CQ

August 1967
75¢

Build a 40M QRP S.S.B. Transceiver

CQ Lab Tests the Hallicrafters HT-46

Convert your Ranger I to 6 Meters

MICROWAVE

AMATEUR RADIO'S UNTAMED FRONTIER

The Radio Amateur's Journal

Very Selective

In fact, the Collins 75S-3B Receiver now has the sharpest selectivity available in a ham receiver. Improved cross-modulation characteristics immunize it to nearby transmitters. CW DXers using the 75S-3B easily dig that one signal from a pileup. Mechanical filter options provide just the right degree of selectivity for operating conditions in SSB, CW, or RTTY. Have you tried the 75S-3B lately? See your Collins distributor.

For further information, check number 7, on page 126

COLLINS

Meet The Dividers!

ICD SERIES INTEGRATED CIRCUIT DIVIDERS

They are new from International. Use them for crystal controlled time bases, scope calibrators, and clock sources.

International ICD units are totally integrated circuit frequency dividers. They are smaller than a pack of cigarettes (1" x 2¼" x 2⅜"). All have two separate outputs. They are packaged in nine types providing divide ratios 2 thru 10. No tuning or adjustment is required. The output pulse has the same stability as the driving pulse. Voltage required, 3.6 vdc ± 10%.

FREQUENCY RANGE

ICD-10 to 10 MHz ..... $19.95 ea.

ICD-2 thru ICD-9 to 2 MHz ..... $19.95 ea.

ICD Buffer (for feeding more than one circuit) .. $ 9.95 ea.

WRITE FOR COMPLETE CATALOG.

INTERNATIONAL

CRYSTAL MFG. CO., INC.

10 NO. LEE • OKLA. CITY, OKLA. 73102

For further information, check number 1, on page 126

Hallicrafters advanced technology brings you a new breed of amateur equipment

SX-146 Receiver

This is an amateur band receiver of advanced design employing a single conversion signal path and pre-mixed oscillator chain to assure high order frequency stability and freedom from adjacent channel cross-modulation products. The SX-146 employs a high frequency quartz crystal filter and has provision for installation of two more crystal filters. The receiver may also be used from 2 to 30 mc, with the exception of a narrow gap at 9.0 mc, with the connection of auxiliary oscillators. The highly stable conversion oscillator chain may be used for transceiver operation of the matching HT-46 transmitter.

FREQUENCY BANDS: 3.5-4.0; 7.0-7.5; 14.0-14.5; 21.0-21.5; 28.0-28.5; 28.5-29.0; 29.0-29.5; 29.5-30.0 mc (28.0 to 28.5, 29.0 to 30.0 requires extra crystals at users option).

SENSITIVITY: Better than 1 μv for 20 db S/N.

TUBES AND FUNCTIONS: 6JD6 RF amplifier; 12AT7 Signal mixer and cathode follower; 6AU6A 9 mc IF amplifier; 12AT7 AM detector—AVC rectifier—product detector; 12AT7 USB—LSB crystal oscillators; 6GW8 Audio amplifier and audio output; 6BA6 Variable frequency oscillator; 6EA8 Crystal heterodyne oscillator and pre-mixer; Plus diode power supply rectifier, ANL diode and AVC gates diode; *6AU6A—100 kc crystal calibrator oscillator; *Harmonic generator diode.

PHYSICAL DATA: Size: 5⅞" x 13⅛" x 11". Shipping wt., 20 lbs.

FRONT PANEL CONTROLS: Frequency: Power off CW-upper-lower and AM; Audio gain; Band selector—3.5, 7.0, 14, 21.0, 28.0, 28.5, 29.0, 29.5; Selectivity—0.5, 2.1, 5.0 kc (0.5 and 5.0 kc filters optional extra); Pre-selector; RF gain; AVC on-off; Cal. on-off; ANL on-off; Phone set jack; S-meter.

REAR CHASSIS: S-meter zero adjust; Internal-External oscillator switch; Slave oscillator output; External oscillator input; Antenna socket; Speaker, ground and mute terminals; Grounding stud; AC power cord.

POWER REQ.: 105/125 volt—50/60 cycle AC—55 watts.

I-F SELECTIVITY: Uses a 6-pole crystal filter to obtain a nose-to-skirt ratio better than 1 to 1.8.

Amateur net, $269.95

Model HA-19 plug-in, 100-kc quartz calibrator available as accessory. **Amateur net, $19.95**

**Part of HA-19 calibrator.*

HT-46 5-band transmitter

All new from the ground up! Here's the "new breed" transmitter that matches your SX-146 . . . works independentl or may be interconnected for transceiver operation.

FEATURES: 180 watts PEP input on SSB; 140 watts on CW Frequency control independent or slaved to SX-146 re ceiver; Upper or lower sideband via 9 mc quartz filte Built-in power supply; Press-to-talk or optional plug-i VOX; grid block for keying for CW.

FREQUENCY COVERAGE: 3.5-4.0, 7.0-7.5, 14.0-14.5 21.0-21.5 mc and 28-30 mc in four 500-kc steps. Crysta supplied for 28.5-29.0 mc coverage. Other plug-in crystal at user's option.

TUBES: 6BA6 VFO; 6EA8 Heterodyne crystal oscillato and mixer; 12AT7 Carrier oscillator-third audio; 12AT Mic amplifier; 6EA8 9 mc I-F amplifier and AALC; 6AH Mixer; 12BY7 Driver; 6HF5 Power amplifier; 0A2 Reg.

FRONT PANEL CONTROLS: Frequency Tuning; Opera tion-Off, Standby, USB, LSB, CW-Tune, Standby LSB USB Microphone gain; Driver tune; Carrier level; Band selecto Final tune; VFO selector—Transmitter-Receiver; Dial cal Calibrate Off-On; Meter MA-RFO.

REAR APRON FUNCTIONS: AC Cord; Ground lug; Fuse Key jack; VOX accessory socket; Antenna jack; Receive input (for transceiver); 11 pin control socket; bias adjus

PHYSICAL DATA: Size: 5⅞" x 13⅛" x 11". Shipping wt 26½ lbs.

HA-16 Vox Adapter, **$37.95** **Amateur net, $369.9**

R-51 Speaker,

4 x 6 inch oval speaker and attractive 24 hour clock **amateur net $34.9**

"Quality through Craftsmanship"

hallicrafters

Fifth and Kostner Aves., Chicago, Illinois 6062
Export: International Division

Available in Canada from Gould Sales Co.

For further information, check number 16, on page 126

CQ

AUGUST 1967 VOL. 23, No. 8

The Radio Amateur's Journal

TABLE OF CONTENTS

DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L. I., N. Y. 11050. Telephone: 516 883-6200.

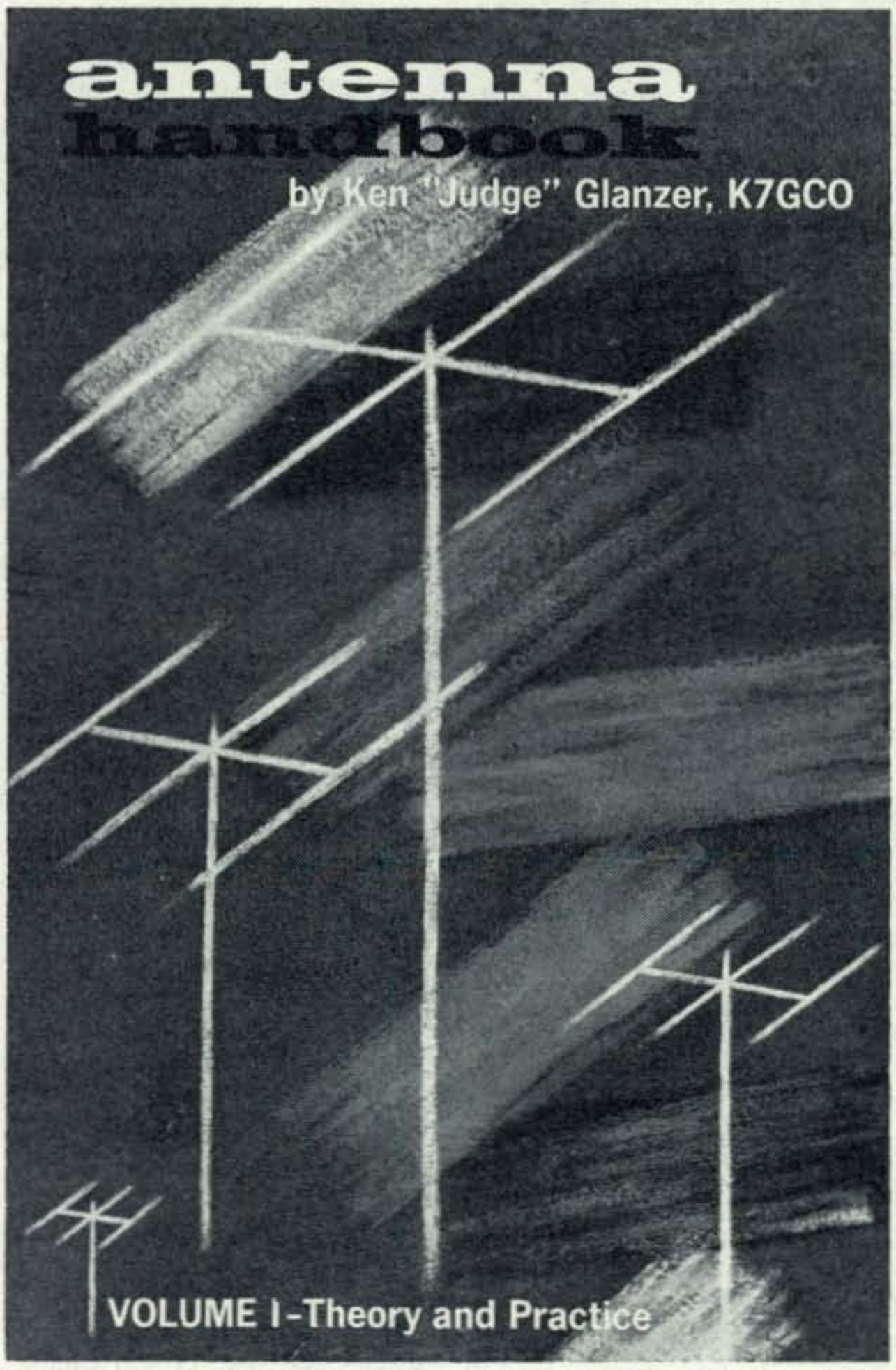
CQ—(Title registered U. S. Post Office) is published monthly by Cowan Publishing Corp. Second Class postage paid at Port Washington and Miami, Florida. Subscription Prices: U.S.A., Canada and Mexico, one year, $5.00; two years, $9.00; three years, $13.00. Pan-American and foreign add one dollar per year. CQ does not assume responsibility for unsolicited manuscripts. Please allow six weeks for change of address. Printed in the United States of America.

Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

Something Really New!

The result of 15 years of exhaustive research—of trying to find the best antenna for every possible situation. Not a re-hash of old material, but a completely new and exciting book describing techniques and concepts as never before seen in the antenna field.

So big and complete that it takes *three* volumes to tell the whole story. Now, after six years of preparation, the *CQ* Technical library is proud to present Volume I of this soon-to-be-classic trilogy. Volumes II and III will follow in quick succession.



Here's just a sample of what Volume I covers: Transmission line theory, Attenuation, Impedance, Standing waves, resonant and non-resonant lines, stub matching, single and parallel coaxial lines, radiation fundamentals, current distribution, induction field, radiated field, gain, reciprocity, radiation resistance, dipoles, tripoles, depth of electrical ground, relative ground conductivity from s.w.r., reactive variations, free space **3 dimensional** patterns of long wires of all practical lengths, effect of center and end feed on antennas, tilted antennas, terminated long wires and vee beams, matching, devices, what happens to all that reflected power, which end of feed is more important to match, how to use open wire feed on beams, gamma matches, T-matches, feeding T-match with dual coax, transforming balanced 100 ohm coax lines to 200 or 50 ohms, capacitive match for balanced transmission lines, inductive (hair-pin) match, quarter wave and short bazookas for balanced feed, broad band baluns and effect on feedpoint current, effect of surrounding objects and power lines on feedpoint current, folded dipole matching for beams, feeding stacked beams individually or together.

Watch for the announcement of volumes II and III.

Cowan Publishing Corp., Book Division
14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

Enclosed is $_____ for _____ copy(ies) of the Antenna Handbook, Volume I, by K7GCO.

Name .....Call .....

Street .....

City .....State .....Zip .....

New York City and State residents add applicable sales tax.

Volume I of three volumes.
Price:
$4.00

OUR READERS SAY

"2.1 Kc Filter for 75A-4"

Editor, *CQ:*

This is in reference to the article, "A 2.1 Kc Filter For The 75A4". The hookup as outlined by W1NBM is inoperative.

An examination of the schematic of the 75A4 will show that there is a current flow between pins 1 and 2 of the filter.

With the hookup shown the B+ from pin 1 is going directly to ground. This could be pretty hard on the equipment.

To make the set-up operative it is necessary to put the ground connection on the plate end of the filter above ground also. This of course, is done the same as on the grid end by isolating the ground connection from the rest of the foil.

After doing this the set-up worked very well. Aside from a couple of errors in the drawings everything else was OK and the results well worth the effort.

Jack Cartlidge, WA8ECQ
Cincinnati, Ohio

DX Anyone?

Editor, *CQ:*

I sponsor no cause, have no complaint to make and no grudge to bear. But I do have a little story to tell. The story is about a radio amateur who lived in Eastport, Maine. DX was his supreme delight so one day he called CQ DX and to his surprise he worked an amateur in Penzance, Cornwall, England, then one in Vimianzo, Spain.

Then in succession he worked Scotland, Iceland, Greenland, The Azores Islands and Ireland. After lunch the countries to the south began coming in and he worked Panama, Costa Rica, Honduras, Guatemala, Mexico, El Salvador, The Dominican Republic, Trinidad, Cuba, French Guiana, Venezuela, Colombia, and an expeditionary party in northern Brazil. In the late afternoon and evening he worked the VE4, 5, 6, and 7 Provinces and also a VE8. About ready to call it a day he worked a KL7 in Hyder, Alaska.

About ready to pull the big switch, a W6 in San Francisco called him. So to top the whole day off just right he had a FB rag chew with a local stateside station. He went to bed that night and dreamt about all the wonderful DX he had worked that day.

What he did not dream about was that the W6 in San Francisco was the best DX he had worked all day!

Now Gentlemen, don't be alarmed or provoked! All of the distances have been carefully checked using correct latitudes and longitudes and a real sophisticated computer program.

Pleasant dreams and 73 and DX!!!

John E. Walstrom, W6OA
Orinda, California

Lightning

Editor, *CQ:*

I found Jerold Simons' article (June '67) about lightning most interesting and informative notwithstanding the fact that there are authorities other than those listed in the bibliography who aren't in full agreement with the composite thesis he presented.

However, criticism is not my purpose for writing. One of the major aspects of lightning danger which he failed to mention is that of induced voltages in conductors near the fantastically high-speed collapsing magnetic fields associated with the very high currents he so ably covered.

Because human (and animal) bodies are fair conductors, one of the chief causes of death from lightning "bolts" is not conduction of the current through the victim per se, but the tremendously high induced voltage and the circulation of eddy currents (also high) within the body. Incidentally, animal bodies show generally considerably lower electrical resistance (with consequent better conductivity) than human bodies. Farm animals are frequently killed while standing near an iron wire fence that in itself, shows but small damage from a "light" bolt.

Many victims of lightning, both human and animal, show not the slightest outward sign of electrical burns.

Another item of interest is the fact that due to the high speed of the event, the actual power (in watt-hours or in joules) expended is quite small.

B. H. Hansen, W6HOZ
Los Angeles, California

Pakistani Operations

Editor, *CQ:*

This letter refers to a news item which appeared on page 98 of the April '67 issue of your esteemed magazine.

In this context I wish to submit the following information which I hope will be of considerable interest to your readers.

You have correctly stated that I (AP2SG) was the operator at AP2NMK, which was an entirely legitimate operation. As a matter of fact, AP2NMK is the callsign of the Pakistan Boy Scouts Association club station which was on the air some time in February this year—having been granted special permission by the authorities—for a week on the occasion of the 4th National Boy Scouts Jamboree. Since this was a temporary license valid only for the aforementioned event, operation was subsequently suspended. I am glad to report that radio amateurs will now again be able to work AP2NMK along with other AP stations in a few weeks from now as AP licenses have been revalidated by the Government after nearly two years of prohibition.

It was a pleasure for me to work many DX stations on behalf of AP2NMK and I think that I have already responded to all the genuine QSL's received here.

It would be opportune to mention that Mr. N. M. Khan, Chief Commissioner, Pakistan Boy Scouts Association, took an examplary interest in having AP2NMK set up for the Jamboree and as a regular Boy Scout club station. I am sure that in view of present hopeful developments he would like to further organize this operation. It would therefore be wonderful if your readers could send him spare copies of the ARRL Handbooks or other relevant amateur radio technical publications for distribution to the Pakistani Boy Scouts. His address is as follows: Mr. N. M. Khan CSP, Chief Commissioner, Pakistan Boy Scouts Association, Amin House, New Queens Road, Karachi, Pakistan.

Azhar H. Shah, AP2SG
Karachi, Pakistan

A 3-band SSB Transceiver Kit for $189.95
An Electronic Keyer Kit for $49.95
A Solid-State AC Power Supply Kit for $79.95

SPECIAL SALE OFFER
$AVE
753 KIT NOW $149.95
751 KIT NOW $59.95
752 KIT NOW $59.95
SEE YOUR EICO DEALER NOW!

Who gives you ham gear so COMPLETE at prices so low?

Who else but EICO

Pro **all the way, from concept to execution — that's what ham editors say about EICO. Critical customers agree, and like the low price, too. They've made the 753 kit, for example, the industry's hottest seller. And the new 717 Keyer seems headed for the same fate. Highlights of both give you some inkling why:**

The EICO 753 is a complete 3-band transceiver, offering SSB/AM/CW operation with conservatively rated 200 watts PEP on all modes (rated for maximum efficiency rather than maximum possible input power). A new Silicon Solid State VFO provides full coverage of the 80, 40, and 20 meter bands. Assembly is made faster and easier by VFO and IF circuit boards, plus pre-assembled crystal lattice filter. Rigid construction, compact size, and superb styling make this rig equally suited for mobile and fixed station use. The EICO 753 is at your dealer now, in kit form and factory-wired.

FEATURES: High level dynamic ALC prevents flat-topping even with extreme over-modulation. Automatic carrier level adjustment on CW & AM. Receiver offset tuning (10 kc bandspread) without altering transmit frequency. Front panel selected STANDBY, VOX, or P-T-T operation. Unique ball drive provides both 6:1 rapid band tuning and 30:1 vernier bandspread with single knob.

SAVE $40.00—753 KIT NOW $149.95

EICO Model 751 AC Supply/Speaker Console: Provides all necessary operating voltages for Model 753. Incorporates PM Speaker, conservatively rated components and silicon rectifiers for minimum heat and extended trouble-free life. Includes interconnecting plug-in cables.

SAVE $20.00—751 KIT NOW $59.95

SPECIFICATIONS: Output Voltages: 750 volts DC at 300ma, 250 volts DC at 170ma — 100 volts DC at 5ma, 12.6 volts AC at 4 amps. INPUT VOLTAGE: 117VAC.

EICO Model 752 Solid State Mobile Power Supply: (Not Shown). For use with 12 volt positive or negative ground systems. Full protected against polarity reversal or overload. Output voltages identical to Model 751. Input voltage 11-14 volts DC.

SAVE $20.00—752 KIT NOW $59.95

The ideal accessory for the CW ham—the **fully automatic 717 Electronic Keyer.** It provides self-completing clean-cut dots, dashes, and spaces accurately timed and proportioned from 3 to 65 WPM in four overlapping switch-selected ranges with vernier control of all speeds within each range. Matches EICO 753 in appearance to make it a perfect table-top companion unit.

FEATURES: Output Contacts — 25 volt-ampere dry-reed SPST relay. Built-in adjustable tone and volume oscillator with a 3 x 5 inch speaker for monitoring. Can be used as a code practice oscillator.

Kit $49.95 Wired $69.95

For FREE catalog and Amateur Radio brochure write to EICO 131-01 39th Ave., Flushing, New York 11352 EICO

For further information, check number 18, on page 126

Announcements

Fairbanks, Alaska

Alaska is celebrating their Centennial year. Fairbanks has been named the official Centennial City and an exposition ground has been erected there. Those planning a trip to Alaska this summer are encouraged to stop off and visit Fairbanks. The local club has obtained special permission to use the call, KL7ACS, the Alaska Centennial Station. There will be a Hamshack on the Fairgrounds aboard the RIVER STEAMER NENANA. Special Commemorative QSL's have been made up. All Hams of this area meet informally at the Kings Kup, each Saturday at noon especially to greet traveling hams. This establishment has an old English atmosphere and good food and beverages. A sincere effort will be made to monitor the frequencies, 3866 kc a.m. & l.s.b., and 145.35 mc a.m. to assist visiting mobiles, etc. Come up and see Alaska!

Fulton, New York

The Fulton Amateur Radio Club is celebrating its Tenth Anniversary by scheduling many special events for this year, the largest of which will be their combination "Birthday Party" and Hamfest to be held at Malone's Route 3, Fulton. Due to indoor accommodations (in case of inclement weather), ticket sales are limited to 100. For further information contact R. G. Ludington, WA2GRV, Trustee, P. O. Box 26, Fulton, New York.

Rock Hill, South Carolina

The Rock Hill Amateur Radio Club will hold its annual Hamfest at Joslin Park, with food, prizes, and bingo. Playground for the children. Plenty of equipment for sale and trade. Bring your junk and do some trading! Check for exact date with WB4BSW, 629 Rockwood Drive, Rock Hill, S. C.

Lyman, Wyoming

The WIMU Hamfest will be held at Mack's Inn, Idaho (20 miles south of West Yellowstone) on August 4, 5, and 6. Activities will include mobile hunts, treasure hunts, demonstrations, homebrew equipment contests, and many other activities for the whole family. Information from K7GOG, P. O. Box 312, Lyman, Wyoming, 82937.

Frankfort, Illinois

The Six Meter Club Of Chicago will hold its Tenth Annual Picnic and Mobile Meet on Sunday, August 6, 1967, at Picnic Grove on Route 45, one mile North of Route 30, Frankfort, Illinois. For further info contact Alfred Bagdon, K9YJQ, Picnic Chairman, 7804 West 66th Place, Bedford Park (Argo P. O.) Illinois, 60501.

Gainesville, Georgia

The Second Annual HAM-NIC will be held on Sunday, August 6, at the Sportsman's Club Pavilion (Follow Ga. 53 east of Gainesville to sign) Gainesville, Ga.-Lake Lanier, by the Lanierland Amateur Radio Club. A real family ham picnic with activities for all. Main prize: World Radio Labs duo-bander transceiver with power supply and many more door prizes—donation $1.00. Talk in for mobiles-10:00 A.M. to 1:00 P.M., 3975 kc and 50.25 mc. Call in for directions—give your QTH when calling. Organizational meetings invited. Box 150, Gainesville, Georgia, 30501.

Levelland, Texas

The annual Northwest Texas Emergency Net Picnic & Swapfest will be held Sunday, August 6, 1967, at the City Park in Levelland, Texas. Registration is free. Picnic tables will be provided. This is an event for the entire family: swings & slides etc. in the playground for the kids. Bring your own picnic basket and join us. Swapfest starts at 9:00 A.M. Lunch at 1300. Mobile talk in is the net frequency, 3950 kc.

Flourtown, Pennsylvania

The Mt. Airy V.H.F. Radio Club, Inc., Phila., Pa., better known throughout the country as "The Pack Rats", is holding its 12th Annual Family Day and Picnic on Sunday, August 13, 1967 (Rain Date; August 20) at Fort Washington State Park, Flourtown, Pa., in cooperation with the Delaware Valley Chapter of the Quarter Century Wireless Association. Games for the harmonics, (children), YL's and XYL's and the OM's, plus free soda for all. For further information contact W3SAO, 821 W. Lindley Ave., Philadelphia, Pennsylvania, 19141.

Florence, Alabama

The 1967 North Alabama Hamfest will be held August 20, in Florence at the Lauderdale County Coliseum. The North Alabama Hamfest is an annual event attended by space probers from NASA and the Army Missile Command, electrical power engineers and researchers from TVA and specialists from any number of other independent industries. Address inquiries to North Alabama Hamfest, Assn., Inc., P.O. Box 9, Decatur, Alabama.

Warren, Ohio

The Tenth Annual Warren (Ohio) A.R.A. Hamfest, Sunday August 27, 1967, rain or shine. At community Center, Newton Falls. Follow arrows from Ohio Rt. 534 or Ohio Tpke. Exit 14. Get route slip at Tpke. exit. Displays, swap-shop, prizes, homebrew and c.w. contests, fall and wig style show for the ladies. Talk-in stations on 10-6-2 meters.

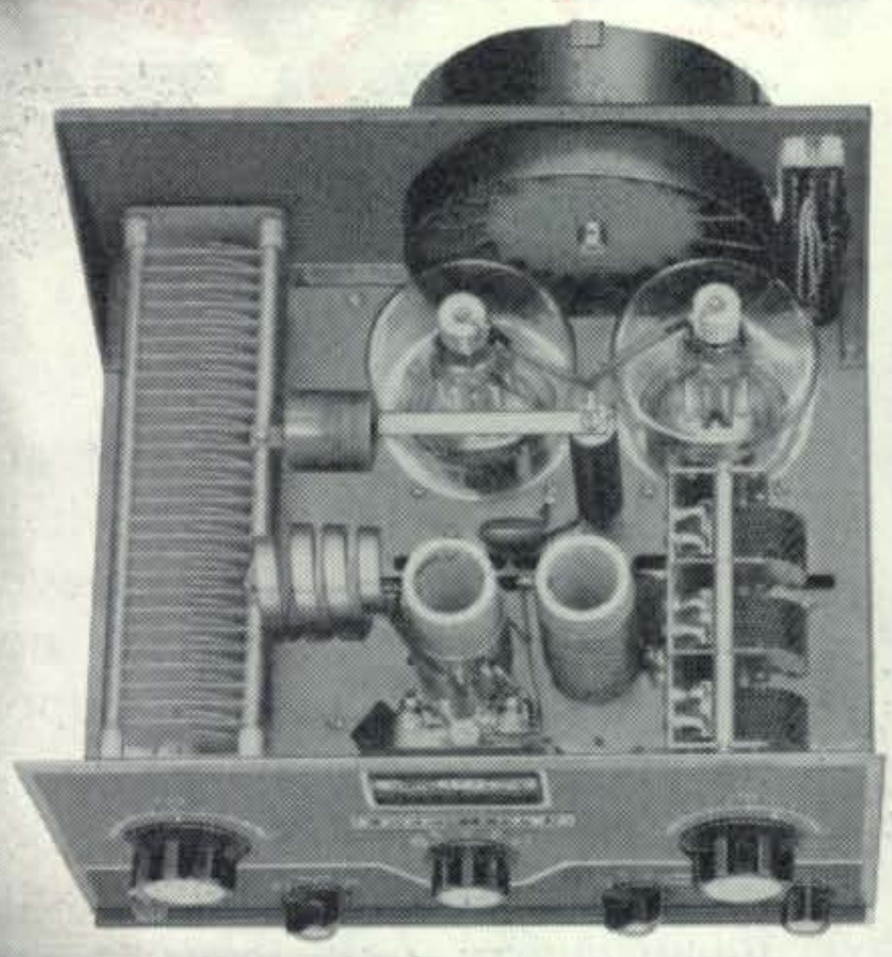
Southern New Jersey

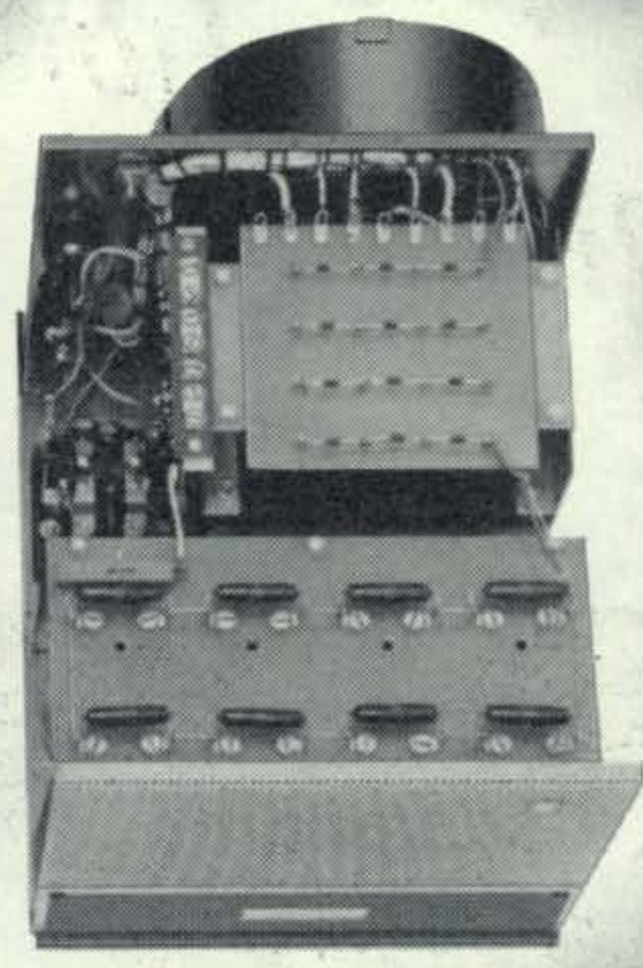
The Southern Counties Amateur Radio Association will again hold their annual Hamfest and picnic at Egg Harbor Lake, Egg Harbor City, N.J. The location is just off Route 50, three miles north of the intersection with Route 30. The date is Sunday, August 27, beginning at 10 A.M. SCARA Hamfests are a family affair. In addition to the popular swapshop, auction and doorprizes, there will be lake bathing, children's events, and tree shaded picnic and refreshment facilities. Registration is $1 per person or $1.50 for the entire family. Monitoring will be on 50.2 and 147 mc. More details from C. J. Hobart, Jr., 313 Shore Road, Northfield, N.J., 08225.

Aurora, Illinois

Shop 'n Swap Hamfest Sunday, August 27, 1967, at Phillips Park Pavillion, Aurora, Ill., sponsored by the Fox River Radio League. Swap tables, picnic grounds, rides for kids, playgrounds, food, shelter. W9CEQ homing freqs. 2 mtr., 145.350 mc., 75 mtr., 3.940 mc. Free coffee and donuts from 9 to 10 A.M.

BLOCK BUSTER





NEW SWAN-MARK II
2000 WATT P.E.P. LINEAR AMPLIFIER

We are pleased to announce production of the new Mark II Grounded Grid Linear Amplifier, and confident that you will thoroughly approve its compact design and many quality features.

Two Eimac 3-400Z Triodes provide the full legal power input: 2000 Watts P.E.P. in SSB mode or 1000 Watts AM or CW input. Planetary vernier drives on both plate and loading controls provide precise and velvet smooth tuning of the amplifier. Greatly reduced blower noise is provided by a low RPM, high volume fan.

The new Mark II provides full frequency coverage of the amateur bands from 10 through 80 meters and may be driven by any transceiver or exciter having between 100 and 300 watts output. The amplifier measures 8″ high, 13″ wide and 14″ deep. Weight is 20 pounds.

The power supply is a separate matching unit which may be placed beside the Mark II amplifier, or with its 4½ foot connecting cable, may be placed on the floor. Component quality is of the highest caliber. Silicon rectifiers deliver 2500 volts D.C. in excess of 1 ampere. Computer grade electrolytic filters provide 40 mfd capacity for excellent dynamic regulation. A quiet cooling fan allows continuous operating with minimum temperature rise, thus extending the life and reliability of all components. Input voltage may be either 117 or 230 volts D.C., 50-60 cycles. Dimensions: 8″ high, 9″ wide, 14″ deep; weight 35 lbs.

If you are interested in high power and a truly clean signal, see the Swan Mark II at your dealers today.

MARK II AMPLIFIER with tubes $395 **MATCHING POWER SUPPLY $235**

SEE IT AT YOUR SWAN DEALER

SWAN ELECTRONICS
Oceanside, California

For further information, check number 14, on page 126

SCRATCHI

Feenix, Ariz.

Deer Hon Ed:

Hokendoke Hackensaki! are Scratchi in 1/c dither. Not knowing what to buleeving. For instance, do you buleeving in sooperstishun? Normally Scratchi not being sooperstishus at all, but what happening resently having me in reel consternation.

For examples, would you buleeving there is such a thing as a lucky pencil? Likesame lucky charm, only this are wooden pencil I talking about. It's only a stub about 2 inches long, well marked with Hon. Teeth. Just a no-account pencil, but if I using it to write in my log, I can working what I want to!

Hon. Ed., maybe you thinking I fit subject for Hon. Bug House, but before you drawing any conclusions, letting me telling you what happening, so you can making up your own mind.

Cupple months ago I desiding to trying to work all counties in Hon. Yewnited States. As you knowing, there are umpteen-elevendy of them, and it being reel good test of ops skill to getting them all.

Are getting reel slicky postal guide which listing states, then counties, and even towns and cities in all counties. It running from Autauga county in Alabama to Yellowstone National Park county in Wyoming.

So, I getting on air and starting, and for next few weeks having no problum at all. Everybuddy I working are new county. Calling seek-you, amchoor coming back, and Scratchi having new county. First cupple in my log are Arizona counties like Maricopa and Pima, natchyourally.

After while, howsumever, things getting harder. Calling seek-you, and getting answer, but not from new county. Matter of fackly, cupple nites not working any new counties at all.

Then, one nite when sitting down at operating table, I not finding my usual automatic pencil, so digging around in drawer

◄ For further information, check number 10, on page 1

and finding stub of old yellow pencil. I using it to enter seek-you in log. Bang! getting answer from Piscataquis county in Maine—and if you thinking that are easy you are the crazy fellow, Hon. Ed.

From then on, all nite, I raking in new counties like sixty. Getting Currituck in N. Carolina, Sequatchie in Tennessee, Kitsap in Washington, Huerfano in Colorado, and lots and lots of goody dee-x counties.

Next nite I settling down for another big evening at rig, and noticing that old yellow pencil need sharpening, so instead of sharpening it, I grabbing pen out of desk set and entering seek-you in log with it.

No dice. Not even getting anykind answer. I trying for another hour, and not picking up one new county. Not only that, but not even getting good signal reports.

About this time figyouring, for luck, I'd sharpen little old yellow pencil and trying it, on acct. it had been lucky previous nite. I getting out knife, making nice point on pencil, entering seek-you in log with it, calling seek-you, and Whammo! back coming feller in Tangipahoa county in Louisiana.

Same thing hole rest of evening. Working Tuscarawas in Ohio, Pushmataha in Oklahoma, Tooele in Utah, Ozaukee in Wisconsin and Tift county in Georgia. What a nite!

Hon. Ed., howcomes all these counties have such funny names? I thinking maybe this country settled by foreigners. They certainly not All-American names like Hashafisti Scratchi.

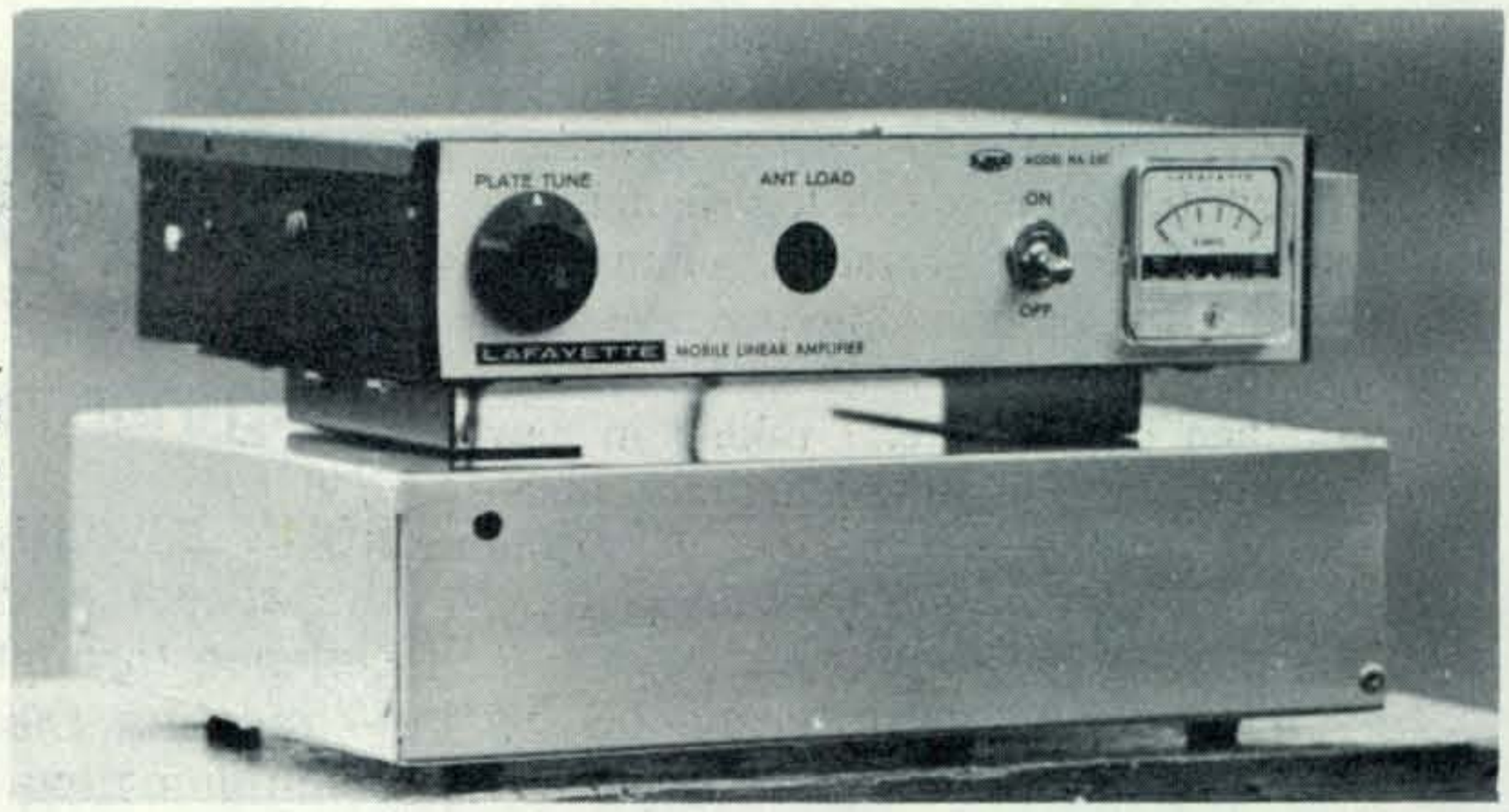
Following nite again I going like crazy. Picking up Kalawao in Hawaii, Volusia in Florida, Siskiyou in California, even Pottawatomie in Kansas. Having more fun than mouse in Hon. Cheese Factory.

Next nite catastrophy striking. Getting reddy for big QSO nite, and can't finding lucky yellow pencil. Looking in log, in drawer, on floor, under rig, searching my clothes, looking all over house, and not finding pencil.

So, telling myself there is no such thing as lucky pencil, getting out automatic pencil, writing seek-you in log and letting out long seek-you. Back coming some UA9. Of all the rotten luck. Trying again, and all I can getting is some guy with SP7 call. Hon. Ed., it plum discouraging. Next half hour working all continents twice, but can't pulling in one lousy new county.

It that way for next hole week. Can't find-

[*continued on page 120*]



Complete unit has the Lafayette HA-250 linear mounted atop the chassis to provide a compact 100 watt p.e.p. mobile rig.

A 40 METER QRP S.S.B. TRANSCEIVER

BY LARRY WALROD,* VE7BRK

The author describes a 40 meter QRP s.s.b. transceiver that is used to drive a Lafayette HA-250 linear. The unit does not use any converters in either transmit or receive. The t.r.f. receiver has more than adequate sensitivity and the selectivity is set by the homebrewed filter using FT-243 or HC-6U surplus crystals.

NEWCOMERS to amateur radio might have the impression that sideband is too difficult for them to tackle. This article describes one of the simplest and most inexpensive ways to produce an s.s.b. signal of decent quality along with a simple but effective receiver. Old timers might find this just the answer for that extra 40 meter rig for emergency use. Under normal propagation conditions, this rig is effective over distances of a thousand miles during daytime.

This project was initiated with the purpose in mind of producing the biggest and most reliable signal we could with the least outlay in cash and at the same time, maintaining as high a quality of transmitted signal and receiving equipment as this objective would permit. We were also interested in the minimum primary supply drain that would be consistent with other requirements. It was expected that the unit might often be used in field locations where a.c. power would not be available so it was designed for use with a 12 volt auto battery as primary power.

We have heard the proponents of single conversion for transceivers say something like this, "The only thing better than simple conversion is no conversion." There are no conversions in this unit. Of course this results in one very definite limitation on the equipment for general amateur use but for the purpose intended, this limitation turns out to be an advantage. Any station with which you might be communicating will know without a doubt where to find your signal. Some other advantages accrue also, including reduction of circuit complexity, elimination of spurious radiations caused by conversions and elimination of image responses in the receive mode.

Almost every district has a net frequency where operators congregate at certain times. Such a unit as this would find considerable use in this area. Actually the design need not be limited to one frequency as a little expansion in the design can include a few

*Nasuli Malaybalay Bukidon, Philippines.

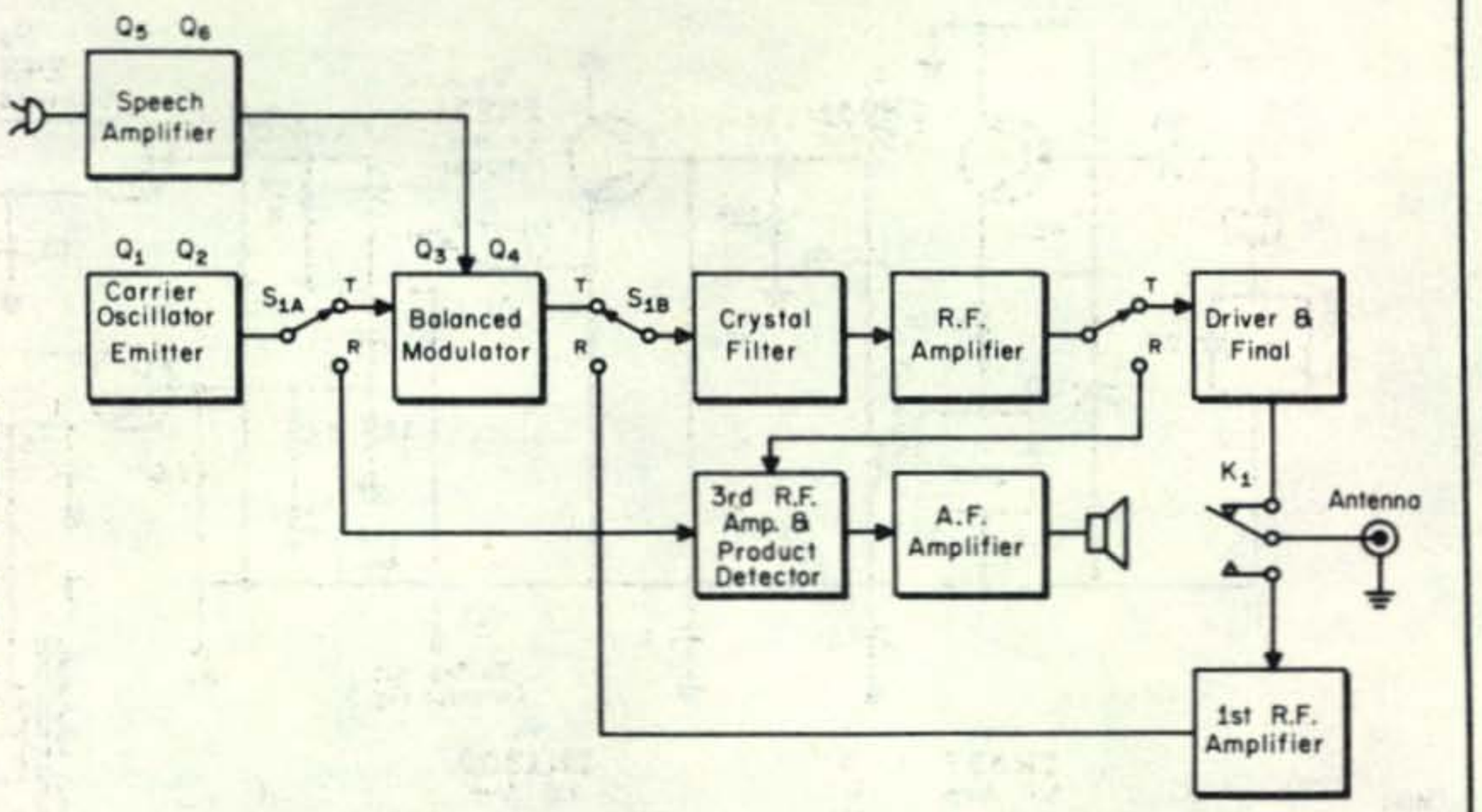


Fig. 1—Block diagram of the 40 meter QRP transceiver. The signal from the carrier oscillator controls the transmitter frequency and also serves for b.f.o. injection in the receiver circuit.

others. The author has an experimental model on his bench in which a television turret tuner contains several sets of filters and carrier oscillators for multiple channel operation.

Even though this unit was designed for a specific frequency, an arrangement was incorporated to adjust the transmit-receive frequency slightly since it was anticipated that there might be a number of stations operating in this manner on a net and it would be a very definite advantage for them all to be on precisely the same frequency. Wide differences in the temperatures at the operating locations might also result in some slight drift in the oscillator frequency, which tendency could also be corrected by the circuitry employed.

Our circuit is first presented in block diagram in fig. 1. A four pole two position rotary switch is employed to switch the carrier oscillator and the crystal filter from RECEIVE to TRANSMIT. In the receive mode of operation, the transmitter carrier oscillator supplies the b.f.o. injection into the product detector. While all low powered stages are transistorized, it was considered that we could not produce an output signal in the 100 watt class with transistors except at considerable expense so we selected the Layfayette HA-250 mobile linear amplifier for our output stage and modified it to suit this application.[1] Since this Layfayette unit has a 350 volt supply incorporated, it was handy and convenient to use this voltage for our driver stages which otherwise might have been transistorized.

[1] Walrod, L., "The Lafayette HA-250 On 40 Meters," *CQ*, Dec. 1966, p. 38.

Circuitry

We tried a number of v.x.o. circuits but eventually decided on the one shown in fig. 2 because it proved to be the most stable of those we worked with. Almost any crystal, if its activity is high or low, will oscillate well in this circuit. Only a very slight frequency change results from a 25% change in the collector voltage nor is there undue sensitivity to temperature changes. Since, in our application, we were interested in a frequency adjustment of only a hundred cycles or so we made no attempt to explore the possibilities of this circuit for use in a wide range v.x.o. From initial observations made here, though, we consider it would be useful for that purpose.

In selecting a crystal for use in this circuit (shown in fig. 2), one with a natural series resonance of 500 to 1000 cycles above the proposed carrier frequency should be employed as the range of frequency adjustment available is all below the normal crystal frequency. One surprising thing about this circuit is that a good crystal will oscillate nicely with only half volt of supply voltage. This makes possible a wide range of output voltages which come in handy when the amount of drive to the balanced modulator is being set. Adjust the value of R_1 for 0.35 volts measured at point "A" in the circuit.

The construction of coil L_1 is a bit unusual because the range of travel of the core is important. The limits of the travel of the lower end of the slug should be marked on the coil form and the winding kept within 1/16" of these marks. Wind a double layer, close spaced, within the limits

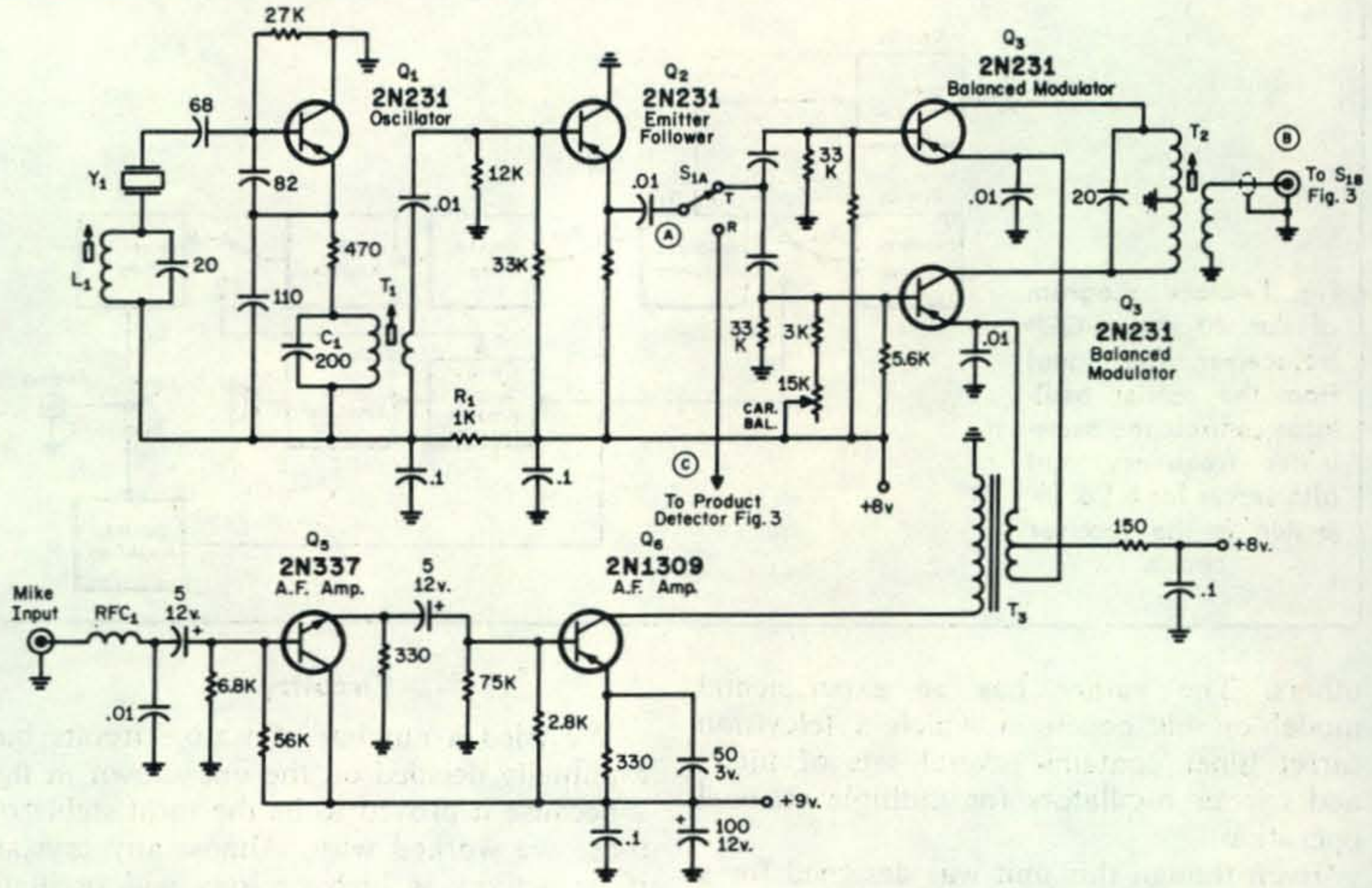


Fig. 2—Circuit of the carrier oscillator, balanced modulator and speech amplifier. All capacitors whose values are less than one are rated in mfd. Capacitors whose values are greater than one are rated in mmf except for electrolytics; these are indicated by polarity markings and are rated in mf. The 0.1 and 0.01 mf capacitors are 50 volt ceramics and all others are silver micas. All resistors are ½ watt.

C_1—200 mmf. Value may have to be adjusted in order to resonate T_1.

L_1—40 t #35 e. wire on a 5/16" ceramic slug tuned form, closewound in 2 layers. (See text.)

R_1—Approximately 1K, value to be adjusted. See text.

RFC_1—1 to 10 mh. Optional; to prevent feedback.

S_1—4 p.d.t. rotary switch. See text under "Component Modification."

T_1—9 t of #40 e. and 2t #40 e. wound on a 455 kc i.f. transformer form as explained in the text.

T_2—12t #35 e. bifilar wound (total of 24 t on primary) and 10 t #35 e. on the cold end of primary wound on a 3/8" dia. slug tuned form.

T_3—Transistor interstage a.f. transformer, 10K to 2K. Merit A-2781 or equiv.

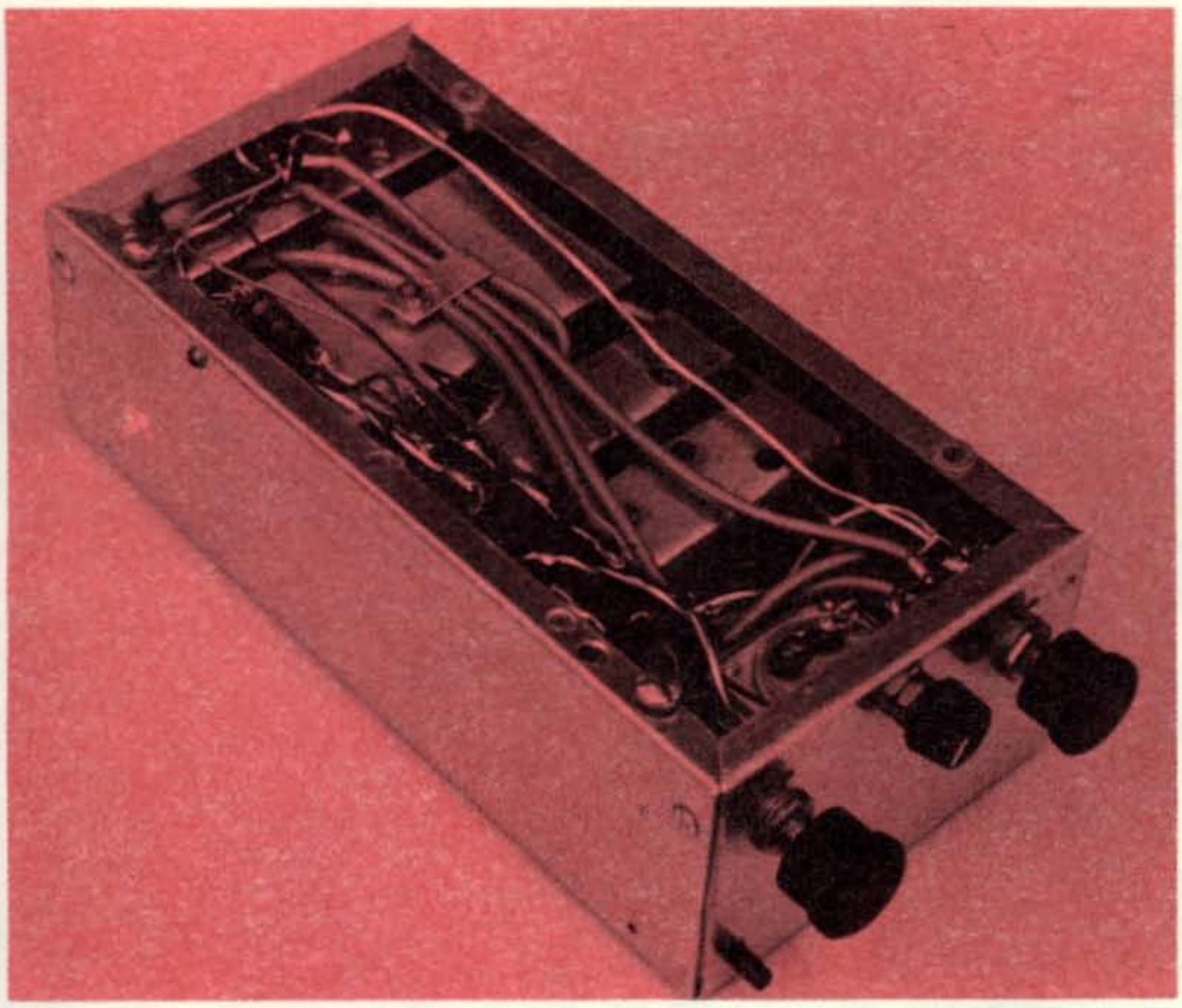
Y_1—Set for 1 kc above the desired operating frequency in the 40 meter phone band.

indicated and *dope the coil well.*

Balanced Modulator and A.F. Circuits

The modulator and speech amplifier circuits are shown in fig. 2. After some experience with diode balanced modulators we found them a bit critical to adjust and subject to some instability due to temperature variations. This circuit overcomes these difficulties to a considerable degree. It is important not to overdrive this balanced modulator since doing so will actually decrease the output on the wanted frequencies as well as degrade the carrier suppression. For the particular transistors used, approximately 0.35 volt of drive proved to be sufficient. Without taking any particular care with transistor matching or output transformer design it was possible to secure about 20 db of carrier suppression with this circuit. We believe that careful attention to the above noted details would produce even better results. For a low powered rig such as this, though, 20 db of suppression in the balanced modulator plus another 20 db of carrier rejection resulting from the crystal filter action was considered to be adequate.

Since we had chosen to use a low impedance dynamic microphone, it proved to be an advantage to use a n.p.n. transistor



View of the control head shows the five smaller chassis containing the carrier oscillator and emitter follower, balanced modulator and transmitter audio system, crystal filter, r.f. amplifiers and product detector and the receiver first r.f. amplifier. The controls are U.S.B.-L.S.B., A.F. volume, T-R switch. The shaft protruding in the lower left hand corner is used to adjust L_1 in the v.x.o. circuit.

for the audio input, Q_5. This was due to the fact that a p.n.p. used in this type of circuit with negative ground is forced to draw a very considerable current while the 5 mf capacitor feeding its base is charging up at the time the supply voltage is first turned on. Almost any audio transistors with 12 volt ratings could have been used here. We selected the 2N1309 for the audio output because it has excellent gain.

Even though the balanced modulator transistors were bypassed for r.f. close to their emitters, we still considered it to be good practice to mount the audio output transformer as close as we could to the balanced modulator. With a view to increasing the stability of the circuits, we did not bypass the 150 ohm emitter resistor for audio frequencies.

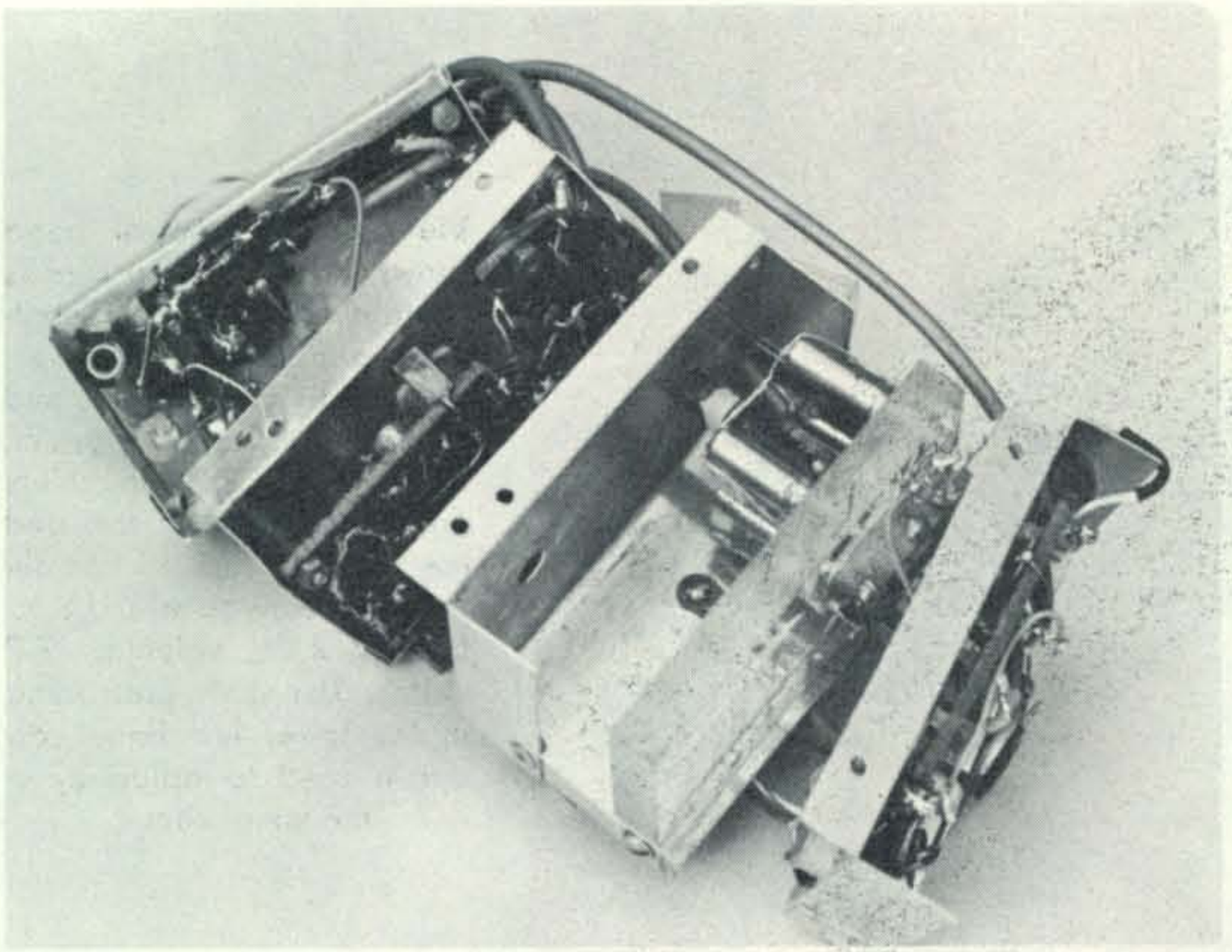
Crystal Filter

We do not propose to cover all of the possibilities of crystal filter design in this article since this subject has been fairly well presented in other amateur publications. A few ideas might help, though. Figure 3 shows the simplest bandpass crystal filter that has come to our attention (Z_1, Z_2). We do not believe it is possible to secure a flat bandpass characteristic with a simple filter like this but, nevertheless, on-the-air tests have proven that the irregularities of the bandpass are not noticeable to the average listener. The crystal filter could be improved upon by adding double tuned input and output transformers with the filter input and output tapped down on the transformer windings to a point about 25% from the cold end of each coil.

The bi-filar coils between the filter elements should be wound as symetrically as possible. The coupling between the two halves of the bi-filar coils should be as great as possible therefore the number of turns should be adjusted so that the slug is fairly well in the coil when properly adjusted. Some cut and try is in order here while inspecting the flatness of the bandpass, the out-of-bandpass rejection and the shape factor of the filter response. A small torroidal core might be used to advantage here but it is considerably more difficult to wind than the standard slug tuned coil form.

In selecting crystals for the filter, the set closest to the carrier should be 700 to 800 cycles removed from the carrier while the other set should be about 1500 cycles farther away. The filter crystals should be checked for frequency in the carrier oscillator circuit *but with the slug tuned v.x.o. coil shorted out* (L_1). Do not check them in an ordinary oscillator circuit or you will end up a couple hundred cycles or more out.

We heartily recommend trying FT-243 type crystals first as they are a little easier to manage than the hermetically sealed units. Crystals in HC-6U type holders can very easily be adjusted to precise frequency when



View of the partially assembled chassis that make up the control head. Note the crystal filter in the foreground with a set of HC-6-U crystals mounted on a 5/16" lucite strip along with the necessary components.

the case is removed but keeping them there while applying the heat necessary to resolder the case cover back on is another matter altogether. It can be done, though, with considerable diligence. If HC-6U crystals are tested in the v.x.o. circuit do not short out L_1; merely retract the slug from the coil, fully.

A four crystal filter is not the only possibility. A six or eight crystal filter can be constructed which does not need to take a back seat in any company.

When checking out your completed filter, a 50 mmf trimmer temporarily connected across the bi-filar coil will help you to tell whether or not you need more turns on the inductance. We employed a combination of upper and lower sideband filters in this unit. The outputs of each were left connected to the following transistor at all times but the inputs were switched. The input of the filter not being used was shunted to ground through a 50 ohm resistor for the purpose of dissipating some of the unwanted sideband component which might be passed through the filter in use.

