CQ

FEB., 1951

The Radio Amateurs' Journal

35¢

...GO PR

and KNOW WHERE *you are!*

"Looks like you're out of the band, old man. Of course, my receiver may be off but according to my readings you're . . . etc." — "There's a CW sig on you . . . better check your frequency" — "I can't find you since you moved up, Bill. You said you'd move up 25 kaycees but can't hear you there" — "Sorry, Charlie, I am monitoring the spot set for our sked but no soap. Guess you must be on the wrong frequency." — *How much of this kind of talk do you hear these days?* Plenty. Unless you are CRYSTAL CONTROLLED you can never be sure *where* you are. Get set to enjoy yourself this winter. Pick PR Precision CRYSTALS at your jobber's and KNOW WHERE YOU ARE!

20 METERS, Type Z-3, $3.75 • 40, 80 AND 160 METERS, Type Z-2, $2.75

PR Crystals

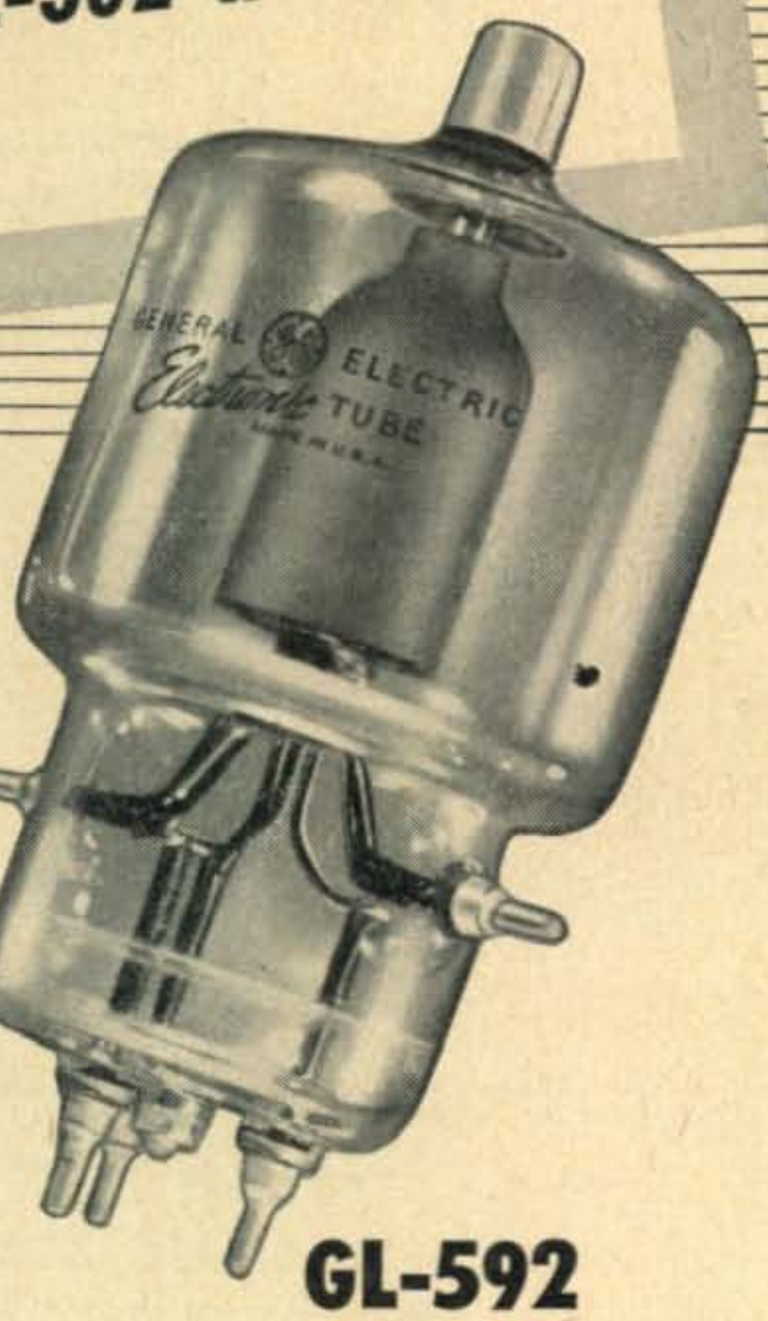
Since PR CRYSTALS 1934

USE PR AND KNOW WHERE YOU ARE

PETERSEN RADIO COMPANY, INC.
2800 W. BROADWAY • COUNCIL BLUFFS, IOWA

HIGH POWER AT 2 METERS

Get it easily, get it cleanly ... with the GL-592 triode!



ROBUST performance—a BIG signal that commands attention—these are one chapter of the GL-592 story. Here's a tube, usable up to 150 mc at full ratings, which will take 700 w phone input. A pair will handle a cool-as-January kilowatt.

Smoothly, cleanly, too, with few parasitics! For along with power goes ease of tube installation and operation. Look at the GL-592 to learn why. Everywhere you'll observe short, low-inductance leads—indispensable in h-f work.

Silver-plated externally for better conductivity, these leads are solidly braced for strength. GL-592's a tough, "can-take-it" tube! The unit seal and anode terminal, with no cemented cap or screw connections—the large cap-seals elsewhere of matching metal and glass—mean extra dependability, long life.

Moreover . . . as always with G-E tube design . . . there's that *something special* which translates into tip-top performance. How can the GL-592's carbon anode dissipate up to 225 w (phone) and 300 w (CW)? Zirconium-coating is the answer. It permits bright-orange temperatures without gassing.

Call at your G-E tube distributor today to inspect this high-power champion of the 2-meter band. Or write *Electronics Department, General Electric Company, Schenectady 5, New York.*

GL-592

Typical Operation, Class C Telephony, ICAS

Filament voltage	10 v
Filament current	5 amp
Plate voltage	2,800 v
current	250 ma
input	700 w
dissipation	225 w
Frequency at max ratings	150 mc

● As is true with other G-E modern h-f transmitting tubes (such as the GL-4D21/4-125A and GL-4-250A/-5D22), the GL-592 attains its high watts-per-dollar value by taking advantage of a small amount of forced-air cooling. An ordinary 8" household fan, or a small furnace-type or other blower, is all you need.

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

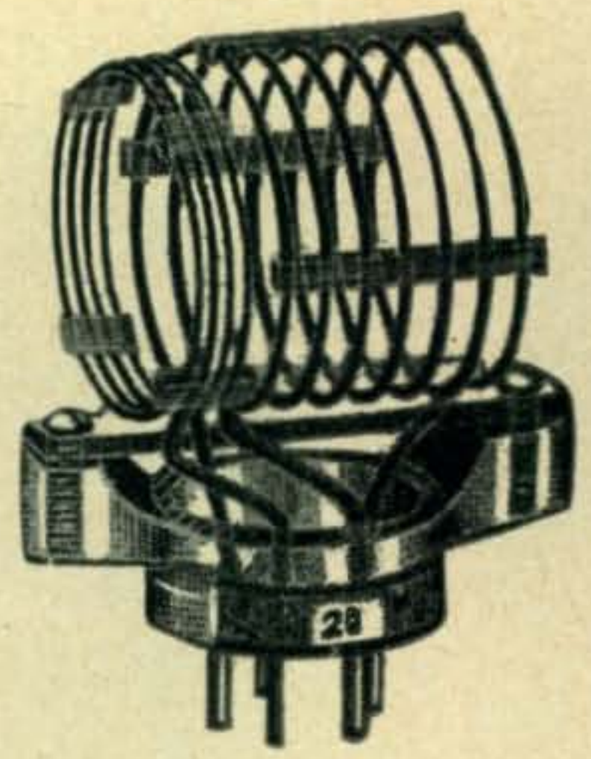
GENERAL ELECTRIC

184-KA1

the COIL that foils breakage

BUD 75 WATT COIL

with Polystyrene Plastic Base



Now Bud gives you improved performance, better appearance and long lasting quality in these 75 watt coils with the new Polystyrene base. Polystyrene has proven superior to porcelain for many reasons, including

1. Far greater resistance to breaking or cracking.
2. The Q of the coil is exceptionally high due to the exrtemely low power factor.
3. Pins are moulded in place—always remain perfectly alligned.
4. Sharp corners eliminated—no danger of chipping.
5. Transparency adds to smooth modern appearance.

Bud 75 watt coils are furnished with fixed or adjustable center links and fixed or adjustable end links. They are air wound, mount into 5-prong tube sockets and can be used on bands from 6 meter to 160 meter. OEP and OCP Coils are designed for use in circuits using Pentode tubes with high output capacity such as 6L6, 807, etc.

Catalog No. Fixed End Link	Catalog No. Fixed Center Link	Catalog No. Adjustable Center Link	Catalog No. Adjustable End Link	Band	Capacity*	Dealer Cost
.....	.....	OLS-160	.....	160 Meter	100 MMFD	$2.28
.....	.....	.....	OES-160	160 Meter	86 MMFD	2.28
OEL-80	OCL-80	OLS-80	OES-80	80 Meter	75 MMFD	1.95
OEL-40	OCL-40	OLS-40	OES-40	40 Meter	52 MMFD	1.92
OEL-20	OCL-20	OLS-20	OES-20	20 Meter	40 MMFD	1.83
OEL-15	OCL-15	OLS-15	OES-15	15 Meter	30 MMFD	1.80
OEL-10	OCL-10	OLS-10	OES-10	10 Meter	25 MMFD	1.74
OEL-6	OCL-6	.....	.....	6 Meter	17 MMFD	1.41
.....	.....	OCP-10	OEP-10	10 Meter	45 MMFD	1.74
.....	.....	OCP-20	OEP-20	20 Meter	50 MMFD	1.83

* Denotes tube plus circuit plus tank plus output coupling capacity required to resonate coil at low frequency end of band.

• SHIELDED • COIL LINKS

These links are made to fit **RLS, VLS,** and **MLS** series of coils. This link will prevent capaciy coupling between the tank coil and the link and would reduce **TVI** by greatly attenuating harmonics. The links can be used on co-ax or balanced lines.

Catalog Number	DESCRIPTION	Dealer Costs
AM-1300	Used wih **RLS** coils (150W)	$1.92
AM-1301	Used with **VLS** coils (500W)	2.19
AM-1302	Used with **MLS** coils (Kilowatt)	2.61

Bud products include coils, condensers, R.F. chokes, sheet metal ware, etc. See the complete Bud line at your local distributors.

• ADD-A-LINK

When the circuit that you are using requires a different number of turns on the coil link than is furnished with the standard coil, the links listed below can be used to replace the standard link.

Cat. No.	Used With	No. of Turns	Dealer Cost
AM-1303	RLS	3½	$ .52
AM-1304	RLS	4½	.54
AM-1305	RLS	5½	.63
AM-1307	VLS	3½	.52
AM-1308	VLS	4½	.54
AM-1309	VLS	5½	.63
AM-1310	VLS	6½	.72
AM-1311	MLS	3½	.81
AM-1312	MLS	4½	.96
AM-1313	MLS	5½	1.05
AM-1314	MLS	6½	1.14

BUD RADIO, INC.

BUD

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CQ

VOL. 7, NO. 2

CONTENTS

FEB. 1951

OUR COVER

When the winter DX starts to roll in at W4BRB, the 20 meter rotary comes off the mast and the 40 meter ground plane goes up. A horizontal dipole for 80 meters runs to another mast, and gets a workout the year 'round. See page 20 for the story on W4-BRB's specialty - 80 meter DX.

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Feenix, Ariz.

Deer Hon. Ed:

Scratchi are about to having big hee-haw on radio expert from California, who are coming over to telling me why something can't work. The big hee-haw is on acct. it is still working, although not even Scratchi himself are figuring out how come. But I are getting the horse ahead of the story, so I better backing up and starting from scratching.

Several weeks ago I deciding to ride around Brother Itchi's ranch, to getting acquainted with its farthest away parts, so I saddling up nice gentle horse, packing a lunch, and taking along my battery-powered BC set. Reason for taking latter item is not only so can hear cupple favorite soap operas, but also if Brother Itchi wanting me he can turning my rig on (which are covering hole BC band like a tent) and calling me in case of emergency.

I are spending most of day riding around, dodging caktus, keeping out of sun by staying under shade of big hat I wearing, and are even finding small tree to having lunch under, which are sharing with one gopher and several lizards. Later in afternoon are turning radio on for programs, and continuing ride. First thing I knowing are finding that radio programs getting louder and louder. I keep turning down volume control, and finally have it turned all the way back, but stations are booming in like nobodies business. This are making Scratchi most curious, so are doing some investigating.

By riding around are finding that in one spot all radio stations, even those from California, are coming in so loud that the speaker cone are in danger of being broken. Even when opening set and disconnecting antenna, stations still so loud they distorting and everything.

Riding back to ranch, Scratchi get to thinking, and by time arriving home for dinner, plans are all made. Next morning I getting into jeep, after loading it with lots of radio equipment, and quick driving out to my magic place. Using emergency power gas generator are firing up my regular a-c receiver and are finding that battery receiver are telling the truth — the signals are fantastiely loud. So, next are driving sticks of wood into ground, and running lots of wire around. First thng you know I have about five antennas strung around the desert, all in place where real loud signals are coming in.

Each antenna are a certain length, as are making them half-wave long on frequency of a certain broadcast station. Now I should be having

(Continued on page 55)

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For Variety... Dependability ...and Value!

SUPERIOR POWERSTATS

Smooth, efficient, voltage control, 0-135 volts output from 115 volt AC line. Models also for 230 volt input. Write for free literature. Models for table and panel mounting.

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116, 7.5 amps, table mtg.	23.00
116U, 7.5 amps, panel mtg.	18.00
1126, 15 amps	46.00
1156, 45 amps	118.00

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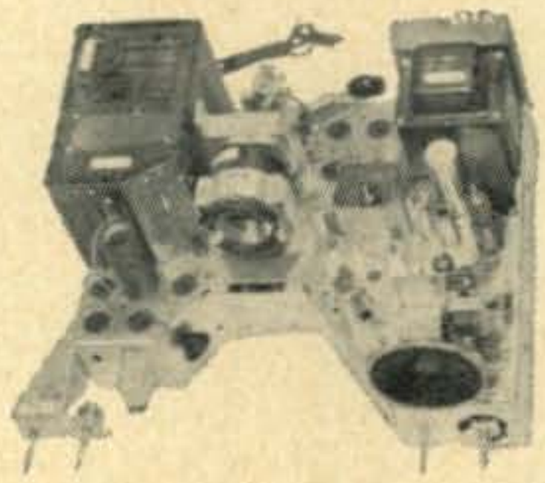

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1930T Chassis—With Push-Pull Audio	**$199.50**
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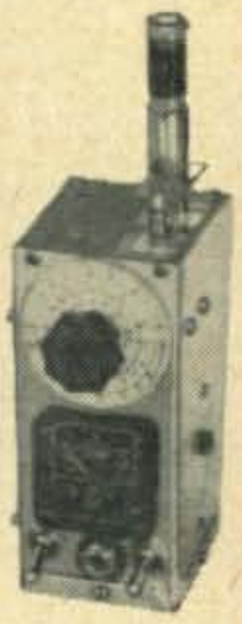

The most valuable piece of test equipment in the ham shack is the Grid Dipper. Build one with this kit and save countless hours in building, improving and de-bugging your rig. The GDO Kit builds an exact duplicate of the "Grid Dipper", now with regeneration. Includes everything from the special handy case permitting one-hand operation down to a complete application and instruction book. With tube and internal power supply, range 3 Mc to 250 Mc in 6 steps, size 5½" x 2⅜" x 3". **Complete Kit $29.50**

Eldico TVT-62 low-pass filter, kit	$7.99
Wired and tested	$10.99
Eldico TVR-300 for Twinex or TVR-62 for co-ax, high-pass filter, kit	$1.98
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Copper mesh shielding, 36" wide, min. order 6 sq. ft., per sq. ft. plus $.50 per order for packing.	$.85
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MD-40-P, same with power sup.	$44.95
MD-100, 100-watt mod. kit	$49.95
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Now you can be sure of maximum antenna performance with this Antennascope based on design of W. M. Scherer, W2AEF published in CQ, September. Used with a Grid-Dipper, you can measure radiation resistance, resonant frequency of antenna, line impedance, receiver input impedance, feedline s.w.r. Reduce TVI, increase xmttr efficiency, improve receiver performance, by knowing and measuring your rig. Eldico Antennascope is available in kit form or completely wired and tested.

Kit form $24.95;
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NOTE: In view of the rapidly changing price situation in both complete units and components we wish to emphasize that all prices are subject to change without notice, and are Net, F.O.B., N.Y.C.

★ ★ Letters ★ ★

Bread Cast on the Waters?

The General Theological Seminary
Chelsea Sq., New York 11, N.Y.

Editor, *CQ*:

A few months ago, I was looking over my "extra parts" shelves, and an idea occurred to me. Most of this material I would never use. All kinds of junk, old magazines, ancient power transformers, call books from 1947, '48 and '49. Was there, somewhere, a ham who was in need, who would put this stuff to good use? In the June (or was it July?) 1950 "CQ" I ran an ad: Used magazines and Call Books to any DX willing to pay the postage costs.

I wish you could have seen the letters I got. You wouldn't believe it. They came from all corners of the globe, from nearly every continent. They asked all kinds of questions: for Call Books, swap magazines, CQ and QST; for old chassis, for war surplus. They did everything but ask for O1A's by number.

I had no idea there was such need, such dollar shortage, over there. I sent all I had and some good stuff besides. And the letters and gifts that came back were something to touch the hardest heart.

It occurred to me that there must be other hams with idle gear. Wouldn't you like to lend a hand to a guy who was really trying hard to get along with ten watts to PP 47's? Call it investment in DX QSL's, call it investment in international friendship, charge it up to the ham fraternity, call it anything you like, but if you really want to do a good deed and lend a hand to some swell Joes, try giving away some of that gear you're not using right now. It has occurred to me that perhaps some club would be willing to set up an agency where old gear and books could be donated, to be forwarded on request to DX hams. What say, OM's?

Charles L. Wood, W2VMX/2

On the BC-221

151 8th Ave., NYC 11

Editor, CQ:

In the December issue, there are some mild misconceptions in the piece on measuring frequency with the BC-221. So far, I haven't seen one of them that actually has "2.5 dial divisions per kc." I have calibrated one of mine rather carefully, using high harmonics in the 20 to 30 mc band, against a frequency standard and multi-vibrator unit, checked and monitored against WWV. From 3950 kc to 4000, mine runs 2.094 divisions per kc. Call that 2.1, and each tenth of a division is just a mite shy of being 46 cycles, instead of the 40 mentioned in the article. When using the eighth harmonic, this can run into quite an error, if a fellow happens onto a setting well removed from a calibration point.

Even at 3500 to 3550 kc, this one only runs 2.158 divisions per kc, which we can call 2.16 without causing a tremor to shudder the foundations of the Bureau of Standards. Actually, the BC-221s I have shaken hands with show a fairly smooth taper from almost exactly 2.5 divisions per kc at 2000 kc, to about 2.1 divisions per kc at 4000 kc.

(Continued on page 44)

SEE LEO FIRST . . . for National RECEIVERS

Brand New NATIONAL SW-54 RECEIVER

Here is National's latest engineering triumph . . . the most compact general coverage receiver ever built. Entire frequency range covers from 547 kc. to 30 mc. voice, music or code. Sensitive and selective superhet circuit, new miniature tubes make possible new sensitivity and performance. Unique slide rule general coverage dial is adjustable to assure complete logging accuracy. Police, foreign, amateur and ship bands are clearly marked.

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$49.95

LOW DOWN PAYMENTS

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Built-in power supply on separate chassis. Front panel oscillator compensation control. 20 to 1 precision gear drive. Provisions for NBFM adapter. Push-pull audio output. Speaker matching transformer built into receiver with 8 and 500/600 ohm output terminals. Packed with important new features.

$359.00 (less speaker)

HRO—TS, 10" PM Speaker in matching cabinet $16.00

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SELECT-O-JET 3	24.95
NC-183 (WITH MATCHING SPEAKER)	295.00
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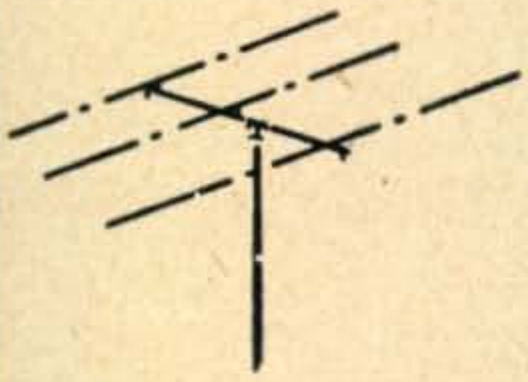
(MATCHING SPEAKER)	11.00

NOW YOU CAN AFFORD TO OWN A BEAM

10 METER BEAM



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Narrow spaced **$15.95**

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160 METER

1.8 to 1.825 — 1.875 to 1.9

1.9 to 1.925 — 1.925 to 2.0

$1.25 ea.

80-40 METER

3.5 to 4.0 — 7.0 to 7.4

98¢ ea.

Please state frequency. We will come as close as possible.

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Most compact flexible unit of its type ever offered. Ideal for semi-portable or emergency use— for vacations or for new amateurs. A complete one-package station.

10 Watt input crystal controlled transmitter for 80, 40, 20, or 11/10 Meters. Pi network output for matching wide range of antenna impedances. Built in keying relay. Socket for plate meter.

Receiver substantially same as famous S-38B. Transmitting section uses separate crystal oscillator plus receiver output tube.

NEW COMPLETE TRANSMITTER-RECEIVER

SR-75 $89.95

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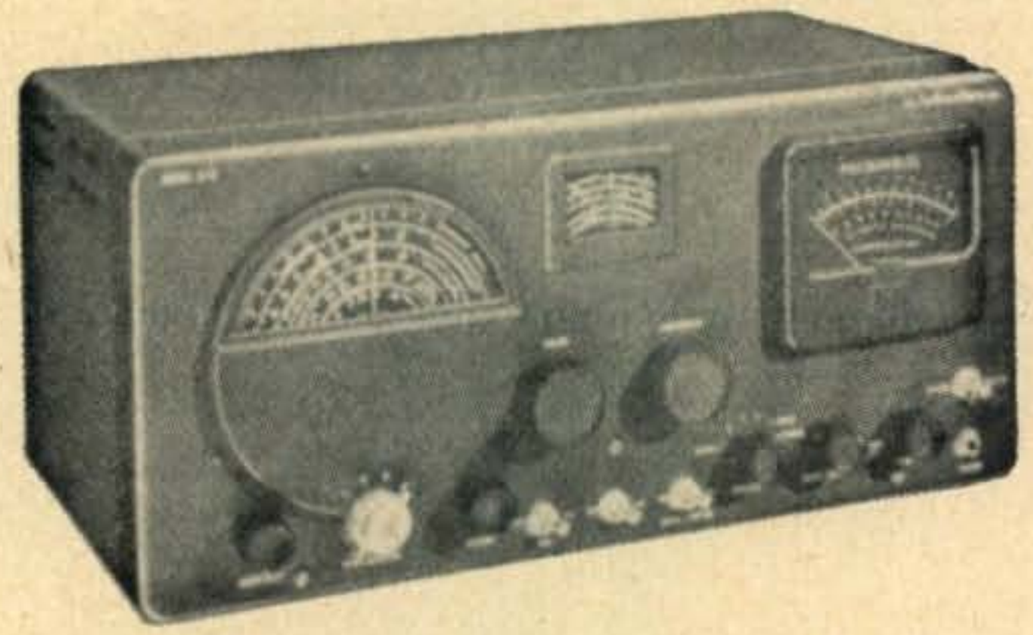
Hallicrafters precision instruments have been sold in 89 countries, used by 33 governments. They are remembered by veterans, prized by experts, and preferred by radio amateurs throughout the world who want a radio that is all radio.



S-76 $169.50

NEW DUAL-CONVERSION RECEIVER WITH 50-KC I-F

You've read about it, you've heard about it, now here it is—with the most wanted features, at the lowest possible price.

DUAL CONVERSION (1650 Kc and 50 Kc)—more usable selectivity than the best crystal.

GIANT 4-in. "S" METER—calibrated in microvolts and "S" units.

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COMPLETE TUBE DATA AVAILABLE FREE

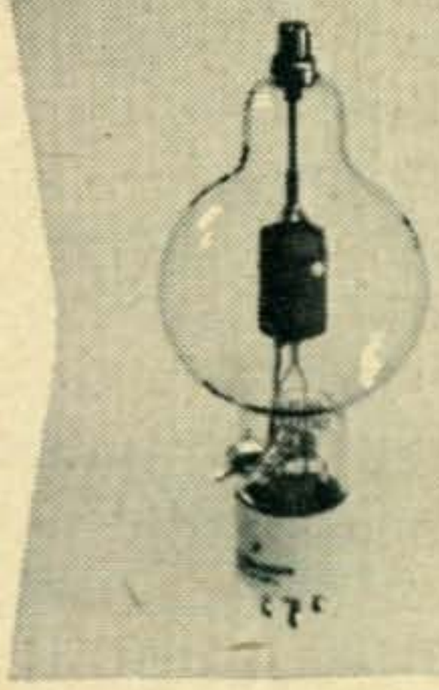
4-65A This small tetrode operates well at plate voltages from 600 to 3000 volts. At 2000 volts one tube will handle up to 300 watts input for CW or 240 watts for phone. Driving power is 2 to 3 watts.

4-125A The tube that made transmitting screen-grid tubes popular. The 4-125A will take a plate input of 500 watts for CW or 380 watts for phone. Driving power is less than 2 watts. A pair of these tubes makes an ideal high-power phone or CW final.

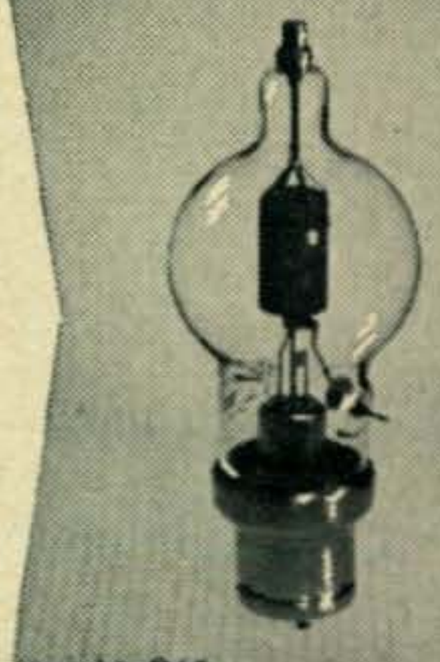
4-250A A pair of 4-250A tetrodes will easily handle a KW for phone. In CW service, one tube will take a KW input. Driving power is only 2 to 3 watts per tube. As modulators, a pair will deliver as much as 750 watts of audio with zero driving power.

4-400A For really deluxe equipment use the 4-400A tetrode. One tube can be run at a KW input for CW or 880 watts for phone. Low drive, too, of course, less than 5 watts. Available as an accessory is an air-system socket for simplified cooling.

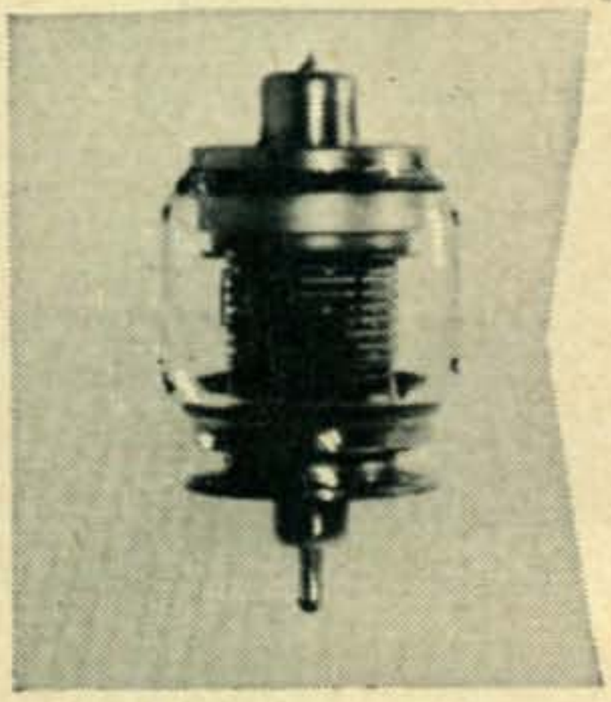
4X150A For VHF or UHF work, use the 4X150A. This small, forced-air cooled external anode tetrode will handle 250 watts input on the ultra-highs with a driving power of but a few watts. The 4X150A operates well on plate voltages as low as 400 or 500 volts, making it ideal for portable or mobile equipment with a wallop.



100T The "old reliable" 100T, improved throughout the years, is still top choice of amateurs who prefer a triode. Will take a plate input of 500 watts for CW or 350 watts for phone. As modulators, a pair will deliver 420 watts of audio.



250T A tried, proven, and continually improved 250-watt triode. The ideal triode for 1 KW CW input. Will handle 825 watts input on phone. With plate voltage as low as 1500 volts, a pair will modulate all the law allows.



VVC60-20 This is but one type in the Eimac line of variable and fixed vacuum capacitors for plate tank circuits. The VVC60-20 is variable over a range of 10 mmfd to 60 mmfd. Maximum r-f voltage is 20 kv.

EITEL-McCULLOUGH, INC.

San Bruno, California

Export Agents: Frazar & Hansen, 301 Clay St., San Francisco, California

ZERO BIAS

EDITORIAL

FLASH!

FCC Announces Amateur Frequencies Reserved for Civil Defense Communications

On January 17, the FCC announced that the following frequencies have been exempted from possible military use, and will be retained specifically for amateur emergency communications if circumstances require release of amateur frequencies to the Armed Forces:

Present bands between 1800 and 2000 kc.

3500 to 3510 kc, and 3990 to 4000 kc.

28.55 to 28.75 mc., and 29.45 to 29.65 mc.

50.35 to 50.75 mc., and 53.35 to 53.75 mc

145.17 to 145.71 mc., and 146.79 to 147.33 mc.

220 to 225 mc.

This notice does not affect present amateur regulations. It is intended as a guide for Civil Defense planning, and as such is serves immediately to end much of the present confusion. It certifies our place in the Civil Defense picture, and squashes such rumors as "the Air Force is sure to take the entire 2 meter band," etc. Since it is intended solely as a planning guide, it does not cover the circumstances under which these frequencies may be used and does not discuss the possibility of routine QSO's on any of these frequencies.

ITV

Our recent editorials on radiation of 15.75 kc. harmonics from TV sets has resulted in more reader correspondence than we can handle. Since the problem seems to be so widespread, it looks like a good idea to list some initial findings here, rather than hold things up until an article can be prepared.

Several manufacturers have traced the effect (in their models) to coupling through the heater supply, through which the interference reaches the AC line. In production, the cure is proper heater by-passing; the obvious remedy for such a set already in service is a line filter.

ITV also can and does occur due to coupling between the TV receiver antenna and a poorly shielded deflection system. A high-pass filter in the receiver antenna line ususally is a definite help in such cases. (This is a setup for Scratchi. Can't you see him running super power to overload his neighbor's TV sets, to force them to add high pass filters to cut down the ITV he gets from them?!)

Nostalgia

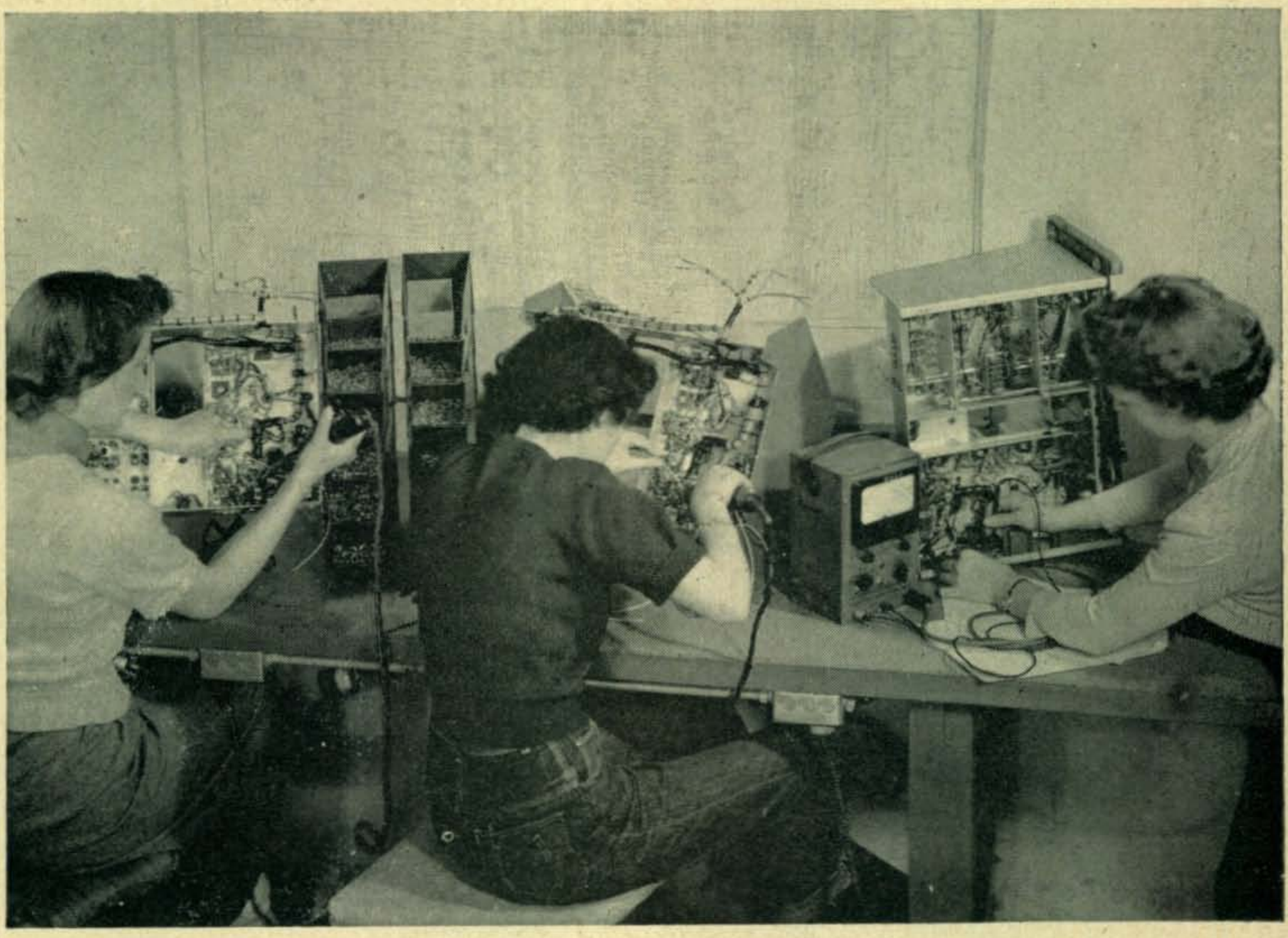
Them as longs for the good old days of ham radio have a chance to sample some of the old time flavor via the 160 meter DX tests now being conducted by G6FO and W1BB. These tests are run on alternate Sunday mornings until the middle of March, between the hours of 0500 and 0800 GMT. This is being written before the first test period, but the Trans-Atlantic path has already been broken down by EK1AO and a number of G's. EK1AO was S6 to 7 on the East Coast on January 7, and on the same morning G6GM worked as far inland as W8 and was heard in W9. Signals peak up just before sun-up on the other side; even if you're not transmitting in the tests, you might take a listen to get an idea of what it might have been like in the 200 meter days.

