may notice such effects during the total eclipse of June 8, 1956.

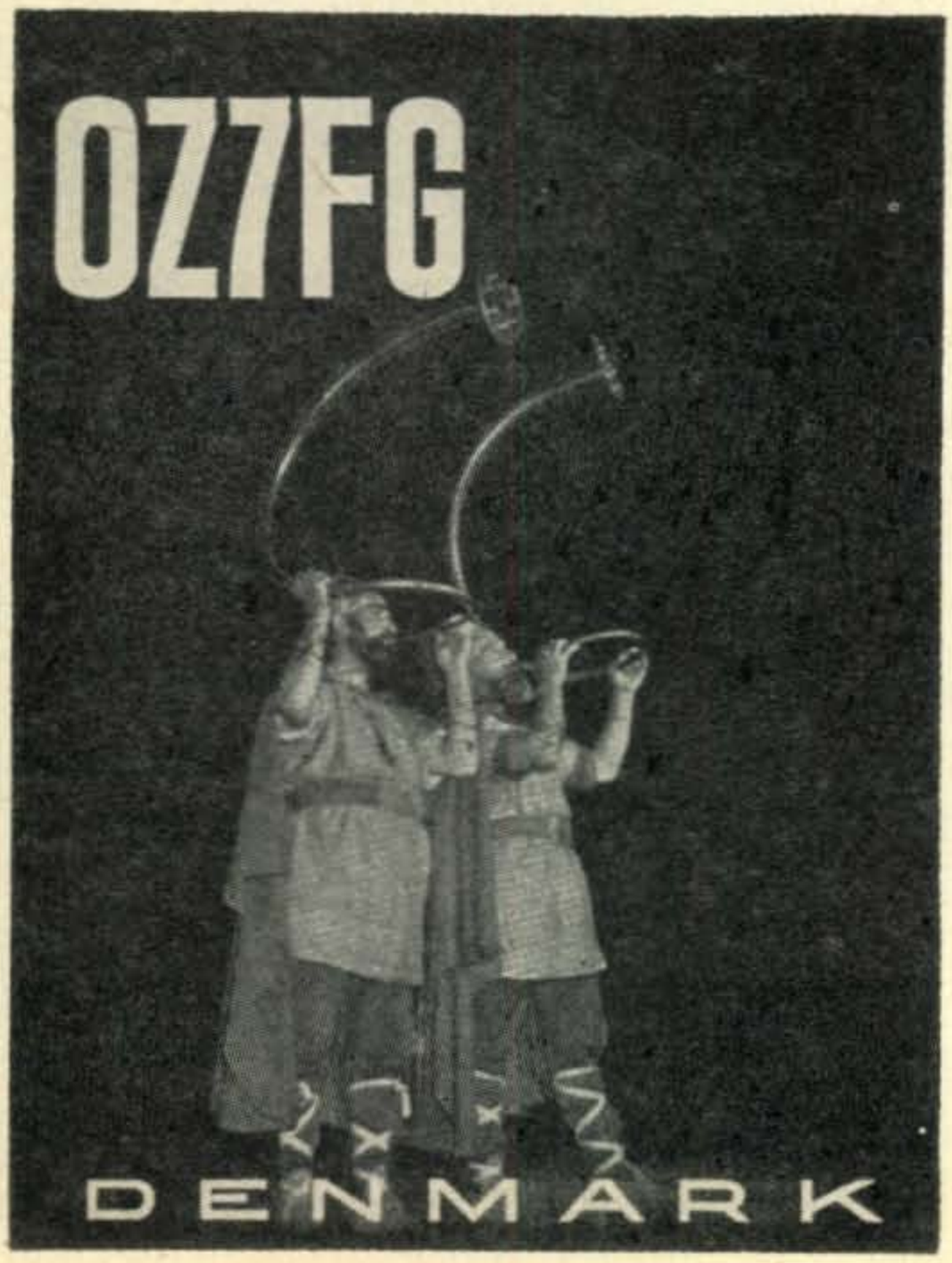
73, George, W3ASK/W2PAJ

QSL Contest Winner

This month another DX winner, OZ7FG. Fortunately the impartial, unbiased, steadfast Official Judging Group holds itself dignifiedly aloof from our greying circulation manager, who by now only moans a little when we tell him another DX station has won (DX subscriptions cost quite a bit more, you know). So you can see that, were we not impartial, unbiased, and steadfast as we are, we would not be erring in favor of the DX men. No, sir, boy. They just happen to be sending better cards, most of the time.

Now, shouldn't it be the other way around? I mean, a DX station can send out almost any kind of a card and it will be well-received stateside. But don't you think that, added to the deadening similarity of most stateside QSO's, the DX ham may get a little weary of answering stacks of stereotyped QSL's?

(Winners in CQ's monthly QSL Contest receive a 2-year subscription to CQ)



runners up

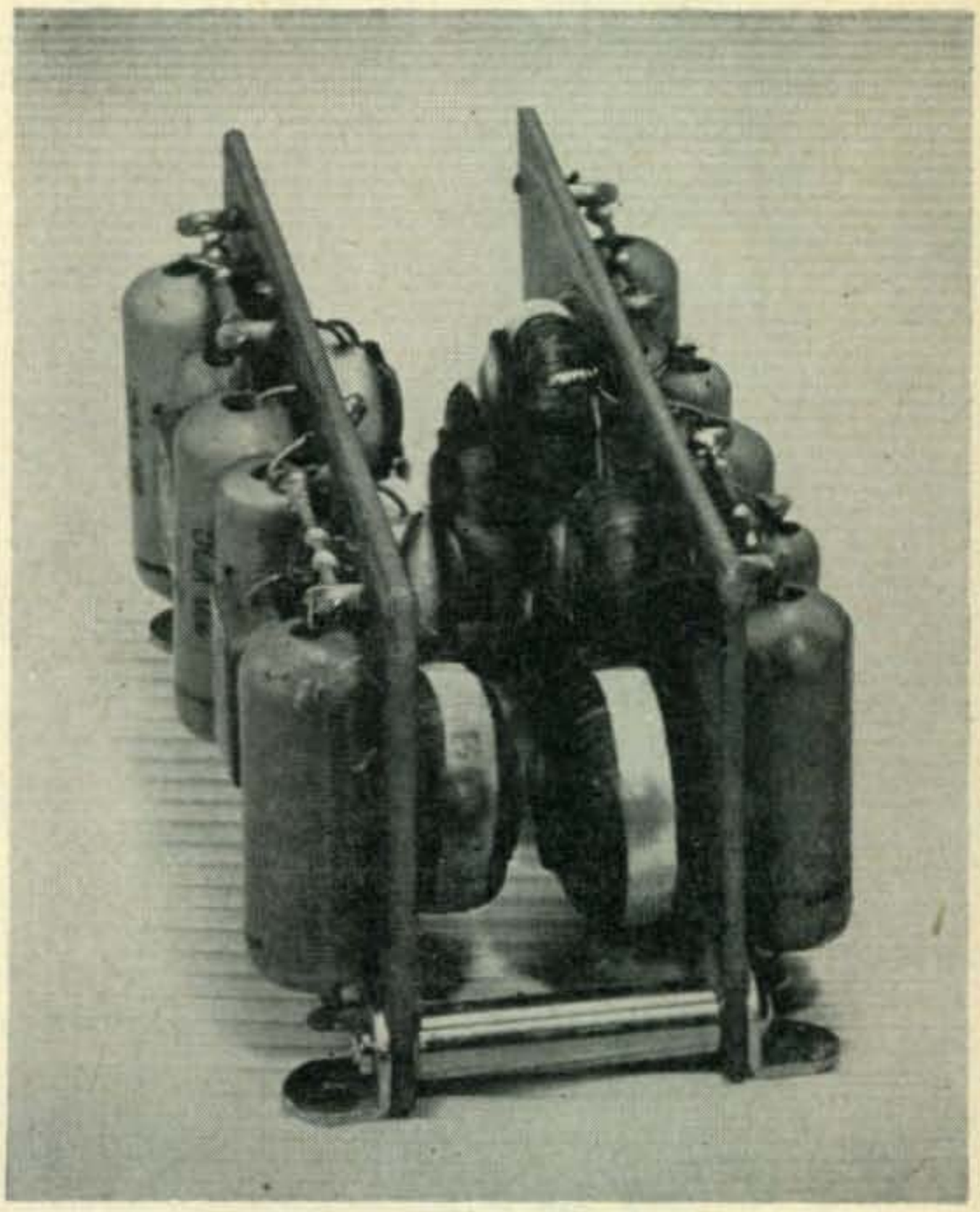
RTTY

as reported by

Byron H. Kretzman, W2JTP
9620 160th Ave., Howard Beach 14, N. Y.

Filters. That appears to be the bug-a-boo that has caused many would-be RTTYers to shy away from this relatively new and fascinating phase of amateur radio. Early amateur radio-teletypers built their audio tone *mark* and *space* filters out of filter chokes and small receiver output transformers. Today's well-informed, and active, RTTYer invariably uses high-Q toroidal inductors in the terminal equipment that he builds. Here-to-fore, toroids were not too easily available. The surplus C-114A loading coils, (*CQ*, Jan. '56) for example, are just not to be found on the east coast.

Things are looking up now, though. A few months ago an advertisement for "RTTY Filters," allbeit expensive, intrigued me. Writing to the manufacturer, *D & R, Ltd.* of Santa Barbara, California, it was discovered that the "D" stood for Ray Dawley, W6DHG, a former editor of the old pre-war Radio. Subsequent correspondence with Ray disclosed that the high cost of those filters lay in the casing, potting, and hermetic seals required for military applications. Ray will make available to amateur RTTYers those very same filters, but uncased, at a considerable reduction in cost. In addition, simple uncased 88 mh. toroids (new) can be had for around $2.25 each, which is a doggone good bargain, as anyone who has ever unpotted a C-114A on the XYL's kitchen stove will agree.



Mark and Space Filter Assembly.

The accompanying photo shows an assembly of the *mark* and *space* filters mounted together. *Fig. 1* indicates the response curves for these filters. Note, in particular, the broad, flat, tops. This permits a practicable amount of transmitter and receiver drift without causing bias distortion. Five toroids in each filter are employed to get this kind of response. *Fig. 2* shows one type of circuit for driving these filters, which are of 600 ohms impedance. The bandpass filter is of similar construction, and has the response curve depicted in *Fig. 3*. By making the proper connections, 500 to 15,000 ohms, 15,000 to 15,000 ohms, 15,000 to 500 ohms, or 500 to 500 ohms impedance transformations are possible. The nice part of this whole deal is that these filters can be purchased from *D & R* for only $16 each. To the best of our knowledge,

AMATEUR RADIOTELETYPE CHANNELS

National, FSK (mark frequencies; space 850 cycles lower) 3620, 7140, 27,200, 29,160, 52,600 kc.

National, AFSK (2125 cycles mark; 2975 cycles space) 27,200, 147,960 kc, calling & autostart; 144,138 kc. repeater & duplex

California, AFSK 147,850 kc. calling & autostart

Washington, D. C. AFSK 147,960 kc. calling & autostart; 147,495 kc. working

Chicago, AFSK (FM) 147,700 kc. calling & working

Detroit, AFSK (FM) 147,300 kc. calling & working

New York, AFSK 147,960 kc. calling & working

Dick Urian, W3CRO, Demonstrates a Printer Selector Unit.

this is the first time that completely adjusted high-Q filters have been available to the amateur RTTYer at a reasonable cost.

This month we have omitted the usual "RTTY Principles & Practice" section in your RTTY column in order to bring you the above story on the availability of filters and toroids. So many fellows have said that they would like to get on RTTY but were afraid to tangle with toroids. (Have you ever wound any, yourself?) Adjustment of filters can be tricky as well as time consuming, but if you still want the fun of tuning up the toroids, the high-Q coils available from *D & H* will permit you to build a very fine set of filters yourself. Next month we hope to bring you a section devoted to tape equipment. Use of perforated tape can really move traffic on an RTTY net.

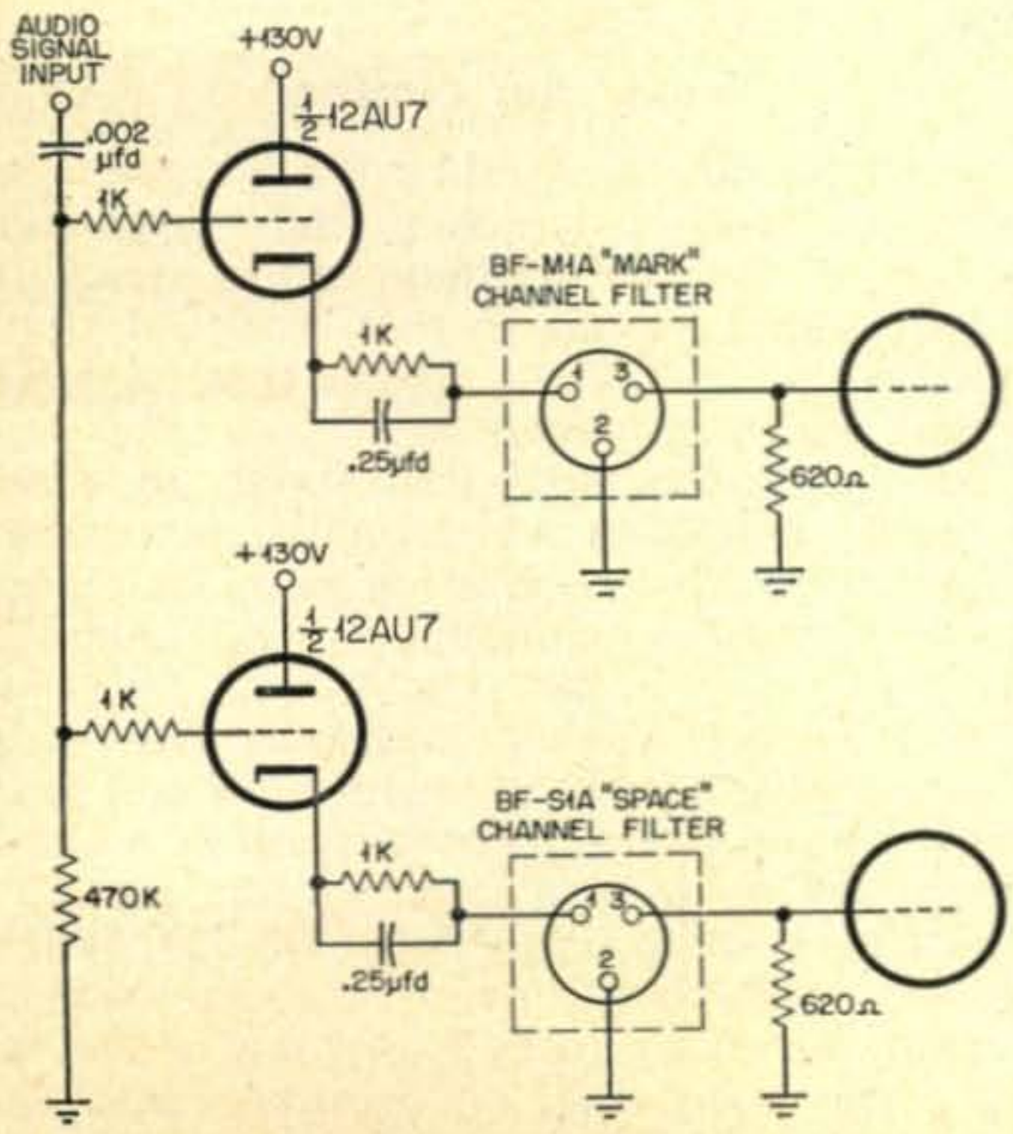


Fig. 2. Cathode Follower Filter Circuit.

"Where can I find some *basic* information on *Teletype*?" This is the question most often asked of your RTTY editor by so many hams, old and new, fellows who have become aware that something else besides the International Morse Code is being transmitted in our "CW" bands. Only recently, the *Teletype Corporation*, the manufacturer of just about all of the teleprinter machines that we use, has brought out a very informative booklet called, "The ABC's of Teletype Equipment." This skillfully prepared booklet not only discusses the fundamentals, terminology, and use of teleprinter transmission, but illustrates them as well with excellent drawings and pictures, including pictures of the related machines. It covers tape transmission and equipment as well as the page printing gear that most of us are familiar with. The booklet can be obtained simply by writing to:

Teletype Corporation
J. G. Hammer
Department 1261 RTTY
4100 Fullerton Avenue
Chicago 39, Illinois

NYC RTTY Dinner

The RTTY dinner held in New York City on March 19th was a howling success, with the wind doing most of the howling. In spite of the worst storm of the winter to hit New York, 38 hale and hearty RTTYers showed up. Some of the fellows from southern New Jersey spent most of the day getting there, too. Nine others didn't make it at all.

Phil Catona, W2JAV, and Dick Urian, W3CRO, teamed up to put over a bang-up talk on the Model 26. Phil discussed in fine detail the importance of ranging, distortion, and range-finder adjustment. Dick had brought up a Model 26 in a suitcase—disassembled! He used the various parts to illustrate difficulties, their correction, and other important adjustments. He didn't try to explain, of course, how and

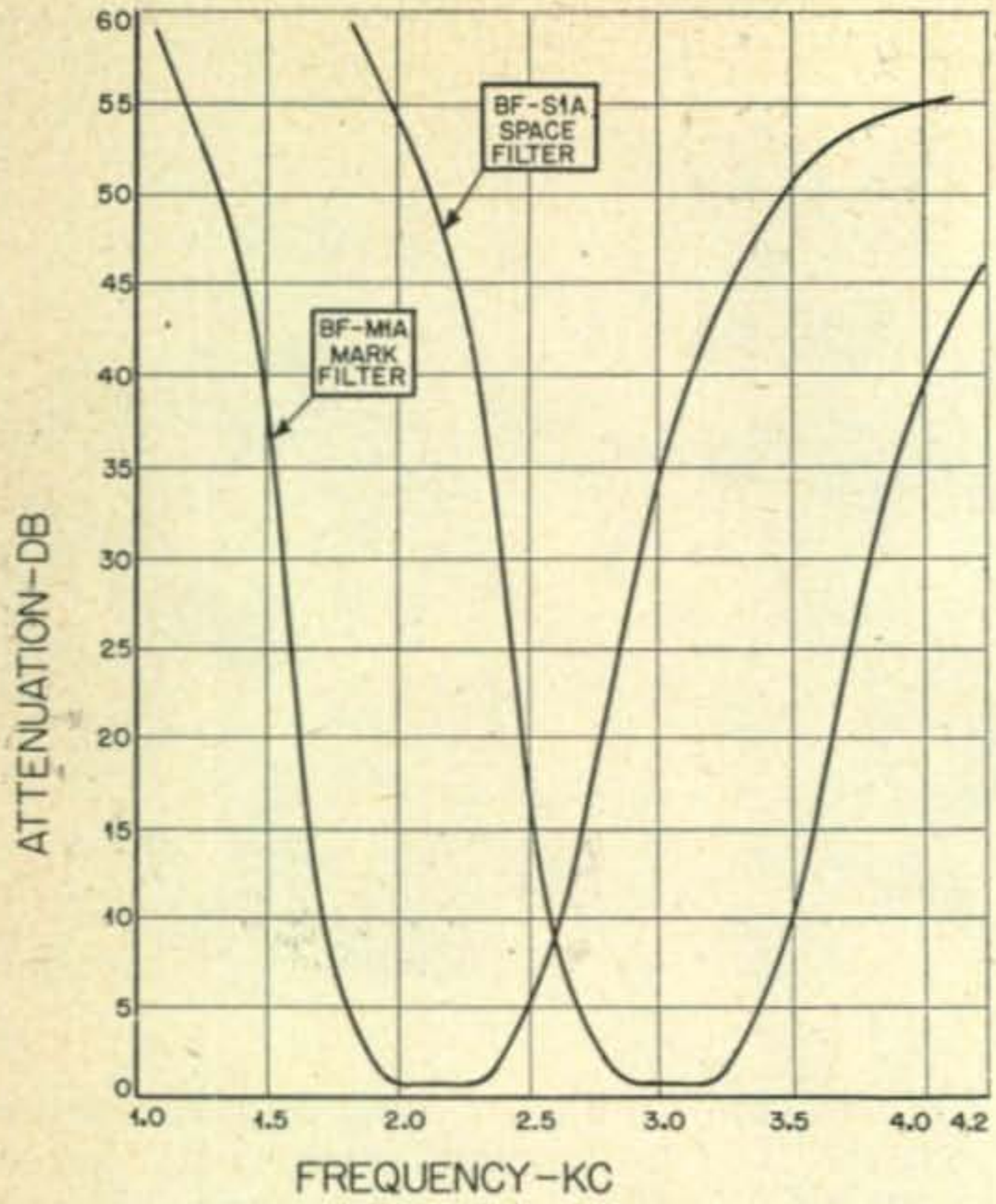


Fig. 1. Frequency Response Curves, Mark and Space Filters.

why W2BDI's Model 26 could back-space! (Ed swears it's true!)