Any constructor who does not have access to adequate testing equipment to fully evaluate the crystal filter characteristics could come up with a tentative adjustment of the filter by feeding an audio signal of about 2 kc into the completed transmitter and adjusting the core of the bi-filar filter coil for greatest output indication on the HA-250 linear (using a dummy load).

R.F. Amplifiers

The transistorized r.f. amplifier following the crystal filter does not need any special attention. It might be noted, though, that only one stage of amplification is used here in the transmit mode while two stages followed by a product detector are used in the receive mode. We used the highest gain (at 7 mc) transistors we could obtain over here which happened to be OC170 tetrode units. No instability was encountered. Transistor i.f. transformers (455 kc) were rewound for use in this circuit as well as other circuits in the set because they were the smallest shielded tunable coil forms we could secure. It might be good insurance for any constructor to wind a 3 turn neutralizing coil on the cold end of each of these r.f. amplifier transformers just in case instability is experienced in these stages. It is a great deal easier to do this while winding the transformer than to have to remove it later for that purpose.

Transmitter Driver Stages

The 12BA6-12AQ5 driver combination was used because it was small, inexpensive, easy to construct and because it worked fine. An r.f. input of one quarter volt produced an output of over forty volts at the output link tap. The circuit is shown in fig. 4. Figure 5 shows a circuit that may be used to replace V_1, the 12BA6. The second driver stage, the 12AQ5, is difficult to transistorize satisfactorily unless a supply voltage of more than 12 volts is available. Also, the price

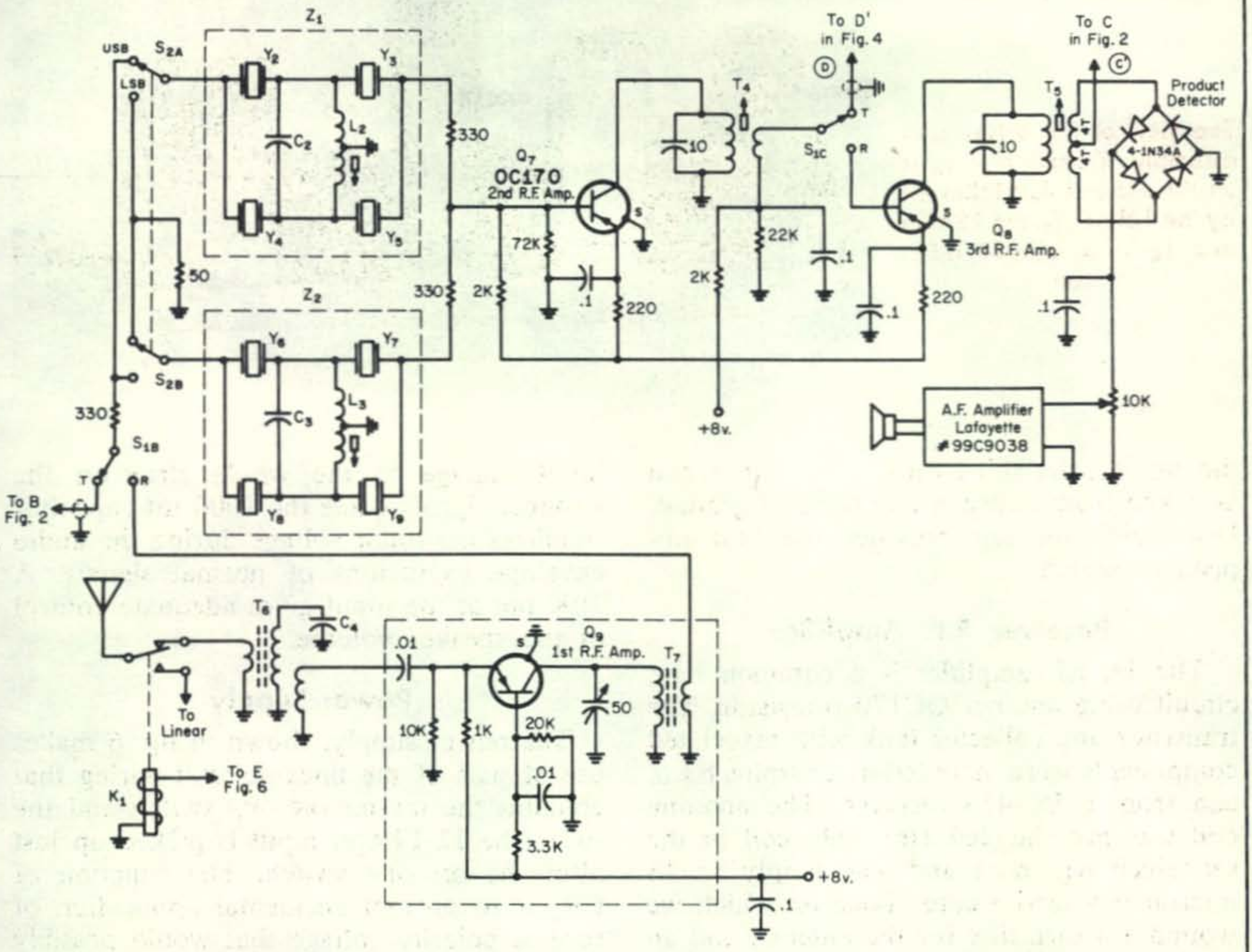


Fig. 3—Circuit of the sideband filters, the r.f. amplifiers and the product detector section of the 40 meter QRP rig. All capacitors with values less than one are rated in mf. All resistors are ½ watt. Relay K_1 is the antenna relay in the linear.

C_2, C_3—approximately 15 mmf. Required value may differ for various crystals. Set value with a 50 mmf trimmer as explained in text.

C_4—Approximately 27 mmf. See text.

L_2, L_3—30 t #35 e., bifilar wound (60t. total) on a 5/16" diam. slug tuned ceramic form.

T_4—30t. pri, 4t sec. #40 e. rewound on a 455 kc transistor type i.f. transformer.

T_5—28t. pri., 4 bifilar turns sec. (8t, total) #40 e. rewound on a 455 kc transistor type i.f. transformer.

T_6—18 microh. r.f. ferrite core choke with a 4t. input and 8t output winding, #26 e., wound over lower end of choke.

T_7—22t #35 e. wire close wound on a 3/8" dia. form with ferrite core. Secondary, 8t #35 e. on cold end of main winding.

Y_2, Y_3—0.3kc below Y_1.

Y_4, Y_5—1.2kc above Y_1.

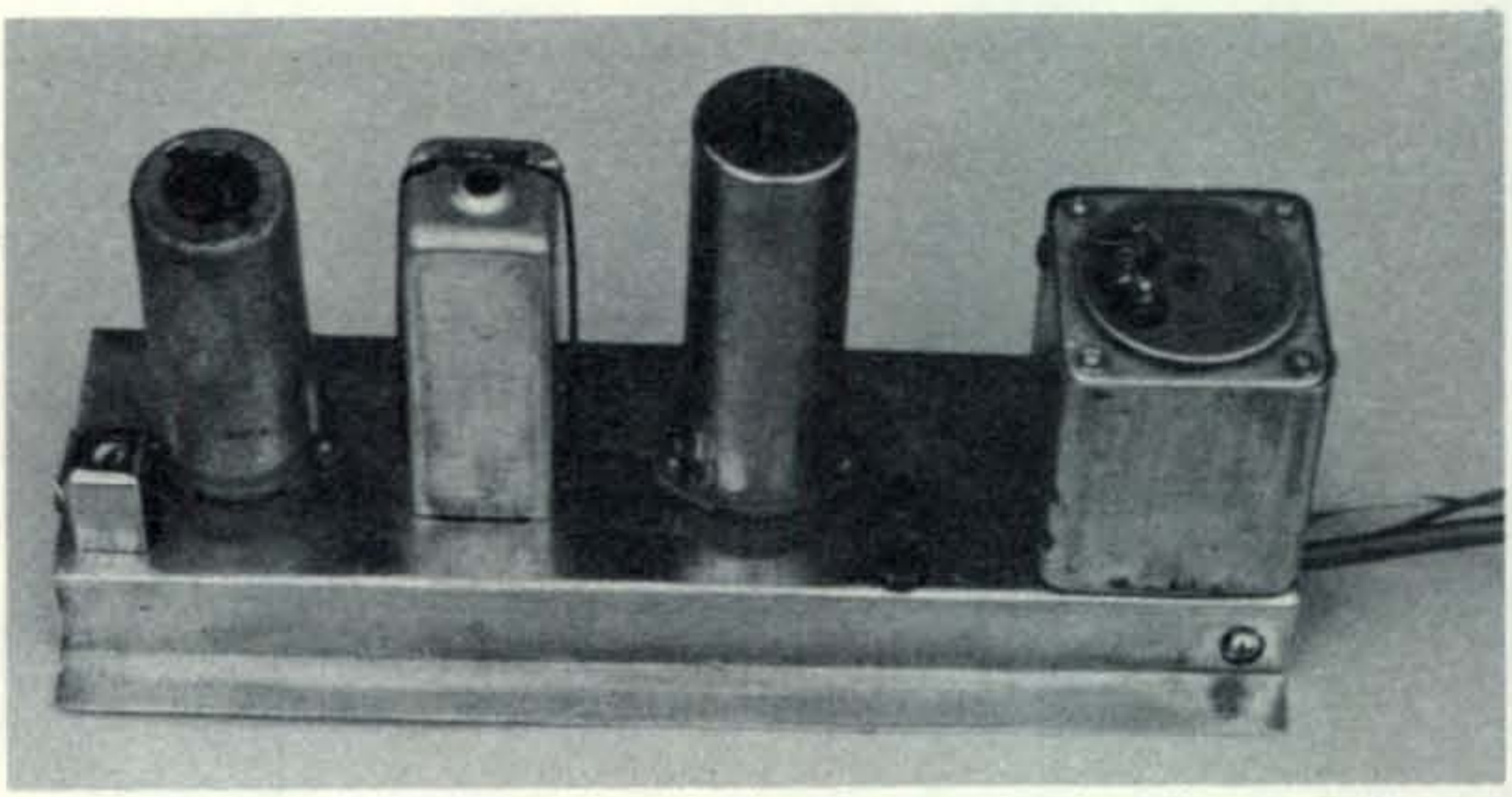
Y_6, Y_7—1.7 kc below Y_1.

Y_8, Y_9—3.2 kc below Y_1.

of suitable transistors for this stage begin at about five dollars.

Coil L_4 shown in fig. 4 is wound on a 3/8" diameter 3/4" long ferrite slug form (not slug tuned) found in a BC-454 b.f.o. can. Winding of the coil L_4 on this form is done as follows: Cover the slug form with a layer of plastic insulating tape. Wind 5 turns of #26 e. on the lower end, close spaced, tapping at the first, second and third turns. Bring out the fifth turn with a few inches to spare as the tap will be grounded. Connect a length of #35 e. wire at the base of the fifth turn and add 18 more turns in the same direction as the first 5 turns, all close spaced. Enclose the coil in a shield of at least 1½" × 1½".

The first part of the coil, 5 turns, forms the low impedance secondary. The neutralization capacitor, C_5, can be connected to



Top view of the driver sub-assembly. Transformer T_8 is on the extreme left followed by the 12BA6, T_9, the 12AQ5 and L_4 in a BC-454 b.f.o. can.

the tap on the third turn. The output can be taken from between any tap and ground. Use whichever tap provides the best impedance match.

Receiver R.F. Amplifier

The 1st r.f. amplifier is a common base circuit using another OC170 transistor. The transistor and collector tank with associated components were mounted in a surplus b.f.o. can from a BC-454 receiver. The antenna coil was not shielded (the only coil in the set which was not) and was simply an 18 microhenry ferrite core choke on which we wound a 4 turn link for the antenna and an 8 turn link for output to the Q_9 emitter. After installing this choke in position it was resonated to frequency with a small 3-50 mmf trimmer which was then replaced by a fixed capacitor of proper value.

No a.v.c. as such was included in the receiver circuitry but it could be added by lifting the 10K emitter resistor from ground in this r.f. amplifier circuit and feeding in a voltage from an audio derived a.g.c. system.

Receiver Audio

We do not believe anyone could do any better than to use the Layfayette 1 watt 3 stage audio strip for any application such as this (catalogue 670, page 242, stock #99C9038, $6.95). We used an external 5" speaker mounted in an aluminum case in which was also mounted the Layfayette audio strip. The dropping resistor from the 12 volt supply to the 9 volts required by the audio strip in conjunction with a 1000 mf electrolytic at the strip input provides a sort of a.v.c. which doesn't work too badly. It prevents speaker blasting on strong local signals while still allowing normal reception on average signals. The extra current drawn by the Class B output stage reduces the input voltage to the whole strip on the stronger signals while the 1000 mf capacitor stabilizes the input voltage during the audio envelope excursions of normal signals. A 10K pot at the input gives adequate control of the speaker volume.

Power Supply

The power supply, shown in fig. 6 makes use of part of the linear circuit wiring that contains the master ON OFF switch and the fuse. The 12-14 volt input is picked up just after the ON OFF switch. The function of CR_2 is to prevent accidental application of reverse polarity voltage that would possibly damage the transistors.

The two Zener diodes, CR_3 and CR_4, stabilize the input voltage at 10 volts and CR_5 stabilizes it at 9 volts for the Audio Amplifier and the speech amplifier-modulator section. The exact value of the series resistor (shown as 75 ohms, 1 watt) may have to be adjusted so that CR_5 draws 3 to 5 ma with a fully charged battery.

General Information

We have had a number of our engineer friends tell us that they had difficulty in believing that 3 stages of t.r.f. would give us enough signal amplification. The sensitivity is adequate. In fact the stages can be stagger tuned some 200 kc or so with still adequate sensitivity while using various crystal filters. A.m. signals which are on frequency can be received with excellent audio quality and even though removed by as much as a couple hundred cycles can still be understood easily due to the fact that the crystal filter attenuates a considerable portion of their carriers.

We selected a negative ground arrangement for our circuitry due to the fact that this made it compatible with a number of

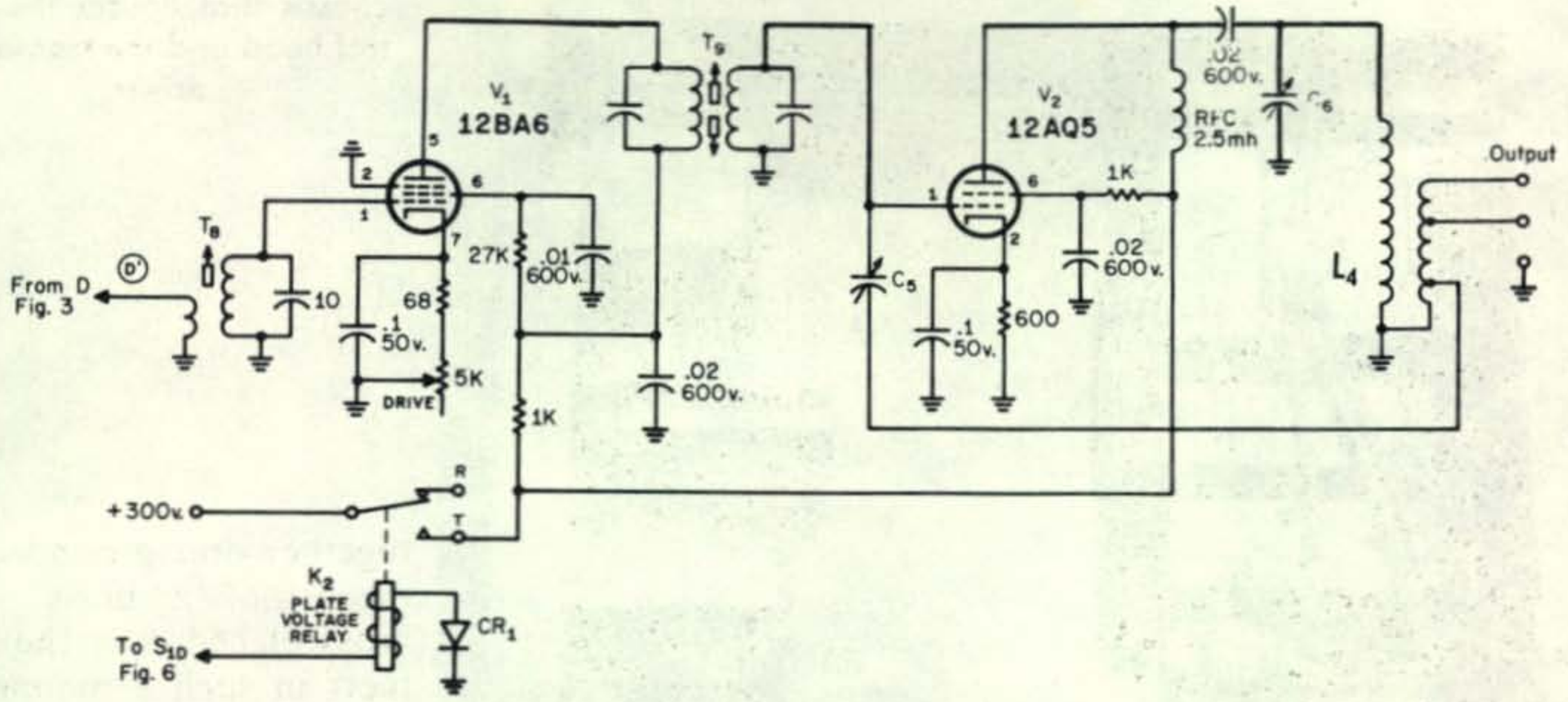


Fig. 4—Circuit of the driver amplifier section of the 40 meter QRP s.s.b. transceiver. All capacitors less than one in value are in mf; capacitors greater than one in value are in mmf. All resistors are 1 watt. The relay shown is part of the linear amplifier. Filament voltage for V_1 and V_2 is obtained from the 12-14 volt feed of the power supply in fig. 6.

C_5—1-7 mmf ceramic trimmer, neutralizing .

C_6—3-50 mmf air trimmer.

CR_1—750 ma, 600 p.i.v.

L_4—See text.

T_8—Rewound 455 kc transistor type i.f. transformer. 4t. pri, 30t. secondary #40 e. wire.

T_9—Rewound ¾" x ¾" tube type 455 kc i.f. transformer. Pri and sec 24t #40 e., windings ⅜" apart. Original capacitors are used.

accessories we considered using such as an audio T notch filter, audio compression preamplifier, and of course the Layfayette linear. P.n.p. transistors work quite nicely in this arrangement due to the fact that the cold end of any collector coil can be run right to ground and in the case of emitter followers the collector is grounded directly.

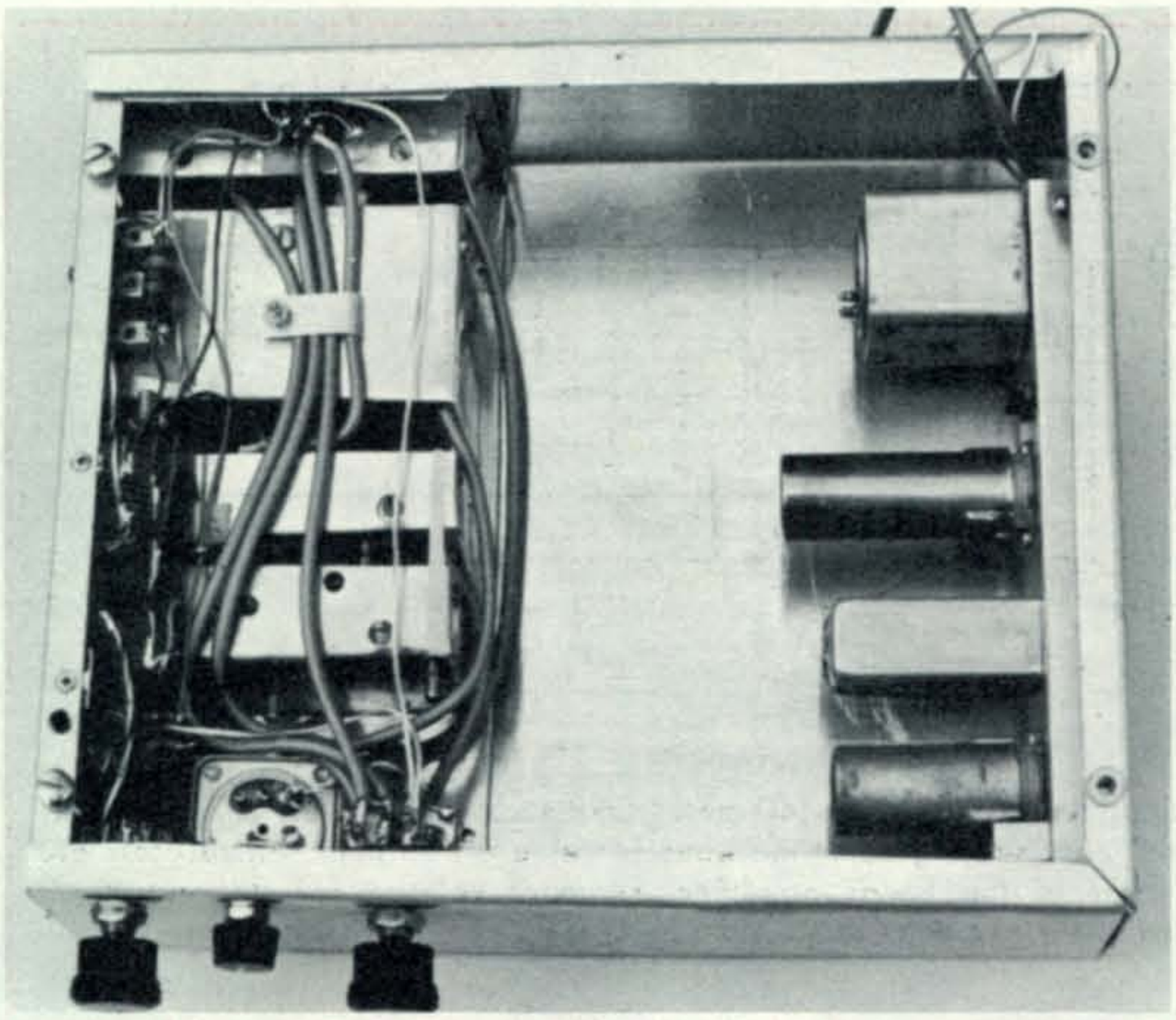
Almost any p.n.f. r.f. transistors can be used in most of these circuits; good units can often be found in surplus stores. We found a number of good ones in a store in Pasadena, California a year ago which included some 2N231 and some 2N1301 which work nicely.

The three r.f. amplifier stages, though, should employ better than average units. Possibly an SK3006 would serve here. The Layfayette 19C4211, 30 mc transistor at 59 cents each showed fair gain at our 7 mc frequency. The OC170 tetrodes were the best we could obtain in Manila stores. (We suspect these transistors or something like them could be found in the States, however, the author would be willing to mail any interested party a limited quantity, not more than 5, postpaid to any U.S. address for $1.25 each for a period of a year following the appearance of this article. Mail service is a bit slow at this distance.

Construction

It will be noticed from the photographs that a novel type of construction was employed in this project. In the control head, five small aluminum chassis house separate units as follows; carrier oscillator and emitter follower, balanced modulator and transmitter audio system, crystal filter, intermediate r.f. amplifiers and product detector, and receiver 1st r.f. amplifier (in shield can).

Transistors were mounted by drilling holes in the aluminum chassis (tight fit) and forcing the transistors part way into the holes. Where needed a small terminal strip was bolted to the bottom of each small chassis for input, output and d.c. supply. These units were all wired up to the switches and, with the switches, can all be easily removed from the main chassis for any necessary inspection or service work. In dividing the control head up in this manner we had in mind the eventual utilization of integrated circuits with about the same component division and with consequent reduction of the overall size of the complete unit.



Interior view of the bottom chassis that houses the control head and the transmitter driver.

The control head was built as a complete unit as shown in the photographs due to the fact that we planned to use it in a light aircraft mounted in the instrument panel with connecting wiring to the power supply and linear amplifiers in the baggage compartment of the plane. The same head is also being used in several fixed units mounted in one end of a 2½" × 8" × 10" chassis with the drivers mounted in the other end of the same chassis, the whole being mounted under the Layfayette linear

Component Modification

The TRANSMIT-RECEIVE switch, S_1, was actually a 4 pole, 3 position unit but the third position terminals were all connected together and grounded by means of a brass sheet cross placed over the contacts in such a manner as to separate each circuit entering and leaving the switch. In addition to the shielding effect resulting from this arrangement this made a fine place to solder the shielded from each cable.

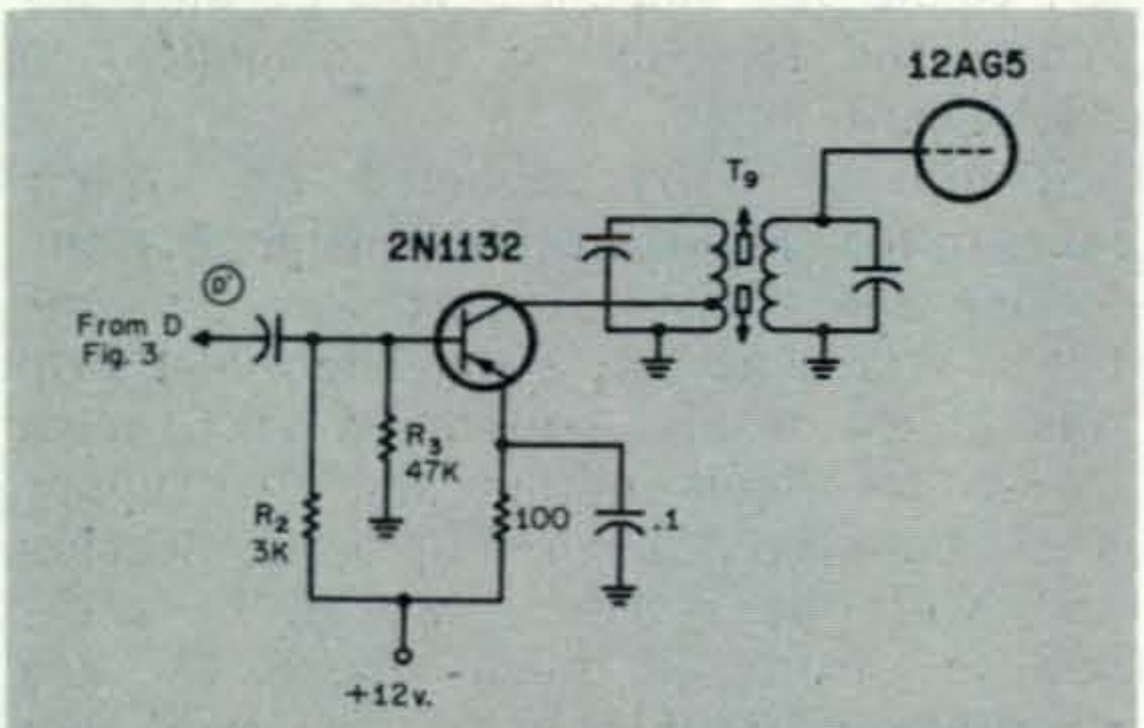


Fig. 5—Circuit of a transistorized driver that can be used to replace V_1 in fig. 4. The value of R_2 or R_3 should be adjusted for a 3 ma collector current. Transformer T_8 is not needed and T_9 is wound as explained in fig. 4 but is tapped twelve turns up from ground on the primary.

The UPPER-LOWER SIDEBAND switch was a unit similar to the above but, in this case with the middle set of contacts and all extra contacts grounded. Only two of the poles were used and these were selected at opposite sides of the switch for maximum separation. All cables to the switches were shielded except those carrying only d.c. voltages.

There are several kinds of transistor i.f. transformers on the market. Some are easy to rewind and some are difficult. One kind has a ferrite cup screwed into a plastic sleeve both of which come off when the case is removed. This type is easiest to rewind. Reconnecting the wires to the pins is not easy at first, but it will help to hold the wire down to the base with a pair of needle nose tweezers while winding a couple of turns around the pin before soldering. After soldering, the wire must be dressed to clear the tuning slug. We had considerable trouble connecting two wires to the small center tap pin in the case of the bi-filar coils until we came upon the idea of drilling a small hole just behind the pin and running the wires through it, then soldering to the pin down below the base. There is no need to worry about removing the insulation from these small wires because they are treated with a coating which melts when in contact with a soldering iron. The quality of the ferrite in the cores of these transformers seems to be adequate for frequencies up to 7 mc.

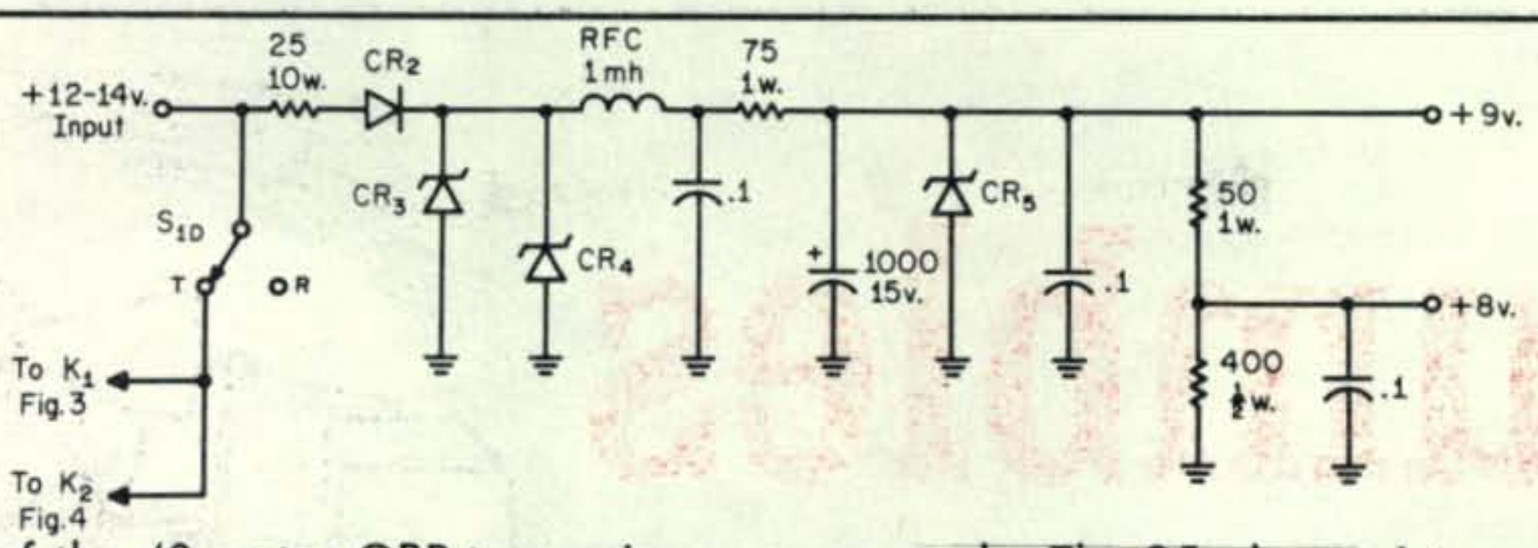


Fig. 6—Circuit of the 40 meter QRP transceiver power supply. The 25 ohm resistor and Zener diodes CR_3 and CR_4 are not needed unless a mobile installation is made. If used they should be mounted externally to the control head with adequate heat sinks. The 75 ohm resistor value may require adjustment so that CR_5 draws 3 or 4 ma with the transmitter operating. Relay K_2 powers the d.c to d.c. converter in the linear from which the 300 v.d.c. is obtained.

CR_2—750 ma, 600 p.i.v.

CR_3, CR_4—12 volt 10 watt Zener diodes.

CR_5—9 volt 1 watt Zener diode.

Suggestions

It is important, when constructing any equipment of this nature, to resonate each circuit as you procede with the construction. The grid dip meter used to be the standard instrument for this purpose but it has its limitations and is slow to use. A much more satisfactory setup is a standard signal generator used in conjunction with a v.t.v.m. equipped with an r.f. probe. By wrapping a couple turns around the coil and feeding it from the signal generator, you will find that your v.t.v.m. will very likely show some indication as soon as you connect it to the circuit. You will be able to tell immediately when you start swinging the generator frequency whether or not you are heading in the right direction. The generator set at 50% of the resonant circuit frequency will produce a real healthy indication too though, so this possibility should be kept in mind.

In some applications where the adjustment is quite critical, it might pay to insert a small capacity in series with the probe, say 2 or 3 mmf, since connecting the probe to the circuit adds some capacity to the overall combination. Wherever possible it will pay to check these circuits in conjunction with their related components. For instance, a low impedance winding connected to the base of a following transistor will operate somewhat like a shorted turn around the coil and affect the resonant frequency of the combination while a transistor collector connected to a higher impedance tap will reflect some capacity into the circuit. Keep your peak indications under a volt or two or you will find yourself buying some new transistors.

Microphones

The rig was designed for use with low impedance microphones due to the fact that in some of our applications we planned to run the mike cable a considerable distance. You can get fair results with some sacrifice of audio quality with a Polypaks 100 ohm speaker-microphone ($1.00). A number of others were tried including a surplus #19 Army mike set, a sound powered telephone mike, some $10.00 dynamics and a broadcast quality mike. Although the more expensive mikes sounded better there was little improvement in communicating ability compared to the cheaper mikes. With the circuit used, high impedance mikes produced considerably less output.

Results

If the circuits are all resonated during the construction, very little touching up is needed when the assembly is completed. The carrier oscillator, after two or three touch ups in the first couple days has not needed readjustment. We have had two of these units in continual service for a number of months with complete satisfaction. Inexperienced personnel can manage them fine. The daytime signals from these units are consistent up to a thousand miles and on the shorter hops of up to two hundred miles the signals come in like a ton of bricks. So far our reliability factor has been 100%.

Cost

The final amplifier costs just under eighty dollars. By using surplus transistors and winding your own r.f. transformers the bal-

[*Continued on page 120*]

Grumbles

by Sam

EVER pay attention to the current hubcap scene? I do.

While strolling down the street I have taken to noticing the names on the hubcaps and wheelcovers on today's cars—it's a terrifying and frightening experience, full of savage fury. *Wildcat! Fury! Mustang! Thunderbird! Firebird! Rocket! Jaguar! Cobra! Barracuda! Dart! Shark! Cougar! Spyder! Tempest! Charger! Falcon! Comet!* —where, oh where, are those sweet *Model A's* and stately *Imperials,* romantic *Clippers,* the twittering *Skylarks,* stiff-upper-lipped *Valiants?*

I'll tell you where they are, Charlie—they've either seen the handwriting on the wall or have shuffled off the mortal coil (or ignition coil, as it were) altogether. The folks in Detroit have finally realized that there is only one way to sell to the American public today—you've got to blow their minds out with some kind of exotic and hairy name and then jam the sales pitch down their gullets until they yell "uncle" and buy.

I tell you this for a reason.

We're always hearing talk about the ham radio industry and how it isn't as good as it was a number of years ago—seems that a while back sales were much brisker. Then I look through the radio supply house catalogs and what do I see? *The Frammis IV, The R&B Model 44–107A, The Schlockmeister Senior.*

The message here must be obvious. Our industry is still peddling *Skylarks* in a sky full of shrieking *Falcons!* Ham radio needs to jump feet first into the mainstream of hard-core commercialism.

The *Frammis IV* would undoubtedly be a sellout if retitled the *Band Blaster,* the *R&B Model 44–107A* could knock 'em dead as the *Bone Crusher,* then we would change the *Schlockmeister Senior* to something like the *Panther-Fiend Mark II.*

What is also needed here is a fantastic "socko" (as they say on Madison Avenue) saturation ad campaign in the mass media —beat the ham radio gear so loudly and wildly that everybody will want a rig, even if they've never heard of ham radio. On every TV channel, over every radio station, on each page of each newspaper, every magazine from the *Police Gazette* to *True Confessions.*

And when it comes to advertising, who are we to argue with success? Frankly, we're already so far behind the times that we haven't got time to piddle around with motivational studies and trial approaches. *Procter & Gamble* seems to manage to pay their phone bills with their sales approach, the *American Tobacco Company* makes out O.K., and *General Foods* isn't going hungry. Therefore, in the finest traditions of business ethics, I propose that we steal their proven ideas and capitalize on their popularity built up over the years.

For instance, the camera pans in on a ham seated by his rig; he speaks into the mike (firmly): "I don't know how to tell you this, Fred, but you have a bad signal—a BAD signal, what you need is a scope."

Or, we see a kindly looking white haired lady and a mangy looking snotty kid both working around a transmitter:

---

* c/o *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050.

Kindly Lady: "Sonny, how many mils on the plate?"

Wretched Kid: "Mother, PLEASE, I'd rather dip it myself!"

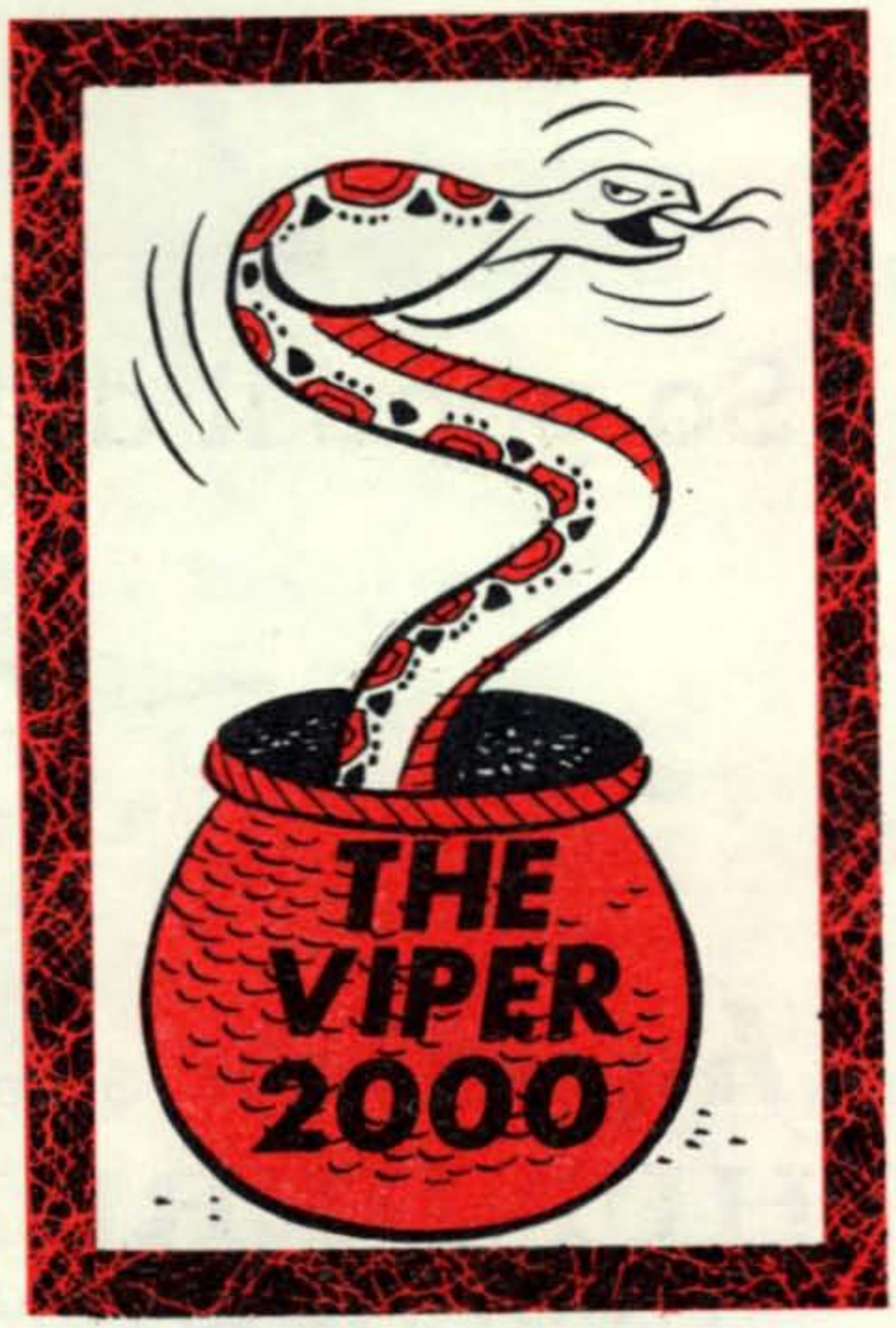
Maybe we show a guy struggling to find something in his workshop. The announcer chimes in: "When your out of Litz, your out of wire."

Now, after we have inundated the public with the "dramatization" bit we then move into our next phase, the singing jingle.

"See the whole damned band
On your 'Spectroscan,'
It's the greatest little gadget in the world!"
Or to borrow from *Kent Cigarettes:*
"Happiness is different things to different people,
Here's what happiness is:
To a human it is S-E-X,
But on 20 it is good D-X;
To a diver it's 40 fathoms deep
To a ham it's another creep.
(chorus)
To Fido it's a bag of bones,
To a ham it's brand new zones;
To a hippie is some L-S-D,
But on 6 it's Sporadic-E.
(chorus)"

Of course, through all of this we are banging home the slogans—on billboards, sides of trucks, in busses, on mens' room walls—the whole catastrophe. We'll swamp 'em under with things like:

How's this for an image builder?



"For the quick, clean, deadly signal . . ."

"*Weston* tests good like a ammeter should."

"Get your electrolytics in the new *Sprague* can."

"Let *Hertz* put you in the driver stage." (Hertz Rent-a-rig)

"Try a tankcoil of load-free *Ameco* filters."

"Read 73, Jolly Green's enjoyment."

"No PEP? Bring home a big bottle of *RCA*-6146."

"Feedback? Get Joe *Miller's* choke book."

"Is this any way to round an *Airdux?* You bet it is!"

"Dirty signal? Here's mud in your *eye, Mack.*"

"Aren't you glad you use *Delco,* don't you wish everybody did?"

That's the general idea. Actually, there are so many worthwhile slogans that the list is almost endless.

One thing bothers me though. If ham radio really makes it big I'm afraid that the killjoys in Washington will find a way to throw a damper on our party. Remember when they started forcing cigarette makers to include this message on all packs of smokes—"Caution: Cigarette smoking may be hazardous to your health."

Are you ready for: "Caution: Condenser smoking may be hazardous to your *Heath.*"

Well, maybe the public isn't ready for ham radio yet. ■

So good it defies comparison...

hy-gain's 3-element THUNDERBIRD TRIBANDER MODEL TH3Mk2

10-15-20

- **Delivers uncompromised full-sized performance on 10, 15 & 20 meters**
- **Takes maximum legal power**
- **Exclusive time-proven Beta Match**

Try as you may, you just won't find another three-element tribander for 10, 15 and 20 meters that will even begin to compare with Hy-Gain's Model TH3Mk2. Some say it's the individually tuned, large diameter Hy-Q traps that make the difference by providing full-sized performance on each band. Others say it's the spacing of the elements on the 14 foot boom. Still others claim it's the exclusive, time-proven Beta Matching System that provides the optimum gain and maximum F/B ratio you get with the Model TH3Mk2. Actually, it's a combination of all of these factors plus rugged heavy gauge, taper-swaged seamless aluminum construction...solid aluminum trap housings using air dielectric capacitor...weather impervious molded high impact cycolac insulators... and Hy-Gain's over-all engineering excellence, that makes the Model TH3Mk2 so good it defies comparison. Get the best in 3-element tribanders—get a Model TH3Mk2.
Model TH3Mk2..... **$114.95** Net

Other hy-gain Thunderbird TRIBANDERS...

Hy-Gain's 6-element DX THUNDERBIRD
Provides the very ultimate in tribander performance. Takes maximum power. 24' boom. Exclusive Hy-Q traps and time-proven Beta Match.
Model TH6DX **$149.50** Net

Hy-Gain's 3-element THUNDERBIRD JUNIOR
Fantastic performance in limited space. Takes 600 watts P.E.P. 12' boom. Exclusive Hy-Q traps and Beta Match. Rotates with heavy duty TV rotator.
Model TH3Jr. . . . . **$74.50** Net

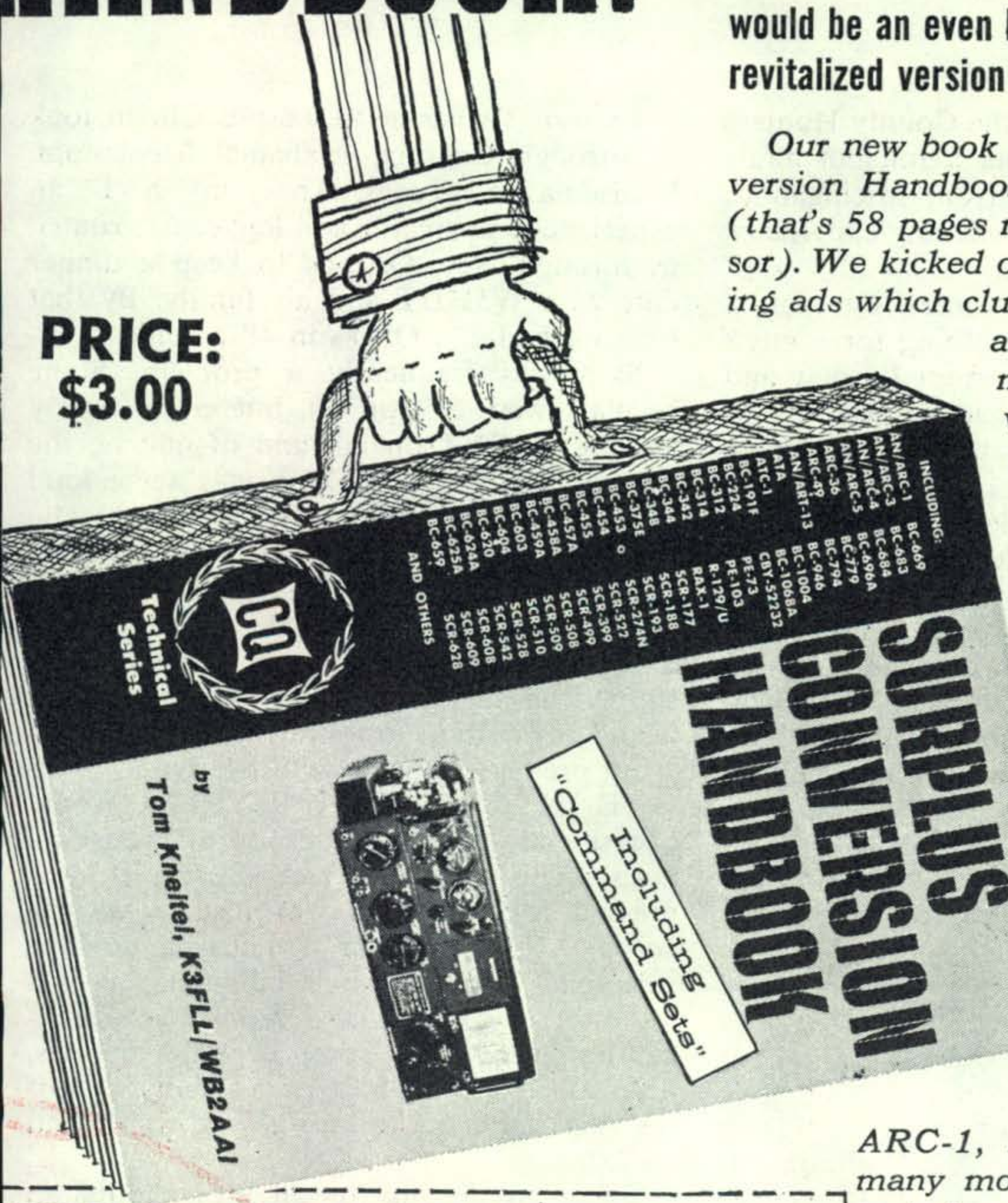
Hy-Gain's 2-element THUNDERBIRD
Installs most anywhere. Delivers outstanding performance. Takes maximum power. 6' boom. Exclusive Hy-Q traps and time-proven Beta Match.
Model TH2Mk2 **$74.50** Net

Available now from your Hy-Gain distributor or write...

hy-gain ELECTRONICS CORPORATION
8402 N.E. Highway 6 • Lincoln, Nebraska 68501

For further information, check number 8, on page 126

OUR MOST POPULAR HANDBOOK!



PRICE: $3.00

The most popular handbook ever to be presented in the CQ Technical Series was the venerable old "Command Sets." Countless signals on the air today are there because of the information contained in "Command Sets," which went on to become the standard reference guide and definitive work on the topic. It went through 5 sellout printings, and when the last book of the final printing was stripped from our stock room we decided that the next printing would be an even bigger, newer, expanded, revitalized version of "Command Sets."

Our new book is called "Surplus Conversion Handbook," it's 192 pages BIG (that's 58 pages more than its predecessor). We kicked out all of the space-taking ads which cluttered up the old book and replaced them with more conversions — conversions of surplus gear other than just "command sets" alone. So the new book contains all of the best command set conversions of the original edition, plus complete conversion details on a whole slew of the most popular military surplus gear available today, including such winners as: SCR-522, ART-13, BC-603, BC-620, BC-624, BC-659, BC-779, ARC-1, ARC-3, ARC-4, and many more. Actually, it covers just about every piece of surplus gear which is worth the time and effort to convert for ham use.

"Surplus Conversion Handbook," Edited by Tom Kneitel, K3FLL/WB2AAI, is a book which every ham will find to be a valuable and interesting addition to the shack. It's available for immediate delivery.

COWAN PUBLISHING CORP., BOOK DIVISION
14 Vanderventer Avenue
Port Washington, L.I., N.Y. 11050

Gentlemen: Enclosed is $_____ for _____ copy(ies) of the brand new SURPLUS CONVERSION HANDBOOK.

Name _____, Call _____

Address _____

City _____ State _____ Zip _____

COUNTY HUNTING ON THE MOVE

BY ALBERT KAHN,* W8DUS

I've flirted with the County Hunters before, but I've never had a full out affair like this. C.w. mobiling from Michigan to Texas and return was an exciting experience for a blasé old DX-chaser.

I suppose just being wanted by such a dedicated group does something for a guy's ego. Over and over, as I entered a new and out-of-the-way county, I had the pleasure of spreading serendipity to a great group of hams.

It all started when Alex, W4OWE, suggested that I take a different route on my Michigan-Tennessee beat. By the time I reached our plant at Newport, Tennessee, I had logged 121 QSO's in 21 counties. Alex was NCS and we used the usual CHN frequency of 7035 or thereabouts. The activity ranged from one QSO in Marion County to 13 in Decatur County, Indiana.

*429 Moccasin Avenue, Buchanan, Michigan 49107

Al Kahn, W8DUS, and his charming XYL, Anne, at the operating position they shared during the 8 state, 127 county trip.

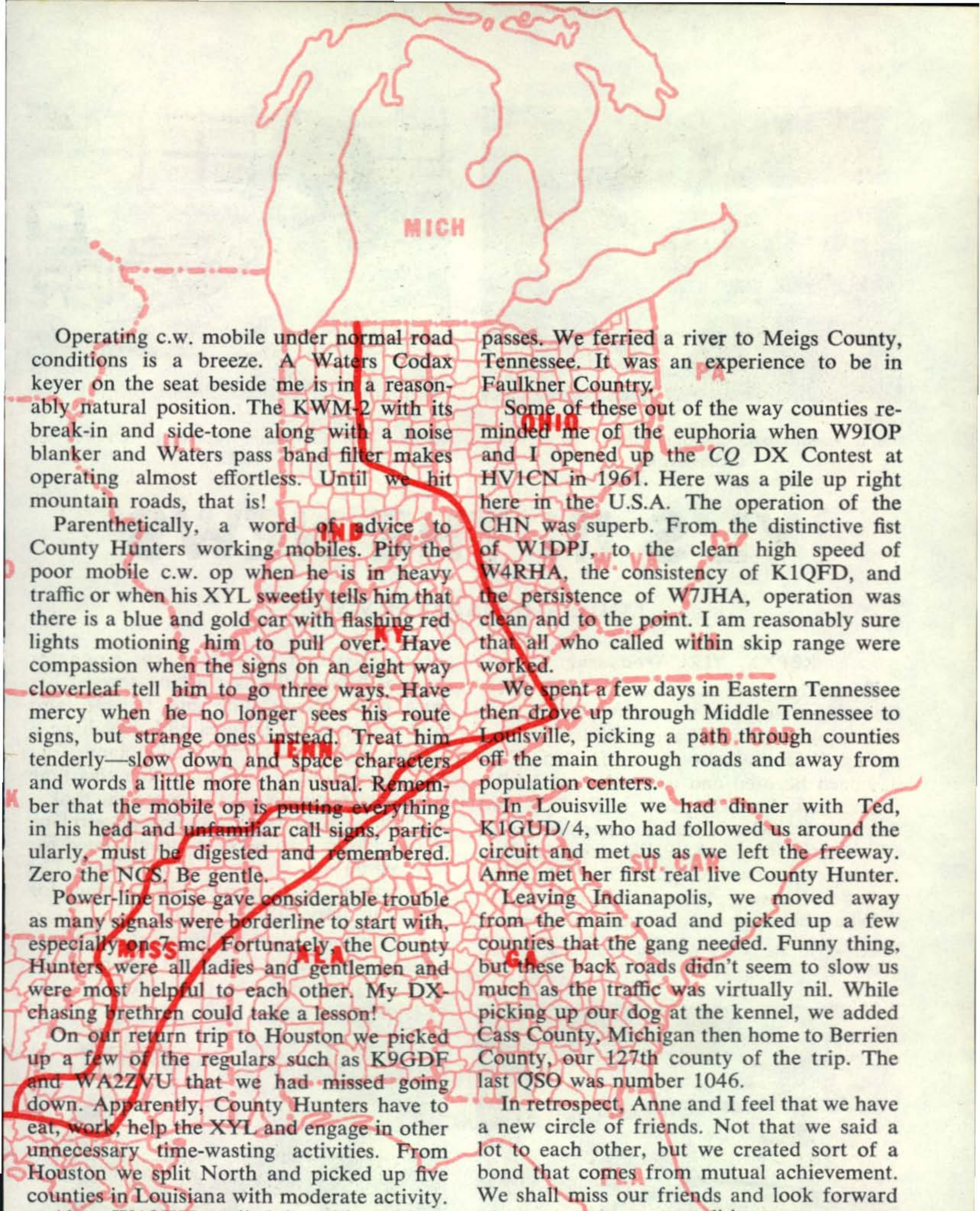
Eastern Tennessee to Corpus Christi took us through Georgia, Alabama, Mississippi, Louisiana and Texas. Anne, my XYL, an experienced navigator and logkeeper, routed us through New Orleans to keep a dinner date with W5HHT and his family. By that time we had 234 QSO's in 48 counties.

Skip was frequently a problem. Some regulars were S-9 on 40, but either barely audible or QRT on 20, and of course, the reverse was true. VE2DCW was never loud but seemed to always be readable. The ubiquitous twins, W8AL and W8AQ, were always on hand. The decision to move to a different band was a tough one. It meant losing some, but picking up others. It was simply the judgment of the NCS what band would favor the most stations.

By pre-arrangement with the NCS, (W4-OWE, K3WWP and W4GYP), I would occasionally take the flock on a free-for-all basis. This was necessary when I was pressed for time and was just crossing a corner of a county or had driven down a side road to get within a boundary. It is a lot more work, but a dozen or so QSO's can be peeled off in seven or eight minutes. Then, too, the NCS is occasionally out of the skip range on 40 and nearly always out on 20.

Being on the air for all these hours on predetermined frequencies has a great advantage. Old friends called in from time to time. W5GEL popped up fixed, later, mobile. The gang from home, W9ABL, W9TO, W9YXX, W8RAE, W8HKT and my son-in-law, WA8TQN called in. Vic, W4KFC, who probably has run out of countries picked up a few counties.

Checking the log at Corpus Christi, we found that we had a total of 439 QSO's in 67 counties and my right hand was tired.



Operating c.w. mobile under normal road conditions is a breeze. A Waters Codax keyer on the seat beside me is in a reasonably natural position. The KWM-2 with its break-in and side-tone along with a noise blanker and Waters pass band filter makes operating almost effortless. Until we hit mountain roads, that is!

Parenthetically, a word of advice to County Hunters working mobiles. Pity the poor mobile c.w. op when he is in heavy traffic or when his XYL sweetly tells him that there is a blue and gold car with flashing red lights motioning him to pull over. Have compassion when the signs on an eight way cloverleaf tell him to go three ways. Have mercy when he no longer sees his route signs, but strange ones instead. Treat him tenderly—slow down and space characters and words a little more than usual. Remember that the mobile op is putting everything in his head and unfamiliar call signs, particularly, must be digested and remembered. Zero the NCS. Be gentle.

Power-line noise gave considerable trouble as many signals were borderline to start with, especially on 7 mc. Fortunately, the County Hunters were all ladies and gentlemen and were most helpful to each other. My DX-chasing brethren could take a lesson!

On our return trip to Houston we picked up a few of the regulars such as K9GDF and WA2ZVU that we had missed going down. Apparently, County Hunters have to eat, work, help the XYL and engage in other unnecessary time-wasting activities. From Houston we split North and picked up five counties in Louisiana with moderate activity.

Alex, W4OWE, called in with a "How about Chocktow County, Mississippi?" It was on our way allright, but the lines on the map were blue instead of red and made a sine wave look straight.

This is an opportunity to thank Alex for an introduction to scenic Mississippi, Alabama and Tennessee—to see backwoods country that travelers in a hurry just don't visit. We drove through snow, mud, narrow passes. We ferried a river to Meigs County, Tennessee. It was an experience to be in Faulkner Country.

Some of these out of the way counties reminded me of the euphoria when W9IOP and I opened up the *CQ* DX Contest at HV1CN in 1961. Here was a pile up right here in the U.S.A. The operation of the CHN was superb. From the distinctive fist of W1DPJ, to the clean high speed of W4RHA, the consistency of K1QFD, and the persistence of W7JHA, operation was clean and to the point. I am reasonably sure that all who called within skip range were worked.

We spent a few days in Eastern Tennessee then drove up through Middle Tennessee to Louisville, picking a path through counties off the main through roads and away from population centers.

In Louisville we had dinner with Ted, K1GUD/4, who had followed us around the circuit and met us as we left the freeway. Anne met her first real live County Hunter.

Leaving Indianapolis, we moved away from the main road and picked up a few counties that the gang needed. Funny thing, but these back roads didn't seem to slow us much as the traffic was virtually nil. While picking up our dog at the kennel, we added Cass County, Michigan then home to Berrien County, our 127th county of the trip. The last QSO was number 1046.

In retrospect, Anne and I feel that we have a new circle of friends. Not that we said a lot to each other, but we created sort of a bond that comes from mutual achievement. We shall miss our friends and look forward to our next county expedition.

In one of our rare moments of conversation on this trip, Anne made a remark that I think is quite profound. "Bet you think we are all nuts" I said. "No" she answered. "How is it different from throwing a basketball through a basket or moving a football down a field. It's just one more form of competition." Them's kind words from an XYL. ■

Idena Vondrakova operates OK2BII at Havirov, Czechoslovakia.

K8PXX, Toni Chapman, receiving treasurer for YLRL.

YL'S IN THE NEWS

LOUISA B. SANDO,* W5RZJ

K8PXX, YLRL Treasurer

Toni Chapman, K8PXX, of Plain City, Ohio is serving her third term as YLRL's disbursing treasurer, having held this office during 1966 and also most of 1965. Toni has been licensed and a member of YLRL since 1959. Her OM Bob is K8PXY and son Bob Jr., who is studying engineering at Ohio State Univ., is K8PXW. Toni and Bob also have a married daughter. Toni's brother-in-law at Tucson, Ariz., is K7KHO.

When Bob and Bob Jr. went to code and theory classes, Toni only "went along for the ride." Now she is working toward her extra class license. Bob and Bob Jr. also hold private pilot licenses and they have a Cessna Skylane 182 for a family plane. Toni still "goes along for the ride" but this time instead of getting a pilot's license she took a pinch-hitter's course in landing an airplane so should her pilot become incapacitated for any reason she could land the plane. The ham gear usually goes along in the plane for operating aeronautical mobile.

Toni belongs to the Columbus ARA and the Buckeye Belles, for which she has been

[*Continued on page 118*]

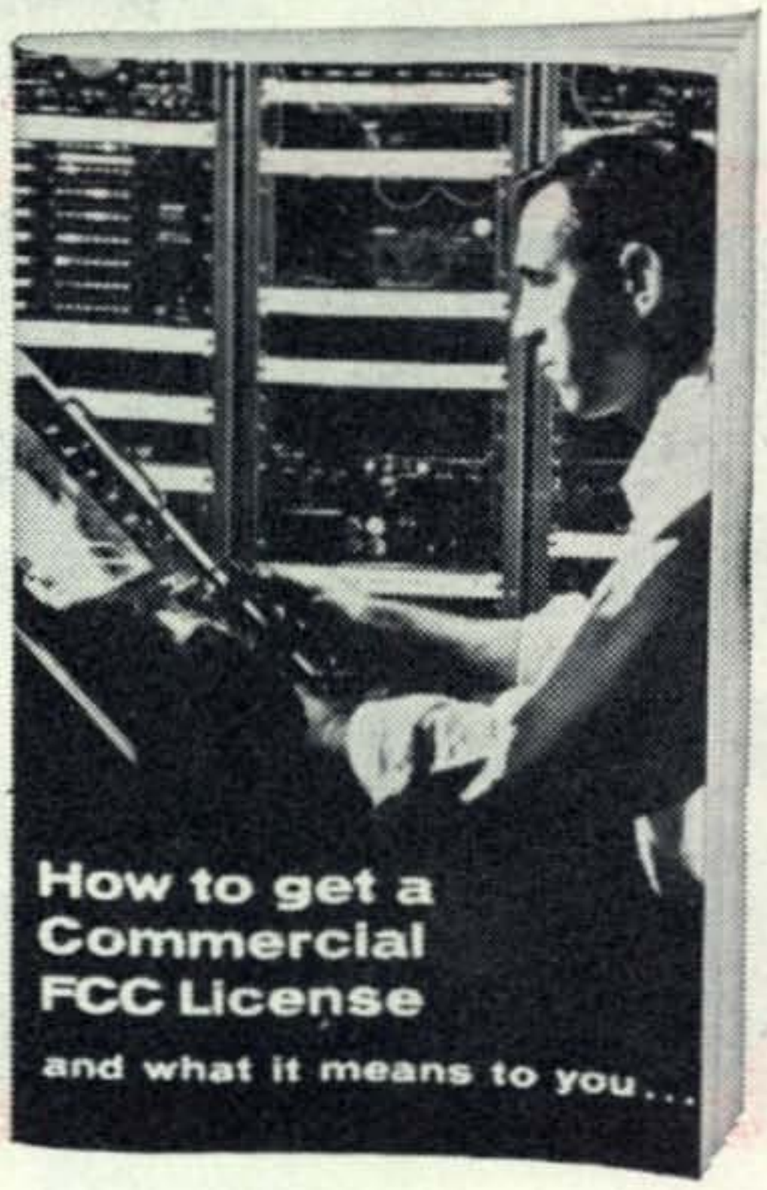
*4417—11th St., N.W., Albuquerque, New Mexico 87107.

Patricia Dyer, WA5NVY, won second place among the YLs in the phone section of the YL-OM Contest (Feb. '67). Pat's OM is Arch, WA5NVZ, and they have been on the air for two years. Besides their ham station they share the activities of three jr. ops, Cathy, 6; Cindy, 5 and Trey, aged 2. Pat is an active member of Navy MARS, loves ragchewing, chasing DX and working contests.

Kayla Bloom, WØHJL, accepts the YLRL Past President's Plaque from Betty Lindsay, WAØEXX, president of the Colorado YLs. Kayla was YLRL president in 1966 and the previous year served as vice president. The plaque is the handiwork of Vi Grossman, W2JZX.

Want a high-pay career in Electronics?

This free book may change your life



It tells how to go about getting the key to job success in the growing electronics boom—a Government FCC License

THERE'S A BIG BOOM IN ELECTRONICS. And YOU can be part of it. You don't need a college education or y previous experience in electronics. The free book own here tells you how.

In the last 15 years, the electronics manufacturing dustry alone has grown from $2.7 billion to $17 billion, d is expected to hit $24 billion by 1970.

Thousands of trained men are urgently needed to help sign, manufacture, inspect, test, install, operate, and vice electronics marvels that are making headlines. you qualify, it means a secure, steady high-pay job h a real future to it.

Maybe you'd like to become a broadcast engineer . . . famous radio disc jockeys and television entertainers the air." Or be your own boss servicing some of the re than a *million* two-way mobile radio systems in is, trucks, trains, etc. Or work alongside famous sci- ists developing and testing such electronics miracles picture-frame TV, desk-top computers, pea-sized ring aids, rocket guidance and control systems.