Oops - - - Sorry!

It's nice to be made aware of the eagerness with which the gang awaits CQ, but being late with an issue is an embarrassing way to find it out.

What happened is that the railway strike, the usual holiday shut-downs and present procurement difficulties combined to prevent delivery of our usual paper supply. As a result, we ran out of paper early during our run, and consequently lost our turn on the presses. It's a goshawful feeling, and we hope we never get caught like this again.

—Gene, W2ESO



The best final test of all

Early last November a limited run of 75A-2 receivers went through the planned procedures for assembly, inspection, test, packaging, and shipment to distributors for delivery to amateurs.

Production was then temporarily halted, to await the findings of the most revealing final test a receiver can have — for the condition in which it was received, and its operation in the hands of customers.

Minor bugs were uncovered, and have been eliminated for present and future owners.

The assembly line rolls again in January, 1951, and will be in full production in February.

You who have ordered will soon have your Collins 75A-2's.

FOR THE BEST IN AMATEUR RADIO, IT'S . . .

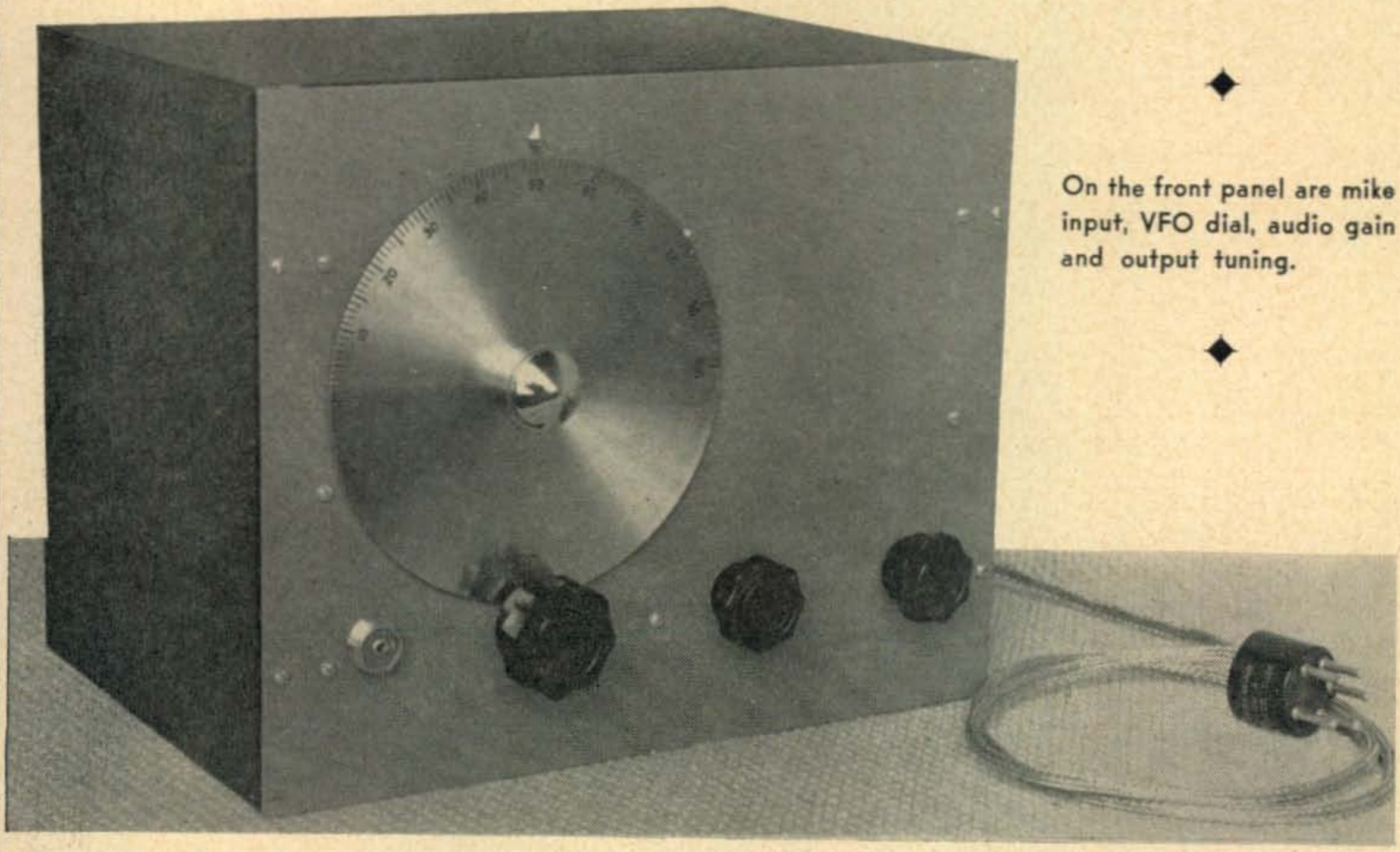
COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 West 42nd Street, NEW YORK 18 **2700 West Olive Avenue, BURBANK**

A TVI-PROOF 10 METER EXCITER

JOHN F. CLEMENS, W9ERN*



On the front panel are mike input, VFO dial, audio gain and output tuning.

The Second Place Winner in CQ's Prize Contest, W9ERN's exciter features operation of the oscillator on the 10-meter band, to simplify TVI problems.

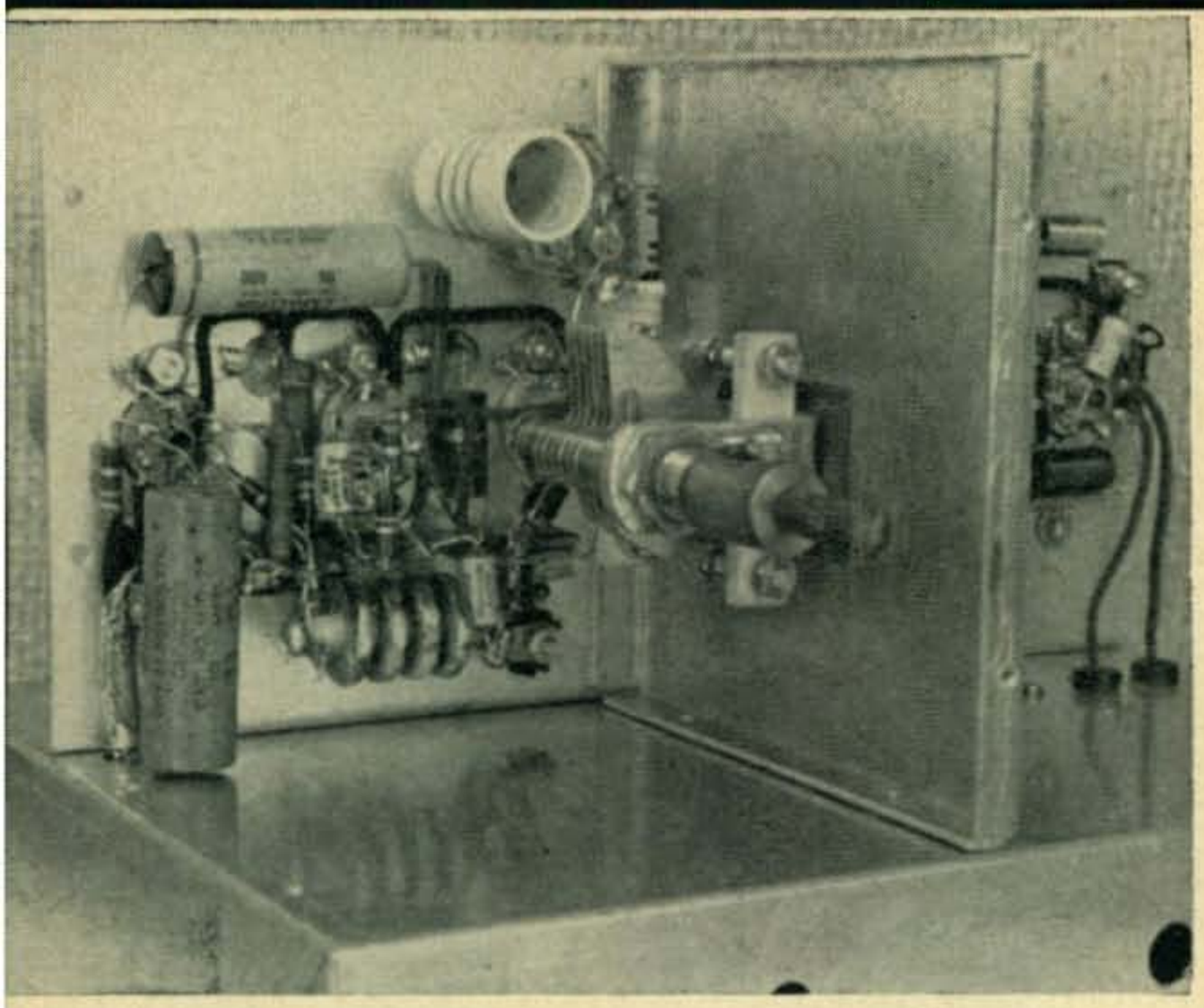
FOREMOST AMONG THE PROBLEMS which challenge the advance of the art of amateur radio is the elimination of interference to television broadcasting. Unfortunately, the eye is not so tolerant with respect to interference and an extremely small amount of interference will seriously degrade television reception. Amateur transmitters which are well-behaved in other respects are almost universally guilty of objectionable radiations unless special precautions have been taken in their construction. A near revolution in transmitter design is being forced upon hams in the attempt to eliminate TVI, but the new high standards are not entirely without reward to the amateur. This is true because measures taken to reduce TVI are of benefit to the quality of the transmitted signal. For instance, an antenna system which reduces TVI by eliminating transmission line radiation also puts all of the available power into the antenna where it will be most effective for communication.

The principle objective in the design of the exciter to be described was freedom from TVI and BCI. To approach this problem, the interference situation must be analyzed and each type of interference eliminated.

TVI Considerations

All TVI cases and most BCI cases can be put into one or more of the following categories: 1) Harmonic radiation from the transmitter which falls into a television channel; 2) Intermediate-frequency amplifier interference occurring where a harmonic of the transmitter falls in the receiver I.F. channel, usually near 21 MC; 3) Fundamental transmitter signal overloading the TV

*612 College Hwy., Evansville, Ind.



Inside Oscillator Compartment: The VFO tuning condenser frame is instulated from ground except for a single wire which grounds the rotor to the rear wall to prevent the flow of tank current in the shield.

receiver; 4) Direct pickup in the video amplifier or the receiver which is sensitive to signals up to about 4 MC.; 5) Generation of spurious signals in the TV channel due to transmitter exciting a non-linear conductor near the TV antenna; 6) R. F. pickup and rectification in the receiver audio circuits. This last item is the cause of a common BCI situation where 10-meter AM phone signals are heard across the entire dial of a conventional AC-DC midget receiver.

Only the first two of these categories are caused by malfunction in the transmitter, but it is nevertheless possible to suppress some of the other types of interference at the transmitter.

To deal with each of the above types of interference the following measures are effective, respectively:

1) Reduction of harmonic generation by operation of transmitter stages class A. Use of low-pass filters. Complete shielding.

2) Reduction of harmonics which fall near 21 MC by steps above or by a shift of the fundamental frequency, e.g., to ten meters.

3) High pass filter at the TV receiver antenna terminals.

4) Removal of all modulated components from the 160 and 80 meter bands. Use of SSSC.

5) Eliminate the non-linear element. If this is not possible, reposition the transmitting and/or TV antenna.

6) Use of FM rather than AM. These points have been followed in the equipment pictured and all details will be given. The results have been well worth the effort involved. All succeeding power amplifiers must be likewise treated to realize the benefits of TVI-proofing the exciter.

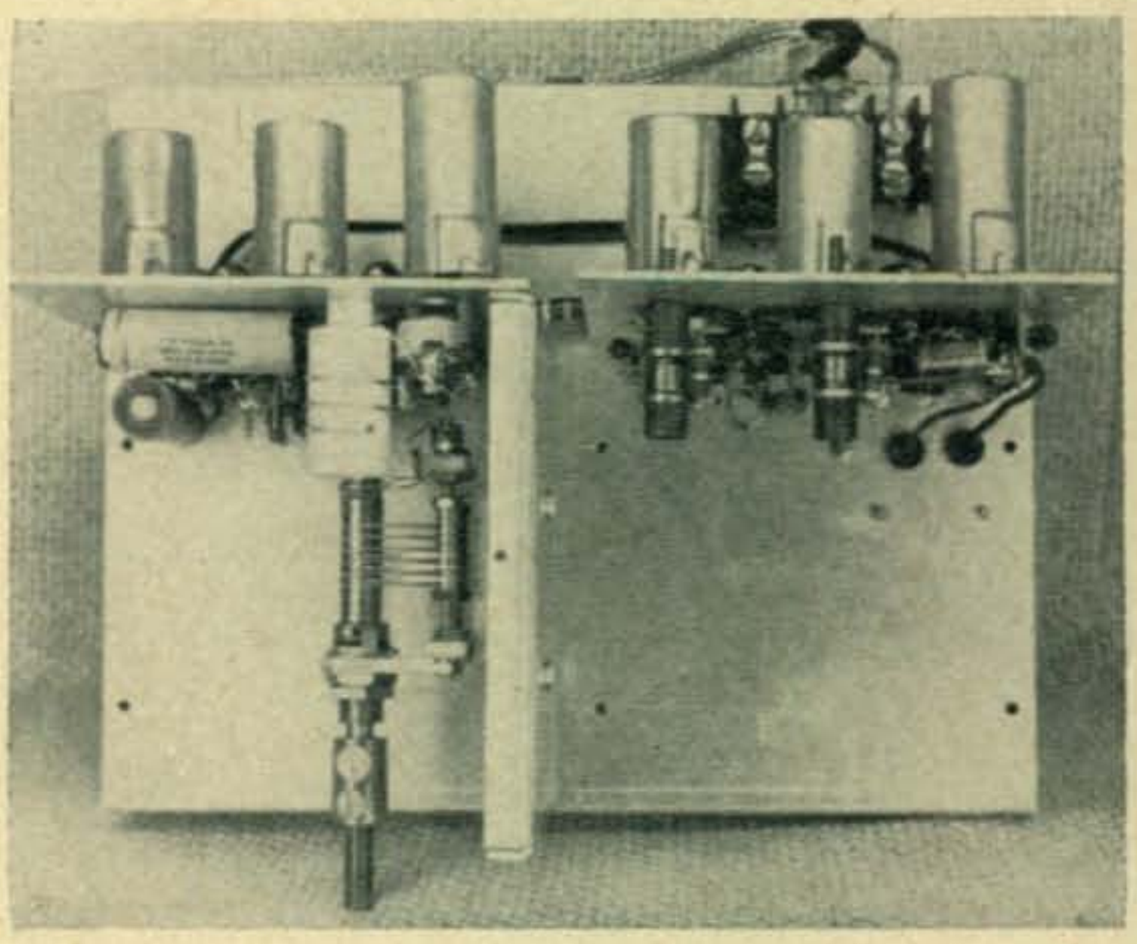
Circuitry and Construction

The most radical departure from conventional design is the complete absence of frequency multipliers in the exciter. The unit is strictly a one-band piece of equipment for 10 meters; similar units for other bands are planned and partially completed. This system of providing a separate exciter for each band has certain advantages. For instance, a 40 meter exciter can include special keying and break-in circuits, while the 80 meter exciter may include SSSC. The investment in each exciter need not be great, especially since a common power supply may be used.

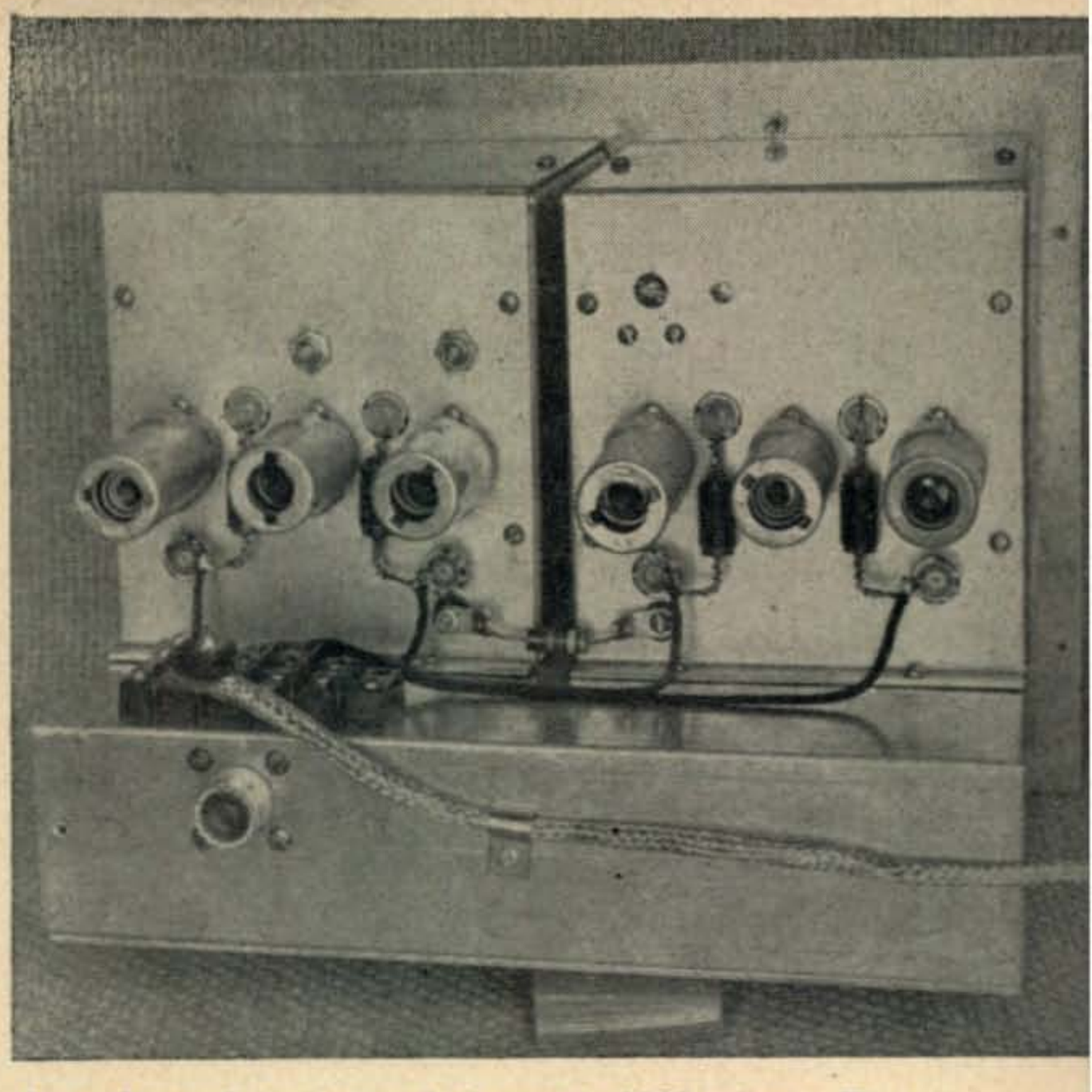
The elimination of frequency multipliers makes possible the operation of all exciter stages as low-distortion class A amplifiers and thereby tremendously reduces harmonic generation. Also, since the VFO operates on the 30 MC band, the harmonic frequencies are widely spaced so that there is no possibility of TVI in a channel not some multiple of the transmitter output frequency. This same feature prevents interference of the types in the second and third categories above since no frequencies are generated in the spectrum below 30 MC.

Double shielding of all the exciter circuits is accomplished by enclosing the wiring inside either of the two compartments above the chassis or under the chassis and then mounting the entire unit inside a standard 7x8x10 utility box. The 7x9x2 aluminum chassis has a bottom cover of aluminum. The power cable is shielded and coax cable is used for the output.

Filters are used in all the power leads into the exciter compartments. The combination of shielding and filtering not only prevents harmonic radiation but also enhances the frequency stability. Note that the two compartments, one containing the audio and oscillator circuits, and the other the three r.f. amplifier stages, are completely separate. A common wall or baffle between two compartments should be avoided for minimum interstage coupling. In the output coax line, an m-derived low pass filter is installed. This filter has a cutoff frequency of 36 MC and a frequency of maximum attenuation of 58 MC. It was necessary to depart slightly from the calculated values of capacity in the filter to use standard components; the principle effect of this change is to modify slightly the input im-



Top View:
The circuit progresses from speech amplifier on the left to power output stage on the right.

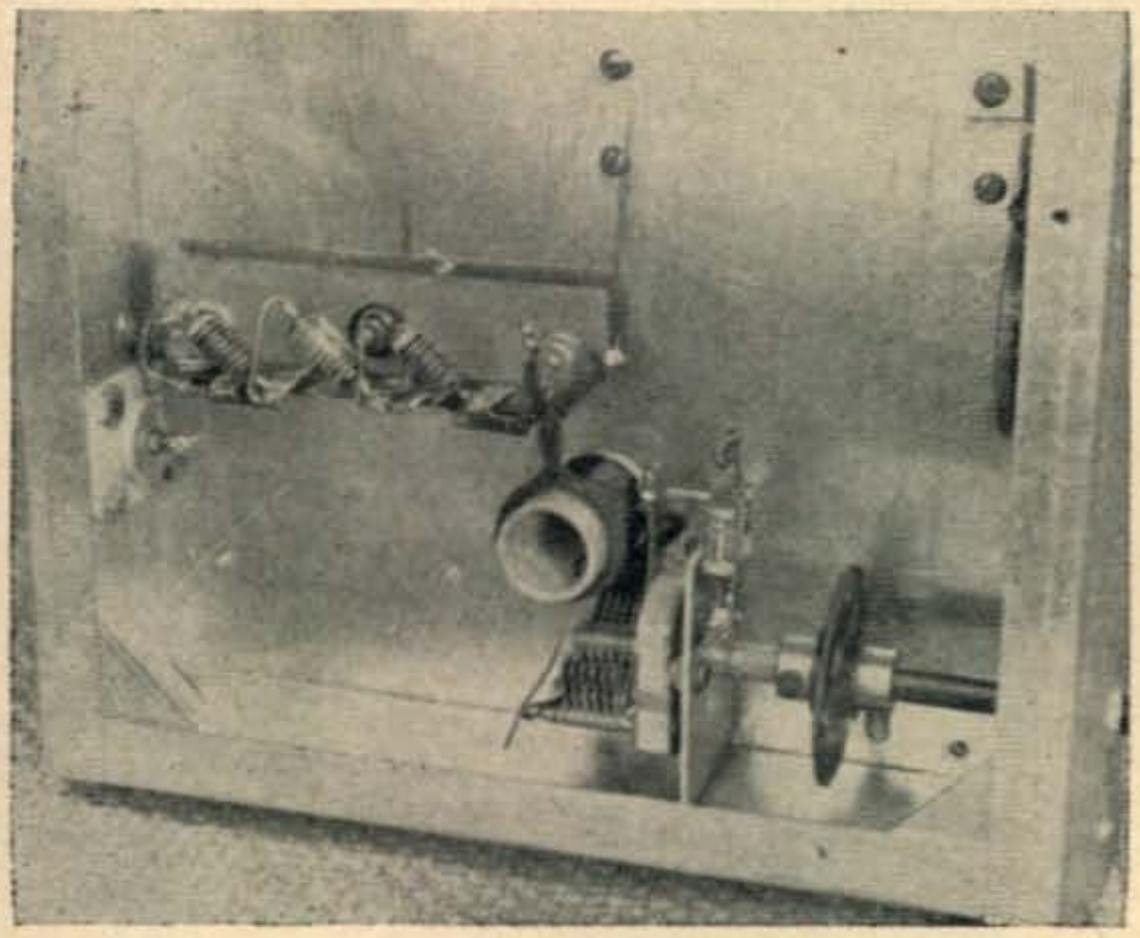


Back View:
Power is carried into the two compartments by the mica button feethrough condensers.

pedance looking into the filter when it is terminated in 52 ohms. Setting the frequency of maximum attenuation at 58 MC gives excellent suppression of the second harmonic.

FM is used to prevent the sixth type of interference, namely, rectification of r.f. by the audio circuits of a receiver. Since the exciter output is entirely free of amplitude variations, no audio output can occur if r.f. is rectified in a receiver.

The oscillator, operating on the output frequency, uses the TNT circuit. This type of oscillator was chosen over several other circuits tested as the best choice for this particular application. The cathode operates at ground potential, so there is no frequency drift due to a varying heater-to-cathode capacity. The frequency range and feedback adjustments are independent so the task of determining the proper feedback tap on a coil has been eliminated. The plate coil and condenser control the frequency range and the grid choke determines the feedback. It should be noticed that the usual connections of grid leak and grid choke are reversed with the grid leak being in the ground return of the grid coil. The output voltage is then taken from across the grid condenser. Since this capacity shunts the output, harmonics of the oscillator are attenuated. In the usual arrangement, where output is taken from across an inductance, there is a high impedance to harmonic voltages across the output terminals. With the system in use, the output voltage is quite low, yet additional attenuation is still necessary to prevent over-driving the following amplifiers. The oscillator voltage output is taken out of the oscillator compartment by means of a 1 uuf condenser which connects to the output terminal. The voltage is brought into the amplifier compartment via a similar feedthrough grommet with a 3.9 K resistor connecting the two terminals. The amplifier input terminal is



Under Chassis View: The m-derived output filter greatly attenuates harmonics. The angle of the coils on the tie strip produces minimum mutual coupling.

then shunted to ground through 1000 ohms. The coupling resistor, 3.9 K, was selected by increasing its value until the output of the exciter began to drop. This prevents limiting and attendant harmonic generation in the amplifier stages. All grounds in the oscillator compartment are made to the rear wall of the compartment on which the tubes are mounted. The variable condenser rotor is also grounded at this point, to prevent the flow of the circulating oscillator tank current in the shield walls. The tuning condenser is mounted on a piece of bakelite on one of the side walls and a wire grounds the rotor to the rear wall. A trimmer condenser for setting the frequency range of the oscillator to the proper value of 26.9 to 29.9 MC is accessible through a small hole in the rear wall, just above the oscillator tube.

In the amplifier compartment, the two 6AK5 voltage amplifiers are slug-tuned, also from the rear, while the power output stage is condenser tuned by a control on the front panel. The slug-tuned stages are sufficiently broad that the output of the 6AK6 is within 1 db of 1.25 watts over the entire band. The broad response of the 6AK5 stages is in part due to the resistance loading across each slug-tuned coil which limits the amplification per stage to approximately 25. As a further measure of isolation, a simple series resonant circuit is used to couple between each of the amplifier stages The self-supporting coils are first resonated at 29 MC with the 30 mme. coupling condensers by means of a grid-dip meter or use as a wavetrap in a receiver antenna lead, and then re-connected as series circuits in the exciter.

Both the 6AK5 and 6AK6 stages are neutralized to prevent self-oscillation and reduce variations reflected from plate to grid of each stage which might affect the oscillator stability. The neutralization scheme has been used with good results in stabilizing FM receiver I.F. stages.[1,2] Briefly, the

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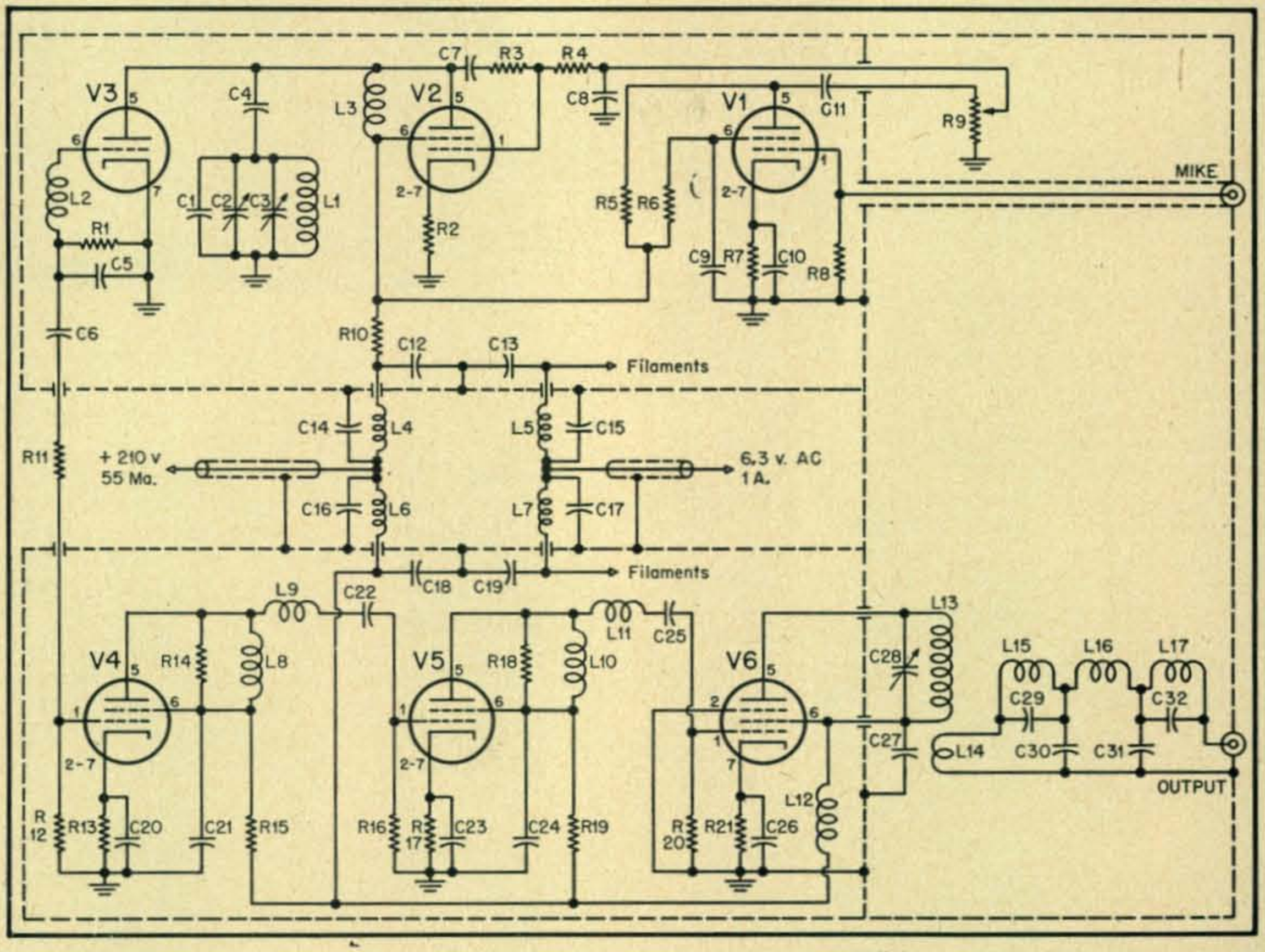
1 G. E. Gustafon & John L. Rennick "Low Cost FM-AM Receiver Circuits," Tele-Tech, October 1948, p. 36
2 CQ, July, 1949, p. 44

system consists of balancing a bridge circuit so that voltage between plate and screen does not appear between grid and ground. The bypass condenser from screen to ground is adjusted to balance the bridge circuit which also includes the grid-to-plate, plate-to-ground, and grid-to-screen tube capacities. This neutralizing capacity was determined experimentally as 150 uuf for a 6AK5 and slightly more for a 6AK6. The value is not critical and standard fixed condensers may be used. Note that to use this system, the plate return must be connected to the screen for rf. The resistors which supply the plate and screen current to the 6AK5 stages are required to decouple the screen from ground to take advantage of the neutralization scheme, as well as to drop the regulated 210 volt supply to the proper 150 volts for a 6AK5.

The output tank coil and coaxial filter are mounted underneath the chassis. The coaxial filter is assembled on a tie strip which is mounted on a narrow metal plate which forms the ground side

(Continued on page 56)



C_1 100 $\mu\mu$f zero temp ceramic
C_2 3-12 NPO trimmer
C_3 35 $\mu\mu$f variable
C_4 500 $\mu\mu$f zero temp ceramic
C_5 C_8 C_{22} C_{25} 30 $\mu\mu$f ceramic or mica
C_6 1 $\mu\mu$f ceramic or mica
C_7 5 $\mu\mu$f ceramic or mica
C_9 .01 μfd.
C_{10} 25 volt, 10 μfd. elect.
C_{11} .005 μfd.
C_{12} C_{13} C_{18} C_{19} 1000 $\mu\mu$f mica feed-through disc
C_{14} C_{15} C_{16} C_{17} 1000 $\mu\mu$ mica stand-off disc
C_{20} C_{23} C_{26} .001 μfd. ceramic
C_{21} C_{24} 150 $\mu\mu$f ceramic or mica
C_{27} 500 $\mu\mu$f mica
C_{28} 50 $\mu\mu$f variable
C_{29} C_{32} 50 $\mu\mu$f ceramic
C_{30} C_{31} 100 $\mu\mu$f ceramic
L_1 3 turns #22 11/16 dia., 5/8 long
L_2 40 turns #28 closewound on 1w. (7/32" dia.) 1M. resistor
L_3 2.5 mh r.f. choke
L_4 L_5 L_6 L_7 20 turns # 22 closewound on 2 w. (5/16" dia.) 1M. resistor
L_8 L_{10} 17 turns # 28 enameled closewound on 3/8" dia. form with powdered iron tuning slug (Cambridge Thermionic Corp. type L5-3)
L_9 L_{11} 20 turns #22 closewound 1/4" dia., self-supporting. Resonate with C_{22} & C_{25} at 29 Mc.
L_{12} 40 turns # 28 on 2w. (5/16" dia.) 1M. resistor
L_{13} 10 turns # 22 enameled on 11/16" dia. form, 5/8 long
L_{14} 2 turn #22 hookup wire link.
L_{15} L_{17} 8 turns #22 on 7/32 dia ceramic cond. (C_{29} & C_{32})
L_{16} 11 turns # 22 on 1 w. (7/32" dia.)
1 M. resistor
R_1 27 K 1/2w.
R_2 R_{13} R_{17} 330 1/2w.
R_3 10 K 1/2w.
R_4 100K 1/2w.
R_5 470K 1/2w.
R_6 1 M. 1/2w.
R_7 R_{11} 3.9K 1/2w.
R_8 SM 1/2w.
R_9 1 M. Pot.
R_{10} 2.2K 2W.
R_{12} 1K 1/2w.
R_{14} R_{15} R_{18} R_{19} 4.7K 1/2w.
R_{16} R_{20} 47K 1/2w.
R_{21} 470 1w.
V_1 V_2 V_4 V_5 6AK5
V_3 664
V_6 6AK6

RADIO WAVE PROPAGATION

CHESTER R. UNDERHILL, W2YT*

Concluding a three-part article giving the authoritative low-down on why our high frequencies act as they do.