Merrill Swan, W6AEE, spoke briefly about west coast activity and the possibility in the future of obtaining FSK privileges for the 160 meter band. F. E. Handy, W1BDI, suggested that we contact our ARRL Directors concerning this matter. He said that the " . . . Coast Guard was not unfavorable." Ed also commented that the ever increasing attractiveness of RTTY was because it was " . . . an *accurate* and *fast* means of handling traffic." Jack Berman, W1BGW, spoke of the new birth of 2 meter AFSK activity in the Boston area. Jack said that there are 16 stations on, including W1FZJ, *CQ's* VHF Editor. Wayne Green, W2NSD, ye Editor, spoke briefly on single-sideband. It was recalled that someone using an SSB exciter for RTTY was cited for spurious frequencies, and it was suggested that extreme caution be used. Bob Straub, W2PBG, reported on his survey of 40 meter band occupancy, the object in view of abandoning 7140 kc as the "national" RTTY frequency. Bob reports that, from his point of view, (New York City) 7105 or 7110 kc would be infinitely better. Joe Juel, W9BGC, spoke of the probability of another RTTY Meeting in Chicago this coming October. Joe asked that each fellow drop him a card with comments.

W9NOE won a subscription to *CQ* and W2LLR won a subscription to *RTTY*. Polar relays, given as door prizes, were won by W2ZKV, W2AKE, and W3FMC. Dick Urian, W3CRO, won a copy of TM 11-680, "Teletypewriter Circuits and Equipment (Fundamentals)"!

Those who attended were, W1AFN, W1BDI, W1BGW, W1EVZ, W1FGL, W1FZJ, W1RBF, W1WB, W1WEW, W2AKE, W2AVI, W2BDI, W2EBZ, W2GHH, W2JAV, W2JTP, W2KXT, W2LLR, W2MIB, W2NSD, W2PBG, W2PTD, W2QGH, W2QQG, W2RMB, W2TBD, W2ZKV, W3CRO, W3FMC, W3MHD, W5UHV, W6AEE, W6DRL, W9BGC, W9NOE, W9TPU, KØDFR, and Rudy Couppez.

Those who didn't quite make it because of the storm, were, K2CSC, K2HHJ, W2IRT, W2JYD, W2OOG, W2PAU, W2PEE, W2TKO, and W4LNW.

This NYC RTTY dinner was better than last year's. Next year we hope it will be better than this year's. At least the weather has a good chance of being better! (It *couldn't* be worse!) See you all there.

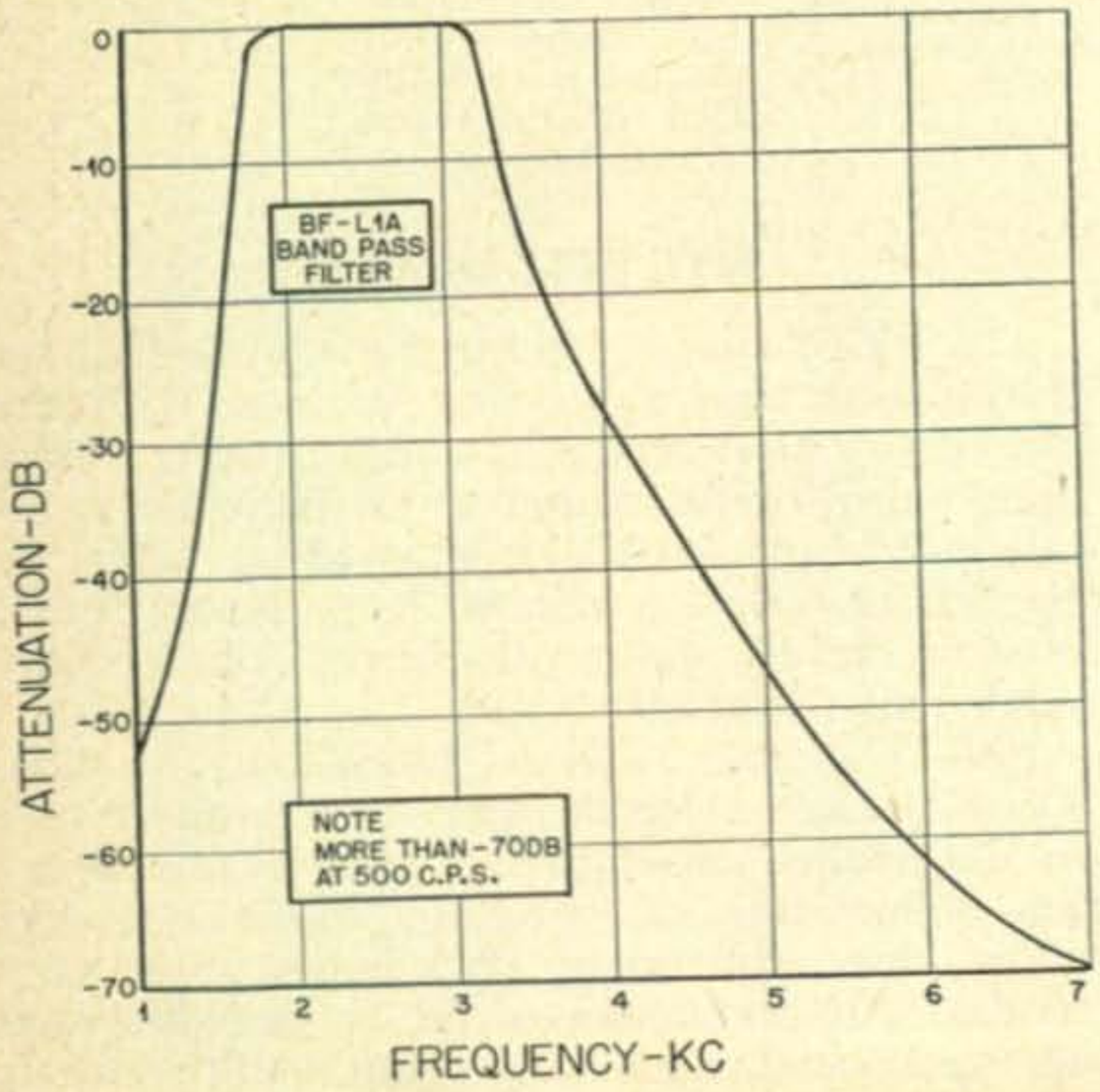


Fig. 3. Frequency Response Curve, Band-Pass Filter.

Across the Nation

W3LGK and W3MHD have worked out a system of break-in which permits rapid interchange of RTTY communication. Each installed a microswitch so that it would be actuated by the bell lever. (upper case "S") This switch, via a ratchet relay, then alternately places the printer, and transmitter, in a *send* or *receive* condition whenever the bell is rung —once. Of course, operators *must* be present. FCC approval was obtained. (See Feb. '56 *RTTY*).

W7JFU received his Model 12 with an a-c motor on the keyboard/distributor and a d-c motor on the printer! For anyone in a similar fix, see the de-hashing dope for d-c motors in the RTTY column in the April '56 *CQ*. W7JLF in the Olympia-Thurston County part of Washington offers to help anyone in his area that is interested in RTTY. Sam uses his Model 26 with a W4TJU TU, a BC-348, and a Ranger, on 40 meter FSK.

W5WZF, a technician in Houston, Texas, is all fired up on 6 meter AFSK on 52.6 Mc. Bill would like to exchange tape-recorder (3.75 in/sec) tapes of AFSK with anyone interested. He will also be looking for any other RTTYers at the Galveston Convention in June. W5AXY, Austin, Texas, has a Model 19 complete except for keyboard. Lee reports, "There are quite a few of the fellows down here trying to get on, but we all need a lot of help." Any volunteers for the Austin area? KØDFR, ex-W5IJC,. is now in St. Louis. Baity says there is little activity in his area. Can that *be*?

W2ANB, and XYL W2ZPR, have a Model 15 and some tape gear working on local loops. Just the simple matter of hooking up to the transmitter and receiver remains, John reports. W2PEE still hasn't found a printer with weather symbols. Can anybody help?

VE3BAD of Toronto, Canada, is putting a fine signal into New York City on 3620 kc. George has been investigating various types of a-f converters. VE7KX, on Lulu Island, Vancouver, and SS contest winner, pours a good signal into the east coast on 40.

W1FGL reports that he, W1WB, W1WEW, and W1EFF, of Gray, Maine, are now proud possessors of Model 26's.

WØSV has worked out a tone standard using gears which will be described shortly in this column. W4LMN is using a simplified method of frequency shifting his VFO directly from the keyboard of his Model 26. This, too, will be described in detail in a forthcoming column.

Comments

When your RTTY column was started, we said that the basic purpose was to serve as a communication center for information concerning radioteletype. One of the ways that we have been trying to do this is to bring to your attention books and articles in other periodicals of special interest to the RTTYer. This month, of particular interest to those of you that are designing and building converters, we suggest that you read "Bandwidth Requirements of SW Radio Telegraphy," by J. B. Moore, in the March '56 issue of *Tele-Tech & Electronic Industries* magazine. This is an absorbing, but not too theoretical, treatment of a subject of great importance to all of us who are continually searching for the ultimate in converter design.

Since the Fritz Franke converter, (Nov. '54 *RTTY*) and W2BDI's version, little has been seen of anything new in the way of an i-f converter design. W2JTP is just starting one at this time. Is anyone else working along these lines? Let's hear from you. 73, Byron, W2JTP

Windblowers Four State Jamboree

The Windblowers VHF Society, certainly one of the most aggressive VHF clubs in the country, set up four stations in four states on April 28th and for twelve hours worked every two-meter station they could hear. Since certificates were promised for all stations that managed to work all four of the Windblowers there was no shortage of contacts. All four stations were set up in good locations with reasonable power and good vertical and horizontal antennas. W3CIP/3 thundered into New York, some 75 miles away, and that was the furthest of the four.

A preliminary report from the foursome gives the following results:

Station	Location	Nr. Contacts	Certificates
W2IMG/2	Middletown, N. Y.	180	9
W2IMI/1	Redding Ridge, Conn.	142	48
W3CIP/3	High Knob, Pa.	157	24
W2GEX	Tenafly, N. J.	178	25

When any station contacted his fourth Windblower he gave his QTH so they could send the certificate. This also made it simple for the Windblowers to know just how many stations had managed to qualify. The total number of certificates was 160. Last year's Big Blow resulted in only 64 certificates so it would seem that interest in this event is on the rise.

Each of the stations had their own miseries and fortunately there were plenty of extra hands around to build and repair while the operators kept something on the air. W3CIP/3 was off the air for an hour when a fierce storm struck. The tent had to be taken down to keep it from blowing away and the beams had to be hastily struck. Despite the high winds and heavy rain they had a good time. W2IMI/1 also had a bad storm to cope with. This one rain-soaked their generator which then had to be taken into the trailer and cleaned inside and out. Net: 30 minutes off the air. And such static! W2IMG/2 had to spend two hours on a Gonset Communicator while a new fuel pump was installed on the generator. This didn't really hurt the signal much though, for what is a few db when the signal is 30 db over 9? The crew at W2GEX had the toughest time of all. This station, operating at the home QTH of W2GEX, had to cope with a full-fledged roast beef dinner and all sorts of other goodies served by the XYL. No other problems were encountered.

Activities of this nature are good for the two-meter band and it is hoped that other clubs will work up some activities which will benefit themselves and the VHF's. ■

NOVICE

for the Novice and the Technician

reported by
Walt Burdine, W8ZCV
Waynesville, Ohio

The big Dayton Hamvention has passed. If you were there, I'm sure I met you. If not, you sure missed a good time. There were 1924 guests registered during the day. Anyone that attended the Novice and Technician Forum, listened to the two wonderful speakers appearing on that forum, and didn't go away determined to be a better ham really missed the boat and can start his other hobby. Lew McCoy, W1ICP of ARRL's Technical Staff warned us of the big increase in second harmonic radiation notices from the FCC that are appearing in Novice mailboxes. Let's clean up those signals. Read your handbook and the Novice Shack for May. Lew has your interests at heart, do you?

John L. Reinartz, K6BJ was the main speaker. "Instrumentation In The Hamshack" was his subject. If you ever get a chance to hear this speech, don't let it pass. It's a rare privilege to see, hear and heed John's very good advice. I really think a lot of the radio signals leaving the Tri-state area will be improved by those who heard this speech.

Another interesting display was the first radio license of Daniel C. "Dan" McCoy, W8DG. This certificate of proficiency and operating skill was issued in 1912. Dan was a Commercial Operator at the tender age of 15 years, Amateur at 11 (Novice, did you say?).

I did get a chance to get acquainted with the "Boss" from *CQ*. Wayne, W2NSD and Jim, K2OLK came to visit me at *just the right time*. The six-meter band was wide open and S9 signals were coming in from the entire east coast area. I do believe Wayne was the first ham signing the call W8ZCV to work Pennsylvania, but I worked another one there so I now have 36 states on Six Meters. Jim was thus awakened to the possibilities of the six-meter band. Jim read *CQ* and you can find some dope on six-meter gear there. I guess anyone on Six could have worked 20 states or so April 15.

With this opening of the six-meter band, we were reminded again that Sam Harris and Helen, W1FZJ and W1HOY missed the Hamvention because of an opening (a nasty gash in the forehead)—toooo bad, Sam, and this is one boy that sure hopes you have a speedy recovery from your unfortunate auto accident. We called W1HOY quite a few times Sunday.

I have always been proud of my ham ticket, but I am even prouder than ever since I met so many readers of *CQ* and *The Novice Shack* this last weekend. I will try to make this column ever better in the future—thanks for all of the help. Attending such gatherings and your regular radio club meetings and helping when asked to do a little work will make *you* a better ham, and you'll find more enjoyment in Ham Radio, where there's always room for improvement.

Re: QSL's

Have you seen the new QSL's of the editorial staff of *CQ*? I'm proud of mine.

Net News:

The Novices of the *Akron Radio Club* have a Net that meets at 1830 EST Wednesday on 3712 kc. For more information contact Dick Bitner, WN8HYD, 210 Kenwood Avenue, Akron 13, Ohio.

News of nets for Novices will appear in this column if you let me know of their existence by letter. Novice nets can improve your operating procedure. They provide good training ground for the newcomer. Let me know of the net you are in if it hasn't appeared in the Novice Shack net listing. Be sure to give the name and address of the net manager, the name of the net, the frequency and time of operation.

NNQB

The QSL managers of the *National Novice Technician Association*'s QSL bureau are open

for business and you should at least send a card with your name to the one in your district. Send him a stamped self-addressed envelope for the cards for you that he has or may get. Use the *NNQB* to deliver those cards that you can't get delivered otherwise. The QSL managers are:

W1.....W1BPW, 88 South Avenue, Whitman, Massachusetts.
W2.....KN2PQY, 85 Nassau Road, Massapequa, New York.
W3.....WN3DGY, 1204 Broadway, Hanover, Pennsylvania.
W4.....K4DWP, 154 Claredon Circle, Danville, Virginia.
W5.....K5ATT, 554 Hermine, San Antonio, Texas.
W6.....K6OGM, 4832 North Fruit Avenue, Fresno, California.
W7.....W7ZSE, 4447 Eastland Street, Tucson, Arizona.
W8.....WN8CZN, Jim Tullis, R. #3, Waynesville, Ohio.
W9.....W9JZK, 4224 Bobolink, Skokie, Illinois.
W.Ø.....KNØCFH, 202 North Russell Avenue, Ames, Iowa.
KH6.....KH6BIF, 157 Alae Street, Hilo, Hawaii.
KL7.....No appointee as yet (can you help?).
KP4.....KP4QA, P.O. Box 2573, San Juan, Puerto Rico.

Any questions on the *NNQB* should be sent to Barry T. Joseph, W7ZSE, 4447 Eastland, Tucson, Arizona, and questions on the *NNTA* should be sent to 4490 Van Ness Blvd, Fresno, California.

Hint of the Month

There have been quite a few requests in the mail asking how the *BC-451* can be used as a *Q-5'er* and how it is hooked into the regular receiver. In answer to these questions I am publishing a letter from R. K. "Dick" Jump, W9HYV, Cameron, Wisconsin, *verbatim*. Here is Dick's letter:

"Dear Walt: Here's a tip for anyone wanting to use the *ARC-5* or *BC-453* as a *Q-5'er* with the surplus receivers such as the *ARC5, BC-454, BC-455* or the *BC-348*. Assuming power supplies are already available, we will get to the point. Solder a piece of wire to the grid cap of the 12K8 in the *Q-5'er*, a foot or so long and insulated. Bring it up and out of the case. Now remove the 12SK7 (or 12SF7) tube—the second one behind the antenna post on the *BC-454* or *BC-455* receiver.

Wrap a turn or so of hookup wire around the plate pin—*do not bare the wire* (*no electrical contact—just capacity—Ed.*) Put the tube back in its socket and bring wire up and out of the case. Make a twisted electrical connection of this wire and the wire from the grid cap of the *Q-5'er*. Now tune the *Q-5'er* to 415 kc for the *BC-454*, or 510 kc for the *BC-455* receiver. Use the b. f. o. of the *Q-5'er*.

For the *BC-348* receiver: insert about 10 inches of insulated (tape the end) wire into the top phone plug of the *BC-348* and tune the *Q-5'er* to 415 kc. Use the b. f. o. in the *Q-5'er*. Set the *NC348* to MVC full on, BFO off, Crystal filter off.

For the *Hallicrafters S-40* receiver I have merely attached a piece of wire to the *Q-5'er* antenna terminal, with the other end in a phone plug inserted in the phone jack of the *S-40*. The *Q-5'er* is set to 455 kc using the *Q-5'er* b. f. o. and controlling the gain from both the *Q-5'er* and the *S-40*.

I sure hope this helps some of the fellows with their receivers. I'll be glad to answer any further questions on this. Any 6-meter men up here in my part of the country? where?

Best of luck on your Novice column, Walt, you are doing a wonderful job. I hope to see more for the Technicians. I'm due for my general examination this spring—as soon as Mr. Stork puts in his appearance so I can be away from home for a full day.

73, Dick.

Circuit Diagram Discussion

Why do you have trouble drawing diagrams for that test? Do you know why you put this or that component in the schematic? Just what is the difference between an r-f and an i-f amplifier? What is the difference between an r-f amplifier and a multiplier stage in the transmitter? A little study with the handbook and a study guide should help you to answer these questions and to be a better informed ham.