Regardless of which you choose, the secret of "getting r foot in the door" is getting a Government FCC (Fed- *l* Communications Commission) License. It's govern- nt-certified *proof*, respected by employers everywhere, t you have passed a standard Federal exam on the damentals of electronics — that you're not just an ctronics handyman, but a real "pro." Many jobs ally require it.

Now, because of the importance of getting your FCC ense, Cleveland Institute of Electronics has prepared aluable 24-page book telling you how to go about it.

You will find out why the Commercial FCC License **is** often called the "passport to success." You'll see how and why the Government issues these licenses. You'll learn how you can get your license . . . and qualify for top opportunities in Electronics.

With this book, you will receive a second free book, "How To Succeed In Electronics." It's the catalog of the Cleveland Institute of Electronics . . . first organization to offer an FCC License Warranty. (CIE will refund all of your tuition if you don't pass the FCC exam . . . on your first try . . . after completing the course designed to prepare you for it.) You will learn why better than 9 out of 10 men with CIE training get their FCC Licenses, even though 2 out of 3 without this training fail.

To receive both books without cost or obligation, just mail the coupon below. If coupon has been removed, write to: Cleveland Institute of Electronics, 1776 East 17th Street, Dept. CQ-31. Cleveland, Ohio 44114. Do it now—it may change your whole life.

ENROLL UNDER NEW G.I. BILL

All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, OR are in service now, check box in coupon for G.I. Bill information.

MAIL COUPON FOR 2 FREE BOOKS

CIE Cleveland Institute of Electronics
1776 East 17th Street, Cleveland, Ohio 44114

Please send me, without cost or obligation, your 24-page book, "How To Get A Commercial FCC License," together with your school catalog, "How To Succeed In Electronics," of license-preparation courses.

Name _____
(please print)

Address _____

City _____ State _____ Zip _____

Occupation _____ Age _____

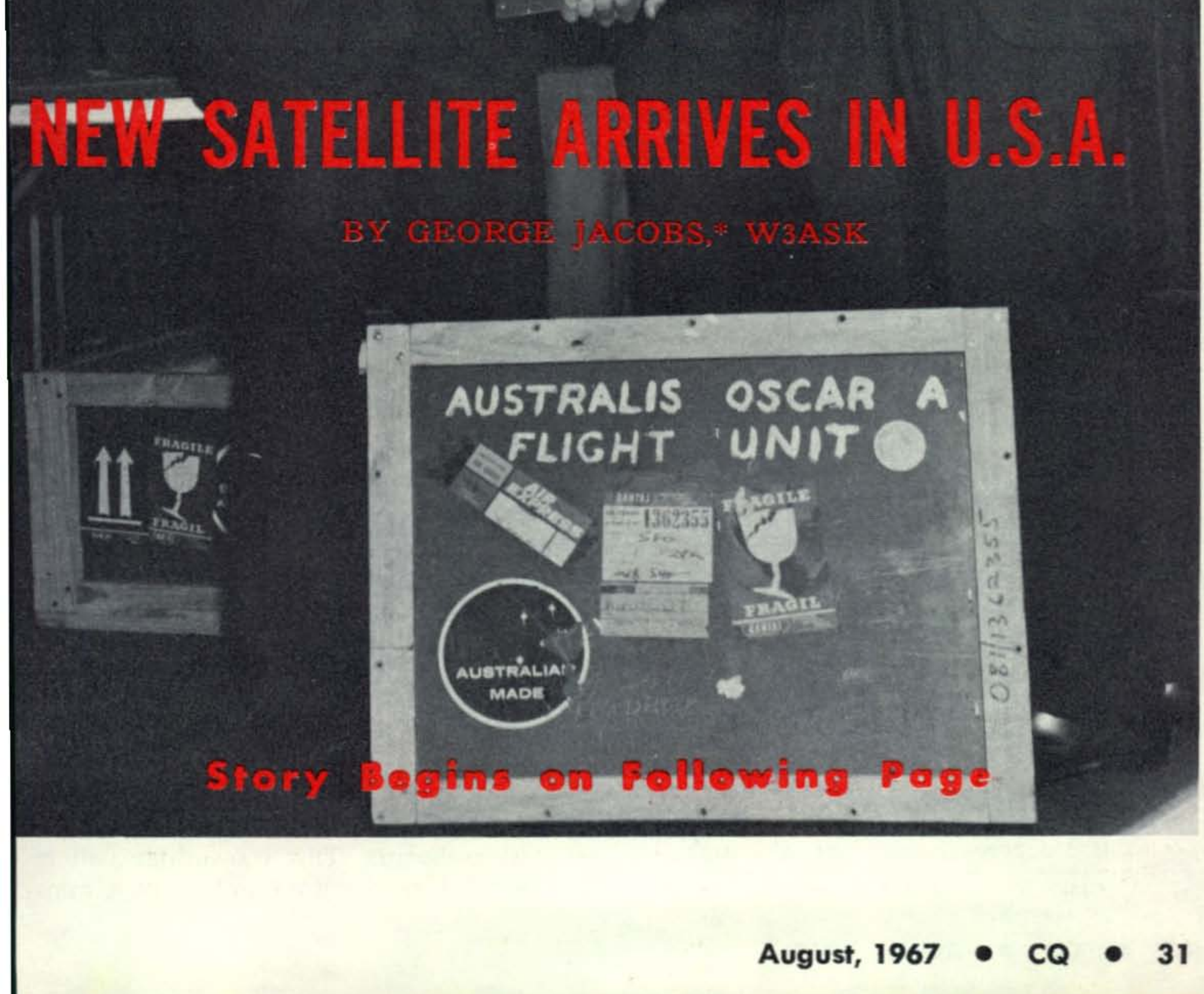
☐ **Check here for G.I. Bill information.**

Accredited Member National Home Study Council
A Leader in Electronics Training . . . Since 1934 CQ-31

AUSTRALIS-OSCAR

NEW SATELLITE ARRIVES IN U.S.A.

BY GEORGE JACOBS,* W3ASK



Story Begins on Following Page

AUSTRALIS-OSCAR ARRIVES IN U.S.A.

On the preceding page the AUSTRALIS-OSCAR amateur radio satellite is shown being unpacked at the California headquarters of Project OSCAR. Proudly holding the satellite are three members of the Australian project team who accompanied the satellite to California. From l to r are: Owen Mace, Richard Tonkin, and Paul Dunn, VK3ZPD.

(Photo by K6JAH.)

THE AUSTRALIS-OSCAR satellite, built jointly by the Melbourne University Astronautical Society and the Melbourne University Radio Club, arrived at the Foothill College, California headquarters of Project OSCAR on June 4. The satellite, sent by jet from Melbourne to San Francisco, was accompanied by three members of the Australian project team, Messers Paul Dunn (VK3ZPD), Owen Mace and Richard Tonkin. During early June, the Australians together with their colleagues at OSCAR headquarters put the satellite through the rigorous tests that are required before it can be considered for launch.

The satellite went from a paper design to delivery at Project OSCAR Headquarters in just under 15 months. It was built, as are all OSCAR amateur radio satellites, entirely on a voluntary basis, and none of the project participants received any payment for their work. Similarly, most of the electronic components used in AUSTRALIS-OSCAR were donated by Australian firms. The Wireless Institute of Australia gave the project a small grant for the purchase of special materials and components.

The Satellite

The AUSTRALIS-OSCAR is a 30 pound rectangular satellite, measuring 17 inches by 12 inches by 6 inches. The case of the satellite is made of aluminum which has been specially strengthened to withstand the acceleration and vibration during launch into orbit. The satellite will be thermally controlled by a black and white paint pattern which will be applied at Project OSCAR Headquarters. It is hoped that the internal temperature will be kept within a range of 60 to 100 degrees Fahrenheit, although the satellite should be able to survive a range considerably greater than this.

Its Purpose

AUSTRALIS-OSCAR *will not* be a communications satellite. It is intended to be a flying laboratory which will act as a testbed for systems and techniques that will be used to improve later models of amateur radio communication satellites. It will also provide a means for a greater number of radio amateurs to participate in space activities such as satellite tracking, telemetry decoding, propagation studies, etc. The telemetry system aboard the satellite has been specially designed so that radio amateurs can decode the information using relatively inexpensive equipment. Special decoding charts are now being finalized at Project OSCAR headquarters and they are expected to be ready for distribution in the very near future to radio amateurs that want to participate in the AUSTRALIS-OSCAR project, once the satellite is in orbit.

How It Works

The AUSTRALIS-OSCAR satellite will carry two transmitters operating in international amateur radio bands. One transmitter will operate on a frequency of 144.050 mc, and will have an average power output of 100 milliwatts. This transmitter will operate continuously from the time that the satellite is put into orbit until it's batteries are exhausted, about two months after launch.

The second transmitter will operate on a frequency of 29.450 mc, in the ten meter band, and will have an average power output of 250 milliwatts. This transmitter will be commanded to switch on and off by a num-

*11307 Clara Street, Silver Spring, Md., 20902.

ber of pre-selected, specially-equipped amateur radio tracking stations.

Command control will be necessary in order to conserve the satellite's batteries since the 10 meter transmitter will put a heavy load on the batteries.

This will be the first amateur radio satellite to have a transmitter in the 10 meter band, which should enable almost every active radio amateur throughout the world to track it. The 10 meter band is of particular interest since it is capable of very long distant propagation at the present phase of the sunspot cycle, and it is hoped that observations of the satellite's signals on a worldwide basis will produce some useful propagation data.

The telemetry system aboard the satellite will convert the impulses produced by battery voltage, temperature and other sensors, into audible tones. These tones are then fed into the two transmitters which will relay the information to radio amateurs on the ground. The telemetry unit is also linked to a keyer, which produces the letters HI in Morse Code (.... ..), the radio amateur's greeting, every 60 seconds. The satellite will carry seven sensors which will be fed into the telemetry system. These consist of three horizon sensors, a battery voltage sensor, a battery current drain sensor, a battery temperature sensor and a sensor attached to the inside skin of the satellite. Each of these sensor outputs will appear as an audio tone on the signal sent back to earth by the two transmitters. Each sensor will be sampled for seven and a quarter seconds. The total sampling period will amount to 51 seconds, after which two HIs will be sent to round out a minute transmission period. This sequence will be repeated continuously.

The command decoder and receiver system in the satellite will receive specially coded signals from a number of pre-selected amateur radio tracking stations. These signals will be used to switch the 10 meter transmitter on and off, to conserve battery power.

A magnetic attitude stabilization system (MASS), which consists of a permanent bar magnet and hysteresis rods, will stabilize the satellite so that one of its faces will always be pointed towards the earth. This is expected to reduce the satellite's tumbling, and eliminate signal fading which bothered reception of signals from previous OSCAR satellites. AUSTRALIS-OSCAR will be the first amateur radio satellite to incorporate such a system.

Launch and Orbit

There is no information available concerning launch at the present time. AUSTRALIS-OSCAR and EURO-OSCAR satellites are at Project OSCAR Headquarters undergoing final tests, inspections and modification before they are presented to the launching authority. The first of these two satellites to go will be designated OSCAR-5, the other OSCAR-6. According to Project OSCAR officials, neither satellite is expected to be launched before the end of 1967.

It is hoped that the AUSTRALIS-OSCAR will orbit the earth at a height of about 500 statute miles, with an inclination to the equator of approximately 70 degrees. This will permit the satellite to orbit the earth once every 103 minutes, completing about 15 orbits every 24 hours. Although the satellite is designed to operate for about two months, it will probably remain in orbit for 50 to 100 years.

Project OSCAR

Project OSCAR Inc. has been designated as the group responsible for coordinating radio amateur activity in the field of space communications. They are also the recognized organization for negotiating with the United States launching authorities to obtain rides into space for satellites built by radio amateurs. Four Project OSCAR satellites have been built and launched successfully since December, 1961. OSCARS 1 and 2 contained 2 meter beacon transmitters which relayed battery, internal temperature and propagation information to hundreds of radio amateur tracking and telemetry decoding stations in all corners of the world. OSCARS 3 and 4 contained electronic repeaters which made it possible for dozens of radio amateurs to relay Morse messages over great distances on the 2 meter band, including the spanning of the Atlantic and Pacific Oceans, and the first direct satellite communication between the USA and the USSR.

Additional information concerning OSCAR satellites, including membership in the program for radio amateurs with an interest in space communications, can be obtained by writing directly to Project OSCAR Inc., Foothill College, Los Altos Hills, California, 94022. ■

Automatically Tuning The Linear Amplifier

BY H. C. SHERROD,* W5ZG

Contest men, take note! Here's an example of advanced thinking in a bandswitching rig. A single rotary switch selects the band of operation by changing fixed-tuned input circuits, fixed output loading capacitors, and automatically adjusts the vacuum variable capacitor to the predetermined correct setting. A surplus CU-145/ARC tuning unit supplies the capacitor and motor drive.

THE CU-145/ARC tuning unit was designed to tune an antenna to a number of predetermined frequencies. The various switches are electrically operated as is the vacuum variable capacitor which is incorporated in this unit. The vacuum variable, the circuitry, and the components which have been added thereto, are the features of this article.

This variable capacitor is rated for 10,000 volts, and the capacity range is from 20 to 675 micro-microfarads. The operating mechanism includes a permanent magnet 24 volt d.c. drive motor, a magnetically released spring brake, a magnetically engaged clutch and the overtravel limit switches. The variable capacitor and the operating mechanism as described are integral. By removing six bolts from the tuning unit chassis, the complete capacitor and operating mechanism is released as a unit.

Having a 4-1000A tube on hand as well as the socket, blower, and chimney, a CU-145/ARC tuning unit was obtained and the design of a final amplifier began.

After a detailed inspection of the vacuum variable capacitor it was apparent that if a mechanism could be added for precisely setting its capacity, all band changing functions in the final amplifier could be controlled by the bandswitch alone.

*4715 Crockett Blvd., Galveston, Texas 77550

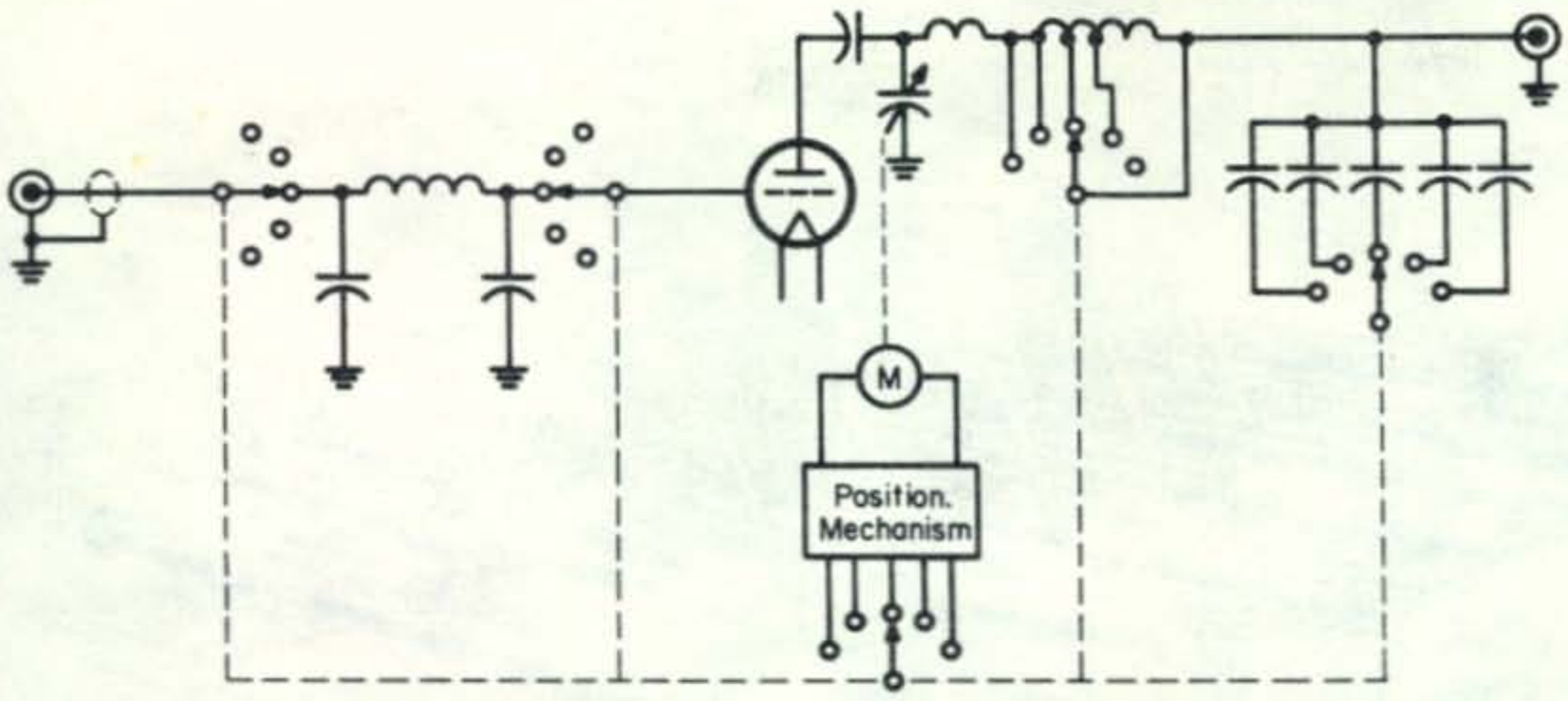


Fig. 1—Partial diagram of the final amplifier showing how the positioning mechanism is connected to the bandswitch to set the plate tuning capacitor. The loading capacitor is set by the bandswitch.

Bandswitching

In the amplifier constructed, a five position bandswitch was employed as shown in fig. 1. One section of this switch selects one of five pretuned pi-tank grid circuits. The second section switches the coaxial input cable to the proper grid tank. The third section selects the required value of loading capacitor for the pi-tank output circuit. The fourth section selects the proper value of inductance for the pi-tank output circuit. The fifth section controls the setting of the motor-driven vacuum variable capacitor.

Capacitor Positioning

The fifth switch section and the associated circuitry and components comprise the system for setting the capacity of the vacuum variable. When the bandswitch is thrown, the vacuum capacitor drive motor power supply is energized, the drive motor is energized, the brake is released, the clutch is engaged and the capacitor is driven to the value of capacity determined by the adjustable setting for the particular band. The drive motor stops, the brake is set, the clutch is released, and the drive motor power supply is de-energized. The described sequence is initiated by selection of a band by the the bandswitch and the sequence termination is automatic.

Switches

The nucleus of the capacitor control system is a traveling cam limit switch. A rendering of this switch is shown in fig. 2. A plan view, and section through the switch are shown in fig. 3. The basis of the switch shown is a cam plate (Item 11) which is supported by and slides along, two cam guide rods (Item 3). The cam plate is driven in either direction by the threaded lead screw (Item 4). The lead screw is geared to the variable capacitor drive shaft. The ratio of the gear mechanism is such that, in this application, the cam plate (Item 11) travels a total distance of three inches as the capacity of the variable changes from 20 to 675 micro-microfarads.

It will be seen that the traveling cam limit switch comprises five identical switch elements (Item 12). The operation of these switch elements is best illustrated by the section shown in fig. 3. Basically, the switch element is a single pole, double throw switch, with a center "off" position. The bottom set of contacts is normally closed and the top set of contacts is normally open. In these switch elements, the interval of travel between the opening of the bottom set of contacts and the closing of the top set of contacts is small. The smaller this interval, the closer the capacitor adjusts to the capacity value desired. Each switch element (Item 12) includes a striker which is actuated by the traveling cam.

Each switch element is supported on two rods which act as a "track" along which the switch element can be moved throughout the limits of travel of the cam plate (Item 11). The two rods comprising this "track" are: guide rod (Item 2) along which the switch slides, and threaded rod (Item 1) which provides support for, and adjustment of the

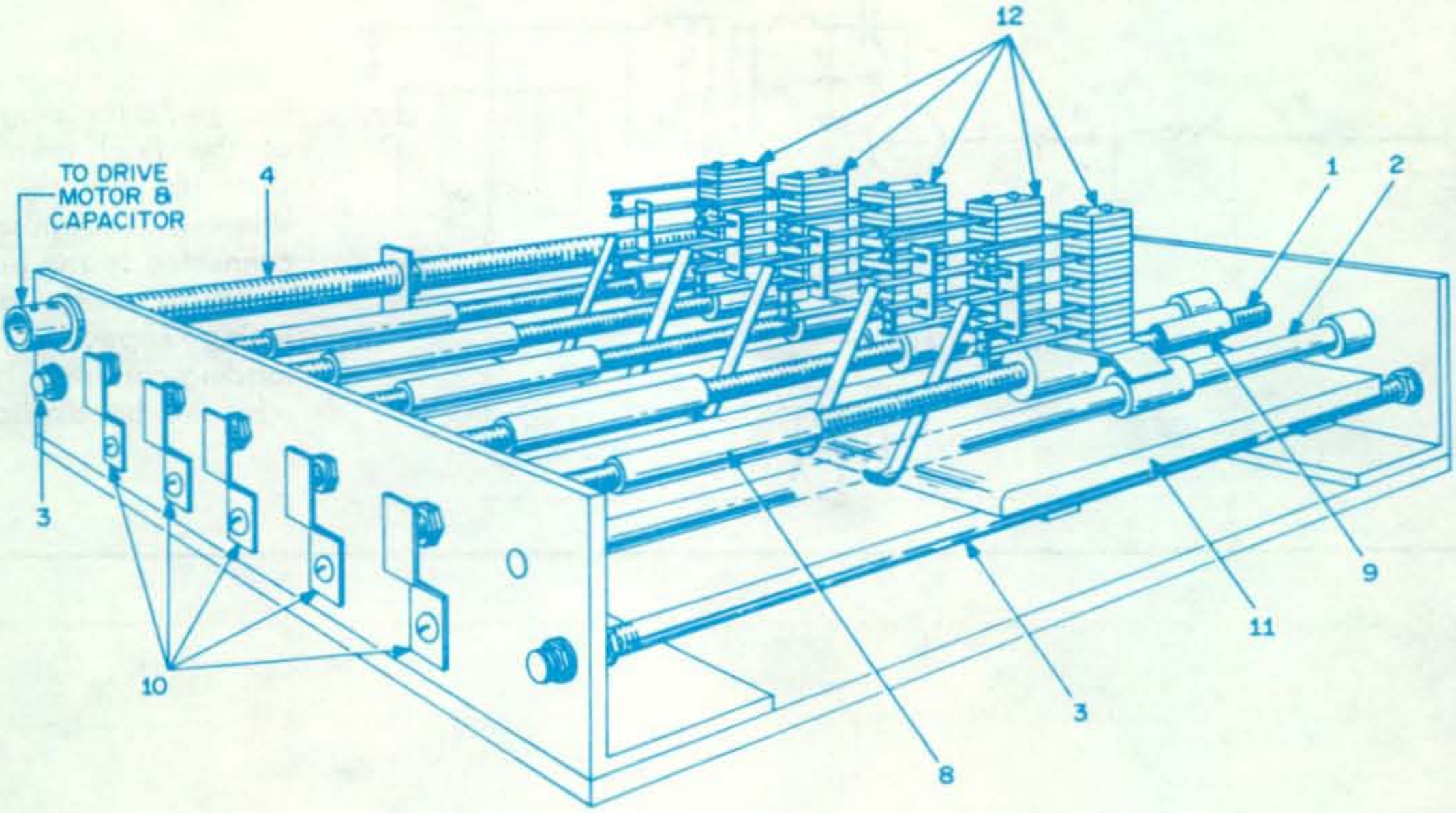


Fig. 2—The traveling cam limit switch, shown above, is the heart of the automatic tuning system. The numbered parts are discussed in the text.

switch element. By rotating the threaded rod (Item 1) the switch element (Item 12) can be placed at any location within the limits of travel of the leading edge of the cam plate (Item 11).

In fig. 3, the left (leading) edge of the traveling cam plate (Item 11) is just to the right of the striker of the switch element. The bottom set of contacts on the switch element (Item 12) is closed and the top set of contacts is open. If the traveling cam plate is moved to the right, the contacts will remain as shown. If, however, the traveling cam plate is moved to the left, the left (leading) edge of the cam plate will push the striker upward and the bottom set of contacts on the switch element will open. If the cam plate continues to move to the left, the striker will move upward closing the top set of contacts on the switch element. If the cam plate continues to move to the left the striker will ride along the top surface of the cam plate, the bottom set of contacts on the switch element will remain open, and the top set of contacts on the switch element will remain closed. It should be noted that by this arrangement there is only one very small interval of cam travel in which *both* contacts of any switch element are open, and that the location of this interval with respect to cam travel is adjustable throughout the range of cam travel for each switch element.

The traveling cam limit switch is mounted in the amplifier chassis so that slotted ends of the five threaded rods (Item 1) project through the front panel of the amplifier chassis. These are the five adjustments for setting the capacity of the vacuum variable for each band.

On the threaded rod for each switch element are two stop guards (Items 8 and 9). The purpose of these guards is to limit the travel distance of the switch element thereby preventing damage to switch element components.

Attention is invited to the five friction springs (Item 10). One friction spring is provided for each of the five threaded rods (Item 1) which, by screw-driver adjustment, determine the capacity setting of the vacuum variable condenser. The purpose of these springs is to prevent rotation of the threaded rod due to vibration of the switch mechanism. This arrangement maintains the capacity setting at the desired adjustment.

Switch Construction

No difficulty should be encountered in

obtaining the materials required for construction. The materials include 1" × 1" × ⅛" angle aluminum, ⅛" thick brass plate, ¼" diameter brass rod threaded ¼-20, ⅛" diameter bronze welding rod, thin brass tubing (available at any model airplane shop), ⅛" brass rod threaded 6/32, and miscellaneous nuts and bolts, preferably brass. The switch elements are made from switch fingers and insulation taken from the tuning unit containing the vacuum variable condenser.

Control Circuit

The wiring diagram of the capacitor control system is shown in fig. 4. The d.c. power supply for the capacitor drive consists of a 29-volt, 50 va. capacity transformer, four silicon diode rectifiers, bridge connected, and a 2000 microfarad, 50 volt filter capacitor.

The wafer on the bandswitch controlling the capacitor setting is shown in Position 3. Note that switch element S_3 is the only switch element having *both* contacts open. Note also that the drive motor is a permanent magnet type which is reversible by changing the polarity of the d.c. driving voltage. With regard to cam movement, the relays K_1 and K_2 (salvaged from the CU-145/ARC tuning unit) are connected as motor reversing relays. Relay K_2 causes the

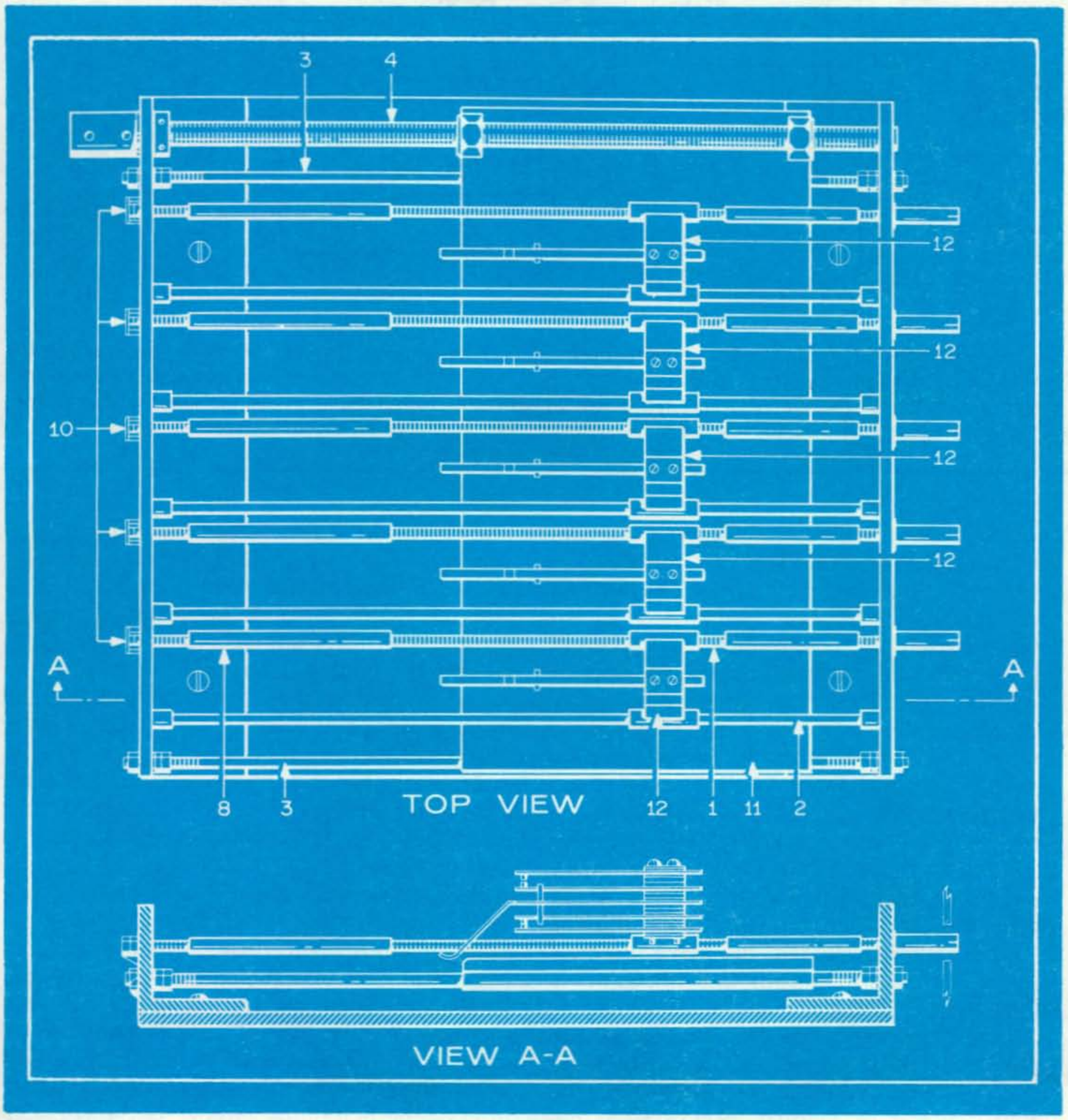


Fig. 3—Plan view of the travel cam limit switch.

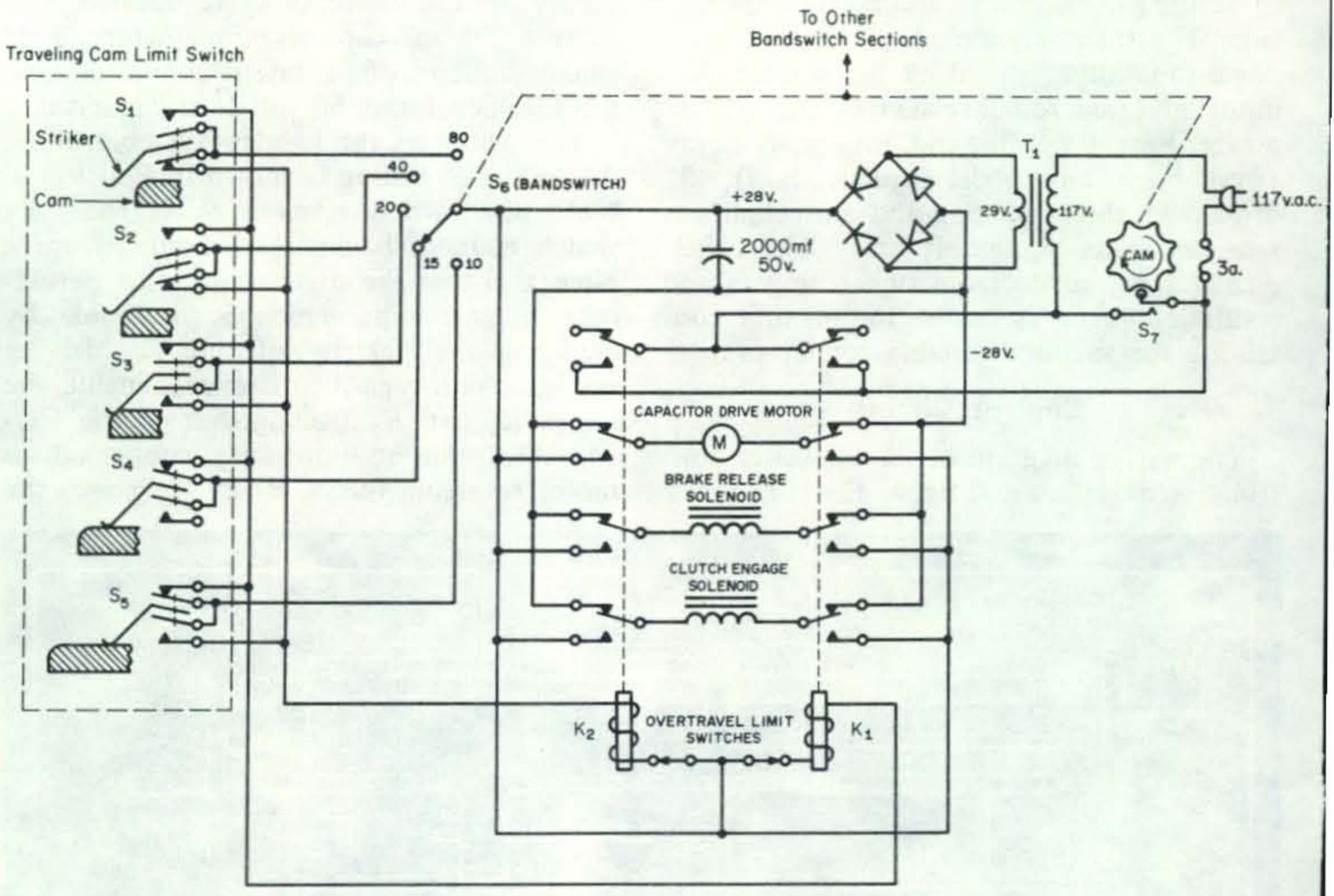


Fig. 4—The travel cam limit switch wiring diagram is shown above. Switches S_1 to S_5 are set for the tuning stops desired. Switch S_6 is a section of the bandswitch and switch S_7 is coupled to the bandswitch so that any change of band made by S_6 closes S_7 to activate the motor. The rectifier diodes are rated at 7 amperes, 50 p.i.v. Transformer T_1 delivers 28v. at 50 volt amperes.

cam to move to the right. Relay K_1 causes the cam to move to the left.

Assume that the bandswitch is thrown to Position 1. As the bandswitch is rotated, switch S_7 is momentarily closed by its associated rotating cam. Closing of switch S_7 energizes the 28 v. d.c. transformer/rectifier power supply. Voltage is applied to relay K_2 through the upper contacts of switch element S_1. Relay K_2 closes and bypasses switch S_6 thereby maintaining 110 v. a.c. to the transformer/rectifier power supply. As relay K_2 is closed, the clutch solenoid is energized and the clutch is engaged, the brake release solenoid is energized and the brake is released, the drive motor is energized and runs, causing the cam to move to the right.

When the cam plate has moved to the right sufficiently to permit the striker on switch element S_1 to move downward, the upper contacts of S_1 open. Relay K_2 is deenergized thereby shutting off power to the transformer, disengaging the clutch, and setting the brake on the drive mechanism.

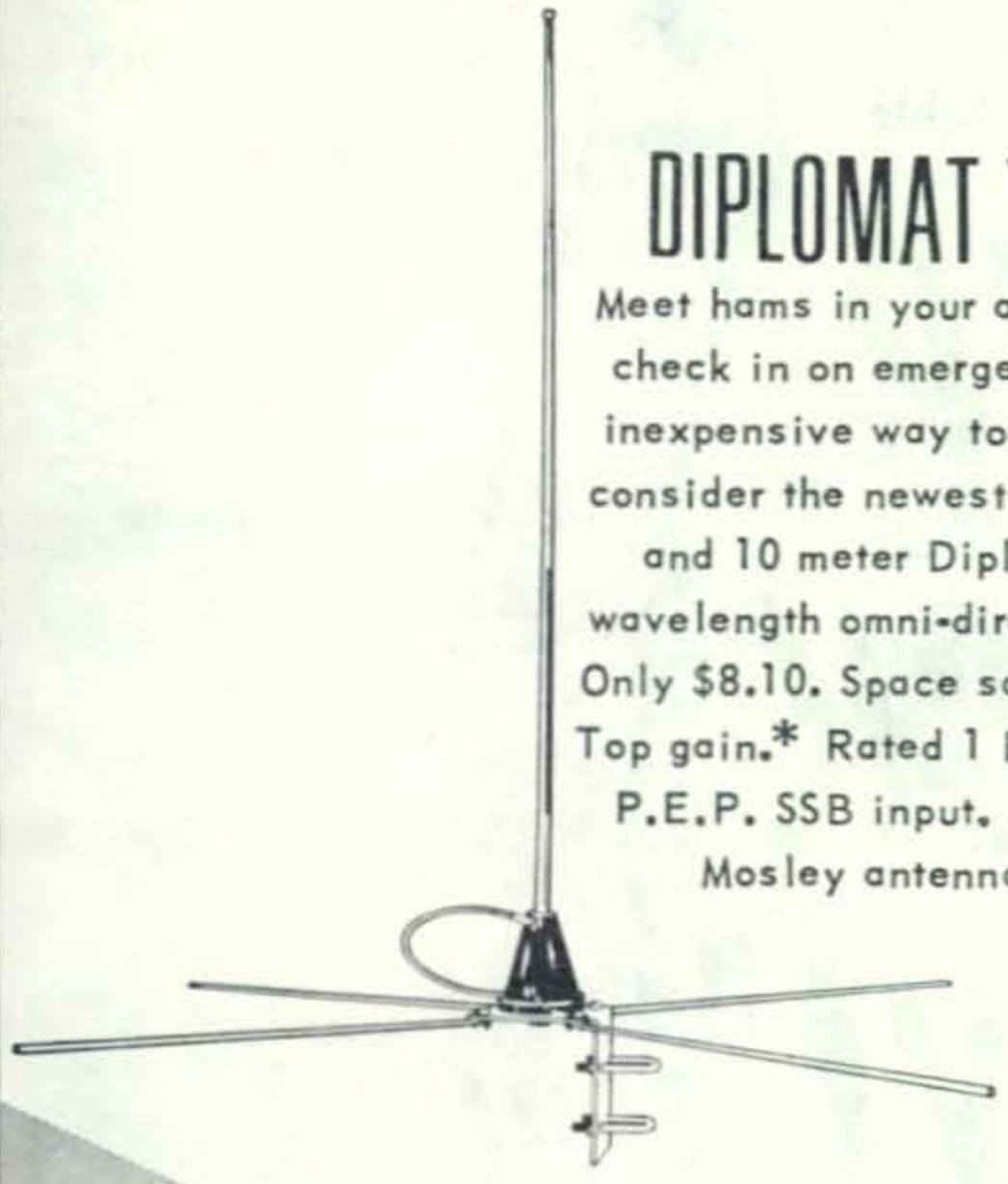
Should the cam plate movement inadvertently "overshoot" permitting the lower contacts of switch element S_1 to close, current through the lower contacts of switch element S_1 energizes relay K_1 thereby releasing the brake, engaging the clutch, energizing the drive motor, maintaining 110 v. a.c. power to the transformer/rectifier power supply, and causing the cam to move to the left until the lower contacts of switch element S_1 are opened by the cam causing the striker to move upward.

As previously stated, the reset accuracy of this mechanism is a function of the distance of cam travel during which *both* contacts of a particular switch element are open. In the described application the reset accuracy of the vacuum variable condenser is less than plus or minus one and one-half micro-microfarads. Because of the reduction in Q of the plate tank circuit by the resistive output load, the reset accuracy is well within entirely satisfactory limits. ■

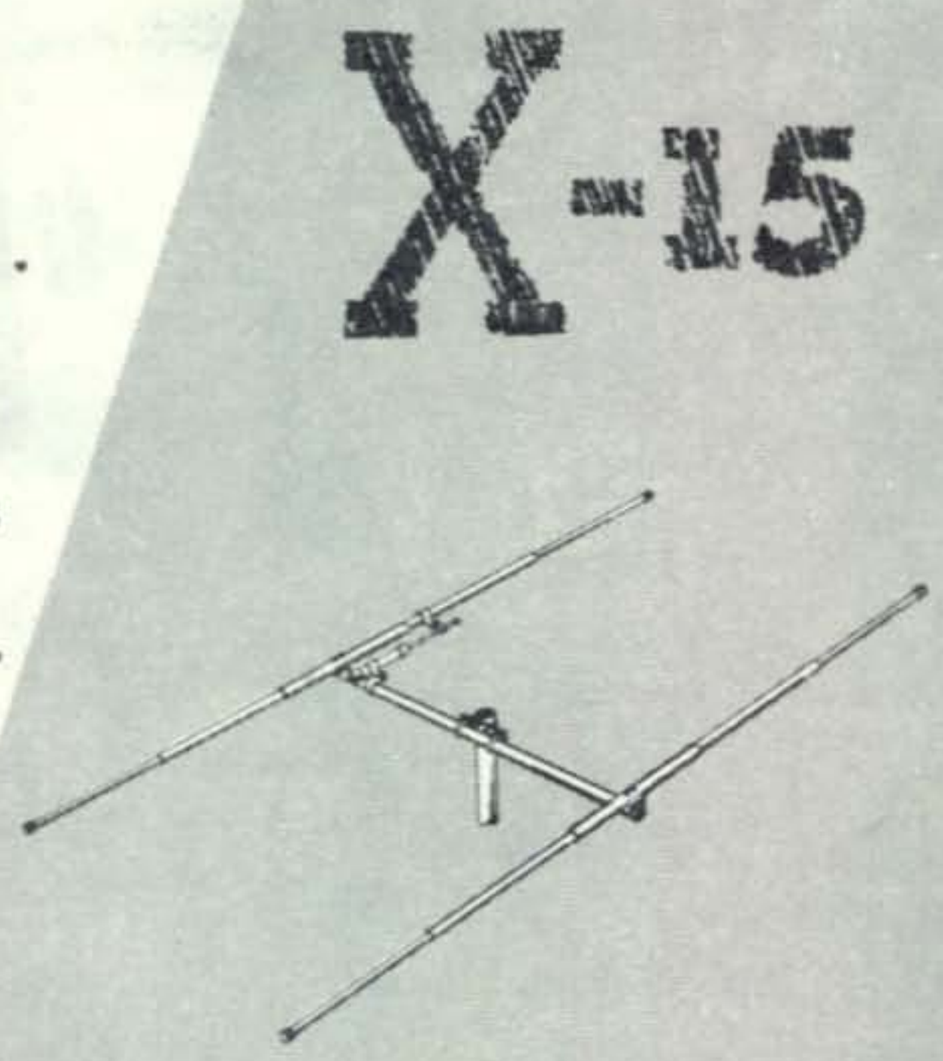
Whats NEW from Mosley!

DIPLOMAT '2'

Meet hams in your area on 2 meters . . . check in on emergency nets! For an inexpensive way to keep in touch, consider the newest addition to the 6 and 10 meter Diplomat family of 5/8 wavelength omni-directional antennas. Only $8.10. Space saving. Lightweight. Top gain.* Rated 1 KW AM/CW, 2 KW P.E.P. SSB input. Another Quality Mosley antenna!



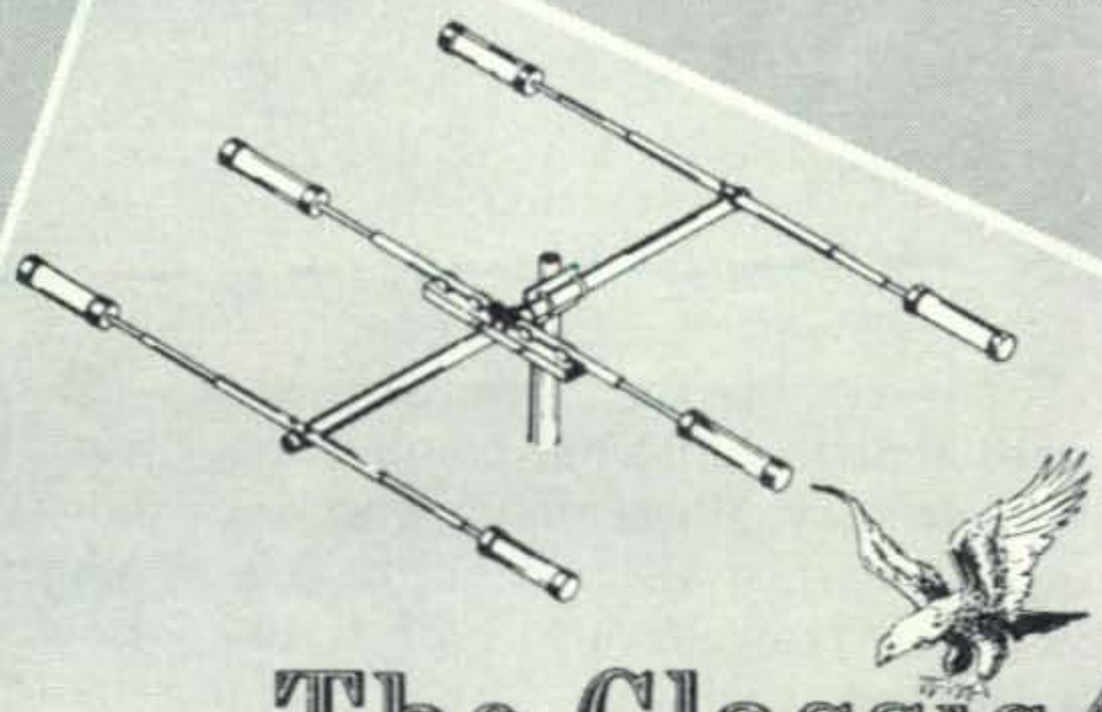
X-15



Own a Quality Mosley 15 meter beam, yet build it yourself - - just like in magazine projects. Drill your own holes and assemble according to concise instructions given. All parts included (minus coax). Gamma matched. Outstanding gain.* Full power rated. By readjusting elements according to instructions supplied, Generals may use this beam on 10 meters.

LANCER 1000

Hams are working lots of DX with this 5-band mobile antenna! Full power rated. Use on 10 meters without coil. Interchangeable coils for other bands. Adjustable upper whip section for peaking antenna to desired frequency. Coils with whip tip pre-cut and set for each band, available (extra). Hinged break over.



The Classic 10-15

The 10 and 15 meter bands are hot again! Command your share of DX on these popular bands with this Classic New Trap-Master beam. Full power rated. Broad Band Capacitive Matching. Incorporates performance proven Mosley metal encased traps. Tops in DX punch . . . gain!*

Gain omitted due to requirements of certain publications. For full details, send for FREE '67 catalog. Dept. 140

MOSLEY ELECTRONICS, INC.

4610 N. LINDBERGH BLVD., BRIDGETON, MO. 63042

For further information, check number 34, on page 126

BY SYLVIA MARGOLIS*

DESPITE Britain's grudging acknowledgment that the internal combustion engine is here to stay, those of us who are keeping our heads when all around are falling for these new-fangled means of transport, know that the real way to get about is on a horse.

Horses still have legal right of way on British roads and, in the same way that you should always give preference to a mobile in a pile-up on the air, you must always give priority to a horse on the road. Any difference of opinion between a motorist and horse that gets as far as the courts is resolved fairly and without bias by the judge—against the motorist. Her Majesty appears on official occasions, looking very uncomfortable, but lady-like in the extreme, side-saddle on a horse. Race meetings bring out the best and worst in British fashion, the power of cars is still measured in "horse-power" and even the most frozen-faced Englishman has been known to show emotion at the mention or sight of horses.

So the installation of mobile gear in a horse-drawn coach, with the call sign GB-2GG, for a ten-mile run in the country seemed the most natural thing in the world. All that was remarkable was that it had never been done before.

They chose a coach-and-four, the one-hundred-year-old "Harrier," which used to ply between London and Leicester and which reposes now in comparative retirement, carrying visitors around the park at Woburn Abbey, historic home of the Duke of Bedford, at 30 cents a trip. The "Harrier," of course, is a mere kitten of a coach. Some

*95 Collinwood Gardens, Clayhall, Ilford, Essex, England.

GB2GG in the 100-year-old "Harrier" at Woburn Village. The mobile whip can just be seen behind the man in the top hat at the back of the coach.

in captivity are much older but few still earn their living. The four horses were called Highgate, Newgate, Aldgate and Coachman.

The owner and driver of the coach, James Hewat, who had the distinction of having been at school with the Duke of Edinburgh, had loaned the coach and the services of himself, horses and outriders for a whole day and had brought along a crowd of his friends to join in the fun. There was to be a lunch at the end of the trip, with roast beef of course, then the return drive back to the Abbey. The proceeds of the day were to be donated to a radio charity, the Radio Amateur Invalid and Bedfast Club, which has members all over the world, including several in the United States.

A few days before the event we had a call from W6HPH, *CQ* writer Fred Brown, vacationing in London. He wanted to see something of the city and of the British Way of Life and to meet some radio amateurs. "Keep Saturday free," I told him, "We can do a little of everything for you. We'll pick you up outside your hotel at 8 A.M., drive you through London and out the other side, then you're going for a ride on a stage coach—with mobile gear on board!"

Would that we could offer such a comprehensive service to every amateur radio visitor to London!

The project was devised by Bob Barton, G3PQH, indeed a man of ideas. It was at his instigation that a local radio club hired a double-decker bus to take the members to a Hamfest, with mobile gear on board, operating GB3BUS/Mobile, the first bus ever to use mobile amateur radio.

The people who rode inside and on top

"We are operating mobile from a stage coach!" That's G3PQH, Bob Barton, who devised the project.

The "Harrier" used to ply between London and Leicester (pronounced "Lester").

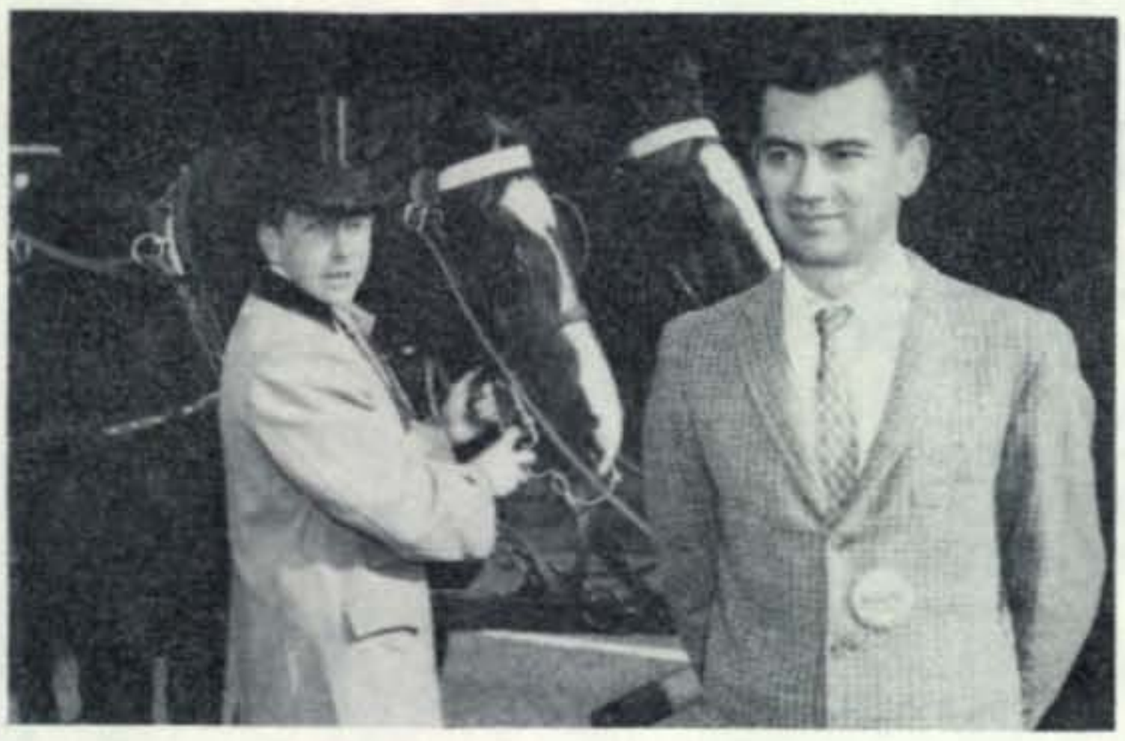
We set off in fine style down the village street.

of the coach had hired or made mid-Victorian costumes for the occasion. Those of us who followed tamely in our horseless carriages made do with twentieth century clothes and insipid they looked by the side of the splendid and dashing cut-away coats, toppers, frilled shirts and broidered weskits of the gentlemen, and the lovely, graceful, feminine gowns, bonnets, mittens and pelerines of the ladies, although the ladies confessed that they wore stretch nylon pants underneath their long skirts, because it was a chilly day, although the Spring sunshine shone bright on the awakening countryside.

They started from a pub in Woburn Village called the "Royal Oak." Everything in Britain starts and ends at a pub. The coach rattled off in fine style, sent off by the village policeman, three dogs, five children, an octegenarian who thought that sanity had returned to the world once more, and a slightly bemused party of American tourists who assumed that this was the way the British normally spend a Saturday morning. But they were very sporting and entered into the spirit of the thing, with fine shouts of "fare thee well" and "God speed" and "Gadzooks" as we clattered off.

The "Harrier's" speed is 8/10 miles an hour and the cars in the procession didn't like that at all, but we had no time for their tantrums, changed down firmly and told them to get on with their job!

The broidered weskits of the gentleman and the long skirts of the ladies made our twentieth century clothes look insipid.



Fred Brown, W6HPH, a CQ writer, vacationing in U.K., saw more of the "British Way Of Life" than he expected.

A group of people had got together to do nothing more than have a bit of fun and raised $100 for a radio charity.

Drivers overtaking the long queue of cars in the narrow country lanes looked annoyed, understandably, until they saw what it was holding them up, then there were shouts and halloos of joy, and children leaning out of every window and waving, and dogs barking, and the horses tossed their heads and the coachman cracked his whip and the operators called "CQ" and policemen at quiet crossroads held up the traffic with a flourish and everybody was happy it was Spring and Saturday and that there were still daft things like coaches-and-four with mobile gear on board, to prove that there's still some fun to be had, if you know where to look for it.

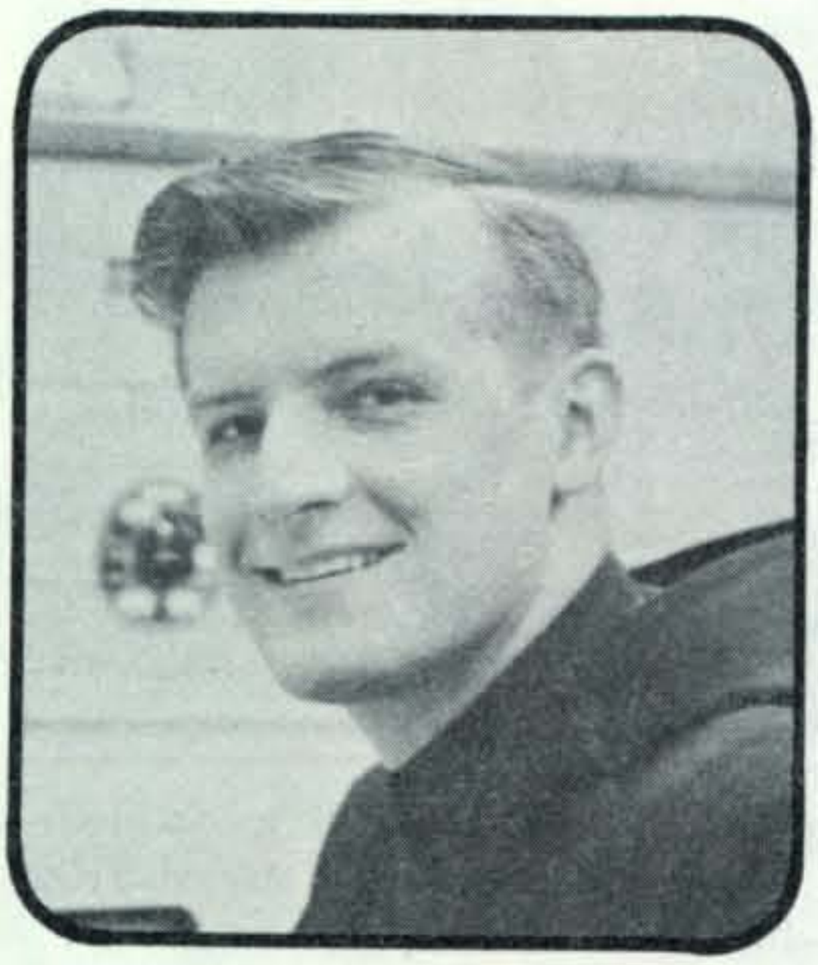
The mobile rig they had installed was on a.m., which seemed a pity, for, on the way north out of London, we had worked a gaggle of W6's, 5/9, no trouble at all on s.s.b. Then we realized that a.m. operation is just about suitable for the horse-and-buggy age. They couldn't get a bite at first, so we tuned up on 20, on the Drake TR4, using the Mark Mobile heliwhip, worked a couple of Europeans and alerted them to the very unusual QSO that was theirs for the taking. Some of the foreign amateurs had difficulty in understanding, then in believing, that GB2GG was really operating from a stage-coach. One Russian refused to believe it altogether and doggedly logged the QSO without the mobile qualification. But then the Russians still won't accept the principle of mobile operation, so you can't blame them for getting crazy-mixed-up at a situation like this.

There had been a breath of criticism beforehand that GB2GG was a sensational stunt, frivolous, non-constructive and doing nothing to help the image, nor the advancement, of amateur radio. But, at the ceremonial luncheon, at another gorgeous pub called the "Five Bells," James Hewat said that here were two groups of people, each of them with an obsessionist hobby. One hobby, coaching, was old. The other, amateur radio, was young. Yet the two groups had got together in amity and good-will to do nothing more than to have a bit of fun, a day out in the country, to enjoy themselves in the pursuit of their hobbies, and to raise money for a most deserving charity.

It was certainly thought-provoking, that speech. Radio amateurs do tend to get so hot under the collar about their hobby, about *"my"* frequency, and whether a reef is a reef or a country and whether you can call yourself a radio amateur if you don't wind your own coils. . . . And here we were, relaxed and laughing, quite a knotty technical problem overcome, with that mobile gear in the coach, and we had made one hundred dollars for the Radio Amateur Invalid and Bedfast Club.

So nobody had any cause to grumble, not even the horses. ■

"Good DX!" That's a whole pint of strong British beer in the tankard.



News from the IMRA

INTERNATIONAL MISSION RADIO ASSOCIATION

BY TOM AQUINAS COX, O.F.M. CAPUCHIN W2CBX*

IN the June News Notes you saw an article concerning the IMRA and the 'Peace Corps?' Now I can say the Peace Corps and IMRA. For the past few months I have been trying to discover if amateur radio could become a part of the Peace Corps. There have been many obstacles to overcome. At the moment the solution of these problems is becoming clear.

IMRA is very concerned with this problem. We would like to see amateur radio be of service to the Peace Corps. We feel this would be of advantage to the PCV's and to the people they are working with. IMRA wants to bring these advantages to the Peace Corps. If we succeed, not only will the Peace Corps benefit from the use of amateur radio, but the condition of amateur radio will be enhanced by its use in the Corps.

I have been in communication with Mr. Stuart Awbrey, editor of the Peace Corps magazine *The Volunteer*. His cooperation has been encouraging and extremely helpful. He has pointed out the problems involved in this matter while showing areas of possible cooperation. This is a section of a letter I received from him last month.

"I was glad to read your further views on radio communications possibilities for the Peace Corps, and I appreciate your deep interest in and concern with the subject of amateur radio around the world. Again, let me say that I think members of the Peace Corps would be in agreement with your ultimate goal of better understanding through better communication. And some volunteers undoubtedly are convinced that amateur radio should be applied to this end.

"But at the same time the Peace Corps has had a number of unpleasant experiences with radio operation by Volunteers, and aside from isolated individual cases I do not think you would find much support in the agency for any type of institutional radio effort. By and large the objections to extensive use of amateur radio have developed out of contradictions between radio use and Peace Corps goals.

"For example, you cite recent earthquakes in Latin America as a time when Volunteers might have utilized amateur radio. The Peace Corps is seldom engaged in disaster relief, and I think most Peace Corps officials on the spot would favor some role for Volunteer work in such situations other than communications work. Also, you cite the need for Volunteers in the field to talk over problems and discuss solutions among themselves and support groups. In most areas the Peace Corps attempts to keep Volunteers apart from one another because clustering has tended to encourage Peace Corps intramurals at the expense of relationship with host nationals.

"As for host national regulations, which I cited in my earlier letter, you must keep in mind that the Peace Corps is very sensitive to any real or imagined identification with political activity and especially intelligence gathering. Only recently I read a propaganda paper which said Peace Corps Volunteers used radio to transmit information of a political and military nature. Such

*Mary Immaculate Friary, Garrison, New York.

charges are not unfamiliar, and I doubt if many people believe them. Still, it is one area of vulnerability. Also, I think one must distinguish between private, individual radio operators and representatives of the United States government who might operate radios. Because the Peace Corps is an agency of the Government, Volunteers may be seen as agents of government policy. If numbers of them were equipped with radio transmitters and receivers, an unfortunate interpretation of their activities could easily develop. Perhaps missionaries or businessmen would be less vulnerable here.

"In my earlier letter, I perhaps gave the impression that an agency-wide policy governs the use of *all* radio usage in the Peace Corps. Let me clarify that. As far as I can tell, the only agency-wide regulation is the one that bars all Volunteers from taking radio transmitters to their overseas assignments. Regulations governing Peace Corps use of radio overseas are determined by the Peace Corps director in each country. So in fact we have 53 "policy makers" in this area, one in each Peace Corps nation. Some of them, of course, have no latitude because the host country imposes a ban. Others have wider discretion and, as we know, Volunteers in some nations have maintained transmitting equipment.

"The above reservations about widespread use of amateur radio in the Peace Corps are general and are drawn from what I gather to be the prevailing mood of officials in the agency. I am very doubtful that any of the regional operating divisions of the Peace Corps would endorse an agency application of radio transmitters at this time, though certainly some country directors and some isolated Volunteers will continue to use radio as a means of communication."

Conclusion

It seems now that we have made some progress. Amateur radio is not out-lawed for Peace Corps Volunteers, but neither does the Peace Corps officially support the general use of amateur radio for its volunteers. There are limited areas where the use of amateur radio is possible and permissable.

With the continued cooperation of the Peace Corps IMRA is going to try to determine where these areas are and then try to bring the advantages of amateur radio to them. I hope to have a definitive solution of this matter in next month's News Notes.

IMRA Convention—August 7th and 8th

This is the final reminder and invitation to you to join the IMRA members at their convention in Asheville, N.C., this month. We are expecting many members from around the country. Join us in Asheville.

This year's meeting is expected to be action packed and most enjoyable. Many of the IMRA projects have to be discussed, and we could use your fresh thoughts. Progress is possible only with your continued help and cooperation. IMRA is on its way to success. We need your help now more than ever.

One project, for example, that needs your immediate support is the weekly International Communications Service. As you know IMRA meets weekly on 15 meters and 20 meters (14. 270 mc and 21.393 mc) at 1830 GMT to provide a communications service for Latin America. We need many more stations on these frequencies to facilitate traffic handling and phone-patching. Knowledge of our service is spreading in Latin America. Each week there are more stations calling in for assistance. I am sorry to say there are some we just can't help because there is no station on frequency in the area being sought. May I encourage you to just monitor one of the two frequencies each week. Your help to IMRA will be a help to amateur radio.

For late convention registration write: Rev. John Wall, 237 Victoria Road, Asheville, North Carolina 28801. Registration before August first is $5; after August 1st $6.

For those of you with mobile rigs, the talk-in frequency has been established as 3,956 kc on Sunday afternoon, August 6, 1 P.M. to 8 P.M. EDT: Monday morning, August 7, 6 A.M. to 10 A.M.

I hope to see all of you in Asheville! ■

EIMAC

vapor-cooled high-linearity tetrode powers unique new 2000 watt PEP linear amplifier

The unique new linear amplifier shown here is powered by an EIMAC 4CV1500B tetrode. The ultimate in amateur equipment, this fine linear was designed by Jack Quinn, W6MJG, and uses the advanced concept of vapor-phase cooling for ultra-quiet operation. The amplifier runs cooler than most forced-air-cooled amplifiers, and because there is no extraneous noise from air blowers, your shack is quiet—ideal for receiving weak DX signals! On CW, the amplifier has an average input of 1 kW, with only 400 watts of plate dissipation at 60% efficiency.