IN Part I and Part II of this series, which appeared in the Dec. and Jan. issues of CQ, the various mechanism of transmission which may be involved in working DX on our v.h.f. bands were discussed. Part I dealt primarily with ionospheric phenomena. Part II described the various departures from the "normal" atmosphere which might produce extended-range contacts. The third and final article of this series, which follows, elaborates on the considerations touched upon in Part II, and offers suggestions as to how v.h.f. tropospheric "band openings" may be predicted.

The weather patterns responsible for non-standard atmospheric conditions that form over the continental United States may be due to any one of several discrete meteorological conditions arising in the troposphere, or possibly a temporary combination of them. The three most common types of inversions that affect v.h.f. propagation are known as Nocturnal, Dynamic and Subsidence. It may be of interest to discuss each type in some detail, as amateur textbooks seem prone to skim over them rather lightly, leaving much to the imagination. Parenthetically, any amateur seriously interested in v.h.f. propagation via the troposphere would be well repaid by visiting his local library and procuring a text book on elementary meteorology. He will find the content interesting and it will yield him a basic knowledge of the dynamic physics of the troposphere that will be of great aid to him in his understanding of v.h.f. propagation phenomena.

Nocturnal inversions are due to the heating of the earth's surface by infra red solar radiation during the daylight hours and the re-radiation, or loss of this heat energy after sunset. The cycle may be visualized as follows: During the daylight hours the earth absorbs infra red radiation from the sun which heats its surface. The air in contact with the earth is gradually heated during the day by convection to a height of several hundred feet. After sunset the process reverses; the earth's surface is rapidly cooled by infra red re-radiation. The warm air in contact with the earth is, therefore, also cooled and during the course of time gradually cools the air above it by convection to an increasing height. This condition, of course, constitutes an inversion (temperature rising with height) starting at the earth's surface at sunset and reaching to a height of several hundred feet as the night wears on. The height of the inversion varies the location of the tangent ray and thus determines the distance that VHF signals may be propagated by this type of inversion. This frequently extends from 150 to 300 miles.

Steep gradient changes in the index of refraction at the boundary of the air masses involved in nocturnal inversions also create the so-called surface ducts or natural "wave guides" as previously described. Over certain tropical ocean areas, surface "ducting" at UHF persists as long as the covering air mass is undisturbed by meteorological frontal action. As pointed out, the height or thickness of the inversion limits the frequency that may be horizontally propagated. The higher the "duct", the lower the frequency.

*Senior Engineer, Radio Propagation Laboratory The Pennsylvania State College, State College, Pa. (On special leave from the RCA Service Co., Inc., Camden, N. J.)

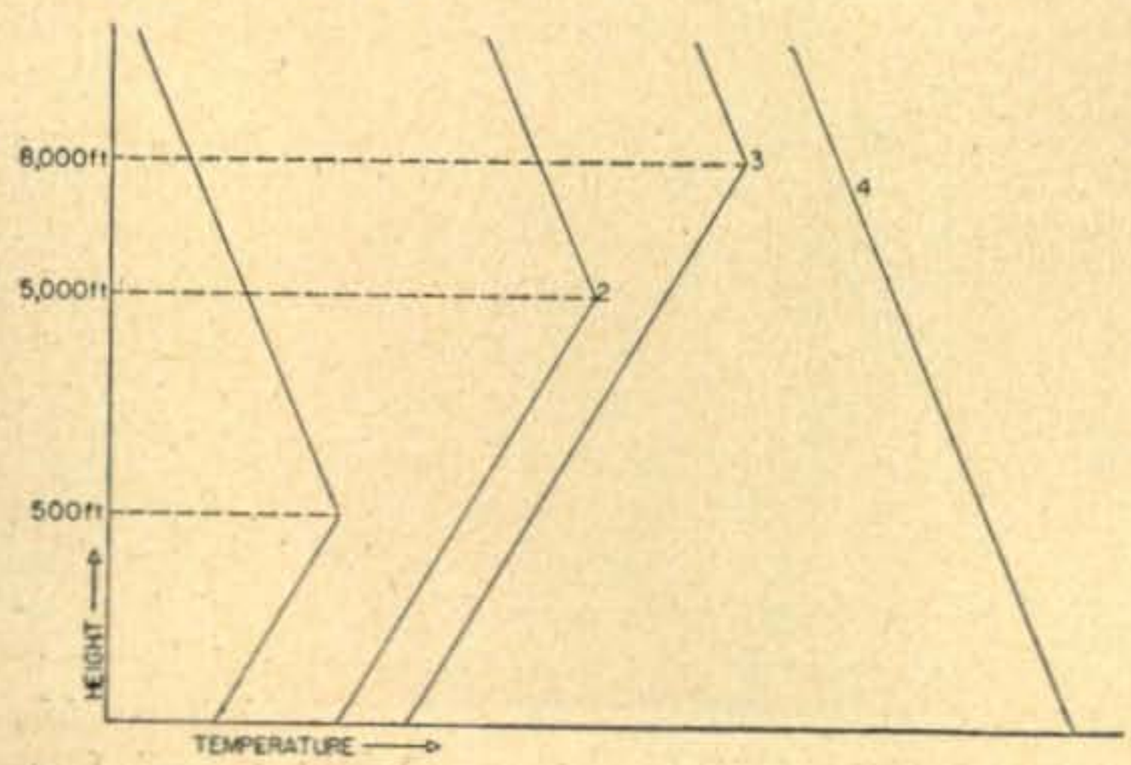


Fig. 7. Family of Temperature vs. Height plots showing three inversion types. 1)-Nocturnal or surface. 2)-Dynamic or advective. 3-Subsidence. 4)-Standard atmospheric condition (no inversion)

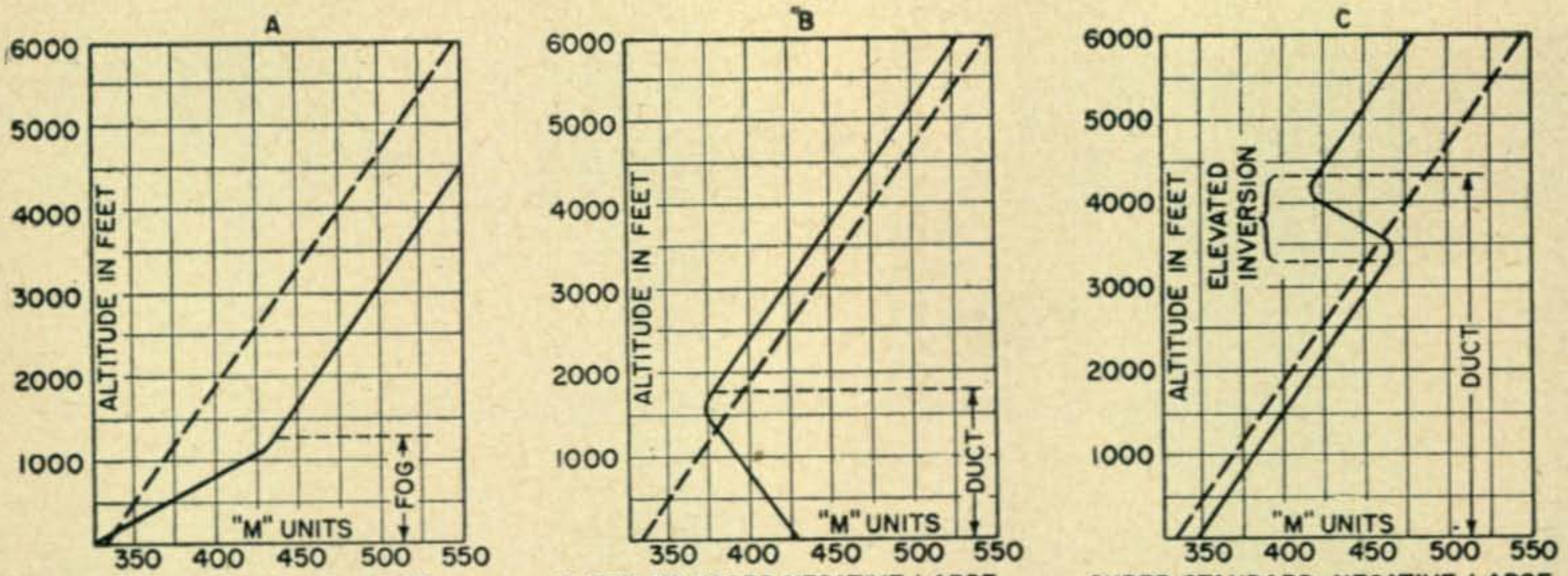


Fig. 8. Family of M curves showing inversion effect. The slope of the broken line in drawings indicates standard atmospheric condition with M units increasing linearly with height. When the slope of the M curve is less than the standard slope it is considered "sub standard," and the slope and lapse rate positive. When greater than standard it is considered "super standard," and the slope and lapse rate negative.

Dynamic inversions are caused by warm air masses over-running cold, or a cold front coming in under a warm air mass. Horizontal movement of air is known as "advection" and dynamic inversions are, therefore, sometimes referred to as "advective type". This type of inversion occurs at relatively high altitude, in the order of two to ten thousand feet, and results in about the only "predictable" type of VHF band opening. The advection of the warm dry air, occasionally formed over the arid Western plains regions in summer, may at times be charted and its probable course plotted a few days in advance.

Subsidence inversions take their name from the "subsiding" or falling of air toward the earth from the dome of a high pressure area due to compression. Air, like other gases, rises in temperature adiabatically when compressed. "Adiabatic" simply denotes a change in temperature without the addition or loss of heat. Now we know that when air rises in temperature, it is able to hold a proportionally greater amount of moisture. In other words, its *relative humidity* decreases as it becomes progressively "drier". When this falling warm dry air mass reaches the upper surface of the cool moist air adjacent to the earth's surface, a discontinuity of refractive index results.

Like the advective type of inversions, subsidence inversions usually occur at relatively high altitude, and thus lend themselves readily to VHF DX. However, as they are frequently associated with the falling away, or dispersing, of a high pressure area towards a low pressure area, it is impossible to forecast the elevation at which the discontinuity boundary will be likely to form. Best DX conditions, however, have been noted when the intervening air masses along the propagation path are undisturbed by the frontal turbulences associated with low pressure areas.

Another type of inversion, occasionally reported by aviators, is caused by convection heating of the air above cloud masses that have been heated by solar radiation. This is usually a duct forming type of inversion, probably not more than a hundred feet or so thick and effective only in the radar micro wave spectrum.

Fig. 7 shows a family of temperature plots and inversion boundaries for the three major types of temperature inversions discussed. As previously noted, dynamic and subsidence inversions may form at any altitude from two to ten thousand feet. The last plot (4) shows the Standard Atmosphere condition with temperature and relative humidity decreasing linearly with height. All of the temperature plots are to be considered as starting from a common surface temperature.

Modified Refractive Index and the M Unit

We have previously stated that Snell's Law gives the bending of a ray entering the plane boundary between two media of different refractive indices. We know, however, that our refractive index decreases with height in a homogeneous atmosphere. Without becoming involved in mathematics, we can resolve this situation if we consider an earth with a radius extended by 1/3. The case where the earth's radius is multiplied by 4/3 is called "Standard Refraction" and corresponds to a linear variation of refractive index with height based on standard atmosphere conditions.

Snell's Law has been manipulated to take this modified earth's radius and "Standard Refraction" into consideration, resulting in a "Modified Refractive Index", expressed in "M" units. The modified unit of refraction is expressed by the amount it exceeds unity and is measured in parts per million, laying in the range of 300 to 550 units. A plot of "M" units vs. height is called an

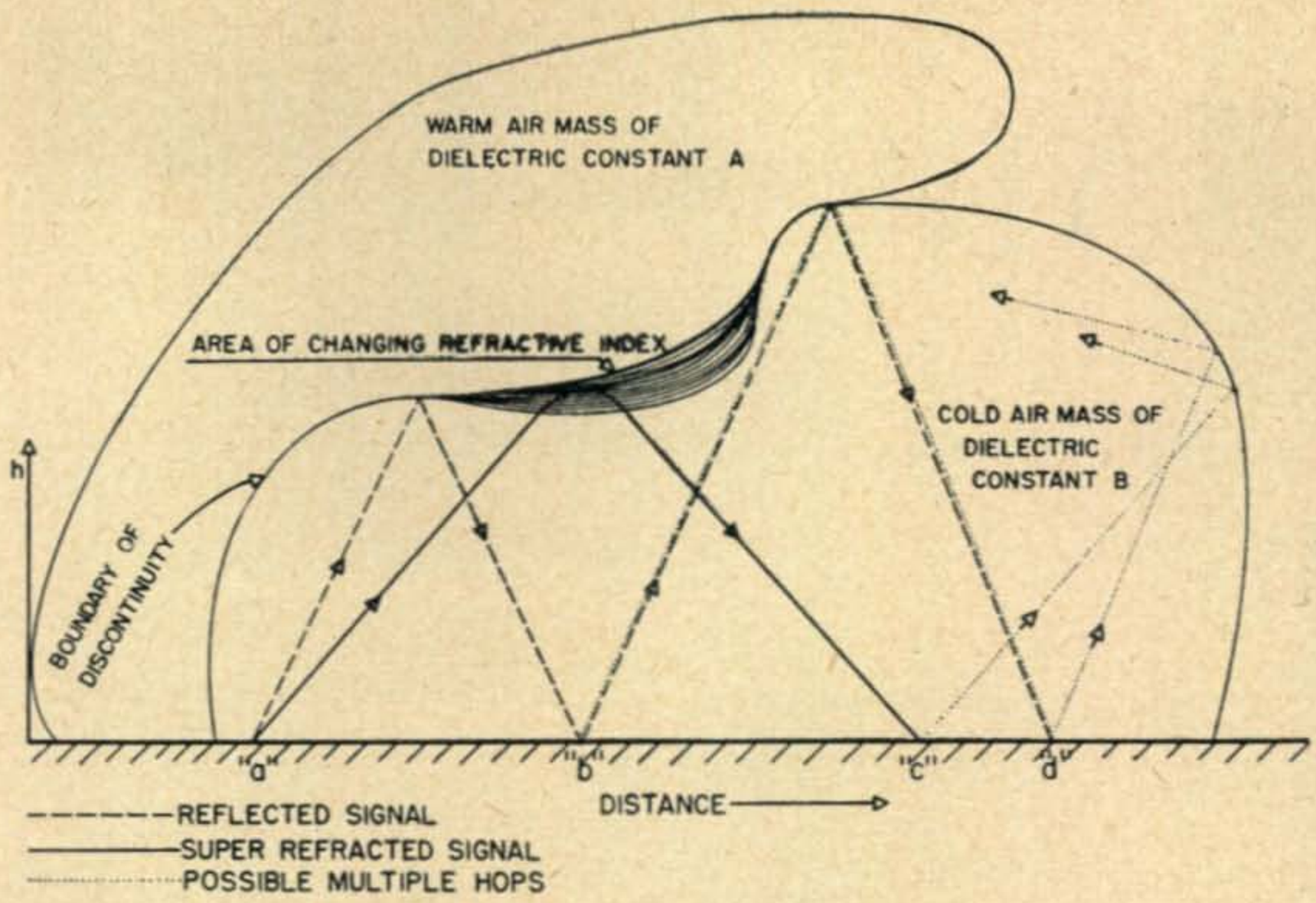


Fig. 9. Some possible paths of VHF propagation in the troposphere. By letting the imagination complete the dotted lines an idea of the complexity of possible propagation in the troposphere by second hop may be obtained.

M curve. A "standard" M curve results when the air of the lower atmosphere is thoroughly mixed and represents the 4/3 earth's radius approximation.

For those that are interested in the physical makeup of the Modified Index of Refraction it is represented by the following equation:

$$M = \left[(N-1) + \frac{H}{A} \right] 10^6 = \frac{79(P-E+4800E)}{T} + 0.48H$$

where M is the modified index of refraction, N the index of refraction, H the altitude in feet, A the earth's radius, T is the absolute temperature, P and E are the total pressure and moisture vapor pressure, respectively, in millibars.

It has been pointed out (1) that for waves in the radio spectrum the index of refraction of the atmosphere depends principally on its temperature and water vapor concentration. The M curve, therefore, depends upon the distribution of temperature and water-vapor with height. The modified refractive index is *decreased* by an increase of temperature with height (a temperature inversion) and a decrease of water vapor with height. The slope of the M curve then shows a negative lapse. An increase of water vapor content with height, usually associated with fog. yields a sub-standard M curve with a positive slope. Fig. 8 shows a family of M curves illustrating how various types of inversions may form non-standard atmospheric layers.

Tables have been prepared from which M can be computed from observed meteorological data such as temperature, barometric pressure and water vapor content as a function of height taken by radiosonde technique. These data are accumulated every 12 hours from numerous observation points over North America and are broadcast on schedule by NSS. They are also available at any U. S. Weather Bureau or CAA aeronautical station.

(1). Martin Katzin, Research and Development Board—Digest Series No. 141, Oct. '48.

Predicting Band Openings

In attempting to predict two meter band openings from meteorological data, close scrutiny should be given to lapses in M units. However, it must be borne in mind that radiosonde equipment is born aloft by ballons and does not continuously record data as a function of height but merely samples it. Therefore, although an inversion may be spotted at high altitude, its "thickness" may not necessarily be measured nor sufficient data obtained to calculate the gradient of M in the layer, which we are primarily interested in.

Meteorological maps, showing barometric pressure areas over North America, are published daily in some metropolitan newspapers. Comparison of the shown pressure gradients, with DX conditions noted at the same time, have yielded some very interesting correlations, particularly along the path of steep gradient edges.

It may be well to note that while, over a period of time, lapses in M units and steep pressure gradients have individually been correlated with abnormal propagation conditions, there have also been many times when these correlations simply did not exist. While it is very convenient for those of us that have observed these correlations to shrug off the non-correlation instances with "there was no one on the air", this logic obviously has little basis in scientific fact. In the meanwhile, we are informed that W2PEN is keeping his crystal ball well polished and reports some very satisfactory results in predicting band openings.

Propagation Paths Under Non-Standard Atmospheric Conditions

Fig. 9 shows some possible propagation paths when a warm air mass of dielectric constant A moves in over a cold mass of dielectric constant B. Or, of course, the cold mass may move in under

(Continued on page 61)

DXING A LA 3.5 MC

GENE SYKES, W4BRB*

Here's the inside story on 80-meter DX, by the band's outstanding DX man.

DURING THE FALL AND WINTER of 1947 a new phase of operations was added to the overall amateur picture; Low Frequency DXing. Many operators, jaded by the cut and dried pattern of DX chasing on 28 and 14 mc and looking for new worlds to conquer, descended upon the 3.5 mc band with the express purpose of "opening it up." It is true that long distance communications had been established often and by many different stations in the years prior but such communications were generally coincidental to the normal operations of the stations involved. Therefore, the cool months of '47 can generally be regarded as the beginning of the 80 meter DX era.

In such a movement it was inevitable that certain high-frequency techniques, proven on the "DX bands" should be introduced. Also, it was inevitable that the operators should adopt themselves somewhat to the nature of the 3.5 mc band.

It is well-known that the daylight "skip" in the region around 80 meters is practically non-existant. Therefore it can be considered as a purely nighttime DX band. Also, due to the atmospherics peculiar to this part of the spectrum, 3.5 mc yields its best results during the cooler months. Against this may be balanced the fact that the skip on this band is comparatively predictable between two points and experience has proven that the times at which a certain area may be worked from any other given area may be determined in advance with much more accuracy on 80 than on 14 or 28 mc. This last property allows DX schedules to be made with a higher percentage of hits on 3.5 mc than on the higher bands.

*410 Franklin Rd., W. Palm Beach, Fla.

What and When

For example, in the New England states the western European countries will break through as early as 2200 GMT during the months from October thru February and will remain "in" until 0800 GMT. In the southern seacoast states the same Europeans will not ordinarily reach a working level before 0000 GMT (due to the longer period of daylight) and will remain in for approximately the same period. This, of course, gives the northeastern states a definate edge in this department due to the fact that during the favorable winter months they enjoy a longer period of darkness.

In working South Americans this situation is somewhat reversed in that the southern states and those along the Gulf of Mexico will receive a stronger signal somewhat earlier than the northern states. This is due, of course, to the geographical locations which permit these states to intercept the expanding "skip" before it extends up to the more distant northern states and, also, because the signals are less attenuated in coming across the Gulf of

Those are all 80-meter cards on the wall; Gene has 87 countries worked on this band, and it looks like about 75 confirmations on the wall.

Mexico and Caribbean than they are after travelling another thousand or so miles across the United States. It is a matter of fact that these low frequency signals are attenuated by land masses to a greater extent tha nare 14 or 28 mc signals.

A fact to be remembered in inter-hemisphere DX-ing is that the seasons are reversed and even though we may experience greater atmospheric interferences during our summer, these will generally be balanced by stronger signals from the southern hemisphere. Argentinian stations have put strong signals into Florida as early as 2300 GMT in mid-summer, which is some two hours before dusk. The same signals will not ordinarily be readable in the northern states before 0100 GMT and, apparently, never do reach the levels reported in the southern states.

South Africans appear to peak throughout the eastern seacoast states between 0300 and 0400 GMT after which there is a rapid and definate attenuation to all signals from this area. Northern African stations exhibit about the same characteristics as Europeans and are, if anything, slightly stronger and easier to work.

The South Pacific area varies in time according to its longitude. New Zealand stations come through as early as 0600 GMT and remain in until 1200 GMT with a peak at approximately 0800 GMT. Australians are hardly ever heard before 0900 GMT and also fade at approximately 1200 GMT on the east coast. The common fade-out at 1200 GMT is undoubtedly coincidental with daybreak in this longitude, and in the more westerly states may be retarded to again coincide with the local daybreak. However, these more westerly states do not appear to hear the South Pacific area earlier—geography notwithstanding—since undoubtedly the DX station must depend upon its local dusk for the necessary "skip".

The necessity for an "all-dark" path is confirmed by the many contacts between United States and Japanese stations. The Far Eastern stations could not be heard on our east coast before approximately 0830 GMT and faded out at approximately 1100-1200 GMT. They remained "in" for Pacific Coast stations for several hours after this time and the W6s could be heard working them until they, too, faded out on the east coast. Asians located in the near-East are subject to similar conditions governing Europeans and North Africans and appear to come through to the East Coast of the United States from 0000 GMT until approximately 0630 GMT (depending upon the time of their "local" daybreak).

In brief, successful DX scheduling on 3.5 mc is greatly dependent upon a dark-path, and times should be selected that will permit the signal to travel through a dark-path all the way. It has been indicated that VK stations are to be expected in the period between 0900-1200 GMT, for instance, but there is no reason not to believe that they are workable at dusk as well as at daybreak in the more northerly latitudes. *

Antenna and Equipment

3.5 mc DX stations are as varied as those found

A 32V-1 drives p-p VT127A's at a KW. Looks like Gene is worrying over those missing cards.

on any other band. High powered transmitters and sensitive receivers pay the same dividends. However, much of the success of any station is dependent upon its antenna and this is particularly true on the lower frequencies. Much has been said and written concerning the relative merits of horizontal and vertical polarization. It is accepted that for long-distance, low-frequency communication a vertical radiator is preferable. However, the physical proportions of such an antenna makes it an impossibility for most stations. Much of the performance of the vertical antenna can be duplicated with the "ground-plane" vertical which is a much less pretentious system. Reports from several stations using this antenna indicate its excellence. In addition to the favorable vertically polarized characteristic it has the further advantage of simplified (co-axial) feeding with a good match over a wide frequency range and may be located at any reasonable distance from the transmitter. Also, and quite important—the co-axial feeder may be grounded, thus eliminating lightning hazard to a great extent. Further, the grounded coaxial feeder should tend to eliminate to some extent the noises inherent around any amateur station and confine all transmission and recepton purely to the vertical radiator.

However, noteworthy results have been achieved by many stations using some form of doublet or zepplin antenna in the horizontal plane. The fold-

*Editor's note: W4BRB is too modest. There's good reason to believe that long haul DX is possible at dusk here on the East Coast. During the last 80 meter DX season, a lot of us heard him on the band around 0000 GMT one evening, working XZ2EM crossband.

The postman saves the day! The three new ones on the desk are VR4AA, VS6AC, and VS9AL, all on 80.

ed-dipole performs excellently on the low frequencies as it does on the higher bands. The straight doublet (70 ohm feed) is equally efficient and as widely used. For the many stations that do not have sufficient space available for an 80 Meter halfwave, the ends may be "bent-down" along the supporting masts. Some distortion of the radiation pattern will result, it is true, but since the major amount of radiation is performed by the (high current) center section of such a wire, the overall effects of the distortion will be negligible.

Directivity (or orientation) of the 3.5 mc antenna seems to be of minor importance in DX work. On this band, a good halfwave antenna appears to radiate equally well in all directions despite accepted theory. This is advantageous in that it permits good, all-around coverage with one antenna rather than requiring several to cover various directions.

Of far more importance than the type or orientation of the antenna is the height above ground. The ability to work consistent DX on any frequency depends to a great extent upon the angle above the horizon at which the signal leaves (and enters) the antenna. This angle of radiation is, in turn, dependent upon the height of the wire. As the wire is raised the angle is lowered up to a certain point and the signal at a distant point, all other things being equal, is increased. In terms of proportion, an 80 meter antenna suspended 65′ above ground is roughly equivalent to a 28 mc antenna 8′ above ground. Since there is a limit to all things, including the height of 80 meter antennas, the best advice is contained in the ancient ham proverb, "Put 'em as high and as clear as you can". This does not mean that the operator limited to perhaps a height of 25 or 30′ is dealt out. Outstanding results have been accomplished by low and medium powered stations using antennas which would be considered low for 14 or 28 mc usage.

One of the main requisites to the working of DX is that first the DX must be heard. In addition to a receiver this factor introduces the need for a GOOD receiving antenna. Sufficient to say that the transmitting antenna should be switched between the receiver and transmitter so that the receiving apparatus enjoys the benefit of the best possible antenna. If the antenna be one employing "flat lines" or co-axial feed the relay may be inserted directly into the line at an appropriate point. If, on the other hand, the antenna employs "open" or tuned feeders, the relay should be inserted in the link line between the tuner and the transmitter so that the receiver may also enjoy the benefits of the tuned coupler. This has the further advantage of placing the relay in a comparatively "cold" circuit. Such an arrangement will permit the use of a less-expensive relay and at an improvement in performance. [1]

On 3.5 mc the operator can generally "hear the competition" to a greater extent than on the higher bands. Therefore, it is definitely advantageous to use break-in procedure and the transmitter should be so equipped. [2]

The use of a VFO is a definite advantage here as on the other bands. DX operators on 3.5 mc, as on other bands, generally sean their own frequency first. However, low frequency DXing is still novelty enough to most operators that they WILL tune a bit above and below their own frequency. At this time the DX segment of the 80 meter band is not so overcrowded (except during DX contests) that the rockbound station is handcuffed.

The W station may safely employ CQ DX on 3.5 mc more readily than on 14 or 28 mc since he IS DX to many foreign operators. If and when this band wins wide popularity in foreign countries this practice will lose ground as foreign stations search for other foreign stations (not W's) but at present this call does not carry with it the stigma that it does on 14 mc.

Promoting the Band

The apparent lack of interest in 3.5 mc evidenced in many distant areas has led to the practice of "DX Baiting". The bait may take the form of an 80 meter crystal, call books, pleading letters or the good, old-fashioned challenge. The accepted procedure is to ambush a station in a desired locality on any of the higher frequency bands. (7 mc is preferable since it is generally a fair bet that if he CAN work 40 he CAN be seduced into a try at

(Continued on page 60)

1: This helps a lot. I use it here and find that it contributes at least one "S" point to ANY signal.
2: Any band, for that matter. 3: W2QHH, W1BPX, W1DHD, W4NNN, W4KFC
4: VP8AI

The Monitoring Post

gleaned by THE BRASSPOUNDER

WHEN the emergency boys anyplace in New York City go to work, we can be sure a genuine disaster has occurred! And two such workouts within three days, bringing the total to three within the boundaries of the city since ham radio became a means of such communication, is pushing things a bit hard. *W2TJA* obeyed his xyl and went below stairs to sharpen a knife at 6:30 P.M. on Nov. 22. Turning the switch for light over the workbench also turns on one of his standby receivers, tuned to the N.Y.C. Fire Alarm Freq. A Brooklyn alarm came in; then one for Manhattan, then a first and a second for a location near his home, the second calling for ambulances and rescue companies to respond. An immediate telephone call to the chief dispatcher at fire alarm headquarters brought the news of a Long Island R.R. wreck, and within five minutes of the first alarm TJA was all mobiles on two and ten, simultaneously, to get to the location immediately. *W2AAG, BAE, LGK, PQG, and ZOS* picked up the alert and immediately began rounding up the mobiles.

Ten-meter mobiles, after police line clearance had been obtained, maintained constant circuits between the wreck and the police precinct headquarters nearest the scene, with one mobile parked at the curb at the police station. A heavy overload on normal telephone facilities required this service. Police emergency trucks equipped with two-way radio, telephone company radio trucks, and several other communications means were not enough to handle the load. *K2BQ* drove in from Westchester and set up a portable station in Flushing Hospital, with all hands working till after 2 A.M.

And three days later, when a storm with gales touching the hurricane force hit the city, the nets again went to work and did not complete their jobs until Nov. 28—four hard days of emergency communications. In Nassau County, the Long Island neighbor of N.Y.C., a long list of accomplishments has been reported: assisting the Red Cross, U. S. Coast Guard, County Police, and other agencies in evacuation work.

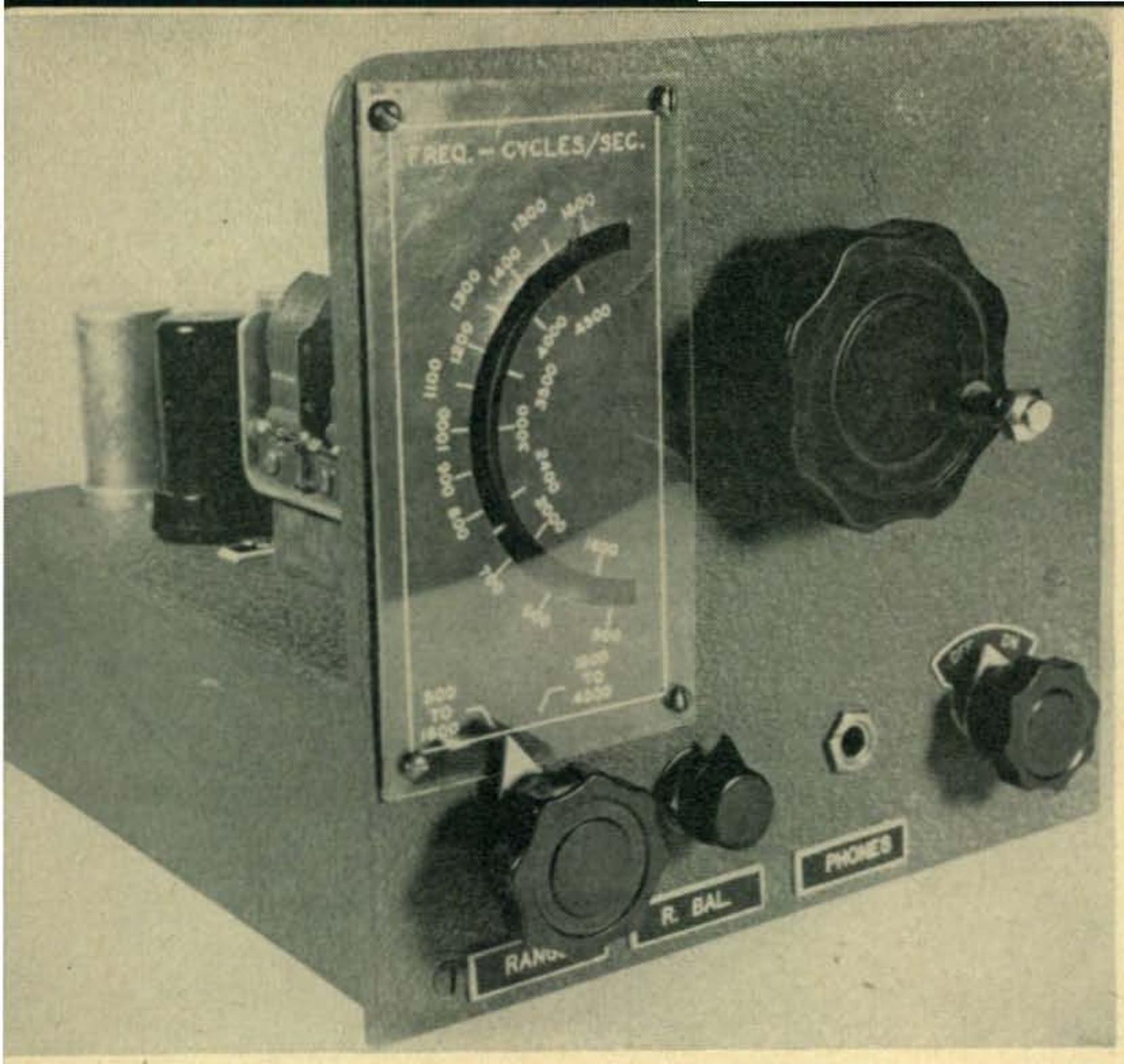
W2FI was called by Red Cross at 10:30 A.M. Saturday asking for help. Put to work immediately were *W2TUK, SFV, JXP, NI.* By noon *W2UOL* was on hand with his truck laden with a 10-meter mobile and other auxiliary radio gear. W2SPI and PG went into the Long Beach area to work with the Red Cross in evacuation work, at this time there being no telephone lines and but one road open to reach the area. W4KKM/2 reached the Coast Guard station at Short Beach and worked with them until early the following morning, when normal communications were again available. A 2-kw. gas generator was hauled from the Nassau County RC clubrooms to Mineola, where it supplied power from 2 to 11 P.M., when power was restored in the county seat. *W2KAZ* and *PQO* had not even time for a cup of coffee, their mobiles kept on the go constantly. *W2BTA* was dispatched to Oyster Bay to survey and supply a report to county Red Cross headquarters—no telephones in this area at all. At Seaford, on the South Shore, *W2JXP/M* stayed with Red Cross field men until 2:30 A.M. the following day when all evacuation had been completed. On the two-meter net continuous communications was maintained with Red Cross headquarters in Mineola, furnishing information regarding conditions, availability of shelters for evacuees, plans for rescue work using Army "Ducks", etc. Thirty-three stations worked ceaselessly—10 mobiles, 2 portables, 21 fixed.