The similarity of the following circuits should be noted and the changes necessary to make them perform in the way that you want them to perform should be recorded in your notes. Please don't forget that circuits of all elements within the tube should be returned to B minus (ground) electrically. This ground return can be through the electron stream in some places and thru the electrical components in the circuit at the other times. In a tube with the emitting element being a cathode (*"K"*), all the current flowing in the tube comes from the cathode (except the current for the heating element which heats the cathode sleeve). All element voltages for the circuit should be measured from the cathode to the particular element contact of the tube, not from the chassis to the element.

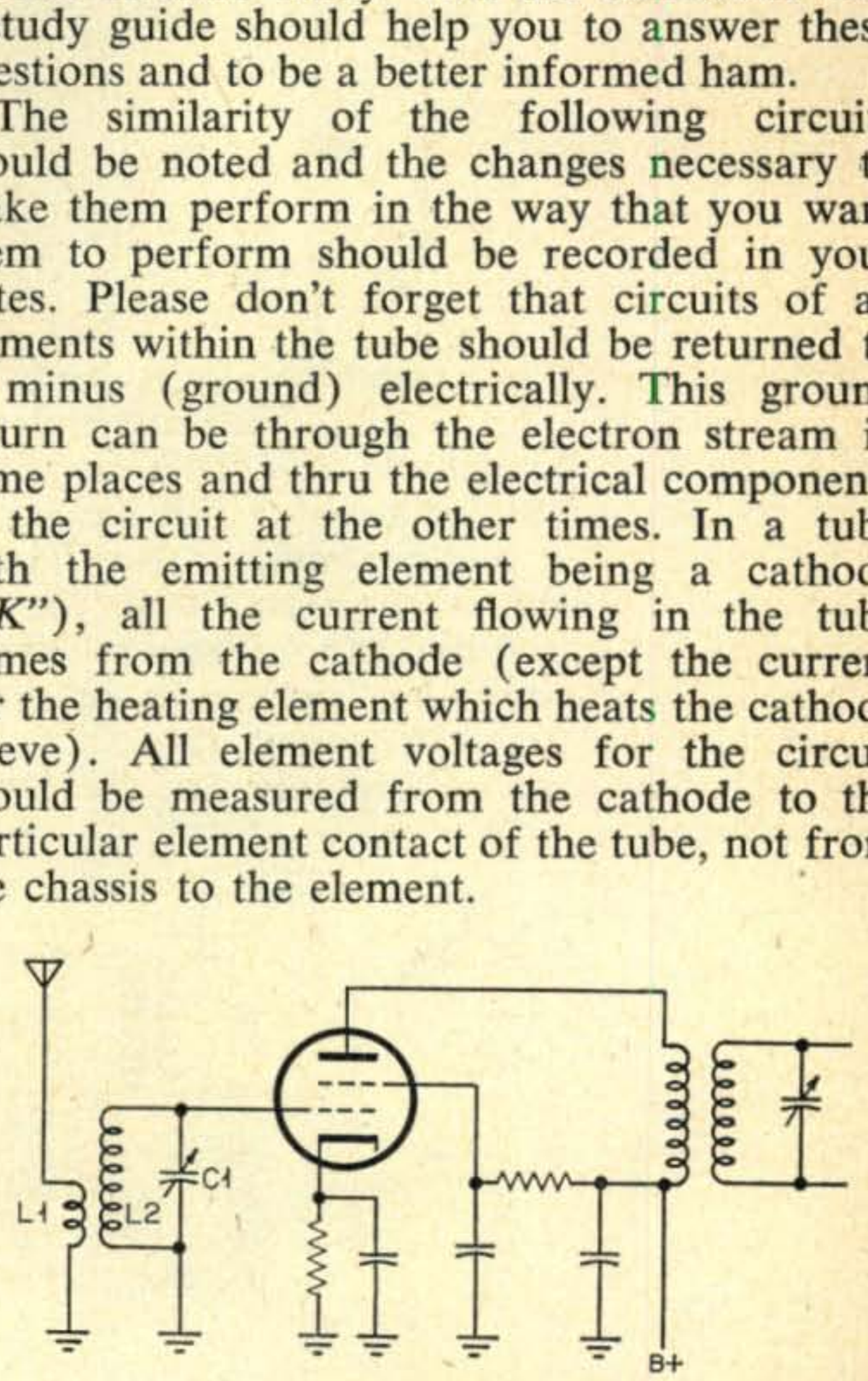


Fig. 1.

Fig. 1 shows a stage of tuned-radio-frequency amplification, transformer-coupled to the following stage. The purpose of the radio-frequency amplifier is to increase the amplitude of the signal delivered to the following stage. A radio wave coming in on the antenna passes through *L1* and induces a voltage in *L2* which is tuned to resonance by the parallel condenser *C1*. This voltage is amplified by the screen-grid tube. The amplified wave passes through the plate circuit and coil in the plate circuit and induces a voltage in the secondary of the coupling coil to the next tube. Sometimes two or more stages of radio-frequency amplification are used to further increase the sensitivity of the radio receiver. The size of the coil-and-condenser combination will determine the frequency to which the circuit will tune (resonate). Remember: the smaller the coil and the condenser the higher in frequency the circuit will resonate: the frequency of a resonant circuit is inversely proportional to the inductance of the coil and the capacity of the condenser. With a fixed value of one, decreasing the value

of the other will increase the frequency. The coil is fixed in this circuit and the condenser is a variable unit, therefore the circuit can be resonated.

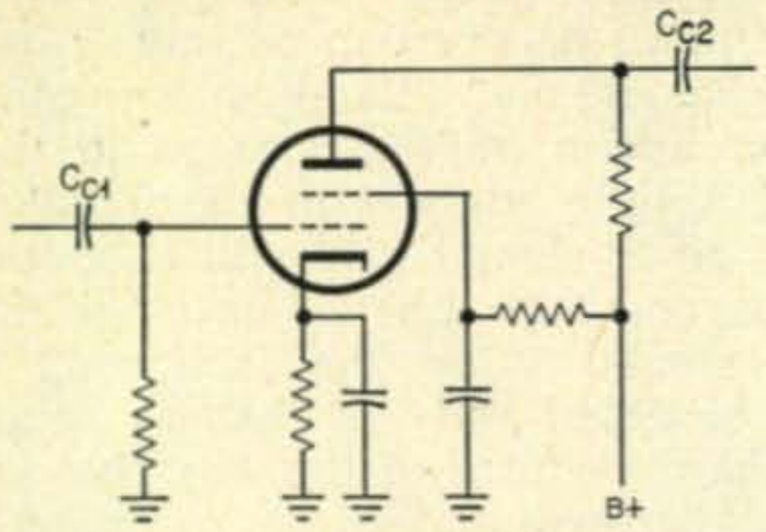


Fig. 2.

In *Fig. 2* the LC combination is replaced by a resistor and the coupling coils are replaced by a coupling condensers *Cc*. This circuit is used for any amplifier needing a wide bandwidth such as an audio amplifier. Resistance-coupled amplifiers have been used for i-f amplifiers in early high frequency receivers. The value of the coupling condensers will limit to some extent the frequency range of the amplifier. The larger the condenser, the lower the frequency it will pass.

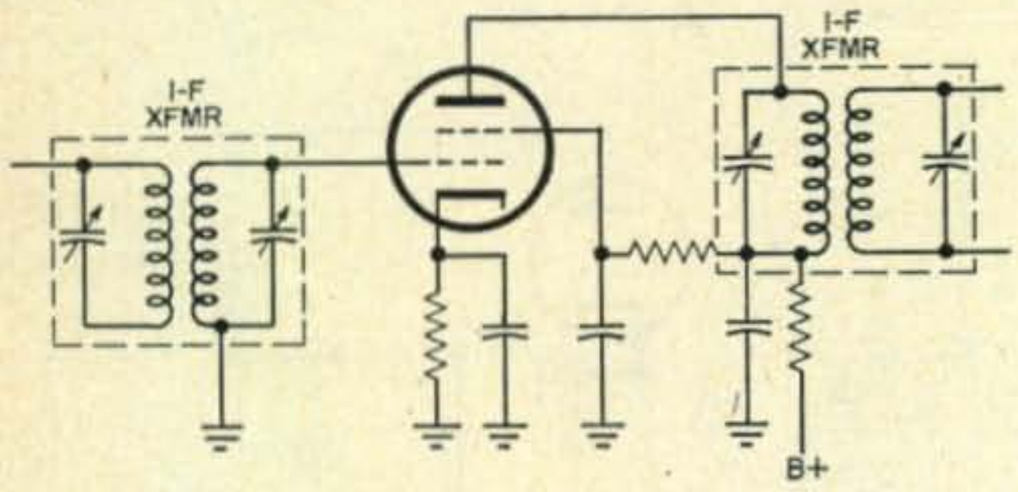


Fig. 3.

The circuit in *Fig. 3* is that of a Class-A intermediate-frequency (i-f) amplifier. This type of amplifier will be tuned to one frequency band and left there. It is not tuned during operation. The frequency is usually in the lower radio-frequency regions between the audio and the broadcast frequencies, hence the term *intermediate-frequency* amplifier. High stability is important in this type of amplifier in order to keep the resonant frequency of the coils at the same frequency at all times. Operational theory of this amplifier is the same as that of the unit in *Fig. 1*. The resonant frequency of the inductance in the windings of the transformers and the condensers of the same unit will determine the frequency of the amplifier.

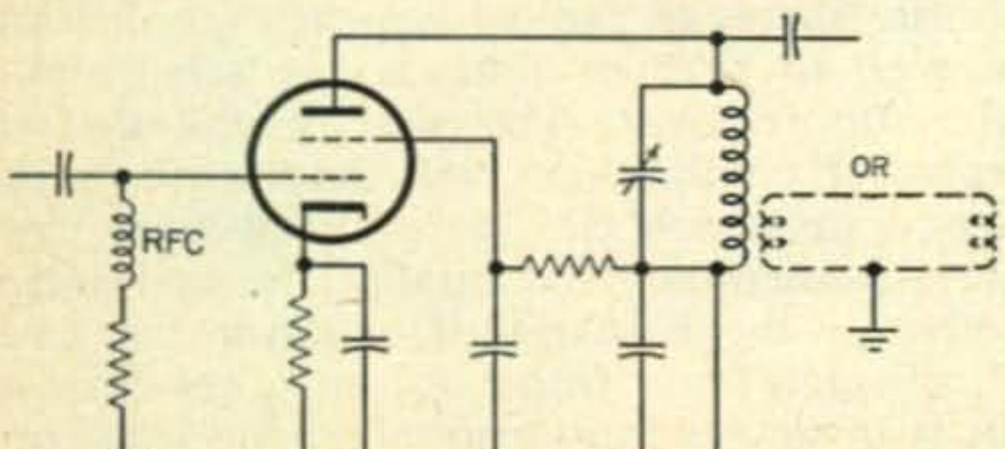


Fig. 4.

The circuit of *Fig. 4* is that of a radio-frequency amplifier or a frequency-multiplier stage. The radio frequency can be fed to the grid of the tube through the condenser or by using link coupling and a tuned coil-condenser combination tuned to the same frequency as that of the plate tank circuit preceding this stage. The r-f choke in the grid circuit is used to prevent loss of radio-frequency power through the grid circuit. This circuit can be used as a frequency multiplier if the grid resistor is increased in value and the grid drive is increased to make up for the grid losses. The plate should be resonant at the desired multiple

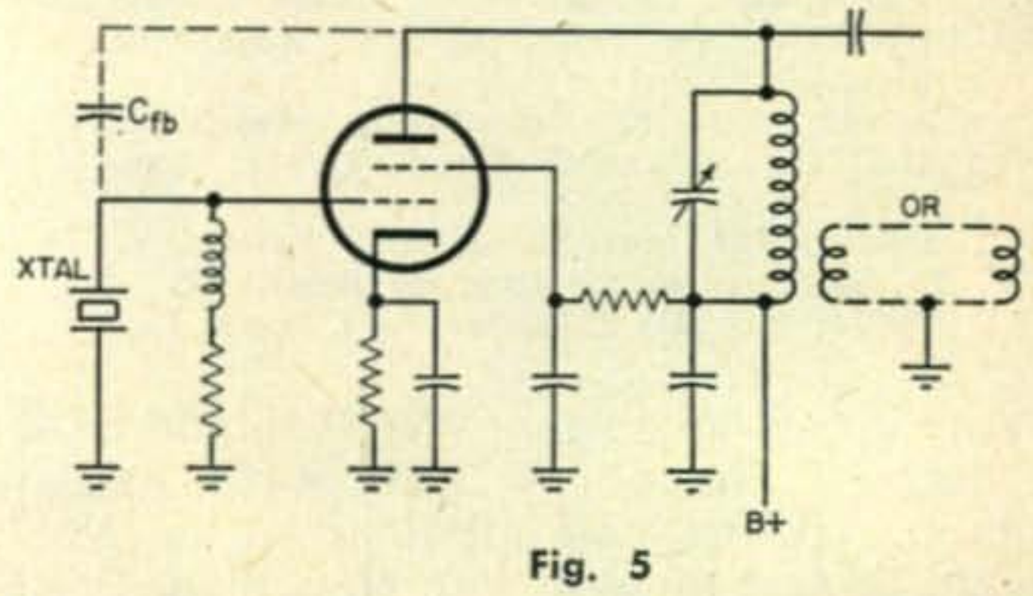


Fig. 5

of the grid circuit's frequency. The tank circuit should have a high L-to-C ratio. The efficiency of a multiplier stage ranges from 40 to 50 per cent.

The crystal oscillator circuit in *Fig. 5* is very near the same as that of the multiplier or radio-frequency amplifier diagram in that all of the components are drawn in the same position except the grid coupling condenser or the grid coil-condenser arrangement is replaced by a crystal. The crystal is the frequency-determining device now, instead of the voltage fed through the coupling condenser from a previous stage. A properly cut quartz crystal is the equivalent of a very high-Q tuned circuit, and holds doggedly to the one frequency for which it is cut.

Now that we have noted the similarity of the foregoing circuits we can go on and apply the same thing to push-pull circuits and make the drawing of those circuits a lot easier for us. A little thought applied to these drawings along with a little practice in using the diagrams as study material will simplify theory study considerably.

Questions and Answers

A couple of months ago I said in this column that while this subject had been covered in all of the publications dealing with radio a lot of my readers did not have access to these publications because they are newcomers to the hobby of radio. I will try to give you a few representative questions, but I will try to answer them in a slightly different way so that you will understand the reason for the answer.

I feel that if you know the answer to the question in a technical way you will not be the kind of a ham that is lost if the question is worded differently than it was in the study guide. In other words I want you to know the reasoning behind the answer.

The questions for your examinations are of the multiple-choice type. The answer is right before you, and all you have to do is pick out the right answer and check that answer. There are five answers printed after each question and some of them are a little tricky, for it may *seem* that there are two correct answers to the question asked. If you *know* the correct answer, you will have no trouble with the examination. I will give you more about taking the examination, getting the necessary forms and how to get some one to give you the test. The questions contained herein are not a representive sample but if you know these and use your handbook and do some study on the laws and regulations you can pass the novice test. Do not try to memorize the questions and answers just to get a ticket. Try to know the why's and wherefore's for the answers so you can find the answer to any question. A good way to study for the examination is to take the representive question and study the handbook dealing with that particular phase of radio, thereby adding to your knowledge of radio theory. You will be a better ham as the result of the little extra study.

Questions and Answers

1.

Q . . . Define the term, "amateur."

A . . . A radio amateur is a duly-licensed person interested in radio technique solely with a personal aim and without a monetary interest. His interests are as a hobby and not as a business adventure. No money may be received for any service or use of an amateur license, either directly or indirectly. Receiving monetary contributions are against the rules of the *Federal Communications Commission*.

2.

Q . . . Name the four classes of licenses issued by the *FCC*.

A . . . Novice, Technician, General (called the "Conditional" if taken by mail) and the Amateur Extra Class licenses are issued by the *FCC*.

3.

Q . . . What frequencies are allotted for use by the Novice?

A . . . The following frequencies are allotted the novice: 3.700 to 3.750 Mc for CW. 7.150 to 7.200 Mc for CW. 21.100 to 21.250 Mc for CW. and 145 to 147 Mc for phone or CW.

4.

Q . . . What is the penalty for a violation of the rules and regulations of the *Federal Communications Commission?*

A . . . A fine of $500 for each day during which the offense occurs, suspension of the operator license and revocation of station license.

5.

Q . . . What is the logbook and what should it contain?

A . . . The log is the written record book of an amateur radio station. The log should contain the date and time of all transmissions, the signature, name and call of any person operating the station. It should record the call of the station called and the name of any one other than the licensed operator who speaks over the microphone. The input power frequency and the type of transmission used should be recorded. A record of any traffic handled, and a copy of such traffic, should be filed and kept for a year. The location of the transmitter should be recorded in the log book. The log book can be used to keep complete records of the operations of the station. By referring to the log you can tell when John or Ruby were at your place and talked to Uncle Bill. All pertinent data concerning the operation of the station will always be on file.

6.

Q . . . What is the maximum percentage of modulation to be used in an amateur radiotelephone station? Why?

A . . . Not more than one hundred percent. Overmodulation (more than one hundred percent) causes your signal to occupy too wide a portion of the band. Overmodulation causes serious distortion of the signal, this distortion of the modulation envelope causing new frequencies to be generated which combine with the carrier to form sidebands too far removed from the channel on which you are operating, thus causing the channel to be wider than when operated correctly. These spurious frequencies are commonly called *splatter*. Splatter is that portion of the signal that causes the *"shush-shush"* you hear on the bands when tuning the ham phone bands. The operator causing splatter has lots of people muttering threats about what should happen to him, none of them good.

7.

Q . . . What are the rules and regulations regarding the transmission of improper language, false signals, or malicious interference?

A . . . The transmission of indecent, profane or obscene language is forbidden by law. Malicious interference, deceptive or improper call letters are prohibited by law and are subject to heavy penalties. Let every thing you say or do reflect to the good of amateur radio and the amateur radio operator, that way you won't have to worry about troubles with rules and regulations. The best rule is the *Golden Rule*. Don't forget that anything you say may be heard by any one in the world—you never know who is listening to you. So be careful of what you say. That anyone should have to be warned against using indecent, profane or ob-

scene language is truly a shame. He "shoulda been brung up better."

Letters

Al, WN8HYR, 632 Kedzie Drive, East Lansing, Michigan writes:

"Dear Walt: I am writing to tell you how much I enjoy your column. I get a real kick out of reading the letters from the fellows that I have worked. I have 17 states confirmed here on 40 Meters. The rig is an *AT-1* and an *AR-3*. The best DX so far is KN5DGI in Shreveport, Louisiana. I will sked anyone needing Michigan. Thanks and 73, Al."

Milt Rosenblum, KN9ASR, 2709 West Granville, Chicago, Illinois says his pet peeve is the lid that calls CQ at 15 wpm and can't copy more than 5, says he has to QRT and then calls CQ again. Please send at the speed that you can copy. Milt has 21 states confirmed.

Dick Bittner (14), WN8HYD, 210 Kenwood Avenue, Akron 13, Ohio says:

"Dear Walt: I have read *Novice Shack* for a long time and I want to say what a fine job you are doing as editor.

The rig here is about the average but I'm real proud of it. The transmitter is a *Heathkit AT-1* and it is converted to Six Meters. The receiver is a *BC-312* and the antenna is a freak doublet for transmitting and a 15-meter vertical for receiving.

My ticket is about 4 months old and is becoming more fun every day. I will take the test for the Technician as soon as the test comes. This summer I will sked anyone on Six Meters who wants to ragchew or anyone that needs Ohio for WAS. I owe my interest in ham radio to Phil, W8TTN and Jon, WN8GKB who rammed the code into me. Keep up the good work, Walt and 73, Dick."