High SSB performance of the amplifier is credited to the 4CV1500B's outstanding intermodulation distortion characteristics...better than −40 db third-order products at all drive power levels from zero to 2 kW PEP. The 4CV1500B—and its air-cooled brother, the 4CX1500B—are products of a four-year development study which included optimization of internal tube geometry by computer techniques. Because the tube has very low grid interception (typically less than 1.5 mA grid current) it is possible to drive the grid positive without adverse effects upon the distortion level of the driver. Both tubes are recommended for Class AB_2 linear amplifier service. For further information on advanced EIMAC power tubes, write Amateur Services Department or contact your nearest EIMAC distributor.

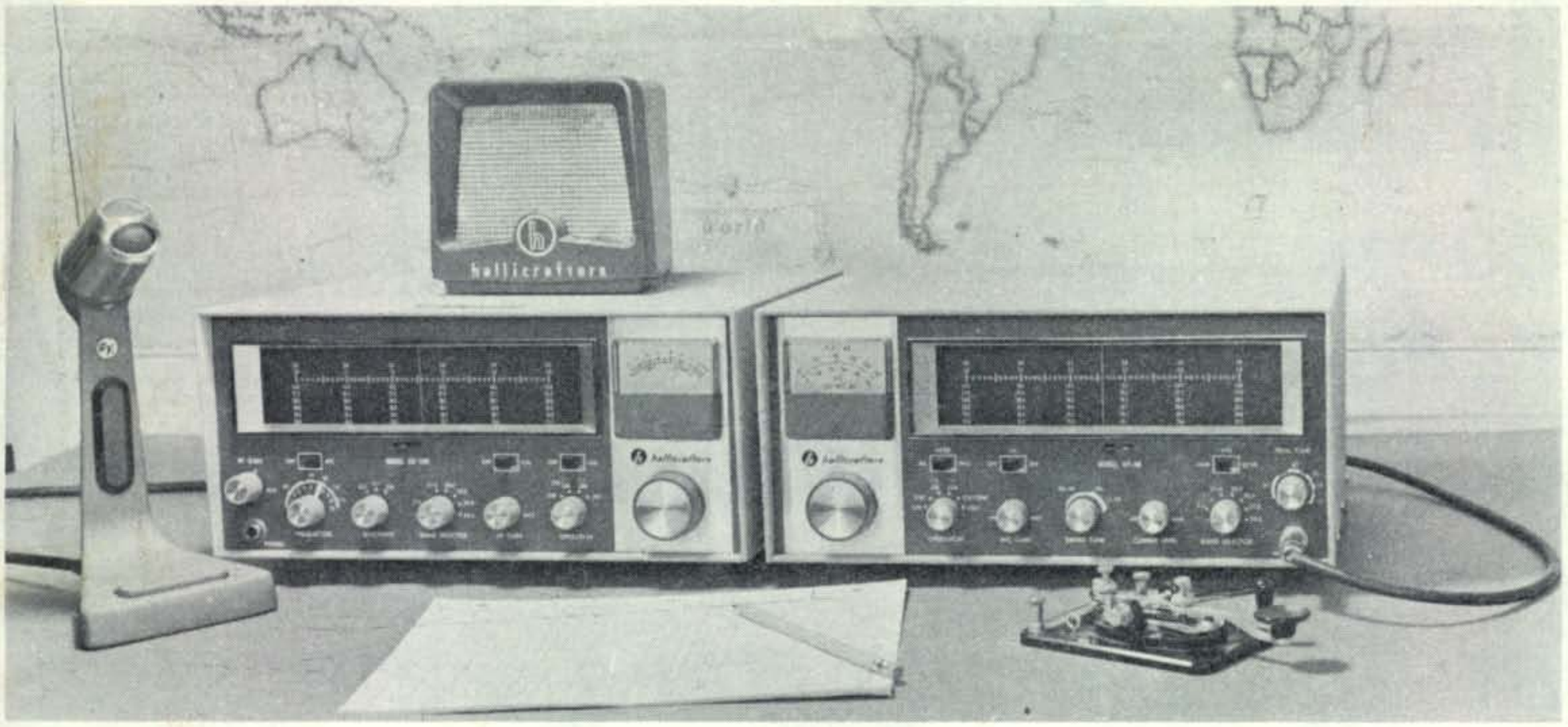
4CV1500B
TYPICAL OPERATION (Frequencies below 30 MHz)

DC Plate Voltage	2500	2750	2900	V
DC Screen Voltage	225	225	225	V
DC Grid Voltage	−34	−34	−34	V
Zero-Signal DC Plate Current	300	300	300	mA
Single-Tone DC Plate Current	720	710	755	mA
Two-Tone DC Plate Current	530	555	542	mA
Driving Power	1.5	1.5	1.5	W
Useful Output Power	900	1100	1100	W
Intermodulation Distortion Products				
3rd Order	−38	−40	−43	db
5th Order	−47	−48	−47	db

We have a new brochure entitled "Linear Amplifier and Single Sideband Service." Write for your copy.

EIMAC
Division of Varian
San Carlos, California 94070

For further information, check number 2 on page 126



Left: SX-146 Receiver. Right: HT-46 Transmitter.

CQ Reviews:

The Hallicrafters HT-46

An All-Band S.S.B. Transmitter

BY WILFRED M. SCHERER,* W2AEF

SOME time ago *CQ* reviewed the Hallicrafters SX-146 amateur-band-only receiver [1] in conjunction with which a companion unit, the model HT-46 transmitter, was designed for optional transceive or independent-frequency operation. Unfortunately, the evaluation had to be limited to the receiver alone, inasmuch as the transmitter was not available to us at the time.

Since we now have one of these units on hand and since the receiver itself had turned out to be a dandy job, a report on the transmitter should still be of interest at this time. In order to better understand the similarities and other features between the two units, it might be well to also refer to the review on the SX-146.

*Technical Director, *CQ*.

[1] "*CQ* Reviews the Hallicrafters SX-146 Receiver," *CQ* June '66, page 58.

This perfect mate for the compact SX-146 receiver produces top quality SBB from 80-10 M. and offers transceive operation to boot!

CQ Reviews:

The

Hallicrafters

HT-46 Transmitter

(continued)

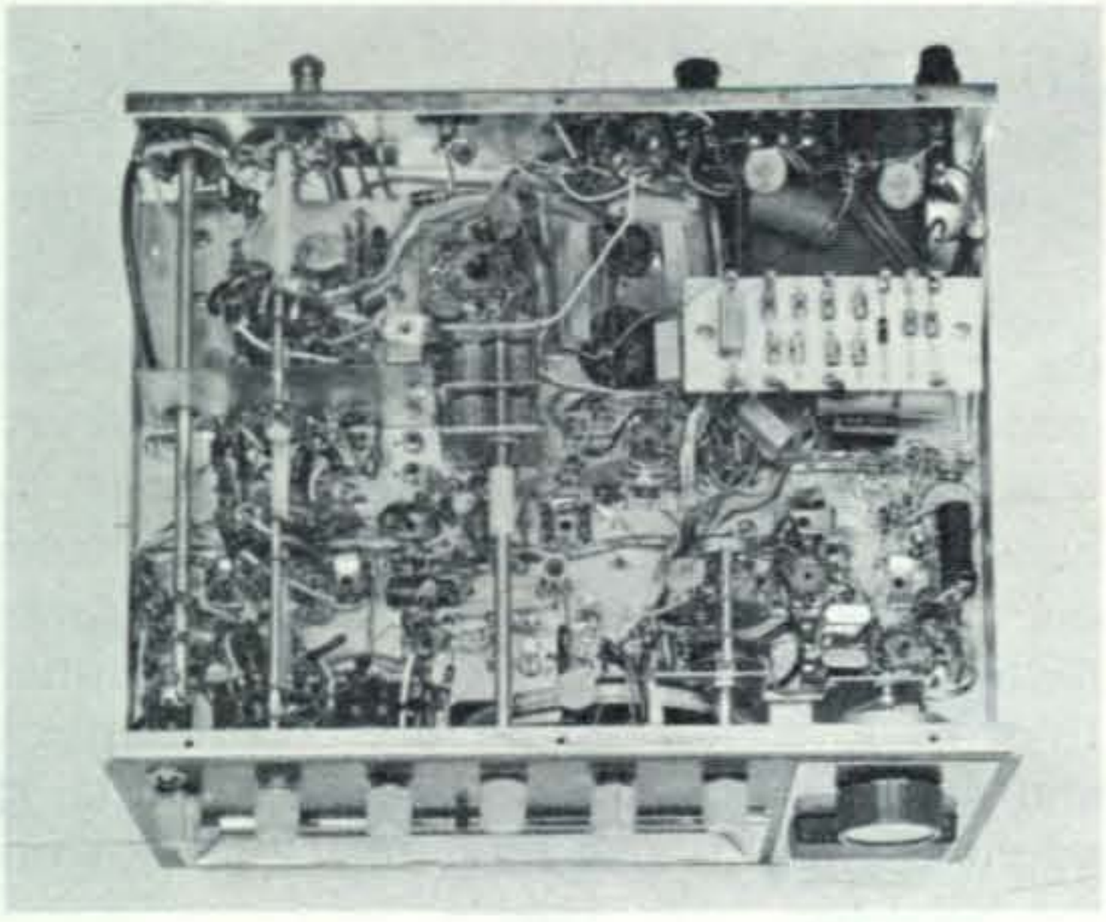
The HT-46 transmitter is an s.s.b./c.w. rig for operation on the 80-10 meter amateur bands. Besides being designed for use along with the SX-146 receiver, it also may be employed separately to serve as an independent transmitter/exciter. The power-input ratings are 175 watts p.e.p. on s.s.b. and 150 watts on c.w. Full band coverage is available with a constant tuning rate over 500 kc segments (4 segments used for the 10-meter band). Operation may be obtained on either upper or lower sideband on any range. Hallicrafter's customary *amplified* a.l.c. system is included. There also is a built-in power supply.

Details

Single-sideband generation is employed with a 6-pole 9 mc crystal filter using single-*signal* conversion to the amateur-band frequencies obtained directly with a 5.0-5.5 mc v.f.o. (for 3.5 and 14 mc) or by pre-mixing the v.f.o. output with an appropriate crystal-controlled frequency (for 7, 21 and 28 mc) to produce the required heterodyning signal. A block diagram of the setup is shown at fig. 1.

There are two stages of speech amplification. A third stage functions as a cathode follower to provide an impedance match to the balanced modulator which employs two solid-state diodes in a series-connected arrangement as shown at fig. 2. The carrier-balance control is an internal screw-driver adjustment and need not be reset, except for an occasional touchup as the equipment ages.

The carrier oscillator is a conventional affair using a triode oscillator with a tuned plate. The 6-pole crystal filter is designed for a nominal bandwidth of 2.1 kc at 6 db. The carrier-oscillator crystals can be adjusted with trimmers for the correct frequency relation to the filter passband and are thus set so that the carrier is 25 db down the filter skirt. When sidebands are changed,



Bottom view of the HT-46. The silicon rectifiers for the power supply are on the oblong board near upper right. The dual-section drive-tuning capacitor is near the center.

the crystals are switched to shift the frequency 2.8 kc to the opposite skirt of the filter. The frequency of the v.f.o. is not automatically compensated for this change, so the transmitter must be retuned by 2.8 kc when operation is shifted from one sideband to the other.

The heterodyning-signal injection at the transmitter mixer (V_4) is obtained from a "heterodyning" mixer (V_{8B}). For the 3.5 and 14 mc bands this stage operates as a straight-through amplifier at the v.f.o. frequencies of 5-5.5 mc, in which case the difference-frequencies, combined with the 9 mc s.s.b. signal at V_4, provide 3.5 mc operation. The sum frequencies are used for 14 mc.

For the other bands the v.f.o. signals are pre-mixed at V_{8B} with crystal-controlled signals from V_{8A} and are fed through bandpass circuits to provide heterodyning signals at V_4 of 16-16.5, 30.5-30 and 37-39 mc for the 7, 21 and 28 mc bands respectively.

The output circuit of the transmitter mixer is gang-tuned with the output circuit of the driver for the final p.a. which consists of a single 6HF5. The p.a. is neutralized in the customary manner. The output circuit is a Pi-network with loading fixed for 50 ohms.

A meter may be switched to show relative r.f. output power or p.a. cathode current. In order to obtain better accuracy at the low end of the meter scale, the meter is connected in a bridge circuit when the p.a. current is to be read. The bridge is arranged so that the p.a. idling current does not produce a forward current through the meter. The zero point on the p.a. current scale is therefore calibrated as 40 ma, which is indicative of the current for the required bias setting. A second scale is calibrated 0-100 for the r.f. output readings. Either function is selected with a slide switch.

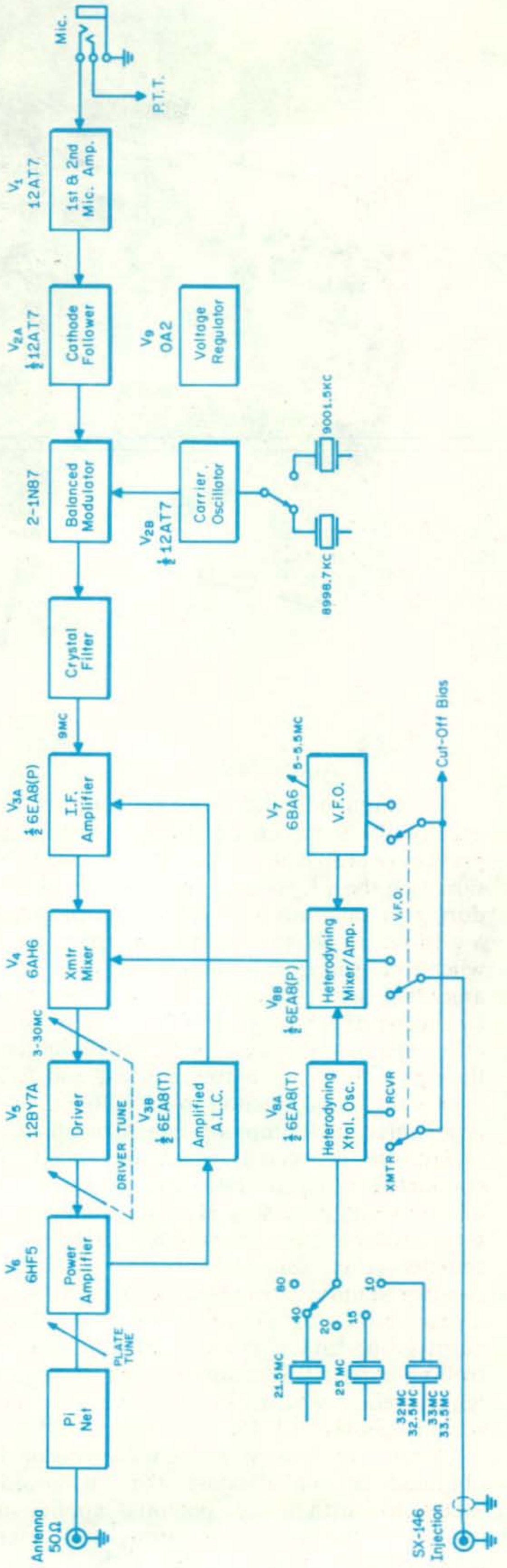
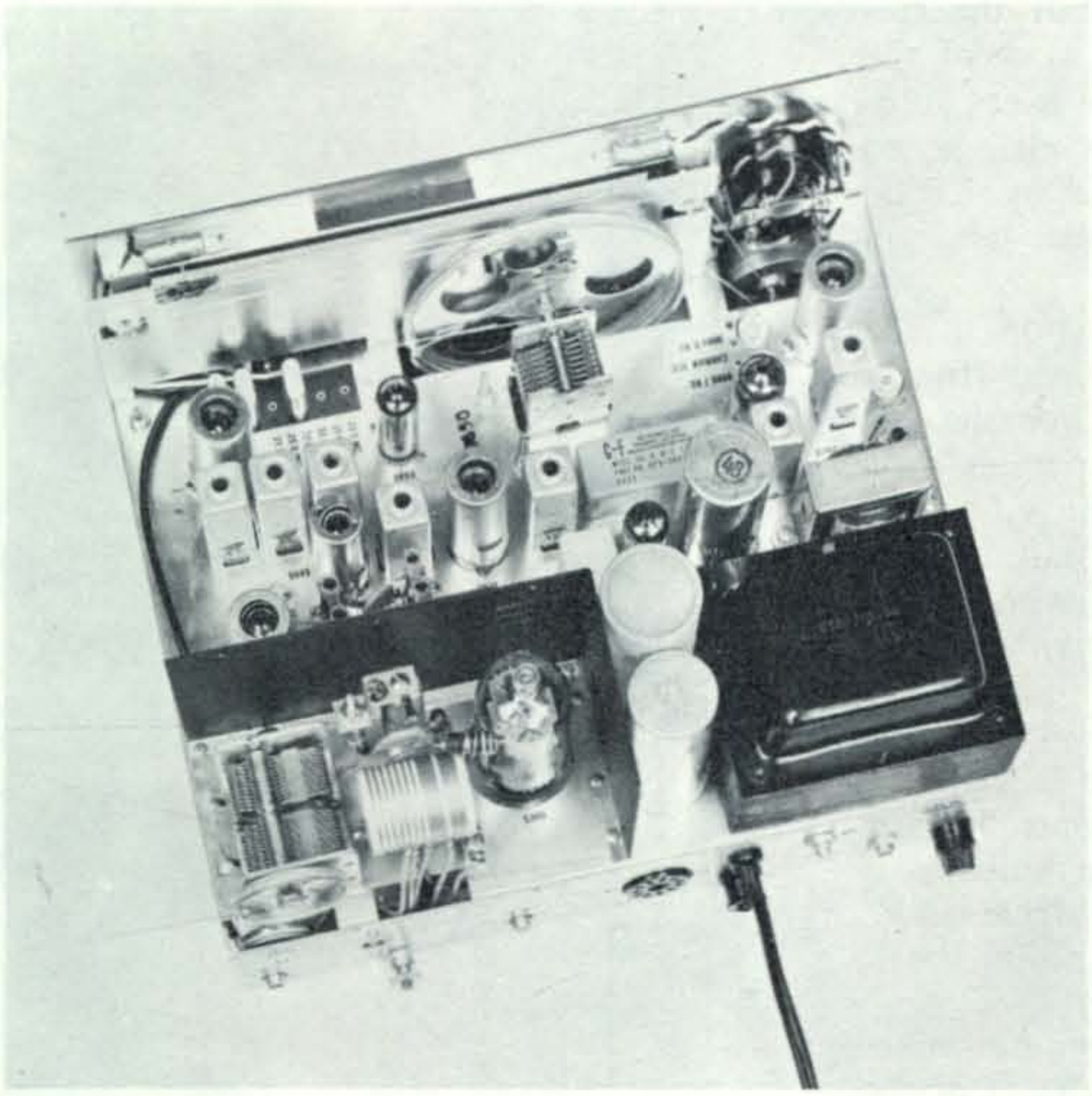


Fig. 1—Block diagram for the HT-46. See text for oscillator-injection frequencies at V_4. For transceive operation, the oscillator injection from the SX-146 receiver is applied to V_{8B} through the v.f.o. switch which also disables V_{8A} and V_7 with cutoff bias.



Top view of the HT-46. Part of the enclosure for the p.a. has been removed to show the components. Behind the tank coil is the plate choke from the top of which a bracket holds a piston-type neutralizing capacitor. The v.f.o. tuning capacitor is at upper center. The crystals are at the upper left where only one of the 10-meter band crystals is installed.

Amplified A.L.C.

An amplified a.l.c. voltage controls the gain of the 9 mc i.f. amplifier as needed to prevent overdriving the p.a. It is obtained by sampling the a.f. component that is produced during modulation by a voltage drop, across a grid-return resistor in the p.a., that occurs whenever grid current starts. This signal is amplified and converted to a d.c. potential by means of a voltage doubler. Unlike most other systems, the amplified control voltage, thus provided, acts extremely fast and thus causes the control action to take hold *before* any degree of flattopping can take place.

Transfer between transmit and receive is conducted using push-to-talk; however, an add-on v.o.x. accessory also is available. Besides switching the transmitter circuits, the transfer relay also activates the associated receiver standby or muting facilities through a rear-apron plug. Auxiliary s.p.d.t. contacts (arm grounded) also are available for controlling external accessories, such as an antenna relay which, by the way, is not included in the HT-46.

Carrier for tuneup and c.w. operation is obtained by unbalancing the "balanced" modulator with a d.c. potential applied to one leg of the modulator through a carrier-level control. One of the s.s.b. carrier-oscillator crystals is used and although its frequency is well down the filter skirt, there is enough r.f. output from the oscillator, when the modulator is unbalanced, to allow sufficient carrier to get through the filter. Grid-block keying for c.w. is employed with an R-C shaping filter at the transmitter mixer and driver.

Transceive Operation

Where transceive (or slave) type of operation in conjunction with the SX-146 receiver is desired, only the v.f.o. output from the receiver is required to be fed to the transmitter. This is done through a rear-apron phono jack that is connected to a slide switch on the panel marked V.F.O. For normal independent frequency control the switch is placed at XMTR. For transceive work it is placed at RCVR in which case it disables the transmitter v.f.o. (V_7) and the pre-mixing heterodyning oscillator (V_{8A}). It also applies the receiver v.f.o. or its premixed v.f.o. signals to V_{8B} and then to the transmitter mixer. Instantaneous switching between transceive and independent operation is thus possible by sliding the switch one way or the other.

In order to maintain synchronized transmitter carrier-generator and receiver b.f.o. frequencies, the crystals in the b.f.o. are adjusted to zero beat with the carrier-

oscillator crystals when the equipment is initially set up.

Frequency Spotting

A calibrating position is arranged so that when independent frequency control of the transmitter is engaged, its signal frequency may be heard on the receiver and set to zero beat with any frequency to which the receiver is tuned, such as that of the station you're working. This is done with a slide switch which activates all the transmitter stages, except the p.a. and speech amplifier. At the same time it unbalances the modulator and inserts the carrier-level control which may be used to set the calibrating level.

Power Supply

The built-in power supply operates from 117 v.a.c. It employs 8 silicon diodes in a bridge-rectifier configuration to supply 650 v.d.c. plate potential for the p.a. A low-voltage source for other stages is obtained from a center-tap on the power transformer, in which case one section of the bridge functions as a full-wave center-tap rectifier. Bias of −130 v.d.c. is obtained from a separate winding and a half-wave rectifier. The power-supply circuitry is shown at fig. 3.

Construction

Styled to match the SX-146 receiver, the HT-46 transmitter is installed in a square-cornered cabinet that fits the motif of a panel dominated by a similarly-shaped bevelled escutcheon for the slide-rule dial. The v.f.o. tuning is accomplished using a string drive with a "fly-wheel" tuning control that rotates about 2½ revolutions per 100 kc.

The dial is calibrated in 5 kc steps spaced about 1/16" apart over a 500 kc range on a common scale for all bands. The scale can be mechanically moved to the left or right, by a small tab on the panel, for calibrating against a known frequency. Calibration numerals are located at each 100 kc increment and are separately provided for the individual amateur bands (including each of the four segments on the 10-meter band), thus furnishing a direct frequency readout. This is especially helpful, since the frequency on

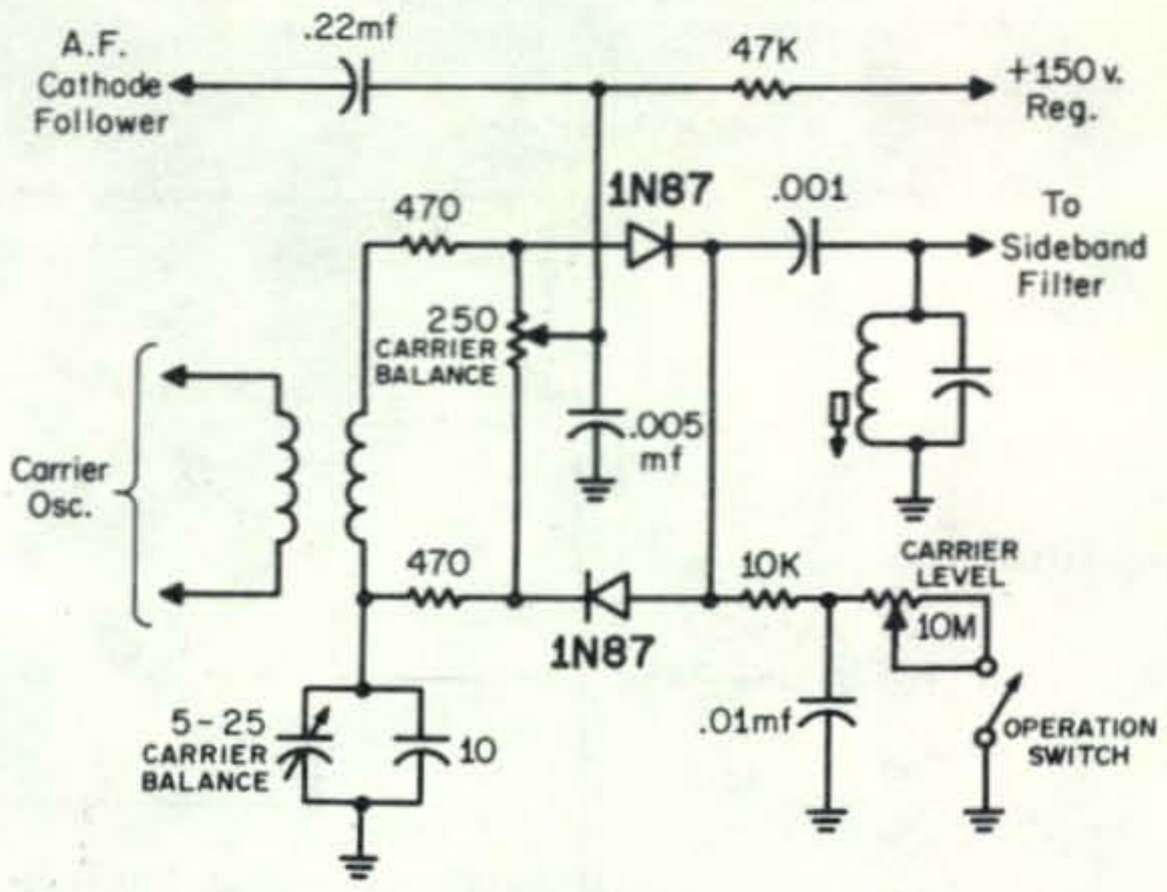


Fig. 2—Circuit for the balanced modulator used in the HT-46. On c.w. and tuneup the operation switch is closed and the balance is upset with a d.c. potential difference between the carrier-balance potentiometer and one side of the modulator. The degree of unbalance is adjusted by the carrier-level control.

the 3.5 and 7 mc bands increases going from left to right, while on the other bands it rises going in the opposite direction. This happens, because either the sum or difference mixing frequencies are used in the various cases.

Sidebands on the different bands also are in reverse for the same reason, but in order to keep track of which sideband position is which for each band, red or white identifications at the sideband switch are correlated with similarly color-coded markings at the bandswitch.

The panel has mic-gain and carrier-level controls, separate driver and p.a. tuning and a standard 3-circuit jack for a p.t.t. mic. The c.w. key jack is on the rear where there also is an 11-terminal socket for interconnections between the associated receiver and controls for an external antenna relay.

Phono jacks are used for the antenna and the v.f.o. output from the receiver for transceive operation.

Facilities are provided on the rear for mounting and plugging in a v.o.x. add-on accessory. The overall dimensions of the set are 5⅞" × 13⅛" × 11" (H.W.D.) and it weighs 26 lbs.

Performance

The HT-46 performed better than the specifications, putting out an s.s.b. signal of

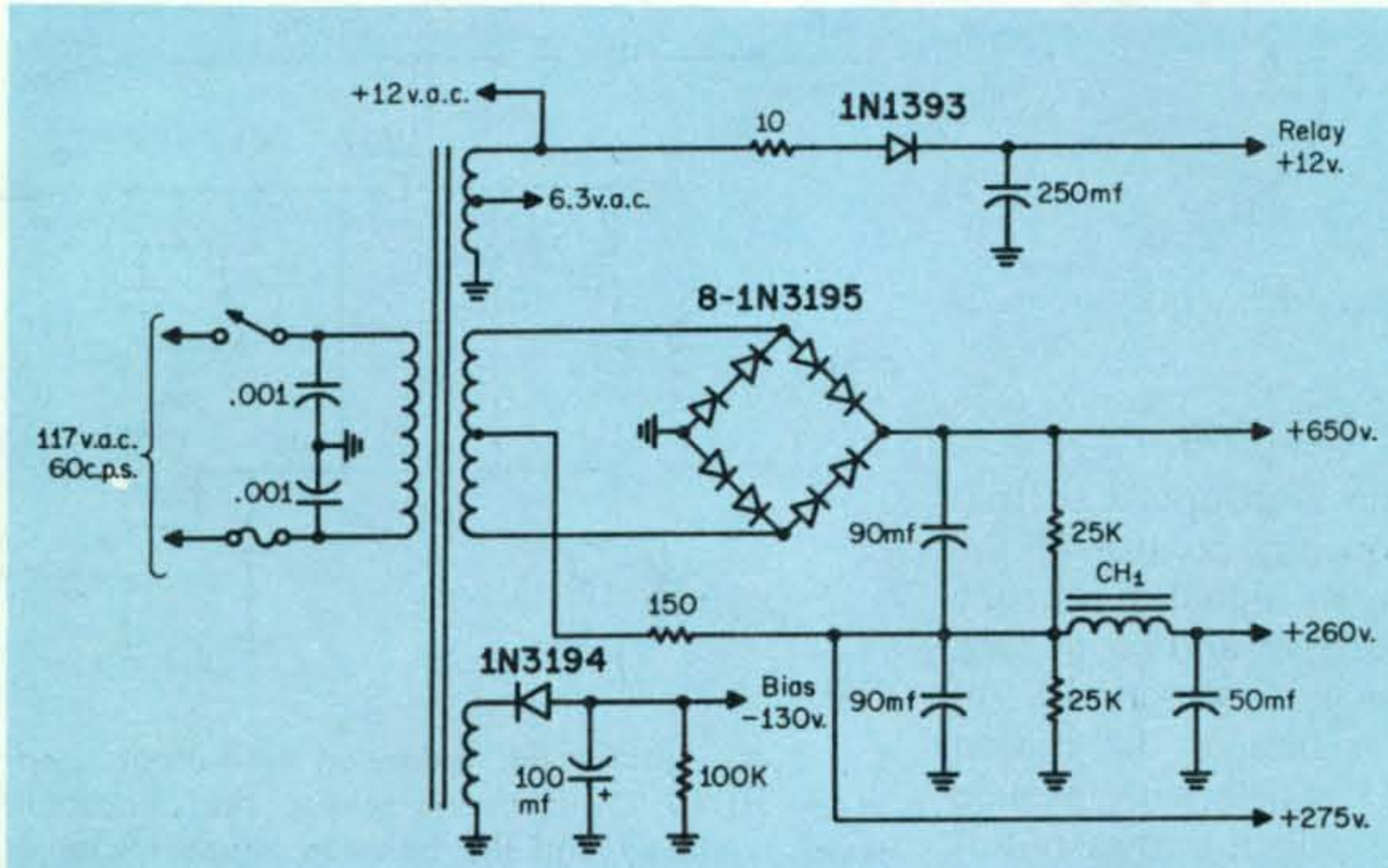


Fig. 3 — Power-supply setup for the HT-46. The p.a. plate potential of 650 v. is obtained from a full-wave bridge, one half of which functions as a full-wave center-tap rectifier for the low-voltage source. The center tap is at positive potential, rather than negative as usually is the case, due to the reversed polarity of the diodes.

125-130 watts p.e.p. on all bands with a p.e.p. input of 220 watts (120 v.a.c. line potential). On tuneup and c.w. the output was 100 watts with 175 watts input, except on 21 and 28 mc where 75 watts output was found with a corresponding decrease in input. Apparently this was due to less steady-state drive available on these bands than dynamic drive with s.s.b. voice modulation. On s.s.b. the unwanted-sideband suppression was within the rating of 50 db @ 800-2200 c.p.s., with carrier suppression a like amount. Two-tone test patterns indicated good linearity and thanks to the fast-acting amplified a.l.c., no evidence of adverse flattopping was observed during voice modulation, even with maximum mic gain.

C.w. break-in operation is not possible, as the switching between transmit and receive must be conducted manually; however, some convenience is provided by a second standby (RECEIVE) position next to the c.w. position at the function switch to eliminate the need for going through the other positions (LSB & USB) to get to the normal standby setting.

The frequency stability was essentially the same as reported for the SX-146 receiver and as such was well within the specifications of 500 c.p.s. drift in first hour after 15-minute warmup and less than 100 c.p.s. per-hour thereafter. The shift with ±10% line-voltage variation was within ±50 c.p.s. Excellent stability also was experienced under mechanical stress.

On-the-air reports of clean and good-quality signals came up to the expectations resulting from our lab tests. The set tunes up easily and handles smoothly and the fine frequency stability adds much to operating pleasure.

Either transceive-type operation in conjunction with the SX-146 receiver or independent frequency control of the transmitter by itself worked out nicely and for the latter type operation the frequency-calibrating (or spotting) arrangement works like a charm, particularly as needed for c.w. wherewith independent frequency control *must* be used in order that the receiver may be tuned for a beatnote on a received signal that is on the transmitter frequency. Needless to say, the use of independent frequency control also is handy for receiving out-of-band DX stations while you're transmitting in your own legal band.

Along with the SX-146 receiver, the HT-46 transmitter makes a neat and complete station setup, taking up scarcely more room than a conventional transceiver and its associated power supply. The setup also offers a higher degree of flexibility.

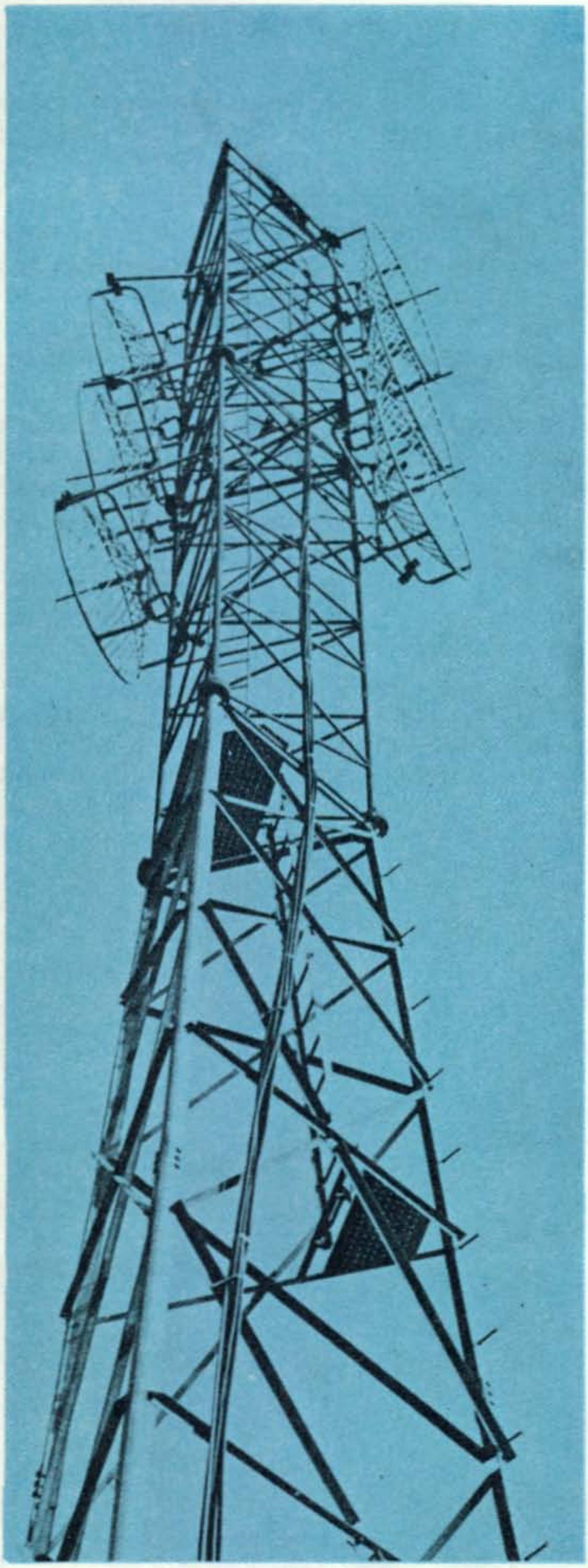
Operation of the HT-46 is not limited to use with the SX-146 only, as it will do a bang-up job as a separate and independent transmitter/exciter alongside other receivers as well.

The Hallicrafters HT-46 transmitter is priced at $369.95. Four crystals are required for complete 10-meter band coverage; only one is supplied with the unit, for 28.5-29 mc. The HA-16 Add-on V.O.X. Adapter is $37.95. The manufacturer is Hallicrafters, Inc., 5th and Kostner Aves., Chicago, Ill. 60624—*W2AEF*

MICROWAVE And the Amateur

BY BYRON H. KRETZMAN,*
W2JTP

The author tells the story of microwaves, what it is, what it is used for and what it looks like. The design and application in industry and amateur radio is also discussed.



Typical toll plaza installation of grid parabolas on an Illinois toll road system.

MICROWAVE is a broad term; it cannot be sharply defined. Like "transistor", which could mean anything from a portable radio to a solid-state amplifying device, "microwave" has many connotations, some of which can be attributed to popular usage by the non-technical public. "Microwave" could be one of those new-fangled kitchen stoves that cooks by means of r.f. energy; or, it could be the means by which radio and TV broadcast programs are carried from coast to coast, over land or by satellite. Let us see if we can pin down this elusive word.

What is it?

Literally, "microwave" means extremely small or very short wave lengths. Today we are more used to thinking in terms of frequency rather than wave length, so then it could be u.h.f. or s.h.f.—*super high frequency*. (You all are aware, no doubt, that v.h.f. is defined as 30 to 300 mc, u.h.f. as 300 to 3000 mc, and s.h.f. as 3000 to 30,000 mc.) We can't simply define microwave as anything above, say 3000 mc. That would be too easy. Actually, those of us who are in

* 431 Woodbury Road, Huntington, L.I., N.Y., 11743.

the business professionally also think of it in broad terms, possibly as those frequencies above which ordinary tubes do not work satisfactorily; perhaps those frequencies where coils and capacitors give way to short coaxial lines as circuit elements. This "grey" area could be roughly 400 to 1000 mc.

What is it used for?

Besides the limited kitchen stove application previously mentioned, the use of microwave can be divided roughly into two categories: (1)—Radar, and (2)—Communications. Let us begin with "Radar," a contraction of RAdioDetectionAndRanging. You know the most common uses; tracking aircraft, missiles, or thunder storms. Another use with which you might have had some experience, the radar speed trap. (More about this later.)

In communications, microwave is used largely for point-to-point communication; think of it as a chain with many links. Why microwave instead of telephone lines or cable? Well, for two reasons, which could be rolled into one: Accessibility and economy. It might be uneconomical to run lines or lay a cable between certain points. It might even be dangerous. (In some foreign countries wire or cable lines are immediately stolen.) Such a microwave system may carry 600 or more telephone circuits; and, in addition, hundreds of teletype or data circuits. (Yes, computers *do* talk with each other.) American Telephone and Telegraph and Western Union are the big operators here. Much of your TV is carried over A.T.&.T. microwave, too.

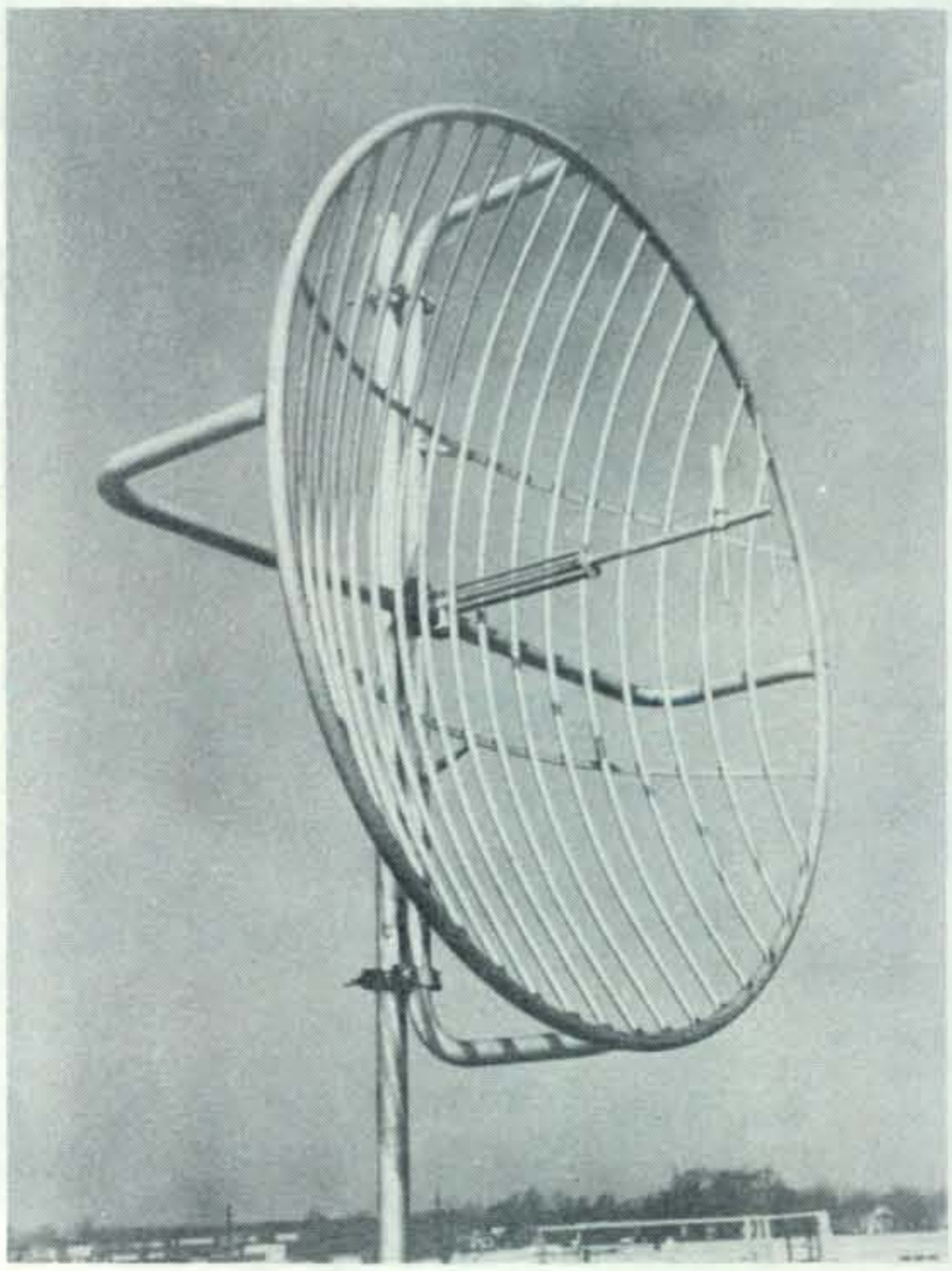
Small microwave chains may have only a few hops and may carry only five or 12 channels. The petroleum and gas pipe line companies are the big users of these "thin route" systems. Small independent telephone companies also make good use of such relatively inexpensive microwave. There is such a system on Mt. Washington, New Hampshire, used because it was not economical to string lines or a cable up the mountain. Another such system off the coast of Maine links the little fishing community islands of Matinicus and Swans Island with the mainland.

Even smaller systems, having just one hop and carrying only one voice channel plus a few tone channels for control purposes, are used by police departments to control a remote repeater station, for contact with their highway patrol cars. Such a system is used by the Suffolk County Police, providing a link between their headquarters at Hauppauge and their remote base station at Coram.

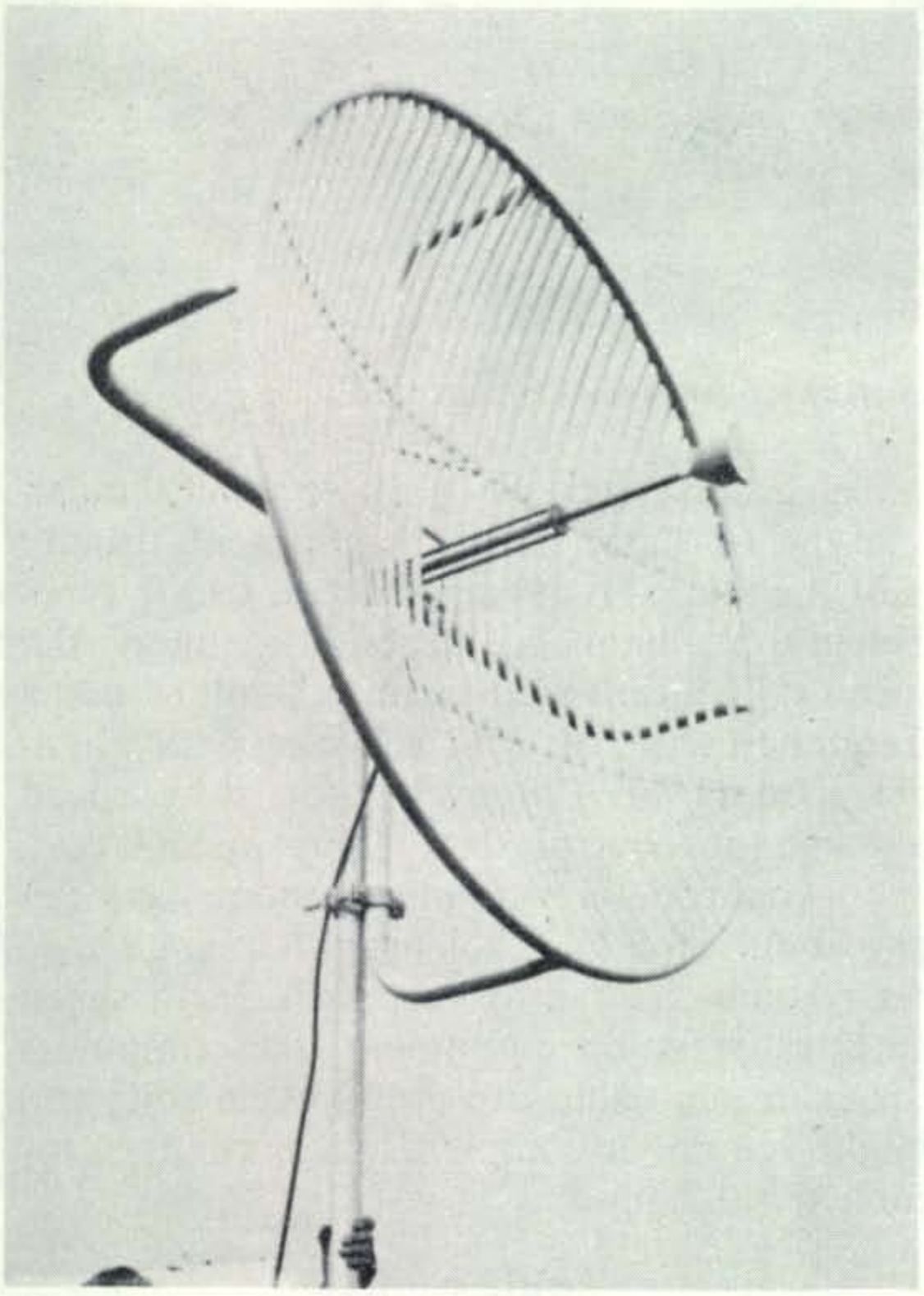
What's It Look Like?

Microwave communication systems are readily identified by their tall towers or masts and their fixed parabolic or "dish" type of antennas. You can see these along most thruways or turnpikes, particularly at toll booths and near administration or maintenance buildings. Sometimes the dishes are on the ground, alongside the tower, pointing up to a large plane reflector mounted at about a 45-degree angle near the top of the tower. These are known as "periscope" antenna systems, and sometimes the reflectors are called "fly-swatters," because that's what they look like. You may have seen such antennas at the FAA installations at Wantagh and at MacArthur on Long Island.

Radar installations are readily identified by their large semi-parabolic rotating antennas. Sometimes these are covered by a large plastic dome for protection against the weather. The traffic or speed radar you seldom see—until it's too late. It might be a small green box on a camera-like tripod,



View of a six foot grid parabola for 960 mc. Photo courtesy of Mark Products.



View of a six foot grid parabola for 1900 mc. Photo courtesy Mark Products.

just off the side of the road. A patrolman could be sitting on a camp chair nearby. Or, you might see, if you look real close, a parked and unmarked patrol car with a strange-looking "spotlight" mounted on its cowl. (It's really a tiny parabolic reflector antenna.)

Frequencies

Where are all these microwave stations, frequency-wise, in respect to our amateur bands? First of all, our bands (in this "microwave" region) are: 420-450 mc, 1215-1300 mc, 2300-2450 mc, 3300-3500 mc, 5650-5925 mc, 10,000-10,500 mc, 21,000-22,000 mc; and, everything above 40,000 mc.

Radar bands are given letter designations, the most common of which are, in the order of frequency: L-Band 1120 to 1700 mc; S-Band 2600 to 3950 mc; C-Band 3950 to 5850 mc, X-Band 8200 to 12,400 mc, and K-Band 18,000 to 26,500 mc. Traffic control speed radar operates at 2455 mc or at 10,525 mc.

Under the heading of communications, simple control and repeater stations operate in the 450 to 470 mc region. Thin route systems usually use 952 to 960 mc or 1850 to 2200 mc. Most commercial high-density systems, those with hundreds of channels, operate about 6000 to 7000 mc, except that A.T.&.T. also uses 3700 to 4200 mc for their high-density and TV cross-country TD-2 system. Other commercial bands for high-density or TV exist around 11,000 to 18,000 mc, however these bands are less used for technical and economic reasons.

Band	Frequency (mc)	Waveguide Size
L	1120 to 1700	6.6" × 3.4"
S	2600 to 3950	3" × 1½"
C	3950 to 5850	2" × 1"
X	8200 to 12,400	1" × ½"
K	18,000 to 26,500	½" × ¼"

Microwave Bands.

Emission

Radar emissions are generally of the pulse type. The microwave radar transmitter emits a short high power pulse of r.f. Concentrated into a very narrow beam, it bounces off a target and returns to the receiver, connected to the same antenna. Of course the reception takes place in between transmitted pulses. The time it takes the pulse to return is translated into distance from the target, and the rotation of the antenna permits the direction to be determined. The information gained is usually displayed upon a cathode ray tube in the form of a map.

Speed radar is almost a completely different device. Its emissions are not pulsed, but are c.w. The beam is relatively broad and is pointed in the general direction of the traffic flow. A companion receiver also connects to the antenna, but via a hybrid ring which nulls out the transmitter. The beam bounces off a moving car and returns to the receiver, but it is not nulled out because the carrier phase and frequency has been changed due to the Doppler effect; and, the frequency difference depends upon the speed of the car. The difference is audio and can

Region	Frequency (mc)
U.H.F.	420 to 450
U.H.F.	1215 to 1300
U.H.F.	2300 to 2450
S.H.F.	3300 to 3500
S.H.F.	10,000 to 10,500
S.H.F.	21,000 to 22,000
E.H.F.	all above 40,000

Amateur Microwave Bands.

7/8" Heliax® Coaxial Cable. Photo courtesy of Andrew Corporation.

easily be measured by means of a counter-type audio frequency meter calibrated in miles-per-hour rather than in cycles. While an ordinary meter movement permits visual reading of speed, there is also connected a pen-recording type of meter, such as an Esterline-Angus, which provides legal evidence for court room use.

Microwave communications emissions are most likely f.m. although there are some systems which utilize pulse time modulation or pulse code modulation. Depending, of course, upon the band used and the FCC regulations that go with it, the transmitter and companion receiver are capable of transmission of an extremely wide baseband—up into the hundreds of kilocycles. This means that many voice channels can be carried, each one with its own carrier frequency. The channelizing equipment is called "carrier equipment," and the super-imposing of these extra channels on the microwave is called "multiplexing."

Voice frequency carrier equipment, itself, may be double sideband a.m., double sideband suppressed carrier, single sideband suppressed carrier, or f.m. The double sideband a.m. is the least complicated and the least expensive, so it is used mostly on thin route systems where only a few channels are required. The single sideband carrier is the most expensive, but it is used to conserve baseband spectrum where a large number of channels are required. Most large multichannel systems also use some form of synchronization by transmitting a "pilot" carrier from which all mixers are fed or to which all oscillators are locked. The object here is to eliminate the translation frequency error which would cause distortion.

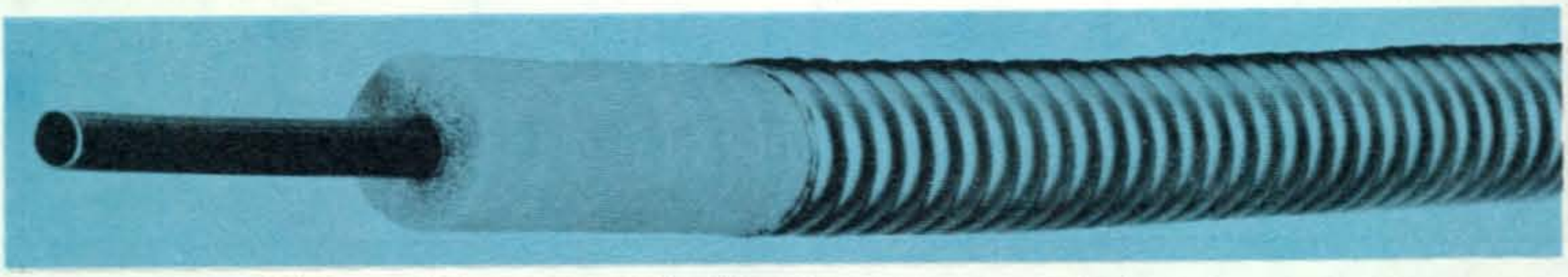
Telegraph, and by this we really mean teletype or data, carrier equipment usually is of the audio frequency shift (a.f.s.k.) type. Telegraph channels, depending upon the speed of transmission required, might use a frequency shift of ±42.5 cycles with channel spacing of 170 cycles for slow speed teletype or control data. This means that, in a synchronous multiplex system, you can put about 16 a.f.s.k. telegraph channels into *each* voice channel, if you wish. High speed data transmission equipment, for computers for example, could use ±600 cycle shift and might require a complete voice channel for each data channel.

Equipment

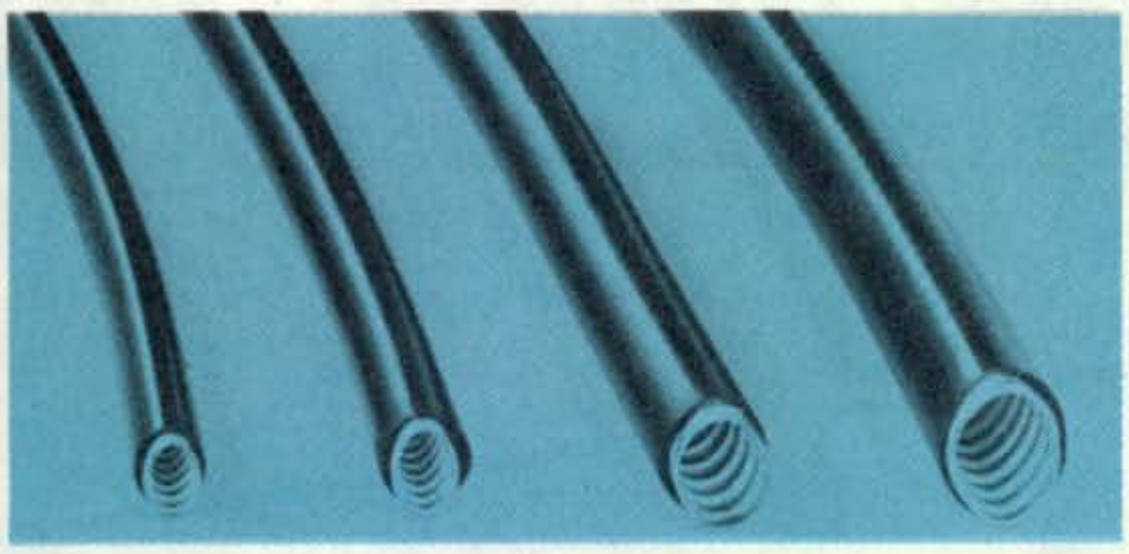
In broad terms, radar equipment may use special tubes such as klystrons and magnetrons to generate the high power pulses required. A klystron is also used frequently as the local oscillator in a microwave superhet receiver which usually uses a crystal diode first mixer. Transmission lines are wave guide needed to handle the high power. An "L-Band" (1120 to 1700 mc) radar wave guide has a cross section of 6.6 × 3.4 inches. Very expensive, naturally.

Communications equipment for the lower microwave bands, say 450 to 2300 mc, is not much different from the mobile f.m. two-way radio gear used by taxis and the police. The difference mainly is in the tubes or semiconductors used and by the fact that tuned lines are used instead of coils. In other words, a transmitter has a crystal oscillator, a phase or frequency modulator followed by a multiplier string, and a power amplifier or diode "varactor" output stage.

Receivers are superhets. A stage of r.f.



7/8" Foam dielectric coaxial cable. Photo courtesy of Andrew Corporation.



Flexible eliptical waveguide. Photo courtesy of Andrew Corporation.

amplification may be used at 450 and even 960 mc, but at 2300 mc the antenna usually feeds a crystal mixer through several cavity filters.

For the bands above 2300 mc, klystrons are generally used in self-excited oscillator circuits, perhaps with automatic frequency control. Some of the latest state-of-the-art equipment is all solid state, using the technique of the crystal oscillator followed by multiplier stages. The receivers are still superhets, but with a crystal controlled oscillator chain instead of the klystron as the local oscillator.

Because communications microwave transmitters are very low power, compared to radar, coaxial cable is used as antenna transmission lines up to about 2600 mc. This is much less expensive than wave guide. Coax used is mostly ⅞" diameter and may be foam filled or air filled, using a spiral-wound spacer. At 2000 mc, loss in the spiral-wound cable is in the order of a very reasonable 2 db per 100 feet, while the loss in the foam coax is a little over 3 db per 100 feet. The spiral-wound cable costs just a bit more than the foam filled cable, but dry-air pressurization equipment is required to prevent internal condensation. It is general practice to use wave guide in the 6000-7000 mc band but with the "periscope" technique of mounting the parabolic antenna on the ground and using a reflector on the top of the tower. 12,000 mc equipment may be mounted right behind the parabola to eliminate just about all line losses.

A new development, elliptical wave guide, is now manufactured in the form of semi-flexible cable, so it now becomes practical to eliminate the "fly-swatter" reflector by mounting the antenna at the top of the tower. Of course, the economics and engineering must be carefully considered, taking into account the losses permissible balanced against the length of line which must be used.

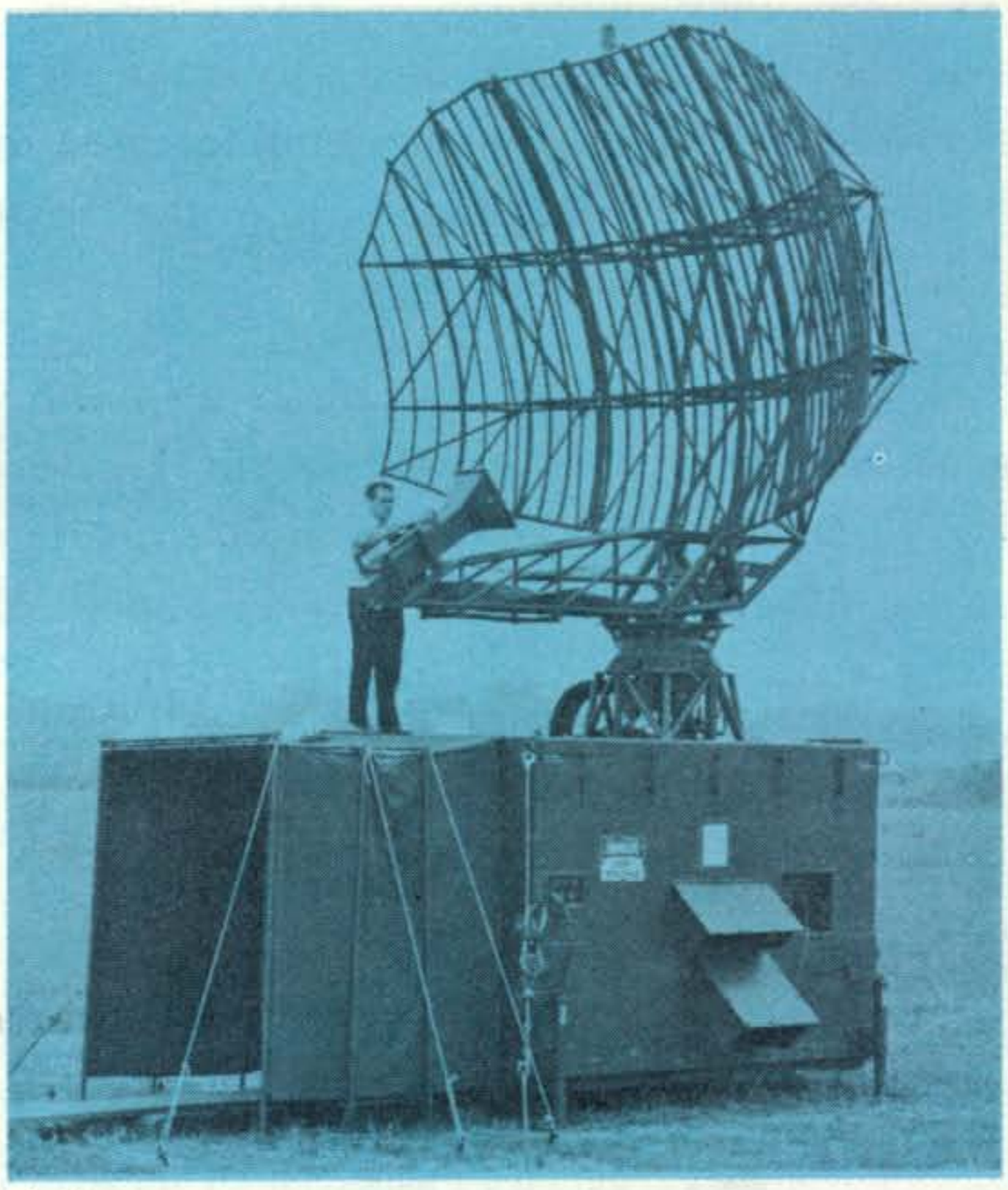
Summation

We have tried to tell you the story of microwave; what it is, what it is used for, and what it looks like. We have also told you a little bit about the design of the equipment. How does all this fit into amateur radio? Let's give a quick glance at both the present and the future.

For the present, large quantities of 450-470 mc f.m. gear is now becoming available to us at low prices because the FCC has obsoleted the present commercial equipment by splitting channels from 50 kc spacing to 25 kc spacing. We are using this gear right now as "microwave" links to control 2 and 6 meter f.m. repeater stations, and without much modification. Also, the last OSCAR satellite used the 420/450 mc band.