In Queens County trouble began to pile up as Nassau reached the point where their communications were somewhat under control, so mobiles were sent from the latter county to Queens, where two- and ten-meter portable rigs had been set up at Fire Dept. Central Office. Sixty-eight circuits, serving more than 2,000 fire alarm boxes, were out of commission. The work of the portable and mobile stations was not completed until noon of Nov. 28—three and one-half days of intensive emergency communications. Staten Island's ten-meter net served faithfully for long hours assisting Red Cross in evacuation work. A splendid job, but each group, no matter where located, all report a shortage of mobiles. To do a job during disasters the hams will have to become more conscious of the value of mobiles. This is just one more of the many splendid achievements of the Amateur Service.

W5OK reports "yours is the best sig I'm seeing on the band right now", based on what he sees on the scope. He's back on 40, forsaking 75 for a while, and has been licensed for the past 30 years.

(Continued on page 59)

Gov. John W. Bonner, Montana, receiving his "Dog-catcher" certificate from "The Mayor", W7LCM.



CLARENCE A. WEST, W2IYG*

Figure 1

The HETERONULL

BECAUSE OF HETERODYNE INTERFERENCE in the crowded phone bands, a heterodyne elimintor operating in the audio-frequency range can be very helpful in the successful completion of phone qso's. The main requirements for suc a heterodyne eliminator are:

1. That it be continuously tuneable over the range from a few cycles per second to the maximum sideband frequency passed by the receiver. If a receiver, for example, can separate stations 4 kilocycles per second apart, the maximum tuning frequency of the audio nulling device should be 4 kilocycles per second.

2. That it have an extremely sharp rejection bandwidth to reduce loss of the voice frequencies as much as possible.

The device described in this article, The Heteronull, meets both these requirements.

Operation

The circuit of the Heteronull stems from the RCA Distortion and Noise Meter* and is that of a tuneable audio-nulling amplifier. It is possible, when the audio output from a communications receiver is fed into the Heteronull, to eliminate the audio heterodyne between two stations when the frequency of the heterodyne falls within the tuning range of the device. The Heteronull serves equally well when used for CW work. It is simply tuned to the interfering CW signal, thereby eliminating this signal and leaving the desired signal in the clear, provided, of course, that the signal to be retained is not blocked out by the interfering signal.

The Heteronull is a tuneable three-stage audio amplifier having a Wien bridge between the 2nd and 3rd stages and employing negative feedback to increase selectivity. The Wien bridge, adjusted by means of variable capacitors, is sharply tuned to filter out the heterodyne frequency.

Construction

Since audio frequencies in low-gain circuits are involved in the Heteronull, there is no need for any special layout or shielding. For experimental purposes, a tuning range of from 500 to 5000 cycles was selected. A chassis measuring 2-1/2" x 7" x 9" was chosen to suit the largest components, the two variable capacitors. Fig. 2 shows the general layout of the chassis. As indicated in the circuit diagram and Fig. 2., these tuning capacitors are insulated from the chassis. One-half inch thick bakelite is used for the insulation. If a dual-variable capacitor with common shaft and large enough capacitance in each section is available, some mechanical problems can be avoided. In my case, however, two identical three-section variable

*Tube Department, Radio Corporation of America, Harrison, N. J.

* Type WM-71A

A Tuneable Audio-Nulling Amplifier for Rejecting Heterodynes.

Figure 2

capacitors were available plus the gears, so these were used. To obtain approximately 1200 uuf, all three sections of each capacitor were wired in parallel. The trimmers, C9 and C10, shown in the circuit diagram, are part of the tuning capacitors. Because the unit draws only a few milliamperes, the receiver power supply can usually be used for B voltage. However, a separate 6.3-volt heater transformer may be required. The tuning capacitors, tubes, and large cathode bypass and plate-decoupling capacitors are mounted above the chassis. The range selector, balancing, tuning, and "off-on" controls, plus the phone jack, are brought out to the front panel as shown in Fig. 1. The "off-on" switch in the "off" position connects the phones directly to the input terminals of the unit and removes B voltages when the nulling action of the bridge is not required. In the "on" position the switch connects the phones to the output of the Heteronull and applies B voltages.

The risk of poor ground connections is avoided by running a heavy piece of copper wire across the bottom of the chassis to provide a common ground point. Tubes and components were arranged to facilitate short, direct connections. In addition, wiring which might bring input and output circuits close to each other was avoided. A bottom view of the chassis is shown in Fig. 3.

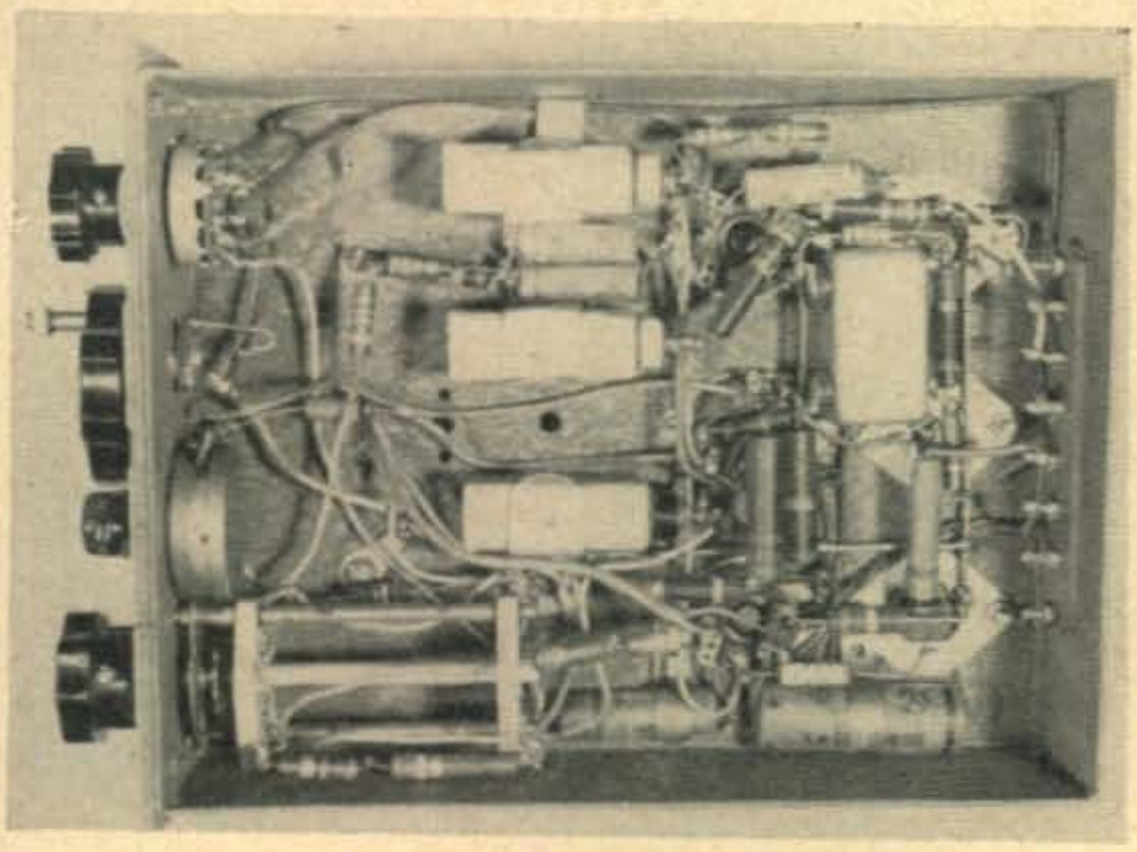


Figure 3

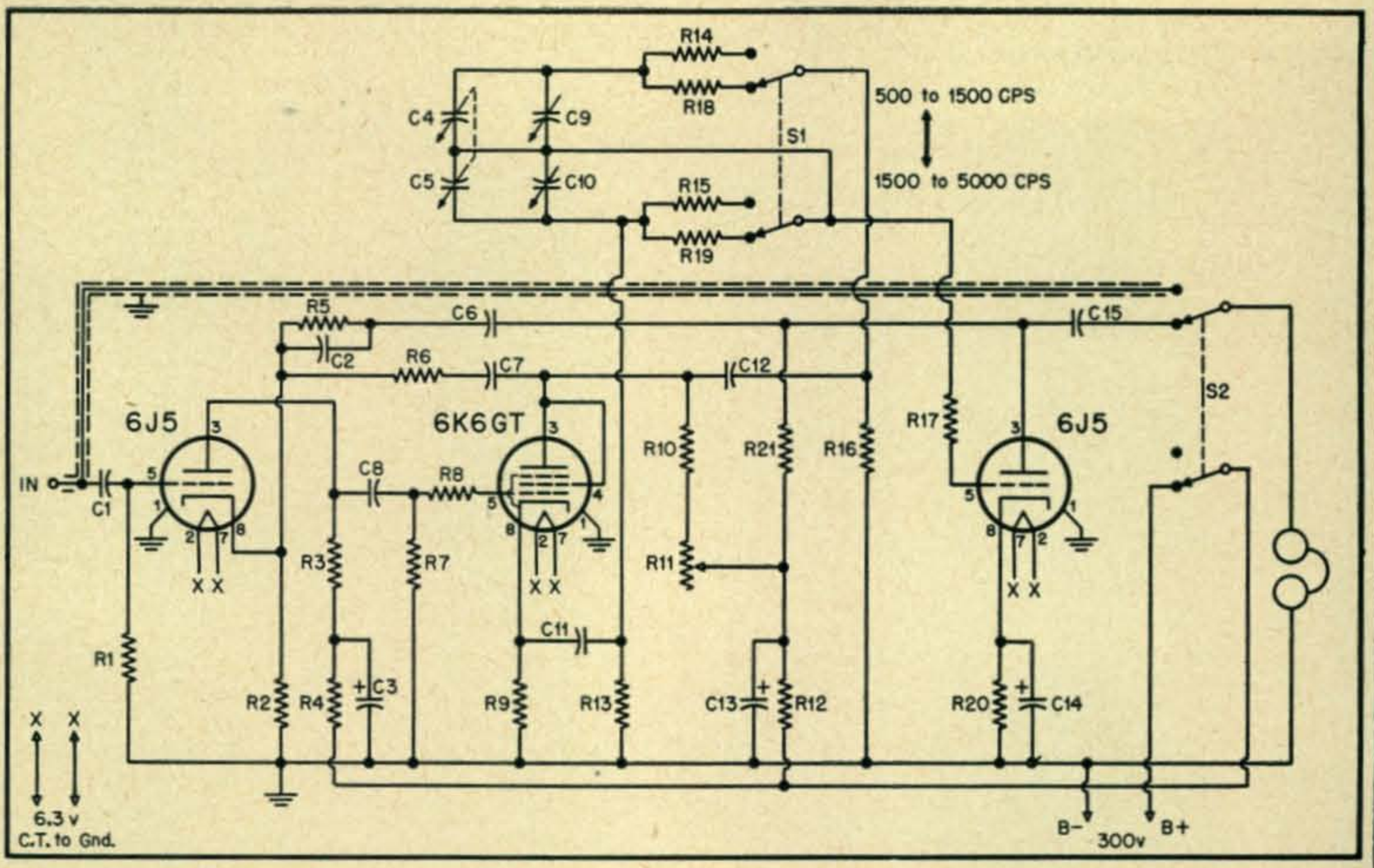
Adjustment

After the chassis is wired and carefully checked, connect an audio oscillator to the input terminals. (I used the 1000-cycle station code practice oscillator for tuning up the amplifier). Apply the heater and B voltages and plug in the phones. Throw the off-on switch to the "off" position to make sure the 1000-cycle signal is available at the input. Adjust the trimmers on the bridge capacitors for somewhere near equal setting. Switch to the "on" position and throw the range switch to the low range (Approx. 500 to 1600 cycles). Rotate the tuning knob and listen for the null. Make this adjustment slowly because the tuning is quite sharp. If the null is not heard, try different positions of the balance control, R11, and repeat the tuning. When the null is found, adjust the R balance knob for maximum nulling, then adjust the bridge trimmer capacitors for further nulling. A pronounced null should occur as the bridge is tuned to the incoming signal.

Operation

The earphone output from the communications receiver may now be connected to the input of the Heteronull. Throw the "off-on" switch to the "off" position and tune over the band for two stations which are heterodyning each other. Throw the "off-on" switch to "on" and tune the Heteronull slowly, listening for the rejection of the heterodyne. Try both range positions. A point will be found where the heterodyne will be eliminated, making it possible to "copy" the modulation. If there are several heterodynes, select the loudest and reject it.

The Heteronull is also effective for rejecting



Capacitors

C1—0.01 μfd., paper, 200 w.v.d.c.

C2—200μμfd. mica, 450 v

C3—20 μfd., electrolytic, 450 v.w.d.c.

C4, C5—1200 μμfd., variable tuning capacitors

C6, C7, C11—1.0 μfd., paper, 450 v.w.d.c.

C8, C12—0.05 μfd. paper, 450v.w.d.c.

C9, C10—(Approx.) 50 μμfd trimmer.

C13—60 μfd., electrolytic, 450v.w.d.c.

C14—100 μfd., electrolytic, 25v.w.d.c.

C15—0.1 μfd., paper, 450v.w.d.c.

Resistors*

R1—1/2 megohm, 1/2 w.

R2, R4—8200 ohms. 2w.

R3, R21—33,000 ohms, 2 w.

R5, R9—3900 ohms, 2w.

R6—27,000 ohms, 1 w.

R7, R13, R16—1 megohm, 1 w.

R8, R17—100 ohms, 1 w.

R10—4700 ohms, 2 w.

R11—10,000 ohms, wire wound—(balance control)

R12—1000 ohms, 2 w.

R14, R15—184,000 ohms, 1 w.

R18, R19—80,000 ohms, 1 w.

R20—270 ohms, 2 w

* All resistors ± 10% except

R14, R15, R18 and R19 = ± 5%

S1—DPDT Range Switch

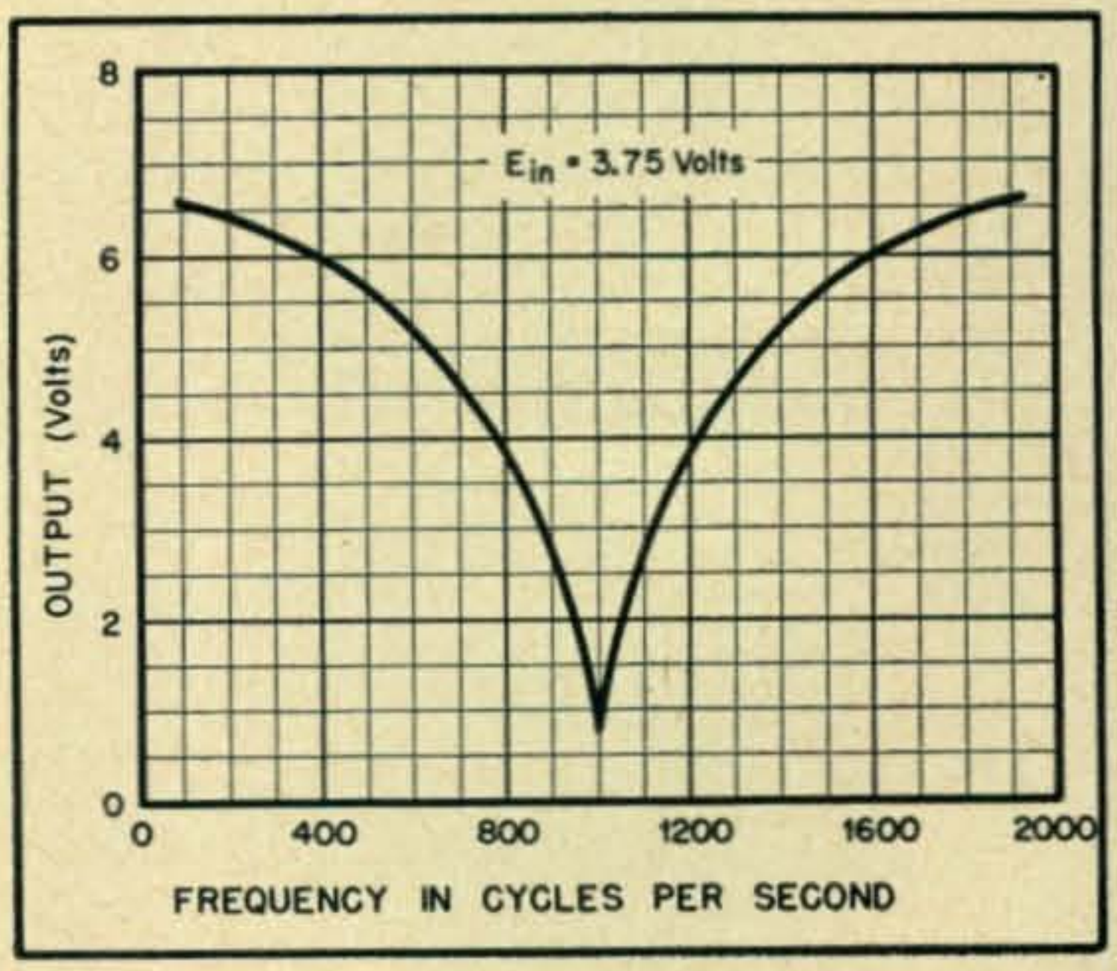
S2—DPDT Off-On Switch

an unwanted CW signal. Tune into the CW band and locate two CW signals which are close enough to interfere with each other. By tuning the Heteronull, it is possible to reject either of the signals with no change in the other.

Other Uses

The Heteronull may be put to several other useful purposes provided that the tuning knob is calibrated. The calibration of the device may be accomplished as follows: Fasten a sheet of heavy white paper beneath the pointer of the tuning knob. Be sure to mark the exact position of this template if you plan to later remove it for use in preparing a fancier dial as was done in my case. Careful marking allows one to return the final dial to the same position without disturbing the calibration. Next, connect a calibrated audio oscillator to the input of the device and a pair of headphones or audio output meter to the output. Start at one end of the dial to be calibrated and mark calibration points all along the dial at suitable intervals by nulling the known frequency of the input signal. Repeat this calibration procedure for all ranges. From the template a neat dial may be made, or as was done here, a tracing was made and a photostat obtained. The photostat was then covered with a sheet of 1/16" plexiglass and fas-

(Continued on page 59)



Selectivity characteristic of the Heteronull

Conducted by HERB BECKER, W6QD*

WE WOULD LIKE to offer our sincere congratulations to the following DX men who have achieved WAZ. The certificates have been awarded as follows:

240	PY1GJ	Roland Pereira de Souze	40-199
241	W7IYA	Rick G. Price	40- 59
242	W6BUY	Jack Holmes	40-157
243	W3GAU	Joe Gillson	40-183
244	W3IYE	Ray A. Belair	40-214
245	W3JTC	Larry Eisler	40-224
246	VK6RU	James E. Rumble	40-186
247	W3JNN	Oscar L. Short	40-215
248	W3KT	Jesse Bieberman	40-222

It looks as though the W3's hit the jackpot this month. As you will see, there are five of them listed above. W7IYA should take some sort of a prize for working the smallest number of countries and yet made WAZ. This was a case of a man gunning principally for WAZ with little emphasis on countries. Rick has subsequently moved and is now W9IPX. It is good to see W6BUY in there and we certainly can't overlook VK6RU whose station has given Zone 29 to many many Hams throughout the world, and then last but not least PY1GJ. None of the above really should need any further introduction to you.

W2HMJ is getting fed up with this DX business, as he seems to think that his 250 watts can't compete with the power houses around the country. Then of course conditions haven't exactly added to his happiness, so from the way things look Augie is pulling the switch until things get better all around.

W9LM still has enough energy to work in a DX contest. Hal thinks it is going to be good in a few years when the sun spot cycle is on the increase and, at the same time, wonders if we old fellows will have to be wheeled up to the operating desk in a wheel chair when it comes contest time. Maybe a Wheel Chair Club wouldn't be so bad at that.

KL7PJ has his rig and shack in a hall closet. He generally runs 350 to 400 watts into the 813 final while the receiver is an NC-173 with pre-amp and audio filter. Chuck says the Anchorage Amateur Radio Club has started up again and looks like they will do O.K. with about 25 to 30 attending the last meeting.

W6ETJ worked FO8AG, who is on Makatea Island, and usually can be found at about 14120. For a lot of the old timers, this fellow is ex-F30CD who was on around 1931. His name is Emil Helme. W6ETJ got a tremendous bang out of working him the other day since the only other contact he has ever had with him was in 1931.

OE1FF is moaning about the fact that he doesn't get much of a chance to stay home and work DX. He is on the move again, and this time to HB for a few months. He managed to knock over a few new countries when he was home in November, as well as XZ2SY for a new Zone.

DL3AB just discovered that when he worked VK1FE a year ago, he didn't realize that it was a new zone for him. Anyway, I guess in looking back over his log it finally dawned on him. Adolf has also added three new countries to his list. This makes him 39 and 106.

W1NLM thought he had something when he worked VQ9AA. He drew a bead on him with his rotary and found he was about 45° off. All good things come to an end, and in this case it

SM5RM on the air, and his XYL doesn't seem to mind.

Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.

This composite of three photos taken at EK1AO's QTH helps explain his outstanding signal on all bands. That's

happened when he read about the doubtfulness of VQ9AA in the December column. . . . W6AM is doing a little more phone work these days and added YJ1AA and 4X4CR. Another new one for Don on c.w. was VK1RF on Macquarie.

W5GEL nailed down VP5BH on Grand Cayman, 7018 kc. He was running 40 watts into a pair, of 807's. . . . W5FFW worked VU2GJ 14060 and FF8AC 14040 for a couple of good ones. . . . W9HUZ has added a few including FK8AH, FQ8AE, VS7KR, and CR5AC.

From the Southern California DX Club Bulletin I see where W6PFD has acquired the rig of W6TSW and this includes key clicks. Remember, I am only quoting, but I won't argue. . . . Apparently W6FSJ found out through FK8AI that FW8AA is on the air on Wallis Island, but up to now has only had one contact—this being with FK8AC on 40.

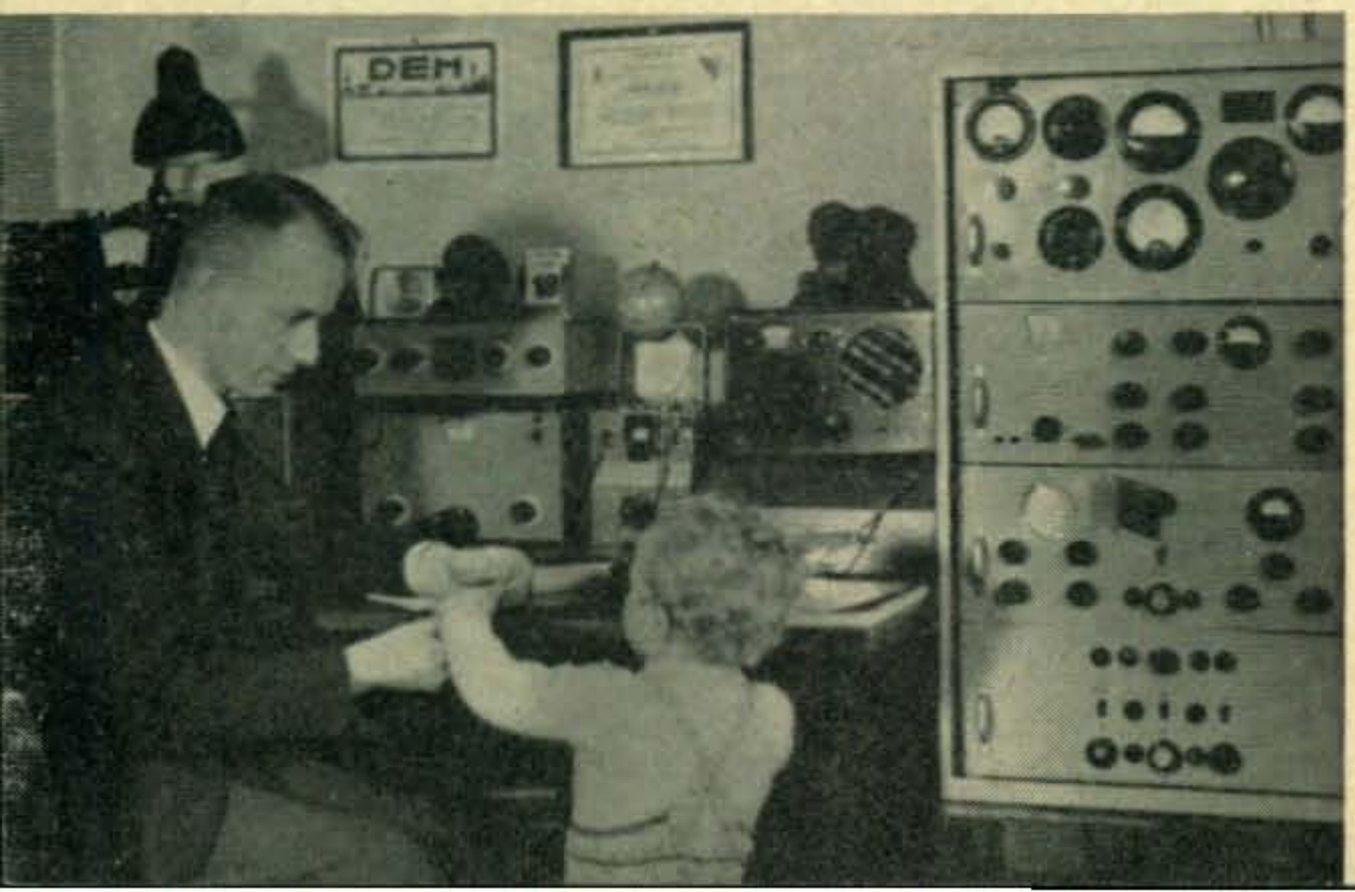
W6TT was one of the few to work 3A2AB on phone. Elvin also connected with VR1F as well as ZK2AA making his phone total 142. . . . It is good to hear from W5MPG for the first time. It seems that he has just put up a new 3-element beam after being off the air for quite some time. The old beam came "tumbling down" as he puts it, and with a new telephone pole supporting this present rotary, things are on the up again.

The other day W8EBC was saying the snow on the level was 1/4 wave on 440 mc. and in drifts it was 1/2 wave on 5 meters. . . . W6EPZ sewed up Macquarie good and proper when he worked VK1RB and VK1RF. . . . G6ZO still carries a horse shoe as was proved when he worked

IIRB in a contemplative mood.

YJ1AB. This was done on 20. . . W5MET crawled into the phones in order to hear VU2CU when he worked him. In other words, it wasn't one of those QSO's "UR RST 599 FB Sig, OM. Pse repeat last transmission."

W3CHH, whom many of you will remember as W3CHH/IWO, is still getting many cards from stations he worked while on Iwo Jima. He actually sent cards out to everyone he worked from there, but still has a few for those of you who haven't received his. You might, however, check with your QSL Bureau, because it could be that yours is waiting for you there now. If you should want to get in touch with him, write to



DL1EZ and his jr. op.

ZB2 in the center, and the EA coast on the horizon. EK1AO has been working W's on 160 recently.

J. J. Frekot, W3CHH, 7236 Rupert Street, Philadelphia 24, Pennsylvania.

W9NZZ has just about given up ever getting his Zone 19 card from UAØKFD . . . F9BO was another one who worked HV1A, but a letter from Vatican Radio told him the guy was a pirate, and no amateur stations were known in the City. . . . W7HXG lost his 20 meter beam in a recent wind storm, so in its place he now has a 4-element 10 meter job and has been working 10 phone for the past couple of months. . . .

I appreciate this, Clif. Now, how about bringing yours up to date?

It looks like the Tri-State Amateur Radio Society has some new officers, the head man being W9HX and the V.P is W9DGA. The secretary (who probably does all the work—and I know I'll hear about this crack) is W9AZJ, and the guy who handles all the dough is W9QLW.

I wonder how many of you heard a couple of recent newscasts of Lowell Thomas relative to Bob Ford, AC4RF? For those of you who haven't heard, apparently AC4RF has been arrested by the Chinese Communists on some sort of a charge which I am sure most of us will bet is not true. According to the Lowell Thomas broadcast, Bob is accused of murdering a Tibetan monk with a poisoned cup of tea.

GM3CSM is still trying to get all the W's to QRP—all of them, that is, over 100 watts. He says when the W pack is in full cry the bagpipes don't stand a chance. Ian spent a little time in Denmark and Sweden meeting quite a few Hams.

Remember, fellows, last month I mentioned something about you phone DX men sending in a little more of your DX? Of course, it's got to be on the air to work before you send it in, but nevertheless keep it in mind and let's see if we can't once again have a little more phone work reported. Even my W9's let me down this month. What happened? 73.

Q T H COLUMN

CP5EK	Box 496, Cochabamba, Bolivia.
CR5AF	Box 206, Bissao, Port. Guinea.
CR7IV	Box 595, Beira, Mozambique.
FF8AC	Box 19, Port Etienne, French West Africa.
FK8AH	Via W6AGS.
FO8AG	Emile Helme, Makatea Island, French Oceania.
FQ8AE	Box 69, Ft. Lamy, French Equatorial Africa.
VK1RF	Via. W. I. A.
VP5BH	Alvin Hanlan, Georgetown, Grand Cayman Island, B. W. I.

The comfortable looking shack of XZ2SY.