Bob Carlson, WN7AMY, 2446 North East 58, Portland 13, Oregon surely has garnered some nice QSL cards. Among those worked are PY7, PY2, JA1, CX2, KZ5 and CO2 on 15 meters, also ZL2LL on 40 meters. That's a neat layout, Bob.

Edward A. Whitman, KN2MFY, 35 Crown Street, Brooklyn 25, New York writes:

"Dear Walt: My time as a Novice is drawing to a close, but I expect my General license to come any day now. I have been on the air for about ten months. For the first five months I was on 40 and 80 Meters. For the last five months I have been on Fifteen Meters. I have 36 states and 86 foreign contacts in 34 countries and 4 continents. The best DX was VQ-4 land.

The rig is a *Viking Adventurer* and the receiver is an *S-38-C*. I think that the *S-38-C* is the best of the low priced receivers. The antenna is an 80 meter dipole (130 feet) fed with 72-ohm coax.

I will gladly schedule anyone needing New York, especially the W7 land. I would like to have skeds on 15 Meters. I will answer all letters. So keep up the good work, Walt and 73, Eddie."

P. S. If any novice is expecting DX QSL's it would be a good idea to send a stamped self-addressed envelope to your *ARRL QSL Bureau.*

That is a very good idea, Eddie and also while you are at it why not send a couple to your N.N.T.A. QSL Bureau *and get those overdue QSL's that he has on hand. They are piling up and also some other mail is being sent through them for you Novices and Technicians. It would be to your advantage to take advantage of the* N.N.T.A. QSL Bureau *in your district. A list of them appears in the novice column this month.*

Tom Eavenson, KN5BWZ, 248 Roma Drive, Shreveport, Louisiana pens this letter:

"Dear Walt: The *Novice Shack* is my favorite part of *CQ*. Some of my friends have written you and had very good results.

Doris Ann Eggleston (16), KN5CPA, 1229 Dunn Lane, Corpus Christi, Texas has worked 33 states, KZ5 and VE3 since October 4. Her Frequency is 21.135 and 21.180 and she operates every afternoon around 1700 CST. Her mother is KN5COZ and her dad is W5QEM.

I am 14 years old and in the 9th grade at Byrd High School.

I work 40 Meters only, as I don't have enough room in the yard for an 80-meter antenna. The rig is an *AT-1* and a *Super-Pro*. I have worked 23 states and an XE2.

I would like to have skeds with KN6's and WN7's. I will sked anyone needing Louisiana for WAS. I QSL 100% here when I can get the address. Good luck, Tom."

Utah is again represented in novice shack by the letter from K. J. Farnsworth, W7WLV, 3708 South 23rd East, Salt Lake City, Utah.

"Dear Walt: I understand that your column is also for the Technician. Well, I am one and you might pass along the word that early in the spring like this we should listen in the mornings for 6-meter openings. I am on every morning from 6:30 to 8:30 a.m. calling and listening. (*DOES ANY ONE NEED UTAH?*)

I sure do miss my Novice days. I guess I will finally break down and go up for my General ticket. Even

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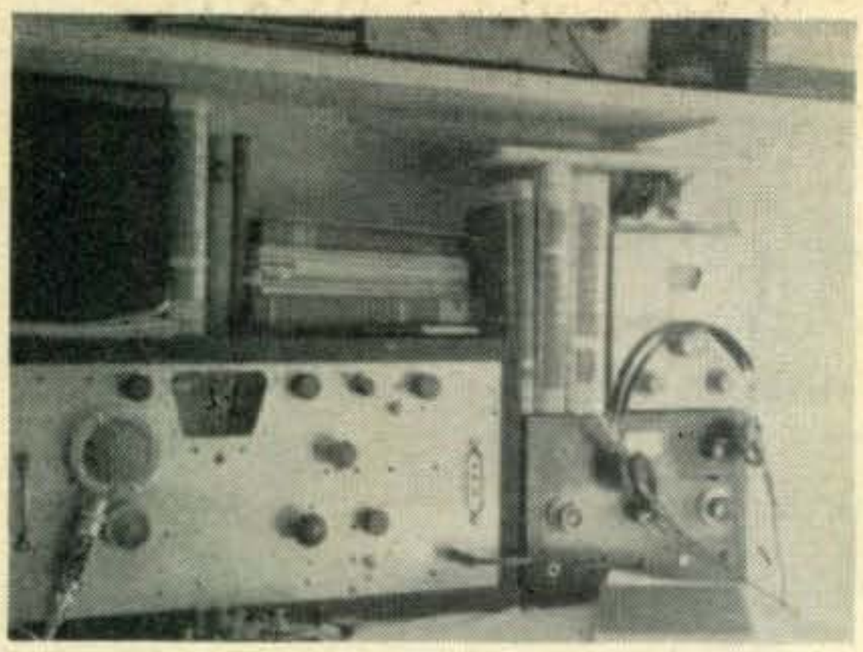

Norman C. Peterson, K6ANE, 2003 Clark Street, Fresno 4, California. Norman says his biggest problem is trying to share a room with the rig and a room mate at the dorm at Fresno State College, looks like he is successful though. Norm says he enjoyed ham radio more as a novice.

then I will still like to work the novice bands. 73, K. J."

(**DOES ANY ONE NEED UTAH?** *That is the $64,000 question and I am just "the guy what kin anser hit." Next to Nevada, where the six-meter operation is nil, Utah is in much demand. An expedition from the East Coast put Utah on the six-meter map last year and made quite a few new states in their six-meter logs. These same hams put Nevada in the logs of more hams than ever before. I have said before in my column that we are sadly in need of hams that will operate the high frequency bands consistently so that we back-east hams can have something West to look for, we can better judge our efforts that way. You Technician operators get your back issues of CQ and start building for the greatest boom in v-h-f activity the ham fraternity has ever known. Don't leave it to George (unless he has a license) to do all the operating and the experimenting to help save these bands for the amateurs. So, K. J., I will pass along the thanks of all Eastern hams for putting Utah on the v-h-f bands.*)

Here is a letter that gives us something to think about:

"Dear Walt: I have been a Commercial for a good many years, Amateur for this time for two years, but the main thing I wanted to bring out is the wonderful job you are doing in the 'Novice' column. I am sure if the person is really interested in his ticket and reads your column, he can make it. (*Thank you for the kind words*).

As an instructor in "How to become a Radio Amateur" in Adult Education and at Church, I recommend without fail that those who are interested in becoming Radio Amateurs read your *Novice Column*. This leads me to the next thing at hand, why does not *CQ* or someone connected with it publish a handbook and license manual plus code records for the beginner and the Technician? I find this sort of thing hard to get. The records on the market are inadequate and the handbook available improperly presented. 73, Walt. E. C. Sherrill, K6JFP, 5406 Churchward Street, San Diego 14, California."

Joe E. Minyard KN5DXL, R.F.D. #4, Eupora, Mississippi writes:

"Dear Walt: I got my first issue of *CQ* this month and discovered the *Novice Shack*. I think it is great.

I got my license about a month and a half ago. I have made 131 contacts in 23 states with all 23 confirmed. My best DX is New York, Michigan and Pennsylvania. I operate 80 Meters only at 3716 and 3726 kc.

The rig is a *Heathkit AT-1* running 30 watts. The receiver is a *Hallicrafters S-53-A*. My antenna is a 135-foot doublet fed with coax. I also have a home-made CW monitor.

I plan to take my test for the Conditional License in about three weeks. I will schedule anyone needing Mississippi for WAS or for a good old rag chew. I QSL 100%. 73, Joe."

Al Johnson, KN6QBY, 10329 East Weaver Street, El Monte, California says "See you on 80 with this nice setup." Besides the TR-75-IV he has a BC-430 for a standby rig.

Tommy Painter (12) KN6MQN, 1428 Conejo Drive, San Bernardino, California says he likes the 15 meter band best but will work you on 40 or 80 if you haven't worked his state for WAS. The rig is a BC-348-O and two ARC-5 receivers for 40 and 80 and an AT-1.

M. B. Kilcrease, KN5DXW, 708 North Grand Avenue, Olney, Texas has been on the air for about six weeks but has worked some of the hard to get states for this short time of operation. He needs some help in getting a diagram for an RK-20 final.

Charles Tannen, KN2ODU, 18 Lake Shore Drive, Rockaway, New Jersey writes:

"Dear Walt; I've been reading the *Novice Shack* for a long time and enjoy it very much.

The rig here is a *Viking Adventurer* and the receiver is an *S-38-C*. I would like to sked anyone in Vermont, Maine, New Hampshire and any of the W4's or anyone needing New Jersey. I haven't worked much DX because I would rather rag chew. I am a member of the *Rag Chewers Club* and would be glad to help anyone get their certificate. I will answer all letters. That's all for now. 73, Charles."

John Brosious, WN3FMF, R.F.D. #1, Nescopeck, Pennsylvania writes:

"Dear Walt: I'm 15 years old and I've had my Novice call for a few weeks now. My call is WN3FMF. I haven't had any contacts yet but really hope to get going before long.

My transmitter is a homemade rig running around 30 watts. The receiver is a *Heathkit AR-2* and the

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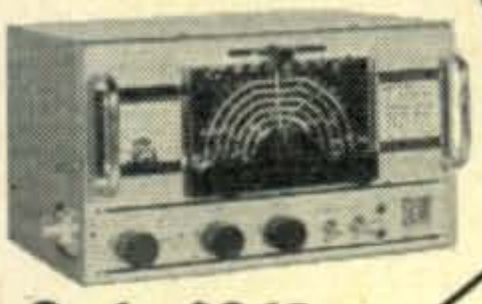

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antenna is a 170-foot long wire center-fed.

I enjoy the novice shack very much so keep up the tgood work Walt. 73, John."

Dick Mills, W7AMH, 615 West Alturas, Tucson, Arizona says:

"Dear Walt: I have just received my Conditional Class License. Boy, it feels good te be a ham after about two years of work on it. Any boy or girl needing help in getting his ticket please call me before 7:00 p.m. by phone. The telephone number is 4-7775. I'm on the 40-meter Novice band—7176 and 7194—with 30 watts to a 6C5-6L6 Transmitter. The receivers are an *AR-2* and a *BC-455*. Thanks and 73, Dick."

Jim Grubbs, 833 Highland Terrace, Atlanta, Georgia writes:

"Dear Walt: I have been a Novice for about two months and in that time I have had 48 contacts in 8 states. A lot of the boys say I am their first Georgia contact so if any one needs a sked just write me. I work 40 and 80.

The rig is a *HQ-140-X* doing a very fine job. The transmitter is a *Lysco 650* into a dipole antenna.

There is a teen-age net here in Atlanta that meets on 3885 at 1300 EST Saturday. 73, Jim."

A letter from Midway Atoll says:

"Dear Walt: Just a word from 'Gooneybird Island' to let the fellows know that KM6AX has a Novice shack now. Our Frequencies are 7175, 7180, 7190 and 7195. The rig is homebrew by two of the General operators, W6HDO and K4CMP. We now run 40 watts and will soon be up to 75 watts, the receiver is a BC-342-N and we have a 300 foot long wire. The operators are watchstanders so we can't handle any skeds, but we will be looking regularly for the fellows from 0500 GMT to 1300 GMT. Sincerely C. C. Buttschardt, Truste, Midway Amateur Radio Club."

The first letter from Maine came from Joseph A. Foss Jr., WN1HZZ, South Windham, Maine. Joe writes:

"Dear Walt: I thought where I have a few spare moments that I would write and let you know how WN1HZZ was making out. I got my license January 18. The transmitter is a home made 6AG7-807 combination running about 42 watts input. The antenna is a 125 foot long wire. The receiver is an *S-38-D*. I am particularly pleased with the transmitter because I laid out only **$11.**00 for it. For the power supply I have two old receiver power supplies in series which is doing FB.

So far I have worked Maine, New Hampshire, Vermont, Massachusetts, Connecticut, New York, New Jersey, Ohio and Virginia on 80 meters. My contact with W4EII gave me a signal report of 5-8-9, which I think is pretty good for this old bucket of bolts. I work on 3738 kc and my best time is between 5:00 and 7:00 in the morning. I would like to sked anyone needing Maine for WAS. I will QSL 100%. I am 16 years old, 73. Joe."

Gus Britzman, WØJEU, Houston, Missouri writes:

"Dear Walt: I read your Novice column and enjoy it very much. Would anyone be interested in the setup here? I have a 1½ horsepower engine, an auto generator, car battery, vibrator power supply powering a two tube rig. The rig is a 6C5 oscillator feeding a 6V6 amplifier running about 4 watts input to a one half wave dipole antenna. I use less than one gallon of gasoline a week. I worked VE, XE and 40 states. The antenna is fed with 72 ohm twin lead, the two cents kind. I also worked 36 states and some VE's with only 3 watts input with 40 meter CW.

I once hooked my rig to a rural telephone (1 wire) for an antenna but the guys thought I was crazy and would QRT when I told them that I was running 4 watts to a seven mile long wire. A W5 gave 599X but would not finish the QSO with me when I told him of my power input. He didn't QSL either. The receiver is a 3 tube regenerative set using 3-3Q5's using one half of each filament at a time. I worked a W8 in Ohio who said he was running 1 watt.

This experience should be interesting to someone who is afraid to get his ticket and get on the air due to lack of equipment and power.

I would like to see one day a year when no one runs over 3 watts, perhaps as a contest. 73. Gus."

Editor's Note: Gus, I too would like to see such a contest, then we would locate the HAMS that actually do their experimenting on their own. This would probably make some of the high power boys stand up and take note if they were not in there to cover the little boys all of the time, I have 5 continents, 17 states and 16 countries with 6¼ watts on ten meter phone. Congratulations Gus, on your low-power work.

If those western hams don't quit writing such letters as the following one of them will have to buy me a ten gallon hat 'cause my head is a growin' too fast. I beg your pardon, but just let me print a sample.

Ron Sefton, (17) W7VWR, 717 West 16th Avenue, Spokane, Washington sends this gem:

"Dear Walt: After reading the February issue of *CQ* and especially your Novice column, I have come to the conclusion that *CQ* is the *only* ham magazine. Your column with its informality and just plain good old ham news, is typical of the whole *CQ* effort. I hope you can keep up the good work, Walt, you just don't know how much good you are doing for prospective hams and hams of all classes. Thanks for the time. 73. Ron." *You are welcome Ron, come again.*

Help Wanted

Miss Carol Rawie, (13), 230 West 17th Street, **Sioux Falls, South Dakota** needs help in code and theory and advice on equipment.

Lilly Purnell, 708 Linden Street, **Camden, New Jersey** needs help in code and theory.

Bill O'Brien Jr., (13), Box 367, Route 2, **Pilot Point, Texas** needs help with code and theory.

John W. Williams, (46), 22195 Park Street, **Dearborn, Michigan** wants some help with the code.

Ira E. Antley, Box 216, **Monroe, Louisiana** needs help with code and theory.

Raymond Pint, **Raymond, Iowa** wants some one to help with code and theory.

Barry Weiss, (13) 1633 Monroe, **Evanston, Illinois** needs help with code and theory.

Gary Maher (14), 516 Schenectady Street, **Schenectady, New York** needs help in code and theory.

Jack Pookiard (13), 1014½ Stanford Street, **Concord, California,** Phone MU-5-7529 had a code oscillator and needs a helping hand to practice with. He will answer all letters.

Larry Albert, 150 Long Drive, **Hempstead, New York** needs help in code and theory.

Arnold Fine, (17) 29 Monroe Avenue, **Worcester 2, Massachusetts** needs help with the code. His telephone number is, PL-2-2646.

Jesse Woodson, 14, 1841 South Homan, **Chicago, Illinois** would like to have some one to give him the novice test.

Ernest A. Washburn Jr., (16) Phone: Lakewood 7791, Box 176, **Ashville, New York** needs help with his code and wants some one to help him design his rig.

Joe Evans, 304½ West Martin, **Martinsburg, West Virginia** needs help with code and theory.

Charles M. Weiss, 1611 Carmel Road, **Walnut Creek, California** needs help in code and theory. His phone number is YE-5-0638.

Ed. A. Daggett, 44 Holmes Court, **Albany, New York** needs help in code and theory for the test, he has the equipment.

Those aspirants listed above could use some of your time to get started, can you spare a little? To get listed in the column as one desiring help just drop a letter with the full particulars to me: Walter G. Burdine, W8ZCV, R. #3, Waynesville, Ohio. *Do not* write me in care of the office in New York as that just puts more needless work on the office staff. Please put the full address on the envelope so that I will be sure to get it, I have received letters just sent to *Walt.....Waynesville, Ohio,* and sometimes Waynesville is spelled wrong. That may be the reason you didn't get your name in the column. Again, just: Walter G. Burdine, W8ZCV, R. #3, Waynesville, Ohio. Thanks and see you again next month.

73, Walt, W8ZCV.

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STANDARD AND DELUXE BEAMS. Standard beams in the 6, 10 and 15 meter bands use ⅝" and ¾" tubing elements; the deluxe models for these bands use ⅞" and 1". In 20 meter beams, the standard has a single boom, while the deluxe uses twin booms.

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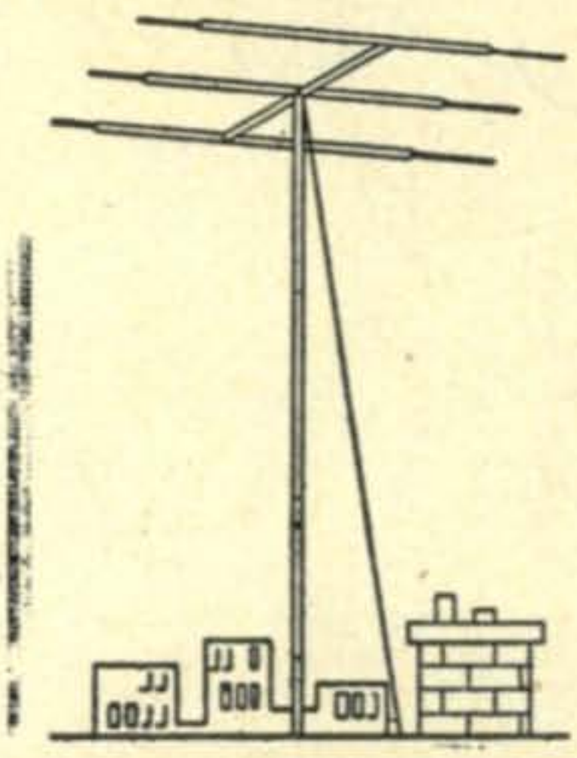

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☐ Std. 4-El Gamma match	16.95	☐ T match	19.95
☐ Deluxe 4-El Gamma match	25.95	☐ T match	28.95
10 METER BEAMS			
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☐ Deluxe 2-El Gamma match	18.95	☐ T match	21.95
☐ Std. 3-El Gamma match	16.95	☐ T match	18.95
☐ Deluxe 3-El Gamma match	22.95	☐ T match	25.95
☐ Std. 4-El Gamma match	21.95	☐ T match	24.95
☐ Deluxe 4-El Gamma match	27.95	☐ T match	30.95
15 METER BEAMS			
☐ Std. 2-El Gamma match	19.95	☐ T match	22.95
☐ Deluxe 2-El Gamma match	29.95	☐ T match	32.95
☐ Std. 3-El Gamma match	26.95	☐ T match	29.95
☐ Deluxe 3-El Gamma match	36.95	☐ T match	39.95
20 METER BEAMS			
☐ Std. 2-El Gamma match	21.95	☐ T match	24.95
☐ Deluxe 2-El Gamma match	31.95	☐ T match	34.95
☐ Std. 3-El Gamma match	34.95	☐ T match	37.95
☐ Deluxe 3-El Gamma match	46.95	☐ T match	49.95

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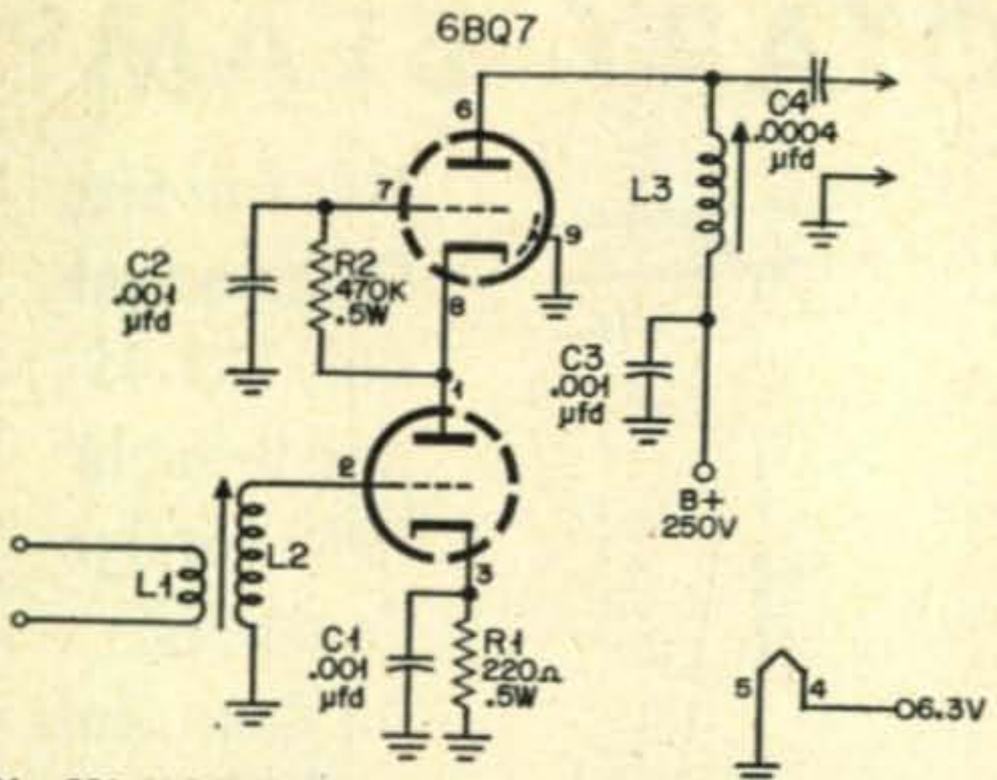

This preamp circuit is the acme of simplicity and uses close to the absolute minimum of parts.