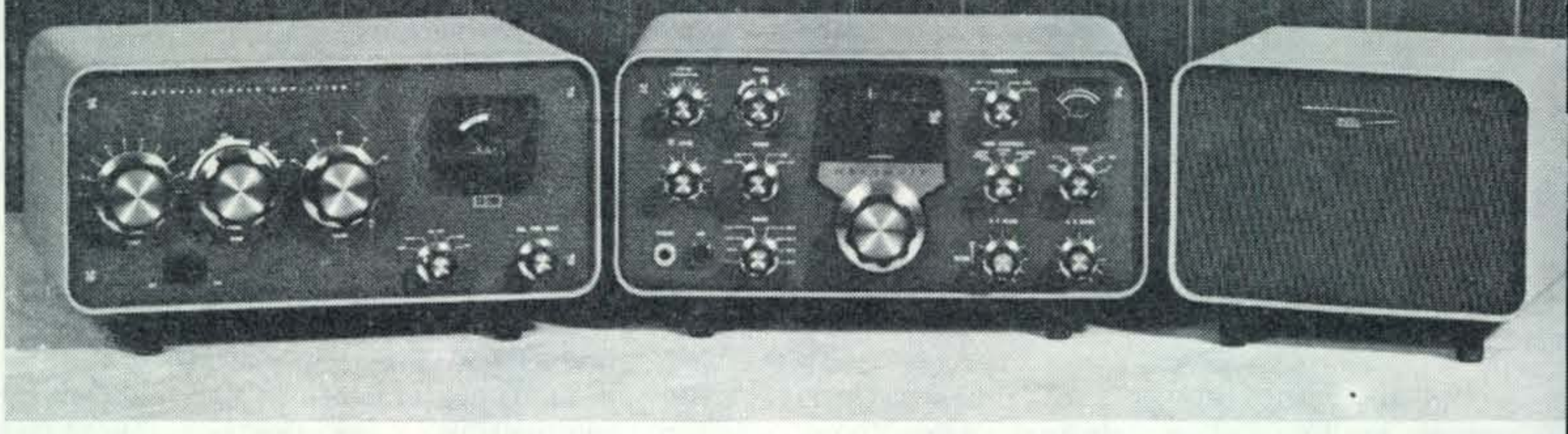
For the future, we can reach the 1215/1300 mc band by using one of the above commercial surplus transmitters to drive a varactor tripler. The next OSCAR may use this band. And, don't forget moon bounce.

Those of you younger fellows looking forward to a future in "radio" would do well to train yourselves in microwave. The experience you gain in modifying, in building, and in using the amateur microwave bands will be of vast use to you and your employers in industry. ■



Typical semi-parabolic rotating radar antenna, in this case, that of the AN/TPS-44 Radar Set. Note, next to the man, the size of the "L-Band" waveguide and the horn feed. Photo courtesy of Cardion Electronics Inc.

NOW FACTORY ASSEMBLED THE WORLD'S MOST POPULAR RIG



The HEATHKIT® SB-101 Transceiver and SB-200 KW Linear Plus Accessorie

In Answer To Your Requests . . . now those of you who just can't spare the time for "do-it-yourself", can purchase the SB-101 Transceiver and SB-200 KW Linear factory assembled and tested ready for operating the moment you unpack them. For those who want to save the most, these units also will continue to be available in kit form. Either way, you get the renowned SSB performance and features that have made the Heath SB line the fastest selling rigs on the air.

The following related accessories also will be available factory assembled or in kit form: HP-13 DC Power Supply (for mobile operation of the SB-101), HP-23 AC Power Supply (for fixed station operation of the SB-101), and SB-600 Communications Speaker (matches appearance of SB line and has space for installing the HP-23 AC power supply).

SB-101 80-10 Meter SSB Transceiver

• 180 watts PEP, 170 watts CW • Switch select Upper or Low sideband or CW • CW sidetone • PTT or VOX • Linear Mas Oscillator with 1 kHz dial calibration (resettable to 200 Hz) Provision for switch selection of optional SBA-300-2 CW fil • Provision for external LMO • Separate CW offset carrier crys • 100 kHz calibrator

Assembled SBW-101, 23 lbs., write for terms..... **$540.**
Kit SB-101, 23 lbs..... **$360.**

SB-200 80-10 Meter KW Linear Amplifier

• 1200 watts PEP, 1000 watts CW • Drives with 100 watts Built-in SWR meter, antenna relay, solid-state power supp • ALC • Shielded, fan-cooled amplifier compartment • Pr tuned cathode input • Circuit breaker • 120/240 v.

Assembled SBW-200, 41 lbs..... **$320.**
Kit SB-200, 41 lbs..... **$220.**

SB-600 Communications Speaker

• Styled to match SB series • For fixed station use • 8 oh speaker with shaped 300-3000 Hz response • Has space HP-23 power supply

Assembled SBW-600, 5 lbs..... **$24.**
Kit SB-600, 5 lbs..... **$17.**

HP-13 Solid-State Mobile Power Supply

• Supplies voltages for SB-101 • Provisions for remote operati (can be located in engine compartment) • Circuit breaker pr tection • 12 to 14.5 VDC input (neg. ground only)

Assembled HPW-13, 7 lbs..... **$89.**
Kit HP-13, 7 lbs..... **$64.**

HP-23 Solid-State Fixed Station Power Supp

• Supplies voltages for SB-101 • Excellent dynamic regulati • Fused primary • Can be installed inside SB-600 speaker ca

Assembled HPW-23, 19 lbs..... **$64.**
Kit HP-23, 19 lbs..... **$49.**

FREE 1967 CATALOG

Describes these and over 250 kits for stereo/hi-fi, color TV, amateur radio, shortwave, test, CB, marine, educational, home and hobby. Save up to 50% by doing the easy assembly yourself. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.

HEATHKIT®

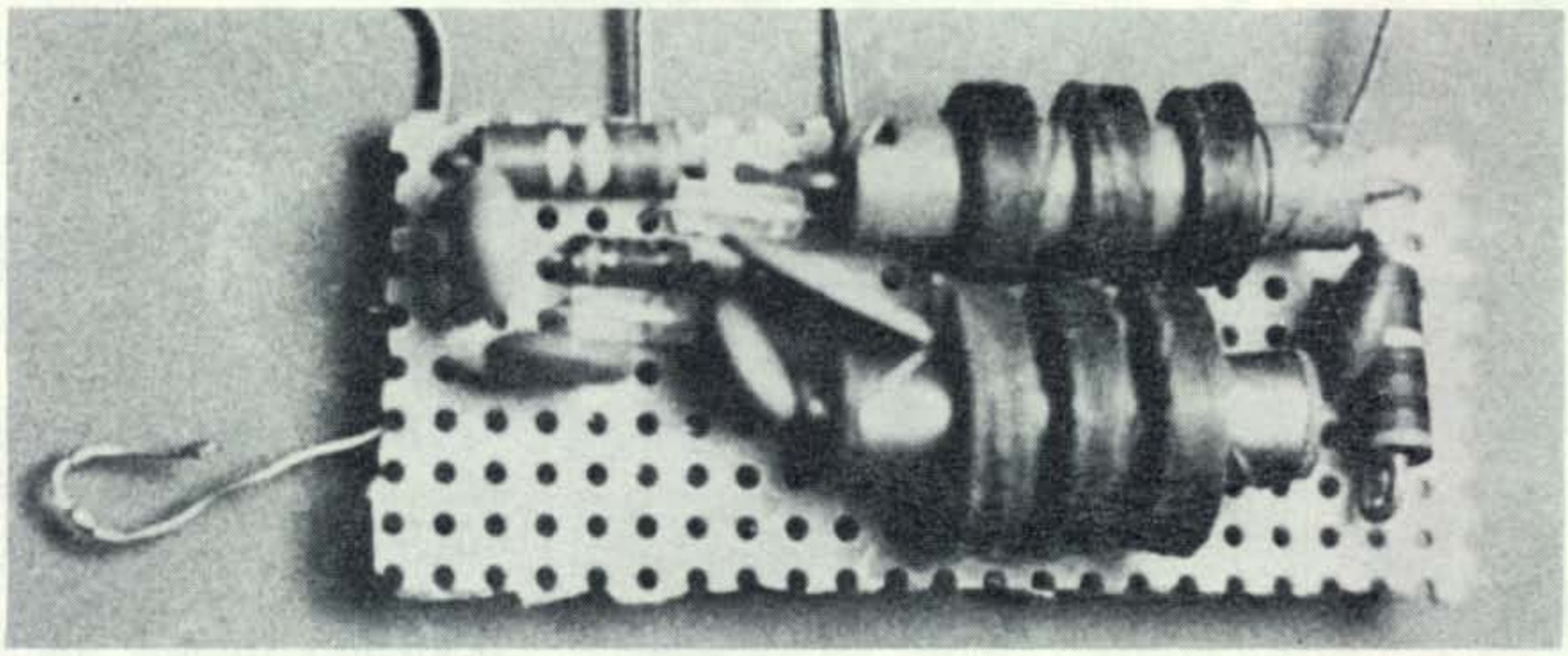
HEATH COMPANY, Dept. 12-8
Benton Harbor, Michigan 49022

☐ Enclosed is $_____, plus shipping.
Please send model (s)_____
☐ Please send FREE Heathkit Catalog.

Name_____
(Please Print)
Address_____
City_____ State_____ Zip_____

Prices & specifications subject to change without notice. AM-182

For further information, check number 28, on page 126



Top view of the diode attenuator showing the simple construction technique. The three diodes may be seen in the upper left hand corner.

THE DIODE R.F. ATTENUATOR

BY JOHN J. SCHULTZ,* W2EEY/1

It is not uncommon to find diodes used for rectification, switching, or as variable capacitances. The diode can also be used as a variable resistance and can form a simple electrically variable T pad attenuator used to improve the cross-modulation characteristics of a receiver.

VARIOUS general purpose diodes exhibit interesting dynamic resistance characteristics, depending upon the amount of current flow through them (fig. 1). In effect, over a certain operating range, they can be made to act as current-controlled resistance elements. This type of operation is different than when the diodes are used only as switching elements. In such an application they are forward biased sufficiently to produce low dynamic resistance and then, in the opposite state, reverse biased sufficiently to provide a very high impedance condition simulating an open circuit. The dynamic resistance variation between these extremes depends upon the characteristics of a particular diode but over a rather wide resistance range can be fairly linear.

Of particular interest in the two extreme states of diode operation are the minimum resistance and the maximum capacitance. When forward biased sufficiently, the diode should present a very low resistance of not more than a few ohms to simulate a short circuit. When reverse biased many diodes will present sufficiently high resistances but the elements of the diode still present a capacitive effect. In order not to disturb an r.f. circuit, this capacitance should be as low

*40 Rossie Street, Mystic, Connecticut 06355.

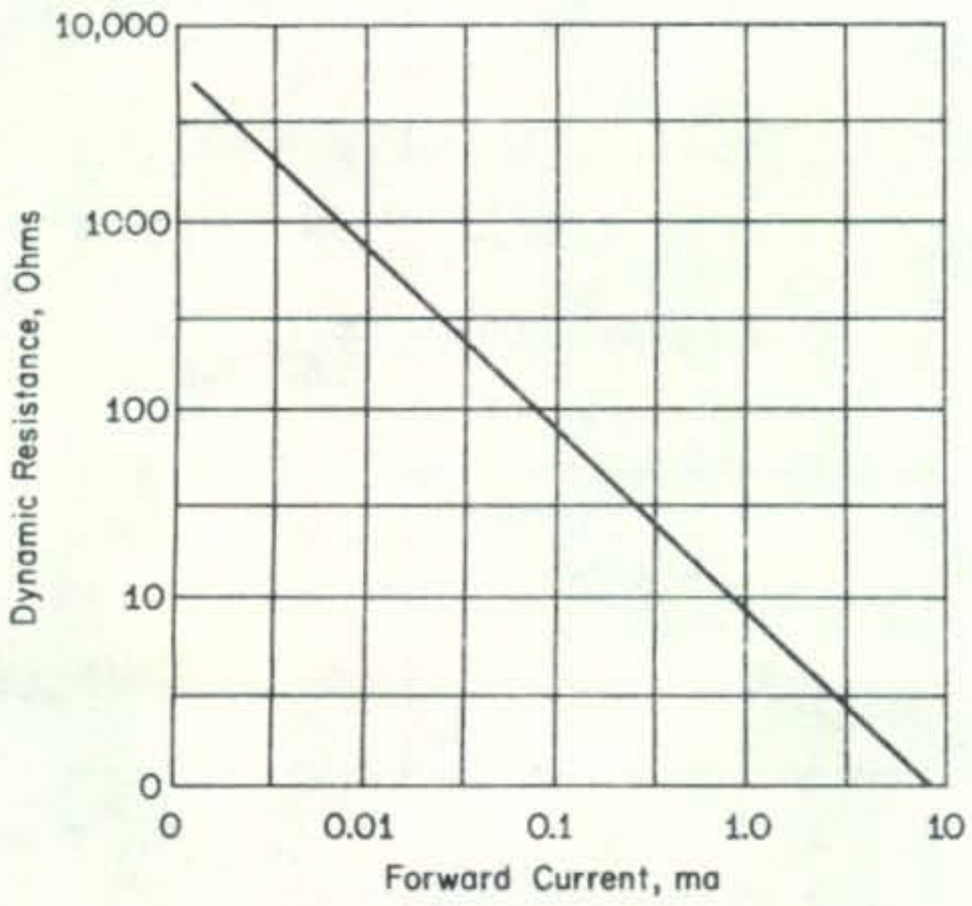


Fig. 1—Forward resistance characteristics of the general purpose IN527 germanium diode. Note that the resistance ranges from a low of 10 ohms or less to a high of 5 to 8K.

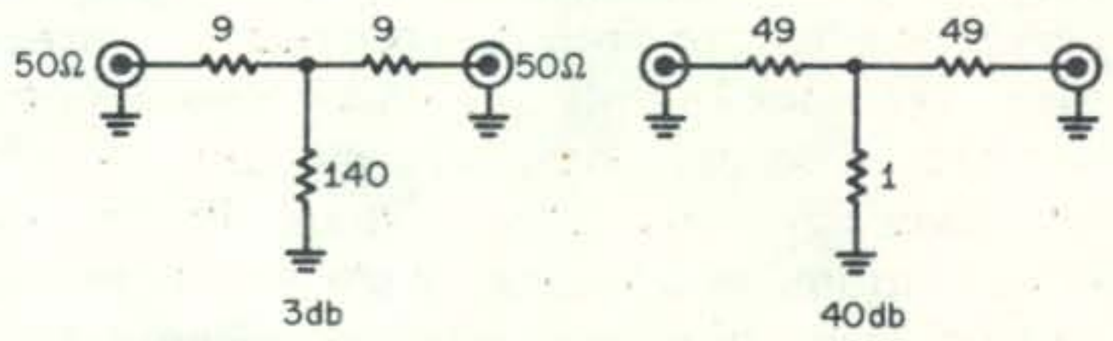


Fig. 2—The two "T" pad circuits shown above are able to provide a 3 db or 40 db attenuation. All that is necessary is a variation of resistance in the three legs of the circuit.

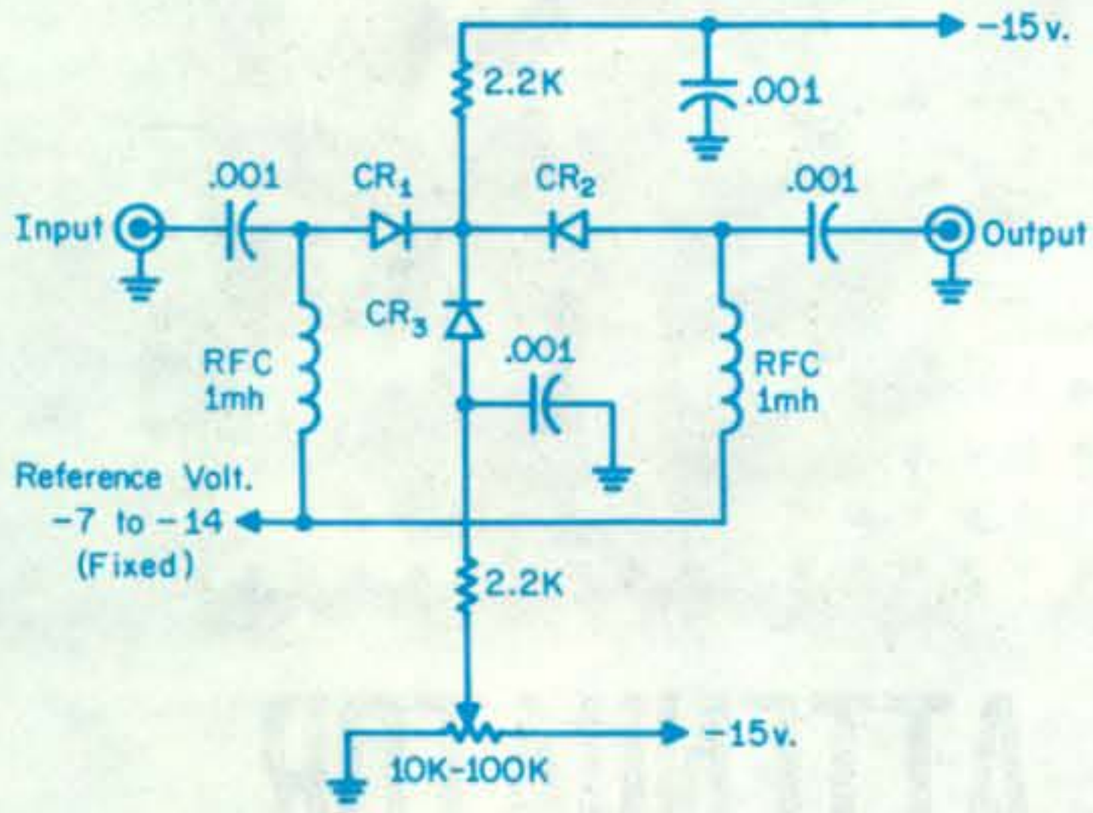


Fig. 3—Circuit of a variable attenuator using diodes and a d.c. control voltage for an effective range of less than one db to over 40 db. Either 1N527 diodes or 1N840 diodes may be used.

as possible, a maximum of a few microfarads.

Diodes which do meet the requirements of low forward resistance, fairly linear dynamic resistance variation and low maximum capacity are fairly common and inexpensive. This article concentrates on the use of such diodes in one very common and useful application, a "T" pad r.f. attenuator, but the reader can apply the principles shown to other circuits where a remotely-controlled resistance element is needed.

Figure 2 shows the resistance range required for the legs of a 50 ohm "T" pad going from 3 to 40 db attenuation. The use of such a pad directly between the antenna and the first tuned circuit or between the first tuned circuit and the r.f. amplifier stage in commercial transistorized communications receivers is very common and can well be adapted to amateur equipment, either to supplement or replace the conventional r.f gain control. The main advantage of introducing attenuation in this manner is that cross modulation can be much more effectively prevented on strong input signals which exceed the a.v.c. control range. There is also some advantage, as far as noise in the receiver is concerned, in having the receiver stages continue to operate at maximum gain while only the input signal level is reduced to accommodate the receiver input level capability. Under unusually strong signal input conditions, such as when a nearby transmitter operates simultaneously, the attenuator also acts to prevent first-stage burnout.

Variable Attenuator Circuit

Ganged-potentiometers can be used to achieve the resistance range shown in fig. 2 but few types are sufficiently non-inductive up to any appreciable frequency. The usual solution is to use fixed resistors, switching in various values to give attenuation, as desired, in 5 to 10 db steps.

The diode attenuator of fig. 3 (A) offers several advantages over any of these methods. Once adjusted properly, the circuit will provide a smooth attenuation variation from less than a db to over 40 db. When biased to cut-off, the diodes effectively open up the input circuit. This can be controlled by contacts on a send-receive relay to protect the first-stage in the receiver. Only one conventional potentiometer is needed to control the attenuator and since only a d.c. voltage control is involved, the control may be located on the front panel of a receiver while the diode attenuator is located where it will be most effective, directly at the antenna input terminals.

Figure 4 shows the two extreme states of the diodes in the attenuator. When the control potentiometer is set for minimum attenuation (fig. 4 (A)) the two diodes (CR_1 and CR_2, in series for the r.f. circuit (but in parallel for d.c. current control) are forward biased to present a very low resistance while the diode directly in the d.c. potentiometer circuit is back-biased for maximum resistance.

[*Continued on page 116*]

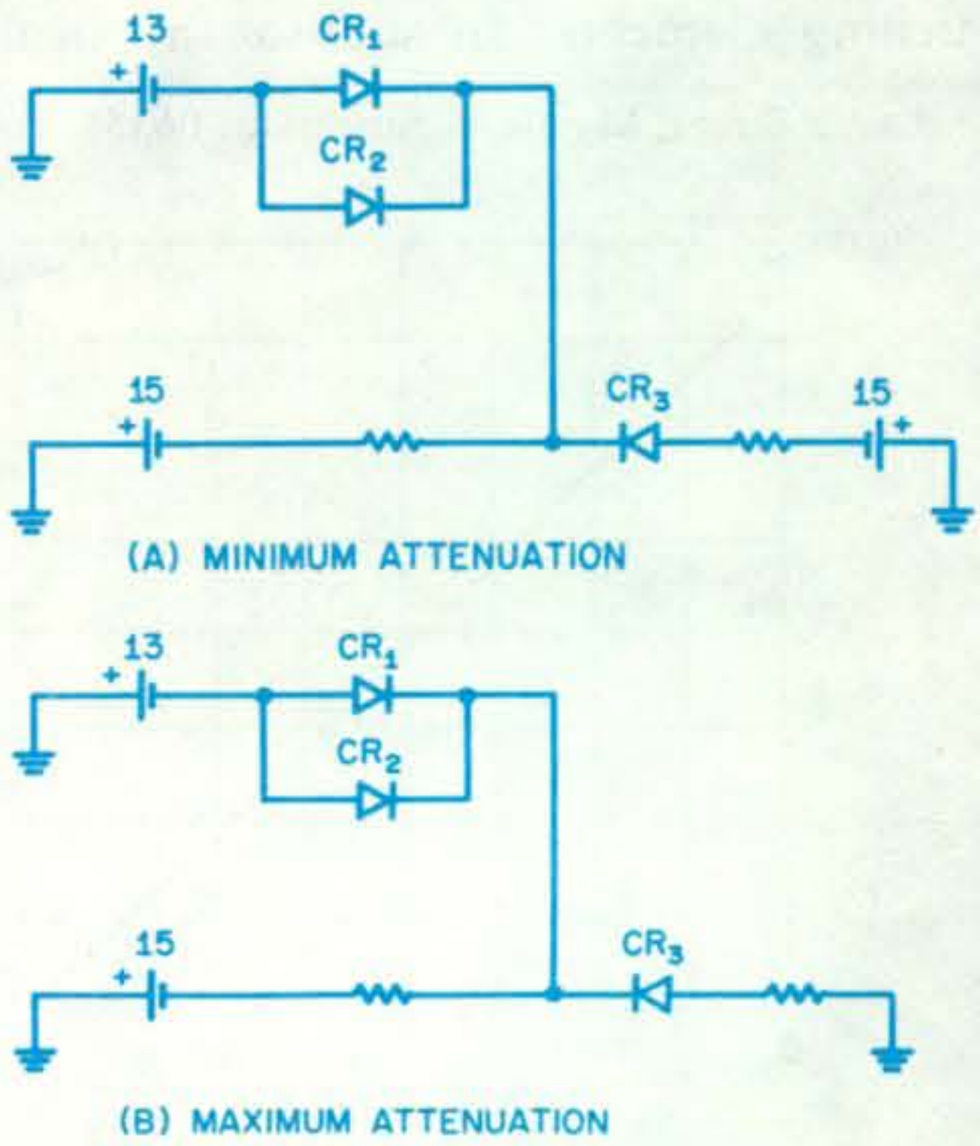


Fig. 4 (A)—The d.c. equivalent of the attenuator circuit at minimum attenuation is shown above. (B) The equivalent circuit for maximum attenuation.

A FAST TUNING SPINNER KNOB

BY WILFRED M. SCHERER,* W2AEF

MANY of the present-day amateur-band-only receivers tune over a 500 kc range which is usually done with a high-ratio tuning control, especially to make it easier to tune in s.s.b. signals. A large number of revolutions of the tuning knob is thus required when the receiver frequency is shifted from one end of a band to another, making the job somewhat laborious and inconveniently slow. This is the case with the Heathkit SB series; however, the situation can be alleviated by modifying the tuning knob with a cranking handle for rapid and easy rotation when large frequency excursions are to be made.

The modification may be accomplished as follows:

1. Remove the knob from the equipment and place the knob on the bench, resting it on the skirt.

2. Referring to fig. 1, at the top of one of the serrations between the flutes of the knob, file a slot in the ridge that circles the top of the knob, so that the bottom of the cut-out portion is flush with the top of the serration and with the metal insert on the face of the knob. Place a round piece of heavy paper (such as that from an index-file card) over the metal insert to prevent its being scratched.

3. Drill a #36 hole at the top of the serration, exactly at the point indicated. The location should first be pricked with a center punch. It also will be best to first use a smaller drill and then enlarge the hole with the #36 size. The top surface of the knob is only about ⅛" thick, but run the drill through to a depth of about 5/16". Use of a drill-press will ensure proper alignment of the hole, but where one is not available, have someone else hold the knob in place on the

[*Continued on page 117*]

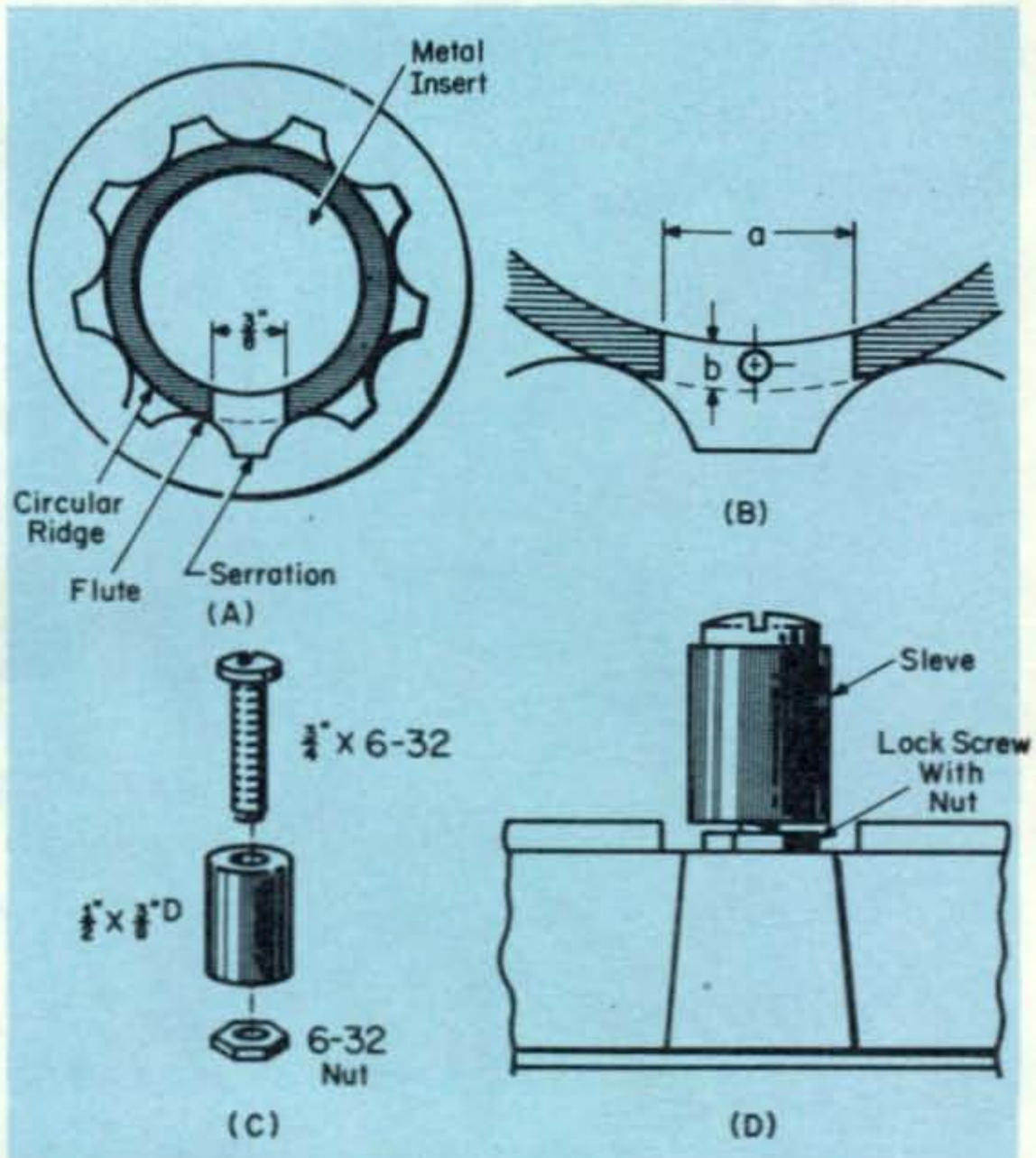


Fig. 1—Mechanical details for modifying Heathkit SB-series tuning knob. A—File 3/8" wide slot in circular ridge, making it flush with the top of the serration and the metal insert. B—Drill #36 hole exactly centered between dimension *a* and dimension *b*. Thread hole with 6/32 tap. C—Pass screw through sleeve and thread nut on screw *almost* up to the sleeve. D—Thread screw into the hole and lock with nut as described in text.

*Technical Director, *CQ*.

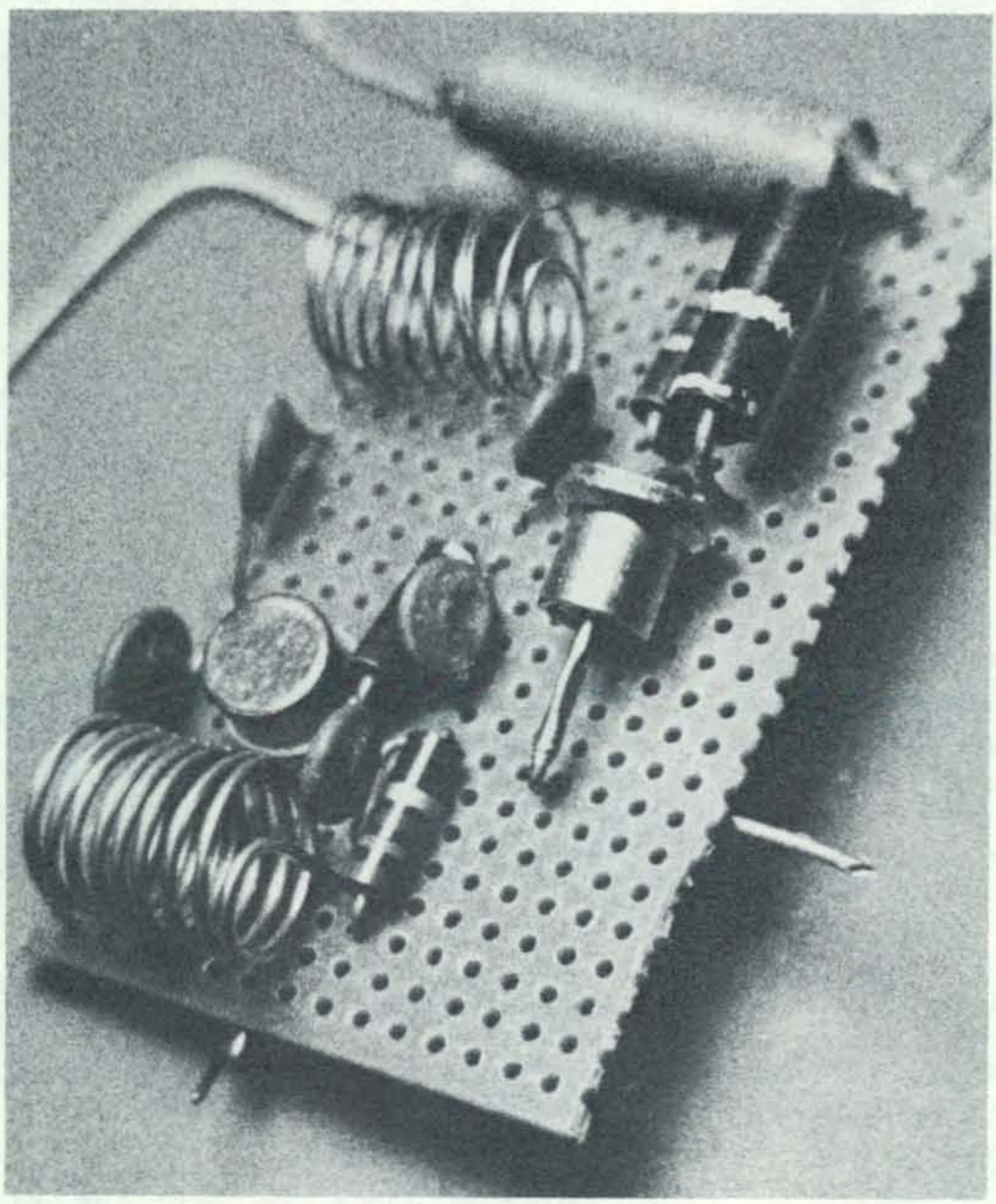
A MAST MOUNTED F.E.T. PRE-AMP

BY JOHN J. SCHULTZ,* W2EEY/1

The F.E.T. transistor preamplifier described in this article was especially designed to be mounted on a mast as close to the antenna as possible. Provisions are made for switching around the preamplifier and supplying operating power over the same coaxial cable that is used for the antenna transmission line. No additional control or power cables are necessary.

MANY receiver and transceiver front-ends exhibit poorer performance on 10 or 15 meters either in terms of sensitivity or image rejection. A preamplifier is the usual solution to such a problem. Of course, the best location for such a unit would be at the antenna terminals since it would compensate for the attenuation characteristics of the line, which increases with frequency and can be appreciable when coaxial cable is used for long runs. The preamplifier can also raise the signal level to reduce the effect of noise pickup on the line. The problems associated with such a mounting for the preamplifier are that power must be fed to the unit and some switching provision must be made for bypassing the one-band amplifier when used with a multi-band antenna. It may also be necessary to bypass the amplifier on the band for which it is designed in case strong local signals should overload the preamplifier.

*40 Rossie Street, Mystic, Connecticut 06355.



F.E.T. amplifier assembled on vectorboard section. Transistor is near the input coil in the foreground. Top-hat device is the zener diode regulator. The r.f. choke is at the rear.

These problems are solved nicely by the F.E.T. preamplifier shown in fig. 1. The normal coaxial cable used with the antenna is utilized also to deliver d.c. power for the amplifier itself and for energizing a transfer relay.

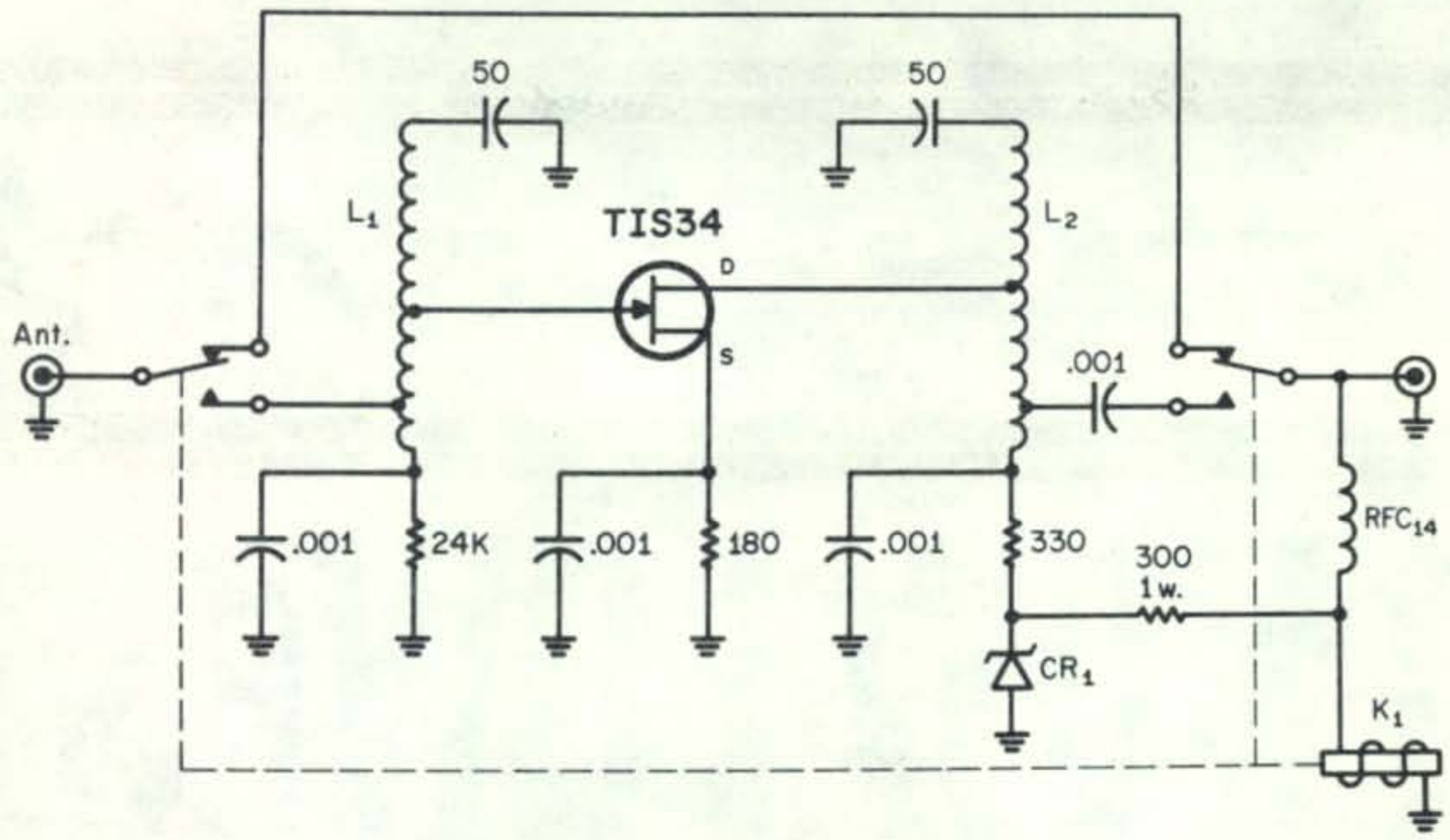


Fig. 1—Circuit of the 10 meter F.E.T. preamplifier designed for operation at the antenna. The relay contacts are shown in the bypass position and the relay may be wired for this position in the energized or deenergized state as discussed in the text. Resistors are 1/8 or 1/4 watt composition types and the capacitors are 250 volt disc types.

CR_1—12 volt Zener diode, 1ZF12T10 or equiv.
K_1—D.p.d.t. relay, 24 v.d.c. coil, 130 ohms.
L_1 L_2—9t #18, 3/8" dia., coax tap at 1½ t., transistor tap at 4t. See text for winding length.

Circuit

The amplifier circuit uses an *N* channel TIS34 silicon F.E.T. in an unneutralized common source circuit. The circuit is relatively simple but still provides good performance. The gain is about 10 db and the noise figure should be 5-8 db, which is certainly sufficient for most 10 and 15 meter applications since the noise figure is better than most receiver front-ends exhibit on these bands. The same circuit can also be used on 6 meters and possibly on 2 meters although neutralization may be required and the noise figure on 2 meters is somewhat high if a good receiver is being used. The preamplifier will certainly not improve the weak-signal reception capability of a receiver if its noise figure exceeds that of the receiver r.f. amplifier stage.

The input *LC* circuit is tuned for one end of the desired band of frequencies to be amplified and the output *LC* circuit is tuned for the other end of the band. For instance, for 10 meters, L_1 will be adjusted by varying the spacing between the turns to resonate at 28.5 mc with the fixed 50 mmf capacitor. Inductor L_2 would be similarly resonated for 29 mc (or 29.7 mc. if entire 10 meter coverage were desired). Alternatively, the 50 mmf capacitors shown could be replaced by variable units but the increased cost does not seem warranted for the slight improvement in ease of adjustment. The adjustments need not be done with the preamplifier mounted on the mast but can be done in the workshop using a grid-dip meter or a receiver and signal generator. The amplifier is energized and the input and output terminations are suitably loaded by 50 ohm resistors or otherwise properly matched. The adjustments made to resonate the input and output circuits should then remain valid when the preamplifier is mounted in place providing the transmission line operates at a low s.w.r.

Operating power for the amplifier is simply supplied over the coaxial transmission line by using a blocking capacitor and r.f. choke both at the output of the amplifier and at the receiver end to separate the r.f. and d.c. paths. The 12 volt zener diode shown in the drain circuit of the amplifier would not normally be necessary but is used to maintain the supply voltage for the amplifier constant at 12 volts d.c. when the d.c. voltage on the coaxial line is raised to a sufficient value (24 volts) to energize the bypass relay.

The zener diode may not be necessary if other F.E.T. types are used which can safely take a higher voltage but, the zener is useful even then to stabilize the amplifier operating voltage and to possibly prevent any

[*Continued on page 122*]

EXTRA

CQ NOW LOWEST PRICED HAM MAG!!

Port Washington, N.Y., August 1, 1967—Effective this date, CQ magazine is officially the lowest priced amateur radio magazine published in the United States. A recent increase by QST to $6.50 per yearly subscription and by 73 Magazine to $5.00 per year, places CQ as the lowest priced, best buy in the ham radio field.

Circulation Manager Hal Weisner, WA20BR explains this situation by pointing out that not only does CQ undersell QST by 30%, but it offers readers a $4.00 saving on subscriptions as opposed to a mere $2.20 saving on 73. In addition, CQ offers numerous free bonanza bonus premiums to subscribers, as well as a policy of absolutely free classified advertising space to subscribers throughout the duration of their subscriptions. This means that subscribers may advertise in the classified section free of charge every single month, a potential savings of up to $30.00.

What's more, he points out, CQ is the only ham radio magazine that's been increased in number of pages, has gone to a perfect binding with a four color cover and color throughout. Not only that, he adds, but CQ is mailed to subscribers in handsomely printed white envelopes for faster handling and better insurance against damage in the mails.

So all you CQ subscribers, be proud. You've taken advantage of this year's BEST BUY.

BONANZA!

1. **100 UNIVERSAL QSL CARDS** handsomely printed in 2 colors on fine quality stock. This #200 value is free with a bonanza subscription.
2. **W9IOP's Famous "SECOND OP",** valued at $1.00 is free with a bonanza subscription.
3. **1" x 3" CALL LETTER BADGE,** handsomely engraved with your call and valued at $1.50 is free with a bonanza subscription.
4. **A SHURE REACTANCE SLIDE RULE,** valued at $1.00 and is free with a bonanza subscription.
5. **TEPABCO** package of 3 plastic QSL holders. Each holds 20 cards; fine for WAZ WAS displays. Valued at $1.00 it is free with a bonanzo subscription.
6. **RAND-MC NALLY** Panoramic Map of the U.S.; a topographic map masterpiece 38" x 52" in full color is perfect for framing. A $2.00 value, it is free with a bonanza subscription.
7. **RAND-MC NALLY** 50-state U.S. Map showing boundaries, cities, towns and major roads is 38" x 52" in full color. Valued at $2.00 it is free with a bonanza subscription.
8. **RAND-MC NALLY** World Portrait Map showing the surface textures of the Earth is 38" x 52" in full color and suitable for framing. A $2.00 value, it is free with a bonanza subscription.
9. **RAND-MC NALLY** Cosmopolitan World Map showing all national boundaries and time zones is 38" x 52" in full color. Valued at $2.00, it is free with a bonanza subscription.

CQ MAGAZINE,
14 Vanderventer Ave.
Port Washington, L. I., N. Y. 11050

1 Year..$5 ☐ 2 Years..$9 ☐ 3 Years..$13 ☐
Pan-American and Foreign Add $1.00 Per Year Postage.

Please enter my subscription to CQ for_____year(s). Enclosed $_____. Please start with the _____ issue.

☐ New ☐ Renewal

Please Print

NAME_____ CALL_____

ADDRESS_____

CITY_____

STATE_____ ZIP_____

CHECK ONE BONANZA BONUS ITEM FOR EACH YEAR OF SUBSCRIPTION

1	2	3
☐	☐	☐
4	5	6
☐	☐	☐
7	8	9
☐	☐	☐

The Infiltration Affair

BY NANCY EVE DAUGHTREY

ONE Tuesday morning a typical mild, mannered radio amateur walked briskly through the door of Barrison's, a large but ordinary looking radio shop. He tipped his hat to Al, the accountant, strode jauntily to the rear of the store, and stepped into a closet.

Now, the accountant had seen the mild mannered amateur do this every Tuesday morning since he started coming there on the third Tuesday of every month. Himself a C.B. man, Al enjoyed this particular job, felt a kinship to the radio store, and wanted to be included in things. So he had investigated the closet many times, but had found it to be vacuously empty on all occasions. Al therefore suspected that some secular ritual was performed there which he, a mere citizens bander, was unjustly barred from witnessing. During the next week of mental torment over this, he plotted a course of action which, he hoped, would solve the mystery. He planned to wait only a few moments after the mild mannered amateur entered the closet, throw open the door, and triumphantly expose the amateur's debauchery.

He observed a carefully timed countdown from the moment his victim disappeared.

"5 . . .4 . . .3 . . .2 . . .1 . . .0!" Al whispered, and thrust open the offending door.

His expectant eyes were met by four blank walls and a vacuum. If Al had been a man given to tantrums, he would have surely had one then.

Grimly, he marched into the closet and stood in the center of the tiny cubicle. His eyes fell upon a tiny knob in the wall marked *input*. Puzzled, he turned it as far to the right as it would go.

He heard a low hissing sound, and the walls began to slide upward. Or was the floor, and he, sliding downward? Soon he came to a gentle landing in front of a door much the same as the one which had disappeared above him.

He tried the door gingerly, and peered out into a long barren hall. Convinced there was no one in the immediate vicinity, he decided to investigate his strange surroundings. He stole silently down the domed hallway and reached what appeared to be a dead end. Al looked at it in despair. Then he noticed a knob identical to the one in the closet, but this one was labeled *vertical gain*. As Al turned the knob, the dead end section of the wall rose upward, revealing another hallway.

Along this hall were several doors. He stopped abruptly outside the first door where he was accosted by agonizing screeching and whistling sounds from within. Aha! Al knew that noise from his own C.B. rig. Then a strange sequence of sounds fell upon his ears, first the high pitched chatter of many nasal chimpanzees. This mellowed into an almost normal human voice, but quickly slid into the low gutteral gargling of a hippopotamus's stomach. It was like nothing the accountant had ever heard on or off the air. He felt compelled to find out what it was.

A peep through the keyhole revealed a startling eyeful to the aghast accountant. The "mild mannered" amateur was poised, grinning sadistically, over a mountain of treacherous equipment. A series of Indian spearheads flashed regimentally across a green screen, and the frenzied amateur was spinning knobs. Rather promiscuously, Al thought.

Ah. A pair of shapely legs came into view through the aperture. In fact, so shapely that Al forgot himself while gaping, lost his balance, and went sprawling against the door causing considerable tremor.

Mercy me, thought Al. I must depart. He darted to the next door and slipped inside. Fortunately for all, the room was empty of people. It was populated only by an official looking conference table surrounded by a caucus of chairs. Settling into the black leather seat at the head of the table, Al found he could listen comfortably to everything in the next room. He leaned back with his feet perched on the vast mahogany tabletop.

There was a shuffling in the hall, and then

*394 Columbus Ave., Tuckahoe, N.Y., 10707.

the amateur who had come out to investigate the noise in the hall, returned to the room.

"Well, I'll just have to call the Big O.M. and tell him to send someone down here to investigate that suspicious sound." said the voice.

"You mean Number One himself?" asked an awed female.

"None other than our leader, Hunt One-toon," assured the man.

"Hello, Number One? This is Sherlock Ohmns down here in Dragg net control. I need an agent to assist me in tracking down a possible intruder."

The resonant voice of Number One filled the elaborate shack. Al, next door, shivered as it spoke. "Do you suspect a SPLATTER infiltration, Ohmns?"

"Can't say yet, Number One. Just send me a man."

"Roger," consented Number One.

"What's this SPLATTER business?" asked the quizzical female.

"Great Scott, girl! You *are* new here." exclaimed Sherlock. "That's our organization's arch enemy, the *S*ociety *P*roposing *L*argescale *A*dvancement of *T*erminating *T*actics *E*ngulfing *R*adio."

The girl gasped.

Shortly, our accountant heard a crisp knock at the door where he had been peeking moments before. The knocker was given entry.

"I'm Lester Watts, agent 20," stated the new arrival.'

"You wouldn't want lester watts than that, jested Sherlock.

"Ho. Ho," said Lester. "I'm from C.B."

The wench gasped.

"Oh, no, he means Control Bureau," explained Sherlock. 'Lester, this is my new secretary, Yummy Love. YL for short."

"Charmed." said Lester gallantly. "but why the gasp, Miss Love?"

"She gasps quite a lot." Ohmns offered.

"Really, Mr. Ohmns. I'd gotten the impression from your cohorts that that other group is a bunch of renegades," claimed Yummy indignantly.

"It's true that there are some likely candidates for SPLATTER among the sub-amateur group, Miss Love," admitted Lester. "But there are many who could be trained to strengthen our ranks."

"An elementary deduction, Watts," commented Sherlock. "In Intelligence Training we know it's good strategy to get neutrals on our side before SPLATTER brainwashes them."

Lester added, "Then they strengthen the enemy. We may have a SPLATTER man in our midst right now, or one of those slithery characters from their sister organization, QRM (*Q*uack *R*adio *Maneuvers*).

"Suffering signals!" breathed the lady. "Sound the alarm!"

Listening in the adjoining room, Al became fully aware that it was time for him to make a hasty exit. There was a chance he could make a break before the alarm was spread. Slipping out of his haven, he slunk noiselessly down the domed hall.

The dead end wall was sealed shut!

Al searched desperately for a congenial *vertical gain* knob, but none was in sight. A strange electronic sound penetrated from all sides. Beep . . . beep . . . beep . . . beep.

The alarm!

The citizens bander knew he must escape unseen or risk being condemned as a SPLATTER agent. They probably wouldn't believe any other explanation for his unauthorized snooping. But the situation seemed utterly hopeless. He was stymied at the dead end wall. Eerily, the sonorous alarm filled the domed chambers, and the scuttling of multiple footsteps echoed, coming closer, closer.

Al looked up, desperately willing the blockade to rise. Instead he saw a shaft of metal tubing protruding from the ceiling. On it were printed the words *horizontal polarization*. As the anxious man pulled the tube, it telescoped to reach the floor. There was a hissing sound barely audible beneath the incessant beep . . . beep . . . beep.

The wall swung open on its center axis, permitting the undaunted fellow to pass. Just as he bolted through, the wall hissed shut behind him. Al dashed down the barren hall into the welcoming closet. He found a lovely knob marked *output*. The lift carried him swiftly upwards.

Stepping out of the closet into the ordinary world of Barrison's, Al the accountant straightened his tie and smoothed his garments. Wearing a small benign smile, he walked primly to the desk where his record book was laid.

Sometime later, the mild mannered amateur strolled by Al's desk on his way out, tipping his hat as usual. He paused for only an instant when he spyed *The Radio Amateur's Liscense Manual* propped in the accountant's open ledger. ■

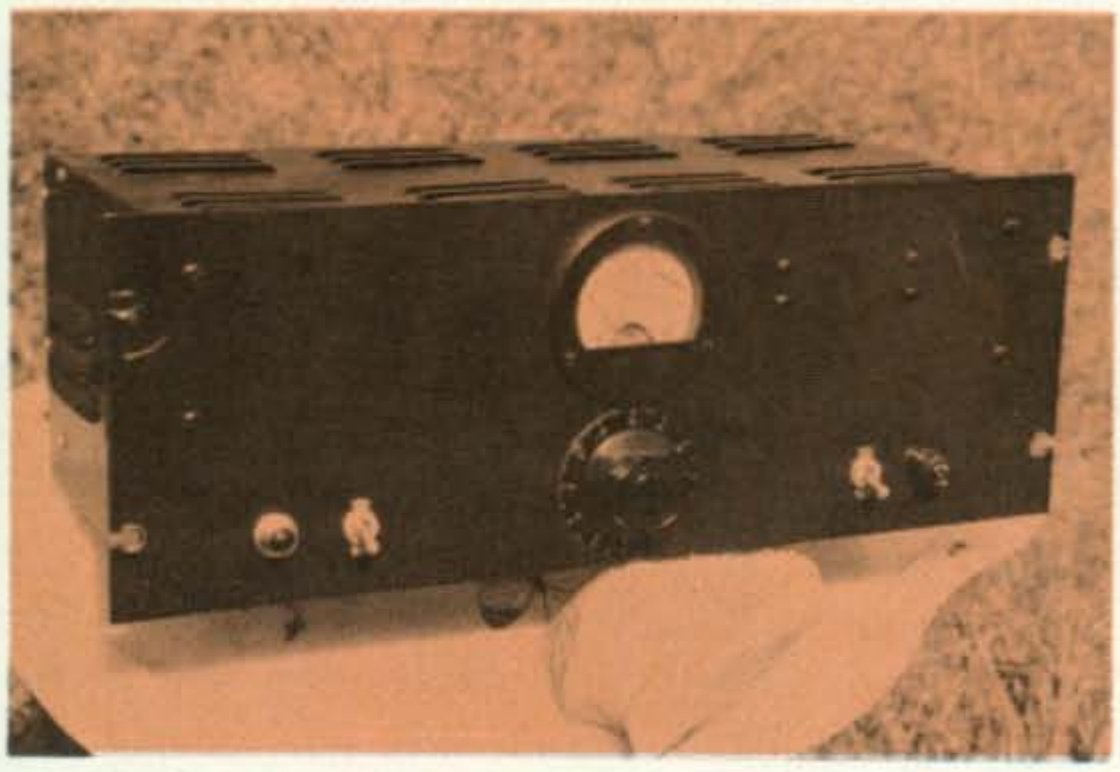
MORE WATTS PER DOLLAR

BY CAPTAIN PAUL H. LEE, U.S. NAVY,* W3JHR

THE peak-to-average power ratio of a pure sine wave is 2:1; that is, the average power in a pure sine wave is one half the peak power. This simple fact has led to the rating of many s.s.b. linear amplifiers as "2 kw p.e.p., or 1 kw voice." Such a rating is really erroneous, because the average speech waveform is characterized by intense peaks of short time duration which occur at a very high repetition rate. These peaks are caused by the high harmonic content of the speech waveform. The peak-to-average ratio of speech is thus much higher than that of a sine wave of the same peak power. It is thus desirable to use some means to compress the dynamic range of the voice to make it more compatible with radio communication devices such as transmitters of finite modulation capability. Overmodulation in a.m. transmitters causes splatter due to negative peak clipping. Overdriving of the linear stages of an s.s.b. transmitter causes splatter due to generation of unwanted modulation products. One way to prevent such overdriving is to use an audio compressor ahead of the s.s.b. exciter. I personally feel that the compressor is more desirable than an a.l.c. circuit in the s.s.b. transmitter itself.

Back in 1952 I wrote an article on a homemade audio compressor amplifier [1] for use with my a.m. transmitter at W4RXO. This was a very fine unit which used high quality parts, and it gave my a.m. signal quite an increase in "talk power" without risk of overmodulation. When I sold the a.m. transmitter in 1954, I foolishly sold the compressor with it. (I wonder who has it now?) Recently I built a transistorized compressor in order to increase the "talk power" of my present-day single sideband signal, and this little transistorized gadget has been quite effective in preventing overdriving of the s.s.b. transmitter.

* 5209 Bangor Drive, Kensington, Md. 20795



Front view of the modified AM-864/U. The controls of the compressor amplifier are left to right: E_1, S_1, Attenuator R_5, and meter switch S_2.

Surplus Compressor

I recently obtained a compressor amplifier which employs vacuum tubes, very much

[1] Lee, LCDR P.H., "More Modulation Per Dollar," *CQ*, August 1952, p. 19.

like the one I built in 1952. This unit is the AM-864/U which was built for the U. S. Army Signal Corps. I suspect that it was procured by the Army for the Armed Forces Radio Service, because it is of "broadcast quality." The AM-864/U is available from surplus dealers at the present writing at a cost of about $30.00, and it is well worth the price.

Having the AM-864/U on hand, I desired to make use of it. As originally built, it is designed for use as a line amplifier with fairly high input level. It does not have sufficient gain for use directly with a low level microphone. I wanted to use it with my low level high impedance dynamic microphones to feed my s.s.b. exciter, with no external preamplifier.[2] Thus it was necessary to modify the AM-864/U, and it is the purpose of this article to show how these modifications can easily be accomplished.

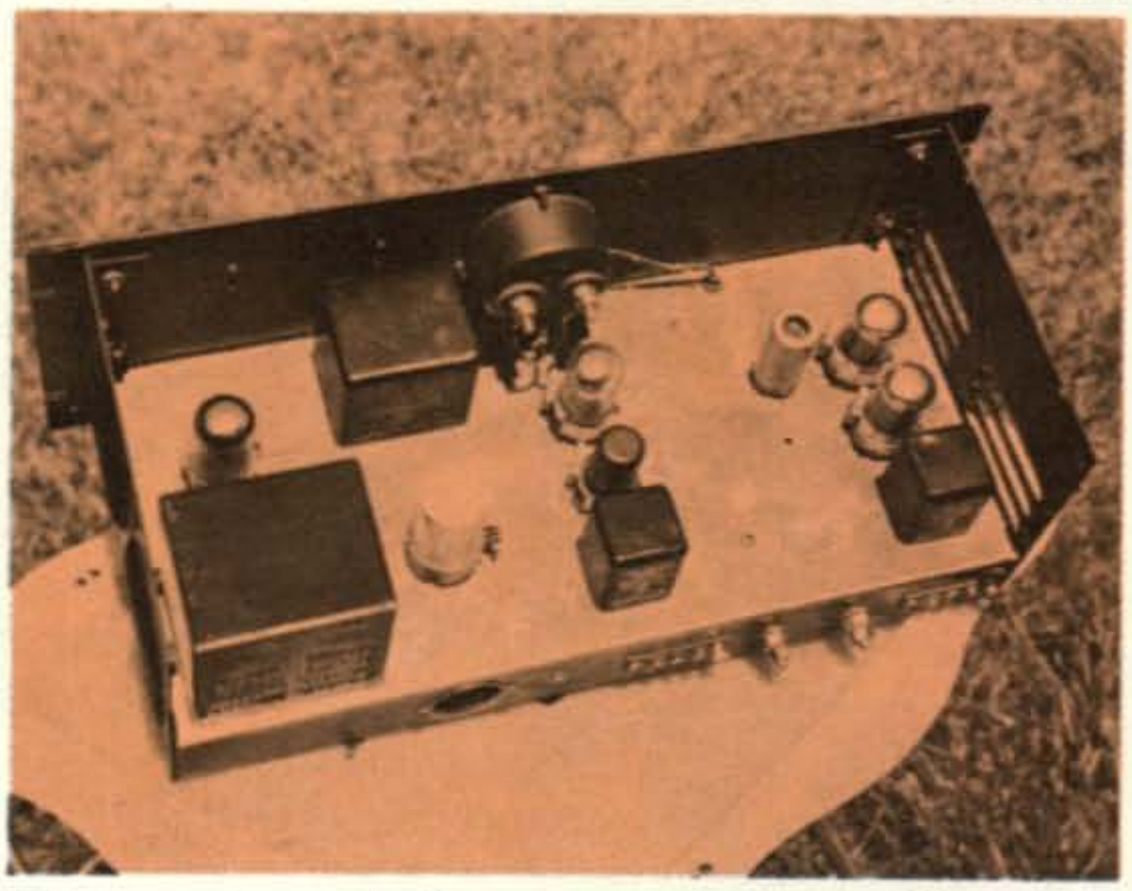
Testing

The first step is to hook up the AM-864/U and test it "as is." This is easily accomplished by feeding the output of a receiver or a record player amplifier into it, "padding down" the audio level if necessary to avoid over-driving it. If the unit has not been damaged in shipment and if the tubes are okay, it should work, with compression action being indicated by a downward swing of the meter when the meter switch is in the ATT (attenuation) position. Adjustment of the THRESHOLD control on the back of the chassis should produce a change in the level at which compression starts. As stated previously, the unit does not have enough gain to operate satisfactorily from a low level microphone. It will be noted that the AM-864/U has input and output impedances of 600 ohms, and it will be necessary to correct for this so that the unit can be used between a high impedance low level microphone and the usual high input impedance of an amateur transmitter.

Modification

A few simple voltage gain computations showed me that one stage of preamplification would be sufficient for use with my dynamic microphones, which are a Turner 22D and an Astatic DN-HZ. I wanted to maintain the push-pull circuit configuration of the unit, and thus chose a 12AU7 twin triode for the preamplifier. I chose to mount the 12AU7 socket in a space just to the right of the two 6SK7GT sockets. Looking under the chassis, it may be seen that there is a fairly clear space where the socket will not be covered by the resistor mounting board. A Greenlee punch of suitable size was used to cut the hole for the 9 pin socket, which was mounted by means of 4-40 machine screws. Two soldering lugs were used under each 4-40 nut, for future grounding connections.

The 12AU7 filament circuit was connected to the filament terminals of one of the 6SK7GT sockets. Then the cathode bias resistor and its bypass capacitor, 4700 ohms at 1 watt and 10 mf at 25 volts respectively, were connected to pins 3 and 8 of the 12AU7 socket. The other end of each of these two items was connected to one of the ground lugs. Next, the pair of leads which connect to the variable contacts of the dual potentiometer, R_5, were removed from pin 4 of the 6SK7GT sockets and reconnected to pins 2 and 7 of the 12AU7 socket. The variable bias connection was lifted off terminal 5 of input transformer T_1, and the wire was cut off and left floating. Terminal 5 was then grounded. The original capacitor, C_1, was completely removed from its mounting under the chassis, and a triple 0.1 mf metal can type unit was bolted in its place. The voltage rating is not critical. A single 0.25 or 0.3 mf 100 volt unit is satisfactory here in the time constant circuit. Resistor R_1 was replaced by a 1 megohm ½ watt resistor. These two changes speed up the compression action considerably, because C_1 and R_1 determine the time constant



Interior view of the compressor amplifier. The 12AU7 is located to the left of the two 6SK7GTYs. The T pad shown in fig. 3 is mounted within the unit.

[2] Lee, Capt. P.H., "The Ultimate SSB Exciter," *CQ*, Feb. 1967, p. 24.

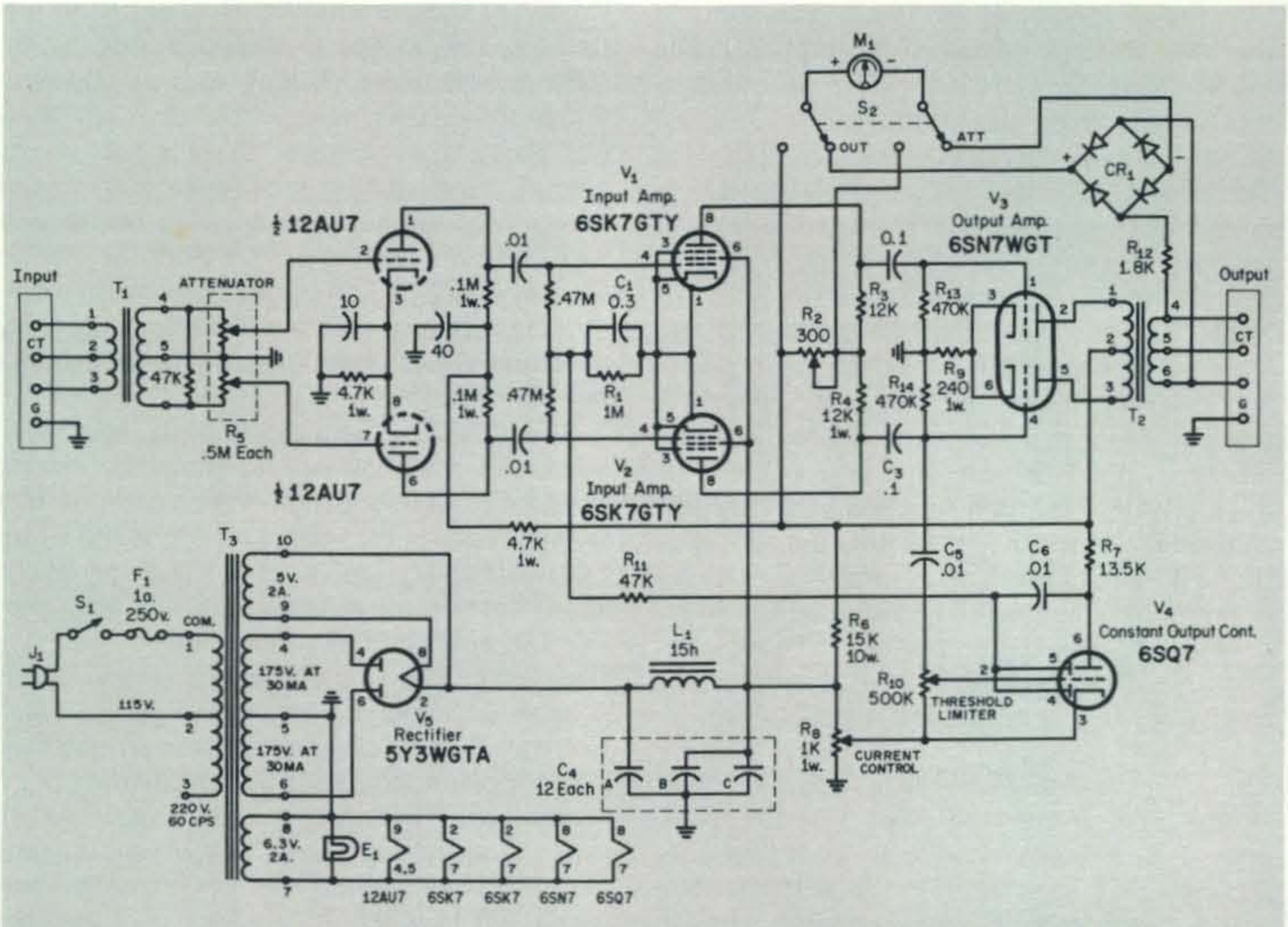


Fig. 1—Circuit of the modified surplus compressor amplifier, the AM-864/U. The 12AU7 stage has been added and other simple modifications have been made to make the unit suitable for speech. Unless otherwise noted all resistors are ½ watt and capacitors are in mf.

which regulates the attack time and release time of the compression action. The original values of 1 mf and 2 megohms gave a time constant which was satisfactory for program material but was much too great for speech only.