W. A. Z. HONOR ROLL

CW & PHONE WAZ

W1FH	234
W6VFR	234
W3BES	232
W6ENV	230
W2BXA	229
W6EBG	227
WØYXO	226
W6PFD	226
G6ZO	226
W6ADP	225
W6MEK	225
W6GRL	224
W3GHD	224
G6RH	224
W3JTC	224
W3KT	222
W3LOE	222
W6SN	222
W6FSJ	222
W6ITA	219
W8BHW	218
W3EVW	218
W6AM	218
W6TT	217
W6SYG	217
WØPNQ	217
G2PL	216
W2PEO	215
W7AMX	215
W3JNN	215
W3IYE	214
W2AGW	213
W4AIT	213
VK3BZ	213
PY1DH	212
W8BRA	212
CE3AG	212
W6MX	211
W6NNV	211
VK2ACX	211
ZL2GX	211
W6SAI	210
W6BPD	210
W6MJB	210
W6OEG	210
W6DZZ	209
W9VW	209
W2AQW	208
W8HGW	208
W9NDA	208
ZL1HY	208
W6SC	207
VE7ZM	206
W4BPD	206
LU6DJX	205
W6MVQ	205
W6PQT	205
W6ZCY	204
W6DI	204
W6PKO	204
VK2DI	204
KH6CT	204
W4CYU	203
ZS2X	203
VE4RO	203
W7GUI	203
W6RM	202
W6OMC	202
W6PB	202
W6AOA	202
KH6IJ	202
W6DLY	202
W6GDJ	201
W6TS	201
W9KOK	200
KH6BA	200
VK5JS	200
W6RBQ	200
PY1GJ	199
W6EFM	198
W2IOP	197
WØDU	197
DL1FF	197
KH6QH	197
PY1AJ	196
W6WB	196
G2FSR	196
G4CP	195
W6UCX	195
W5KC	195
G6QB	195
OK1FF	194
W6GAL	193
W6TI	193
ZL1BY	193
W6AVM	192
W6HX	192
WØSQO	192
VK2NS	191
W6RW	190
W6SRU	190
W6EPZ	190
VK3JE	189
ON4JW	189
W5GEL	189
W6VE	189
WØNTA	188
W6AMA	186
W8SDR	186
VK6RU	186
W2CZO	185
W6RLN	185
G8IG	185
W6SA	184
KH6VP	184
W3GAU	183
LA7Y	182
WØELA	182
W6KRI	181
W6IFW	180
W6EHV	180
CE3DZ	180
I1KN	179
W6UHA	179
VK4HR	178
G3DO	178
W9VND	178
W7DL	177
WØUOX	177
VK6KW	177
W6UZX	177
LX1FY	176
W6IBD	176
KH6CD	176
W1AB	175
W6WKU	174
W6CIS	174
W7FZA	174
W6PCS	174
W6KUT	174
W6TZD	173
DL7AA	173
G5YV	172
OK1LM	172
W6WWQ	172
W6SRF	171
PY1AHL	171
OK1HI	171
VK2HZ	171
W6LN	171
W7OY	171
OE1CD	170
W6BAM	170
W6PZ	169
W5AFZ	169
G2VD	169
W6JZP	168
W6ANN	167
VK3CN	167
W6LDD	167
W6BVM	167
W6DUC	166
KH6MI	166
W6CEM	166
W6JK	165
VE7GI	165
W6LRU	165
W6BUD	165
W6BZE	165
W6EAK	163
W6YZU	163
VE7VO	162
W6PH	162
ZS6DW	162
W7ENW	162
VK4EL	162
W6PDB	161
OK1SY	160
VK3EK	160
W6PUY	160
JA2KG	160
W6MHB	160
I1IR	158
W6CYI	157
W7BD	157
WØOUH	157
G3TK	157
W6QD	157
W6BUY	157
W7BE	156
KH6LG	156
W6BAX	155
VK5KO	155
G3AAM	154
W5KEV	153
G3YF	152
G2IO	152
VK2QL	151
W6LEE	150
W6FHE	150
W6EYR	150
W6RLQ	150
W6LER	150
W6ATO	149
OK1CX	147
W6LS	147
W4CYY	147
W7KWC	147
W7DXZ	146
W6AYZ	146
VE6GD	146
W9NRB	145
W6MUC	145
OK2SO	145
ON4TA	144
G3BI	144
KH6PY	144
W7LYL	143
I1XK	140
W6ONZ	139
W6ID	138
ZC1CL	138
W6NTR	138
OK1WX	135
G3AZ	133
W6TEU	133
W6RDR	133
W6OBD	131
ZS2CR	131
W6IDZ	130
W7ASG	129
W6BIL	128
W7GBW	127
G8IP	127
G5BJ	126
PK6HA	124
G5VU	124
W6NRQ	123
W6MLY	123
ZS6CT	113
KG6AL	103
VK6SA	103
W7KWA	98
W6DUB	89
W7IYA	59

39 Zones

W8NBK	219
W3DPA	219
W9ANT	218
W9RBI	214
W2NSZ	214
WØNUC	211
W3OCU	210
W1ENE	209
W1BIH	209
W2HHF	208
W1JYH	208
F8BS	206
W3EPV	205
W5ASG	203
W5LVD	203
W9IU	201
VE3QD	201
W2HZY	200
W2WZ	198
W4GG	197
W2GWE	195
W3DKT	195
W2CWE	192
W9LNM	192
W1HX	191
W2AGO	191
W1AWX	191
OK1VW	190
W2EMW	187
W8SYC	187
W3JKO	186
WØEYR	186
W9MXX	185
W1ZL	185
KP4KD	185
W8RDZ	184
F9BO	184
W3DRD	183
W4INL	183
W3KDP	181
W1DQH	181
W9TQL	180
VO6EP	179
VE3IJ	177
W9FKC	175
W2CNT	173
W8CVU	172
W4LVV	171
W2RGV	171
W7PGS	171
W9LM	170
W6CTL	169
W1NMP	169
W3JTK	169
OZ7EU	169
W4VE	169
HC2OT	169
PY2AC	168
W2BJ	168
W4DKA	168
W2CYS	167
W4RBQ	167
VE3AAZ	166
W8LEC	166
W4BRB	162
W4AZK	159
GM3CSM	159
WØGKS	158
W4OM	158
WØAIW	157
I1AY	157
W9ABA	156
VK4DO	156
W9YNB	155
DL1FK	155
W8VLK	155
W8WWU	155
I1AIV	154
W9TQL	154
W2RDK	152
G3AKU	150
DL1AT	150
SM5WI	148
W2COK	146
W2GUR	146
W2MEL	145
W6LGD	145
W9HUZ	145
OK1AW	144
W6KYV	143
TF3EA	142
W9DUY	140
W5FFW	140
W6KYT	135
W9NZZ	134
VE7KC	133
W7ETK	132
W6TE	131
CR9AG	131
W6WJX	131
W5CPI	130
W7BTH	129
OE3CC	128
DL1DA	127
VR5PL	124
W6MI	124
W6MUF	122
KG6GD	121
W7HXG	120
DL3DU	118
W6NRZ	117
KL7UM	117
ZS2EC	116
W6JWL	114
W6EYC	114
KL7GG	114
W6VAT	110
W6FBC	110
DL3AB	107
W7GXA	105
W6LEV	103
W7LEE	91

38 Zones

W2HMJ	192
W2PUD	180
CM2SW	174
W8KPL	173
W8FJN	167
W2SHZ	160
W8EYE	158
W2GVZ	158
W2UEI	156
LU7CD	155
4X4RE	146
W3LVJ	145
W8ZMC	143
ZS2AT	143
WØAZT	143
ZL3AB	143
VE2BV	140
W9FKH	135
VE3ACS	134
W6ETJ	132
W4FPK	131
W2PQJ	130
W4LQN	130
W3ZN	129
WØRBA	127
W9MZP	126
FE8AB	126
W9TB	122
GW4CX	120
WØFET	118
VE7VC	116
W6CAE	113
KL7PJ	112
W7EYS	107
W6FXL	92
C1CH	84

37 Zones

W1KFV	171
W2ZA	160
W3WU	157
W4IWO	149
W3FYS	147
ZL3CC	143
GM2UU	142
W4ML	140
W5MET	137
W2WC	136
W9HUZ	134
W2AYJ	133
W7HKT	130
W4DIA	129
W1APA	127
VE5JV	126
W9LNH	122
OE1FF	117
VE1EA	116
W6AX	110
WØFWW	108
W7PK	104
W8HSW	104
W2BLS	99
OH3OE	93
KL7KV	88

36 Zones

W4HA	151
W9WCE	136
OA4AK	128
VE1PQ	128
I1IZ	126
W3AYS	124
F8TM	124
W9LI	124
SV1RX	119
W2BF	115
4X4BX	112
G3BPP	111
W5CD	108
EA1AB	103
W2JA	102
W5BK	99
VE8AS	98

35 Zones

W2OST	146
W1BFT	141
W4DHZ	132
W9CKP	132
W5FXN	125
OZ7BG	124
W5JUF	121
G6QX	121
W6ZZ	120
W9RQM	119
CO6AJ	119
W9DGA	115
W9FNR	114
W8AVB	113
WØGBJ	110
W2HAZ	109
KZ5IP	108
ZL1QW	99
KL7CZ	69

34 Zones

W1DEP	150
W8NSS	133
W1NLM	130
W4IYT	127
W3MZE	126
W1MRP	118
W5NTT	107
W8JM	102
W6VBI	100
G2BVN	91
W9WEN	83
W8PCS	80
W6EUV	66
W6OKL	61

33 Zones

W4QN	110
W2SEI	100
W8QUS	85

PHONE ONLY

G8IG	159
ZL1HY	157
W1HKK	153
W6KQY	151
W9NDA	149
F9BO	145
W6AM	139

37 Jones

XE1AC	192
W1JCX	179
W9RBI	175
PK4DA	170
W3LTU	169
W8REU	163
CE3AB	163
W7MBX	158
VK3BZ	158
W6WNH	157
G3DO	155
G2PL	154
W6PXH	153
W3JNN	150
W8BF	146
W6TT	142
F8VC	124
W7MBW	107
C1CH	83

36 Zones

W1NWO	176
W1MCW	172
W1BEQ	164
W9HB	160
W4ESP	152
W2DYR	140
W9BZB	139
GM2UU	135
WØHP	131
W6PDB	130
W4INL	129
W1FJN	128
W8AUP	128
G6BW	127
VE3BNQ	126
VE7HC	123
WØHX	120
W3GHD	114
W8CYL	112
W3DHM	96
W6SA	92
F8DC	87

35 Zones

HC2JR	158
ZS6Q	156
W4HA	142
W6PCK	141
W9RNX	140
W2RGV	136
HC2OT	134
W6CHV	133
W2GHV	131
WØEYR	131
W9BVX	130
WØPRZ	124
W9CKP	124
G8QX	123
W8ZMC	122
WØPUE	117
W5LWV	108
W4OM	106
W3PA	105

34 Zones

W5ASG	142
W3KT	129
LU8CW	129
W5KC	125
W2ZVS	125
W4LZM	124
I1AXD	124
W6UZX	123
W8BIQ	122
W5JUF	117
WØANF	115
W1BPH	105
W8UIG	100
W4IWO	100
W8QBF	92
WØBFB	70
W2NXZ	65

33 Zones

W9MIR	131
W5ALA	126
W9WCE	119
W2ZW	115
I1VS	11..
W8BFQ	114
W8SDR	113
W8NSS	112
VE3BQP	108
W2PQJ	100

PHONE ONLY

39 Zones

W6DI	192
VQ4ERR	187
W6VFR	173
HB9DS	164
W7HTB	161
VE7ZM	145
DL1FK	125

38 Zones

W2BXA	168
W4CYU	160

UP AND AT 'EM

CARL A. WEIDENHAMMER, WIZL*

Having trouble getting out? Here's the encouraging story of a simple vertical that really does a job for W1ZL.

IN THIS, THE AGE OF SUPER-POWER, four-element wide-spaced beams and rhombics, the newcomer who has been mesmerized by the DX merchant's tales of contacts with the far-away places with the strange sounding names, or the casual communicator with a yen for a flyer in the DX market, may find himself restricted, antennawise, by the physical dimensions of his property. He puts up a horizontal, half-wave doublet or Zepp for twenty or forty, and finds that he can't get optimum height for the span. After calling the rare ones time and time again and hearing them come back to somebody else, the DX aspirant goes back to viewing the man on the pogo stick behind the Venetian blinds. He could have spared himself complete disillusionment by remembering one thing—low angle of radiation. With his horizontal half-wave he had been spraying the heavens with a barrage of vertically-directed energy.

What to do about it? He should have built up, not out—vertically instead of horizontally. We did, three years ago, just out of curiosity, and results were like a shot in the arm.

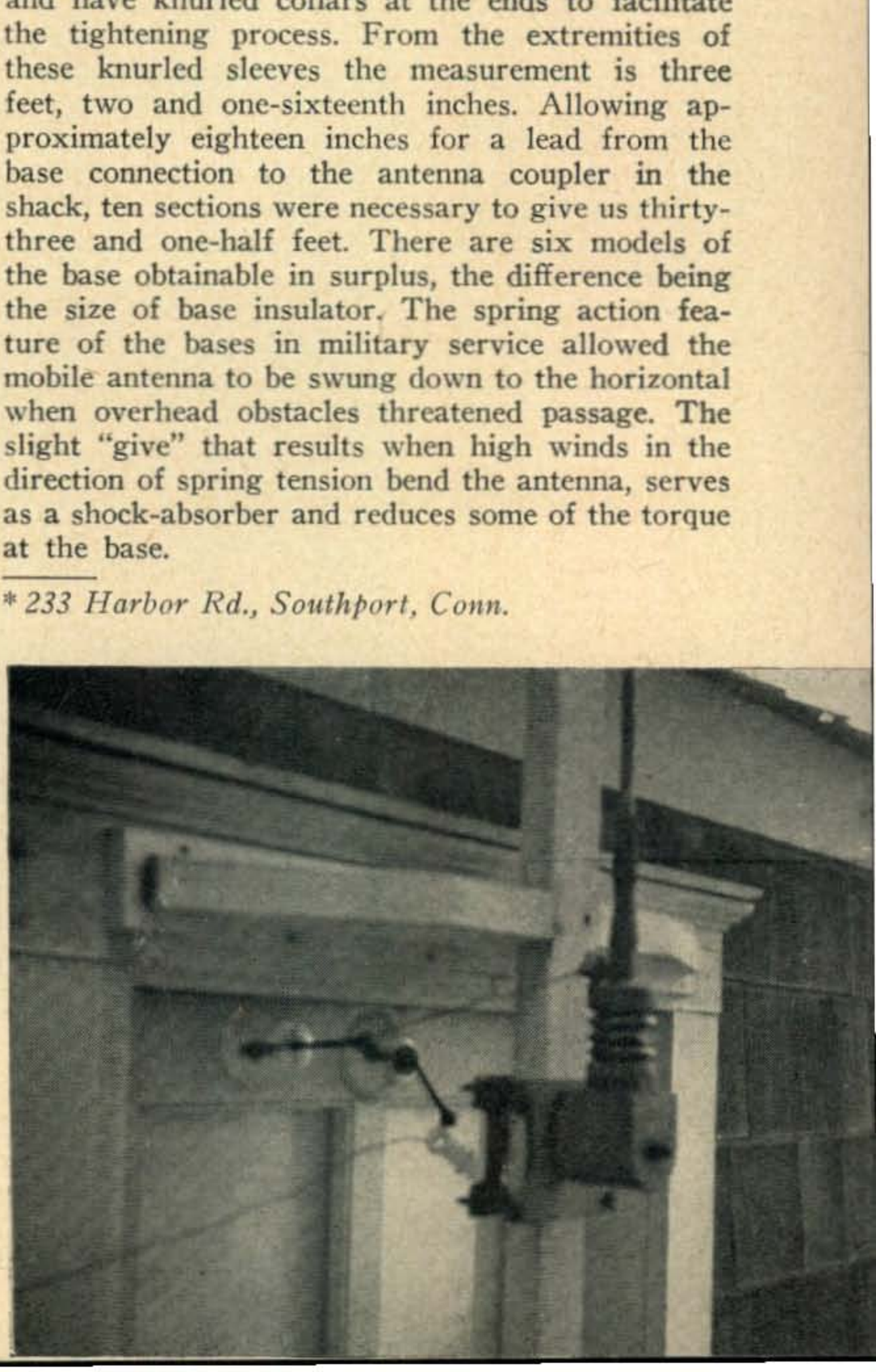
The vertical half-wave has been maligned by many authorities for years and dismissed with the damning contention that it transmits signals that are equally weak in all directions. This holds, quite obviously, when the vertical is erected over poor ground that is barren of moisture. When used over marshy ground, however, the upright half-wave becomes a very effective DX radiator.

If you live near the seashore, by a lake or a river, or near marshland, reflection will be maximum and reinforcement realized to the full provided the base of the vertical half-wave is approximately one-tenth wavelength above ground. In lieu of naturally perfect ground, copper radials of several wavelengths can be laid or buried to simulate artifically the ideal reflection surface. Low angle radiation can be obtained with a minimum of effort and construction by the antenna under discussion.

There is no antenna that will work equally well on all bands. In our case a compromise had to be reached, so we built the vertical as a half-wavelength for 20, and decided to investigate its ten and forty meter possibilities when necessary. Operation on 80 was also considered if proper loading could be arranged.

Surplus ads in "CQ" and occasional excursions to lower New York's "radio row" made us acutely aware of the Signal Corps MS53 screw-in type vertical antenna units and the MP series whip antenna spring-action bases that were used on military mobile equipment during the last war. The elements, threaded male at one end, female at the other, can be purchased in five diameters, allowing a taper to the antenna peak. They are made of tubular steel, copper-coated, and painted, and have knurled collars at the ends to facilitate the tightening process. From the extremities of these knurled sleeves the measurement is three feet, two and one-sixteenth inches. Allowing approximately eighteen inches for a lead from the base connection to the antenna coupler in the shack, ten sections were necessary to give us thirty-three and one-half feet. There are six models of the base obtainable in surplus, the difference being the size of base insulator. The spring action feature of the bases in military service allowed the mobile antenna to be swung down to the horizontal when overhead obstacles threatened passage. The slight "give" that results when high winds in the direction of spring tension bend the antenna, serves as a shock-absorber and reduces some of the torque at the base.

* *233 Harbor Rd., Southport, Conn.*



This closeup shot shows the mast base and the cleat which braces the two by three. The 33 ft. counterpoise goes off to the left.

Supporting the antenna was ridiculously simple. A piece of reasonably clear two-by-three fir stock, eighteen feet long, was used as the foundation unit. To it was spiked a section of one-by-two fir, six feet long, allowing two feet for overlap. This extra section will not be necessary in most localities, but is was used at our place because of frequent high winds.

The wooden support assembly was placed on the ground and the antenna base clamp plates bolted around the two-by-three, seven feet from the bottom. A screw-in type corrugated glazed porcelain stand-off insulator eight inches long was attached to the top of the two-by-three and another to the top of the one-by-two. With these as separators and supports, the antenna proper was assembled along the pole. The corrugations of the insulators served as convenient channels for the elements which were fastened when spacing was even, with butterfly hitches of heavy antenna wire. The joints were carefully taped with scotch tape and sealed with glyptal. The over-all assembly was then painted.

The entire assembly can be walked up to the perpendicular by one person, but a helper was employed to steady the antenna during the nailing-down process. Figure 1 shows the orientation of our particular installation, but any other kind of support that is convenient can be employed. The most attractive feature of the antenna and its support is simplicity. A comparable vertical half-wave of antenna wire would require a forty-foot stick with all of the inconvenience of guying and associated evils.

The methods of coupling and the constants used at W1ZL on 10, 20, 40, and 80 meters are shown in Figure 2. Maximum efficiency is realized on 20 and 40, but very satisfactory results have been had on 10 and 80.

Over-all results with the Versatile Vertical have been most gratifying during the past three years.

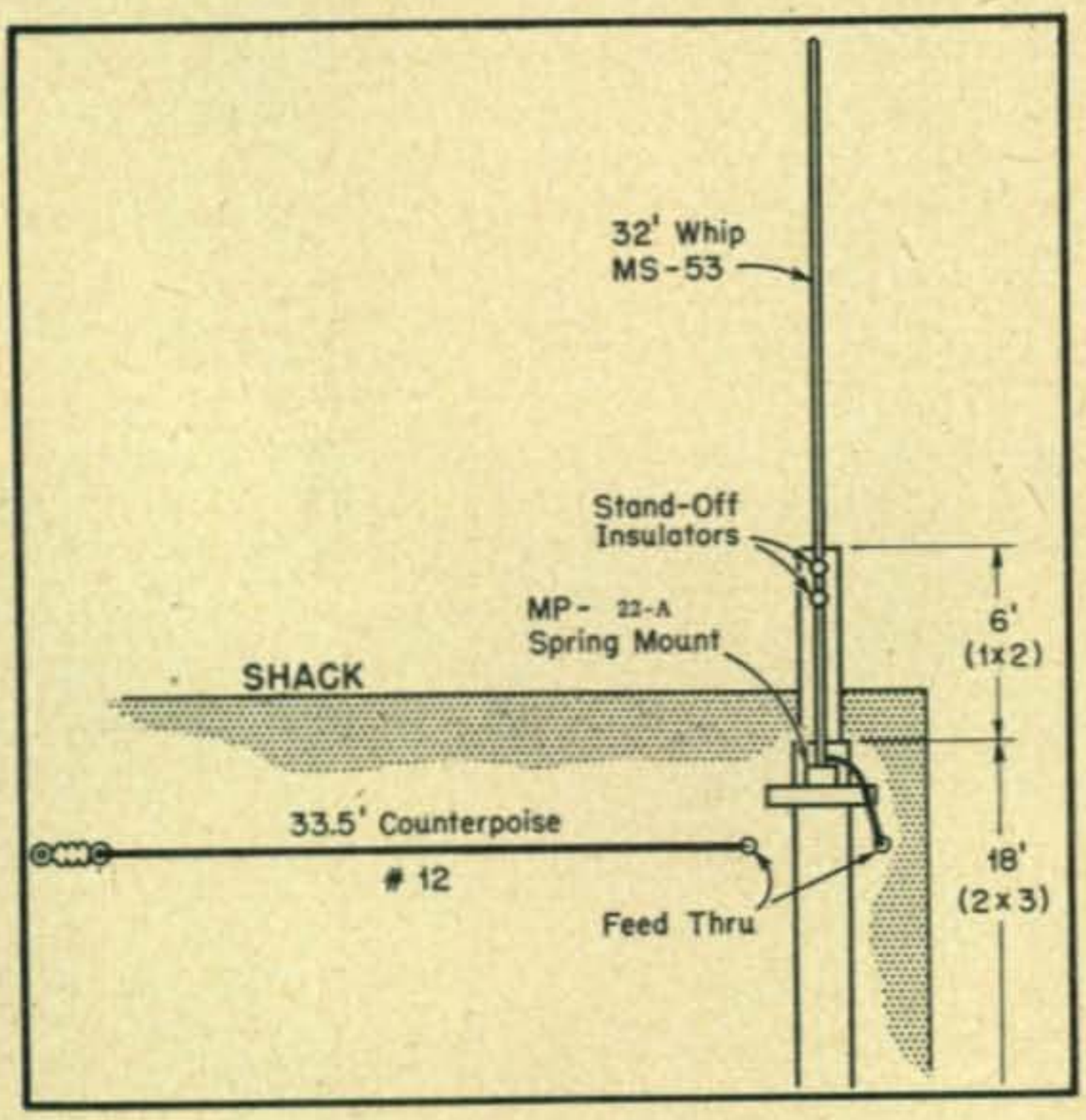


Figure 1

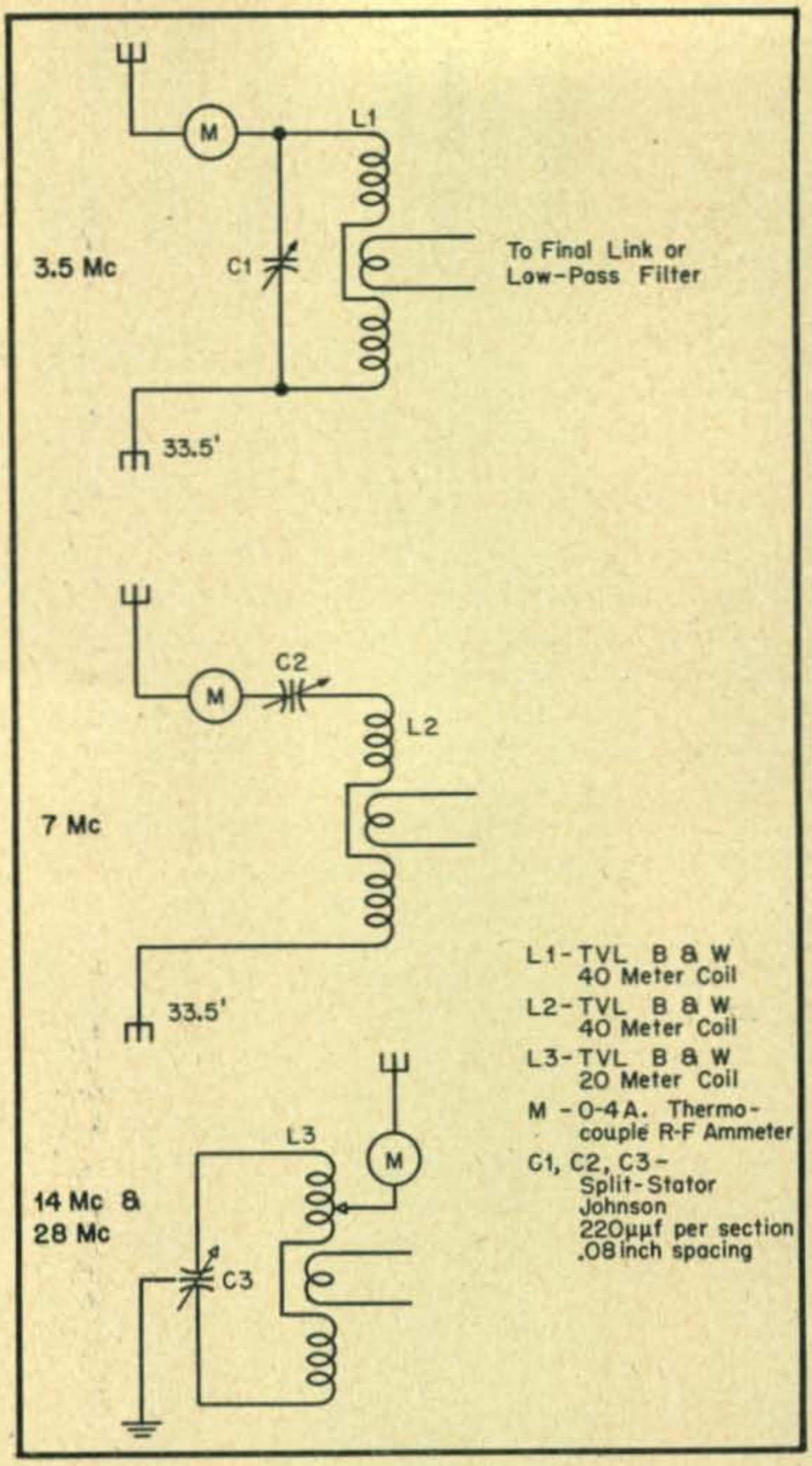


Figure 2

With transmitter inputs of two hundred watts and less, one hundred and eighty-six countries have been worked in thirty-nine zones, with one hundred and seventy-one countries confirmed. Reports from VS1, VS2, VK6, and points equally distant are rarely less than S7 on the 20 meter band unless conditions are extremely poor. The kilowatter with the big beam may cross the finish line first, but the vertical never fails to place or show. In the DX Derby it's nearly always jockeying for position that counts.

On the forty meter band where all men are almost equal, the "30 up and 30 out" combination recalled by Smith, [1] and first used by us in 1925, acts as a modified ground-plane antenna and lays down a fine low-angle signal to all parts of the world. ZS1, ZS2, and VK6 have been worked from this location on 40 in bright daylight late in the afternoon. During the hours of darkness, WAC has been made many times.

Eighty meter activity has been restricted somewhat because of lack of time and inclination, but occasional jaunts to that band have resulted in

(Continued on page 52)

The AUTO CALL

R. V. ANDERSON, W3NL**

Another CQ "first" — an automatic calling system which is immediately applicable to any amateur emergency net.

THE AUTO CALL IS A DEVICE by means of which a station can be called whether or not the operator is on the air at the particular moment. The Auto Call grew out of a requirement of the Washington Mobile Radio Club for contacting another station in case of emergency. One of our members happened along after a very serious automobile accident quite late at night when most hams had closed down, and was unable to obtain assistance by radio. He had to drive three miles over icy roads (the cause of the accident in the first place) to get to a telephone. This was a very poor showing for ham radio and we resolved this should not happen again.

In considering a device for calling purposes, we first imposed one requirement: The system should be operable by any mobile station, with no addition of any kind required at the mobile transmitter. This precluded the use of resonant relays, tuned filters, etc., but did not prevent the construction of a satisfactory device. It was finally decided the design should be centered about a standard receiver, the audio of which would be modified with a high-pass filter to eliminate voice modulation. The speaker normally would be disconnected, the output tube operating instead a plate relay which would in turn operate a "dial system." Once operated, the "dial system" would disconnect the high pass audio filter, plate relay, etc., and connect the speaker to the output tube. The mobile operator would merely whistle the pulses required for the dial system after which he could talk directly to the fixed station.

After the usual mathematical computations on audio filter design, with the invariable result that final figures designated chokes and condensors of odd sizes that couldn't possibly be found, it was decided to try standard components and see what happened. The result is the high-pass filter shown, which cuts off roughly at 1000 cycles. It has proven very satisfactory, eliminating false operation on voice modulation, except from very strong signals.

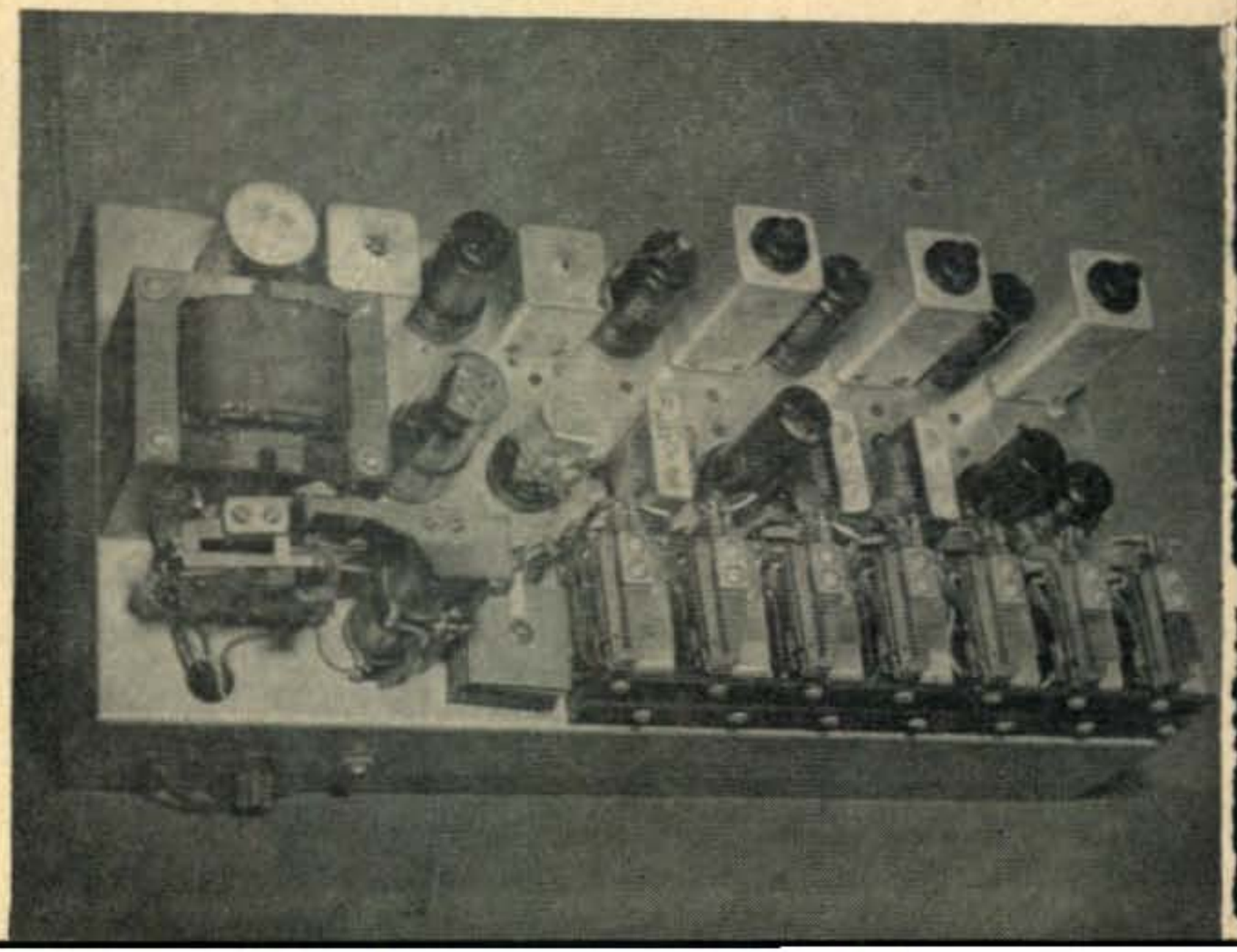
Details of the System

There are a great many ways to build the pulse system. After considering various electronic systems, relay systems and combinations of these, it was finally decided to use a straight-forward relay circuit using "junk-box" relays. This required 2 or 3 more relays than some other methods, but it produced a circuit which can be built from equipment normally available to any ham. The one unit not normally found in the junk-box is the stepping switch. This particular unit used a Miner switch which is available on the surplus market,* but the magnets will probably have to be re-wound for 110v d.c. Mine were rewound with No. *38* enameled wire, giving about 1500 ohms. There are a number of other commercial switches which are available; the main point is that the switch must reset instantly from a single pulse and not "go on around" to do it.

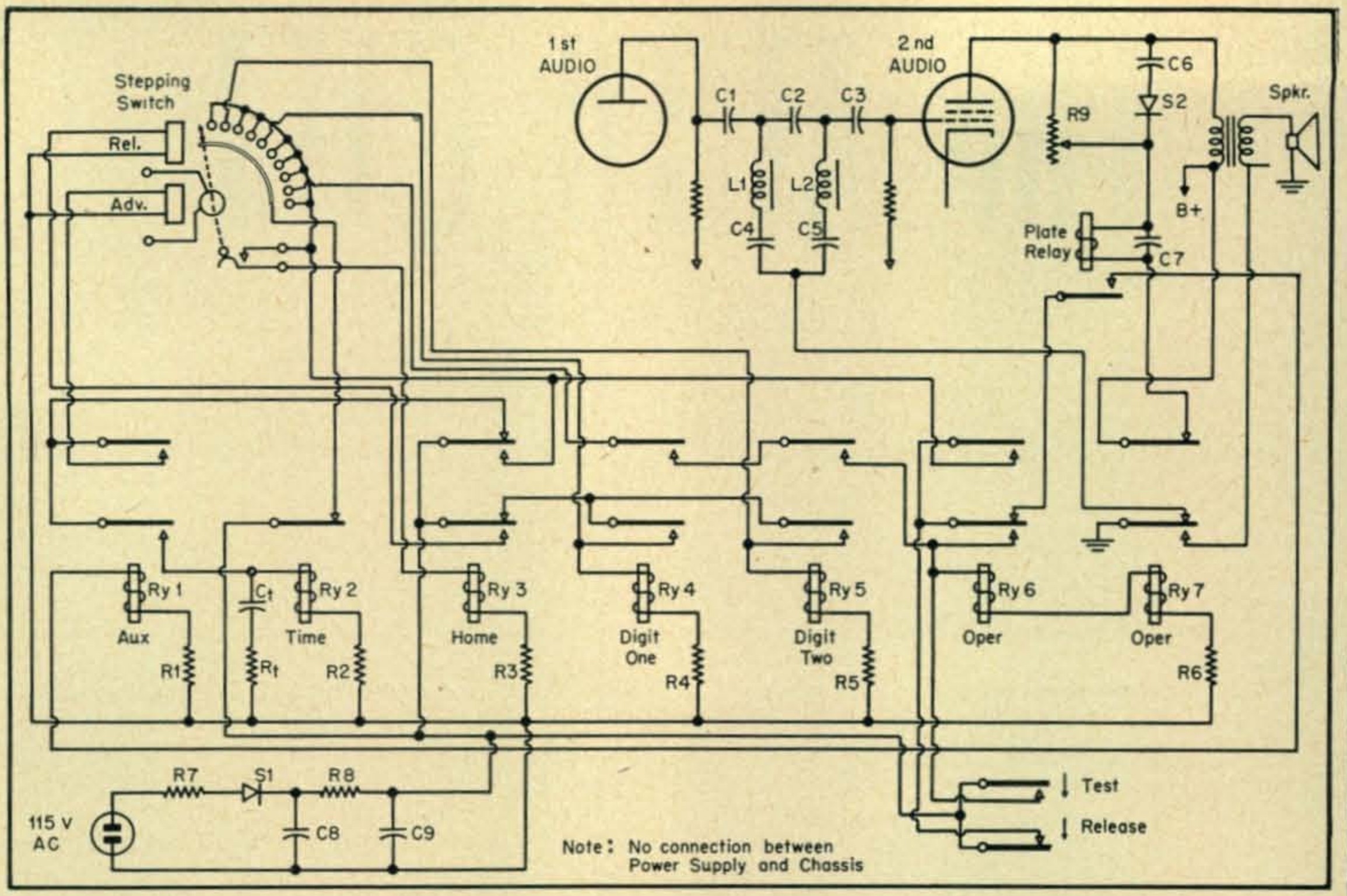
DC for the relays is provided by a standard 250 mil. selenium stack and two 50 or 100 mfd electrolytic capacitors. Resistance as required is

**2818 Que St., S.E., Washington 20, D.C.*

*The AN/TRT-2 and AN/TRR-2 Radio Set is a battery-operated RF stage, super regen det., audio discriminator, and amplifier operating a stepping switch with specific audio-tones and pulse sequences. It did not function satisfactorily for a call system; however, the stepping switch is ideal for this application.



Top view. The receiver section is in the upper right hand corner.



Ry 1,3,4,5,6,7—Any relays which will operate on 25 ma or less, 600 ohms up.

Ry 2—Any relay which will operate on 10 ma or less.

R 1,2,3,4,5,6 — Current limiting resistors if required. With 600 ohm relays should be about 3500 ohms 10 watt each.

R 7,8—50 ohms, 5 watts

R 9—50,000 ohms. Wirewound

Rt, Ct, = depends on Ry 2 and R2. Suggest 20 mfd and 1000 ohms.