According to contributor, W2SHT, none of the local boys who constructed duplicates have run into any tendency to parasitics or instability. ■

ANTENNAS

[*from page 59*]

little long so that the antenna could be pruned to length in its operating position.

The lengths set forth on *Figure 1* were determined as follows:

$$\text{Length (in feet)} = \frac{(492K)}{\text{Frequency (mc)}}$$

K is normally accepted as being 0.95 for the lower frequencies, however this figure varies with the type of ground and surrounding objects. I have found that the same antenna in two different locations will sometimes have to be shortened as much as six feet to resonate at the same frequency! Thus K would seem to vary at least from 0.93 to 0.98. The difference is more than slight, changing the resonant frequency as much as a hundred kilocycles. Thus in the above table all lengths are given longer than is considered possible under any conditions so that the antenna can be safely cut to this length and then in one step (to be described) cut to the correct length. It is far easier to prune extra twin-lead off than to splice it on if you start too short.

Cutting to the Exact Frequency

The folded dipole is quite broad in response and will operate over a wide range of frequencies. Most of us have one channel that

[*continued on page 94*]

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[*from page 92*]

we use most and generally like to have everything operating at optimum on this channel. The Novice will want to cut his antennas for the middle of the Novice band. The phone man will cut his for the phone band, etc. Decide what frequency you would like to cut the antenna to and put that in the formula below as F_d, the frequency desired.

Determining the resonant frequency of the antenna is a bit tricky, but then so am I. You can do it with a grid-dip meter if you have a ladder to reach up to the center of the antenna while it is in its operating position. Unfortunately the grid-dip meter tells all sorts of lies when you try to hook it in at the shack end of the feed line. What you really want at this time is a v-f-o transmitter, preferably of low power, which has a link coupled output stage. A Pi-Network output circuit will tell you the same lies that the grid-dip did. The main reason for *using* a Pi-Network is because it will match almost anything and not be too bothered by little things like antennas being cut for the wrong frequency.

Connect the output link to the 300 ohm feeder, set the v.f.o. at one end of the band and tune up the rig. Notice how much loading you are getting to the final. Move the v.f.o. up the band in easy stages, say 50 kc at a time, until you have passed the peak and the loading starts to decrease again. While it is much simpler to swish the v.f.o. across the band and find the point of highest loading this is frowned upon by the FCC and is not recommended, no matter how much it simplifies the procedure. Figure out some way to do it that is legal.

Let us now say that you have determined the resonant frequency of the antenna you erected. Call this frequency F_a, the actual frequency, in the formula below.

L_a is the actual length of the antenna. Thus you can find the length of the antenna (L_d) that will resonate at the desired frequency. I suggest you make a permanent record of this calculation so that you will be able to alter the frequency of the antenna in the future without having to take it down and measure it again should you desire to tune it to another frequency.

$$L_d = \frac{F_a \times L_a}{F_d}$$ Frequency in mc or kc / Length in feet or inches

L_d will be shorter than L_a so that you can subtract one from the other, take down the antenna, and cut one half of the difference from each end of the antenna. Thus in just one step you have tuned your antenna to the desired frequency.

[*continued on page 96*]

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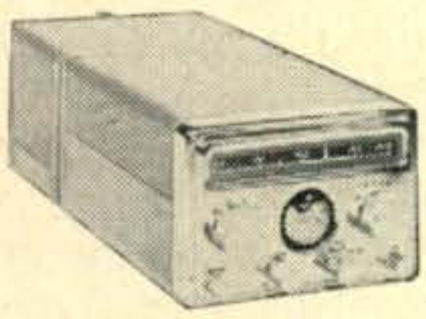


GONSET

G-66 Receiver — AM, CW and SSB six bands. Excellent sensitivity and selectivity. Antenna trimmer — automatic noise limiter — built-in "S" meter.
$16.95 down . . . . . **$9.23** per month for 18 months.

G-77 Transmitter — 50-60 watts input. VFO or crystal control. Highly stable VFO. 80, 40, 20, 15 and 10 meters. Exciter gauged with VFO. Pi-network output.
(Soon to be released — and we'll have it for you.)

Super-Six Converter — Covers 10 through 75 meters and 19 and 49 mc broadcast bands. Ideal 6-band tuning head for Super-ceiver. Powered by receiver.
$5.25 down . . . . . **$4.17** per month for 12 months.

MULTI-ELMAC

AF-67 Transciter — 7 amateur bands 10 through 160 meters. Single knob bandswitching — built-in VFO. 40 watts audio at 500 ohms. Operates from 6 or 12 V AC or DC.

$17.70 down . . . . . **$9.64** per month for 18 months.

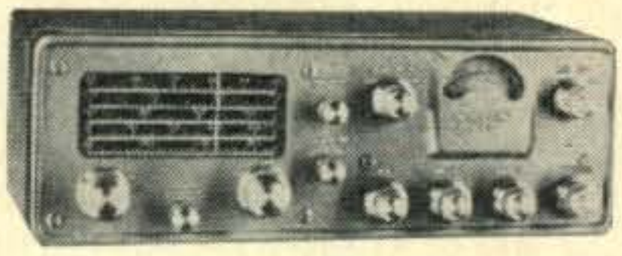
PMR-7 Receiver — 10 through 160 meters and standard broadcast. Slide rule dial. High selectivity. Built-in noise limiter — adjustable squelch. Only 7" wide.

$15.90 down . . . . . **$8.66** per month for 18 months.

HARVEY WELLS

T-90 Super Bandmaster — Fixed or mobile operation. Bandswitching. 90 watts CW input, 75 watts phone. Built-in VFO. Complete with tubes.
$17.95 down . . . . . **$9.78** per month for 18 months.

R-9 Receiver — Double conversion all bands. 6¾" height permits easy under dash mounting for mobile installation.
$14.95 down . . . . . **$8.14** per month for 18 months.



MORROW

MB-560 Transmitter — 65 watts input. 80 through 10 meters. 6146 final. Shielded exciter. Gang tuned low level stages.

$21.45 down . . . . . **$11.69** per month for 18 months.

MBR-5 Receiver — 80 through 10 meters. 13-tube dual conversion, superhet. With tubes, less speaker and power supply.

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[from page 94]

Feeding the Antenna

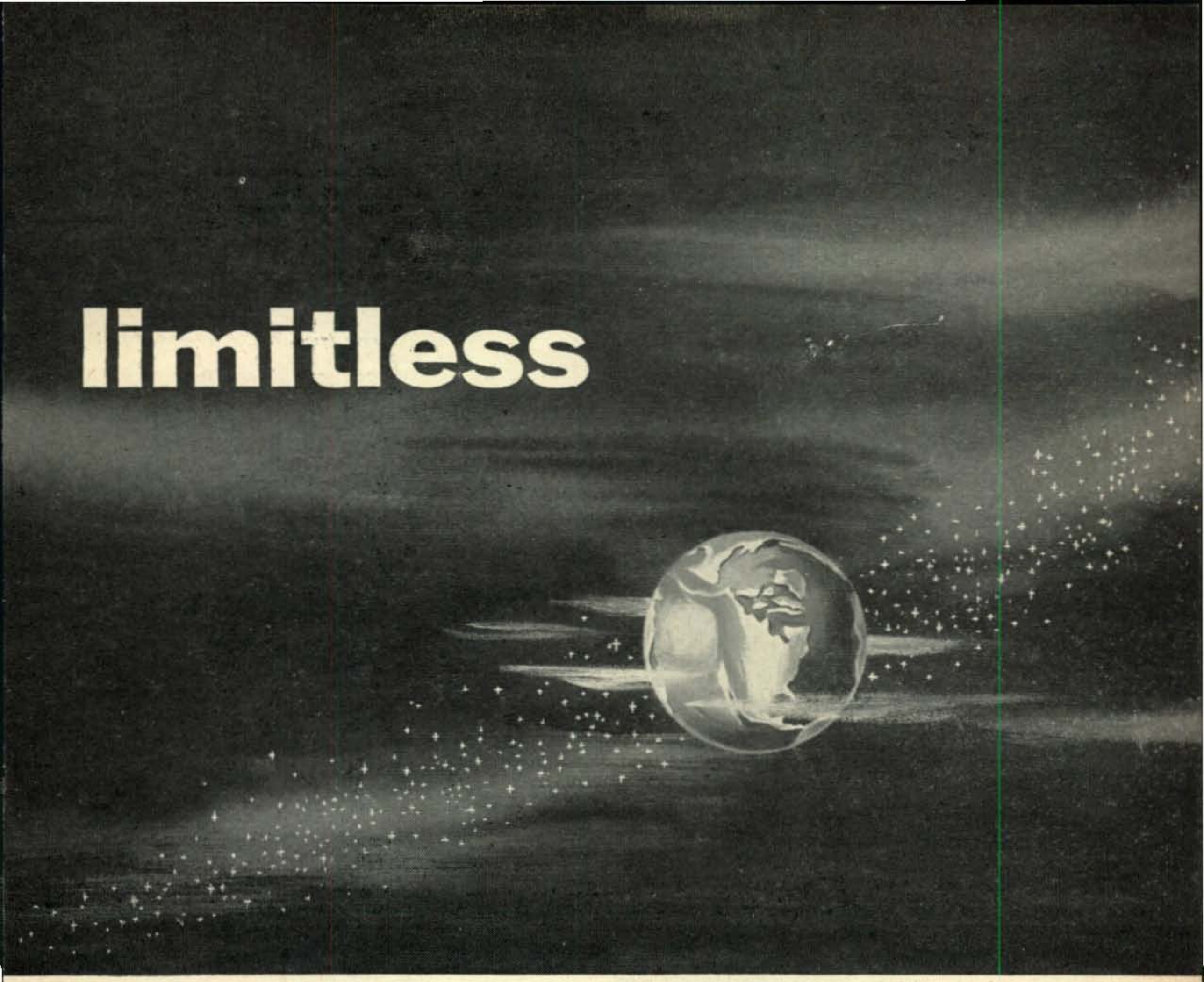
This antenna will handle a kilowatt with no difficulty unless you try to tune the feeders, then watch long lengths of feeder go up in smoke. The best feeding method is to run the feeder directly to the final tank output link. On the lower frequencies there may not be enough turns on the commercially made link to load up the final satisfactorily. Use some good solid insulated wire and wind your own, making five or six turns and trying it for loading. If you make too many turns you can leave the link only part way in the tank coil. It is best to have some spare loading available for the loading will drop a bit when it rains and you can push the link in to compensate.

If you have made both ends of the antenna the same length and have cut it the right length the standing wave ratio should be very low. The twin-lead indicator mentioned in the ARRL Handbook will provide an indication of this ratio and can be put together in a few minutes. Another method of checking this is to pull the link out of the tank coil, tune the tank, then push the link in and notice if the tank condenser has to be retuned very much. Capacitive or inductive reactance reflected from the antenna can be detected in this way. When the antenna is correctly cut it will reflect neither back to the final.

Most of your rigs that use a Pi-Network final will work with 300 ohm feeders and thus they will load up this antenna with no difficulty. They will load almost anything, but the difference is that with this antenna you will suddenly find yourself working out.

That's it. In less than an hour you should be able to cut and erect a good antenna for any band, all tuned to one specific frequency. You don't even have to climb trees. ■

"Quite a rig you've got there, Sam!"



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Philadelphia, Pa.	St. Paul W4, Minn.	South Norwalk, Conn.

VHF [from page 73]

Rensselaer, Indiana: Bill (W9KLR) comes through from the "Hoosier" state with:

"Seems like I can hear well enough on two meters, just need more power to get through the QRM. Have been hearing you on aurora various times in March. The most consistent W1 though is W1REZ, Ray. He never misses any and I've heard him six different days in March. We rag-chewed for twenty minutes before any other station showed up on March 28th. Funniest feeling to have a W1 all to myself with no competition. *Good feeling too, huh Bill. We had it once from W8 land, first W8 contacts with New England.*

"We had thirteen days of aurora here during the month of March, by far the most I've ever heard on Two Meters." *From all predictions it surely should be a wonderful year for DX on the VHF bands and seems like you're active enough that you'll get your share.*

Merced, California: Another "Gold Hunter" heard from is George (K6QVW):

"I am on the air every night on 50.67 mc. Running 120 watts PM into a 4X150A with a 4 element beam 40 feet off the ground. There is plenty of activity in this region. I talk every night to the San Francisco Bay area, about 135 road miles over a mountain range.

"I'm looking for a good tank coil arrangement that will stand power. Helping K6LYB to put his 4-250 on Six Meters. It will run about half a gallon." *Good to know that activity is at a high level in your area, George.*

Fort Smith, Arkansas: Bob (W5EUQ) from the "Bear" state has this to say:

"Rig here is a 6BH6-6U8-6C4 cascode output converter. Receiver is an NC18 D and antenna is a home made 4 element widespread beam. Transmitter is a 12AX7 oscillator, 12BH7 RF amplifier, 6L6 modulator and 12AX s. amp.

"The only place I have worked is here in Ft. Smith and 75-80 miles north to Fayetteville, Arkansas. Stations there are W5BHS and W5TIA. About ten miles west is Farmington, Arkansas and I've worked W5WHU several times.

"Opening here on January 23rd when I heard W1's, W2's and W3's. Have been glued to my receiver ever since but have just heard meteor bursts." *Just be patient, Bob. Your chance is coming when those W1's, 2's and 3's are fighting to get you on an opening. Helen will be one of them.*

Akron, Ohio: Another "Buckeye" heard from, Arline (W8SSF):

"Would like to pass along this information for your V.H.F. section. There will be a V.H.F. party for those who work the 50-54 mc band and their families. For those who plan to come, bring along a picnic basket as we expect to make a day of it and have a lot of fun.

"The date, July 1, 1956, at the home of W8PTL, Homer Everhard, Sr. QTH—145 South Lyman Street, Wadsworth, Ohio. Homer will be at his rig for those requesting information, also mobiles will be there to direct those who have six meters in their cars.

"If the weather does not favor us, that will not be a hold back, as Homer, W8PTL, has the place to take care of all. So, come one, come all, you six-meter operators.

"W8SSD and W8PXX used to have a noon sked on six meters. They started to tune for others and the activity has grown so much that they are now known as the 'Noon Day Rattlers.' Anyone interested in a six-meter contact just give a listen as they tune the band for anyone that wants to get in." *Thanks, Arline. All good news to know.*

73, Sam, W1FZJ

7th Uniontown Gabfest

Saturday, June 30 the Uniontown ARC will hold forth at the Club Grounds on the Old Pittsburgh Road just off Route 51, about 2 miles North of Uniontown, Pa.

Program includes Auction of radio gear, games of Horseshoes, Movies, Prizes and a raffle, and a mystery speaker (not lined up yet at date of publication). Food for the hungry, usual side dishes free, other refreshments at a nominal cost. Club House opens at Noon. Stag. Registration $1.50. Club transmitters will be on the air. Further info from Club Station W3PIE, Box 849, Uniontown, Pa.