The resistance coupling network between the 12AU7 and the 6SK7GTs was next wired in. Two 0.1 megohm 1 watt resistors were used for plate resistors, and two 0.47 megohm ½ watt resistors were used for grid resistors. Two 0.01 mf 600 volt disc ceramic capacitors were used as interstage coupling capacitors. These small items were merely mounted by means of their own leads. A 4700 ohm 1 watt plate circuit decoupling resistor was connected in between the junction of the plate resistors and the plus lead of the power supply. It was found that a 40 mf 500 volt electrolytic bypass capacitor connected to the decoupling resistor stabilized the 12AU7 plate voltage very nicely when the amplifier was compressing, and prevented low frequency "motorboating." It was then found that an intermittent high frequency "motorboat," which occurred at certain settings of the input level control, could be cured by connection of a 47000 ohm ½ watt resistor across the input transformer secondary terminals 4 and 6. An added 27000 ohm ½ watt resistor across R_7, also helped. Thus R_7 became 13500 ohms. Changing C_5 to 0.01 mf and moving it from R_4 to R_{14} gave a much smoother compression action, with less tendency of the amplifier to "thump." The final change was the use of a 300 ohm wirewound control for R_2, and the mounting of it on the rear of the chassis to facilitate the zero adjustment of the gain reduction meter, M_1. Meter M_1 is nothing but a milliameter which reads the plate current of the two 6SK7GT gain-controlled tubes, and it is calibrated in gain reduction in db below an arbitrary 0 db scale reading which corresponds to full plate current with no compression. Meter M_1 is also calibrated with a separate db scale for reading the output level of the amplifier by means of the rectifier CR_1, when switch S_2 is thrown to the OUT position. As a final

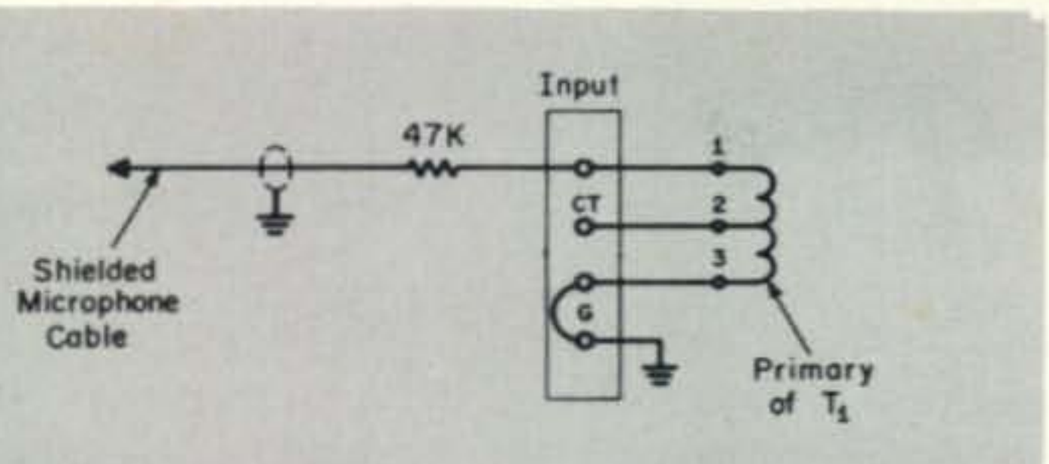


Fig. 2—Modification of the input circuit to accommodate a high impedance microphone.

touch I replaced R_3, R_4 and R_9 with 1 watt components of the original resistance values, because I do not like the use of ½ watt resistors to carry plate current, anywhere. The final schematic diagram of the unit as modified is shown in fig. 1.

Impedance Matching

There is one more thing to be considered, and that is the impedance matching into and out of the AM-864/U amplifier, and the adjustment of the output level to correspond to that required by the average s.s.b. exciter microphone input. As previously stated, the input and output impedances of the AM-864/U are 600 ohms.

Matching to a high impedance microphone is accomplished very simply by use of a series input resistance as shown in fig. 2. A 47K series resistance is used, and this will provide a suitable load for most microphones. The gain control setting here is about "2 o'clock" for about 10 db peak compression. If one does not mind a slight increase in low frequency response, the series resistor can be omitted. In this case the gain control is set back to about "10 o'clock." Note that in either case the transformer primary center tap is not used and one end of the winding is grounded in this application. If one were using a balanced 600 ohm feed, however, as in studio work, the center tap could be grounded as required for hum elimination.

Matching the AM-864/U to the s.s.b. exciter's microphone input is equally simple. A "T" pad is used for both attenuation and impedance matching. It is shown in fig. 3, and is composed of ½ watt resistors. The value of the shunt resistor can be changed to provide an increase or decrease in level as required. The values shown are satisfactory for my own exciter.[2] Decreasing the shunt resistor will decrease the level, and vice versa. This "T" pad is actually mounted right on the output terminal block, with the shielded lead to the s.s.b. exciter being soldered to the end of the 47K resistor.

Shielding

As in all audio work in the vicinity of radio frequency, the AM-864/U should be well-grounded, and shielded cable should be used for input and output connections. I have mine mounted in a cabinet rack which is alongside my transmitter in a similar rack. Both racks are connected together at the bottom by heavy 1½" by 1/16" copper strap, and the transmitter rack is then tied to ground (a copper water pipe leading to the street) by a six foot piece of 1½" by 1/16" copper strap. In addition, the transmitter rack is also grounded via the outer braid of the buried coaxial line to the Mark IV Antenna.[3] There is absolutely no r.f. feedback of any kind in this station on any frequency from 1.8 thru 30 megacycles.

The simple modifications outlined above make the AM-864/U a very useful unit in any station, a.m. or s.s.b. The fact that in its "natural" state it lacks sufficient gain for a low level microphone should not discourage its purchase and use. The 10 db compression on peaks gives the signal a wonderful punch on the air, while at the same time preventing overdriving and consequent splatter. The gain reduction meter hovers around 5 to 6 db while I am talking. While I have not measured the percentage of distortion of the audio contributed by the AM-864/U compressor, I am sure it is very low. I have listened to high fidelity music played through it, on the speaker, and can detect no distortion by ear. I feel that it is every bit as good a unit as the one I built in August 1952[1] on which I did take many audio quality measurements with laboratory test equipment. ■

[3] Lee, Capt. P.H., "The Mark IV DX Antenna," *CQ*, Feb. 1967, p. 60.

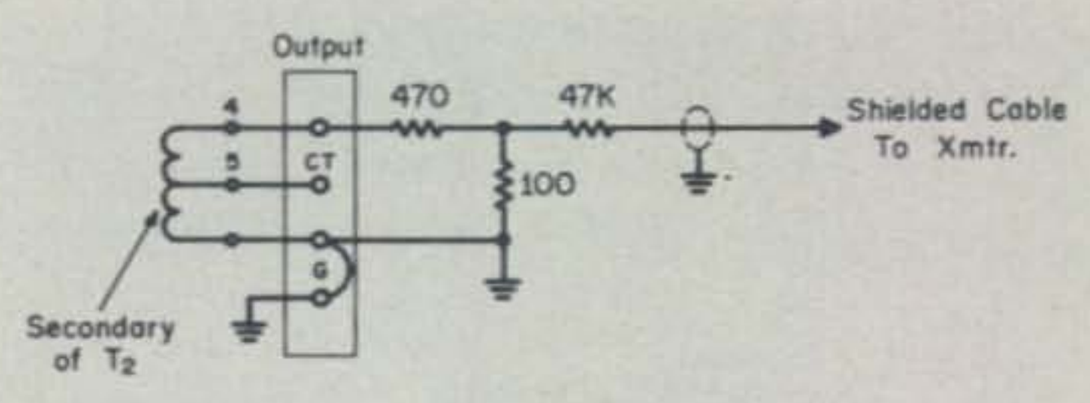


Fig. 3—The network shown above matches the compressor amplifiers 600 ohm output to the input impedance of the s.s.b. exciter. The input level can be controlled by raising or lowering the value of the 100 ohm resistor.

A PORTABLE SUCTION CUP ANTENNA

BY JOHN J. SCHULTZ,*
W2EEY/1

A simple portable antenna that can be used on 80-10 meters is often desired for ordinary portable or emergency uses. This antenna will mount on any flat surface almost instantly and provides good efficiency for its small size.

THE author can perhaps be described as an occasional mobiler and the antenna described in this article was developed to permit such operation with a popular multi-band transceiver on 80 through 15 meters. It can be used on 10 meters as well and provides a vertical antenna that can be mounted on any flat surface on a car or boat in a few seconds. Rubber suction cups are used to permit rapid mounting and have several advantages over the clamp type arrangements used with many removable antennas. The suction cups are inexpensive although strong enough to firmly support the antenna. They permit mounting of the antenna on almost any flat surface and easy repositioning of the antenna for best performance. Even if one already has a regular fixed or mobile antenna for one band, the suction cup antenna provides a very simple means to enable operation on other bands.

The suction-cup portable antenna mounts quickly on the windowpane of any automobile in a matter of seconds.

Basically, the antenna is simple, a whip section of 8 to 10 feet length with a base loading coil and rubber suction cup mounting. The whip section itself can be a surplus item such as the approximately 10 feet long folding whip commonly available or a commercial telescoping element such as the Mosley LC-100 (39" folded to 100" extended in 4 sections) or the Tenna RAD-5 (29" folded to 112" extended in 5 sections). Alternatively, if storage space is not a problem the whip element could be an 11 meter mobile whip or simply two 5 feet sections of aluminum tubing which join together.

The loading coil used is made from standard coil stock or it can be home-made from number 12 or 14 copper wire. A commercial multi-band loading coil with a continuous sliding contact to vary the in-

*40 Rossie Street, Mystic, Connecticut 06355.

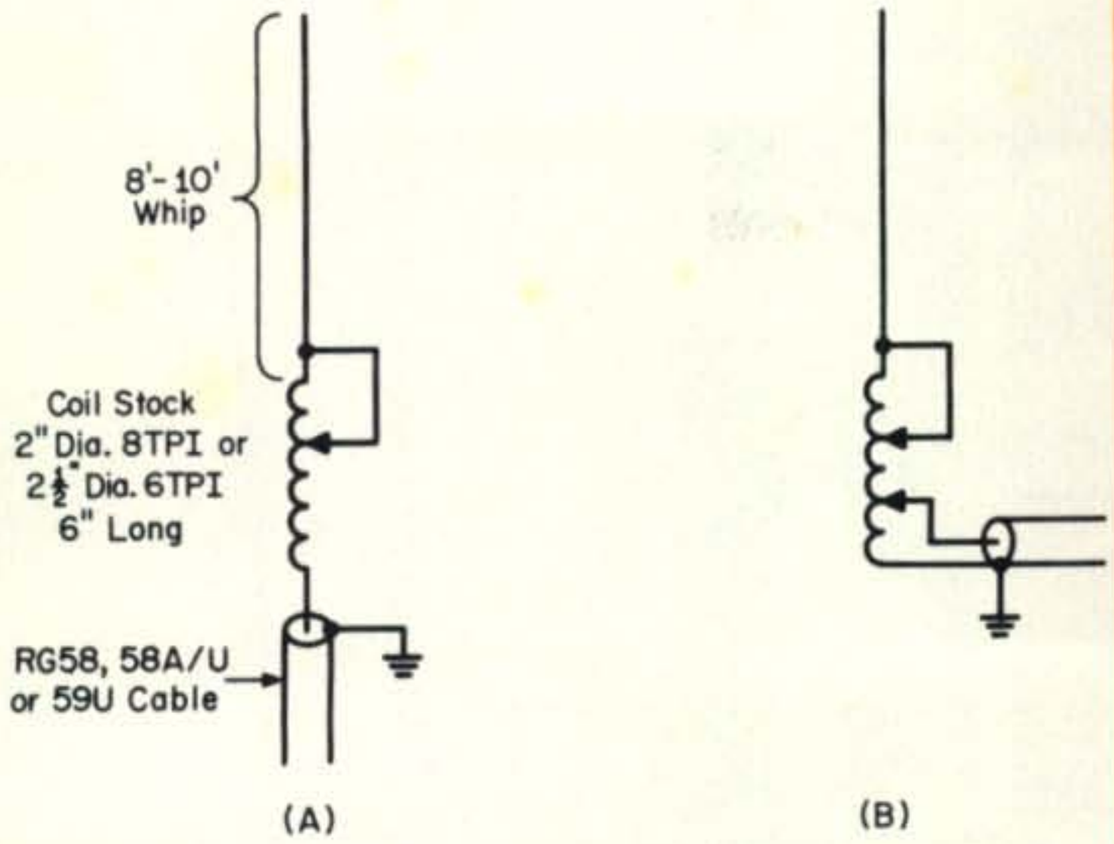


Fig. 1—Shown above are two simple circuits for the loading coil of the mobile whip antenna. The coil for both circuits is 48 turns of # 14, with a 2" diameter. Commercial coil stock can also be used (Air-Dux # 1608T). Either the feed system at (A) or (B) can be used as explained in the text.

ductance value can, of course, also be used. However, its cost will generally not be justified unless the antenna is used as a semi-permanent installation and continuously exposed to weather or used in a salt-water environment where enclosure of the coil and its contact elements is very desirable: In this case the Mosley No. 333 loading coil or a similar enclosed coil can be used.

Construction

Figure 1 shows two configurations which can be used for the loading coil connections and fig. 2 shows the corresponding construction necessary. Either circuit requires basically the same construction. The circuit in fig. 1 (A) permits somewhat quicker band switching since only one adjustable connection is involved. This is the only circuit that can be used if a commercial enclosed type of loading is used.

The circuit in fig. 1 (B) requires two tap adjustments on most bands but has the advantage of providing a closer match to a coaxial line. This feature may be particularly desirable if the antenna is used with a transmitter having fixed output loading which requires working into a line with a very low s.w.r. Another advantage of the circuit is that the whip is grounded for static drain and lightning protection purposes.

The suction cups used to support the antenna are shown in the photographs and are simply replacement types for automobile roof top carriers costing about 20 cents each. They can be purchased in any automotive parts store. The suction cups come complete with an imbedded screw thread.

The holders used to fasten the whip to the suction cups are fabricated from brass or aluminum pieces ¾" wide and 1/16 to ⅛" thick. The holders are shaped by forming them around a piece of wooden dowel approximately the same diameter as the whip. Alternatively, if one can find plastic cable clamps of the correct size they can be used directly. The use of such plastic clamps would also solve the problem of insulating the upper clamp from the whip. In the case of the metal clamp, insulating tape or preferably a thin sheet of teflon is wrapped around the whip underneath the clamp. Some production runs of the surplus folding whips come

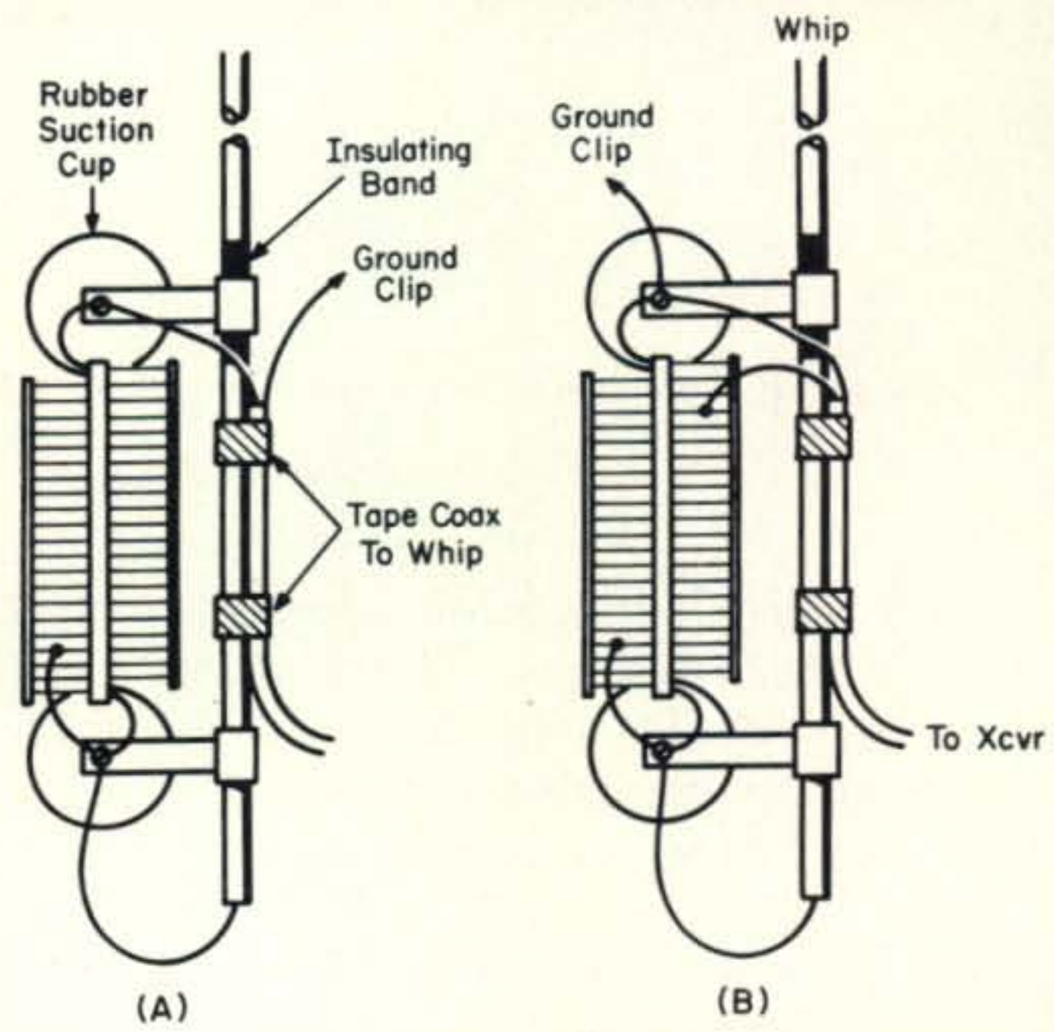
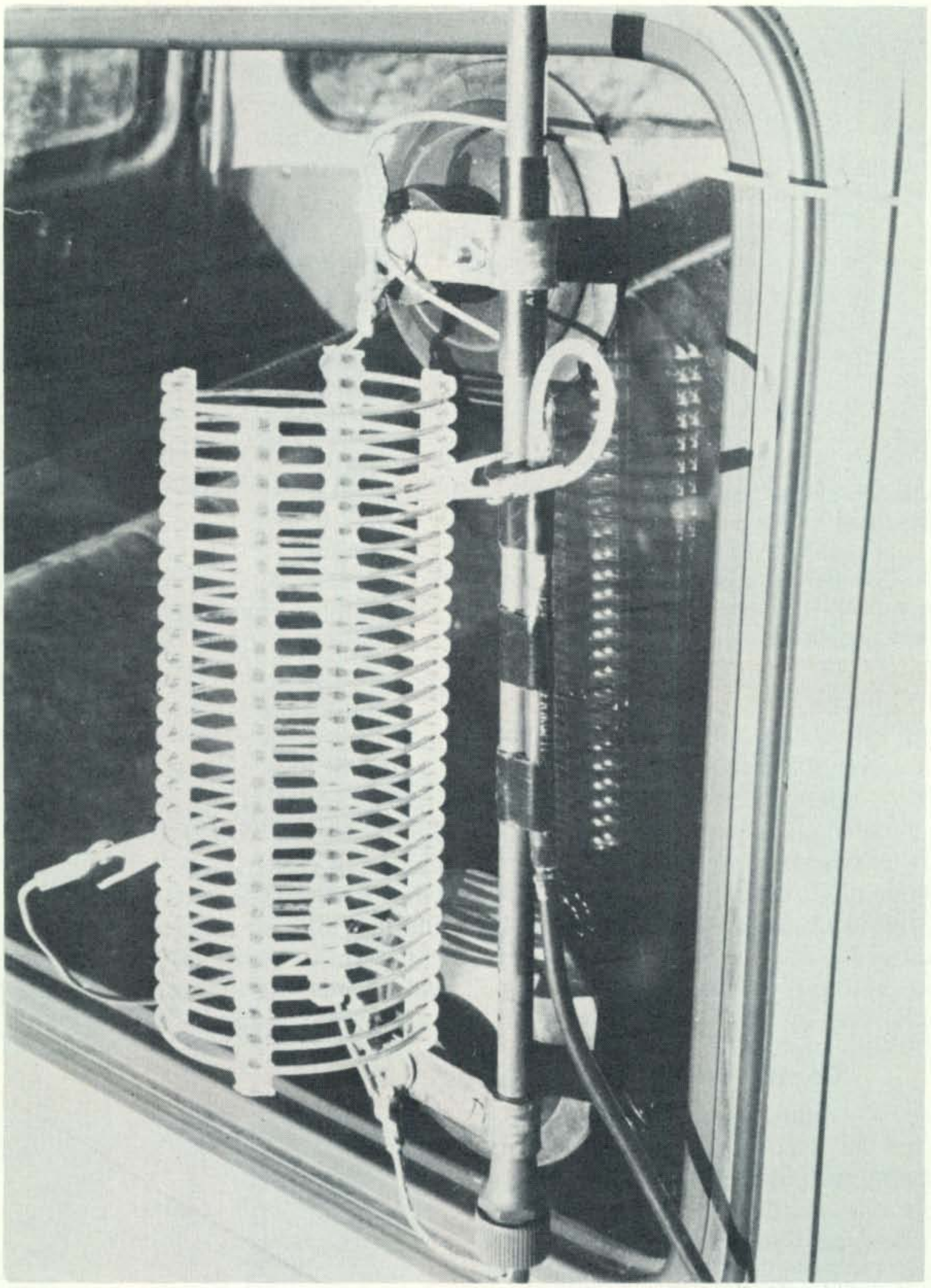


Fig. 2—Construction at (A) corresponds to circuit of Fig. 1 (A) and construction at (B) to Fig. 1 (B).



Close-up view shows how coaxial cable is taped to whip and how loading coil is supported between sucton cup mounts.

with an identification sleeve made of an insulating material attached to the lower section which can be used directly as a means to insulate the clamp.

The lower clamp may not achieve a good electrical bond to the whip and therefore a separate wire is soldered or otherwise attached to the bottom of the whip and connected to the lower end of the loading coil. The loading coil itself is supported between the two suction cups by attaching the lead ends of the coil to large solder lugs supported by the suction cup screws.

Coax Preparation

The end of the coaxial cable used to feed the antenna is prepared by removing the jacket and braid for about 5 inches so the center conductor can be used directly as a lead to tap the coil. If RG-58 A/U is available instead of normal RG-58/U it is preferred since the stranded center conductor used in the former will withstand flexing better. The jacket is further slit open, but

not removed, for several inches and a length of bare hookup wire is inserted underneath the shield and spot soldered. A piece of heat shrinkable tubing is then formed over the slit in the cable jacket so the entire assembly is sealed. If shrinkable tubing is not available, insulating tape can be wrapped around the jacket. The completed cable is simply taped to the whip as shown in the photographs.

Additional solder lugs are used at the suction cups for the hookup wire leads for the coil tap and ground clip connection.

Operation

As shown in the photographs, the antenna is mounted on the window pane of the author's VW. The ground connection is made to a metal clip inside the car which is screwed into the car body. One could also make the ground connection to the rain gutter if a clean contact were made by removing the paint. The ground connection, in any case, for an automobile should be made to a large metal surface of the car and not to one which is effectively electrically insulated by means of rubber stripping or other means. Some experimentation in this area will pay good dividends in terms of better antenna performance as it is surprising how many metal surfaces of an automobile have relatively high resistance electrical contacts between them.

An s.w.r. meter is used to find the proper loading coil taps for each band, starting with minimum inductance loading on each band. Once the proper tap points have been found they will remain the same as long as the antenna is installed in the same position on the vehicle each time. The tap points for each band can be marked with a magic-marker pen on the coil or small wire stubs can be soldered to the coil at each tap point. The rest of the coil and assembly should be sprayed with Krylon or a similar plastic spray to protect the assembly from weather deterioration.

On 10 meters there are several modes of loading which may produce proper tuning and low s.w.r. In general, the one which involved the least amount of inductive loading (with either the ground connection at the antenna removed or in place) will prove the most efficient. ■

A.M. Operation With The Heath SB-110A

BY WILFRED M. SCHERER,* W2AEF

THE a.m. modifications for the Heathkit SB-110 6-meter S.S.B. Transceiver, as described in *CQ* some time ago,[1] have proved to be quite popular. In addition, inquiries have been received about whether or not the changes can be made in the same manner on the later model, the SB-110A. Happily the answer is yes, the only difference being in the SB-110A manual diagram and page numbers referred to in the text of the article.

For SB-110A

In the steps set forth on page 11 of Nov. '66 *CQ* the pictorial numbers and pages should be related to the SB-110A manual as follows:

1—Pictorial 3-19, page 51.
2—Pictorial 3-20, page 52.
3—Pictorial 3-28, page 60.
19—Pictorial 3-22, page 54, as identified in Pictorial 3-28, page 60.
20—Pictorial 3-29, page 61.

For SB-110 and SB-110A

Relating to *both* the SB-110 and SB-110A, an error should be corrected in the circuit diagram at fig. 1 of the modification article. The right-hand arm of the d.p.d.t. switch should go to the *bottom* end of the 0.1 mf 75 v. discapacitor, instead of to the top end. This is *correctly* shown in the pictorial wiring diagram at fig. 5 on page 13 of the article.—*W2AEF*

*Technical Director, *CQ*.

[1]A.M. for the HeathKit SB-110 6-Meter Transceiver, *CQ*, November '66, page 10.

MEASURING COAXIAL LINE LOSS

BY KEN "JUDGE" GLANZER, *K7GCO

The author presents a simple technique that may be used to measure coaxial line losses. All that is needed is an s.w.r. bridge and a signal source.

An S.W.R. bridge can be used to measure the loss in coaxial cable in a very simple manner. This simple procedure does not require a dummy load usually needed to measure differences in power level although that certainly is a good test.

S. W. R. Test Principles

To explain the s.w.r. test procedure let's take the example of a perfect feed line, one that has no losses, and short it at the load end. When power is applied at the input end a directional wattmeter will read the same reflected power as the forward power since the load (a short in this case) reflects all the power back to the generator without loss.

Consider a line that has a 1% loss. For a given input only 99% of the forward power reaches the load, a short. The entire signal is reflected and travels back to the generator, again losing 1% of its power. Thus, a directional wattmeter would read 98% reflected power. This of course indicates a 2% loss, 1% forward and 1% reflected power.

As the feedline losses increase less and less power is received and reflected by the load (a short) and less power is received back at the generator. By measuring the reflected power when the transmission line is terminated in a short the feedline loss can be accurately determined.

Let's take, as an example, a feedline that delivers 70% of the input power to the load. With 10 watts input 7 watts is received and reflected by the load, a short. On the return path the 7 watts reflected also suffers a loss and only 70% of the 7 watts will be returned to the generator, 4.9 watts or approximately 5 watts. Thus for a 10 watt input 5 watts is returned. This represents 50% reflected power.

Calculating Loss in Db

The power loss of the transmission line, in db, may be calculated as follows for the case above.

$$\begin{aligned}\text{Loss in db} &= 10 \log P_1/P_2 \\ &= 10 \log 10/5 \\ &= 10 \log 2 \\ &= 10\ (0.3) \\ &= 3 \text{ db}\end{aligned}$$

* 202 South 124th, Seattle, Washington, 98168

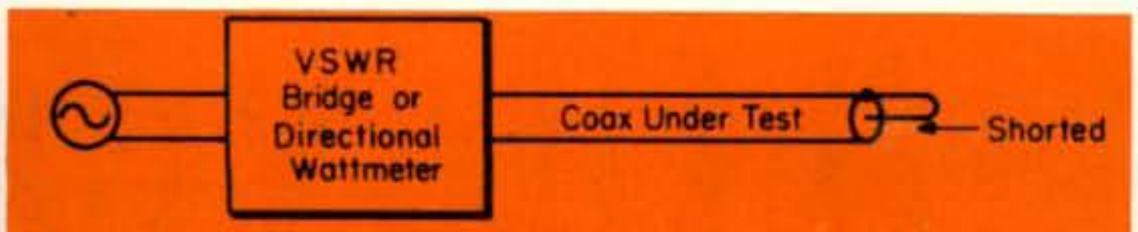


Fig. 1—Simple set-up needed to determine the loss in db in a length of coaxial cable.

where P_1 = Input power
P_2 = Reflected power

Since half of the power was lost in the forward direction and half was lost in the reflected direction, the line has a loss of only 1.5 db rather than 3 db as shown above. To determine the loss in the transmission line directly the formula can be simplified to:

$$\text{Loss in db} = 5 \log P_1/P_2$$

It can be determined from available charts [1] that a 50% reflection in power is equal to an s.w.r. or 6:1. In order to form a pattern that will enable us to correlate s.w.r., reflected power percentage and line loss let's consider another example. If a transmission line delivers 5 watts to the load (a short) for 10 watts input only 2½ watts will be reflected back to the generator. This represents 25% reflected power. The loss of the transmission line is:

$$\begin{aligned}\text{Loss in db} &= 5 \log P_1/P_2 \\ &= 5 \log 10/2.5 \\ &= 5 \log 4 \\ &= 5\ (0.6) \\ &= 3.0 \text{ db}\end{aligned}$$

From the charts [1] it can be seen that a 25% reflection of power is equal to an s.w.r. of 3:1 as well as a loss of 3.0 db on the transmission line. It may also be seen at this point that the higher the reflected power value the lower the feedline loss.

[1] Glanzer, K., *"Antenna Handbook Vol. I,"* Cowan Publishing Corp., 1966, p. 69, fig. 2.26.

Practical Measurements

To measure the loss of a length of coaxial cable the equipment is set up as shown in fig. 1 where we see the generator feeding a length of transmission line through an s.w.r. bridge with the line terminated in a short. If the input power is known and the reflected power is measured, formula (2) can be used to calculate the line loss.

A simpler way of measuring the line loss is to measure the s.w.r. and divide the measured value into 9. For example, an s.w.r. of 3:1 would be

$$\begin{aligned}\text{db loss} &= 9/\text{s.w.r.} \\ &= 9/3 \\ &= 3 \text{ db}\end{aligned}$$

Again, an s.w.r. of 6:1 would be:

$$\begin{aligned}\text{db loss} &= 9/\text{s.w.r.} \\ &= 9/6 \\ &= 1.5 \text{ db}\end{aligned}$$

A chart that eliminates even this simple division is shown in fig. 2.

It is suggested that all coaxial cable be checked when new and every 6 months and the data recorded for future comparison. The comparisons may surprise you. The loss figure obtained by the method outlined is valid only for the specific length of cable tested and will be quite accurate. To assure accuracy be certain that the characteristic impedance of the s.w.r. bridge matches the line and only the power required to obtain full scale deflection on the s.w.r. indicator is used. ■

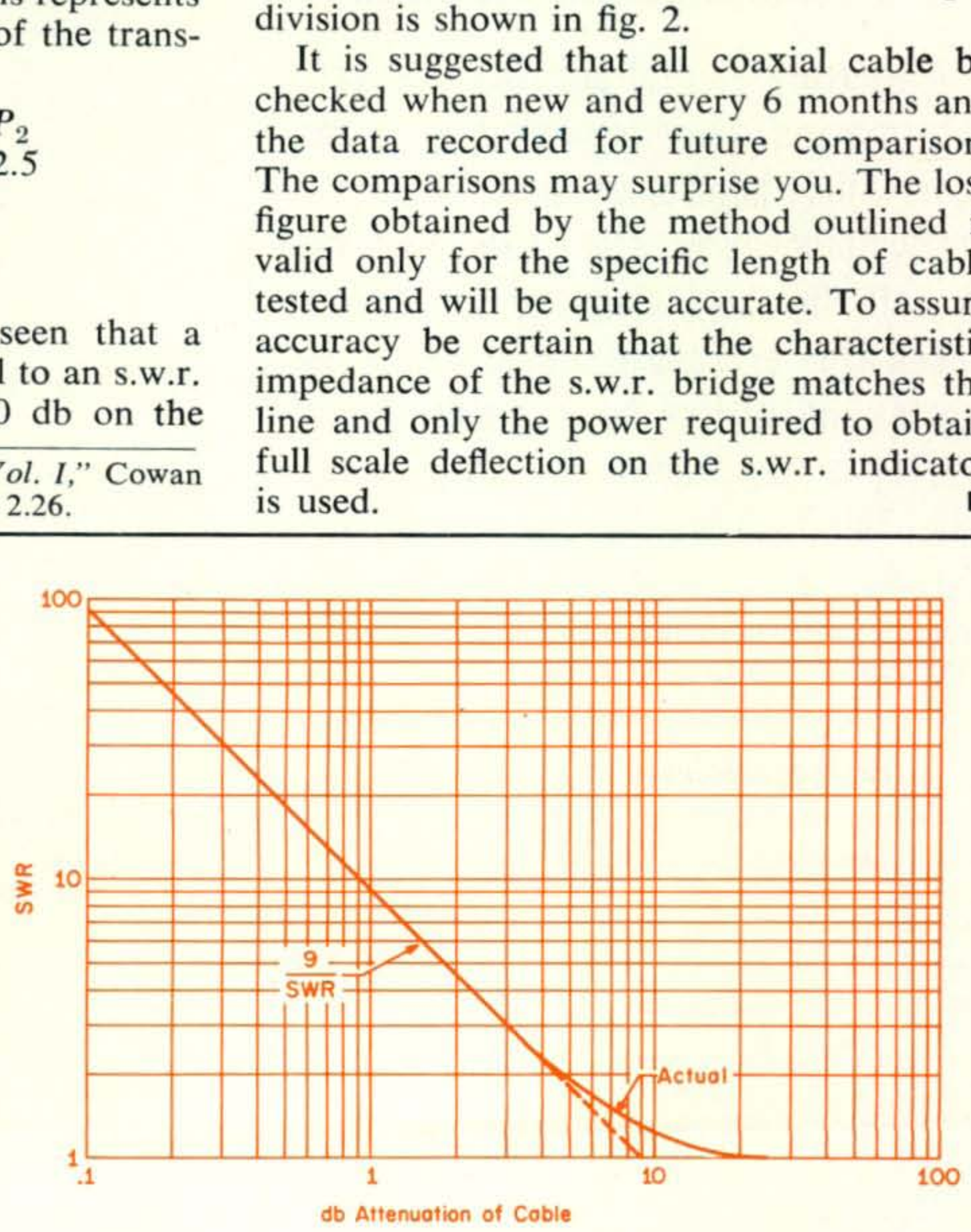
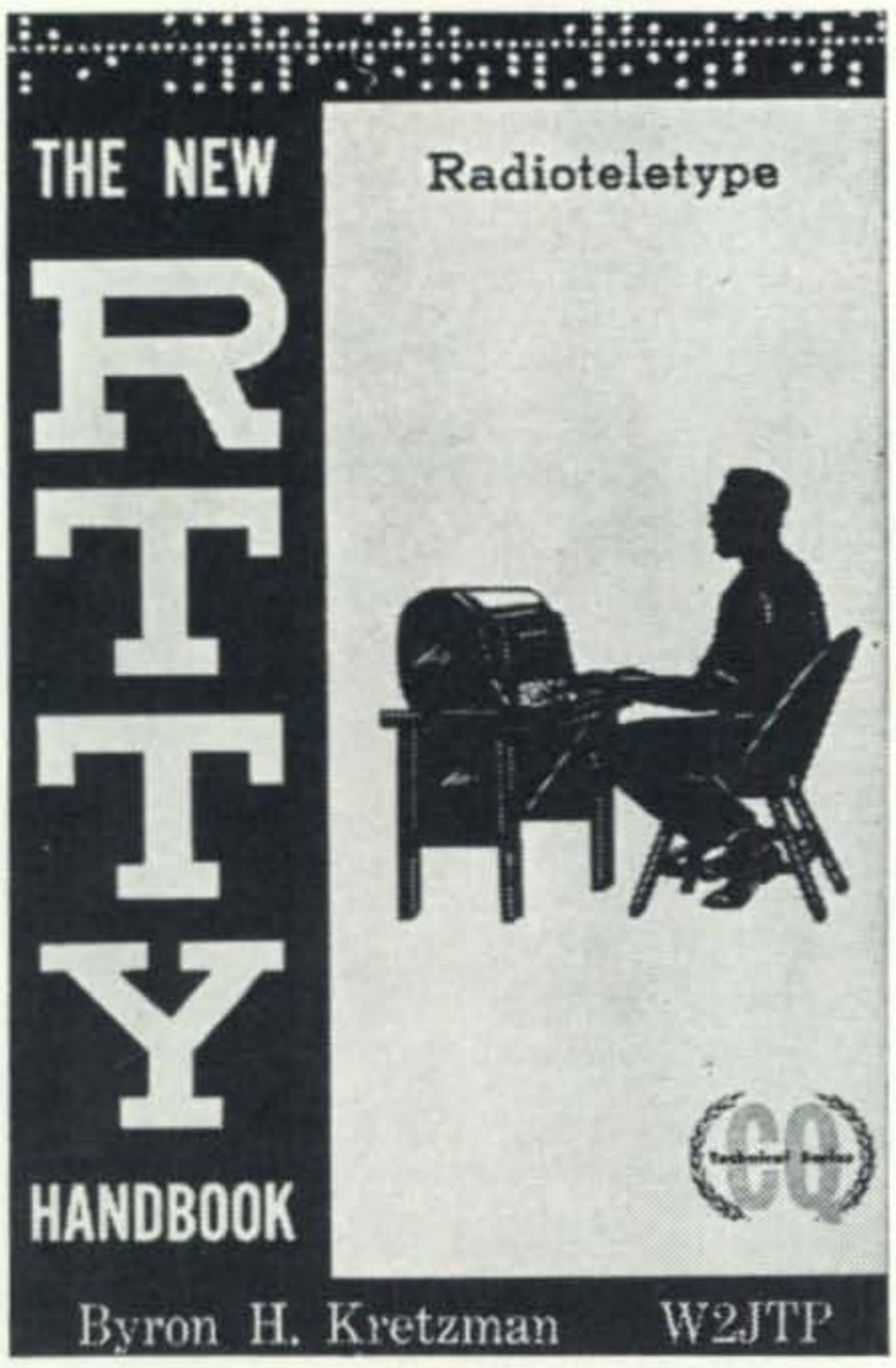


Fig. 2—The above chart enables the rapid determination of the loss of a line in db from the s.w.r. reading taken in the set-up shown in fig. 1. For s.w.r. readings of less than 2.5:1 the dotted line should be used rather than the actual solid plot.

"THE NEW RTTY HANDBOOK"



A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, operating procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, all written by Byron Kretzman, W2JTP, a well known authority in the field. This book is a must for your library! Only $3.95.

*New York State residents Must add sales tax applicable to your area.

CQ Magazine
14 VANDERVENTER AVENUE
PORT WASHINGTON, L.I., N.Y. 11050

SIRS: My check (money order) for $_____ is enclosed. Please send _____ copies of the "The New RTTY Handbook.

Name_____

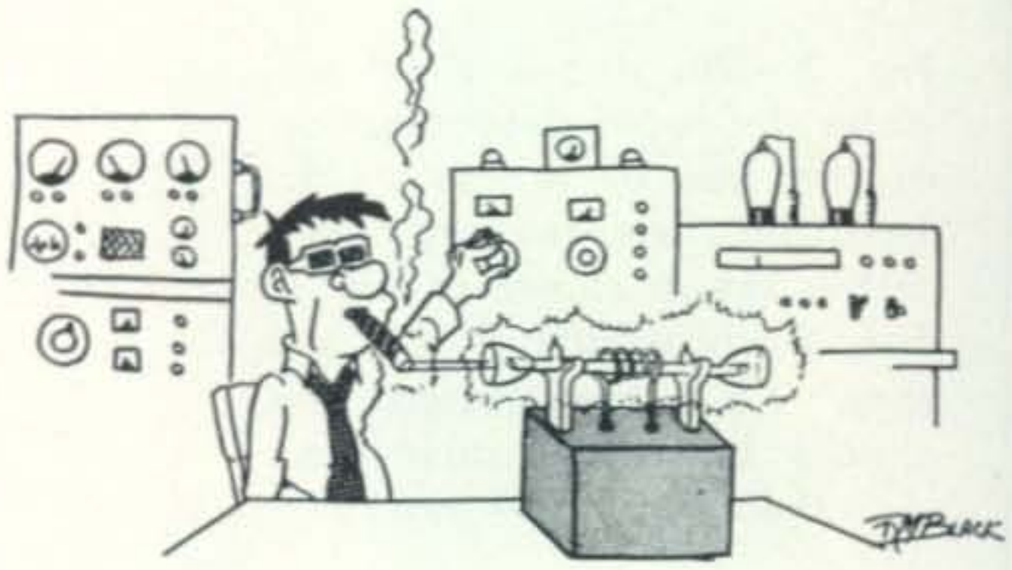
Address_____

City_____State_____Zip_____

Clever Quips!

"W6NYZ! I've always wanted to meet you!"

"You were quite a bit down on that transmission for some reason."



Convert Your Ranger I for Six-Meter Operation

BY RUDOLF ORAS,* W9ZEW

The Ranger I can be converted for 6 meter operation at the cost of the 11 meter band. Most of the parts needed to do this are from the Ranger II and are available from Johnson at a nominal cost.

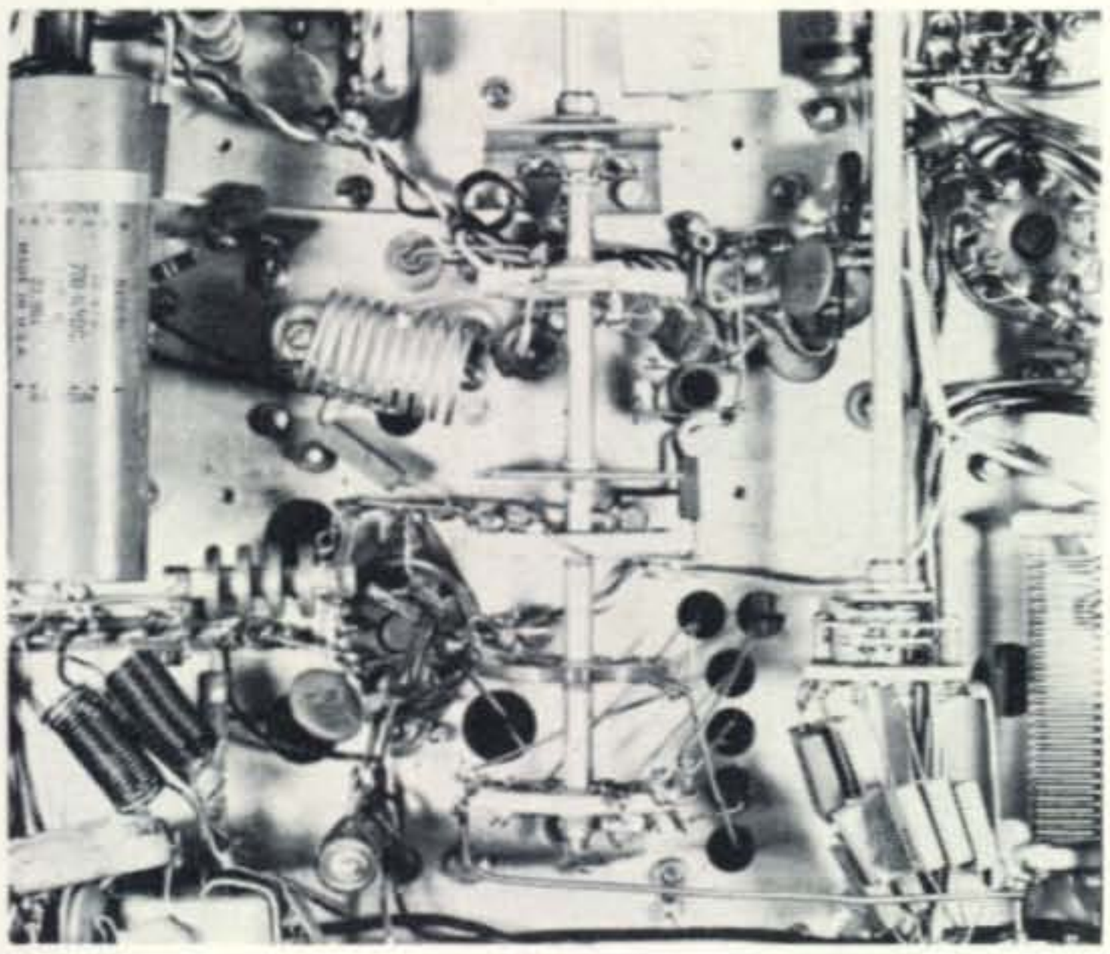
THE purpose of this article is to explain how the Ranger I can be put on 6 meters thus making it, in effect, a Ranger II. The 11 meter band on the Ranger I is all that is sacrificed and it serves no useful purpose for the amateur at present. After this modification the Ranger I can be used for local contacts on 6 instead of cluttering up the DX bands.

V.F.O. Modifications

To begin the modifications one must remove the plastic calibrated dial plate and replace it with a Ranger II dial plate. Order part number 22-993-4 at a cost of approximately $1.25. The numerals are printed in red or black, thus creating a poor contrast with the dark background of the Ranger I. To improve the contrast good bond paper of an appropriate size must be cut and rubber cemented to the panel. Then the dial plate and knobs are assembled to the front panel.

The 11 meter v.f.o. tunes from 6.7 mc; this frequency must be decreased to 6.25 mc. To accomplish this, remove the right side panel from the v.f.o. assembly while facing the front panel, allowing access to the 11 meter padder capacitor C_4. Add a silver mica capacitor, 22 mmf 400 volts, in paral-

*3636 South 59th Avenue, Cicero, Ill., 60650.



Bottom view of the V_{15} area showing the location of the tube socket, coil ground lug and terminal strips.

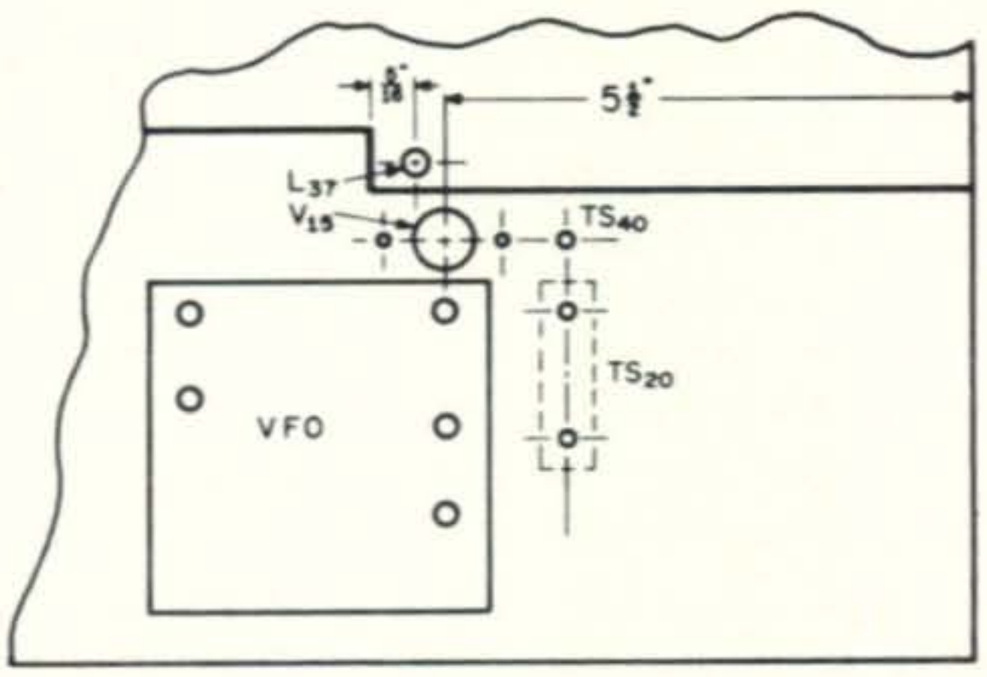
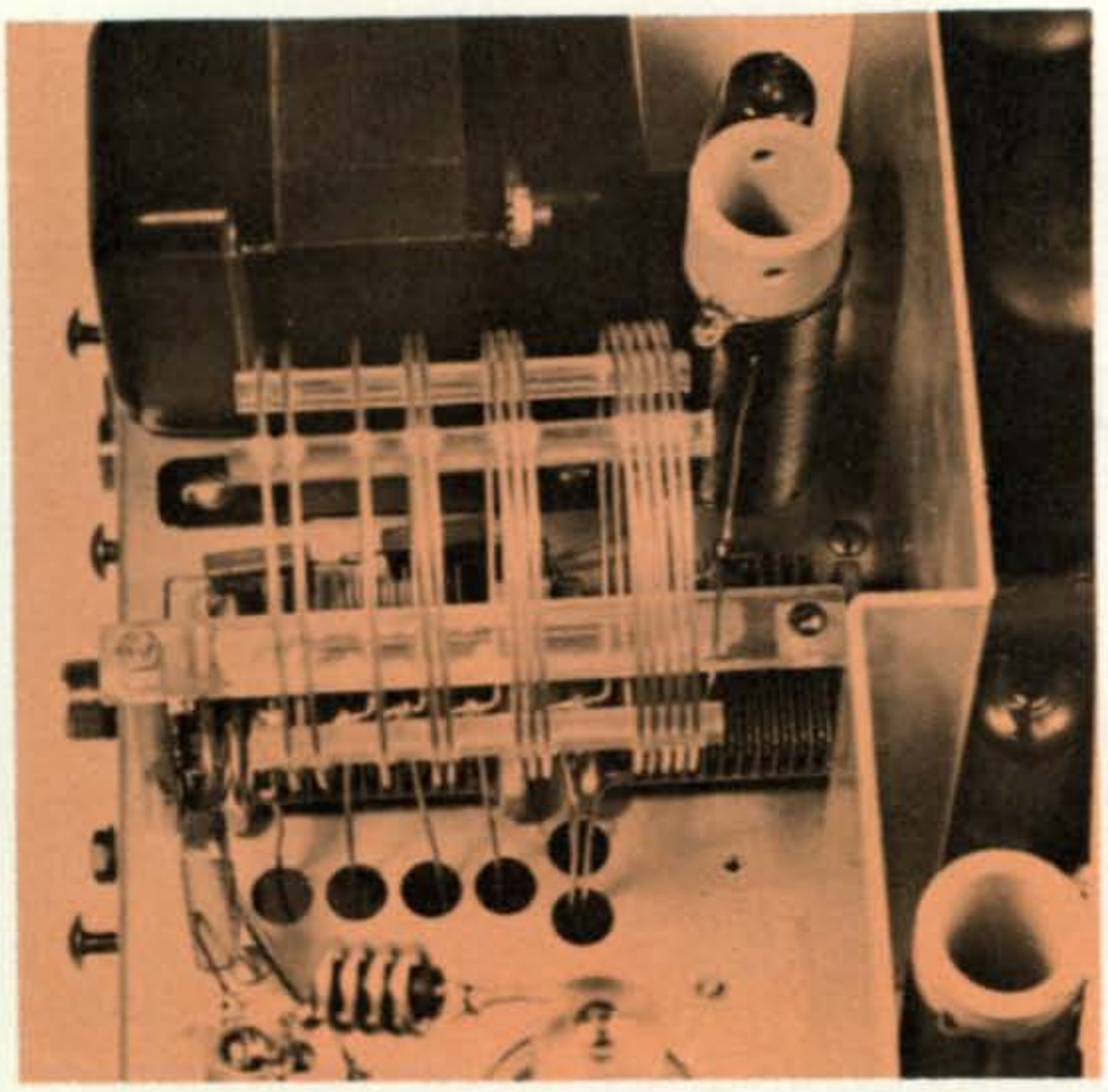


Fig. 1—Holes must be made to permit mounting of V_{12}, L_{37} and a new terminal strip TS_{40}. Shown above are the sizes and locations of the needed holes on the top-side of the Ranger I chassis.



Top view of the final shows the location of the wires from L_{11} routed through holes in the chassis.

lel with C_4 and replace the side cover. The padder capacitor, C_4, is used to adjust the frequency to 6.25 mc (50.0 mc). This adjustment completes the changes required for the v.f.o.

Bandswitch Removal

The next step is to remove the BANDSWITCH, SW_3; of course the switch shield must be removed first. Cut the color coded wires at the switch terminals for later lead identification, or unsolder the wires carefully, but do not burn or melt the plastic insulation. Move coil L_6B so as to remove the switch more easily.

R.F. Doubler Circuit

A 5763 r.f. doubler and a coil must be added to the circuit. As shown in fig. 1, measure off 5½ inches from the right hand side of the chassis, then find the center between the shield and the v.f.o. box. Drill a ⅜ inch pilot hole for a ¾ inch Greenlee socket punch, and punch through the hole. Use the ceramic 9 pin tube socket to locate the mounting holes. Note that pin 9 of the tube socket V_{15}. On the underside of the chassis mount a two terminal, Cinch terminal strip, TS_{40}; one lug is grounded.

Drill a ⅜ inch hole, $\frac{5}{16}$ inch from the edge of the bend in the shield as shown in fig. 1. This hole is used for mounting the 5763 plate tuned coil, L_{37}. The diameter of the hole may vary depending on the coil form being used.

Using a number 26 drill, make a hole at the intersection of the center line of terminal strip TS_{20} and the center line of the 5763 tube socket V_{15}. On the underside of the chassis mount a two terminal, Cinch terminal strip, TS_{40}; one lug is grounded.

Bandswitch Installation

Obtain a new band switch, SW_3, part number 22.1667 at approximately $6.45. Mount the switch in the same manner as the original.

Wire switch section $SW_{3\text{-A}}$, as shown in fig. 2. Note that R_9, a 4.7K resistor, is replaced with a 2.4 mh choke, L_{27}.

Inductor L_{36} is a new coil, constructed from number 18 enameled wire with 19 closewound turns on an inside diameter of ⅜ of an inch. This coil is used to increase the inductance of L_5, because the v.f.o. frequency was decreased from 6.75 to 6.25 mc. Observe the color code of the wires

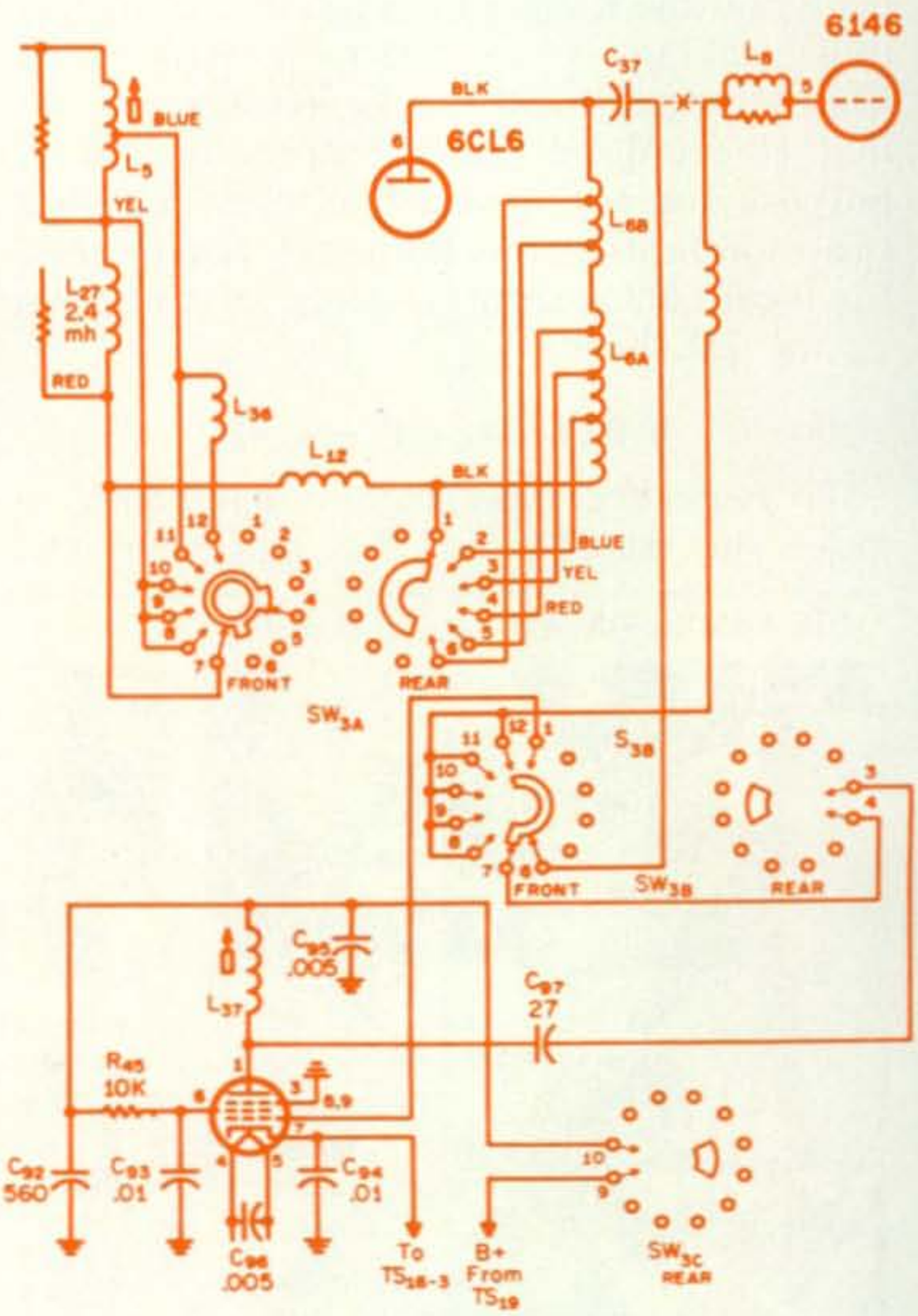


Fig. 2—New wiring diagram of the multiplier input and output switching showing also the new multiplier stage needed for 6-meter operation.

for ease of wiring. Refer to the photo for the location of the 6 meter tap on coil L_6B and the general placement of L_{36}, L_{27}, and L_{12}. Note that they are vertical in respect to the chassis.

$SW_{3\text{-B}}$ and $SW_{3\text{-C}}$, Front Section

The purpose of $SW_{3\text{-B}}$ is to switch in and out a 5763 (V_{15}) r.f. pentode doubler with a fixed tuned plate circuit, resonant at 50.5 mc. The front section of the $SW_{3\text{-C}}$ switches the B plus (300 volts) to the 5763 doubler, V_{15}. Figure 2 shows, schematically, how the above function is accomplished. The 300 volts B plus is obtained from terminal strip TS_{19}, the cathode is connected to $TS_{16\text{-}3}$.

The 6146 grid circuit switching is modified as shown also in fig. 2. Coupling capacitor C_{37} is disconnected from L_8 and rerouted to $SW_{3\text{-B}}$ front as shown.

The parasitic suppressor, L_8, is changed. It can be purchased as part number 23.1212-2 at $0.33 or made by winding three turns ⅛ inch i.d. and ⅜ inch long, over a 56 ohm ½ watt resistor. The terminal strip TS_{30}, is replaced with a 3 lug terminal.

Final Amplifier

The original r.f.c., L_{10}, is replaced due to undersized wire and a tendency to self-resonate, causing excessive heating. Replace L_{10}

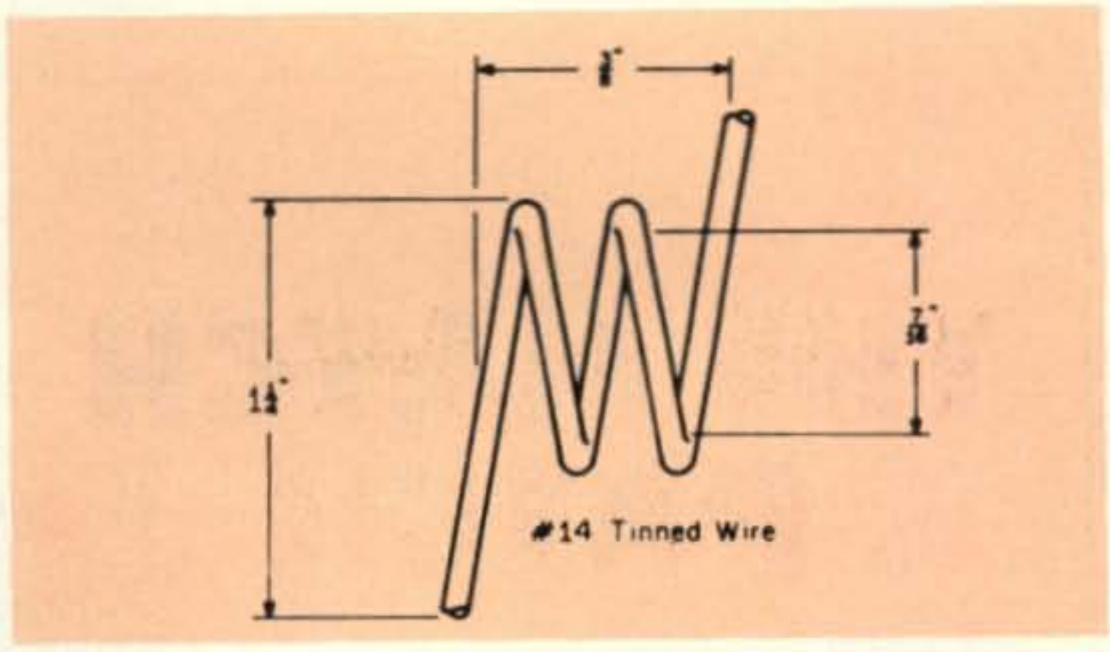


Fig. 3—New wiring diagram of the 6146 output circuit showing the new 6-meter coil L_{11C}.