C 1,2,3,4,5,6—.02, 400 v paper.

C 7—4.0 mfd elec, 150 v.

C 8,9—50.0 mfd 150 v. elec.

S 1—250 ma selenium stack

S 2—60 ma selenium stack

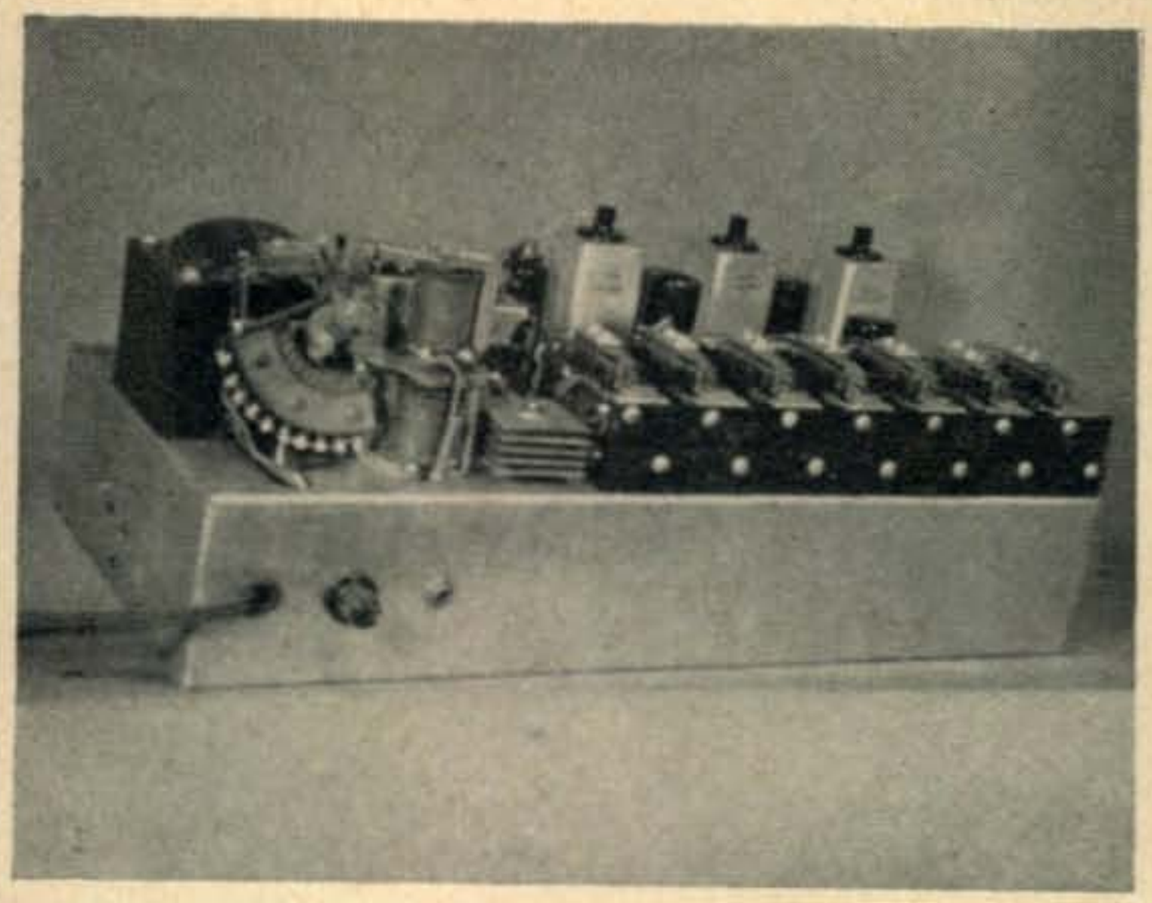
L 1,2—ac/dc choke (Merit C-2975)

added to the relay coils to permit operation from the higher voltage. Time-delay on the "Time" relay was provided by an RC circuit, thus eliminating a special slug type relay. An auxiliary relay was provided to repeat the plate relay because most plate relay armatures are delicately balanced; the slightest contact arc causes the points to stick. With two contacts available on the auxiliary relay, it's easier to make the time-delay relay function.

Referring to the diagram, the Auxiliary relay repeats the plate relay; the Time relay furnishes the delay necessary to discriminate between pulse sequences; the Home relay resets everything to the home position; Digit 1, digit 2 relay and the "Operate" relay are operated in succession as the result of the correct sequence of pulses. *Stepping switch connections are drawn for the pulse sequence 2-3-4.*

When the Auxiliary relay operates, current is supplied to the Time Relay and to the Advance magnet of the stepping switch, advancing it one point. When the Auxiliary relay releases, the Time relay will remain operated until Ct discharges. Rt delays this discharge. As long as the time between pulses does not exceed this delay time, the Time relay will remain operated throughout the pulse sequence period.

If the Auxiliary relay is pulsed twice, the stepping switch will be advanced to point 2. When the Time relay releases, current will be supplied to point 2, energizing Digit 1 relay which will lock through its lock contact. Three more pulses will advance the stepping switch to point 5, operating Digit 2 relay. Four more pulses will advance the stepping switch to point 9. Current will be supplied from point 9 through the contacts of Digit 1 and Digit 2 relays to the Operate Relay, which will lock and remain locked until released by the Release switch. The operate relay, and any relays connected in series with it will restore the unit to a standard receiver. Current will also be supplied through the contact of the Operate Relay to the Home relay which, when operated, will unlock Digit 1 and Digit 2 relays and energize the Reset magnet of the Stepping Switch. As soon as

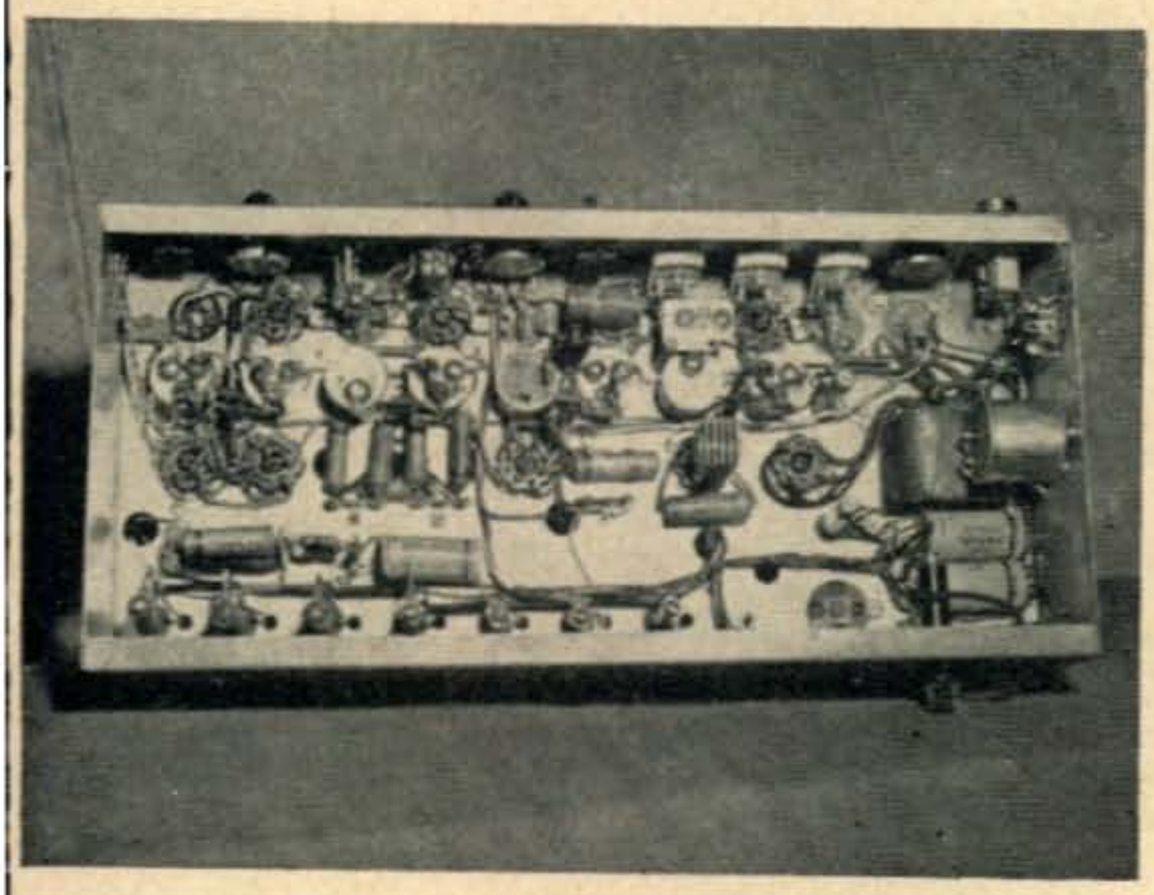


Rear view. The stepping switch is seen on the near left hand corner of the chassis, next to the selenium rectifier.

the wiper has returned home, the Stepping Switch contacts will release the Home relay, thus restoring the unit (except the Operate relay) to its home position.

There are two possibilities if the pulses are not sent in the proper sequence. First, if the stepping switch wiper stops on a point other than #2, 5, or 9, the Time relay, when it releases, will supply current through this point to the Home relay, thus restoring the unit to its home position. Second, if the stepping switch wiper stops on point #5 or 9 (such as five pulses or nine pulses in sequence) the wiper will remain on this point but the Operate relay will not operate because the wiper did not pause on point 2. To insure that the unit starts from its home position, one pulse is supplied previous to operation. One pulse will always insure the unit is starting from its home position. *The calling sequence thus become 1-2-3-4.*

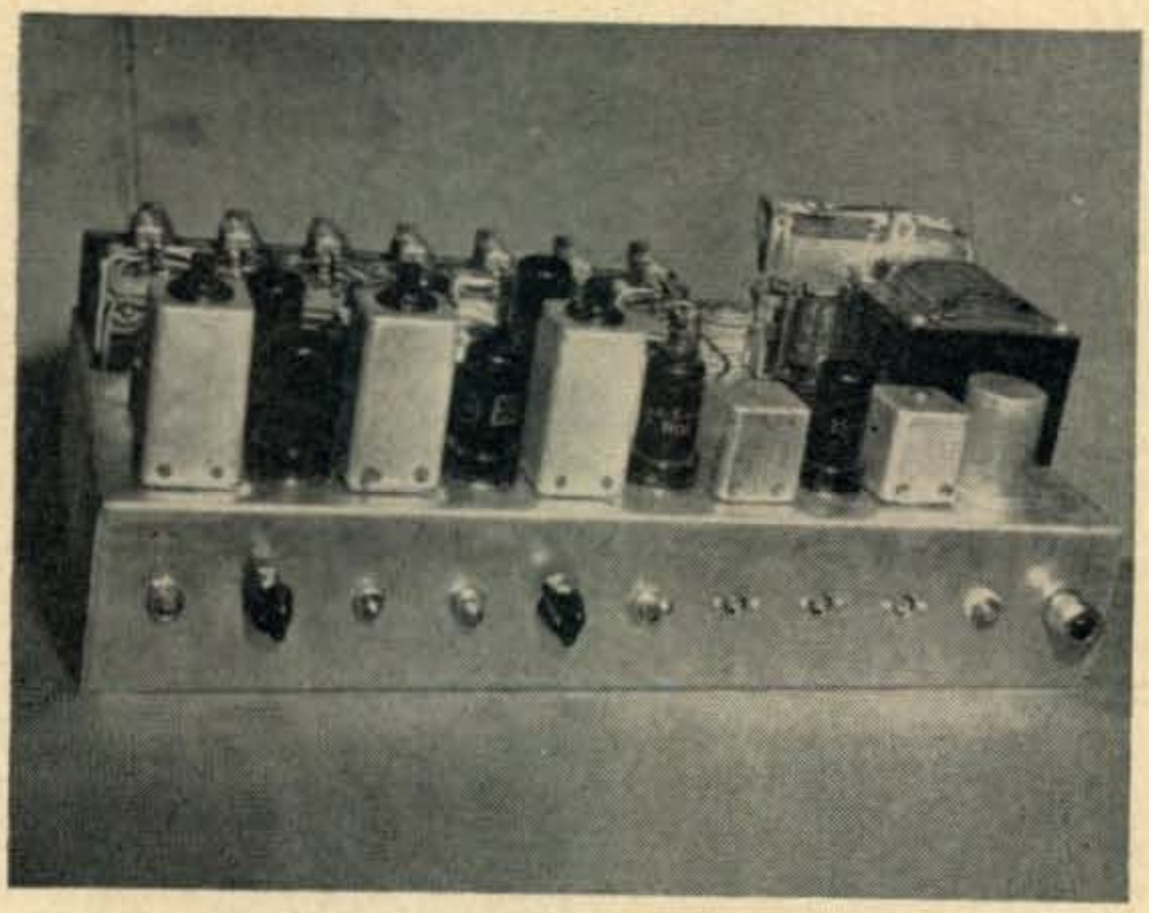
Variable resistor R9 permits a small amount of bleeder current through the plate relay thus increasing its sensitivity. Adjust this control just below the point where the plate relay will unoperate.



Since a transformerless supply is used to power the relays, there is no electrical connection between the control circuit and the chassis.

Receiver Requirments

It was found that the selectivity of the receiver should be about 15 kc wide. The first receiver used 2830 Kc IF's (ARC-5) and functioned satisfactorily. An AC/DC type receiver was also tried but was not too satisfactory because there was an interaction between the receiver and pulse unit—making and breaking current on the relay contacts caused clicks in the receiver. A super-regenerative receiver worked, but was not sufficiently selective for practical use. Adding r.f. stages to narrow it required as many tubes as a super-het, and in addition the super-regen created so much interference that it was impractical to operate the regular station receiver at the same time. A suggestion for a first unit would be a simple mixer, two stages of IF, diode detector, noise limiter and the audio circuit shown.



Front view. Since the unit is designed for fixed frequency operation, calibrated controls are not required.

Results

Experience has shown that the unit can be operated under quite adverse conditions. The receiver signal needs be only about readability three but the mobile station *must stop* to transmit the signal under these condiions. Even with signals of good readability, the usual rapid QSB of mobile signals will cause a pulse to be missed. To insure operation, the mobile operator should stop, give the signal, change his location slightly and give the signal again. He should continue this until the fixed station has answered.

Admittedly, the range and reliability of the system could be improved by the addition of such features as tuned filters at the receiver and a stable tone generator at the transmitter. A polar system, such as is used in radio teletype equipment, is still another possibility. However, since the system described imposes no restriction on the transmitter, it offers maximum flexibility; individual calling can be added at any time by varying the pulse sequence used.

Conducted by LOUISA B. SANDO, W5RZJ*

EVER HEAR of operating "dog-mobile"? Well it's been done, and a couple of YLs were the operators. Last February in Fairbanks, Alaska, the Arctic Amateur Radio Club entered in the local Ice Carnival Parade a dog sled mobile station. The club members built the dog sled, involving many days of hard labor, and the battery operated rig to go in it. Then they located eleven white Siberian huskies that had been trained for parade work. All this assembled, they had to choose an operator to ride the sled. Lucky one was KL7ZQ (now W7OYY), Lucille Spargo, and giving an assist while walking along beside the sled was KL7ZR, Rose Cowles. In addition to the white sled (decorated with tinsel and carrying the club call KL7KC) and white dogs, both girls wore white fur parkas. They made many contacts with the "dog-mobile" and, with their 11 watts, were heard as far as New York. "A very colorful sight," adds Lucille, "and I think it was the biggest moment of my life!"

Lucille and her OM, by the way, were stationed at Fairbanks for two years. Presently at Great Falls, Montana, they live on the Air Force Base in a 31-ft. house trailer. Now Class A, W7OYY is on all bands with their new 32V2 and an NC183.

YL's in EA

Lilia de Yebenes, XYL and 2nd op. of EA4CR (ex-EA5BE), mentioned here some time ago, writes: "Did you know that we already have some licensed YLs in Spain? The first one was EA3GE, Elisabeth Van Jess de Torrens, who passed the exam together with her OM, EA3FR. She is from Venezuela, but her OM is Spanish, and they live in Barcelone." Lilia goes on to say, "We went to the IARU 25th Anniversary meeting which took place in Paris on May 18th. I enjoyed that beautiful city a lot. What happened to the Ws? They were missed there."

While not in time for the May meeting, one W YL, at least, did get to Paris this summer, and to a lot of other cities and countries as well, visiting several YLs on the way. Many of you had cards from her, or a QSO from the DX side, so of course you know we're talking about W3CDQ, Liz Zandonini. Her travels sound so interesting you'll surely want to hear about them, so we'll quote from her letter:

"Mrs. Briggs (XYL of W3CAB, deceased. and a member of the ham fraternity for about 30 years) and I left the States July 1st on the *Queen Elizabeth*. Landed at Southampton July 6th and got to London that same p.m. The next day we went sightseeing and the following day visited G2JK (who had been in the States in '48) and his family. He had a party for us and invited quite a few hams to meet me. Around 11 p.m. that evening (his time) I contacted W3WV, W3PZA, W3KDP, W3IL, W3FMC, and I understand many others called me, but I went to bed at 2 a.m. after having had a busy day. G2JK took us touring the next day to Stonehenge and Salisbury, and the following day I went to visit Nell, G2YL, and in the evening met Meg, G3ACC. Nell, of course, I had met before, but Meg was a newcomer to me. She is a very interesting person and is very enthusiastic about ham radio. She was having a committee meeting of the local radio club to discuss their annual dinner so I met a few hams.

'From London we went to Holland—The Hague, Amsterdam, Volendam, and Isle of Marken. Didn't look up any hams because we were quite busy with sightseeing. From Holland to Brussels, Belgium. Here I had written to ON4LP, whom I had contacted in April. He was on hand to meet me and took me to a UBA radio club meeting. Here 30 hams signed my QSL card. They meet in a cafe and each one coming in orders something to drink. Then they gather around the QSL manager, get their cards and form little groups for rag-chewing, adjourning about 11 p.m. ON4LP kept a sked with W3WV and made a sked for the next p.m. for me. Mrs. Briggs and I went over to his shack and worked W3WV and several others. Next day we went to Antwerp to meet ON4AW, whom I had known since 1938.

Several days of sightseeing in Brussels and then by bus and train to Luxembourg and Basle; then by bus to Montreux. There is the place for me—the lake, the town above it, and the mountains behind that. Saw the Castle of Chillon, went up to the mountain top by cog railway and took several boat trips on the lake. Our hotel room had a balcony which overlooked the lake and the mountains—what a beautiful sight!

"From here to Interlaken and the Jungfrau and Trommelbach Falls. From Interlaken to Lucerne via most beautiful mountain roads through the Grimsel and Furka passes. We saw the Rhome glacier—in fact, went into a part of it; it was ice blue. Stayed at Lucerne for three days. Here we bought Swiss watches, music boxes, handkerchiefs, etc. Then to Oberammergau, in a very peaceful valley among the mountains, where the

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* *Send all contributions to Box 35, Jemez Pueblo, New Mexico.*

Passion Play is given, all the villagers taking part. In the mob scene 1400 people are on the stage. The play is given in what looks like a large Quonset. It seats 5000, but usually there are 6000 attending the performance, which lasts from 8 a.m. to noon; 2-hour lunch, and then from 2 p.m. to 6 p.m. Our tour (28 people) was divided up and we lived with the town's people for two days and nights. The houses are filled with beautiful paintings of different phases of Christ's life. We stayed with the lady who played the part of Mary Magdelene in 1930 and 1934

"From here to Bolzano and Cortura d'ampezzo, where our hotel nestled in the Dolomite mountains, then by bus to Venice. Here we did our traveling by gondola—most interesting. Our hotel was on a canal and just off St. Mark's Square. Did the usual sight-seeing on foot and in gondola, including a ferry boat trip to the famous Ledo Beach, and bought Venetian glass, laces and mosaics. Had some good fruit and cheese here and our first spaghetti.

"I left the tour here for Milan where an old ham (1921), I1ER, met me. We had some QSOs from his place. I1ACD also came over and took me around the city, and to Lago Maggiore on the Swiss border where I took nice boat trips on the lake to Isola Bella, Stresa, and other small towns. On market days these are most interesting for native work such as baskets and crocheting is brought in to be sold.

"Went to visit some relatives in Bressia; then to Rome. The city was crowded with pilgrims from all countries, including many U.S. visitors. Went sightseeing and also attended the general audience the Pope had that Wednesday. The audience is usually for an hour, the Pope welcoming everyone in four different languages.

"In the p.m. I1BBL (whom I had QSO'd) came over to meet me. We went to his place, but found the 14-mc. band dead. We did QSO some locals on 10 phone. Next p.m. visited I1APA and I1OJ. All were quite astonished at my perfect Italian—almost as fluent as my English! Back to Milan, then to Florence. Ada, I1MQ/YL, whom I QSO'd from I1ER, came to Milan August 16th to meet me. We had only six hours, but made the most of them.

'Left Italy August 18th for Paris. We went sightseeing, shopping, etc. G2JK and his XYL flew from London and had the weekend with us. Did the night clubs, etc., and on the 23rd sailed on the *Queen Mary,* arriving in N.Y.C. August 28th. Had a wonderful holiday; took about 20 rolls of 35 mm. color slides and 10 rolls of 8 mm. color movies—with excellent results.

"Enjoyed meeting Meg and Ada and seeing Nell again, and meeting all the OMs. It was a thrill to hear the W stations rolling in R9, and usually getting reports saying, 'I know you'—hi!"

Ada reciprocated 3CDQ's feelings for in a recent letter she commented, "You can't imagine how much joy it gave me to meet Liz and know her personally even though we were together only a little time." I1MQ goes on to say that their little rig is always the same: 6L6, 807, with 15 watts input. But with this she and her father have worked 106 countries for DXCC and 26 zones toward WAZ.

YLRL Activities

Big doings for the YLs (and the OMs) in February are, of course, two days of operating in the YL/OM Contest. You had the details in January CQ, and they are in the current issue of *Harmonics,* so we won't repeat them here. Remember the dates, Saturday, February 24th. 6 p.m. EST, to 11:59 p.m. EST Sunday, February 25, 1951. Any and all licensed OMs are eligible to participate; YLs must be members of the YLRL. Don't forget to send your logs, regardless of score, to W8UDA not later than March 3, 1951. At best the YLs will be far outnumbered by the OMs, so let's all get in there and operate.

20-Meter Phone Net

Because of the unpredictability of 10 meters and with so many of the YLs now Class A, it was decided to start a YLRL net on 20 phone. The net meets on Thursdays at 2:00 p.m. EST, 14,240 kc. with W3UUG, Miriam Blackburn, and W9ILH, Carrie Jones, as NCS. Procedure: NCS will call roll of members, followed by call for new members who would like to report into net. As members report into net they will give the NCS the frequency on which they expect to operate, as well as giving any news about themselves for *Harmonics.* After reporting in, members should QRX on net frequency to hear any YLRL news, then carry on their QSOs on their own frequencies. Here are some of the YLs who checked into the net during November: W2BNC, W2WBN, W4HWR, W4LAS, W4QBY, W5DRA. W5LGY, W6NAZ, W6NLM, W7FTX, W7HDS, W7MUT, W8ATB(QBO), W9LRT and, of course, W3UUG and W9ILH.

On the 40-meter c.w. net, W6YYM, Ellen, says: "Look like I'm 'it' for NCS on the West Coast. If it works out it will be between 7200-7300 on Friday nights about 8 p.m. PST." 33 es CUL.

Key Click

That old printer's devil again: Our apologies to Maxine Thompson for her brand new call, WØCCK, being omitted from the Travelogue section of the January column. Although Maxine received her call shortly after our visit, somehow between Missouri, New Mexico, New York and the printer it just didn't get into that issue.

YL get-together at the QTH of W9FZO described in November CQ. L. to r., standing: W9KQC (ex-W6HZY), W9GME and W9KXL. Seated: W9FZO and W5RZJ.

VHF UHF

Conducted by E. M. BROWN, W2PAU*

THE MONTH OF DECEMBER, 1950, seems to have come and gone without producing any v.h.f headlines. But things have not been completely quiet on the bands—far from it! Six meters rewarded its patient followers with several scattered openings of the auroral and sporadic E type. One of these, on December 21st was unusually extensive for this time of year. Covering the entire northeast-to-southwest section of the country, signals were so strong that W9ZHL was able to work close to a dozen stations ranging from Maine to Texas. This, as such, isn't unusual, but Charlie reports that signals had a tendency to fade a little, perhaps due to the *lack of an antenna* on his end! You see, a recent windstorm knocked all the antennas off his 90-foot tower, and W9ZHL was receiving and transmitting on the remnants of the feeders alone! Maybe this story will help to prove that the old six-meter band still has some life left in 'er.

Speaking of windstorms, our file of sad stories about the big blow of November 25th continues to grow. Among the victims of the storm are many more prominent members of the v.h.f. fraternity than we were able to list in our brief review last month. W1SF of Branford, Connecticut, lost his 32-element array that "opened" the band so many times during the past years. W1RQ's double-twin-five came down. W1HDQ lost his 144 mc and 50 mc arrays but we understand that he has them back in operation now. W2BAV's losses were more serious than we had realized—in addition to the aerial equipment Bill lost his tower, shack, and most of the power lines which were so laboriously rigged up the mountainside. That was, indeed, a real blow. Official Weather Bureau figures show that the wind hit over 118 m.p.h. on peaks here in New Jersey. Our estimate of 50% casualties on v.h.f. arrays seems to have been much too low! Needless to say, there has been a slight reduction in the v.h.f. activity since the storm. Replacement towers and aluminum antenna elements are mighty hard to get, these days! But the recovery is progressing as well as could be expected.

Bet that most of the gang will be back in business in time to participate in the Annual VHF Sweepstakes! You guys who are located on the fringes of the centers of activity shouldn't lose hope. There'll be plenty of bigger and better arrays aimed your way in a few more weeks!

And good ground-wave conditions do come along during the winter months—not as often as in the summer, but often enough to warrant checking the band whenever you get a chance. For example, on December 29th, the weather turned warm (it went above freezing for the first time in over a week!) and we had a first-class opening to the South, with solid 'phone signals over the 200-mile-plus path to Richmond.

At Cornell University, Ithica, N. Y., a group of scientists have been investigating the problems of radio-wave propagation in the troposphere. They have developed a theory which seems to explain some of the unusual propagational effects which we all have noted on the v.h.f bands. This theory should be of great interest to the hams—some of its conclusions have a direct bearing on operating practices and antenna design. If these conclusions

After the storm at W2PAU's. The ten and six meter antennas are left standing but the two-meter beam is gone over the edge of the roof!

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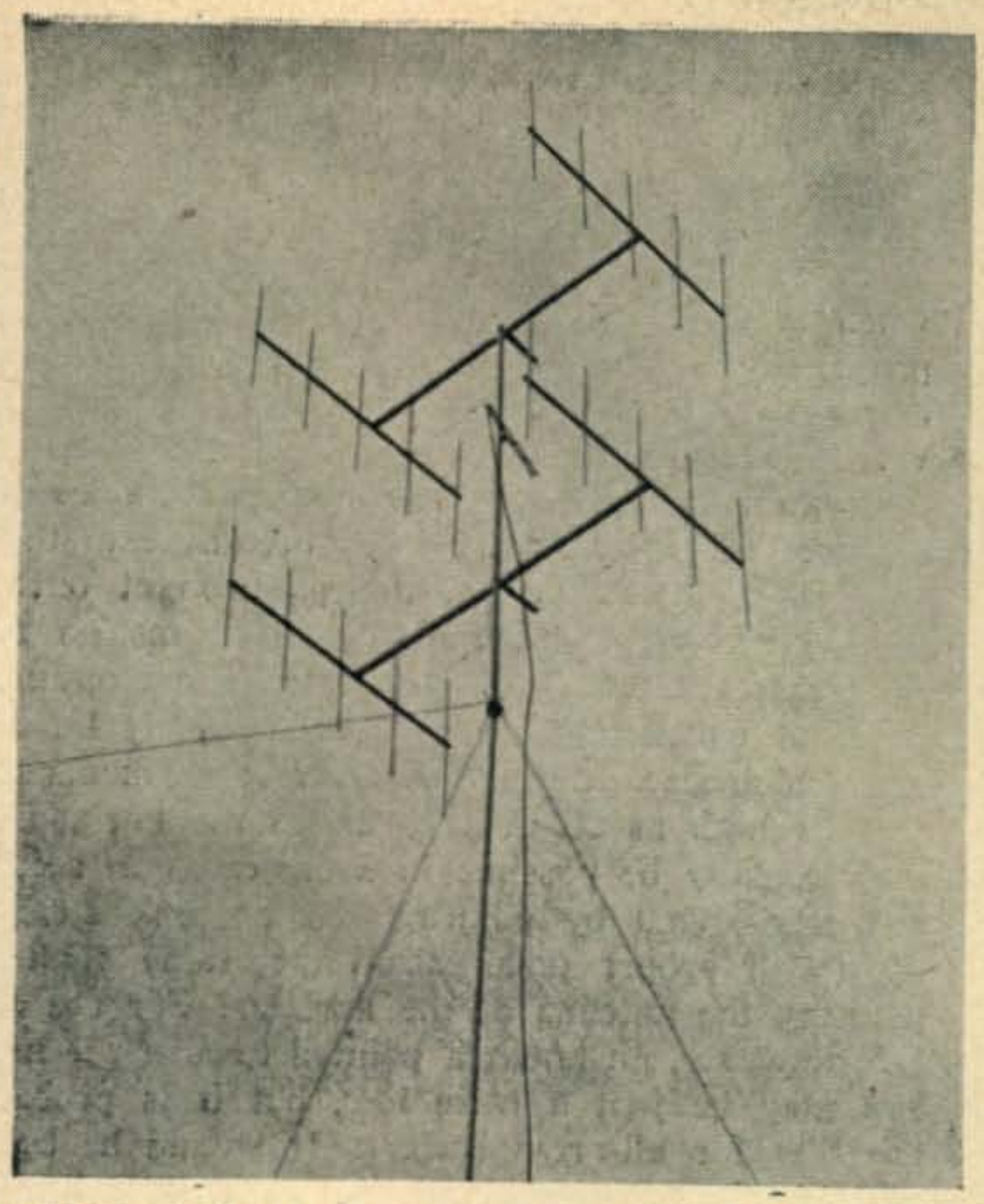
* *Associate Editor, CQ. Send contributions to E. M. Brown 88 Emerald Avenue, Westmont, Collingswood 7, New Jersey.*



WIRQ's dual twin-5 was another victim of the storm—but didn't it look pretty while it was still up?

are correct, we may be able to squeeze a little better performance out of our v.h.f. gear by taking full advantage of the possibilities. And amateurs have something to offer the research workers in this project. They would like to get experimental verification of some aspects of the theory. The amateurs, set up as they are with effective v.h.f. equipment, a wide variety of geographic locations, and flexible beam antenna installations constitute a ready-made laboratory set-up to obtain the type of data that is required.

We are privileged to be able to present a brief review of the new theory by one of the men responsible for its development:

A Discussion of Radio Scattering in the Troposphere

by W. E. Gordon*

It has been recognized for a long time that there are some instances of propagation to distances well beyond the expected horizon which atmospheric bending and sporadic E cannot explain. During and shortly after the war, a number of quantitative propagation experiments showed that the theoretical variation of the signal beyond the horizon agreed closely with the experimental results *out to a certain point*. Beyond this point, the signal refused to drop off as rapidly as the theory predicted. At the time, there was no good explanation for this. Recently an approximate theory describing this phenomena was developed by Dr. H. G. Booker and the author at Cornell.[1] This theory explains these results in terms of "tropospheric scattering".

The theory deals with scattered signals alone and it indicates that these signals will always be relatively weak. This explains the fact that the signals measured in the experiments decreased in accordance with the then-existing theory up to the point where they were fairly weak. But apparently the total signal beyond the horizon was made up of the combination of the direct (diffracted) signal and another signal, the so-called "scattered signal. The scattered component showed up only as random fading until the signal propagated in the "usual way" became smaller than the scattered signal.

The "Blobby" Atmosphere

What is the cause of this scattering? It is apparently due to the existence of turbulent motion in the air. As we all know, the air is not uniform and winds are seldom completely steady, but are frequently accompanied by small but rapid changes. This is particularly true near the surface of the earth where gusts and whirlwinds are familiar. It is also true aloft. Anyone who has done much flying is familiar with the "air pockets" which cause bumpy flights; these are the largest kind of turbulent atmospheric irregularities. They can be *much* smaller, too. The best way to describe this more-or-less random irregularity is by the use of satistical methods. We known that all these pockets of air of different density (and hence dielectric constant) are not the same size and do not differ from the average by the same amount. Even so, we may consider the atmosphere at some point as having a certain average "blobbyness". That is, we may consider that (roughly) there are a large number of spherical "blobs" of air slightly different from the surrounding air, and these are packed closely together. If we can figure out what these blobs do to radio signals, we will have solved the scattering problem.

Not much is known about the size of blobs to be expected at any given time, but it is known that they exist; and they probably exist in the daytime even more than at night. This means that scattering can be used to explain abnormal ranges worked in the daytime when "ducts" are not likely to occur.

How Blobs Scatter Signals

Each blob acts as an antenna, and signals reaching it from the transmitter are scattered in all directions just as they would be if there was an airplane at the location of the blobs and the signal was scattered from its metal surfaces. Of course, a given blob does not scatter as strongly as a metal object of the same size. If the blobs were small compared with the wavelength, their radiation would have almost the same distribution in space as that of a half-wave dipole. So, for small blobs, we may consider that the signal received by scattering comes from a large number of "dipole" antennas somewhere in the air between the transmitter and the receiver. Each one acts as if it were

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* *School of Electrical Engineering, Cornell Univ., Ithica, N. Y.*

1 Proc. IRE. Vol. 38, p. 40 (April, 1950).

excited by a very low-powered transmitter. The orientation of the dipoles is perpendicular to the line connecting them with the transmitting antenna, but they lie in a vertical plane for vertical polarization of the transmitting antenna, and a horizontal plane for a horizontal transmitting antenna. Thus, if we have a vertical transmitting antenna the scattered signal is that which would be received from a number of tilted dioples in the air, the tilting being such that they are broadside to the transmitter. For a horizontal antenna, the dipoles in the air are also horizontal.

In the case of blobs large compared with the wavelength the effect is that of a number of beam antennas of physical size about the same as the blob size—pointed in the direction from transmitter to blob. If these blobs are fairly high in the air and the blobs are large enough so that their beamwidth is small, the scattered beam may miss the earth entirely; in this case we would not be able to receive the scattered signal from a ground station, but would be able to receive it from an airplane.