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Receivers, w/o dynamotors

R-23 or BC-453, 190-550 Kc Exlt $10.95
R-25 Marine, 1.5-3 MC, used $5.95, new 6.95
R-26 or BC-454, 3-6 Mc, used. Exlt. 6.95
R-27 or BC-455, 6-9.1 Mc, used. Exlt. 5.95
R-28, 100-156 Mc, as is, w/o tubes, 7.95, used w/tubes Exlt ..... 9.95 / 13.95
R-4/ARR-2,234-258 MC, as is w/o tubes, $2.95, w/tubes, used 3.95

Transmitters, w/o modulator or dynamotor

T-18 Marine, 2.1-3 Mc, as is, w/tubes, 3.95, used 4.95, boxed 7.95
T-19 or BC-696, 3-4 Mc, as is w/tubes, 6.95, used, 7.95, boxed 8.95
T-20 or BC-457, 4-5.3 Mc, as is w/tubes 2.95, used 3.95, boxed 5.95
T-21 or BC-458, 5.3-7 Mc, as is w/tubes, 2.95, used 3.95, boxed by depot 4.95
T-22 or BC-459, 7-9.1 Mc, as is w/tubes, 2.95, used 3.95, boxed New 5.95
T-23, 100-156 Mc, as is, w/o tubes, 7.95, used, 9.95, new w/xtals 34.95
Special—one usable R-28 and T-23, both for 17.50

Misc. Command Equipment as available

Receiver dynamotors 14v used 3.95 new 4.95
BC-456 SC Mod w/tubes, new 4.95, used 3.95
MD-7 ARC-5 Pi Mod w/tubes Xlnt 8.95
28 v dynamotors inc w/above mods. Separately, w/o mod 3.00
Receiver spinner knobs 69¢, ... 3/1.50
New 24 V Trans. et at 12v, 2A 110v 60 C input 3.50
Plugs for rear of receiver 1.00
BC-442A Ant. Relay, cont. vacuum cap,50 MMFD 5KV Send-Receive relay, RF ammeter, new 2.95

110 VAC power supply for Receiver, cont. above trans & Selenium Rect. kit 8.95
Wired & Tested 12.95
Receiver Conversion kit; cont. schematic, BFO Sw, 25 K Pot, phone jack, and spinner knob, with instructions 1.95
1625 Tubes, for trans & mod, 50¢ 3/1.00
832A for VHF trans 8.00

Popular Dynamotor Specials

DM-34 Recvr. Dyna, 12 V in 220 @ 80 ma Out. new 4.95
DM-36 Same as above, 28 V. new 4.95
either of above used 3.95

PE-101C, Transmitter, 12 or 24 v input, 500 v at 200 Ma out, (300 v 6v in) new 7.95
DM-42, 12 V in, out 1000 and 500, ea at 215 Ma, used 12.95
DM-35, 12V in, 600 at 200 Ma out, New, 12.95 Used 9.95
Wincharger Dyna. 12 v in 440 @ 220 MA Out. new 12.95
BD-69 Rec. Dyna, 14 v in, 220 at 80 Ma out, new 9.95
PE-73, 24 v in, 1000 at 350 Ma out New 8.95, used 6.95
PE-94, 28 v in, for 522, 300 at 250 Ma, 150 bias, and 12 V 10 A, new 4.95
RK-65 Tetrodes, 500 watts each, 6 watts drive, special, 9.95 each, 2 for 15.95

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0-2 Ma	0-200 Ma
0-5 Ma	0-300 Ma
0-15 Ma	0-500 Ma
0-50 Ma	0-20 VDC
0-100 Ma	0-40 VDC
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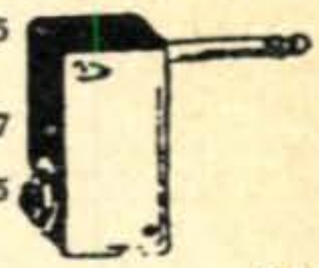
3.29 each, Special, 3 for 9.00

Filament Transformer—240 VAC, Primary 5 VAC, 30 A, 15 KV insulation when used on 120 VAC, gives 2½ VAC for 866's or 249's ..... Brand New $ 7.95
Heavy Duty Collins choke, 300 Ma, can take 500 Ma peaks, new 3.95
249C, 5000 volts, new, each 1.95
Bleeder resistors, 50 K 100 W, new 1.95
Special, all above, including 2 tubes for 500 Ma (50 lbs) 15.95
Transmitter Power Supply Kit contains chassis, 2 transformers, 2 tubes, 2 sets filters and bleeders, gives 500 VDC and 250 VDC, value of parts 23.34 Special ..... $15.95 Weight 22 lbs.
Mobile Microphones, newly assembled, W.E. D173015 similar to the TC-128, push-to-talk switch, 3 cond. 5' curl, cord, new 3.95
Brand New Headphones, your choice of HS-23, 8000 ohms, or HS-33, 600 ohms, complete with brand new rubber cushions 3.95

Used HS-23, w/o cushions 1.95
New small cushions, pr. ..... .49
Used chamois cushions, pr ..... .49
New lg rubber cushions, pr. ..... .29
Brand new Impedance matching transformer, plug in, 8000 ohms to 600 ohms, takes std plug, boxed 69¢ each, 3 for 1.95
CD-307A cords, has JK-26 on one end for phones, std plug other end brand new, boxed ..... .97
Brand New J-38 Code Keys, for sending CW with your transmitter 1.45



Build your Modulator, Input trans., 1.50, driver, 2.50, mod. trans. 2.95, 2 new 1625 tubes, value 7.70, all for 6.95
Stewart Warner Ammeter, 60-0-60 Amps, brand new, 95¢, 6 for 5.00
Phone-CW Filters, 1020 cycles, new, FL-5, 69¢ FL-8 with switch 1.89
GP-7 transmitter with all tubes and 80 meter coil unit only 13.95
Less tubes and coil unit 7.95
BC-375, 100 w CW or phone transmitter, less tuning units, contains multiturn coil used in KW pi network final, w/o tuning units, but with tubes 12.95
TU-7, 4.5-6.2 Mc; TU-8, 6.2-7.7 Mc; TU-9, 7.7-10 Mc; TU-10 10-12.5 Mc; TU-26, 200-500 Kc, choice, used, each 2.29
T-30 Throat Mikes, used, 5 for 1.00

3' Mast Sections, MS-49 thru 52, 50¢ each. 53 and above, 75¢ each. Special, 1 each MS-49 thru 54, makes 18' vertical 2.95
Variable Antenna Matcher, 100 w. rating in the BC-375, ok for 1 Kw in a Pi network 8.95
MN-26C direction finding Equipment
MN-26C Receiver w. dyna 10.95
MN-20E Loop 4.95
MN-52H Az Cont Box 2.95
All above new, special, 1 each for 17.95

Antenna Insulators, Bendix MT-48C, plated end caps, new, 15¢ each, 10 for 1.25
Control Box w/5 Ma S meter, special 1.98
Antenna Reels, new 28VDC, ¼ Hp, w/Gear box 2.95
SCR-522, exc. condition, tubes Contains Receiver, Transmitter and control panel covers range 100-156 Mc easily put on 2 meters $34.50
New transmitters, GF-11 for 12 volts, or GF-12 for 24 volts, with tubes and built in modulator—less tuning unit, GF-11, $6.95, ... GF-12 5.95
Tuning Unit for above 1.95

Last Minute Specials

12 V Solenoid for Mobiles, 100 Amp Capacity 1.49
New Mfg. Surplus wire wound flat strip resistors. Some contain 3 separate resistors orig. cost ..... $ 9.27
Assort ..... 12/$1.00
Hey! You sub-miniature Bugs—we have 1½" speakers. Used ea. 4.95
Hi-Fi Headset with new rubber pads, dynamic elements, each earpiece contains a transformer-headset, matches 600 ohm line ..... ea. 7.00

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SAM'S SURPLUS, 1306 Bond St., Los Angeles 15, California

MOBILE REFERENCE-SHIFT MODULATOR

[*from page 39*]

at least 5 h. and a current-carrying capacity of approximately 200 ma.

Important voltages and currents are shown on the schematic, *Fig. 2*. Total current drain is 210 ma. max.; 100 ma. for the final, 100 ma. max. for the modulator, and 10 ma. max. for the driver and speech amplifier. Optimum plate voltage is 350—375 v.

Values for *C8*, *C9*, and *R15* in the final plate and screen circuits depend on the tube used. Values shown are typical for a 1614 or 6L6. The voltage rating of both *C8* and *C9* should be at least twice the plate voltage.

Audio quality is good; the modulation level is equivalent to or higher than that of any conventional modulator running the same maximum input power.

I have not included a description of the r-f section of the rig since your judgment in this matter is probably as good as or better than mine. However, my rig uses a 6AH6 series-tuned Clapp vfo (screen resistor 220,000 ohms and grid resistor 22,000 ohms) doubling in the plate circuit from 160M to 75M. The final is a 1614 operating straight through on 75M.

Construction

Placement of components is not critical; a reference-shift modulator should be laid out according to the same principles that apply to any ordinary modulator.

The reference-shift-modulated rig shown in the photograph was built on an LMB 144 box chassis. This chassis consists of two members which form a rectangular box. The member not shown is mounted under the dash with two bolts. When the rig is in place, tubes face the firewall and controls face the front seat. The rig occupies a space under the dash only 2-½ in. high and 10 in. long.

Components are admittedly crowded. I do not recommend you attempt such compact construction unless you are outstandingly patient.

However, if you do use an LMB 144 box chassis, replace the screws that hold the chassis together. The two 6-32 machine screws supplied are not adequate. Replace them with two no. 8 x ¼-in. sheet-metal screws.

Conclusion

The reference-shift circuit provides a simple and inexpensive means for obtaining high-level plate modulation without transformers and is particularly well adapted for use with low-power rigs. I hope that other experimenters will investigate the possibilities of this circuit; and I enthusiastically welcome correspondence on the subject of variable-plate-current Heising modulation systems. ■

YL MARINE OP'S

[*from page 53*]

ladder. Then she told them to come up one by one into her office and not to be disorderly. The men queued up and everything went smoothly.

At Bombay, India, where the *Union Carrier* had to deliver cargo, Billie met the son of a wealthy Indian chemical manufacturer. He promptly fell in love with Billie and pleaded with her to marry him. Despite the lavish surroundings, which she admits were intriguing, she turned him down.

Billie's last ship was the tanker S.S. *Gulf Banker*. Billie says it was a good one and she spent four and a half years aboard, plying the blue Caribbean with nothing to worry about but eating, sleeping, and standing a watch.

Billie received permission from the owners, the Gulf and South American S.S. Co., to install her own amateur station on the *Gulf Banker*. She had a 25-watt mobile rig with a home-built power supply and a fine three-element rotary beam up on the deck. Everyone aboard ship had a part in building the antenna. She had to turn it by hand, but found it would beam right through the smokestack. An NC-57 receiver completed her station, which she operated under the call W6HBO/MM. Her bulkhead was plastered with QSL cards and hers were much in demand, for Billie apparently is the only American YL ever to have operated maritime mobile!

In the fall of '53 Billie decided to quit the sea when she found her eyes were back to normal. She has always loved animals—she even took a Siamese cat and her three kittens around the world with her on the *Union Carrier*, and sold two of the kittens in Hong Kong. Now Billie is in her second year at the Veterinary School at Alabama Polytechnic Institute and declares she doesn't miss the sea too much —except perhaps at quiz time. Her call now is W4CJV, and she is trustee of the local club station, W4UJJ.

YLs on Scandinavian Ships

Currently there appear to be no girls operating on any ships flying the U.S. flag. However, according to the Radiomarine Corporation of America there are some sixty Scandinavian (Norwegian, Swedish, Danish) ships that carry women radio operators and it is believed that there are a number of Russian vessels which also carry women operators.

Due to the manpower shortage in Norway it has long been the practice to train girls as combination radio operators and pursers. W4EWS/MM tells us that these girls do all the

[*continued next page*]

[*from page 101*]

paper work and stand a somewhat haphazard radio watch which usually consists of opening up two or three times a day with a "QRU?" The paper work load is so heavy that many of them do not even get ashore in some ports. Dick adds that without exception the Norwegian girl operators are generally good looking and have an excellent command of English. Often they wind up married to one of the mates aboard ship and thenceforth sail as a married couple on the same ship. For "safety reasons" and because of the additional secretarial work, amateur radio stations are not permitted to be used by operators on Norwegian merchant ships.

In Norway maritime operators are trained in seven schools of navigation run by the government. Rolf Suleng, chief technical instructor at the Bergen Sjomannsskole reports that every year about 150 candidates from these schools pass their exams for 2nd class radiotelegraph licenses and that some 25% of the pupils are girls.

One Norwegian (OM) maritime operator says that in his personal opinion the girls are just as good as the men with the key, but when it comes to repairing some broken down equipment "most of them lose their heads." He adds this opinion is common among Norwegian men operators, and that the girls often can't even change a fuse or a tube, and in an emergency there have been cases where some mistakes have been made.

This operator recounts a story he heard from a chief engineer who was telling about one time he was on a ship when a fire broke out and they had to abandon the ship. "I was number two to be in the lifeboat," said the engineer, "and do you know who was first?—it was Olge, the woman operator!" In her praise it must be added that after they tried the lifeboat transmitter and it didn't work (supposedly her fault as it was powered by batteries and after four months aboard she had not once looked after them, and didn't even know they were there), she went back on board the ship and stayed at the transmitter as long as possible, calling SOS. A few hours later the crew was all picked up by another vessel.

Canadian YL Marine Operators

Besides their own Norwegian girls there have been many Canadian women working as radio operators on Norwegian ships. One girl, from Eastern Canada, made so many crossings of the Atlantic during World War II that she was decorated by the King of Norway and a book written of her experiences, "The Lucky Mossdale," was a best seller in Norway.

Miss Lylie Smith, also a Canadian girl, has been a radio operator on Norwegian ships for ten years, having started early in 1946. (Prior

to this she was the first girl radio operator to be hired by the Hudson's Bay Fur Trade Co. for their northern posts.) Since being at sea she has spent five years in the far east run—Philippines, Hong Kong, Singapore, Dutch Indies and two trips to Shanghai just after the War. For almost the last five years she's been in a run between the United States West Coast and Europe—France, Belgium, Holland, Germany, England and Norway, with one round-the-world trip from England through the Mediterranean to Australia, to Los Angeles and back to Europe. Currently Lylie is aboard M/S *Siranger* on a run from Los Angeles which goes around South America and back to the West Coast.

Regulations Do Not Prohibit YL Operators

Though there are at present no girls serving as maritime radio operators aboard U.S.-flag ships, Secretary of the Federal Communications Commission, Mary Jane Morris, reports there is no law or regulation of the FCC which would prohibit women from serving as radiotelegraph operators on board ships.

Such operators now also are licensed by the U.S. Coast Guard as radio officers. The Chief of the Merchant Vessel Personnel Division, Office of the Commandant U.S. Coast Guard Hq. in Washington, D.C., reports: "The Coast Guard regulations for licensing and certificating of merchant marine personnel does not contain any restrictions prohibiting women from serving as Radiotelegraph Operators on vessels of the United States."

One former woman maritime operator claims the Unions are against the use of girl operators aboard ships and that the shipping companies, with rare exceptions, hate to make changes. She feels that women could, and should be encouraged to enter this phase of radio, and that it's nothing but "inflated ego" on the part of the male operators which keeps the YLs from making the $500 to $800 per month paid to maritime operators for handling a comparatively light traffic schedule. She adds that quarters these days are strictly private, food is always good, and a woman who does a good job of radio will never be kicked off a well-run ship.

[*Continued on next page*]

In addition to those mentioned in the preceding account, we express our appreciation to the following persons who assisted in providing information for this record of girl marine operators—W7HDS, W6PCN, W3OB, W5CA, K4AJG, W2PFB, W6LYG; Dr. L. S. H. baird, ex-9HO; Y. Kaldal; Fred Howe, ROU; Wm. Simon, VWOA.

[*from page 103*]

So if any of you YLs are interested, there's nothing in the rules and regulations to stop you—but you'd better be *good* at radio, and have a little spark of the pioneer in you, to compete in a field that to date has been almost exclusively masculine. ■

A-C GENERATORS

[*from page 23*]

generator during the hurricane power-outage. If a 2,000 volt plate transformer had been available, for example, the same capacitor effect could have been had with a 0.4 μfd capacitor tied across the 2,000-volt winding. Of course this capacitor would have to be rated at a minimum of 2,000 $\sqrt{2}$ working volts d.c., or 2,820 volts, because it would be subjected to the *peak* a-c voltage. A 0.5 μfd, 3,000 wvdc, capacitor would have done nicely.

The current drawn by the capacitor should not exceed the rated current of the transformer secondary. Thus, $I = E/X_c$ is the general formuation of Ohm's Law with capacitive reactance, where $X_c = \frac{1}{2} \pi f C$, where f is frequency in cycles per second and C is capacitance in Farads. Assuming 60-cycle operation and rearranging the constants, we get the pracitcal formula, $I_c = 0.377 V_s C$, where I_c is the capacitor current in milliamperes, V_s the transformer secondary voltage, and C the capacitor size in μfd. For the case just mentioned a 0.5 μfd capacitor operating at 2,000 volts, 60 cycles, a.c., the current drawn by the capacitor from the transformer secondary will be 377 milliamperes.

Transformer Sources

One possible source of a heavy duty, high voltage transformer for this service might be the local power company. These days, almost every home has lots of electrical appliances, with the result that the old transformers mounted on the light-and-power poles are no longer adequate for present-day loads. Nowadays it is rare to see a pole, transformer of less than 10 kva. capacity. Power companies are rapidly replacing the older and smaller equipment and usually this old equipment is sold for scrap. These transformers nearly all have a dual voltage secondary rated 115/230 volts, and a primary rated 2,300 volts, with an internal center tap which is easily accessible.

The author once bought a 1 kw and a ½ kw unit at the local power company for a very reasonable price. These transformers will be quite adequate for any size induction generator likely to be contemplated by any ham. Again, caution: *DANGER! HIGH VOLTAGE!*

Regulation

The problem of voltage adjustment can be attacked from two angles: First, the actual amount of capacitance connected for excita-

tion may be varied, or: Second, a fixed-excitation capacitor may be connected but the voltage to it may be varied. Either scheme will vary the excitation, and like any other isolated generator, when the excitation is varied, the output voltage will vary. *Figs. 3-b* and *3-c* illustrate the practical application of these schemes.

Tryout

Once the generator is mounted and belted to the gasoline engine (the lawnmower engine will do nicely here, if you can get away with it!) with pulleys arranged so that the generator speed will be in the proper range, and the excitation system is connected, we are ready to fire up the rig. With an a-c voltmeter connected across the terminals, the engine is started and slowly the generator is brought up to speed. If all is well, the voltage will quite suddenly build up to considerably more than the full rated voltage (about half again as much).

This is the tricky phase of the game. If the generator does not build up voltage, keep speeding it up. If it does not build up even at top speed, stop the engine, unbelt the generator, and plug it into house current for a moment. This will reestablish the residual magnetism in the generator iron which causes it to build itself up. Normally, it will build up without difficulty if it is momentarily run up to 300 or 400 rpm above rated speed. Once it has built up, the engine speed is lowered until the voltage is about normal and a 120 volt, 100 watt light bulb is connected to the terminals to furnish a bit of load. This has a stabilizing effect.

If you have included a voltage adjusting scheme in your system, you should now bring the engine up to operating speed and set the voltage to its normal value. Otherwise, voltage may be set by adjusting the generator speed. Once these preliminary settings are made, they should be noted for future reference. You will be amazed at the "cleanness" of this a.c., for it will be almost a pure sine wave, depending on the design of your particular motor.

Output Frequency

The frequency can be checked with an electric clock—if the clock does an hour in approximately 60 minutes, you're set! While maintaining precisely 60 cycles is not required, it will be desirable to err in the direction of higher frequency, for this will be found to produce less heating effect in the transformers of your radio equipment. In other words, your receiver power transformer will run cooler on 115 volts, 70 cycles than it will on 115 volts, 50 cycles.

The author has operated a standard *National NC-183* receiver on a 115 volt, 400

[*continued next page*]

[from page 105]

cycle power supply with quite normal and satisfactory results. So, since a-c generator frequency is directly proportional to generator speed, run your unit a little fast if you cannot be sure of the exact frequency.

An Effective Cure for Gasoline Engine Ignition and Exhaust Noise

Now that we have gone into the power transformer business, we might as well carry it to its logical conclusion. Assuming that *All Hands* are now possessed of a healthy respect for the dangers of high voltage, the following scheme may be employed to produce excellent reduction of the annoyance caused by the ignition system and exhaust noise of our gasoline engine used to power the generator.

The idea is to use two transformers and step up the voltage at the generator, run it at high voltage over a transmission line to the point of use, and then step it back down to 115 or 120 volts for use, thus physically separating the generator from the operating location by a distance sufficiently large to practically eliminate the effects of ignition and exhaust noise. The principle here is that, for a certain amount of power to be transferred over a transmission line with a given loss, if the voltage be doubled, the size of copper wire may be reduced to ¼ the original size.

The Hingham, Mass., Amateur Radio Club has used this scheme for the past two Field Days with very satisfactory results. Last year the generator was located about 500 feet from the nearest operating position. At this distance the exhaust noise of the engine was barely discernible and ignition noise was no problem at all. In fact, the club members were so unaware of the presence of the generator that it ran out of gas several times during the contest for lack of attention! Transmission in this case was at 450 volts along a line strung from tree to tree and hung from glass antenna strain insulators. The average night-time load was approximately 2,500 watts, including the 600-watt electric coffee pot. Due to the dangers and difficulties involved, operation of an amateur power transmission line at voltages in excess of 450 volts is not recommended unless some rather expert advice and guidance can be had.