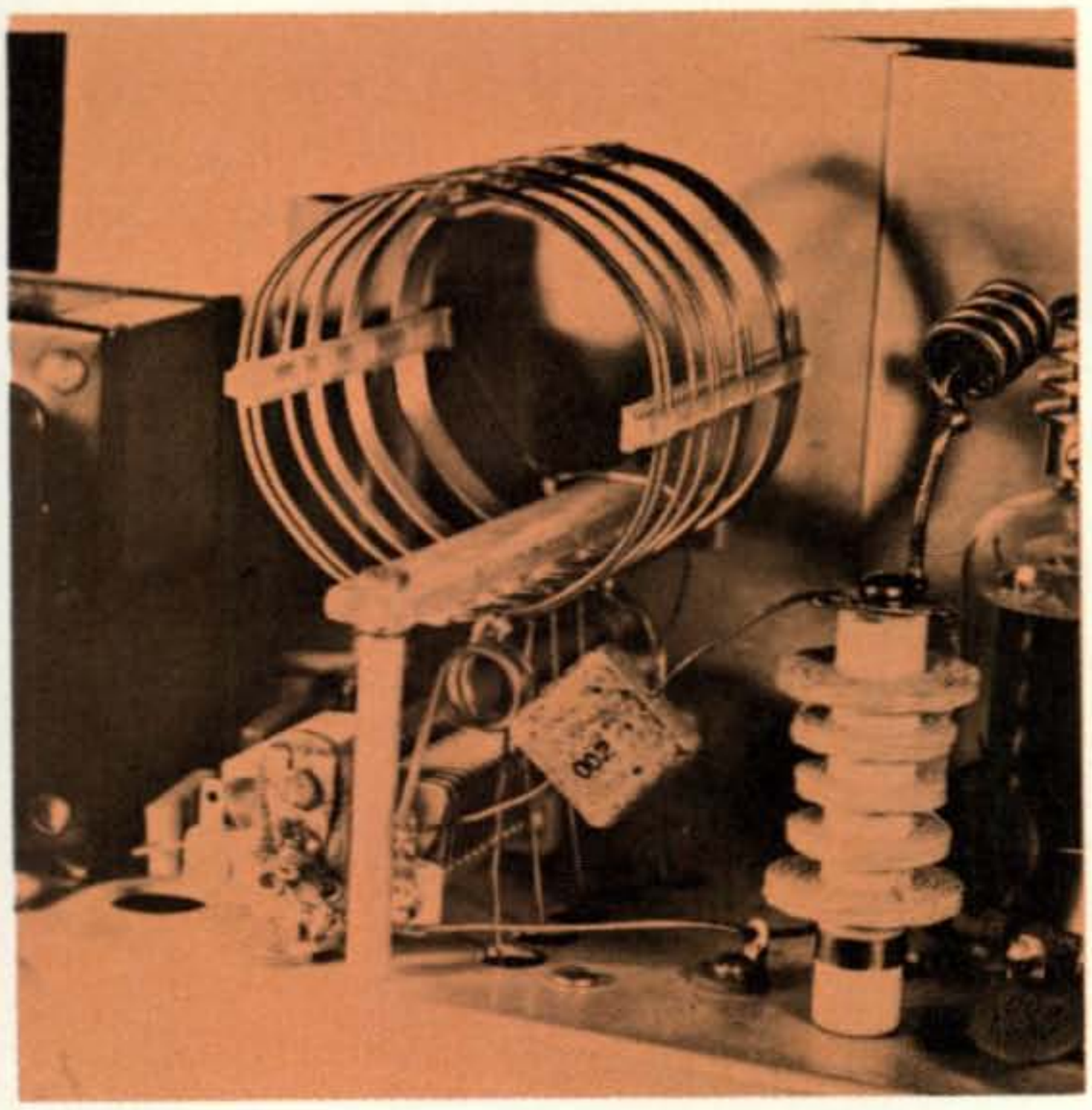
with part number 102-752-5 at $1.75. Replace the parasitic suppressor, L_9, with part number 23.1329-2 at $0.40, or make your own by winding 4 turns of #14 wire, ⅜ inch i.d. and 1" long over a 100 ohm 2 watt resistor.

The leads from the final coil L_{11A} are rerouted through the chassis holes, as shown in the photo, and wired to SW_{3D} and SW_{3C}, as shown in fig. 3.

Construct the 6 meter coil L_{11C}, as shown in fig. 4. To complete all wiring changes, insert the L_{11C} coil between the variable capacitor and coil L_{11A}, as in the photo.

The shield cover for the band switch is modified to allow clearances for the grid and plate leads of the 5763 doubler and the coupling capacitor to the grid of 6146. At-

[*Continued on page 117*]



Location of L_{11C} in the final tank circuit of the Ranger I. Coil L_{11C} is mounted between the variable capacitor lug and L_{11A}.

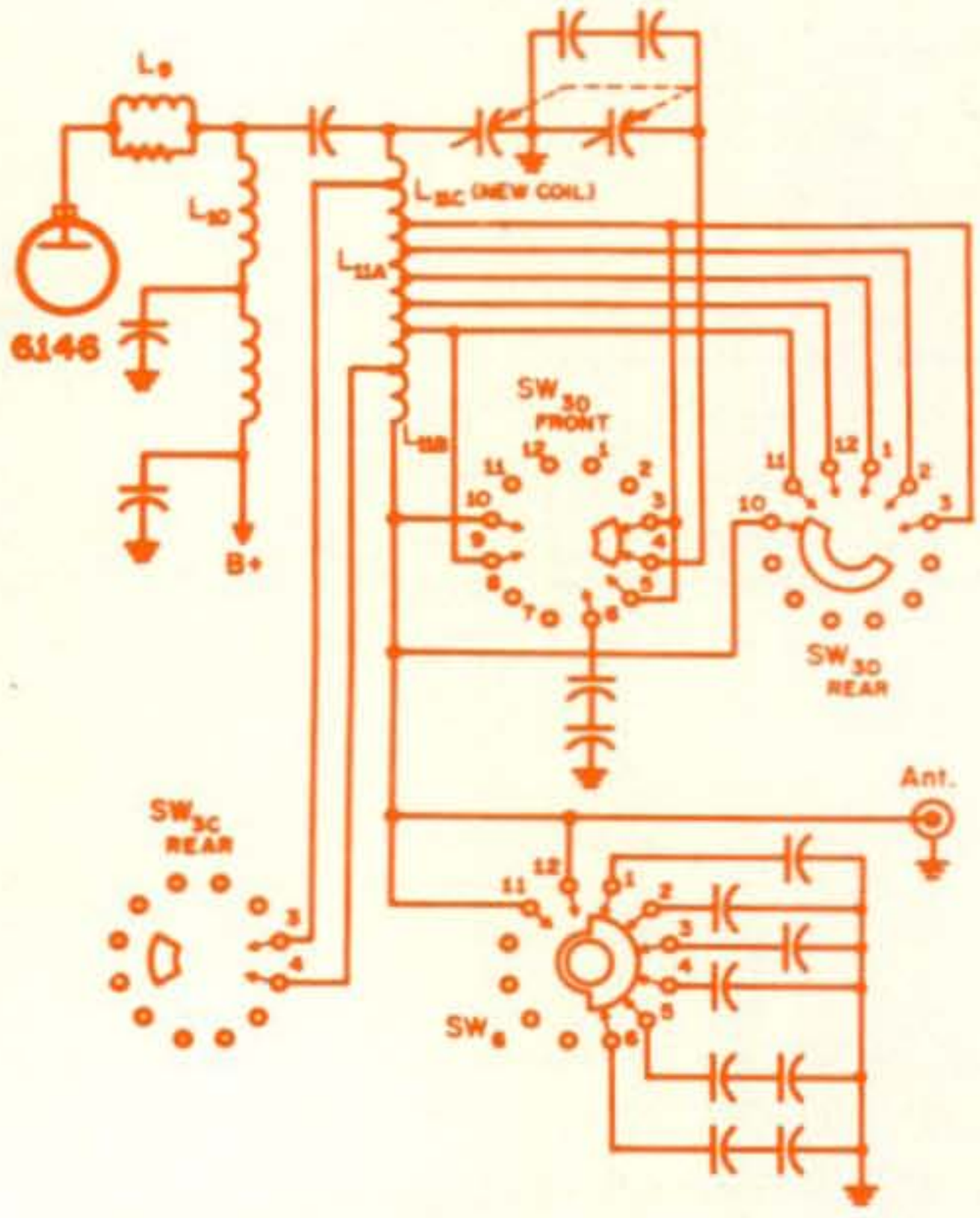


Fig. 4—Winding details of L_{11C}, the 6-meter plate coil.

THE MATCH PATCH

By William E. LaFarra,* W5ZCC

This simple phone patch is ideal for the beginner. Aside from its simplicity it offers convenient control, good performance, rapid adjustment and easy monitoring.

MANY phone patch articles have been published covering every imaginable type of circuit one could dream up. I feel sure that they all worked with great success. However, many newcomers have appeared on the scene and, with the higher bands opening to all parts of the world undoubtedly phone patching activities will increase. Many amateurs in small towns feel they won't get a chance to use a patch, but they are mistaken. If they desire to, they can get phone patching just by asking. Most GI installations and others who do lots of patch work keep an active file on who wants what, where and when. Generally all one has to do is call a few installations and tell the "chief op" that you are available in your location and will patch. Add to the GI's peace corpsmen, missionaries, IMRA, students overseas, and one can see the unlimited possibilities.

Of the many types of patches used electronic types and the hybrid with its vox ability are fine. Our experience has been that the normal person using a patch is too excited and unaccustomed to talking by radio over thousands of miles to a son, husband, or father so that the patch usually has to be operated manually anyway. For your first patch I would recommend something relatively simple to construct and get working, plus ease of operation. Lots of patches will be long distance collect calls and good operating practices are a necessity to insure success.

*P.O. Box 43, McGehee, Arkansas

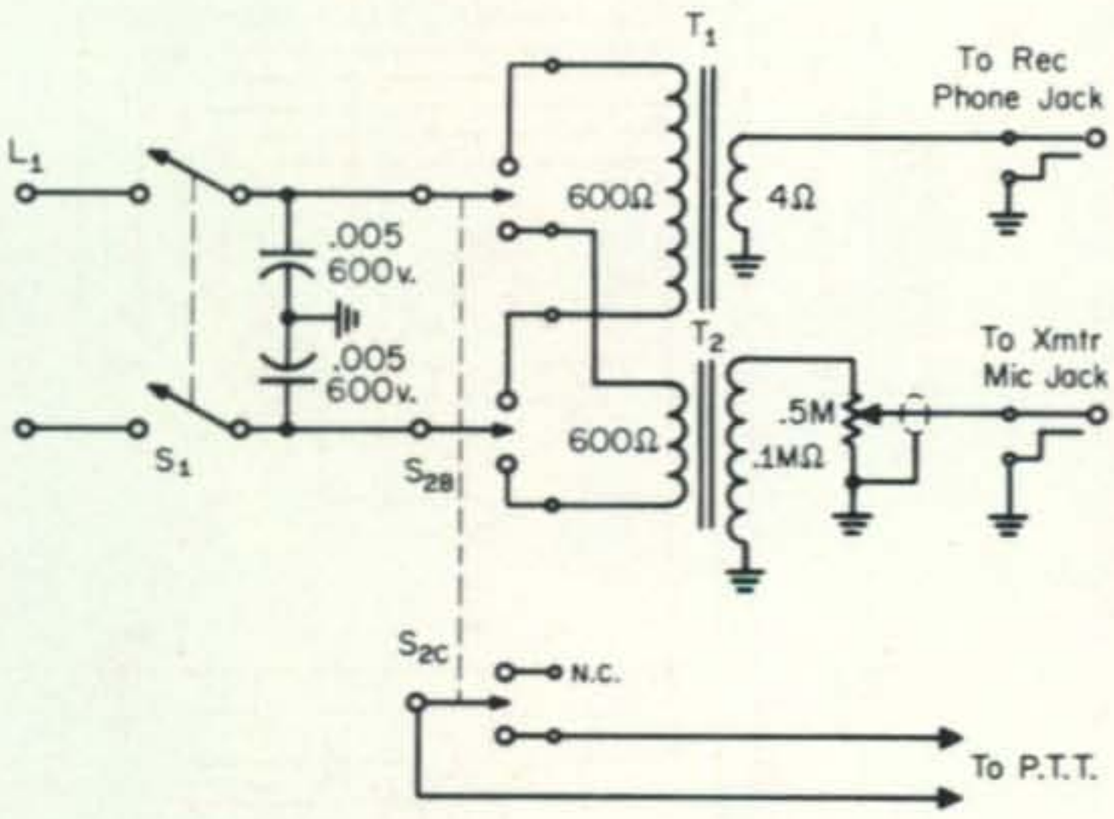


Fig. 1—Circuit of a simple phone patch that is manually operated. All capacitors are in mf.

T_1—600 ohms to 4 ohms (See text). Monarch LT-740, LT-750. Triad TY-45X. Stancor TA-44.

T_2—600 ohms to 100K. Monarch LT-30, LT-31, LT-32. Triad T-1X, T-2X.

Patch Design

Our problem is to match the 4 or 8 ohm output of the station receiver audio to the local telephone line impedance of 600 ohms on receive. On transmit we would like to match this 600 ohms back to our transmitter mike input running from 50,000 ohms to several megohms, depending upon the type of input circuit used.

In a transformer the impedance of the secondary load is reflected into the primary winding in the following relationship:

$$Z_p = TR^2 Z_s$$

where Z_p = reflected primary impedance

Z_s = impedance of the secondary load

TR = turns ratio of the transformer.

To determine the turns ratio of a transformer needed to match the 4 ohm receiver output to the 600 ohm telephone line, the formula is transposed to:

$$TR = \sqrt{\frac{Z_p}{Z_s}}$$

$$= \sqrt{\frac{600}{4}}$$

$$= \sqrt{150}$$

$$= 12.24$$

For an 8 ohm receiver output impedance the

required turns ratio would be calculated as follows:

$$TR = \sqrt{\frac{600}{8}}$$
$$= \sqrt{75}$$
$$= 8.66$$

Thus we need a transformer with a turns ratio of 12.24 to 1 or 8.66 to 1 depending on our receiver output impedance.

On the transmitter portion we will need to match the 600 ohm telephone line impedance to our microphone input. This impedance is usually 50,000 ohms and upward. This would require a transformer with at least a 9.12 to 1 turns ratio, or preferably higher, and one that is designed for this type of service (shielding and frequency response).

Typical Components

If you have a junk box full of old transformers you can easily find the turns ratio by applying a known value of a.c. voltage such as 117 volts to the primary and reading the secondary voltage. The transformer to be used on the transmitter side is a step-up and a lower applied voltage would be in order so as not to subject the secondary to an extremely high voltage that might break down the insulation. Use 6 volts a.c. or some other low voltage.

With no junk box one would have to turn to the market and here we find something new in recent years. It is the small transistor transformer normally used to match low impedances in transistor circuits. Numerous types will match 600 to 4 ohms and some transformers will match 600 to 100,000 ohms. These are economical, compact, of good quality and will make a nice patch. By adding a few extra components we can have an efficient unit that makes a worthwhile addition to our station.

The d.p.s.t. toggle switch used to disconnect the patch from the phone line is of the ordinary variety. The four pole double throw switch, however, is not. As shown in the photograph, it is a low capacity lever type switch and the use of a toggle switch for this function is sometimes troublesome due to signal leakthrough. A rotary type switch can also be used here.

Circuit Operation

In fig. 1 we have the circuit of the completed patch. By utilizing a switching arrangement on the line side we eliminate some of the problems encountered in other types of patches, mainly receiver feedback or hum modulating the transmitter. Having only one transformer in use at a time offers a good match to the line and the transmitter or receiver resulting in good audio quality. A double pole single throw switch is used to connect the patch to the line. The two 0.005 mf capacitors are used to eliminate r.f. on the phone line from entering the patch. Following these we have a 1 mf oil type capacitor which prevents our patch from shorting out the telephone line voltage. A capacitor with several hundred volts breakdown rating would serve nicely.

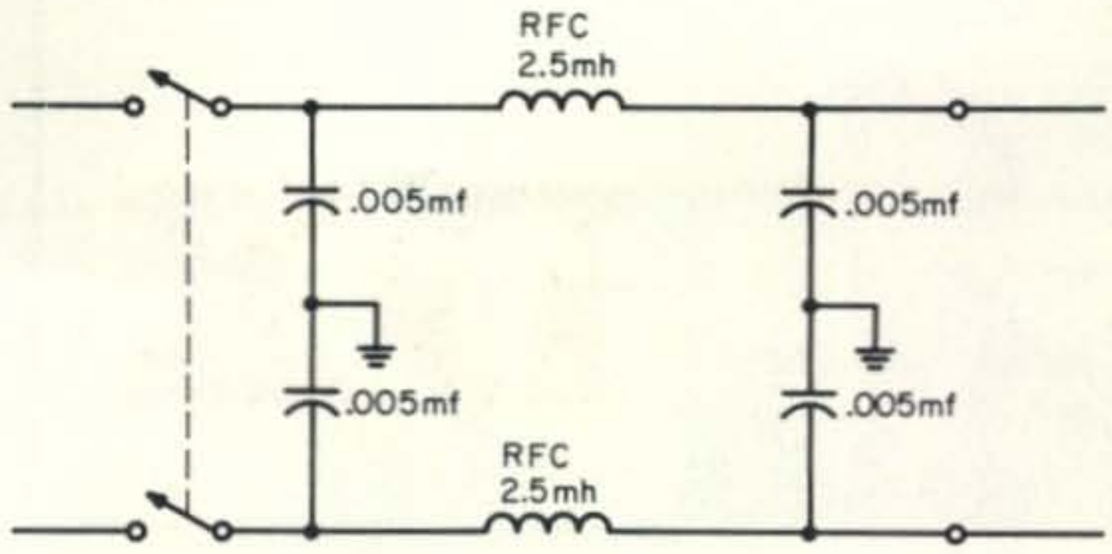


Fig. 2—Circuit of a more extensive r.f. filter that can be used with the phone patch if necessary. View of the interior of the phone patch shows T_1 mounted on the rear wall. Transformer T_2 is underneath T_1. The gain control, lever switch and disconnect switch are mounted on the front panel as well as the two terminals to connect to the phone line. The line connecting to the transmitter mike input (on the left) is shielded.

The 4 ohm (or 8 ohm) side of T_1 is connected to the receiver via the phone jack. This jack is used only when we set up for a patch and serves the useful purpose of killing the speaker of the receiver. The patch output is connected to the microphone input in place of the microphone. The switch used to transfer the line from transmit to receive has extra contacts, and we use them to key the transmitter when we shift to the transmit side of the patch. This arrangement makes for real smooth operation as each party talks and says "over" allowing you to handle everything with one flip of the switch.

Construction

Actually the patch is relatively simple and no problem should arise in its construction. Use normal audio frequency wiring techniques. If r.f. becomes a problem a more

[*Continued on page 141*]

DX

BY JOHN A. ATTAWAY,* K4IIF

WELL gang, this column is going to be pretty much devoted to the *CQ* DX Awards program. As it has been over 5 years since the complete WPX and WAZ rules were published, this issue will give you their full content in the hope that it will clear up any questions that you may have.

Also, the files have at long last completed their trek from New Jersey to Port Washington to Florida and the job of organizing and refiling the material has begun. Unfortunately the forms required for the authorization of new certificates by the Port Washington office were not included and have just arrived from the printer, so those of you who are awaiting certificates will have to wait just a little while longer. However, there was a goodly stack of WPX endorsement stickers and a lot of progress has been made toward distributing them to those hard working DXers who have recently qualified. An up-to-date (May 29) list of the stickers *recently* issued is as follows (this is *not* an Honor Roll):

WPX Mixed: W4OPM—800, W9DNQ—700, G3DO—650, K2ZKU—600, W3DJZ—600, W4RBZ 600, W5LGG—600, HK3LX—550, PAØLOU—550, K1SHN—550, WA6MWG—550, VE7CE—500, JA2JW—500, SM5BPJ—500, W8IBX—500, K4YFQ—450.

WPX CW: W8KPL—800, W4OPM—750, W5KC—700, W2EQS—700, W2HO—650, W8LY—650, ON4QX—650, W9GFF—600, G2GM—600, OK1SU—600, K2ZKU—600, W5LGG—600, W2KIR—600, K2CPR—600, WØAUB—550, VE4OX—550, OK2QR—550, KP4CC—550, K1SHN—550, VK3AHQ—550, WA2CBB—550, G3HDA—550, OK3UI—500, W4RBZ—500, DJ7CX—500, W4CKD—500, K1HVV—500, SM7TV—500, W4HOS—500, WB2FMK—500, W6UNP—500, WØVBQ—500, W9WIO—500, OK1CX—500, K2OUS—450, IS1FIC—450, JA2JW—450, W3MAC—450, G3HIW—450, SM5BPJ—450, W2FLD—450, VK3RJ—450, CN8AW—400, UW3DR—400, KØJPL—400, K4YFQ—400, SP2HL—400, I1IZ—400, 9J2W—400, K5AAD—400, SM3BNV—350, UI8LB—350, I1ZQ—350, SM5BGK—350, OK2DB—350.

WPX Phone: G3DO—600, HK3LX—550, PAØHBO—550, PAØLOU—550, W9UZU—500, CT1PK—500, W3DJZ—500, OE1FF—500, K2POA—450, CX2CN—400, YV2CJ—400, WA2EOQ—400, OE1PC—400, LA8PF—350, YV5BBU—350, XE1CV—350, K4YFQ—350, I1CBZ—350.

WPX SSB: W4OPM—700, W4NJF—650, K1SHN—550, W3DJZ—500, W4RBZ—500, K2POA—450, G3DO—450, W6YMV—450, W4EEU—400, W3VSU—400, W9DWQ—400, WA2EOQ—400, VE8RG—400, K3HHY—350, SVØWAA—350, PAØSNG—350, VE3BJL—350, W4EEU—350, DJ2UU—350, WA5LOB—300, K3BNS—300, OA4KY—300, SM5BPJ—300, VE3ES—300, SM5UF—300, YV3KV—300, WA6ESB—300, K4ZJF—250, OK1MP—250, VE7PU—250, ZB1A—250, F2MU—250.

WPX Band Endorsements: *1.8 mc*— OK1AEH, OK1AFC, DL1VW. *3.5 mc*—K6BPR, OK1AEH. *7 mc*—G2GM, OK1AEH, OK3DG. *14 mc.* 9J2W, SM7EH, K2POA, PAØHBO, OA4KY, ON4QR, UW9OU, DJ7CG.

The lack of endorsements for 21 and 28 mc is surprising. With sunspot conditions improving daily it is hoped that WPX activity on those bands will improve.

WPX Continental Endorsements: *Europe*—SMØBBC, CN8AW, 9J2W, YO2BQ, YO8CF, OK1AEH, SM5BGK, OK2DB, OK3HM, WA2-EOQ, OK1CX, UW9OU, UA4LM, I1ZQ. *Asia*—PAØLOU, W3GJY, PAØSNG, W5LGG, DJ7CX, UW3DR, JA1BN, OK3HM, OK3DG. *Africa*—WA2CBB, OK3DG, WB2FMK. *Oceania*—JA1BN. *South America*—YV2CJ.

We are very pleased by the interest accorded the band and continental endorsements by our overseas brethren. However, we are surprised and disappointed by the lack of interest stateside. *No one* applied for the North America endorsement.

A number of other DXers have joined the elite group of WPX, WAZ, and SSB DX certificate holders either for the first time or in a new category. These are:

WAZ CW-Fone—VE3ACD, JAØSU, DL6PI, W9HP, W4FRO, WB6EFA, W8KXO, KR6ML, OK1EJ.

WAZ SSB—DL6EZA, W8YCP, W4UWC, HB9-AAA (14 mc), PAØDEC, W1MVV, WA9AVV.

WPX CW-Fone—SM7EH, W6OMR, W4ZXI, KR6ML, UA1UD, UA4LM, W4ORT, WA2CFG, K7AGJ.

WPX Fone—LU1DJU, LU3BU.

WPX SSB—K2POA (14 mc), PAØLOU, W4-HUE, OE7UD.

SSB DX-200—OE7UD, K4GXO, W4FPW.

* P.O. Box 205, Winter Haven, Fla. 33881.

De Extra

"Daylight Saving Time" and DXing—THEY DON'T MIX!—DXing will never be the same again in Florida. Since 1945 Florida has always been on Eastern Standard Time (real time). However, this year the politicians got together and decided that honest clocks were a luxury so about the first of May the state went on Atlantic Standard Time (AST). This is the regular time in VP9, KP4, KV4, and VP2 lands. Of course the politicians don't call it Atlantic Standard Time. They call it Eastern Daylight Saving Time which is just confusing terminology because there has never been a politician who could make the sun come up one minute sooner or stay up one minute longer than nature intended. As a result of all this, one no longer gets up and works some good DX before going to work at 0730 EST or 1230 GMT. Now one leaves for work at 0730 AST, 1130 GMT, and all one hears in the morning is a dead band. DXing will never be the same. Anybody for DX Band Saving Time?

160 Meter DX Report de W1BB

Congratulations to WØVXO on hte successful completion of his 160 DXpedition. Between Feb. 5 and Feb. 25 Herb operated from the following stations: PY1NFC, OA4O, FG7XL, VP2AZ, VP2MK, VP2KY (Anguilla), and WØVXO/KV4.

Stew, W1BB, had much to report from his trip to the Orient in the latest issue of his 160 DX Bulletin. Included was his homecoming present of ZD8J for a new country the day after he returned. Some of the outstanding JA-land 160 meter enthusiasts he met included JA1FG, who sparked efforts to get the 1907.5-1912.5 kc band segment allocated to JA amateurs, and JA6AK, who has worked W6 on 160 meters. In crossing the Pacific, Stew found that U.S. east coast 2 kw "marker" stations disappeared about 1000 miles west of Hawaii which is still 2400 miles from Japan.

JA3AA and JA6AK, who have excellent rigs and locations, are trying for a 160 meter contact with the east coast. Around our sunrise would be the most likely time for this outstanding DX event to occur if and when it takes place. To the east coast JA-land is a real *tuffie* on 160 meters.

KL7FRY, Earl, has worked many JA's on 160, and is known as the "stepping stone" to Japan.

Anyone interested in 160 meter DX should by all means contact W1BB about receiving his 160m. DX Bulletin which contains several pages of useful information. His address is 36 Pleasant Street, Winthrop, Massachusetts.

QSL Manager of the Month

In August, *CQ* salutes that genial man about the DX circuit, Stuart Meyer, W2GHK, Founder and Director of the DXpedition of the Month (DOTM). During the past 4 years DOTM has handled over 300,000 outgoing QSL cards and Stu has been honored by Radio Club of Venezuela, the Virginia Century Club, and other organizations for his support of DX activity.

As a consequence Stu Meyer needs no introduction to the DX fraternity. However, his career has many interesting facets of which mayn DXers are unaware. He is presently the Executive Vice President of Aerotron, Inc. of Raleigh, N.C. Previously he was President of Hammarlund, Engineering Manager for the Communications Department of Allen B. DuMont Laboratories, and Chief Engineer of the Link Radio Corporation. He has held the call W2GHK since 1933 and has been active on all bands 160—2 meters. His favorite band and mode is 20 meters s.s.b., but he is occasionally active on everything from 160m. c.w. to 2 m. f.m. He is an A-1 operator and holds membership in the Institute of Electrical and Electronic Engineers, the Armed Forces Communications and Electronic Association, the Asso-

JA 3 District 160 Meter Boosters Meeting with W1BB and xyl W1DQF. L-R top JA3s JM, GKP, ART, AA, HVC, GMI, AH, and ECR. Bottom W1BB, W1DQF/Alice, and JA3EGD. JA3HVC was meeting host. Photo by JA3EGC.

ciation of Public Safety Communications Officers, the Quarter Century Wireless Association, the Amateur Radio Editors Association, the International Amateur Radio Club, and the Radio Society of Great Britain. Recently he was made a fellow in the Radio Club of America.

DX Hall of Fame

Don't forget to send in your nomination for the DX Hall of Fame. For complete details see the DX column of the July issue.

Ohio Valley Amateur Radio Assoc.

The following information on this fine DX-minded club was furnished by past president Jim, W8EVZ:

"The Ohio Valley, or more appropriately the Ohio Hills, has long been a prominent breeding ground for DXers. The majority of the OVARA members are from the greater Cincinnati area, although some hail from Dayton, Hamilton, Hebron, Piqua, and other neighboring towns.

"The club got its start in 1949 when W8JIN, W4FU, W8BOJ, W8FGX, and W8JJW met and formed an Ohio Valley Amateur Radio Association dedicated to the pursuit of DX and contest operation. The OVARA presently consists of about 45 members several of whom have obtained DXCC Honor Roll status, while others have placed first in national and worldwide contests. The club has participated in many expeditions to give fellow DXers a new one. Some of the spots visited include San Felix, Serrana Bank, Baja Neuvo, Malpalo and Navassa. Several joint DXpeditions have been made in cooperation with the Florida DX Club promoting interclub activity and fellowship.

Joe Hiller, W4OPM, a member of the CQ DX Awards Advisory Committee and one of the highest WPX scorers of all time. Look at the WPX endorsement sticker list and see some of the totals Joe has been racking up.

"As in many areas a DX tip off net buzzes with activity when a 'new one' appears. A monthly club paper, the 'Ether Waves', was maintained for many years, but was discontinued when the wide variety of weekly bulletins made it obsolete."

[Information from other DX clubs which we can share with our readers would be appreciated.—*DX Editor*]

New West Gulf DX Club Officers

The new WGDXC President is Ken Montgomery, W1ABY. The new Vice-president is Frank Montgomery, W5JWM. They succeed W5NW and K5JLQ. Good luck fellows!

International Amateur Radio Club News

IARC and the ITU were greatly saddened by the death of Dr. Manohar B. Sarwate, Secretary-General of the ITU. Dr. Sarwate died in February following what was thought to be a routine operation. He had agreed to become patron of the IARC only a short time prior to his death.

The 1966 activity report for 4U1ITU showed that 13,557 contacts were made by 112 different operators representing 31 nationalities and 6 continents. Operation was on all bands from 1.8 to 144 mc. Included among the contacts were 102 U.S. novices ocntacted between 21.1 and 21.15 mc during the last 4 months of the year. These represented all call areas from WN1 to WNØ.

The club acquired 180 new members during 1966 bringing the total membership to 1092. The officers for 1967 include Dr. M. Joachim, OK1WI, President; Jack W. Herbstreit, HB9AJI/WØIIN, Vice-president; Ted Robinson, F8RU, Secretary;and Willi Menzel, HB9AAB, Treasurer. Four key members left IARC in 1967 to return to their home countries. They were Gerald C. Gross, W3GG, John Gayer, HB9AEQ, Heinz Robig, HB9QC, and Gunter Joraschkewitz, HB9UD.

The DX Bulletins

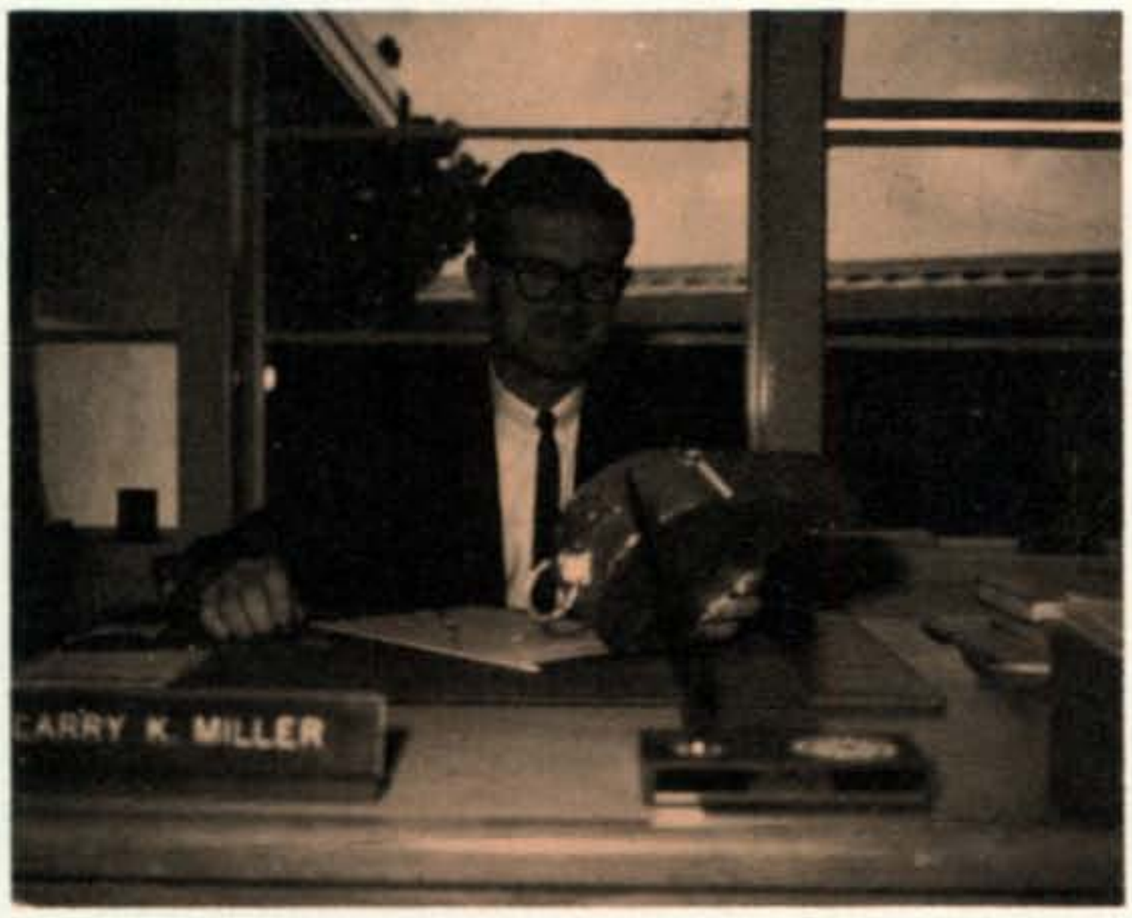
Since this column has been referring to the DX bulletins which are used as sources of information there have been many letters asking which bulletin gives the best service to a particular area. Because of this great show of interest the following listing has been made to let you see what bulletins

Our 1968 catalog of precision quartz crystals and electronics for the communications industry is now available.

It will cost you nothing.

SENTRY MANUFACTURING COMPANY

1634 Linwood Boulevard, Oklahoma City, Oklahoma 73106



Larry, W6ANB, QSL Manager for KG6IF. "Always send that s.a.s.e. fellows or I'll have to blow the whistle on you."

are available, and give you a thumbnail sketch of each of them. They are listed in alphabetical order and no particular endorsement is given by this column to any one bulletin. However, it is obvious that the more often a bulletin appears the more helpful it will be, so consequently every serious DXer should take at least one weekly bulletin.

DXer's Magazine (DX-Mag)—This is the "Cadillac" of the DX bulletins as it not only appears weekly but is actually a small magazine of about 20 pages. It is edited and published by Gus Browning, W4BPD, of worldwide DXpedition fame. The rates are $10.50/year by First Class mail and $12.00/year by Airmail to U.S. locations. For complete information write Gus, Route 1, Box 161-A, Cordova, South Carolina 29039.

DX-MB—This is a weekly bulletin containing 2 pages of DX and contest information in the German language. It is an official publication of DARC and is edited by Walter Geyrhalter, DL3RK. The rates are DM 8.50 for Germany, DM 11 for Europe by surface mail, and DM 15 for Europe by air. For information write DL3RK, 895 Kaufbeuren, Box 262, West Germany.

DX News-Sheet (DX-NS)—Issued weekly by Geoff Watts, 62 Belmore Rd., Norwich, Nor., England. Contains concise DX and contest information, and is sent air mail to the states for $5.00/year. This is an excellent general source of up to date DX information.

DX-Press (VERON)—This is a weekly sheet published by VERON, the Netherlands Section of the IARU. It contains 3-6 pages of DX news and tips in the English and Dutch languages. The news editor is PAØLOU, and the log editor is PAØTO. Rates are f 30 ($8.33) per year air mail to the USA. For complete details write VERON, Postbus 9, Amsterdam, The Netherlands.

Florida DX Report (FDXC)—Issued monthly by Editor Gene Sykes, W4BRB, 6510 Carambola Circle, W. Palm Beach, Fla. and the Florida DX Club. It is a 6-8 page bulletin of DX and club news, has good editorials. The rates are $3.00/year surface mail and $3.50 by air mail.

Long Island DX Association Bulletin (LIDXA)—This bulletin is issued twice monthly by editor Howard Klein, WB2EPG. The rates are $5.00/year by surface mail and $6.50 by air mail. For further info write to P.O. Box 157, Westbury, New York, 11591.

North Eastern DX Association Bulletin (NEDXA)—A two page sheet of DX and contest information issued weekly by editor Herb Kline, K1IMP. The rates are $5.00/year by surface mail and $6.25 by air mail. For complete information write NEDXA, 51 Gulliver St., Milton, Mass.

Ontario DX Association "Long Skip" (ODXA)—A 2 page monthly club bulletin edited by Bob Kenny, VE3EWY. Contains DX and club news. For information write to Bob at 2 Delbert Drive, Scarborough, Ontario.

Puerto Rican DXer (PRDX)—A monthly bulletin from the DX Club of Puerto Rico, editor José Toro, KP4RK. Contains a timely editorial and 3-4 pages of DX information in each issue. Rates are $3.00/year. Contact DX Club of Puerto Rico, P.O. Box 10525, Caparra Heights, P.R. 00922.

The DXer (NCDXC)—A monthly bulletin of club news and DX information from the DX Club of Northern California. W6PHF and W6UMI handle the chores. For full details write The DXer, Box 608, Menlo Park, Calif. 94025.

West Gulf DX Club Bulletin (WGDXC)—This very dependable 1 page sheet of DX news and tips has been issued weekly since 1951. The rates are $8.00/year surface mail, $10.00 by air to the U.S., and $12-15/year to foreign locations. For further information write to the editor, Tom Taormina, WA5LES, 3819 S. Shepherd, Houston, Texas 77006.

OK fellows, there they are. Hope the information is useful to you.

Complete WAZ Rules

The WAZ Award will be issued to any licensed amateur station presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards to be checked by the DX Editor or verified at one of the authorized checkpoints for *CQ* DX Awards. Most of the major DX clubs of the USA and national amateur radio societies abroad can be authorized checkpoints if they clear in advance with K4IIF. If in doubt consult the DX Editor. Any legal type of emission may be used providing communication was established after Nov. 15, 1945.

1. The official *CQ* WAZ Zone map will be used in determining zone boundaries.

2. Confirmations must be accompanied by a list of claimed zones showing the call letters of the station QSOed and the mode. The list should also show the applicants name, call letters, and complete mailing address clearly.

3. All contacts must be made with licensed, *land based*, amateur stations working in authorized amateur bands.

4. All contacts submitted by the applicant must be made within a 250 mile radius of the original location.

5. Any altered or forged confirmations will result in permanent disqualification of the applicant.

6. Continued use of poor operating ethics will result in disqualification of the applicant.

7. In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single sideband operation. The phone certificate requires that all contacts be two-way phone and the s.s.b. certificate requires that all contacts be two-way s.s.b.

8. If, at the time of the *original* application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application.

9. Include with the application $1.00 or 8 International Reply Coupons to defray the cost of the certificate.

10. Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of this award shall be final.

11. All applications should be sent to the DX Editor, P.O. Box 205, Winter Haven, Florida 33881.

12. Zone Maps and/or WAZ applications are available from the DX Editor or from *CQ* for a self-addressed stamped envelope or self-addressed envelope and 1 IRC.

The following list of zones is presented as a guide. Any questions will be decided by the zone map.

Zone 1. Northwestern Zone of North America: KL7, VE8-Yukon, the VE8-Northwest Territories Districts of Mackensie and, Franklin, and the islands west of 102° including Victoria, Banks, Melville, and Prince Patrick.

Zone 2. Northeastern Zone of North America: VO2-Labrador, that portion of VE2-Quebec north of the 50th parallel, and a portion of the Northwest Territories-VE8 east of longitude 102°. The latter includes part of the District of Franklin and the islands of King William, Prince of Wales, Somerset, Gathurst, Devon, Ellesmere, Baffin, and the Melville and Boothia Peninsulas.

DL6PI, another new CQ certificate holder. This is undoubtedly one of the neatest set-ups we've seen in many a day.

Zone 3. Western Zone of North America: VE7, W6, and the W7 states of Arizona, Idaho, Nevada, Oregon, Utah, and Washington.

Zone 4. Central Zone of North America: VE3, VE4, VE5, VE6, the W7 states of Montana and Wyoming, WØ, W9, W8 (except W. Va.), W5, and the W4 states of Alabama, Tennessee, and Kentucky.

Zone 5. Eastern Zone of North America: FP8, VE1, VO1, that portion of VE2-Quebec south of the 50th parallel, VP9, W1, W2, W3, the W4 states of Florida, Georgia, South Carolina, North Carolina, and Virginia, and the W8 state of West Virginia.

Zone 6. Southern Zone of North America: XE and XF.

Zone 7. Central American Zone: FO8-Clipperton, HP, HR, KS4, KZ5, TI, TI9, VP1, TG, YN, and YS.

Zone 8. West Indies Zone: CM/CO, FG7, FM7, HH, HI, KG4, VP2, VP5, VP7, KC4-Navassa, PJ2M/FS7, PJ2E, PJ2S, and YVØ-Aves.

Zone 9. Northern Zone of South America: FY7, HK, PJ2, PZ, VP3/8R, VP4/9Y4, and YV.

Zone 10. Western Zone of South America: CP, HC, HC8, and OA.

Zone 11. Central Zone of South America: PY and ZP.

Zone 12. Southwest Zone of South America: CE.

Zone 13. Southeast Zone of South America: CX, LU, VP8, and all Antarctic prefixes.

Zone 14. Western Zone of Europe: CT1, CT2, DJ/DL/DM, EA, EA6, EI, F, G/GB, GD, GI, GM, GW, HB, HL, LA, LX, ON, OY, OZ, PA/PI, PX, SM/SL, ZB2, and 3A2.

Zone 15. Central European Zone: FC, HA, HV, I, IT, IS, OE, OH, OK, SP, UA2, UP, UQ, UR, YU, ZA, ZB1/9H1, 9A1.

Zone 16. Eastern Zone of Europe: UA1, UA3, UA4, UA6, UA9-Bashkir & Chkalov, UB5, UC2, UN1, and UO5.

Zone 17. Western Zone of Siberia: UA9-Sverdlovsk, Chelyabinsk, Komi, Jurgan, Molotov, Omsk, Tyumen, plus UH8, UI8, UL7, and UM8.

Zone 18. Central Siberian Zone: UA9-Novosibirsk, Tonsk, Kamerovo, and Altai; UAØ-Keasnoyarsk, Irkutsk, Chita, Bruyate Mongolia, and Dickson Island.

Zone 19. Eastern Siberian Zone: UAØ-Khabarovsk, Amur, Yakutsk, Primorsky, Sakhalin Island, Wrangel Island, and the Soviet Kuriles.
Zone 20. Balkan Zone: JY, LZ, OD5, SV, TA, YK, YO, ZC4/5B4, and 4X4.
Zone 21. Southwestern Zone of Asia: EP, HZ, MP4, 9K, VS9 (except Maldives and Socotra), YA, YI, 4W1, UD6, UF6, UG6, and AP-West Pakistan.
Zone 22. Southern Zone of Asia: AC3, AC5, CR8, 4S7, VU (except Andaman and Nicobar Islands), 9N1, and AP-East Pakistan.
Zone 23. Central Zone of Asia: AC4, the BY provinces of Sinkiang, Kansu, and Hinghai, JT1, and UAØ-Tanna Tuva.
Zone 24. Eastern Zone of Asia: BY (except the provinces in Zone 23), BV, CR9, and VS6.
Zone 25. Japanese Zone: HL/HM, JA/KA, and KR6.
Zone 26. Southeastern Zone of Asia: HS, XV, XW, XZ, 3W8, and VU2-Andaman and Nicobar Islands.
Zone 27. Philippine Zone: DU, KC6, and KG6.
Zone 28. Indonesian Zone: CRØ, VR4, VK9 (except Nauru, Norfolk Is., and Christmas Is.), VS1, VS4, VS5, ZC5, 8F, and 9M.
Zone 29. Western Zone of Australia: VK6, VK8, and VK9-Christmas Is.).
Zone 30. Eastern Zone of Australia: VK1, VK2, V3, VK4, VK5, VK7, and VKØ-Macquarrie Is.
Zone 31. Central Pacific Zone: KB6, KH6, KJ6, KM6, KP6, KW6, KX6, VK-Nauru, VR1, VR3, and ZM7.
Zone 32. New Zealand Zone: FK8, FO8 (except Clipperton), FU8/YJ, KS6, VK9-Norfolk Is., VR2, VR5, VR6, ZK1, ZK2, ZL, and 5W1.
Zone 33. Northwestern Zone of Africa: CN2, CN8, CT3, EA8, EA9, 3V8, and 7X.
Zone 34. Northeastern Zone of Africa: ST, SU, and 5A.
Zone 35. Central Zone of Africa: CR4, CR5-Guinea, EL, TU, TY, TZ, XT, ZD3, 5N2, 5U, 5V, 6W8, 9G1, and 9L1.
Zone 36. Equatorial Zone of Africa: CR5-Sao Thome, CR6, EAØ, TJ, TL, TT, TN, TR, 9Q5, 9U5, 9J, ZD7, and ZD8.
Zone 37. Eastern Zone of Africa: CR7, ET2, ET3, FL8, 6O1, 6O2, 5H3, 5X5, 5Z4, and 7Q7.
Zone 38. South African Zone: ZD9, ZE, and ZS.
Zone 39. Madagascar Zone: FB8, 5R8, FR7, VQ8, VQ9, and VKØ-Heard Is.
Zone 40. North Atlantic Zone: LA-Jan Mayen, LA-Svalbard, OX, TF, and UA1-Franz Joseph Land.

The UA9 and UAØ Zones are sometimes rather hard to determine. However, the DX column in the June issue has a handy table to use in locating stations in these zones.

One of our highest WPX scorer's, John Leary, W9WHM, QSL Manager for HKØAI. This rather unorthodox shot was taken at the Indianapolis 500 in 1966. That's John on the left looking down at the driver.

Complete WPX Rules

The general rules 3-11 of the WAZ Award also apply to WPX where appropriate. In addition, the following other rules specific to WPX must be followed:

1. All applications for WPX certificates and endorsements must be submitted on the official application form CQ 1051. This form can be obtained free by sending a self-addressed stamped envelope to the DX Editor. It is highly desirable to use business size envelopes, 8½ × 11 inches, for this purpose.

2. All call letters *must* be in strict alphabetical order.

3. All entries *must* be clearly legible.

4. Use separate application for each endorsement, and be sure to specify whether your certificate is mixed, c.w., phone, or s.s.b.

5. For additional WPX credit list only additional calls.

6. Include with application $1.00 or 8 International Reply Coupons (IRCs) for certificate. A self-addressed stamped envelope or self-addressed envelope with 1 IRC should be sent for endorsement stickers.

Cretificates are issued for the following categories and numbers of prefixes: MIXED—400; C.W.—300; PHONE—300; S.S.B.—200.

Contacts between a s.s.b. station and an a.m. phone station will be accepted for the phone certificate.

Endorsements are issued for each 50 additional prefixes submitted. Band endorsements are available for working the following numbers of prefixes on the various bands: 1.8 mc—35; 3.5 mc—150; 7 mc—250; 14 mc—300; 21 mc—300; 28 mc—250.

Continental endorsements are given for working the following numbers of prefixes in the respective continents: North America—126; South America—88; Europe—146; Africa—80; Asia—68; Oceania—51.

Cards need *not* be sent but *must* be in the possession of the applicant. Any and all cards may be requested by the DX Editor or the Committee.

The definition of prefixes will be as follows:

1. The 2 or 3 letter/numeral combination which forms the first part of any amateur call will be considered the prefix.

2. Any difference in the numbering, lettering, or order of same shall constitute separate prefix. The following would be considered different: W2, WN2, WA2, WB2, WV2, K2, and KN2.

3. Any prefix will be considered legitimate if its use was licensed or permitted by the governing authority.

4. A suffix would designate portable operation in another area and would count only if it is the normal prefix used in that area. For example, K4IIF/KP4 would count only as KP4.

5. Calls without numbers will be considered as Ø plus the first 2 letters. For example, RAEM counts as RAØ.

6. As WPX is intended to be a pleasant past-time

and not a contest for "blood" all legitimate prefixes will be counted. For example, if you have both a VP4 card and a 9Y4 from Trinidad, both will be counted.

Northern California DX Club Proposal

The NCDXC has made an interesting recommendation to the Pacific Division Director of ARRL regarding the administration of DXCC. Space will not allow us to present the proposal in its entirety, but the following are the highlights:

". . . The club recognizes that the present awards committee, composed of headquarters staff members, has done a credible and conscientious job. However, it feels that the vastly increased world wide interest in DX awards make it impossible for a locally constituted committee to adequately represent the views of DX men in all divisions of the league.

"Therefore, NCDXC recommends that a new committee be formed to be known as the 'DXCC Committee.' It would be composed of qualified representatives from each ARRL division plus one member from Headquarters staff to act as coordinator. The division representatives would be DXCC members with at least 250 countries confirmed, and with paid-up membership in the League for at least a full year.

"The committee would work closely with the ARRL Headquarters Communications Manager who would present any 'Application for Change' in DXCC rules or country status to the coordinator for distribution. Decisions would be made by a simple majority of the committee within 30 days. All findings or decisions of the committee relating to rules or country status would be published in *QST* or by special release."

This proposal has merit, and hopefully will be given serious consideration. The entire world looks to the DXCC as a model for DX achievements, and its country list is widely accepted as the basis for DX awards. Consequently, it is imperative that DXCC administration be kept up to date in these rapidly changing times.

Here and There

de K1OTA—"I will be DXpediting in Luxembourg from July 25 to August 4. The call will be K1OTA/LX and my main operating frequencies will be 21.015 and 14.015 mc c.w. I also plan to use 7.015 and 28.015 mc c.w., and 14.2, 21.35, and 28.65 mc s.s.b. Between Aug. 5 and Aug. 15 I will be operating from Gibraltar on the same frequencies. QSL to the home QTH: 36 Pembroke St., Quincy, Mass., 02169."

de W3ZA—The International Amateur Radio Club, IARC, plans to sponsor a "DX Contest With A Purpose" in early 1968. The contest will have two objectives: to provide pleasure and recreation for the participants, and to contribute to IARC's propagation research study (CPR). Those unfamiliar with CPR may obtain information from IARC, Geneva 20, Switzerland or from March 1965 *CQ*, page 57.

de KØJPJ—Roland, FO8BV, is a new operator on Tahiti. He is a good c.w. man. VQ8CC is on 14.080 regularly around 0330 GMT. FL8HM is on 14.047 at around the same time. Some QSL info: 5H3KJ via W7URO, HA7PJ via WB6BYM. ET3USA via W7TDK, VK2AVA/LH via WA2RAU, FL8RA via W2LJX, and FL8HM via W7WLL.

de WA2RAU, QSL Manager for VK2AVA/Lord Howe—All expenses for Arie's DXpedition were paid by him personally. They amounted to over $1200.

de G2MI—"As I will be away on vacation the RSGB QSL Bureau will be closed between Sept. 9 and Oct. 9, 1967."

de K1TWK—"I am now QSL Manager for KC4USB, KC4USM, and KC4USN. S.a.s.e. *please* to 17 Island Park Road, Ipswich, Mass. 01938."

de W9WHM—"For HKØAI cards send only S.a.s.e., no money please. I've never accepted any for 21,250 QSLs of which I had 17,500 printed at my own expense."

de HP1XYZ—"My call is the first issued under the reciprocal agreement between the U.S. and Panama. All HP calls issued to U.S. amateurs will have the letter X after the figure."

de K2HVN—"I am QSL Manager for ZD7IP and ZD7KH. Confirmations usually take one week. Send S.a.s.e. to 860 Atlantic St., Lindenhurst, N.Y. 11757."

de K1ZWK—"I am QSL Manager for SM4CPW and will be happy to handle cards for any other station desiring a manager. Contact William L. Keyes, K1ZWK, 135 Eagle St., Bridgeport, Conn. 06607."

de VE5UF—All QSLs for the club station VE5US will be handled by Lew Christy, WB6QQP.

de W4NJF—"I am now handling cards for VS9ABL. W4CCB is *not* QSL Manager for EA8AH."

de WB4BMV—Dave, TL8DL, is now active. He is using a TR3 and 18AVQ and has a remote v.f.o. for split freuqency work. A beam will be up very soon. Main hours of operation are 1900-2200 GMT on 15 and 20 meters. He is looking for a QSL Manager.

de HI8XAL—"Every station I worked should have received an HI8XAL QSL. However, due to foul-ups in the mail during the D.R. revolution not everyone did. When I get back to W9SZR in July and August I will straighten things out. From Sept., 1967 to June, 1968 I will be in Washington, D.C. and inquiries can reach me through Jack Colson, W3TMZ. In June of 1968 I will be off to Thailand for 3 years. While that country is now on the banned list I will naturally do everything I can to change that situation if possible."

de D.A.R.C.—Remember the c.w. weekend of the WAE contest, Aug. 12-13. This is a good time to qualify for the EU endorsement on your WPX c.w. certificate.

73, John, K411F

THE awards PROGRAM

FEATURING USA-CA

BY ED HOPPER,* W2GT

1st

AWARDS have been issued as follows: "KD", W6DIX/7 earned a USA-CA-2000 award. Ruth, WA8AOK received a USA-CA-500 award, a USA-CA-1000 award and a USA-CA-1500 award, all endorsed ALL A-3. Mixed USA-CA-1500 awards went to Al, K1WQU and Dave, WAØJKT. Mixed USA-CA-1000 awards went to Ron, K1VTM and Merle, W6HVU who also received his USA-CA-500 award. Albert, K5MWV was issued a USA-CA-1000 award endorsed ALL A-3. Walt, W8ZCV received a USA-CA-500 award endorsed ALL A-3. Edmund, K5TOK earned a USA-CA-500 award endorsed ALL A-3-A, and Archie, W2RSV got a USA-CA-500 award endorsed ALL A-1. Mixed USA-CA-500 awards were issued to Henry, K3FPQ; Wallace, K2CYX; Thelma, WA8ENW; and Pedro, YV5BPG (the 2nd award to a YV station).

Amateur Radio Achievement Club

About the time you will be reading this, the ARAC should be organized and ready to issue certificates for outstanding achievement to applicants who meet the qualifications as set by the rules and regulations of ARAC for the attainment of such awards.

ARAC will give free of charge publicity to all sponsors of awards in an annual publication directory with picture of award plus text on how to attain it, and periodic publicity in their monthly publication, also free of charge. Certificates of outstanding merit will be issued by ARAC for the attainment of minimum, 25 awards plus steps up the ladder for 50- 100- 150- 200- 250 with outstanding merit for the attainment of 300 awards.

ARAC will not indulge in amateur radio politics in any manner nor will it recognize any organization where controversy that is detrimental to amateur radio is indulged in with abuse of descretion toward individual members or organizations.

The goal of ARAC is public relations for amateur radio through certificates. The Slogan being the propagation of amateur radio. The first 1000 members will be charter members and the details will be worked out shortly.

A nation wide publicity campaign will be in affect soon with full details, after the charter is made up. More details should be obtainable for an s.a.s.e. to Jack Adams, W4NOK, executive secretary, ARAC, Box 7326 Euclid Station, St. Petersburg, Florida 33734.

*103 Whittman St., Rochelle Park, N.J. 07662.

USA-CA HONOR ROLL

2000

W6DIX/7 .. 35

1500

WAØJKT ... 59
WA8AOK .. 60
K1WQU 61

1000

K1VTM 112
W6HVU 113
WA8AOK ...114
K5MWV ...115

500

W8ZCV 615
K3FPQ 616
YV5BPG ...617
K5TOK 618
W2RSV 619
K2CYX 620
W6HVU 621
WA8AOK ...622
WA8ENW ..623

Letters

Henry, K3FPQ, writes: "Enjoy your column in *CQ*. Like the stories on the different County Hunters. It is nice to read about the active Hunters I work."

Ruth, WA8AOK, writes: "Thank you so much for your promptness. I was so surprised to receive your letter and the certificate so fast. The certificate is by far, the prettiest one I have ever received!".

Merle, W6HVU, writes: "Read with great pleasure your article on Bertha, WA4BMC.

Have worked and rag chewed with her many times.

Have been a ham off and on since graduating from the U.S. Signal Corp School at Camp Alfred Vail (now Ft. Monmouth, N.J.) in 1922. At that time we were privileged to operate amateur rigs with a certificate from the Army School, so I never applied for a 2 letter call. I operated 9MG & 8MG for awhile, then lost interest for many years until obtaining my present call in 1951.

Operated MM nearly 10 years while chief electrician aboard many ships from the west coast (Merchant Marine). Am now retired as of 1 January 1966, cu on the Independent CH net on 14336".

Awards

The ECHO Net Certificate Of Achievement is sponsored by the Eastern Connecticut Amateur Radio Association. The *E*astern *C*onn *H*am *O*perators net operates every Sunday morning from 1500 GMT to 1700 GMT on 50.538 mc. Net Manager is Fred Tourtelotte, K1DVZ. Requirements are 3 *consecutive* check-ins from Conn., R.I., and Mass. area and *any* 3 check-ins from other locations. Send application with log information and 50 cents to K1MUJ, Box 155, Danielson, Conn. 06239.

Honorary Membership Certificate is sponsored by the Bayou City VHF Radio Club of Houston, Texas. There is no charge for this nice certificate and it is necessary to work 5 club members. Send GCR (General Certification Rule) list to Ben Harris, K5DRF, P. O. Box 295, Manvel, Texas 77578. For list of club members, send s.a.s.e.

Amateur Radio Mule Skinners Award offered by the Maskwonicut Mules Radio Club for confirmed contacts with 15 Norfolk County, Mass. stations *after* December 31, 1966, as follows:

HF Bands—work 15 Norfolk County Mass.

Foundation Of Guadalajara Diploma

Honorary Membership Certificate Houston, Texas

ECHO Net Certificate

Oregon Counties Award

WNYC—LI Award

AR Mule Skinners Award

stations, of which at least one must be a member of the MM Club, and at least one must be a Novice.

VHF—work 15 Norfolk County, Mass. stations, of which at least *four* must be members of the MM Club. At time of application, if so desired, AWARD will be endorsed AOMB/M. There is no charge for the award, but postage would be appreciated. Send GCR list showing Call, date, and QTH to Custodian, Phyllis Hoffman, K1QFD, 39 Depot St., Sharon, Mass. 02067.

Foundation Of Guadalajara Diploma is offered by The Club de Radio Experimentadores de Occidente AC of Guadalajara, Mexico, to all licensed radio amateurs under the following rules:

1. Mexico—Ten confirmed contacts with member stations. Club station XE1TD will count as three.
2. American Continent and Antilles—Three confirmed contacts with member stations.
3. Europe, Asia, Africa and Oceania—One confirmed contact with a member station.
4. Contacts are valid on any amateur band and in any mode (c.w., a.m., s.s.b.) after December 1965.
5. Applications and contact list, plus one U.S. dollar must be sent to Club de Radio Experimentadores de Occidente A.C., P. O. Box 197, Guadalajara, Jal., Mexico. Members are: XE1TD Club, XE1AD, AN, AAC, AAR, BM, BS, BBH, BBS, BBT, BBW, CW, CX, CCJ, CCO, ED, EEC, EEI, EEY, EEZ, FFM, GI, GN, GGH, H, HX, HHJ, HHS, IC, IY, IIH, JN, JR, JJA, KF, KKK, ME, MM, MME, MMG, MMQ, NL, NX, OD, OH, OI, RRD, RRK, RRM, SE, SN, SM, SY, TB, TJ, TZ, UE, VH, VJ, WB, WS, XK, XL, ZG, XE2CZ, DB, FI, LU, OA, RN, TE, WW, TI2CBV, W6YHN.

Oregon Counties Award is sponsored by the Oregon Chapter, QRP Amateur Radio Club. Basic award issued as follows: Oregon stations need 25 confirmed counties. W/VE stations need 18 confirmed counties. DX stations need 12 confirmed counties. Endorsement seals available for 25, 30 and 36 counties. Endorsements also given for AOMB/M. All GCR rules apply and if the signatures of two other amateurs cannot be obtained, the applicant must secure notarization or his application will be rejected. Any applicant must furnish QSL cards upon request of the Award Custodian. Basic award cost is 40¢ and the endorsement seals are free for an s.a.s.e. Data on active stations in the various counties is also available for an s.a.s.e. There is no amateur activities in Jefferson county at this time. Custodian, R. Peschka, K7QXG, 2580 S.W. 195th., Aloha, Oregon 97006, this is a new address.

WNYC—LI Achievement Award: This Worked New York City—Long Island Award is proudly offered by The South Shore Amateur Wireless Association (Sponsors of the NYC-LI QSO Party, and now the NYS QSO Party). The award is issued in three classes for confirmed contacts with stations in the seven counties comprising the NYC-LI section. QSLs in each county are required as follows:

County	Class 1	Class 2	Class 3
Richmond	1	2	3
New York	2	4	7
Bronx	3	6	10
Kings	5	10	15
Queens	5	10	20
Suffolk	4	8	15
Nassau	10	20	40
Total	30	60	110

The club station, WA2WEA, may be worked to substitute for any station in any county. Send GCR list, please compile it with the stations arranged in call book order, also include a statement to the effect that you have sent your QSL to each station claimed for credit. For additional credit for higher class award, merely send list of additional stations and the original certificate number. Basic award costs 50¢, endorsements to basic award for one IRC. If separate certificate is desired, each class is 50¢. Apply to T. Richard Bentley, K2UFT, Awards Committee Chairman, South Shore Amateur Wireless Association, P. O. Box 465, Valley Stream, N.Y. 11582.

Notes

A nice note from Bayard, W3AYS, pointed out that there are *two* exceptions to USA-CA Rule C4. They are Baltimore City and St. Louis City, which are not really counties but Independent cities. But I will continue to follow the *USA-CA Record Book* and give credits as so listed.

As you read this, hope you are all enjoying a fine vacation and thus find plenty of time to drop me a line and tell me—How was your month? 73, Ed., W2GT.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

August	5-6	Boy Scout Jamboree
August	5-6	Illinois QSO Party
August	5-6	Maryland/DC QSO Party
August	12-13	WAE C.W. DX Contest
August	19-20	QRP QSO Party
August	19-20	New Jersey QSO Party
August	26-27	South Carolina QSO Party
August	26-27	ALL Asia DX Contest
September	1-30	British Columbia QSO Party
September	9-10	WAE Phone DX Contest
September	9-11	ZERO District QSO Party
September	16-18	Wash. State QSO Party
September	16-17	SAC C.W. Contest
September	23-24	SAC Phone Contest
September	26-28	YLRL "Howdy Days"
October	7-8	WADM C.W. Contest
October	14-15	R.S.G.B. 21/28 mc Phone
October	14-15	RTTY Sweepstakes
October	18-19	YLRL Anniversary C.W. Party
October	**21-22**	**CQ WW DX Phone**
October	28-29	R.S.G.B. 7 mc Phone
November	1-2	YLRL Anniversary Phone Party
November	11-12	OK C.W. DX Contest
November	11-12	R.S.G.B. 7 mc C.W.
November	11-12	ARRL SS Phone
November	18-19	ARRL SS C.W.
November	**25-26**	**CQ WW DX C.W.**

Boy Scout Jamboree

Starts: 0001 GMT Saturday, August 5
Ends: 2359 GMT Sunday, August 6

This is the 10th Jamboree-on-the-Air and coincides with the holding of the XII World Jamboree in Idaho, and also with the 60th anniversary of the first experimental Scout camp on Brownsea Island, England.

Scouts throughout the world are planning special camps for this week-end, equipped with amateur radio stations.

Key station in the USA will be K7WSJ and GB3BSI in England. Look for activity on the following frequencies:

C.W.—3525, 7025, 14025, 21025, 25025.
Phone—3950, 7290, 14290, 21290, 28590.

Bulletins of this activity have been sent to all scout Bureaus in the world.

Your reports and photos of station activity go to: Boy Scout World Bureau, 77 Metcalfe St., Ottowa 4, Ontario, Canada.

Illinois QSO Party

Starts: 1600 GMT Saturday, August 5
Ends: 2200 GMT Sunday, August 6

This is the 5th of a successful series of Illinois QSO Parties.

Exchange: QSO number, RS/RST and QTH; county for Ill. stations, state, province or country for all others.

Scoring: Illinois stations multiply total QSOs by number of different states, VE provinces and countries worked. All others will use Ill. counties for their multiplier. (Max. of 102)

Frequencies: 3600, 3900, 7040, 7220, 14080, 14300, 21100, 21300, 28100, 28700.

Awards: For Illinois stations, 1st, 2nd and 3rd place certificates for single and multi-operator categories. Out of state, a certificate to the highest scorer in each state, province and country.

Logs: Must show date/time in GMT, station worked, exchange, band and mode. A summary sheet with the scoring, other pertinent information and name and address in BLOCK LETTERS is also requested.

Mailing deadline is September 1st and logs go to: Illinois QSO Party, Att: Cliff Corne, K9EAB, 711 West McClure Ave., Peoria, Ill. 61604

Maryland/DC QSO Party

Starts: 0000 GMT Sunday, August 6
Ends: 2400 GMT Sunday, August 6

This is the second MD/DC QSO Party sponsored by the Maydale A.R.C.

Use all bands, one contact per band and mode permitted, and separate logs are requested for each band and mode.

Exchange: QSO Nr., RS/RST and QTH; county for MD/DC stations. (cities of Balto. and Wash. count as separate counties) And

*14 Sherwood Road. Stamford, Conn. 06905.