Effects on Ham Transmissions

What are the implications of this theory for amateur communications? In the first place, scattering permits transmission during the daytime to distances which would otherwise be impossible. It may make such transmission possible at night, particularly over mountainous country. The importance of scattering at night is not likely to be so great because of the fact that some form of tropospheric bending is frequently present at night, and this might cause stronger signals than the scattered signals even beyond the horizon. Nevertheless, ranges might well be extended at night by scattering.

A second point is that horizontal polarization is to be preferred slightly over vertical polarization when scattering by small blobs is the means of propagation. This is due to the fact that the receiver may be end-on to the tilted dipoles when vertical antennas are used. For horizontal antennas, the scattering dipoles are also horizontal, and hence the receiver antenna is always broadside to them.

A third interesting point was brought out by experiments at the University of Texas on FM broadcast stations. It is that there is an optimum angle at which to tilt the receiving array for any given blob size. In some of their experiments this was as high as 30 degrees above the horizon. It may actually be possible in some cases to receive a better signal by pointing the antenna straight up (with proper polarization direction) than by pointing the antenna at the horizon! For the *real* DX however, an antenna pointed toward the horizon may be just a little low, but it is probably the best for all-around work. It should be borne in mind that these statements refer to scattered signals alone. If some other type of propagation predominates, we actually want to *minimize* the scattered signal, since it be a cause of fading.

A fourth point deals with the rate of fading. This rate is directly proportional to the speed of the blobs and inversely proportional to either the size of the beam antennas used or the blob size depending on which is bigger. For high wind speeds and small antennas this fading rate may be several cycles per second. This may explain some of the "wavery" faint signals so often heard on the v.h.f. bands.

It seems likely that the six-meter band and all higher frequency bands will be affected by this phenomena. Incidentally, the higher the frequency the better, until that frequency is reached beyond which the receiver is out of the "scattering beam".

Not much is is known about the size of blobs likely to be found nor about their distribution with altitude. The meteorologists think that blobs of the order of meters in size should be probable, but they don't really know. If more radio information becomes available it may be possible to tell something about the blob size from it, but there seems little chance that the meteorologists will measure the blob size directly. Amateur observations would be a big help in determining such information.

Editor's Note:

Measurements made on any of the v.h.f.-u.h.f. bands would be valuable. If simultaneous observations could be made on more than one band it would be especially interesting. Any ham, acting as an individual, can make useful observations. All that is required is that measurements of signal strength and direction of arrival be made on signals from other stations—which can be using any type of transmitting equipment (although it would be nice to obtain data on power, type of antenna, etc.

(Continued on page 46)

W7QLZ mobile on 430 mc atop Antelope Mountain, near Phoenix, Arizona. Signals at distances up to 100 miles have been unbelievably strong.

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418 440 481 504 | 394 405 | 379 388 | 529 538
419 441 483 506 | 395 408 | 380
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6040 7773 8273 | 5740 5906 6473 7340 7673
6073 7806 8306 | 5750 5925 6475 7373 7706
6106 — | 5760 5940 6506 7406 7806
6140 **49c** EACH | 5773 5973 6540 7440 8340
6173 | 5775 5975 6573 7473
6206 **10 for** | 5806 6273 6606 — **99c** EACH
6773 **$4.50** | 5825 6340 6640 — 10 for **$9.00**
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SCR-522 XTALS

5910 6610 7580
6370 6750 7810
6450 7480 7930
6470 —
6407.9 EACH
6522.9 **$1.29**
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2045 2220 2360 2557 3520
2105 2258 2390 3202 3550
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Payments must accompany order. Enclose 20c for Postage & Handling . Crystal shipped packed in cloth bags. All Shipments Guaranteed.

BENDIX 100 WATT TRANSMITTER

These can be easily converted to 20-40-80 meters. Crystal required for 10 meters. Each electronic coupled oscillator dial has 3000 divisions enabling quick precision shifting. This transmitter was constructed of the highest quality of precision parts, with laboratory precision. Four separate output tanks; one 4-position selector channel switch having seven sections which changes the ECO, IPA and output tanks simultaneously. All the controls are mounted on the front panel. The housing is cast aluminum; shields and case are sheet aluminum. Dimensions 11 x 12 x 15 inches, weighing 35½ lbs. Complete, simple instruction for conversion furnished. Uses three 807, four 12SK7 tubes; one 2-inch 5 amp. R.F. meter. A complete coverage transmitter, for the new or experienced amateur. A TRUE HAM VALUE—BRAND NEW, complete with tubes

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RADAR RECEIVER BC-1068A

Used. Good Condition. Covers 150-210 MC. Can be converted to TV Receiver or a Hot 2 Meter ham receiver. Has 2 RF stages, detector & oscillator. Each individually tuned, 5-10 MC. I.F. Stages, 2nd Detector & Video AMP with 110 V. AC 60 Cycle Power Supply.

(LESS TUBES) 14.95

Modernize Your Old PHONO with a new 3-speed automatic RECORD CHANGER

WEBSTER—100-1, with turnover crystal cartridge.....**$37.24**
100-27, less cartridges, **$34.50**
Base Dimensions 12" x 12⅞"
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GARRARD—RC-80, less cartridges **$39.00**
Base Dimensions 13¼" x 15½"
Turnover crystal cartridge in head for above **$5.10**

MAGNETIC CARTRIDGES FOR USE WITH WEBSTER 100-27, 356-27, and GARRARD RC-80.
General Electric Variable Reluctance

RPX-040	.003 stylus	**$5.85**
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Pickering Cartridges for use with Webster and Garrard Changers.

S120M	Sapphire	.003	**$ 9.90**
S140S	Sapphire	.001	**$15.00**
D120M	Diamond	.003	**$24.90**
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Pickering Adapter Clip, for use in Webster Changers. **$ .15**

HIGH VOLTAGE TRIPLET DC VOLTMETERS—125 OHMS PER VOLT—WITH EXTERNAL MULTIPLIER—BRAND NEW!

VOLTS	2" PRICE	3" PRICE
600	$2.95	$3.95
1000	3.49	4.49
1500	3.49	4.49
2000	....	4.49

WAVEMETER BC-1073A

Used. Good Condition. Covers 150-210 MC. Companion to BC-1068A receiver. Contains resonant cavity wavemeter, oscillator, heterodyne amplifier, tuning eye, 110V-AC 60 Cycle Power Supply.

LESS TUBES

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RADAR TRANSMITTLR BC-1072A

Used. Good condition. Covers 150-210 mc. Contains many parts, such as 110V AC Blower, Gen. Radio—1 AMP variac, kilovolt meter, circuit breaker, 110 volt HI & LO voltage power supply, tubes, oil condensers, and many others. Companion to 1073A. Operates from 110 V AC 60 Cycles. **$19.95**

Special Package
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1—BC-1073A **$24.95**
1—BC-1072A All 3 for **$9.95**

FAMOUS MAKE BUTTERFLY CONDENSERS ALL NEW — ⅓ OFF!

.500 GAP.	.375 GAP.	.250 GAP.
96-22.15	11- 8.15	111-16.80
115-25.20	106-20.15	127-18.25
124-26.65	130-21.60	143-19.85
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Note: Figure in Left Column is Max. Cap. per Section

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Max. Cap.	Gap	Price
300	.077	$ 5.32
230	.171	5.57
500	.219	17.22
250	.219	12.85
75	.344	8.96
245	.344	14.11
50	.469	7.05
100	.469	11.62
150	.469	12.95
75	.719	12.85
200-200	.077	6.58
100-100	.219	14.11
100-100	.344	15.64
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SCR-522 REPLACEMENT TUNING CONDENSERS

Approximately 200 MMF per Section. Continuous Rotation on Ball Bearings. Also ideal for connecting to motor for use as sweep condenser. Each section has own air trimmer.

2 GANG - **$1.29**
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BC-645 UHF RECEIVER TRANSMITTER

"The Citizen's Radio" covers 420-450 mc. Consists of complete transmitter, modulator system and receiver. 15 tubes, and simple complete conversion instructions for Citizen band operation. Brand new ...**$14.95**

NAVY VHF BRAND NEW CW TRANSMITTER

Battery operated (67½V."B" and 1½V."A") Frequency 80 to 105 M.C. uses 2 1G4 Tubes - with instruction manual - less tubes and batteries.

SPERRY AMPLIFIER

Brand new servo amplifier containing two beam power output tubes (1632) two twin triodes (1632 and 1634) two mica condensers, dozens of color coded half watt resistors, two dual and four section bathtub condensers, three transformers, two wafer switches, the volume control, four octal sockets. With schematic **$3.95**

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OF WASHINGTON, D. C.

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TERMS: All items F.O.B. Wash., D.C. All orders $30. or less, cash with order. Above $30.00 25% with order, balance C.O.D. Foreign orders cash with orders, plus exchange rate.

SEEDRICK'S SENDIN' STATION

W. W. PURVIS, W2BK*

(Any similarity to persons livin' or dead that is mentioned in this here is purely on purpose, so I am keepin' my name secret, so's nobody gits wise. Otherwise, I'm a dead pigeon.)

AT the close of world war figger two, (I always gotta say *figger* or *number* when speakin' to rayo hams because most is so dumb they can't tell when two is a figger), I bought some war surplus rayo junk and built a powerful sendin' set with which I expects not only to git on the air in a big way, but stay on there. I hadda little set before the war without hardly no power a-tall, but now I has over 7 hunnert watts an a beam that I figgers could drown out all the hams on my fregussy, just like a rich guy. Boy, what terrific power I'm gettin'! I'm lightin' up bulbs all over the joint that is turned off. Not only was I causin' interference to television and rayo programs, but was bein' received in good condition on all telephone lines around the place. A neighbor said if I din't quit burnin' her cellar lights, I'd have to pay her leckdrit bill.

Well, okay, things is workin' fine; so I starts in rastlin' with a telegraph and goes on the air usin' dots and dashes. I bangs out CQ letters for half an hour and never got no answer. I gits hold of a machine that sends CQ out automatic, and I left it run sometimes while I had tea an then would just make a couple of call letters and turn on the rayo receiver. Nobody never called me, but I din't give up. I trys to figger out what's wrong. Maybe I ain't callin' long enough or something aint workin' just right.

Listenin' in to the rayo set at first I din't hear nothin' but special calls. Some hams was callin' CQ, but mostly it was rich guys callin' for dx. I hears one guy callin' CQ for zone 8, but there aint no postal zones in my town, so that left me out of the pitcher. Others was callin' CQ for SS (meanin' seamship no doubt), and for CD, AD and stuff like that. (Never did find out what them letters was about). One fell' was gittin' Australia, but I don't know if it was direct. I heard him tell Australia how conditions was very bad over here. The guy musta been out of work and hungry, because if he was talkin' to Australia he couldn'ta meant that rayo conditions was bad. If rayo conditions was that bad, who would he talk to with good conditions? Planet Wolfe 369?

After many hours of cussin' and sweattin', I contacted a guy that was callin' for CD. He was mad! He called me a OC, whatever that stands for. I ast him, I says, "What's CD?"

"See page 50, January QST magazine", he says.

"Aint got no QST", I said.

"Okay," says the guy, "You are welcome to join us anyways".

"Where at?" I says. Just then a bunch of guys flocked all over the fregussy an I couldn't hear nothin'. Gee, I wonder what that CD means. Could it mean they was havin' chicken dinner somewheres?

Boy, that ham stuff is terrific onced you git onto it, and I think I was gittin' onto it pretty good. I'm beginnin' to git guys up to three blocks away with no trouble; and don't think I didn't appreciate their weather reports. One guy was kind enough to tell me that our town is 8 miles from Georgetown, which I had knowed all the time. I told him I lived in town for many years.

"Glad to hear it", he says, "Georgetown is miles from here". Next he says, "Best regards see you later, gotta git off the air right away and take out the wife".

I was beginnin' to figger maybe them hams didn't have time to say nothin'. I found out it made 'em happy if I wished 'em good luck in the contest. Of course, I didn't know there was no contest, but they seemed tickled at what I said, so I latched onto that idea of bringin' them joy. The fregussys all over the dial was cluttered up with thousands of guys a

(Continued on page 53

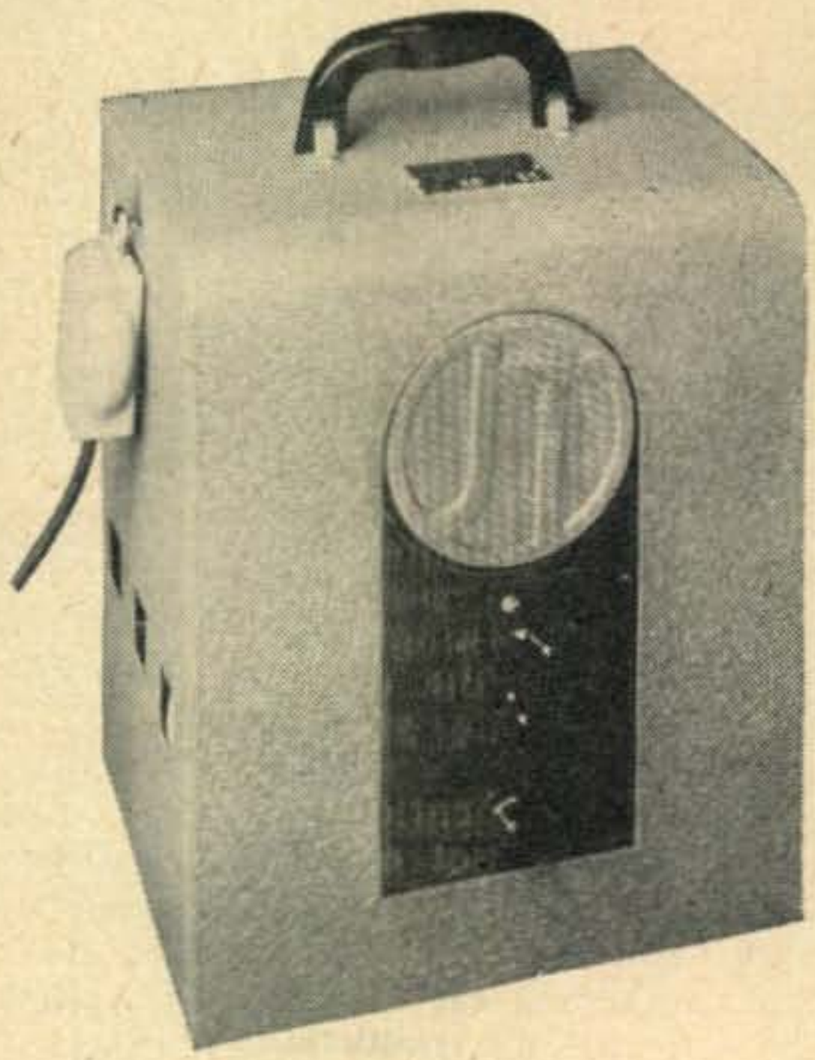
**Wayne, N. J.*

JEFFERSON—TRAVIS MARINE RADIO TELEPHONE

The Jefferson-Travis Model 52, 5 watt Marine Radio Telephone, has been specifically designed to provide radio telephone service on sail boats, small power boats and other craft with no electrical installation or where it is not desirable to use existing power. This unit would also be desirable for the amateur 75 meter band for mobile or portable operation.

The Model 52 has two channels designed to operate in the frequency range of 2 to 3 Mc., is crystal controlled in both receiver and transmitter and can operate with a self-contained rechargeable battery pack, sold as optional equipment, on an external 6 V. DC power source. Battery drain is very slight for this equipment and approximately 10 hours of operation may be obtained from the self-contained battery listed below. The cabinet is made of sheet steel finished in Copen blue wrinkle inside and outside and is protected from corrosion by an intercoating of zinc chromate. The control panel is equipped with a horizontal key type switch to select either two of crystal controlled channels. The vertical push-to-talk key type switch in a combination on/off and volume control knob. A hand type microphone of rugged construction is included and conveniently mounted on the left side of the unit. Speaker is self-contained. Weight of unit, less battery, is approximately 12 lbs.

These units were manufactured and made to sell for much more than our asking price. From reports and information obtained by E.R.C. before the purchase of these sets, we were told that they are operating from 35 to 50 miles off the coast to shore stations or between other craft. We were not fortunate enough to obtain a large quantity of these units; therefore, rush your order to assure your purchase of one of these excellent bargains. This is brand new factory-packed merchandise.



Special Price

$49.50

BATTERIES

Suitable for above equipment

Willard rechargeable storage batteries, brand new. 6 V. battery in spill-proof clear plastic case. Also this battery is applicable for a wide range of uses where battery power is needed. Shipped dry. Uses standard battery electrolyte available at any drugstore, 1.265 specific gravity. Price **$4.00**

HOUSING & DIVIDING ASSEMBLY FOR 931-A

Here is a metal housing, socket, and dropping resistor for supply of proper voltage to various needs of 931-A photo tube. All wired and ready for installation in your devices.

Prices, each $2.50

931-A PHOTOTUBE

An electron Multiplier tube which achieves very high current amplifications from low illumination. Currents of several milliamperes result from as little as 1/1000th of a lumen. The dynodes are supplied with about 100 bolts per stage from transformer or resister taps. Its small size, rugged construction, enormous sensitivity, low noise level, and extremely small current when not illuminated, plus freedom from distortion—make it ideal for application in light operated relays, in sound from film reproduction, in facsimile transmission, and in scientific research, involving low light levels. Mfgd. by RCA.

PRICES, NEW GUARANTEED $3.50

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If not satisfied with any equipment purchased from us—you pay transportation both ways and return within 5 days for cheerful refund.

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TERMS:
Cash with orders for prompt delivery. Or 25% deposit with orders, balance C.O.D. No orders under $2.00 can be accepted due to these special price concessions.

LETTERS

(from page 6)

It's also worth mentioning that most of the BC-221s were machine calibrated, and should be painstakingly hand-calibrated if they are to be used for any really important fine work. Anyone who has the patience to do this as I did will also discover that there is some small eccentricity in the engraving of the dial divisions, and perhaps a little bit in the worm, too. These show up as a slight waviness in the line, when a graph is plotted on a large enough scale. The eccentricity in many of the dial markings can easily be seen by carefully checking the ends of the markings against the vernier scale at points 90 degrees apart on the main dial.

It's worth mentioning also that the BC-221, while good, is not exactly one of General Radio's Primary Standards, although quite a few hams seem to regard it as such. Even with regulated plate and screen supply, line voltage changes will cause some frequency drift in both the crystal and variable frequency oscillators. Correction can be readily made to both of these, of course.

Add to that the fact that the unit can be seriously affected by proximity of objects to its incompletely shielded under side, and you're fairly well in the clear, providing reasonable precautions about large thermal excursions are observed. The trouble with objects proximate to the poorly shielded under side is one I discovered while half way through a very tedious calibration job. Several pots of coffee later, I had the answer in the form of a carefully cut and folded aluminum shield over the entire bottom....after which complete recalibration was necessary.

L. Jerome Stanton, W2WHM

ITV and TVI

139 Gunckel Ave., Dayton 10, Ohio

Editor, *CQ*:

I am glad to hear the CQ staff is analyzing the problem of ITV and the corrective procedures. Harmonics from the horizontal oscillator are definitely a problem even out here in Ohio, although I imagine the situation is even worse in New York and the larger cities. The harmonics are quite strong down in our eighty meter band and even in the higher frequency bands. You are no doubt also aware of the interference which shows up as a strong background noise on 80 meters. I believe this is caused by the video amplifiers in neighboring TV sets. We should do everything possible to get to the bottom of this problem, as many other services are also affected. I will look forward with interest to any articles on the subject in CQ. In this locality the most severe type of interference to TV reception seems to be local oscillator radiation. Although we are 55 miles from Cincinnati, we get good reception from their Channel 7 and 11 stations and since sets use both low and high side local oscillators you can readily appreciate the problem. Naturally, amateurs get blamed for this interference many times.

I personally believe too much emphasis has been placed on harmonic interference. At least every ham seems to want to approach TVI at his transmitter first. If he has an unshielded transmitter, I think of course that it is well to put it in a

cabinet and use a filter in the transmission line if the transmitter is of old design. But in the majority of cases, the complaints are usually due to fundamental overload, etc., and a good high pass filter properly installed at thte TV set will do the trick. Any interference left is usually due to harmonics, but is really amazing the number of complaints that are cleared up with only a high pass filter, plus a filter (needed only in very stubborn cases) in the AC line (two Sprague 48P9's). It should be kept in mind that fundamental trouble does not always show up as overload affecting all channels. In many cases, only the weaker stations are affected, especially when harmonics of the fundamental are generated in the RF or mixer stages of the TV set.

J. F. Skelton, Chairman TVI Committee, Dallas Amateur Radio Club, 704 Interurban Building, Dallas, Texas concurs in my thoughts on the importance of emphasizing fundamental troubles and their cures as there are too many amateurs staying off the air when a high pass filter at the receiver could get them back on.

The amateurs in Dallas have done an outstanding job of tackling the TVI problem down there. They prepared a mailing and sent it to all TV dealers and service shops in Dallas; this mailing and a later follow-up was sent to all amateurs. I would suggest that other clubs write to him for copies. They cited many case histories.

Going back to ITV, have you ever listened on 4.5 Mc? The hash at this frequency is bad, apparently caused by the IF's of intercarrier sets. Luckily it doesn't fall in a ham band.*

Clem E. Wolford, W8ENH

*Editor's Note: A bad case of 4.5 Mc radiation bothered a communications channel on the West Coast last year; with FCC and the Military authorities in on it, *this* case was tracked down and suppressed pronto.

VHF–UHF

(from page 40)

of the station on the other end of the circuit). Measurements should be taken on stations at various distances, under varying weather conditions. These measurements might be accomplished by the use of an antenna which exhibits high directivity in the vertical plane, and "scanning" the pattern vertically by tilting the antenna for maximum signal strength. If the antenna is mounted fairly high above the ground, and if the angle of arrival of signals exceeds about ten degrees, we figure that good measurements could be made with the types of two-meter arrays commonly in use today. Nothing special, except means of tilting the antenna, would be required.

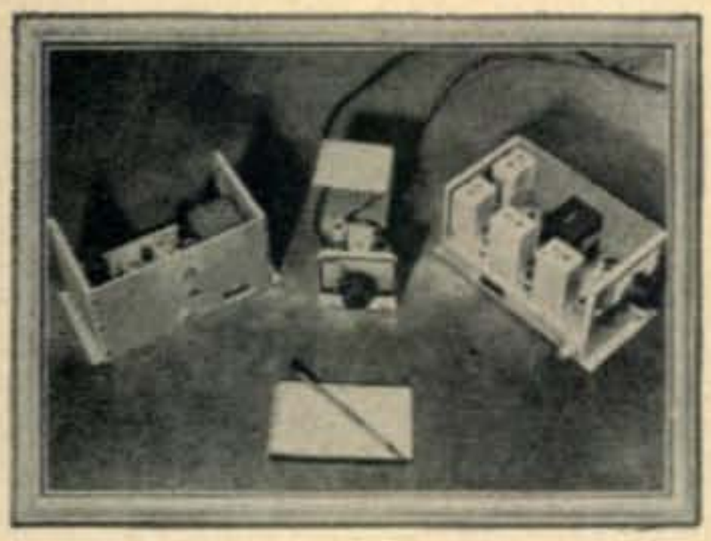
Checks on the effects of polarization would also be interesting, especially at relatively short ranges, where the effects of polarization should be most marked.

Tests should be made over paths sufficiently long that the normal "ground wave" is weak. The most interesting tests should occur under conditions when normal DX conditions are poor.

We are certain that some of our readers will be sufficiently interested in the results of this program to cooperate in making observations. We suggest

RADIO SHACK

presents radio's great new 1951 name: ELDICO



NEW 2-METER ELDICO XMTR/RCVR Equipment

Commercial VHF superhet for mobile, fixed, defence, CAP. 10 tube 2-meter AM 144-150 mc receiver. Xtal-controlled 144-150 mc 7-tube xmtr. Each in metal 5½ x 9½ x 5½" metal cabinets. Jones plugs, coax connectors. All standard parts and tubes. In kit or wired form, complete except for power supply (any supply providing 300V at 200 ma. Write for full details.

2M Rcvr (kit)	**$59.95***
2M Rcvr (wired)	**94.95***
2M Xmtr (kit)	**49.95**
2M Xmtr (wired)	**74.95**

*For external local oscillator add $5.00 to above prices.

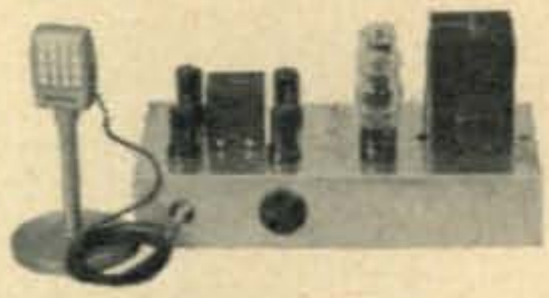
ELDICO ANTENNASCOPE

KIT FORM $24.95

WIRED $29.95

Described in Sept. CQ, the Antennascope measures radiation resistance and resonant frequency of antenna, impedance of transmission line, SWR on feeder, rcvr input impedance. Use with any grid dip osc. or RF sig. gen. Includes Simpson 0-100 ua, meter, full instructions. Kit form **$24.95**; Wired & tested **$29.95.**

FREE — A complete free booklet for de-TVling your rig and a complete list of other Eldico kits



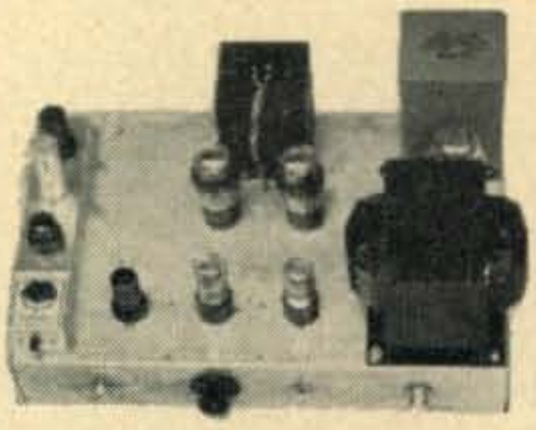
ELDICO LOW POWER MODULATOR KIT

Slick low power modulator or speech amplifier in easy-build kit form. 40 watts of audio (pair of 6L6s). No extras to buy with this famous MD-40 kit, even the E-V 915 xtal mike (less stand) is included! A terrific value!

MD-40 ..... **$34.95**

MODULATOR WITH SUPPLY: Above modulator kit with heavy duty power supply to go on same chassis. Supply includes oversize plate xformer, dual chokes, filters, everything. Order MD-40P.

MD-40P **$44.95**

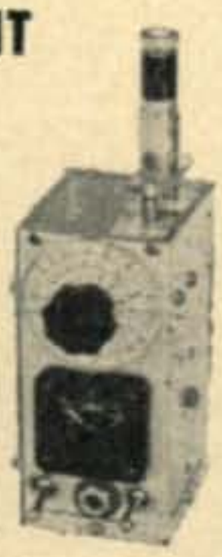


ELDICO Medium Power MODULATOR KIT

The MD-100 kit features 100 watts of audio in a complete AM modulator package that's complete down to the Electro-Voice 915 crystal mike. Tubes: 6SJ7, 6SN7 audio amp./phase inv. driving 6SN7 which drives a pair of 807s. Ideal for 250W CW rig. Price-conscious hams recognize this as a spectacular buy!

MD-100 ..... **$49.95**

ELDICO GRID DIP KIT



High-sensitivity regeneration circuit. Includes special case, tube, internal power supply, meter, detailed instructions. 3 mc to 250 mc in 6 steps. 105-125 V, 50-60 cycles. Locate resonant circuits for pre-tuning, de-bugging without applying power; use as sig-gen, harmonic-measurer, with Antennascope, etc. Only **$24.50.**

ELDICO H-V POWER SUPPLY KITS

Not illustrated. All standard parts, new components, complete less chassis and rectifier tubes.

Order No.	Output	Net
HV-1500	1500VDC 350 ma	**$39.50**
HV-2000	2000VDC 500 ma	**79.50**
HV-2000SP	2000VDC 700 ma	**95.95**
HV-2500	2500VDC 500 ma	**99.95**

300W CW, 250W PHONE ELDICO XMTR KIT

Conservatively designed circuit built around components that loaf at rated power. 6V6, 6V6, 6L6, 813, class B 811 modulators. All bands: 80, 40, 20, 15, 11, 10 meters. Complete kits include aluminum chassis, all components, hardware, relay, meter, E-V mike, coils; and 3 power supplies delivering 1500 VDC at 350 ma. 500 VDC at 200 ma, and bias. Unquestionably the BIG kit value on the ham xmtr market today! Model TR-1.

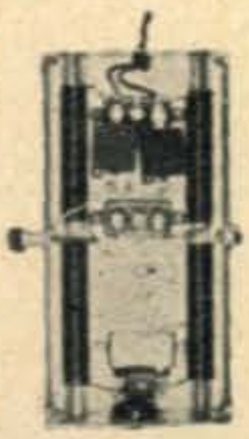
TR-1 Kit **$199.50**

75 WATT ELDICO TRANSMITTER KIT

TR-75 is complete down to the last bolt and simple enough for novices to assemble. CW-men will discover it loafs at 75W. Actually 6L6 oscillator 807 amp.; pi-network output; power supply delivers 600V to the 807. Handsome, shielded cabinet (included) minimizes TVI. Take another look at this low Radio Shack price!

TR-75 ..... **$44.95**

ELDICO Brute Force LINE FILTER



Eliminate a cause of TVI — RF feedback thru AC line. See p. 508 ARRL 1949 Handbook. Model TVL-1KW for total max. power from AC supply line of 1 KW — kit **$5.98,** wired **$8.98.** Model TVL-2.5KW for total max. of 2.5KW 110 or 220 — kit **$11.98,** wired **$17.98.**

The RADIO SHACK Corp.

167 WASHINGTON ST., BOSTON, MASS.

that you contact Mr. W. E. Gordon of Cornell University for advice on the details of any experiments you may have in mind.

Sunspots

While we're on the subject of propagation, here's a note for the fellows who are more interested in ionosphere work. The trend of sunspot activity is falling off even faster than predicted. At the end of 1950 the index of sunspot number had agged to the point where it looks as though 1951 may be about similar to the period from 1942-1945. (But let's hope that ham activity is a lot higher than it was during that period!)

What does this imply for the v.h.f workers? It probably means that the occasional F-layer DX which was encountered on six meters during the past three years will not be experienced until the sunspot activity returns. The frequency and intensity of auroral openings will probably be reduced. It looks now as though 1950 was the peak auroral year. What about sporadic E? There seems to be some controversy in this matter. G6DH claims that the MUF during E_s openings is higher during periods of peak sunspot activity, although he admits that the number of E_s openings seems to be more-or-less independent of sunspot activity. Perry Ferrell will be in a better position to confirm or deny this thesis after a few months of low sunspot activity!

More on Beacon Transmitters

The value of "beacon" transmitters—continuously-operating constant-frequency automatically-keyed signal sources—has been amply demonstrated during the past season on six meters. Several instances have occurred where beacon signals were the only signals heard during band openings of short duration.

We might as well face it—for some reason or other the present denizens of the six-meter band seem to be reluctant to do much transmitting unless conditions appear unusual. There is no doubt that they devote plenty of time listening on the band—the high activity during band openings proves this. Several of the boys use automatic "band-scanning" receivers. A calling frequency (50.1 mc) has been established to simplify searching for signals. But none of these measures provides signals for the waiting listeners to detect! Whether it's due to TVI or a natural reluctance to clutter up the band with useless CQs, there's a sad lack of signals on the band. Which is where the "beacons" come in . . .

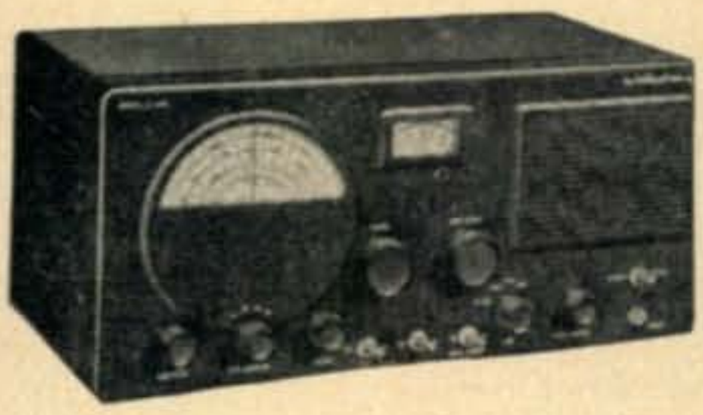
The Canadian Government has established a beacon operating just outside the low end of the six-meter band. This rig operated under the call of VY6R for several weeks, but the call has been changed to VE9RB. (Due to keying troubles, this rig has occasionally been reported as VE9RD").

W9MBL, of New Castle, Indiana, was the first American amateur to establish and operate a beacon on a regular basis. His signals, on 50.1 mc, have been the first to break through on band openings time after time. The six-meter gang owes

Still Available...