Summary

We hope this article has whetted the "ham ingenuity" of some of the readers and that it will offer a few ideas for further development. We feel that the description of the induciton generator is justified by the fact that while relatively few hams own a real a-c generator of the common variety, many of them can probably locate an *induction motor*, a suitable transformer and a capacitor. See you this summer, and more power to you. ■

CYCLE 19

[*from page 30*]

morning and early afternoon hours of the late fall, winter and early spring months, and during most of the daylight period of the summer months, minimum skip distances on 20 meters will be as short as a few hundred miles. During such times, relatively near stations will be skipping in with the DX causing considerable QRM. *Figures 5-8* show good examples of the typical change in 20 meter propagation conditions expected during the next few years of maximum solar activity. For both circuits shown, note the early morning openings, followed by a higher LUF, and consequently weaker signals, during the late morning and afternoon hours, with band conditions improving again later in the day and during the evening hours. Note also the greater number of hours that the 20 meter band is open on both circuits as compared to the openings during the period of low sunspot activity.

40 Meters:

As the sunspot numbers increase, the 10, 15 and 20 meter bands open to more areas of the world, open more consistently, and remain open for considerably longer periods of time. The improvements in propagation conditions on these bands during the period of sunspot maximum is quite emphatic. Propagation conditions on the 40 meter band also change considerably during this period, but unlike the changes on the higher frequencies, they do not always result in improved conditions. Throughout minimum period of the sunspot cycle intense ionospheric absorption, between the mid-morning and late evening hours, limits 40 meter propagation to one-hop openings usually not exceeding several hundred miles at best. Ionospheric absorption increases as the sunspot numbers rise, and at the peak of the cycle it is approximately 8 DB more intense than during the years of low sunspot activity. This increase in absorption further weakens signals during the midday period, and also adversely

affects long distance transmissions during the early morning, late afternoon and early evening periods as well. From dawn until sunset, during the years of high solar activity, multi-hop, long distance propagation will generally not be possible on 40 meters. An example of this affect is shown in *Figures, 5-8*. During the winter of 1953-54, the 40 meter band opened between the East Coast and Europe as early as 2 PM EST, while during the winter of 1956-57, the LUF is considerably higher on this circuit, and the band is not expected to open until after 5 PM EST. The 40 meter circuit between the West Coast and Australasia remained open until 8:30 AM PST during the winter of 1953-54, but because of the higher LUF during the period of maximum sunspot activity, this circuit will fade out by 6:30 AM during the winter of 1956-57. On the other hand, *during the hours of darkness,* when ionospheric absorption is minimum, the improved ability of the ionosphere to reflect shortwave signals during the period of peak solar activity is expected to result in an *improvement* in propagation conditions on the 40 meter band. This improvement will be more noticeable on transmission paths following an easterly and westerly direction and less noticeable on north-south paths. For example, *Figure 5* shows that during the winter of 1953-54, the MUF dropped below 7 Mc at 8 PM EST on the East Coast to Europe path, causing the circuit to fail. From *Figure 6* it can be seen that during the winter of 1956-57, the MUF is expected to remain above 7 Mc throughout the evening hours and the 40 meter band is expected to remain open to Europe until approximately 4 AM. Beginning with September, and at least until the spring of 1958, we can expect *very little change* in the 40 meter band during the daylight hours when propagation is limited to one-hop distances of several hundred miles. Multi-hop, long distance propagation is expected to be *somewhat poorer* during the dawn and late afternoon hours because of the increase in ionospheric absorption associated with

[*continued on page 110*]

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the rapid rise in sunspot activity. Somewhat *improved* propagation conditions are expected during the hours of darkness, and the 40 meter band is expected to open more consistently for DX from shortly after sundown and until dawn than it did during the years of lower sunspot activity. This will be especially true for circuits to Europe and parts of the Far East. On longer circuits to Africa, Australasia, Asia and South America, the improvement will not be as noticeable. With a considerable increase expected in both auroral activity and in the occurrence of ionospheric disturbances, transpolar propagation on 40 meters is not expected to be good during the period of peak solar activity.

80 Meters:

Intense daytime absorption limits ionospheric propagation on 80 meters to one-hop, high angle radiation out to distances of about 250 miles or so between the hours shortly following sunrise and the late afternoon period. As the sunspot cycle reaches its maximum, daytime absorption on 80 meters increases by approximately 10 DB. This results in *considerably weaker* daytime signals and a reduction in the distance that can be covered by one-hop skip during the daytime hours. During the summer months of this period, when seasonal absorption is most intense, ionospheric propagation during the mid-day period may not be possible at all, except over very short distances. Solar absorption on 80 meters begins to decrease as the sun goes down, and is minimum during the hours of darkness. During the years of low sunspot activity, multi-hop, long distance propagation was possible to most areas of the world from shortly after sundown until the dawn. Because of the increase in ionospheric absorption, the greater affects of auroral absorption, and the greater occurrence of ionospheric disturbances expected during the next few years, night time propagation conditions will become somewhat *poorer* during the years of peak solar activity, but long distance transmission should still be possible to many areas of the world. For example,

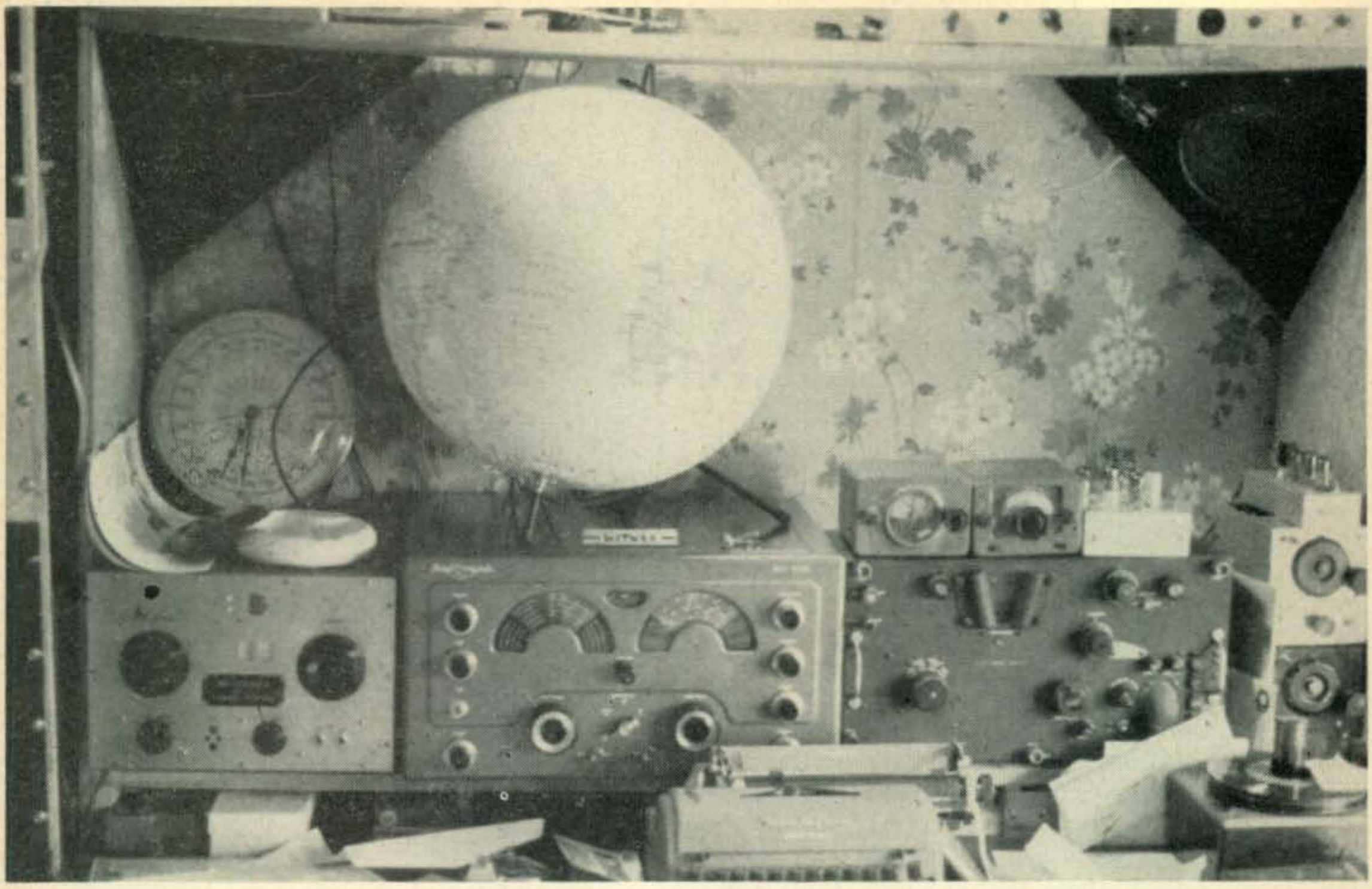
Figure 6 shows that 80 meters is expected to open between the East Coast and Europe between the hours of 11 PM and 3 AM EST during the winter of 1956-57. Since the band lies so near the LUF during this period, we can expect that the atmospheric noise level will be high, and signals relatively weak. This circuit is rather typical of the 80 meter night time propagation expected during the period of peak solar activity. In general long distance propagation should be possible during the night time hours to many areas of the world, but the band will be noisier and signal levels will at times be weak, especially on the longer circuits to Australasia, Africa and South America. Trans-polar propagation is not expected to occur on 80 meters during the period of maximum sunspot activity. Unlike the higher frequency bands, propagation conditions on 80 meters *do not* improve as the sunspot numbers rise, and in fact somewhat poorer conditions are expected during this period.

160 Meters:

Because of the extremely intense daytime absorption at these lower frequencies, skywave propagation is not possible on the 160 meter band during the daylight hours. During this period, 160 meter propagation takes place by way of the *groundwave* component of the radiated signal. Groundwave propagation depends upon the radiated power, conductivity of the earth, and to some extent antenna polarization, but is *independent* of sunspot activity. Under average conditions of ground conductivity, using the maximum power limit for this band, groundwave propagation rarely is possible beyond 50 miles on 160 meters, and is usually considerably less than this. Since groundwave propagation is independent of sunspot activity, no changes in 160 meter daytime propagation conditions are expected during the next few years and daytime communications will be possible only over very short distances.

From shortly before sunset, until shortly after sunrise, when ionospheric absorption has decreased

[*continued on page 113*]



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considerably, skywave propagation is possible on the 160 meter band. Even under ideal conditions of minimum absorption and low static levels, propagation beyond distances of 2000 miles is extremely difficult. Optimum conditions exist on this band during the period of *low* sunspot activity, and as ionospheric absorption increases with the rise in sunspot numbers, night time propagation conditions become *poorer* on 160 meters. Skip, up to distances of a few hundred miles or so, is expected during the night time period of the next few years, but long distance propagation beyond approximately 1500 miles will be extremely poor, with openings possible for only a very small percentage of time. An occasional DX opening to Europe, and possibly other areas of the world, may occur during the late fall, winter and early spring months, but such openings will be fewer, and conditions poorer, than they were during the past few years of lower sunspot activity.

Summary:

During the coming period of peak solar activity, beginning with September, 1956 and lasting through the spring of 1958, ionospheric propagation conditions are expected to *improve considerably* on the 10, 15, and 20 meter amateur bands. Somewhat improved conditions are also expected during the night time hours on the 40 meter band. Skywave propagation conditions are expected to be *somewhat poorer* on the 40 meter band during the daylight hours. *Poorer* skywave propagation conditions are also expected on the 80 and 160 meter amateur bands.

Six Meters

At this point, the hopes of 6 meter enthusiasts probably have already been aroused considerably, and there's good reason for it. After five years of nothing more than an occasional Sporadic-E opening of a thousand miles or so, world-wide DX on 6 meters is now in prospect. With indications that the present sunspot cycle may be the highest ever recorded, long distance F-2 layer propagation conditions on the 6 meter band are expected to be better than ever beginning this fall. Sunspot activity is already high enough for 6 meter openings to have taken place from areas of the world where MUF's are normally somewhat higher than they are

on circuits from the United States. From near Mexico City, XE 1 GE reports almost daily openings to Argentina and Chile during March, 1956. What is believed to be one of the first 6 meter DX openings of the present cycle from the United States took place during the late afternoon of March 28th, when K 6 OBO worked several Argentine stations. On March 24th, 1956, what appears to be a new 6 meter DX record was established when LU 9 MA in Argentina worked JA 6 FR in Japan, approximately 11,000 miles away. *But this is only the beginning* . . . MUF's are expected to rise above 50 Mc. from the United States to almost all areas of the world during the fall of 1956, the winter and spring of 1957, and the fall, winter and spring of 1958, when solar activity is expected to be at peak intensity. Almost daily 6 meter openings are expected to South America between the noon and early evening hours of the fall and spring months, with somewhat fewer openings during the winter months. During the 1947-50 peak of the previous sunspot cycle, a definite tendency was observed for the 6 meter band to open between the United States and South America, following the breakup of severe ionospheric disturbances, or the occurrence of considerable auroral activity. Six meter openings from the eastern and southern areas of the United States to Europe and North Africa (see *Figure 6*), are expected to begin during the late fall months, with peak conditions occurring during the winter months. Some openings should also be possible during the early spring months. On these paths the band is expected to open shortly after sunrise and remain open until noon time. The 6 meter band is expected to open from the western areas of the United States to Japan and the Far East between noon and the early evening hours. Openings to Australasia (Refer to *Figure 8*) from all areas of the United States should also be possible from shortly after noon through the early evening hours of the fall, winter and spring months. The analysis of these few circuits are intended to give an indication of 6 meter propagation conditions during the period of maximum solar activity. The band is expected to open to almost all areas of the world during this period. Six meter cross-country openings, via F-2 propagation, are also expected on paths greater than about 2000 miles, from shortly after noon through the late afternoon hours on at least half the days during the fall, winter and spring months. Ionospheric absorption is usually extremely low on 6 meters and exceptionally strong signal strengths should be possible even for long distance, low power transmissions.

Ionization of the F-2 layer is generally strong enough to support 6 meter propagation in this area of the world only when the smoothed sunspot numbers *rise above 120*. Since 1936, the sunspot cycles have risen above this figure during only four years, 1937, and the period

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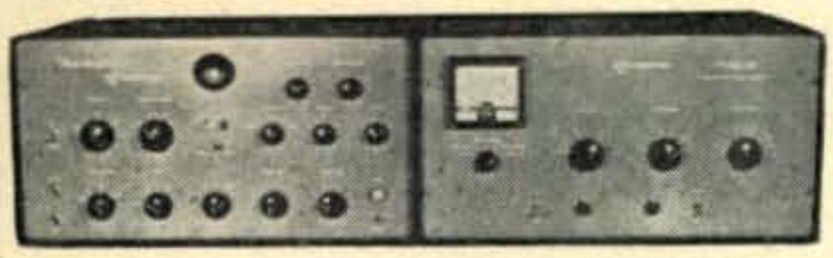

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4852	5880	6700	7575	7850	
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from late 1946 through 1949. On the other hand, during the *sixty-five year period* between 1871 and 1936, the sunspot cycle failed completely to rise above 120, and it is fortunate for the 6 meter enthusiast that amateur radio did not exist during most of this period!!! The world-wide propagation conditions expected on 6 meters during the peak of the present sunspot cycle may truly be of a "once in a lifetime" nature. Bearing in mind the vagaries of the various sunspot cycles, it might be another sixty-five years before sunspot activity will again permit long distance communication on the 6 meter band!!!

VHF

Despite the fact that the peak of the present sunspot cycle may be the highest ever recorded, it is very unlikely that the regular layers of the ionosphere, in this part of the world, will be able to reflect frequencies higher than 60 Mc. The VHF region of the spectrum above 60 Mc. is therefore not *directly* affected by sunspot activity. The rapidly rising curve of solar activity may however have an *indirect* influence on this region of the spectrum, especially in the northern areas of the United States. Auroral activity is expected to increase considerably, both in rate of occurrence and in intensity, as the peak of the cycle is reached. Associated with auroral activity is a type of propagation that can result in radio communication in the VHF range on frequencies as high as, and possibly higher than, 150 Mc. Reflection takes place only when signals are directed at the aurora, preferably at right angles to it, and is believed to be produced by the signal being scattered from the numerous ionized trails and irregularities associated with the visible aurora. Auroral propagation of this nature occurs over distances up to about 1000 miles, and occurs most often in the northern areas of the United States where visible aurora is more likely to be seen. Signals reflected by this mechanism can be identified by the auroral flutter fade superimposed upon the carrier and frequently making radio telephony unintelligible. An example of intense auroral propagation occurred on the 2 meter amateur band during the vivid display of February 25th, 1956. During this period W 1 FZJ in Medford, Mass. worked W 9 GAB, 880 miles away in Beloit, Wis. and W Ø SV, 1200 miles away in St. Cloud, Minn.

Auroral propagation occurs during the late afternoon and evening hours and more frequently during the spring and fall months. It occurs considerably more often during the years of sunspot maximum than during the period of minimum solar activity.

DX TV

During the winter months of the peak sunspot period, 1937-39, television signals on 41-46 Mc. originating in London and Berlin were received at Long Island, N. Y. and as far

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inland as Indiana. During the peak solar period of 1946-1948, the BBC London TV transmissions were again received quite regularly in the eastern United States during the fall, winter and spring months. To actually see and hear the BBC programs required a TV set modified to receive the British 405 line system and AM sound. With the MUF's to most areas of the world expected to rise above 50 Mc. this fall, long distance propagation of television transmissions should again be possible.

Long distance television broadcasts most likely to be received in the United States are those from countries using the American 525 line standard and operating on Channel 2, between 54 and 60 Mc. These would include transmissions from Brazil, Mexico, Puerto Rico, Canada, Cuba, Alaska and possibly Hawaii. Several European television stations transmit in the frequency range between 41 and 55 Mc., and while these transmissions will probably be propagated across the Atlantic on a number of days during the fall, winter and spring months of peak sunspot activity, they can not be seen on an American TV set, except as interference lines, because of the different technical standards and channel allocations used by the European stations. These would include transmissions from England, Germany, Holland, Switzerland and France. For the most part, the long distance reception of television signals will be more of a nuisance than an oddity, since these transmissions will at times interfere with the reception of local TV stations, especially in fringe areas. This in effect will be a sort of TV TVI, for which no doubt, amateurs will inadvertently receive a share of the blame.

QRM

The increase in television QRM is not the only type that can be attributed to the increase in sunspot activity. With the sweet must come some bitter. The considerable improvement in propagation conditions on the 40, 20, 15 and 10 meter bands results in optimum propagation conditions existing simultaneously for both DX and short-skip circuits. Under certain conditions on these bands, stations within distances as short as a few hundred miles and as long as several thousand miles will be skipping in together, resulting in a considerable increase of QRM on each band. The QRM problem is, however, considerably worse for the communication stations in the range 30 to 50 Mc. When the radio spectrum was divided up and allocated to various services at the Atlantic City International Radio Conference of 1947, frequencies between 30 and 50 Mc. were allocated to fixed and mobile services of a "local" nature. These services include Police and Fire Department radio systems, taxi-call services, truck and ambulance dispatching services, etc. At the time of the Conference, the full impact of an exceptionally high sunspot cycle was not yet fully realized, and the general belief was

that frequencies above 30 Mc. *would not* be subject to any significant degree of ionospheric propagation, and allocations were made on a shared channel basis throughout the world. For example, the Police radio system of one city shares a frequency with dozens of other Police radio systems throughout the world. During low sunspot activity, there isn't any skywave propagation in this frequency range and hence there isn't any problem of interference. As the cycle reaches an exceptionally high peak however, the regular layers of the ionosphere reflect frequencies as high as 50 Mc. over great distances and the result is that a police radio call in a European city is received in a police car on a highway in the United States, or a radio equipped taxi in South America suddenly hears a call from a taxi-dispatcher in Florida. During the past winter months newspapers carried several stories of these and similar experiences as a result of radio interference. While some cases may result in rather humorous situations, communication of a vital local nature may be disrupted for several hours at a time. The Federal Communications Commission has recently issued a Public Notice warning all users of the radio spectrum below 50 Mc. that they must expect to have their communications disrupted in this way fairly often during the next few years of peak solar activity.