HALLICRAFTERS RECEIVERS at Newark

These Hard-to-Get Hallicrafter Sets Are Still in Stock at Newark for Immediate Delivery! Order Today...While Quantities Last



S-40B RECEIVER

Continuous range from 540 kc to 43 mc in 4 bands. Has 1–RF and 2–IF stages. Controls include Band-Switch, Main Tuning, Bandspread Dial, AF and RF Gain Controls, AVC, BFO and ANL Switches, 3-position Tone, BFO Pitch and Receive/Standby Controls. Has phone jack and socket for external power supply. Built-in 5" PM speaker. Steel Cabinet, 9" x 18½" x 11". For 105-125 v., 60 cycles AC operation.
98F003. Wt., 33 lbs. NET.. **$99.95**

SX-71 5-BAND RECEIVER

Double-conversion receiver with extra-sensitivity and superior image rejection. Covers 538 kc to 35 mc and 46 mc to 56 mc in 5 bands. Built-in NBFM. Has 1–RF, 2–Conversion and 3–IF stages plus limiter and balanced detector stages. Includes "S" meter, phone jack, external power socket and Receive/Send switches. Steel cabinet, 18½" x 7⅞" x 12". Less speaker. For 105-125 v., 60 cycles. AC operation.
98F008. Wt., 33 lbs. NET. **$199.50**

SX-62 DELUXE RECEIVER

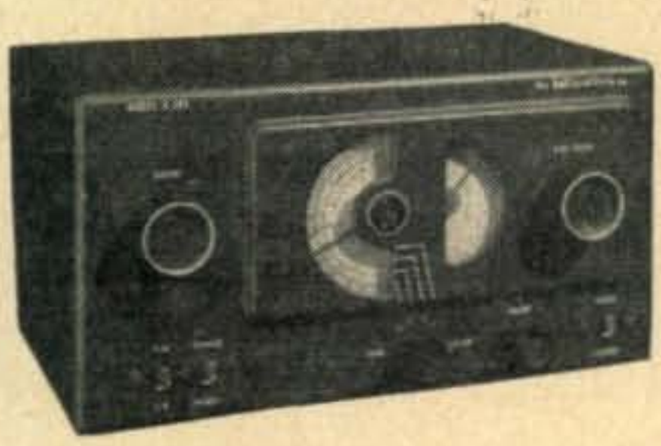
Covers 540 kc to 109 mc in 6 bands – includes AM, FM and SW broadcasts. PP 6V6 output stage furnishes 10 watts andio with response of 50 to 15,000 cps. Separate bass and treble controls plus phono input make this ideal for custom installation. Has built-in 500 kc crystal oscillator with dial pointer for re-set accuracy. Includes BFO for code signals. Steel cabinet, 20x10¼x16". Less speaker. 105-125 v.,60 cyc.
98F007. Wt., 77 lbs. NET. **$289.50**

S-72 ALL-WAVE PORTABLE

Operates on AC, DC, or self-contained batteries. Covers standard broadcast and 3 short-wave bands, 540 kc to 30.5 mc. Has one stage of tuned RF. Controls: Main Tuning, Bandspread, Band Selector, RF Gain-BFO-AVC and On-Off-Volume. With built-in speaker, AM and SW antennas. Size, 12¼" x 14" x 7¼". Less batteries, see below.
98F006. Wt., 16 lbs. NET.. **$109.95**
G6M60. Battery Pack. 7 lbs.NET **$4.17**

S-77 AC-DC RECEIVER

New AC-DC version of an old favorite, the famous S-40B. Covers 540 kc to 43 mc in 4 bands. Has electrical band-spread. High signal-to-noise ratio assures good selectivity. Includes ANL, AVC, BFO, 1–RF and 2–IF stages. Has phone jack and external power socket. 3-position tone control. Built-in 5" PM speaker. Steel cabinet, 9 x 18½ x 11". For 105-125 volts AC or DC operation.
98F004. Wt., 29 lbs. NET.. **$99.95**



S-38B ALL-WAVE RECEIVER

The famous low-cost "Radio Man's Radio". Covers 540 kc to 32 mc in 4 bands. Ideal for the beginning Amateur, SWL, or extra receiver in the home. Electrical bandspread dial with scale for separating crowded bands. Controls: Main Tuning, Bandspread, AM/CW Switch, Speaker/Phone Switch, and On-Off-Volume. Steel cabinet, 12⅞x7x7¼". 5" PM speaker. 105-125 v., 60 cyc.
98F005. Wt., 14 lbs. NET.. **$49.50**

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Ken a vote of thanks for his persistence in this project.

Now, several other U. S. hams are seriously considering the operation of beacon transmitters. W5AJG of Dallas is almost ready to fire up. W6WAI was ready, but has temporarily suspended operations due to a de-TVIing program. W7EVO would like to put his Navy-surplus TBS on the air as a beacon. W4LAW and W8BFQ (yep, Marge has put in an appearance on six meters) also are interested.

It is important that the efforts of the beacon operators be coordinated to derive most benefits from the program. Perry Ferrell, head of the RASO project, is in a good position to tie together such considerations as operating schedules, frequencies, etc., so we would strongly recommend that you check with him before firing up a beacon rig. Perry also warns, wisely that the thing could easily be over-done. There is no need to have more than one beacon in any particular geographical area. But there are still some sections of the country where a beacon would be most welcome.

Notes from the Mail Bag

W7QLZ reports that he took his mobile 144 and 435 mc equipment up to the West Rim of "Bloody Basin" about 80 miles from Phoenix on December 10th. He worked W7FGG and W7NVN in Tucson, and W7YZC in Phoenix on two meters with strong signals. Switching to 435 mc, contact was re-established with W7YZC, still with S9-plus signals! W7FGG was able to copy Clyde in Tucson, 175 miles away, but they couldn't quite make it a two-way. However, W7QLZ is encouraged, for as he puts it, W7FGG has about the worst location in Tucson! W7QLZ also reports that conditions have been pretty poor on two meters during December, the period from the 10th to the 17th the worst ever. Couldn't even copy the signals from Tucson!

XE1GE recently acquired a new 8-element two-meter array. Hope that Jeff can find someone to work on two meters around Mexico City. We could use a two-meter outpost down that way next summer!

W2ZGP will be operating at Ithica, N .Y., on 50.05 mc between 1630 and 1830 EST on a regular basis—main object, to observe aurora effects. Ken will attempt to transmit on the even 1/4-hour intervals. He would like to line up a few stations that he could schedule on a regular basis. He will especially monitor 50.1 mc. (The calling frequency—remember?)

DL4CK sends in a letter packed with news about the activities of the v.h.f. experimenters in Germany and the surrounding countries. We'll have to postpont most of the new due to lack of space. But Jack would like to have us spread around the word that he will be running test transmissions on a regular basis, from Wiesbaden, every Saturday night. The following schedule will be kept: on 144.74 mc, using both cw and voice modulation, at 2000 GMT toward Stuttgart, at 2100 toward Berlin, at 2130 toward Luxembourg and Paris,

at 2200 toward Bremen and Hanover, and at 2230 GMT toward Munich.

G5BY reports that he has little fresh news about 435 mc operations—only one 119-mile contact during December. But he has been busy improving his receiver. Hilton's modifications to the ASB8 should be of interest to anyone owning one of these receivers. He has added an extra tuned co-avial line to the input circuit to permit feeding the input with balanced open-wire feed line. The 955 mixer was replaced with a crystal-diode mixer. The 8 mc i.f. output of the mixer is fed to the communications receiver through a 6AJ5 i.f. amplifier. The 955 u.h.f. oscillator was scrapped, and an external oscillator (1/2-6J6) now feeds into a frequency-tripler stage mounted on the ASB8 chassis. Hilton claims that these features all work very smoothly; in fact, the rise in noise when the light-house tube r.f. stage is peaked up is about the same as is experienced on two meters when the 6J6 pre-amp of the two meter converter is peaked!

Summary of Six-Meter Conditions

The first few days of the month were remarkably quiet. On the 12th a minor auroral opening was reported by VE3AET. The disturbed conditions persisted until the 13th, and VE3AET worked W2MEU and heard several other signals. WØAEH heard WØQIN at 2000 EST. On the 14th a sporadic E opening hit the eastern section of the country, with W1s LLL, GJO, HDQ, LJ; W2s MEU, BVJ; W3OAS; W4LAW and W4NUW and others active.

A few minor openings were reported for the period from the 15th to the 20th. On the 20th conditions seem to have been good over a wide area, but not many QSOs were made. W5AJG, W4LAW, VE5NC and WØUMQ were known to have been in on this opening. On the 21st, from 1850 to 2034 a real bang-up opening took place, with plenty of stations active. The list of stations worked by W9ZHL without his antenna, is typical: W1PWW, VE3AET, W5s QME, DSB, ONS, FXN, BDT, AJG, W8CMS, etc.! W5AJG worked several 4s, 8s, 3s, and VE3s. In short, it was good!

We have too few reports of two-meter conditions to present any sort of a summary of activity on this band during the past month. But we do know that there have been several un-scheduled openings that have produced flurries of activity in widely-separated parts of the country. So don't give the band back to the Indians and the rag-chewers just yet! Stick around and get in on the fun.

And don't forget that we still have the problem of Civilian Defense to contend with. Although there are a lot of questions left un-answered at this time, it looks as though we may get a chance to demonstrate how well our v.h.f. facilities can serve in time of need....

That's about the works for now. . . Keep us posted on activity and conditions in your neck of the woods, and we'll do our best to pass the word along!

73, Brownie, W2PAU

Hams Provided Link In The Korean Crisis

Radio amateurs serving with the U.S. armed forces provided a major communications link in the first hours of the Korean fighting, reports Morton E. Millikan in *Stars and Stripes.* JA2DD, JA2KK, and JA2MA formed the backbone of the Japanese end of the net that kept traffic flowing in and out of Korea during the first hours of the crisis, furnishing the sole direct link to Pusan and Seoul.

HL1CD, Pusan, the first participant in the emergency, was contacted to clear the Pusan airfield after regular aircraft communications had been cut off. With HL1US in Seoul they maintained a vital direct link to MacArthur's headquarters in Tokyo during the first 48 hours. For 31 hours the critical communications line to Seoul was held open on 20 meters until the advancing Communist armies forced the two operators to destroy their rig with hand grenades and barely catch the last plane out.

After the first few hours, American hams in Tokyo organized into monitoring parties to scan the bands for any activity from Korea. This watchfulness was rewarded late Sunday evening of the fateful week when JA2DD heard HL1CD calling QRRR on 20-meter phone, while JA2KK was holding the Seoul link with HL1US. Switching to 20-meter c.w. (HL1CD had haywired together a 20-watt rig), they held a second vital contact between Pusan and Tokyo until regular communications were again established. Operating in the very teeth of the attack, the many operators who helped to hold communications open performed magnificently. Working in shifts, they held the fort during those first hours.

After the situation came under control there were hundreds of personal-inquiry messages from the men in Korea to their folks in the U.S. With W1AW, W7IOQ and many other stateside hams cooperating, these messages were relayed to the national traffic nets for delivery.

Our hats are off to the hams who performed so well during the first critical hours and kept the lines open to Korea.

UP & AT 'EM

(from page 32)

many DX contacts. On this band, however, an antenna designed for maximum efficiency would be more desirable.

W1ZL is located at the edge of a salt water harbor in a valley that runs north and south. From a bearing of approximately 220 to 350 degrees, a nearby hill rises abruptly to a height of one hundred feet. Reports from DX stations worked

in that sector are better by two "S" points when worked via the long path in the afternoon.

You might try the Versatile Vertical for size and find yourself agreeably surprised. What started out to be a jury-rig here has become a permanent installation. It will, however, never take the place of four terminated rhombics!

1 Smith, "Bet My Money on a Bobtail Beam", CQ, March, 1948.

SEEDRICK

(from page 42)

chirpin' away, but soon's I'd git hold of a guy he din't have time to say nothin'. They was all goin' out somewheres or their wives was callin' them to eat, take the garbage out, wash dishes, move the piano and so forth. There is an old sayin' "If at first you don't succeed, give up". Also, "Words is wiser than fiction", and similar, so I quits. I don't care for no dot and dash stuff no-way.

My mod'lation was workin', so I gits on usin' a mike-a-phone. I couldn't hear no futhern a hunnert miles account of too many guys was all time callin' too many other guys. Most the time

everythink was all garbled up mumbo-jumbo that sounded like da stock market.

Ever onced in a while I'd be tunin' the set and hears a ham say, "Standin' by for you".

That's a big break for me! I throws da mike-a-phone on and hollers, "Oh—kay to da station standin' by for me. Who is it, and how did youse know I was listenin' in to youse?" I called lotsa times but no matter how hard I tried I couldn't never find out who it was tryin' to git me.

After while 15 guys that knowed each other's names was takin' turns yellin' on the fregussy, callin' round tables. They was a mixture of jerks and wise guys all speakin' like they knowed somethin' terrible important. Most of 'em was tryin' to see how long they could talk without sayin' nothin' that made no sense except "uh" and

"and uh". I was settin' waitin' for hours wid my rayo sendin' set turned on usin' up hunnerts of dollars worth of leckdrit tryin' to git a chanced to break in an say what kinda rayo tubes I was usin'. Finally I did git a turn and gives my name. Fell' I know fixed up a notch relay that rung a bell and turned on the set after about 15 guys come on, so all I hadda do was lay in bed and sleep. When the bell rings, I jumps up and yells, with a voice put on to sound important, "Oh—kay gentlemens! We hear your voices clear. Stan' by for da next fell'. Over!" Sometimes I'd play smart and confuse 'em with a few numbers which din't mean nothin'. I'd say I was runnin' a 567BW into a 8ZY42 which was walkin' wid 3 blondes on a delta match up 691 gallopin' faze inversion zeppelin; and stuff like that.

Night times I was wonderin' if California could git my signals, when nobody was on. I figgers 'bout 3 am is a good time, because only drunks and looney-ticks is up then; so I gits up and listens. Two guys was on my fregussy, both of 'em in the same town, down south. I feels awful tired and sleepy and wants to git back in bed, but I sits there waitin' figgerin' they'd soon go off an I'd git California. I waited half and hour an they didn't show no signs of quittin'. One dope was eatin' pancakes and the other was readin' a book. While one eat, he was tellin' the other how to work a fregussy meter. The other jerk was readin' about flyin' saucers. Each fell' would say he was, "Callin' and returnin' ". I could hear 'em callin' and I knowed they was returnin'; but if I knowed *why* they was returnin' I'll bet I could 'liminate a lots of television interference. After while I had enough, but instead of goin' to bed I I gits real mad and bursts right in on the fregussy, callin' for CQ. The dopes hears me and they gits mad.

"Is that yankee botherin' you?" says one dope to the other.

"No," said the other dope, "He aint even gittin' acrossed the Susquehanna River".

Bein' a great great grandson of dat great Southern General, and me a rebel myself, I gits maddern ever at bein' called a yankee, but I din't lt on. I was mad enough to think ser'ous of goin' down South and straightenin' them rebs out, but a fell' in Ohio comes on and starts callin' me. With two yanks and two rebels, da civil war was on. We called them dopes everythink we could think of from skinflint cotton pickers to hillbilly jaspers. "Holy smokes", I says, "Must be Don Ameche din't install no telephone inventions in dat rebel town there yet. I ast 'em if they needed a nickle or so to call up. I told 'em I'd lend 'em money to telephone so's I'd git rid of 'em and git California. Things got worst and worst! One dope wanted my license number, but I din't had no number, cause I din't have no license.

What happened next was the most wunnerful thing I ever seen! Up in the attic, I has a big water cool tube a fel' stole from a broadcastin' station. I had it hooked up but never used it, account of ever time I throwed it on the lights dimmed all around the place. I throwed on da big tube and yells, "Callin' da state nuts institution, callin' da state nuts institution. Round up 2 loose nuts from de confedrid army that is gettin' violent approachin' from da rear."

Boy, things was really sizzlin'! Da fregussys was blocked for 'bout 3 thousand miles. The aerial was so hot it burned a hole in da winder sill. Sparks was flyin' from da ceilin' up above. People starts runnin' up and down in da street. Fire engine bells and sirens started up and then there was a loud explosion from da attic. I jumped out da winder, landin' in some poison ivy and was grabbed by two men wid white coats on wearin' some kinda Dick Tracy badges. These guys said dey came from Federal Communists Association and demanded to see my license. Dey said I was bootleggin'. I don't see how they knowed that! I had a small still in da cellar, but never told nobody and never sold no liquor. Well, anyways, no more rayo for me! My eyes is closed wid poison ivy and I can't see nothin', and my case comes up on Tuesday.

When I gits out of jail an rebuilds my house back, I might be interested in knowin' where I can swipe another water cool tube at.

SEEDRICK

SCRATCHI

(from page 4)

five different stations coming in, one on each antenna, and if signals are so loud, with half-wave antenna should really be picking up a few millivolts of energy. Quick check with neon bulb are making Scratchi looking like piker in estimate. Are being able to draw arcs off most antennas, are getting so much energy. Wow!! Scratchi are now all set for big experiment.

Are next running feeders from antennas to box I are making previous night, then doing some

tuning of condensers, then running twisted pair from that box to another box, in which are nice tank circuit. Finally are putting another antenna for eighty meter band, tuning it up, then going back and putting good old hand key in twisted lead between boxes. I then fire up my receiver, and toss out a seek-you — look, Hon. Ed., no transmitter!!

Not getting any comeback on first call, but second time I calling I raise a fellow in California and have a nice chat. Are able to talk to cupple more hams on coast before calling it a day. By gollies, Scratchi are really having something. Here are able to having nice transmitter, when not having transmitter at all.

You see, what are doing, Hon. Ed., is to taking these five broadcast stations, picking up nice hunk of energy from each on special antenna, then feeding energy from each antenna into box where are having resonant circuit for each BC station. Are then feeding energy from each coil into another resonant circuit, where frequencies of BC stations are adding together. I are picking the BC stations so they all between 550 and 900 kilocycles, so that total frequency is nicely in eighty meter band. Then, with eighty meter soup in tank, are coupling this through twisted pair to another box, where are having antenna coupling network for matching to eighty meter antenna. By keying twisted pair are able to putting eighy meter see-w signal on and off the air. Pretty hots idea, you not thinking so, Hon. Ed?

This are where big joke on engineer are coming in. He are driving over from coast today to seeing what happening and to showing me why what I saying are happening can't be happening. He are due to big shocking, because it are happening. Of course, what he are not knowing is that he are already proving it can happen, on acct. he are one of the hams I talking to with this system.

So that's how it are now standing. He arriving any moment now. Of course, even I are not figuring out why signals are so strong at that one point on the ranch, and Scratchi are not knowing why all this is working, but, HEE-HAW, it is!

Respectively pours,
Hashafisti Scratchi

EXCITER

(from page 16)

of the output line. This ground plate is mounted on the chassis by means of a single screw passing thru an insulating grommet in the strip. At one end the filter is grounded to one of the mounting screws of the output coax connector. The purpose of this arrangement is to prevent r.f. current flow through the chassis to reduce the possibility of instability. The success of these measures is verified by the performance of the exciter. While beating the signal against a crystal oscillator, it is possible to tune the output circuit through resonance without any detectable variation in the beat note. The thermal drift is also negligible, less than two k.c. drift occurring in a one-hour run from a cold start. The physical arrangement of the parts is highly recommended for good mechanical stability. Note that a piece of insulating ¼ shaft is attached

to the oscillator tuning condenser and the dial plate is attached to the insulated shaft. This is a further aid in confining the oscillator signal to the oscillator compartment.

The two terminating half-sections in the output filter have coils wound around ceramic condensers. The center coil, the inductance in the pi-section, is wound on a one watt resistor. The photograph of the filter shows how the coils are mounted on the strip, each at an angle of about 60 degrees with the bakelite tie strip for minimum coupling between them. Theoretically, the coupling will be zero if the axis of each coil makes an angle of 54 degrees with a line through the centers of all three coils.

The power supply should deliver 210 volts at 55 ma for the exciter high voltage and 6.3 volts at 1 amp. for filaments. The oscillator frequency is quite sensitive to plate voltage variation, so a regulated supply definitely should be used. A pair of VR 105's in series is adequate.

In constructing the exciter, the coil data must be followed closely to set each coil at the proper inductance. The oscllator and power output plate coils were wound on surplus command receiver coil forms which are not usually available, but other forms may be used with a slight variation of the winding to cover the proper range. A grid-dip oscillator is a most useful piece of equipment for adjusting all the coils, particularly the series resonant coupling coils, L_9 and L_{11} and the coils of the output filter. L_{15} with C29 and also L_{17} with C_{32} should resonate at 58 MC, while L_{16} should resonate at 27 MC with 100 mmf.

The front panel of the utility box was replaced with an aluminum panel. The aluminum panel was finished in grey crackle paint, sprayed on with a fly-spray gun, and baked with a bathroom heater for about five minutes.

Performance

An example of the harmonic suppression of the exciter is the fact that on a Hallicrafters Model S-36 signal, on which the 29 MC fundamental frequency signal was 30 db over S-9 on the S-meter, the second harmonic was S2 and the third and fourth harmonics were undetectable although the receiving antenna was one foot from the transmitter load, a 47 ohm resistor.

More careful measurements show that the second harmonic is attenuated 61 db below the carrier and the third harmonic is 55 db below the carrier. Higher frequency harmonic attenuation exceeded the measuring range of the test equipment. The FCC requirements for this class of transmitter are 40 db of attenuation of all spurious radiations. Obviously, the exciter surpasses these requirements by a comfortable margin.

The useful power output is about 1 watt. An amplifier under construction for use with this exciter uses a 6AG7 and a pair of 807's. The output of the exciter may be readily increased to two or three watts by using a 6AQ5 instead of the 6AK6. The plate voltage may then be increased to 250 volts. To compensate for this voltage increase,

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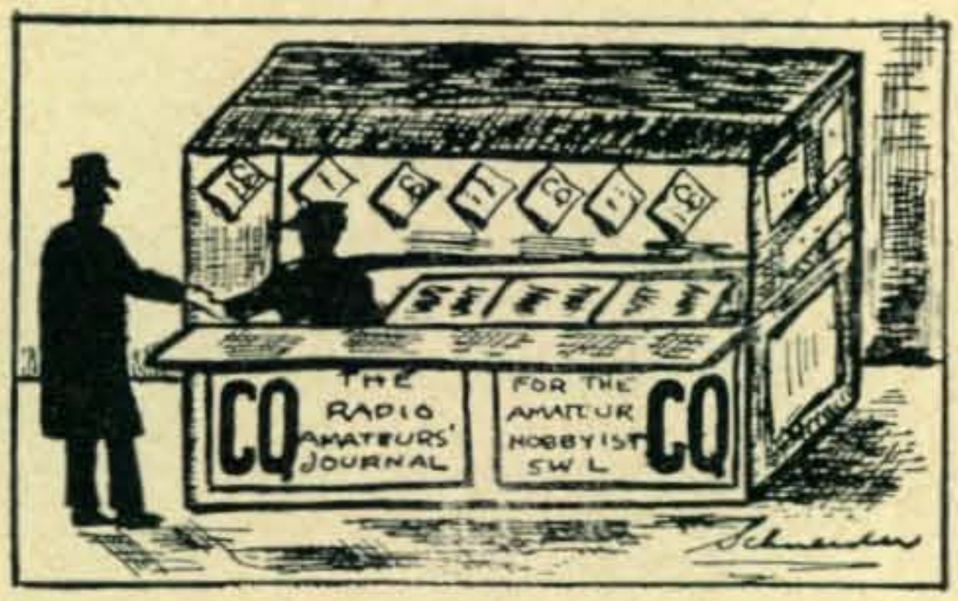

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resistors R_{10}, R_{15}, and R_{19} should be doubled in value. The danger in increasing power output by this change is the aggravation of thermal drift due to increased power consumption and the possibility of self oscillation which always accompanies an increase in voltage gain.

BRASSPOUNDER

(from page 23)

. . . *A5WAC* promises 24-hour return service on traffic to Japan. . . . The emergency boys around St. Louis had a workout when a simulated bombing raid, carried out by planes of the Civil Air Patrol, sent 29 mobile rigs scurrying in all directions between Alton and Tri-Cities in Illinois. The Egyptian RC headquarters was the NCS and 60 club members participated. . . . In Pittsburgh a fire in the telephone company building alerted the emergency gang by a request to *W3OMA* from Red Cross, expressing fear that telephone lines may go out. All hands were on deck, but the fire department kept everything under control. *W3AAK, KXU, KSP,* and *QPJ* signed in, as did *W3LMM* with his 10-meter net; *W3NCD* maintained NCS on 80. . . . The North Bay ARA announces new officers; *W6ZZF,* pres.; *WXU,* v.-pres. and treas. . . . We wonder how true the report is that three hams stole radio gear from the Evanston, Ill., Naval Reserve armory; names were mentioned, but no call letters in the newspaper item reporting the case.

It has been said that amateur radio is "The alleged art of attempting by lethal gadgets to produce a legal signal of questionable importance in distant receivers of similar addicts without blanketing nearby inferior receivers of non-addicts." . . . *W2BFD* would like to have some information on those six radioteleprinters reported to be in the Twin Cities in the Minneapolis RC bulletin. . . . Net news comes from the Amateur Transmitters Assn. saying the Western Penna. Net is on 3585 kc at 7 P.M., Monday thru Friday, and the Third Regional Net on 3590 kc at 7:45 and 9:30 P.M. on the same days. . . . The Portland (Oregon) ARC lists its new officers: *W7VT,* pres.; *JNJ,* activities mgr.; *NPF,* secy., and the club station is known as *W7KYC*. . . . *W7LCM,* Mayor of Huntley, Mont., continues to add dignitaries to his long list of Dogcatchers, one of the latest being Governor John W. Bonner of his state.

HETERONULL

(from page 26)

tened to the front panel.

After calibration, the device may be used to indicate unknown audio frequencies directly. Simply supply the tuneable amplifier with the audio signal, tune the amplifier until the null is heard, and read the dial. To measure the exact rf frequency or amount of drift of an incoming signal to the receiver, beat the signal to be measured against a known frequency and use the Heteronull to measure the small difference in the two frequencies.

By advancing the balance control knob, it is

possible to cause the circuit to go into oscillation, thus making available an audio oscillator which comes in mighty handy around the shack at times.

Extending Frequency Range

Extending the frequency range of the bridge is a relatively simple matter. All that need be done is to substitute a new set of resistors of the proper value for each range desired, for the two shown in the circuit diagram (R14, R15) or (R18, R19).

The value of each pair of resistors required for other ranges are shown below:

Range	*Bridge-Resistor Value*
50-150 cps	1.6 ± 5% Megohms
150-500 cps	580,000 ± 5% ohms
500-1500	184,000 ± 5% ohms (R14, R15)
1500-5000	80,000 ± 5% ohms (R18, R19)
5000-10000 cps	24,000 ± 5% ohms

These additional bridge resistors may be connected in the bridge circuit by means of a suitable switch. A double-deck wafer type, when substituted for the DPDT switch shown in the circuit diagram, should do nicely.

DXING

(from page 22)

80). Once the victim has been nailed he is sounded out as to conditions on the low-frequency bands, followed by a request to "listen for mc on 35—". If the baiting operator has chosen his time well and if conditions are at all favorable, the crossband contact generally results. Having thus demonstrated to the DX that it can be done, the actual baiting begins. Sometimes several months pass before the DX station is ready for the try, and the promoter (if he is wise) won't let him cool in the interim. This same system can be worked by a group of operators [3] who pepper the DX individually with pleas to "try 80." In promoting 80 meter DX there are three rules to remember: (a) Pick, if possible, a favorable time and season and have at least one high-powered station on hand to make initial contact and, perhaps, to act as M.C. (b) Agree on an exact GMT and frequency, and (c) Avoid the Latin American HF BC stations.

Unfortunately, many foreign DX stations do not realize that long-distance communication is possible on 3.5 mc. In order to arouse their curiosity, ask them to listen "on the low end" during the DXing hours (0000-1200 GMT depending upon their continent), or for W1AW on 3555 kc. Although it is almost impossible to believe, many DX stations have never LISTENED to 3.5 mc and are surprised to hear W signals come thru on that band. [4] Tell these stations that many USA and VE stations make a practice of DXing on 80. In short, do anything possible to work up their interest.

It is good policy to brief the DX station somewhat when promoting him. If he does make a schedule and conditions turn out to be unfavorable, he may never return. This possibility can be minimized somewhat at the outset by advising him to listen for a few nights and note which times seem the most appropriate for working your area. Ordinarily it will take the other operator a period to ready

his station for the test and this period can be used by him to gain familiary with the band. Because of the numerical superiority of W stations he will almost certainly hear some W stations and from that will gain a knowledge of the most favorable times for working a given North American area.

One need not wait until the winter months, either, to begin his promotions. If the other station is located in the opposite hemisphere a fair possibility of success exists at any time since one or the other is bound to be favored by cool weather. Generally North American stations will enjoy the greatest possibility of success during the winter months when receiving conditions are at a peak since they can then break through the other area's atmospheric noise with their higher (average) power.

QSLs

DX stations, with very few exceptions, QSL faithfully and quickly all contacts made on 3.5 mc. This is due to the fact that 80 meter DXing is still somewhat of a novelty to most of them—and they respect the eagerness of the other station to receive a low frequency confirmation. It goes without saying that the W or VE station is duty bound to be equally courteous in this respect. Some stations have made up a special "80 Meter DX" QSL which is used in place of the regular station QSL.

In brief, the 3.5 mc band offers the newcomer a chance to work DX in an uncrowded band, even with low power. It offers the jaded "200-plus" DXer a chance at a second honeymoon—and it offers all of ham radio a chance to relieve some of the congestion on the more popular DX channels. It offers another DX band—what else is there to say?

PROPAGATION

(from page 19)

the hot mass. Weather, however, usually moves from west to east.

An examination of these paths may also explain the skip phenomenon occasionally noted on the two meter band. Station at "A" can work station "B" via simple reflection. "A" can also work station "C" via super refraction; but "B" cannot hear "C" as he is in the refraction skip zone. "B" can work "D' by simple reflection and possibly "A" can also hear "D" via second hop reflection.

An example of this condition occurred on the night of July 23rd, 1949 when W2YT/3 at State College, Pa., 150 miles east of Pittsburgh, was in two meter QSO with W9TKL at Waukegan, Ill. and W9EVL at Appleton, Wisc. W3RUE, an outstanding station in Pittsburgh, Pa., was hearing W2YT/3 and W8WJC at Everett, Ohio S9, but was not hearing the W9s at all.

A similar phenomenon was noted during the wide-spread band opening of September 6, 1950. W3QKI, of Erie, Pa., reported hearing W2BAV, at Claryville, N. Y., working several stations in the W9 and WØ call areas, but apparently all this choice DX was passing right over Erie. This was almost without doubt a tropospheric opening, since W2BAV was hearing signals from the en-

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tire region from over 1000 miles away to "local-range" ground-wave distances with no apparent gaps in his coverage.

Conclusion

In this series of articles, the author has attempted to explain and define the phenomena of propagation which are used by ionosphere researchers, radar men and meteorologists in terms of simple language that all amateurs can understand and use correctly in discussing v.h.f. propagation.

A summary of the probable propagation paths and media for local and DX communications on the various amateur bands follows:

Frequency Band	Type of Contact	Probable Means of Propagation
MHF	Local	Ground Wave
	DX	Ionosphere (F_1, F_2, E or Sporadic E)
VHF		
27-30 mc	Local	Ground Wave
	DX	Ionosphere (F_1, F_2)
	Short-skip DX	Ionosphere (Sporadic E), Aurora
50 mc	Local	Radio line-of-sight, Ground Wave plus Diffraction
	DX (Extreme)	Ionosphere (F_1, F_2) (Rare)
	DX	Ionosphere (Sporadic E)
		Tropospheric super-refraction
		Tropospheric reflections
		Aurora
144 mc	Local	Radio line-of-sight, Ground Wave plus Diffraction
	DX	Tropospheric Super-Refraction and Reflection
		Ducting possible, but unusual
		Sporadic E possible, not probable
		Aurora
UHF	Local	Radio line-of-sight, plus Diffraction
	DX	Trospheric Super-Refraction and Reflections
		Temperature inversion Ducting
		(Note: The higher the frequency, the greater the possibility of Ducting becomes.)
		Aurora—?

In the preceeding table, the following definitions apply:

Frequencies from 1.4 to 30 mc—Medium High Frequency, MHF

Frequencies from 30 to 200 mc—Very High Frequency, VHF

Frequencies above 200 mc—Ultra High Frequency, UHF

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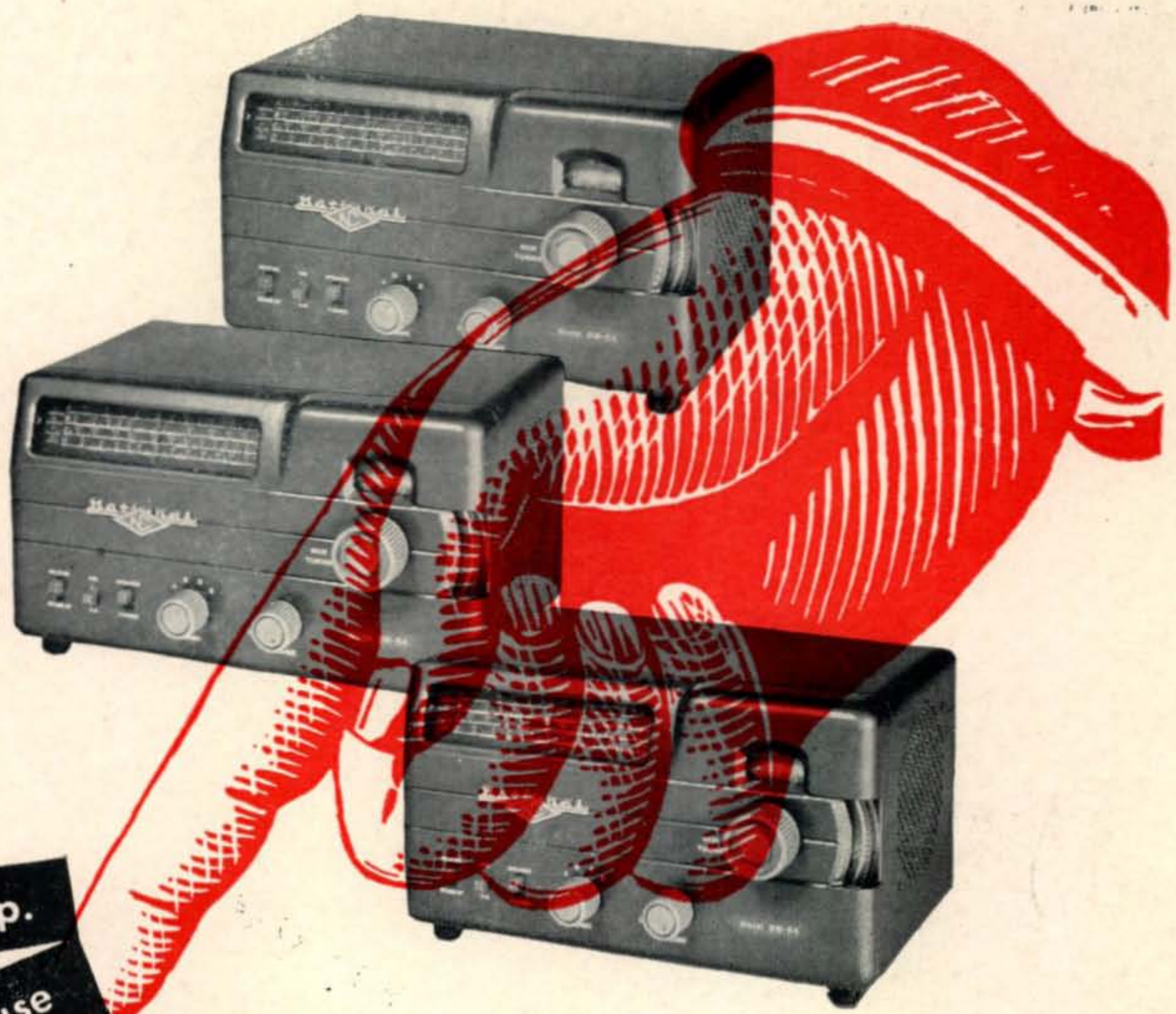

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