Finale

At the present time, sunspot activity, as measured by the Zurich smoothed sunspot numbers, is approaching a higher level than has previously been recorded in over two hundred years of observations. In view of the close correlation between the sunspot activity and the characteristics of shortwave propagation through the ionosphere, very unusual radio propagation conditions can be expected during the next few years, and, in particular the ionosphere may be expected to support radio transmission on higher frequencies than ever before. The period ahead of us may truly be one of *"once in a lifetime conditions."*

73, George, W3ASK

Bibliography

The author wishes to give special acknowledgement to the Central Radio Propagation Laboratory of the National Bureau of Standards as the source of most of the basic ionospheric data used in the preparation of this article. The following texts were also found to be of particular assistance as reference sources:

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HAMVENTION

[*from page 55*]

vided while the YL's attended their forum headed by Betty, WN8AXA, at which Jeanette Ebur, W3QPQ, Ruth Rickett, W8LGY, and Helen Smith, W8SPU, were speakers. The entire ladies' program was under the direction of Ruby Rhude, W8MDK.

Examinations in the General and Extra Class grades were a part of the morning program, being made possible by special permission of the Commission. During the afternoon, Novice and Technician license examinations were conducted by a group of volunteer workers, members of the Dayton Club.

Then a break while the banquet ticket holders prepared for the closing treat, enhanced this year by the fine electric organ music of the hams' own Leo, WØGFQ, of WRL fame.

John Willig, W8ACE, past president of DARA and four-time Hamvention general chairman, was toastmaster for the 1956 banquet, and began the evening affair with the invocation.

At the conclusion of the dinner, toastmaster W8ACE presented General Chairman Rudy Plak, W8ZOF, DARA President A. B. Henderson, W8WYL, and their staffs, together with honor guests and many well-known hams attending the convention.

The award for the outstanding amateur of the area serviced by the Hamvention is made at the dinner session, and this year Edmund C. Ryan, W8LRR, of Mansfield, O., was presented the trophy.

With the introduction of John Reinartz, K6BJ, came one of the big thrills of the '56 meeting. His talk was punctuated time and again by bursts of applause, and at the conclusion he was given a thrilling standing ovation.

And the only thing to properly wind up this kind of a meeting came next—of course, the prize drawing, with the major prize going to W8GVE.

To conclude, some interesting facts: 500 prizes with a total value of over $4,000 were distributed; nearly every major manufacturer and distributor of amateur gear was represented at this session, many of whom have signified they'll return in '57; advance registrations for '56 were almost as large as the total of ticket buyers in '51; and the dates for '57 and '58 are set. See you then! ■

OVARA Picnic in Cincy

Sunday, June 10 will see the annual picnic of the Ohio Valley Amateur Radio Association at the Cincinnati Police Firing Range, Evandale, Ohio. No police will be fired that day, so come and bring the family and a basket lunch. Lots of games and prizes. Adults $1, children 25¢.

SIGNAL SEPARATION

[*from page 61*]

received signal, properly peaked, over the same signal with the multiplier switched off. (This we are at a loss to account for, since the high-Q circuit *shunts* the normal i.f. primary winding. However, we have demonstrated the phenomenon to our own satisfaction, time after time.)

(3) Its installation *does* require tearing into the receiver. But, we hasten to add, the "tearing into" is such a simple procedure that the natural respect for and apprehension of a ham for his commercial receiver can be completely ignored. There are two phases of minor surgery required: one to bring out filament and plate supply leads to feed the twin triode in the QF-1; and the other to tie the gadget onto the high side of the input i-f transformer. (We understand there are multipliers on the market which come self-powered, requiring no power from the receiver; too, a separate power supply could be built up to feed filament and B voltages, thus eliminating the first phase of surgery. The second phase must be done, however, in any case.)

With the QF-1, the Heath people supply a length of 3-wire cable, an octal socket, and a plug to match. For a good, permanent-yet-removable installation, it is recommended that a hole be punched, drilled, filed, or cut in the back skirt of the receiver chassis, and the octal socket mounted therein, so that appropriate connections can be made between the socket and the filament, B plus, and ground leads of the receiver supply. This constitutes the first phase of surgery.

The manufacturer also furnishes a length of co-ax cable, together with an RCA type phono plug and jack. The jack should be mounted in a hole drilled in the receiver chassis as close as possible to the plate contact of the mixer tube or the plate terminal of the input i-f transformer, so that a connecting wire may be kept short. After this wire is soldered in place, the input i-f primary should be touched up to bring it back into alignment; the added capacity of the short wire and jack will have detuned it only slightly. This operation completes the second and final phase of the surgery.

With the QF-1 plugged into the receiver, there's a little more to be done yet. The reactance of the co-ax cable has to be tuned out, and the high-Q circuit has to be aligned to center at the middle of the receiver's bandpass. But the manufacturer's instructions are clear, no instruments are required, and the whole job won't take five minutes.

And after that, Voila! Your Peasant's-Special will separate signals like a Super-Meteor, and you won't have to hock the family furniture after all.

Not for a receiver, anyway. . . . ■

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FOR SALE: Leece-Neville 6 volt system 100 amp. alternator, rectifier, voltage regulator with mounting brackets, schematic. Excellent condition, $49.50. Samuel Lieberman, K2IFL, 130-29 228th Street, Laurelton, Queens 13, N. Y. LA 7-1642.

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FOR SALE: Collins KW-1, perfect condition, like new; 110 foot special heavy duty aermotor tower. All offers considered. K2HLB.

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HEATH AR-1 receiver complete with cabinet. Used 6 months, $25.00. Will pay postage. Dale W. Smith, R.D. 1, Athens, Pennsylvania.

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WANTED: TUBES—Boxed and unboxed transmitting, receiving, and special-purpose industrial types such as Klystrons, etc. Also will buy excess test gear, Hickok tube checkers, Variacs, etc. Will pay cash or swap you for choice equipment and tubes. B. N. Gensler, W2LNI, 330 West 11th Street, New York 14, N. Y.

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WANTED: TRANSMITTER capable of 500 to 1 KW input to final, six meters or six and two combination. TVI'd for weak CH. 4 area. Well metered, cabinet or relay rack mounted, include power supplies and audio. Full price, F.O.B. your station, description, circuit and photos first letter, returned upon request. All replies answered. Box 1361, West Palm Beach, Florida.

WANTED: IMMEDIATELY. 75A1 or 75A2, perfect condition. Low price. W9TJG, 3581 S. 47th Street, Milwaukee, Wisconsin.

WANTED: BC-788 400 mc Trans-receiver, I-152 cathode ray indicator, R-101/ARN-6 receiver, AS-313 loop with glass cover, APS-13 Trans-Receiver. Cash or trade. George McCauley, Mineola, New York.

WANTED FOR CASH: Old radio receivers, crystal sets, old wireless parts, catalogs, books. Please write W6MEA, 2341 Ivyland, Arcadia, California.

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WANTED: ALL types of electronic tubes: Broadcast (water and air cooled), transmitting, receiving, Magnetrons, Klystrons, also all kinds of airborne equipment: ADF-70; ARC-1, -3, -4, -12, -15, -27, -33; ARN-6, -7, -12, -14, -18; BC-312, -342, -610E, -788C, -2121; I-152; ID-48; MN-24C, -31C, -36, -42, -53, -58, -61, -85, -97F, -100A; RA-18; TA-18; 17-L3; 51-R, R3; 51V1, etc. Top dollar paid. Write to Robert Sannet, W6REX, 1524 S. Edris Drive, Los Angeles 35, Calif.

EDITORIAL . . . de W2NSD

[*from page 12*]

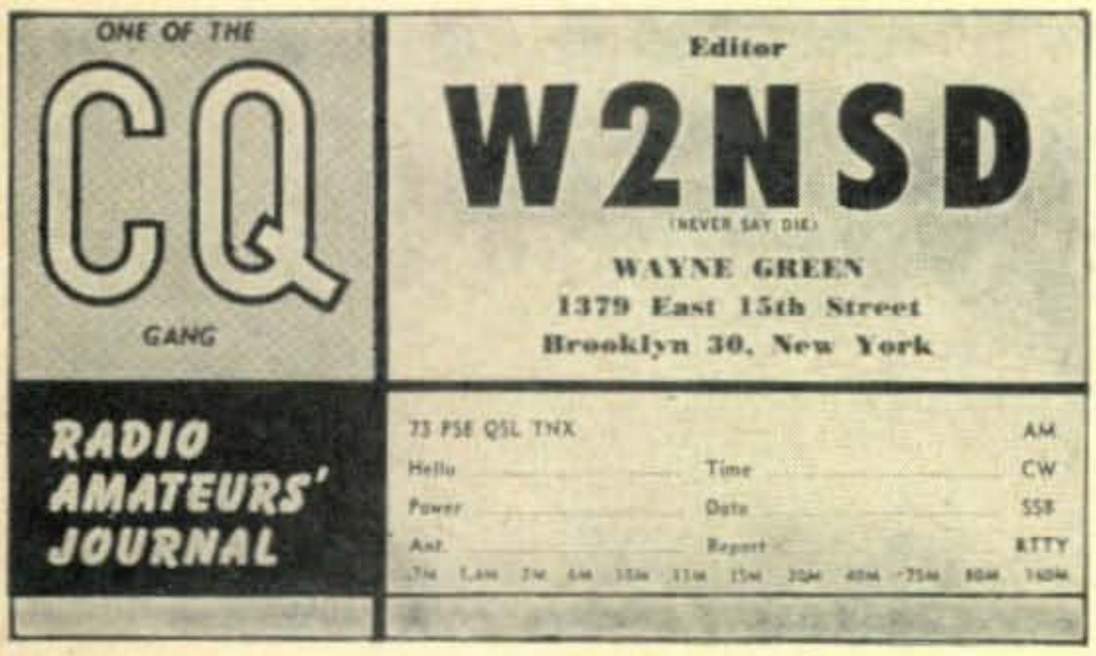
50 kc We'd Better Grab

Used to be that the high end of Twenty was all filled up with DX phone. As a matter of fact, that was where 90% of the phone DX could be found. Then came the axe and we all lost the top half of this segment (14350-14400). Somehow or other most of the DX stations have now set up shop in the lower part of the band and the 14300-14350 segment is slowly getting grassy. Apparently action on this band is imminent, with many people in favor of extending the present U.S. phone band to 14350.

Whatever you think should be done it would be prudent to get into action. As you know, you can send in a petition to the FCC and they will give it every consideration.

The Winner

A few issues back we announced a contest for the best designed *QSL* for the CQ staff.



About three dozen good ideas were submitted. The winner was the above, designed by W4RBI, John W. Moore, Decatur, Georgia. His prize was a Heathkit Signal Generator SG-1.

73 (x 0°), Wayne, W2NSD

SCRATCHI

[*from page 8*]

peres, on acct. I throwing in the sponge.

So you can seeing why Scratchi are a bit sad, Hon. Ed. The good old days of amchoor radio are reely gone. I still think these Yung Fellers could working more stayshuns if they becoming better operators. And, on the other hands, maybe some of the Old Timers could doing the same if they keeping up with all the new fangled ideas.

Anytime your Hon. Mag. starting a mewseum, letting me know, and I'll sending you 1/c xmitter, toob lineup being 53, 76, push-pull 42's.

Respectively yours,
Hashafisti Scratchi

CQ Ad Index

Start making your "dream rig" come true

NC-300TS NC-300 Receiver NC-300CC

with these accessories...

RAZOR-sharp selectivity, reliable frequency stability, and sensitivity of better than 1.5 microvolts are yours in the fabulous NC-300 "dream receiver". If you already own this superb instrument acclaimed by amateurs everywhere as the very finest in its class — you can complete the dream by assembling a rig especially designed for the NC-300. Or if you're considering a new receiver, consider the exceptional flexibility you'll get when you buy the NC-300 with the full set of accessories.

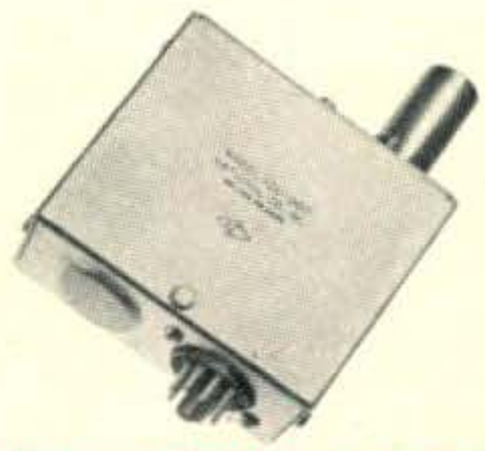
VERSATILITY is combined with attractive appearance and convenience in the NC-300's matching accessories. The plug-in crystal calibrator enables you to check exact frequency at 100 kc intervals for perfect signal reception. With the complete set of crystal converters, you can cover the three extra bandwidths easily — merely by flipping a selector switch, when these units are mounted in the converter cabinet.

START putting your "dream rig" together now, and see how easily and economically you can achieve the ultimate in receiver performance and flexibility.

Write now for your copy of the complete NC-300 book and descriptive literature on the line of accessories. Schematic, test procedure, operating instructions and detailed performance specifications . . . all for 25¢ (for handling and postage). Write to Dept. CQ-6, The National Company.

NC-300TS SPEAKER. Perfectly matched to the receiver in a two-tone grey enamel case with black and silver grille cloth. 8" dia. cone.

NC-300CC CONVERTER CABINET. Attractive matching cabinet for housing the three accessory converters for the 6, 2, and 1¼ meter bands. Eliminates unplugging of converters. Switches all power and IF output leads.



XCU-300 PLUG-IN CRYSTAL CALIBRATOR. Plugs into NC-300 receiver where its operating power is derived. Provides calibrating signal every 100 kc up to 29.7 mc. Is factory pre-set at exactly 100 kc.

CRYSTAL CONVERTERS. When fitted into converter cabinet (above), these converters need not be unplugged or shut off to change bands. Can be used with 3 separate antennas, thus eliminating the need for changing antennas when switching bands. Tube complement: 6BZ7, 6AK5, 6AK5, 6U8. Output frequency: 30–35 mc. Input impedance: 50–70 ohms. Output impedance: 50 ohms. Power required: 6.3 volts at 1.2 amps, 150 volts at 25 ma derived from NC-300 receiver. Shipping weight: 2 lbs.

NC-300 C1 Coverage: 220–225 mc.
Noise figure: 5–7 db.

NC-300 C2 Coverage: 143.5–148.5 mc.
Noise figure: 4–5 db.

NC-300 C6 Coverage: 49.5–54.5 mc.
Noise figure: 3–4 db.

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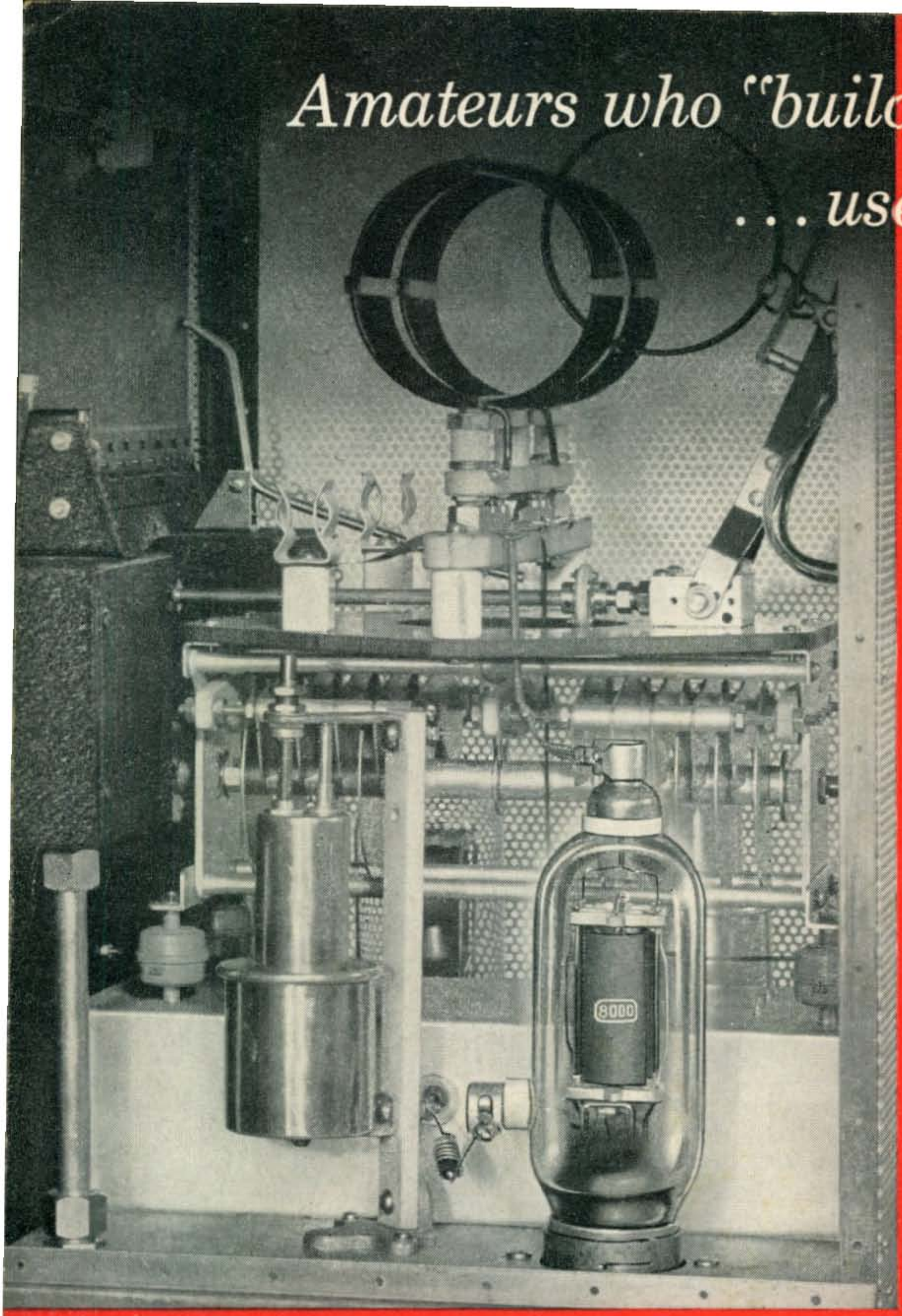

RCA-8000 push-pull 1-KW "final"—fully described in the 14th Edition of the new "RADIO" Handbook. William I. Orr, W6SAI, Editor. Says the Handbook: "A '32-V type' transmitter or a 'Viking II' drives it."

RCA-8000 POWER TRIODE
Up to 750 watts input on CW —at 2500 v on plate. Up to 500 watts input on 'phone— at 2000 v on plate. 360 watts *output* on SSB—with only 4 watts of grid drive.

Designed and assembled right in the "shack", the husky p-p final you see here is rated to take the legal limit—cw or 'phone. Two RCA-8000 power triodes do the job.

Here are just a few reasons why this outstanding tube is a big favorite:

RCA-8000 is a high-perveance type—takes high plate power at reasonable plate voltages. You can drive the tube to full input power—with a grid power of only about 20 watts. And you can operat it at maximum ratings up through the bands t 30 Mc.

Capable of handling nearly 50 watts of plate powe for every tube dollar, RCA-8000 is the answer for th high-power man who prefers triodes. You can get pair—quickly—from any RCA Tube Distributor. Fo technical data on the RCA-8000, write RCA, Com mercial Engineering, Section F15M, Harrison, N.

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