All Asia 1966 Contest Results

North America

All Band

W3MSK	**6104**
WA6IVM	**5432**
W9IOP	**5112**
W5WZQ	4500
W1EVT	4237
W4YMX	2114
K6YCX	2046
W1BIH	1989
W1JYH	1890
WB6OLR	1540
W2MEL	1486
W3YUW	1485
W6BIP	1221
W6LCX	976
W1BGD	948
W8GQU	876
WA7BOA	666
W6RCV	492
W7ATV	448
WB6IEX	440
WØVFN	435
W3BYX	428
W6IXJ	336
W7DJU	295
K1AFC	294
W6ONG	200
W5BUK	175
WA7CGR	164
W5KC	135
W2GKZ	117
K6PJT	112
W8YGR	108
WA5NOM	84
HI8XAL	**1400**
W8DGP/KL7	**2270**
VE3EN	**1088**
VE2YU	**1080**
VE3IR	**440**
VO1AW	182

21 mc

W6MSM	**1464**
K2SHZ	840
W5EQT/5	624
WB6EFA	464
WA4PXP	228
W4MMD	36
HP1AC	**4**

14 mc

WB6LFR	**4085**
W1YYM	**1778**
W6AFI	1370
W2JVU	1176
W2AIW	1050
WB6KIL	462
W4CKD	184
W2WZ	108
W7ENA	108
W6EJA	51
WA8KPO	36
W6AM	26
WA5JWU	26
W4ZSH	18
K1STW	8
HP1BR	**33**
VE3FID	**280**
6Y5BB	**12**

7 mc

W6POW	**288**
K5JVF	135
HP1AC	**4**
WB6TMC	5

3.5 mc

WB6FHH	**6**

ARRL section or country for all others.

Scoring: Two points for each completed QSO. MD/DC will use ARRL sections and countries for their multiplier. All others, number of Maryland counties worked. (Max. of 25)

Frequencies: 3575, 3850, 7075, 7275, 14075, 14275, 21075, 21325, 50.1 and 145.1 Novices: 3735, 7175, 21110.

Awards: Certificates to the highest scorer (total from all modes and bands) in each ARRL section and country, 2nd and 3rd place awards if returns warrant.

Logs: Date/time in GMT and exchange as indicated. A summary sheet with the scoring, a signed declaration that all rules and regulations have been observed and name and address in BLOCK LETTERS.

Mailing deadline is September 1st and logs go to Carl E. Andersen, K3JYZ, 14601 Claude Lane, Silver Spring, Maryland 20904.

DARC WAE DX

C.W.—August 12–13. **Phone**—Sept. 9–10
Starts: 0000 GMT Saturday, Ends: 2400 GMT Sunday in each instance.

Complete rules and WAE Country List appeared in last month's CALENDAR. Logs go to: Dr. H. G. Todt, DL7EN, Chlodwigstr. 5, 1 Berlin 42, Germany. Mailing deadline, September 15th for c.w. and October 15th for phone.

QRP QSO Party

Starts: 0200 GMT Saturday, August 19
Ends: 2300 GMT Sunday, August 20

QRP Radio International members by their own volition keep their power to below 100 watts.

Operation during this party is limited to 20 hours out of the 45 hour period. All bands and modes may be used. Contacts will be between members and non-members as well as between members.

Exchange: QSO Nr., RS/RST, ARRL section and QRP Nr. (non-members send NM)

Scoring: Contacts between W/K, to VE1 to VE7 count 1 point. DX contacts 5 points. Included as DX are VO1 & VO2, VE8, KH6 & KL7.

Multiply total QSO points by the number of ARRL sections and countries worked, and again by a power multiplier if applicable. (Under 1 watt–5, 1 to 10–2, 11 to 20 –1.6 and 21 to 30–1.2)

Frequencies: C.W.—3540, 7040, 14065, 21040, 28040, 50350. Phone—3855, 7260, 14260, 21300, 28540, 50350.

Awards: 1st & 2nd place certificates in each ARRL section and country for members, and in each US/VE call area and country for non-members. Also an award for stations working the most member countries. (Min. of 5 countries)

Mailing deadline is Sept. 23rd and logs go to: Bob Liggett, K8TBR, 817 Springdale Drive, Charloston, W. Va. 25302.

New Jersey QSO Party

Two Periods
1900 to 0400 GMT Sat./Sun., August 19/20
1200 to 2300 GMT Sunday, August 20

The Englewood A.R.A. is again sponsoring the eighth New Jersey QSO Party.

Phone and C.W. are considered the same contest and the same station may be contacted on each band and mode.

Exchange: QSO Nr., RS/RST and QTH. County for N. J. stations, ARRL section or country for all others.

Scoring: Out of state stations multiply total contacts by N. J. counties worked. (Max. of 21) New Jersey stations will use ARRL sections for their multiplier. (Max. of 74) N. J. stations can also work in-state stations for contact and multiplier credit.

Frequencies: 1810, 3530; 3900, 7030, 7250, 14075, 14275, 21100, 21300, 28800, and 50-50.5, 144-146.

Awards: Certificates to the top scorer in each N. J. county. ARRL section and country. Second place awards will be made where returns warrant. Novice and Technician awards will also be made.

Stations planning active participation are requested to advise the EARA by Aug. 5th, as they plan to organize full coverage off all counties.

Logs must show all pertinent information and received no later than Sept. 16th by the Englewood A.R.A., 303 Tenafly Road, Englewood, N. J. 07631.

South Carolina QSO Party

Two Periods
2000 to 0500 GMT Sat./Sun., August 26/27
1400 to 0500 GMT Sun./Mon., August 27/28

This is the second annual QSO Party sponsored by the Low Country A.R.C.

All bands and modes may be used and the same station may be worked on each band and mode for points.

Exchange: QSO Nr., RS/RST and QTH; county for S. C. stations, state, province or country for all others.

Scoring: One point per contact. South Carolina stations multiply by sum of states, VE provinces and countries worked. Out-of-state stations will use S. C. counties for their multiplier. (Max. of 46)

Frequencies: 1820, 3550, 3950, 7040, 7240, 14070, 14240, 21070, 21270.

Awards: Certificates to the top scorers in each state, province and country, and the three top scorers in South Carolina.

You are expected to score your logs and also include a summary sheet with all information.

Mailing deadline is Sept. 15th and logs go to: Low Country A.R.C., Contest Chairman, P.O. Box 5026, North Charleston, S. C. 29406

All Asia DX

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

Rules for the 8th annual All Asia DX Contest are same as in past years with one exception, The latest DXCC country list only will be used for the multiplier. See last month's CALENDAR.

Logs must be at the JARL Contest Committee, P.O. Box 377, Tokyo Central, Japan before December 30th 1967

British Columbia QSO Party

This is a month long activity to celebrate the Canadian National Centennial. Rules and suggested frequencies in next month's issue.

ZERO District QSO Party

Three Periods:
0100–0400 GMT Saturday, September 9
2000–0600 GMT Sat./Sun., September 9/10
1200–0200 GMT Sun./Mon., September 10/11

Complete rules in next month's CALENDAR.

Washington State QSO Party

Starts: 2300 GMT Saturday, September 16
Ends: 0500 GMT Monday, September 18

Complete rules in next month's CALENDAR.

Scandinavian Activity Contest

C.W.: Sept. 16–17. **Phone:** Sept. 23–24. Starts: 1500 GMT Saturday, Ends: 1800 GMT Sunday in each instance.

This year's SAC is being sponsored by the S.R.A.L. Complete rules next month.

CQ World Wide DX Contest

Phone: October 21–22 **C.W.:** November 25–26.

Starts: 0000 GMT Saturday, Ends: 2400 GMT Sunday in each instance.

Rules will remain the same as previous years and will be given in details next month. Following brief rundown for the benefit of our friends in remote areas.

1. All bands may be used, 1.8 thru 28 mc.
2. Contest exchange, RS/RST plus your Zone.
3. QSO point value: (a) 3 points between stations in different continents. (b) 1 point between stations on the same continent but in different countries. (c) Contacts between stations in the same country are permitted for Zone and/or country multiplier but have NO QSO point value. (d) Exception: Contacts between stations in North America will count 2 points. (This applies to stations in North America **only.**)
4. Your multiplier is determined by the number of Zones and countries worked on each band.
5. Final score: (a) Single band, Zones plus Countries multiplied by QSO points. (b) All band, sum of the Zones and Countries from each band multiplied by the total QSO points from all bands.
6. Competition is in three divisions: (a) Single operator. (b) Multi-operator, Single transmitter. (c) Multi-operator Multi Transmitter.
7. Single operators have the option of operating on all bands or on a single band. Multi-operator stations however are judged on all band operation only.

Definition of Multi-operator stations: Single Transmitter, only ONE signal on the air at the same time. Multi Transmitter, all bands may be activated at the same time but only ONE signal per band is permitted.

Official rules including a list of 10 Trophies donated by prominent hams and clubs will appear in next month's issue. These rules as well as official log forms and summary sheets are now available from CQ. Be sure to include a large self-addressed envelope with sufficient postage or IRC's with your request. NOW is the time to make your request, not the week before the contest. Our address: CQ World Wide DX Contest, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

Editor's Note

Every year we usually run into a snag getting some of the Trophies to the winners in foreign countries. If any of you fellows are making a trip to a country which includes a Trophy winner as listed in past, the two results issues, and you would like to be our representative and make a personal presentation, why not contact me personally.

73 for now, Frank, W1WY

Our thanks to the following stations who sent us their logs for checking purposes: (c.w.)

W3DPR, W6VUW, K8QYG, W9LKI, WA0KDI, DL1JT, DL5EH, DM2ABG, DM2AGH, DM2AND, DM2AUA, DM2AUG, DM2AVA, DM2BMG, DM2BWK, DM2BXH, DM2BZN, DM2DEO, DM3KOG, DM3VTG, DM3WRO, DM4IJJ, DM4TKL, F2GO, F2SQ, G3URX, G4JZ, G6JF, HA5FA, JX6XF, LA6U, LA6VK, LZ1YW, OK1AIJ, OK1AKQ, OK1AKW, O1KARH/p, OK1ASE, OK1AW, OK1DK, OK1EV, OK1GS, OK1HA, OK1KNG, OK1KSL, OK1SM, OK1US, OK2BCJ, OK2BHV, OK2BIO, OK2BJE, OK2KOS, OK3KTD, OL3AHI, OH1AG, OH2YV, OH3XZ, OH5UX, OH5VY, OH6NH, OZ4UN, SM4CMG, SM4DXR, SM5BFJ, SM5DRW, SM6CZU, SM7TQ, SM0UU, SP2BMM, SP3BES, SP6AXF, SP6RT, SP9ZE, VE0MD, VS5JC, YO4WE, ZL1AAF, UA1OE, UC2AW, UP2AG, UW3DR, UB5CN, UB5KAW, UF6HS, UL7RL, UH8DR, UM8-8451/UI8, UA9GO, UA9XC.

The following Phone scores were inadvertently left out of the June listings:

Single Operator

UA4KHW	A	285,358	902	36	86
OK3KGI	21	4,305	95	11	24

Multi-Operator

UD6KEA	317,275	620	52	113

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

Propagation

BY GEORGE JACOBS,* W3ASK

TYPICAL summertime propagation conditions, much like those observed during June and July, are expected to continue on the h.f. amateur bands through most of August. By the end of the month, however, a trend towards fall conditions is expected to begin, with an increase in the number of 10 and 15 meter openings during the daylight hours.

During most of the month, fairly good north-south openings are predicted for 10 meters during the daylight hours to such areas as Latin America and Africa. By the end of the month the band is expected to open on east-west paths to Europe and Australasia as well, and possibly to the Far East.

Excellent DX openings are forecast to almost every corner of the world on 15 meters during the daylight and early evening hours. Signal levels are expected to be exceptionally strong during many of these openings, and 15 meters should be the optimum band for DX openings during most of these hours.

Good world-wide DX conditions are expected around-the-clock on 20 meters during August. During the late evening hours, the hours of darkness and the sunrise period, 20 meters should be the best band for DX propagation to just about every point on the globe. Signal Levels are expected to be exceptionally high during many of the openings predicted for this band.

Despite seasonally high static levels, some fairly good DX openings are forecast for 40 meters beginning during the early evening hours, and continuing through the hours of darkness and the sunrise period. Some fairly good DX openings should also be possible on 80 meters during the hours of darkness, with conditions peaking just as the sun begins to rise on the "light" side of the path.

* 11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for August

	Forecast Rating & Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: **4, 11-12, 23, 30**	A	A-B	B-C	C
Normal: **2-3, 5-6, 8-10, 13-14, 17-18, 22, 24-25, 28-29**	A-B	B-C	C-D	D-E
Below Normal: **1, 7, 15-16, 19, 21, 26-27**	C	C-D	D	E
Disturbed: **20**	D	D-E	E	E

How To Use These Charts

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

3—With the forecast rating noted above, start with the numbers in parentheses at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak with considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propagation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 1000 watts d.s.b. into a dipole antenna a quarter-wave above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—The Eastern USA chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through Sept. 30, 1967, and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

High static levels are expected to make DX openings on 160 meters difficult during August, but some may be possible during the hours of darkness and the sunrise period.

This month's column contains a detailed propagation forecast to the major DX areas of the world from the main geographical areas of the USA. The forecast is valid for both August and September, 1967. Instruc-

tions for the correct use of these Charts appear directly below the "Last Minute Forecast" at the beginning of this column. For a detailed forecast of short-skip propagation conditions expected during August, over distances ranging between approximately 50 and 2300 miles, and from Hawaii and Alaska, see the *CQ* Short-Skip Propagation Charts which appeared in last month's column.

V.H.F. Ionospheric Openings

Frequent meteor-type v.h.f. openings are expected during August as a result of the *Perseids* meteor shower. This shower, which began during late July is expected to peak during mid-August and promises to be one of the year's most prolonged and intensive showers. The ionization produced during the shower, as millions of meteors enter the earth's atmosphere, is expected to make possible numerous meteor-scatter openings over distances of several hundred miles on 10, 6 and 2 meters.

Sporadic-E ionization should continue to occur fairly frequently during August, resulting in some good short-skip openings on 6 meters over distances of approximately 750 to 1300 miles. During periods of very intense sporadic-E ionization, "two-hop" 6 meter openings may be possible up to distances of about 2600 miles. An occasional 2 meter sporadic-E opening may also be possible over distances ranging between 1000 and 1400 miles. While this type of propagation may occur at any time of the day or night during August, there is a tendency for sporadic-E ionization to peak between 8 A.M. and noon and again between 5 and 8 P.M., local standard time.

There is a fairly good chance for some 6 meter trans-equatorial openings during August between the USA and Latin America. The optimum times for such openings are the early evening hours, shortly before and just after sundown.

Auroral displays produce ionization in the earth's atmosphere which is capable of reflecting v.h.f. signals over distances ranging upwards to about 1000 miles. Auroral displays and auroral-scatter propagation are most likely to occur when h.f. radio conditions are disturbed or below normal. Check the "Last Minute Forecast" appearing at the beginning of this column for the days that are expected to be in these categories during August.

Sunspot Cycle

Sunspot activity continues to increase. The Zurich Solar Observatory reports a monthly sunspot number of 82 for May, 1967. This results in a 12-month running smoothed sunspot number, upon which the cycle is based, of 70 centered on November, 1966. A smoothed sunspot number of 94 is predicted for August, 1967. ■

CQ DX Propagation Charts

AUGUST & SEPTEMBER, 1967

Time Zone: EST (24-Hour Time)

Eastern USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-11 (1) 11-14 (2) 14-15 (1)	07-08 (1) 08-11 (2) 11-14 (3) 14-17 (2) 17-19 (1)	01-03 (1) 03-05 (2) 05-09 (3) 09-11 (2) 11-14 (3) 14-17 (4) 17-20 (3) 20-01 (2)	18-20 (1) 20-22 (2) 22-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)* 22-00 (2)* 00-02 (1)*
Northern Europe & European	09-13 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-16 (1)	02-05 (1) 05-07 (2) 07-09 (3) 09-13 (2) 13-19 (3) 18-02 (2)	19-21 (1) 21-23 (2) 23-02 (1) 21-01 (1)*
USSR Eastern Mediterranean	08-10 (1) 10-12 (2) 12-14 (1)	07-08 (1) 08-11 (2) 11-14 (3) 14-16 (2) 16-18 (1)	06-08 (2) 08-14 (1) 14-17 (2) 17-20 (3) 20-22 (2) 22-00 (3) 00-02 (2) 02-06 (1)	19-23 (1) 21-23 (1)*
West, Central & East Africa	09-12 (1) 12-16 (2) 16-17 (1)	06-08 (1) 08-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-20 (2) 20-23 (1)	04-08 (2) 08-14 (1) 14-16 (2) 16-18 (3) 18-22 (4) 22-01 (3) 01-02 (2) 02-04 (1)	19-22 (1) 22-01 (2) 01-03 (1) 00-02 (1)*
South Africa	08-10 (1) 10-12 (2) 12-13 (1)	06-10 (1) 10-11 (2) 11-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	05-07 (2) 07-14 (1) 14-15 (2) 15-18 (3) 18-20 (2) 20-23 (1) 23-02 (3) 02-03 (2) 03-05 (1)	20-22 (1) 22-00 (2) 00-02 (1) 22-00 (1)*
Central & South Asia	08-10 (1) 18-20 (1) 18-21 (2) 21-01 (1)	08-11 (1) 19-21 (1)	06-09 (1) 16-18 (1) 18-21 (2) 21-01 (1)	04-06 (1) 18-20 (1)
Southeast Asia	12-14 (1) 17-20 (1)	07-08 (1) 08-10 (2) 10-18 (1) 18-20 (2) 20-21 (1)	04-06 (1) 06-08 (2) 08-09 (1) 17-20 (1)	NIL
Far East	16-18 (1)	07-08 (1) 08-10 (2) 10-12 (1) 15-17 (1) 17-19 (2) 19-21 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-12 (1) 18-22 (1) 22-01 (2) 01-02 (1)	05-07 (1)
Pacific Islands & New Zealand	08-14 (1) 14-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	08-09 (1) 09-10 (2) 10-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	11-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-04 (3) 04-07 (2) 07-09 (3) 09-11 (2)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-08 (1) 03-07 (1)*

Austra-lia	08-10 (1) 15-16 (1) 16-18 (2) 18-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 15-17 (1) 17-19 (2) 19-20 (3) 20-21 (2) 21-22 (1)	05-07 (2) 07-09 (3) 09-11 (2) 11-15 (1) 15-17 (2) 17-21 (1) 21-23 (2) 23-01 (3) 01-03 (2) 03-05 (1)	02-04 (1) 04-06 (2) 06-08 (1) 04-07 (1)*
North-ern & Central South America	07-11 (1) 11-14 (2) 14-17 (4) 17-18 (2) 18-19 (1)	05-06 (1) 06-07 (2) 07-10 (3) 10-12 (4) 12-15 (3) 15-19 (4) 19-21 (2) 21-23 (1)	02-04 (2) 04-06 (3) 06-09 (4) 09-15 (2) 15-18 (3) 18-23 (4) 23-02 (3)	19-20 (1) 20-21 (2) 21-03 (3) 03-05 (2) 05-07 (1) 21-01 (1)* 01-03 (2)* 03-06 (1)*
South-ern Brazil, Argen-tina, Chile & Uru-guay	07-08 (1) 08-11 (2) 11-13 (1) 13-15 (2) 15-17 (4) 17-18 (2) 18-19 (1)	05-06 (1) 06-07 (2) 07-10 (3) 10-15 (2) 15-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	09-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-03 (3) 03-05 (2) 05-07 (3) 07-09 (2)	20-23 (1) 23-04 (2) 04-06 (1) 03-05 (1)*
Mc-Murdo Sound, Antarc-tica	14-16 (1) 16-18 (2) 18-20 (1)	10-14 (1) 14-17 (2) 17-20 (3) 20-21 (2) 21-22 (1)	15-17 (1) 17-21 (2) 21-00 (3) 00-04 (2) 04-07 (1) 07-09 (2) 09-10 (1)	00-04 (1)

Time Zones: CST & MST (24-Hour Time)
CENTRAL USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	08-10 (1) 10-12 (2) 12-13 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-17 (1)	07-12 (1) 12-15 (2) 15-17 (3) 17-00 (2) 00-05 (1) 05-07 (2)	20-22 (1) 22-00 (2) 00-03 (1) 21-01 (1)*
North-ern Europe & Euro-pean USSR	09-12 (1)	07-08 (1) 08-12 (2) 12-14 (1)	04-05 (1) 05-07 (2) 07-11 (1) 11-13 (2) 13-15 (3) 15-17 (2) 17-21 (1) 21-23 (2) 23-00 (1)	20-01 (1) 21-00 (1)*
Eastern Mediter-ranean	09-12 (1)	07-09 (1) 09-11 (2) 11-13 (3) 13-15 (2) 15-17 (1)	05-06 (1) 06-08 (2) 08-15 (1) 15-17 (2) 17-20 (3) 20-22 (2) 22-00 (1)	19-22 (1) 20-22 (1)*
West, Central & East Africa	09-11 (1) 11-15 (2) 15-16 (1)	06-09 (1) 09-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-19 (2) 19-21 (1)	04-08 (2) 08-14 (1) 14-16 (2) 16-19 (3) 19-21 (4) 21-00 (3) 00-01 (2) 01-04 (1)	20-23 (1) 23-00 (2) 00-01 (1) 22-00 (1)*
South Africa	08-10 (1) 10-11 (2) 11-12 (1)	06-08 (1) 08-11 (2) 11-13 (3) 13-14 (2) 14-16 (1)	05-07 (2) 07-13 (1) 13-15 (2) 15-17 (3) 17-00 (2) 00-05 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & South Asia	07-09 (1) 18-20 (1)	08-10 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-10 (1) 16-18 (1) 18-21 (2) 21-00 (1)	05-07 (1) 18-20 (1)
South-east Asia	11-13 (1) 16-19 (1)	07-08 (1) 08-11 (2) 11-14 (1) 17-19 (1) 19-20 (2) 20-22 (1)	05-07 (1) 07-09 (2) 09-12 (1) 18-20 (1) 20-22 (2) 22-00 (1)	05-07 (1)
Far East	15-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-18 (2) 18-21 (3) 21-22 (2) 22-23 (1)	18-21 (1) 21-23 (2) 23-01 (3) 01-02 (2) 02-06 (1) 06-07 (2) 07-09 (3) 09-10 (2) 10-12 (1)	02-05 (1) 05-06 (2) 06-07 (1) 05-06 (1)*
Samoa & Pacific Islands	10-14 (1) 14-19 (2) 19-21 (1)	07-08 (1) 08-10 (2) 10-14 (1) 14-17 (2) 17-21 (3) 21-23 (2) 23-00 (1)	05-06 (2) 06-10 (3) 10-12 (2) 12-17 (1) 17-19 (2) 19-22 (3) 22-00 (4) 00-03 (3) 03-05 (1)	23-00 (1) 00-05 (3) 05-07 (2) 07-08 (1) 01-03 (1)* 03-05 (2)* 05-06 (1)*
Austra-lia & New Zealand	09-12 (1) 12-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	07-08 (1) 08-10 (2) 10-15 (1) 15-17 (2) 17-21 (3) 21-22 (2) 22-00 (1)	07-09 (3) 09-12 (2) 12-18 (1) 18-21 (2) 21-02 (3) 02-07 (2)	01-03 (1) 03-06 (2) 06-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
North-ern & Central South America	07-10 (1) 10-13 (2) 13-16 (4) 16-17 (2) 17-18 (1)	06-07 (1) 07-10 (3) 10-12 (4) 12-15 (3) 15-18 (4) 18-20 (2) 20-23 (1)	06-09 (4) 09-11 (3) 11-15 (2) 15-18 (3) 18-23 (4) 23-01 (3) 01-04 (2) 04-06 (3)	18-19 (1) 19-20 (2) 20-02 (3) 02-05 (2) 05-06 (1) 20-23 (1)* 23-02 (2)* 02-05 (1)*
South-ern Brazil, Argen-tina, Chile & Uruguay	07-08 (1) 08-12 (2) 12-15 (3) 15-17 (4) 17-18 (2) 18-19 (1)	05-06 (1) 06-07 (2) 07-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	08-15 (1) 15-17 (2) 17-19 (3) 19-23 (4) 23-02 (3) 02-05 (2) 05-07 (3) 07-08 (2)	20-23 (1) 23-03 (2) 03-05 (1) 01-04 (1)*
Mc-Murdo Sound, Antarc-tica	13-15 (1) 15-17 (2) 17-19 (1)	09-15 (1) 15-18 (2) 18-19 (3) 19-21 (2) 21-22 (1)	08-10 (1) 16-18 (1) 18-20 (2) 20-00 (3) 00-02 (2) 02-04 (1)	00-05 (1)

Time Zone: PST (24-Hour Time)
WESTERN USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	10-12 (1)	07-09 (1) 09-13 (2) 13-15 (1) 21-23 (1)	05-06 (1) 06-09 (2) 09-11 (1) 11-14 (2) 14-16 (3) 16-18 (2) 18-21 (1) 21-23 (2) 23-02 (1)	19-20 (1) 20-22 (2) 22-23 (1) 21-22 (1)*
Central & North-ern Europe & Euro-pean USSR	NIL	07-08 (1) 08-11 (2) 11-13 (1) 21-23 (1)	05-07 (1) 11-13 (1) 13-16 (2) 16-20 (1) 20-22 (2) 22-00 (1)	18-23 (1)
Eastern Mediter-ranean & East Africa	09-11 (1)	07-08 (1) 08-10 (2) 10-11 (1) 19-21 (1)	04-05 (1) 05-07 (2) 07-13 (1) 13-15 (2) 15-18 (1) 18 21 (2) 21-22 (1)	19-22 (1)

*Predicted times of 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a forecast rating of (2), or higher.

[*Continued on page 118*]

Simon Says...

BY BERT SIMON,* W2UUN

Questions

1500 Watts OK With FCC: "How come the FCC limits the power input of CB rigs to 5 watts input and some manufacturers claim 20 watts p.e.p.? Wouldn't this be the same as 10 watts average power?"

I don't blame you for being confused. The Friendly Candy Company (FCC) says that we can run 1000 watts maximum input but they allow a.m.ers to run 1500 watts average power input to their finals and s.s.b.ers to run 1000 watts input to their finals. The 1500 watt figure is achieved with 1000 watts input to the final with no modulation and an additional 500 watts input with modulation. In fact if you wish to express the power in terms of peak envelope power it comes to 4000 watts p.e.p. Look at it this way:

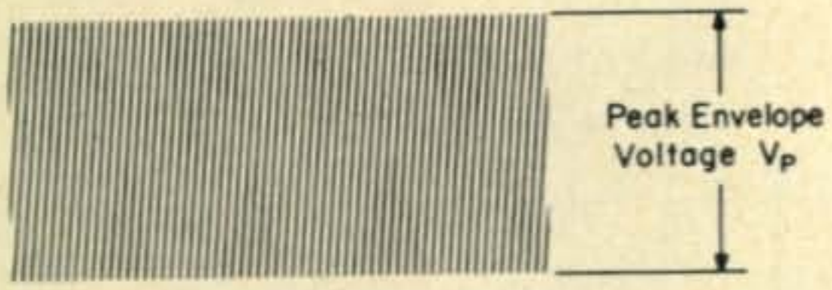


Fig. 1—Five-watt c.w. signal. Peak envelope voltage equals V_p.

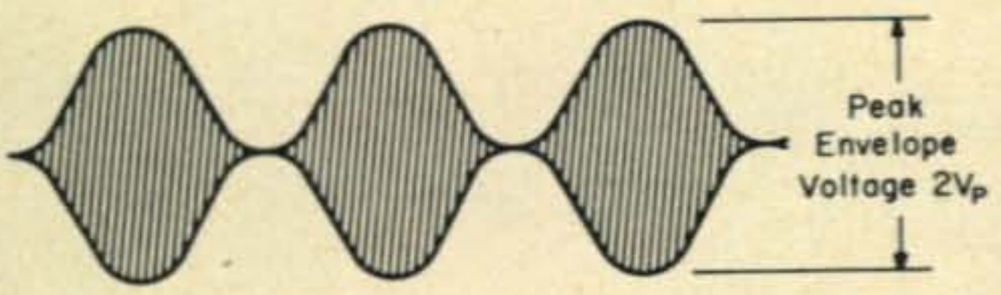


Fig. 2—Five-watt a.m. signal with 100% modulation. Peak envelope voltage equals $2 \times V_p$.

Power is proportional to the square of the voltage. So that a 5 watt 100 percent modulated a.m. signal is $5 \times 2^2 = 20$ watts (p.e.p. that is). P.e.p., of course, is the power at the peak of modulation. 20 watts p.e.p. worth of s.s.b. signal (with two-tone sine-wave modulation) means an average power of 10 watts but not so for am.m., in the a.m. case the average power is 7.5 watts of which 5 watts is supplied from the d.c. supply and 2.5 watts supplied from the modulator.

Now let's look at an s.s.b. rig running 2000 watts p.e.p. input with a single tone modulation (see fig. 3) What this really is, is a c.w. signal and a single tone 2kw p.e.p. input is therefore unlawful. (I was going to say illegal but there's a difference between unlawful and illegal. Unlawful is against the law and illeagle is a sick bird).

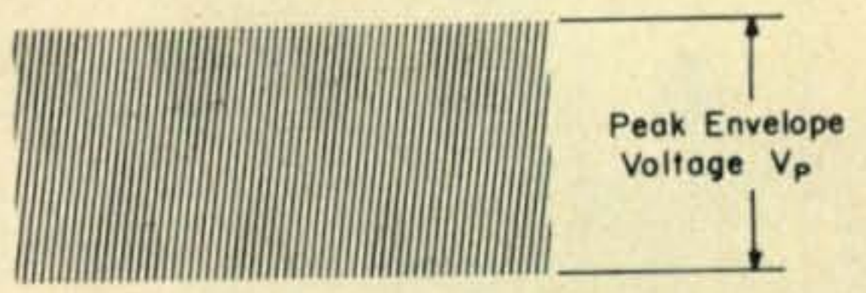


Fig. 3—2kw p.e.p. single-tone modulated s.s.b. signal. Peak envelope voltage equals V_p.

Now when you modulate the s.s.b. rig with a two-tone signal here's what you get (fig. 4).

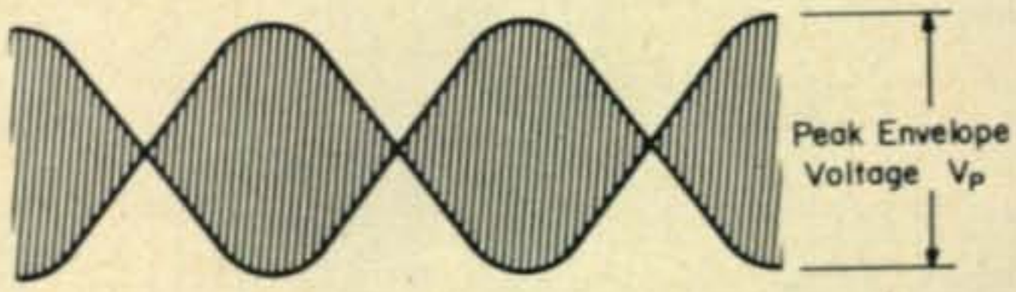


Fig. 4—2kw p.e.p. two tone modulated s.s.b. signal. Peak envelope voltage still equals V_p.

SIMON SAYS is a free technical question and answer service provided exclusively by *CQ*. Every attempt is made to answer each reader's question as promptly and accurately as possible. Occasionally, even Simon will be stumped, but this rarely happens. Readers are requested to enclose a stamped, self-addressed envelope with their questions to speed replies. Address inquiries to the author at his home address.

*Holland Mountain Rd., Oak Ridge, N.J.

The peak envelope volts hasn't changed but as you can see the power is 2 kw only for portions of the cycle and at other times it's zero power. This works out to be an average power of only ½ that of the 2 kw p.e.p.

Linear Amplifier Limitations

Now there are several limitations of a linear amplifier. One being the amount of Peak Envelope Volts that the grid can take without going into distortion (non-linearity) another is how many peak volts the r.f. components can stand before they short out. Then there's the power consideration which asks the question, "How much power can the r.f. tube and components take before they melt away?" So besides the voltage problem and the "melting" problem there's the d.c. supply problem, how much power can the d.c. source provide? If you had a linear amplifier capable of running 2 kw average power input and you supplied power to this from a 1 kw power supply it's also obvious that you wouldn't be able to run 2 kw average power input (well, not for long anyway).

So when someone says they're running 100 watts p.e.p. I get terrible confused. I don't know if they mean input or output, a.m. or s.s.b., one tone or two or three or four in love land with me and my gal (sorry about that, I guess I got carried away).

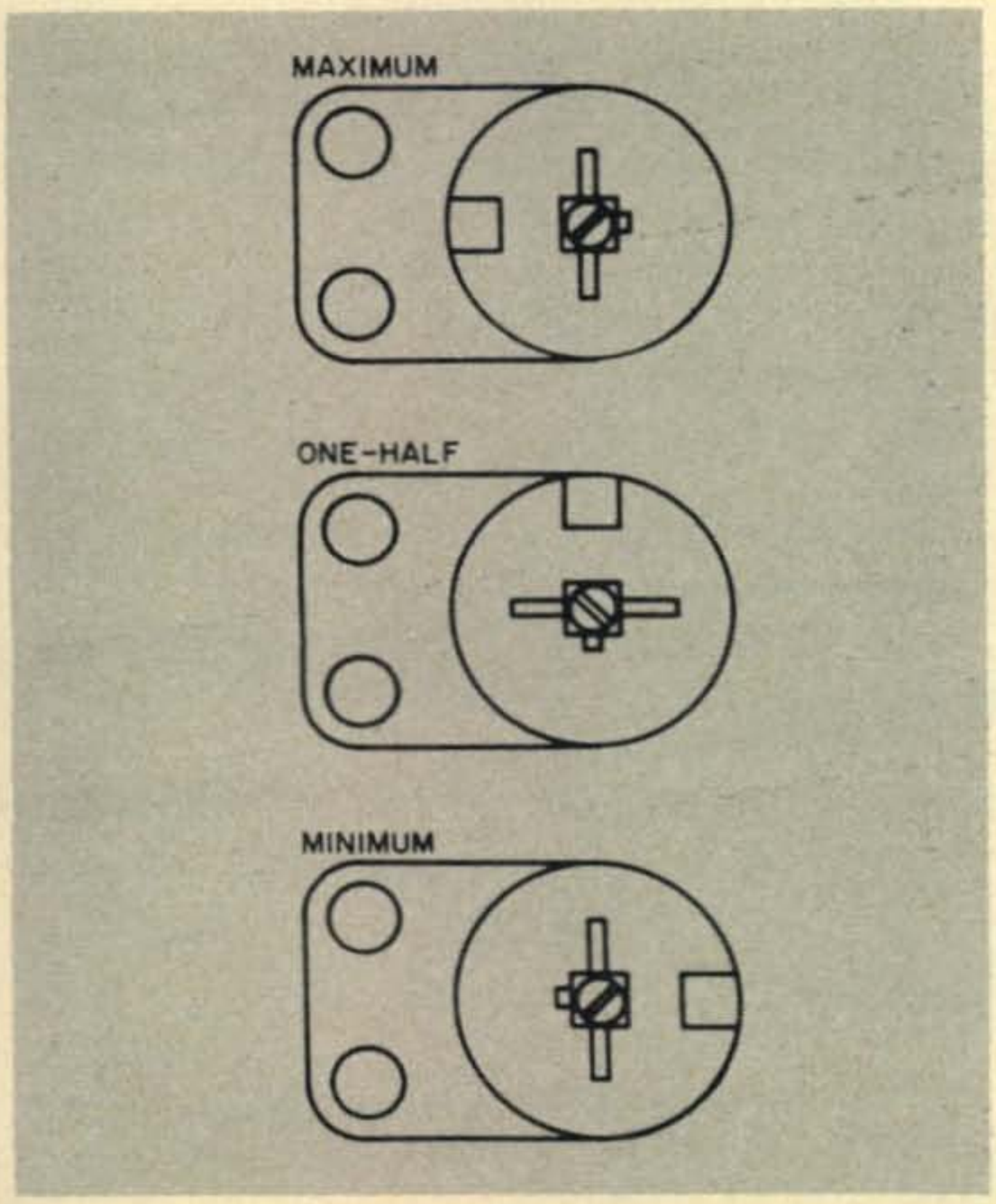


Fig. 5—Ceramic trimmer capacitor settings.

Ceramic Capacitor Positions: "How do you tell the minimum and maximum capacity settings of a ceramic trimmer type capacitor?"

See fig. 5.

1:1 Baluns: "Do you recommend a lumped type balun or one made from coax?"

There are two types of baluns suitable for 1:1 matching, one is the lumped transmission line type such as the W2AU Balun (Unadilla Radiation Products) for $12.95 and the other made from coax line. As to whether to use the lumped type or the coax cable type I believe really depends upon what frequency you're concerned with. At 80 meters the coax cable would require two lengths each 67 feet for a total of 134 feet. Now let's see, RG-8/U sells for about $.15/foot so there's 20 bucks for cable alone. It certainly makes good sense to spend the 13 dollars for the W2AU balun. At 6 meters it's another story, here you only require 9.4 feet of cable, which is about $1.50. One method I've been using in conjunction with v.h.f. antennas made from the Cush Craft Trix Sticks involves a "no soldering topside technique." See fig. 6. I recommend that the SO-239 connector be wrapped with an ample amount of plastic tape and sprayed with a clear lacquer to make it as waterproof as possible. The 50 ohm coax can be RG-58/U or RG-8/U type depending upon the power requirements. I personally use TI-50 cable from Times Wire whenever I'm dealing with powers greater than 100 watts.

Scope Monitor Connections: "I have a 3-inch Heathkit scope that I'm trying to use as a modulation monitor but instead of obtaining a trapazoidal pattern I get a fuzzy and distorted mess. What am I doing wrong?"

You're probably using the vertical amplifiers whihc won't handle r.f. Try connecting the vertical input directly to the CRT by the use of the rear connections.

Gold-Line "Signal Hunter" as an R.D.F.: "Gold Line makes a directional loop called the Signal Hunter and sells for under $10. Although originally intended for CB use, it can easily be used on 10 meters and 6 meters. As originally supplied it has a ceramic trimmer capacitor with a paralleled fixed capacitor. With the original capacitor in place it will easily tune 10 meters and

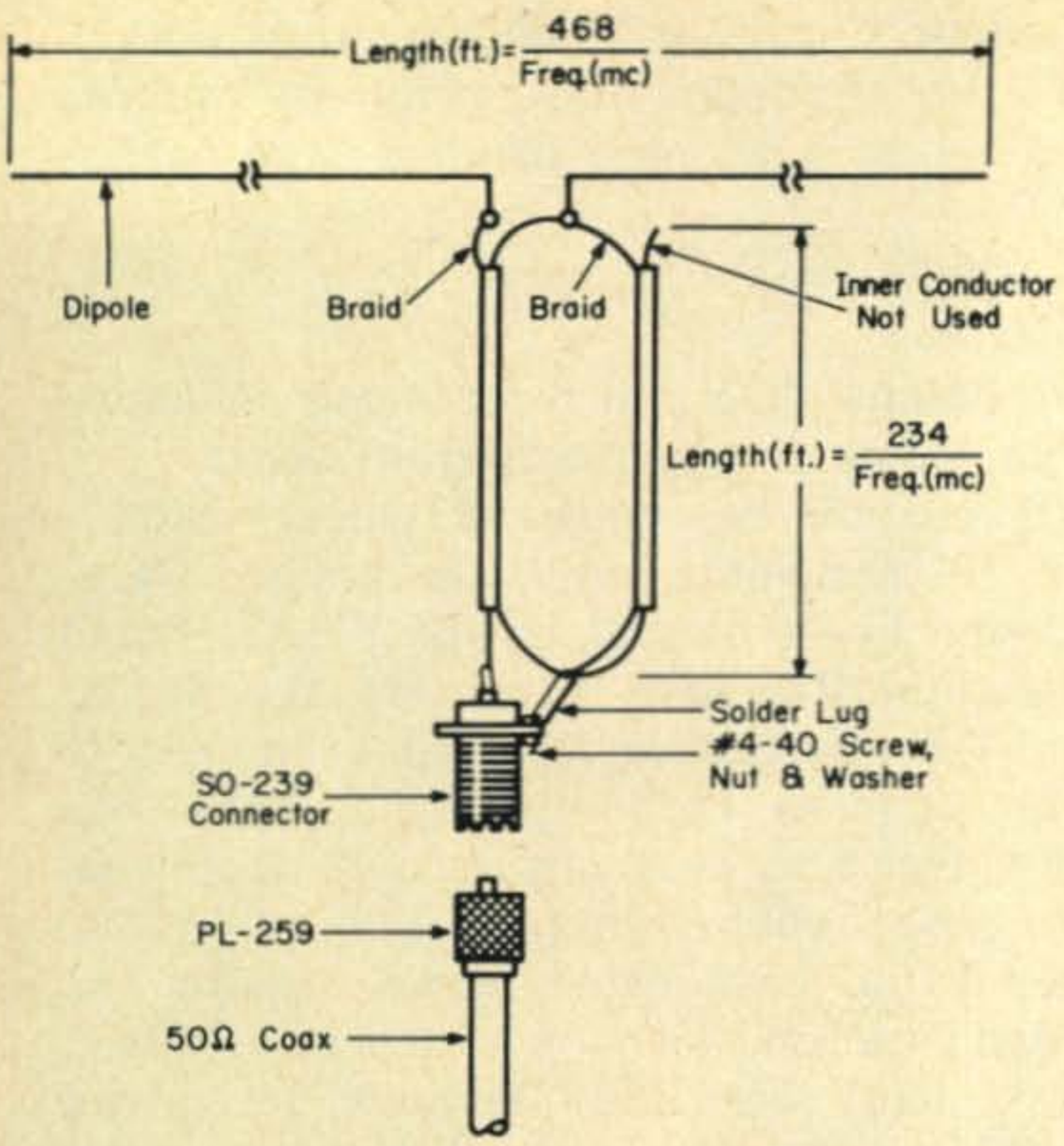


Fig. 6—Simple 1:1 balun using coax.

by replacing the fixed capacitor with other values, operation to 6 meters is a cinch. In fact you can probably go higher by leaving the fixed capacitor out altogether.

Rust-Proof Antenna Mount: "All the mobile antenna mounts I've used show some signs of deterioration (rust) from constant weathering. Can you suggest one that doesn't rust or discolor?"

Yep. Would you believe the Model NTS-1 made by New-tronics Corp., 3455 Vega Ave., Cleveland, Ohio 44113. It costs $19.44 but well worth it. I've transferred one of these from three vehicles of mine and it still looks like new.

Expensive Receiver: "If money was no object what would be the best receiver you could buy to cover the 3.5 to 30.0 mc range?"

The best receiver is not necessarily the easiest one to use for amateur radio, however, to answer your question why not consider the Model HR-240 manufactured by Lorch Electronics Corp. 105 Cedar Lane, Englewood, N.J. 07631. It's all solid state, has a sensitivity of 130 dbm (0.07 μv), has a gain variation vs. frequency of $\pm$ 1 db over its range of 2-32 mc, and it only cost about 3 kilobucks. Let me know how you like it.

Eico Model 753-1 Transceiver Cures:
PROBLEM: VFO Drift
SOLUTION: 1. Revise v.f.o. circuit by replacement of R_{126}, 68K, with 100K, also replace C_{37}, 145 mmf mica capacitor, (NPO), with 150 mmf tubular ceramic (N470). *Avoid excessive heat when soldering.* C_{37}.

2. If necessary, replace Q_1, oscillator transistor, with one coded with a red dot on top (low Beta).

3. Clean excess rosin from bottom of v.f.o. board with alcohol. NOTE: R_{126} primarily affects 40 meters, C_{37} primarily affects 80 and 20 meters.

4. If this unit was a conversion from tube type to solid state type v.f.o., check 0B2.

5. Drift specifications allow 3 kc of drift during the first hour and 400 cycles thereafter.

6. Move all wires and leads away from the underside of the v.f.o. and tape onto the chassis.

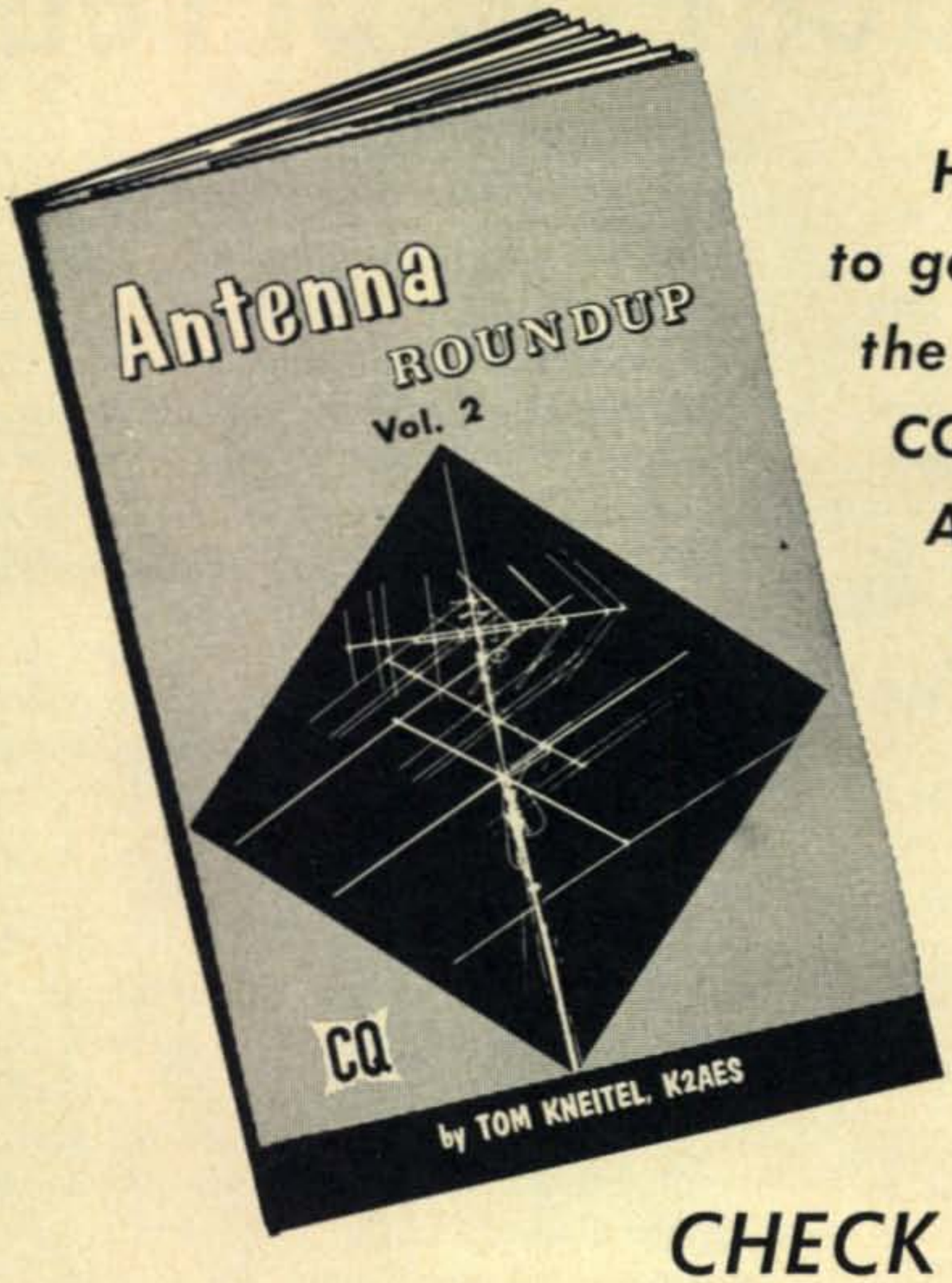
If excessive or insufficient bandspread occurs when C_{37} is replaced, dress R_{125} away from L_4 and dress C_{36}, C_{35} and L_5 away from C_{37}. For excessive bandspread increase value of C_{37} by about 5 mmf. For insufficient bandspread, decrease value by about 5 mmf.

If unable to align v.f.o. for 7.0 mc after replacement of Q_1 oscillator transistor try dressing capacitors away from each other and away from coils on v.f.o. board. Also press C_{37} against choke L_5 adjacent to it.
PROBLEM: Spurious oscillation, manifesting itself in inability to properly dip final (may arise in any version; tube or transistor).
SOLUTION: Confirm spurious oscillation with a grid dip meter placed in the vicinity of r.f. choke (L_{15} in tube v.f.o., L_3 is transistor v.f.o.). Oscillation probably in vicinity of 104 mc. Examine the choke (L_{15} or L_3). The upper pi may have slipped down and it will show discoloration. Replace if necessary.
PROBLEM: "S" Meter drifts and cannot be zeroed.
SOLUTION: 1. Replace R_{38} with a 5 watt wirewound type. 2. Replace 7199, V_4 3. Check regulation of 250 volt source in home-made power supplies.

Sorry

In the May (1967) SIMON SAYS column I signed off by saying "Don't undertake vast programs with half-vast ideas." Fellows (and gals) did I get chewed out for that by one of the readers. I was accused of simplicity, profanity and evilness. Gee Dad I'm sorry about that, it won't happen again.
Illigitimus non-carborundum, Bert, W2UUN

HOOKED ON SKY HOOKS?



Here's your chance to get an early copy of the latest addition to CQ's famous ANTENNA ROUNDUP series. Volume II covers antennas spanning frequencies between 10 cps and 2450 mc.

CHECK THESE FEATURES

- 10 BIG theory features!
- 10 WILD low band verticals to build!
- 20 DB MAKING low band horizontals and beams to build!
- 20 SMASHINGLY GOOD antennas to build for VHF!
- 9 CUNNINGLY CLEVER features on tower construction, coax, switching, etc.!
- 23 OTHER construction projects covering antennas for CB base and mobile use, for use on the shortwave broadcasting bands, etc.
- 92 ARTICLES in all, covering longwires and dipoles right up to 17 element super-giants and Sterba Curtain arrays!

You can have this information for less than 4.348¢ per feature!

YES—THE ANTENNA ROUNDUP, Volume II, is now available. Copies are being shipped on a rush basis! You can have your dream antenna in a few days. Get your copy by sending $4 for your postpaid copy—DO IT NOW!

COWAN PUBLISHING CORP., BOOK DIVISION
14 Vanderventer Avenue
Port Washington, L.I., N.Y. 11050

Gentlemen: Enclosed is $_____ for _____ copy(ies) of the brand new ANTENNA ROUNDUP, Volume II. Please rush me one of the first copies hot off the press!

*New York City and State residents must add sales tax applicable to your area.

Name_____, Call_____

Address_____

City_____ State_____ Zip_____

PRICE: $4.00*

SEND YOUR ORDER NOW!

Can The Patient Be Cured?

In the field of medicine there are dreaded words like cancer and arteriosclerosis. I am not alluding to medical problems. My patient is Ham Radio as it has existed these past fifty years. My client has the middle age bulge. He is apathetic and is so engrossed in his own little world that he cannot see the larger problems that are ready to overtake him. He won't face the fact that he is a sick man, and not being able to admit to a deficiency, you can hardly expect him to do anything about it. He is like the chain smoker who has been told about lung cancer and emphysema, but because it hasn't caught him yet, he continues his four packs a day.

Ham Radio is sick. You don't have to be a trained diagnostician to observe the symptoms. But to those of you who haven't thought much about it, let me enumerate some of the more obvious signs.

A. A falling off of new hams.
B. The reduction of sales outlets catering to hams.
C. The relative lack of advertising revenues in the ham magazines and consequent financial ills of all three publishers.
D. The statistics of those recording the vital facts on our gross ham business.
E. The obvious reduction in respect afforded amateurs by our government.

If these are the signs of illness—what can the reasons for this sickness be? In my judgment there are at least five areas that collectively have caused our plight.

1. The announced need of incentive licensing without the reasonably quick surgery required. The FCC has taken altogether too long to do what should have been done.
2. The abiding concern most of us have had with respect to the Viet Nam war and the possibility that escalation would require a congressional declaration of war with the attendant prospect of our loss of ham operating rights.
3. The existence of CB radio. This simple way to "ham" without code or technical examination has taken the largest number of would-be hams away from our ranks, and with loose FCC enforcement of CB rules, has given a vent to those with an itch to communicate.
4. The science of our art has gone beyond our average ability to comprehend, and we have therefore not been able to keep up with the latest in SSB techniques, in synthesis, in solid state circuits, or in mathematical filter design. What we understood very well in 1947 has become an enigma in 1967.
5. Because the sources of supply have largely disappeared, we as individuals can no longer build as easily as we once did, and therefore we place more reliance on store-bought preassembled rigs. Because we didn't build it, we don't really know the piece.
6. As a nation, more of us exist, with less physical space on which to erect antennas. More of us are moving than ever before, or are living in mobile homes. Certainly less chance to do things the way we used to. And as a corollary, we are more prone *to give in to* rather than fight TVI, for obviously there are more TV sets, more TV stations, more rabbit ears than there used to be. We are not as *determined* as we once were, probably because there are so many other things to do! Ham Radio has gradually lost its preeminent position in the community which it once had for disaster relief and emergencies. Nowadays competing services are better organized to step in and take over. Civil Defense organizations have matured, professional communication outfits exist such as police, public utility and fire departments with far more facilities than yesteryear, and many of these "pros" don't want us hams monkeying around.

These are the symptoms of our illness, but many other threats exist too. For example, the increased number of newly arrived nations will all want to control their own spectrum, to assert their own ideology with their short wave broadcasting stations. For example, there is a larger need for business frequencies, for space for millions of CB'ers, and for a larger government and military requirement. What this means is that despite technical progress, a larger demand on *our* frequencies will inevitably be made.

Should We Roll Over And Die?

Emphatically NOT! Ham Radio is still king of all hobbies. The nation with a large ham population is still really the best prepared country. The Near East scrap was interesting. Israel, with 2,700,000 people, has nearly 400 hams. The U.A.R. and Syria and Jordan, with over 10 times the population, have between them scarcely 20 hams. Surely this lesson is not going to be lost, but as hams, can't we see that the Prime Ministers, or other heads of state, obtain copies of the foreign Call Book and visualize this lesson while it is still fresh?

There are many other things to do. For example, why can't we beat incentive licensing to the punch and *up* our license grade *before we have to*? Wouldn't this prove that we care, to the FCC?

FOR EXAMPLE: Why can't we infiltrate the ranks of CB radio, join their clubs and show them the difference between 5 watts and 500 watts, the difference between legal and illegal QSO's?

FOR EXAMPLE: Why can't we foster more high school radio clubs, more church radio clubs, more Boy Scout radio groups? Why not let every ham club push for new beginners by offering classes and suitable incentives within our existing ham organizations?

FOR EXAMPLE: Why can't the kit manufacturers, instead of just telling us to solder 3" of red wire between points A and B, explain their product's philosophy and circuit details in a better educational manner? Too many kits built, not enough knowledge gained in the process.

FOR EXAMPLE: Why can't the Electronic Industry Association create a committee of Amateur Products manufacturers, said committee to study our problems and the attendant lack of motivation by those handling the sale of this material, and over a period of time, implement their suggestions as only the united strength of the EIA can do?

FOR EXAMPLE: If Ham Radio is the reservoir of trained operators that we are supposed to be, how about enabling legislation in the Congress that would give us tax exemption on the money spent for ham radio in each year? This is worth looking into. And, in a lesser vein, how about convincing your respective state governments that sales taxes should be levied on the difference value of your purchase, when you trade in your old gear? Here is discrimination that has a telling vote against us *hams*. We don't know how to lobby for useful gains–license plates for our cars, yes, but cash in our pockets, *no*.

FOR EXAMPLE: Why not resolve to build something this year, even if it is only a phone patch or an RF monitor? Rolling your own does make it taste better. And, as Doug DeMaw used to say, "we learn by doing."

FOR EXAMPLE: Why can't we make a determined effort to utilize more of our unoccupied 2 and 6 meter bands, before they are gone? Possession is supposed to be 9/10ths of the law.

FOR EXAMPLE: Why can't more authors and more radio magazines concentrate on showing us how to knock down front end over load by enabling us to make our own filters? And why not special emphasis on tact and diplomacy in handling TVI problems? Must we always be Mr. Meek?

FOR EXAMPLE: How about revitalizing ham radio club activities? No imagination equals no attendance equals no club. In the same breath, let's have more small ham fests. These very large ones neither satisfy the visitor, the exhibitor, or the sponsoring group, and *oh*, my feet!

FOR EXAMPLE: Let's all join the ARRL and support their cause, which is really our battle. Even though you may dislike them, or disagree with some of the things that are done–(we're not all perfect, you know)–your membership and support is the most logical way through which you can effect any change, not by leaving them and ranting from outside.

FOR EXAMPLE: As hams, why can't more of us join MARS–either Navy, Army, or Air Force, and prove to our government in the most telling of all ways, that our ham radio is a precious right, for *both* pleasure and public good, rather than something we take for granted like social security and medicare. God knows we've depended too much already on government and not done enough for ourselves!

Gee whiz, fellows–look in the mirror now. Is your face clean?

73, Herbert W. Gordon W1IBY

P.S.: Don't misunderstand me. I'm no angel! I am in the business of selling exclusively to hams. It's to my advantage to see Ham Radio healthy and pink–not with a white tongue the way it is today.–*HWG*

SURPLUS sidelights

BY GORDON ELIOT WHITE*

SURPLUS is definitely moving out of the World War II era, into the period we will probably remember for a score of years as the Viet Nam vintage. The Korean conflict was fought with communications that were more than 90 percent leftovers from 1945, though some of the later WW II designs had seen little or no combat before V-J Day. Now the transistor and the microcircuit are moving in, the latter probably to be the wave of the future, as the transistor alone was obsolete in military terms almost before it became operational.

The military is talking now of such things as the AN/MSC-46, a satellite terminal weighing 60 tons, capable of providing two voice and two RTTY channels simultaneously. This is the transistor model. The AN/TSC-54 is the integrated, microcircuit version, with an 80 percent weight saving, capable of being airlifted with its crew of six, in a single C-130-E turboprop cargo plane. For tactical applications, jeep-mounted satellite terminals are being developed.

Although the operational sets are not at the edge of the state-of-the-art, Korean War tactical radio is now being phased out as the AN/VRC-12 sets (f.m.) are procured. The smaller AN/PRC-25 is the current walkie-talkie, replacing the old AN/PRC-6 (SCR-536), and the h.f. set, AN/ARC-54, is the airborne part of the "new family" of f.m. gear. The next step, to microcircuits, is being made in the AN/PRR-9 and AN/PRT-4 handi-talkies, which will be the surplus of the '70s.

The reason I mention some of these sets, which are still quite new, is to make the point that surplus is changing. The Super Pro and the SCR-522 are ancient history now, and I think many of us must look into the more sophisticated material in the future. Even for Novices, for whom surplus has often been an inexpensive way of getting on the air, the older surplus units will not be available, in fact many of the standby sets are now showing their age, and the scarcity is driving prices up. But now, and certainly after the Viet Nam war is settled, a new crop of electronics will be appearing in the surplus emporiums.

The smaller size of the post-1945 armies, air forces, and navies dictate a little less surplus quantity, but the quality is a great deal above what we surplus hounds grew up with. Military satellite terminals may never be useful to the amateur, but one of these days we may be using OSCAR XXI, say, for worldwide 2 meter DX, and the cost element alone will force the conversion of surplus to this kind of work. Stepping back a few years, the broad-band f.m. gear that was outmoded when the FCC decreed narrow-band gear on the commercial bands is now being used by thousands of amateurs, with more than a score of repeaters now operating, chiefly on 6 meters, by some very sophisticated amateurs, with great improvements for emergency and public service work.

A group of RTTY amateurs in the Chi-

*5716 N. King's Highway, Alexandria, Virginia 22303.

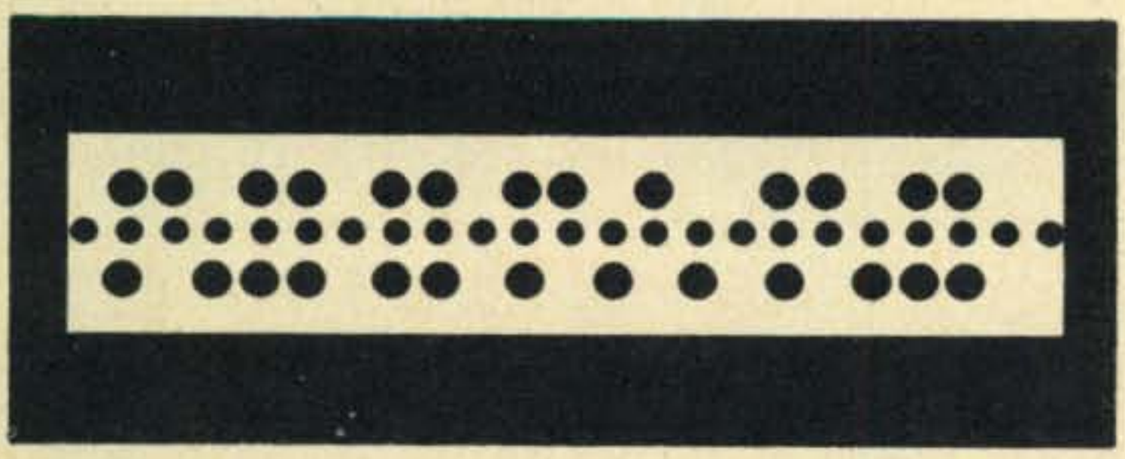


Fig. 1—This is standard Boehme/Wheatstone perforated tape for machine transmission of automatic Morse code. The tape is prepared by hand on a perforator, then run at high speed through a keying head, which keys either make-and-break c.w., or frequency-shift-keying on the air.

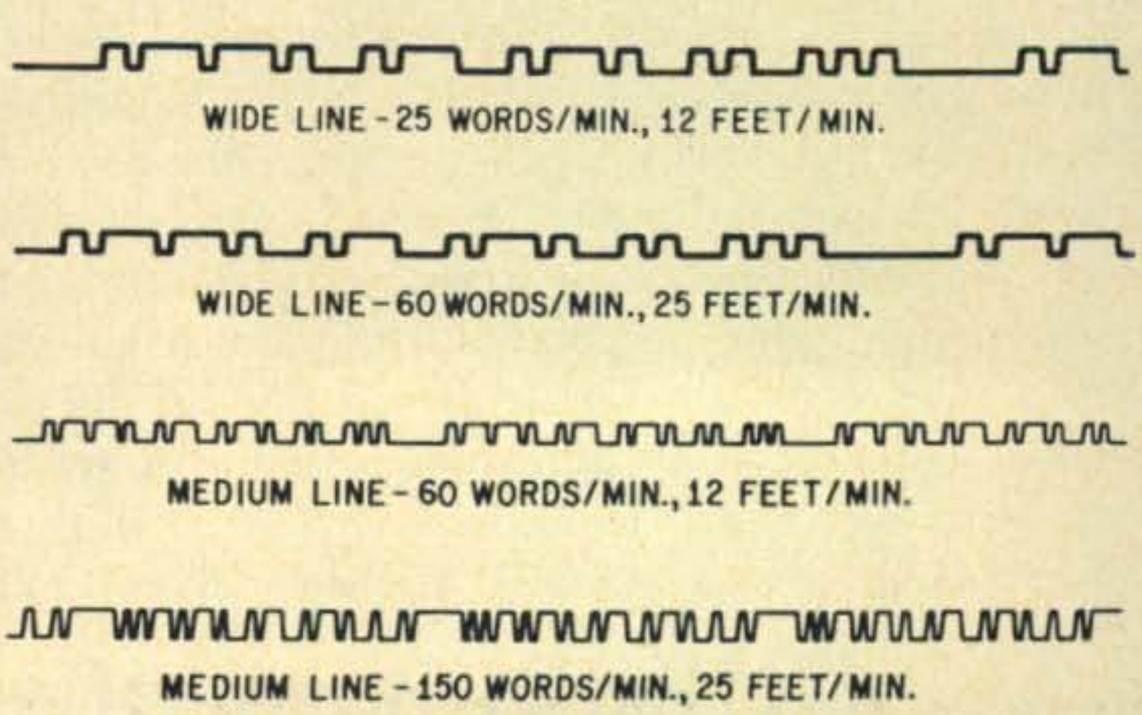


Fig. 2—Off-the-air recording of medium-speed Morse made on an ink type McElroy recorder.

For further information, check number 32, on page 126

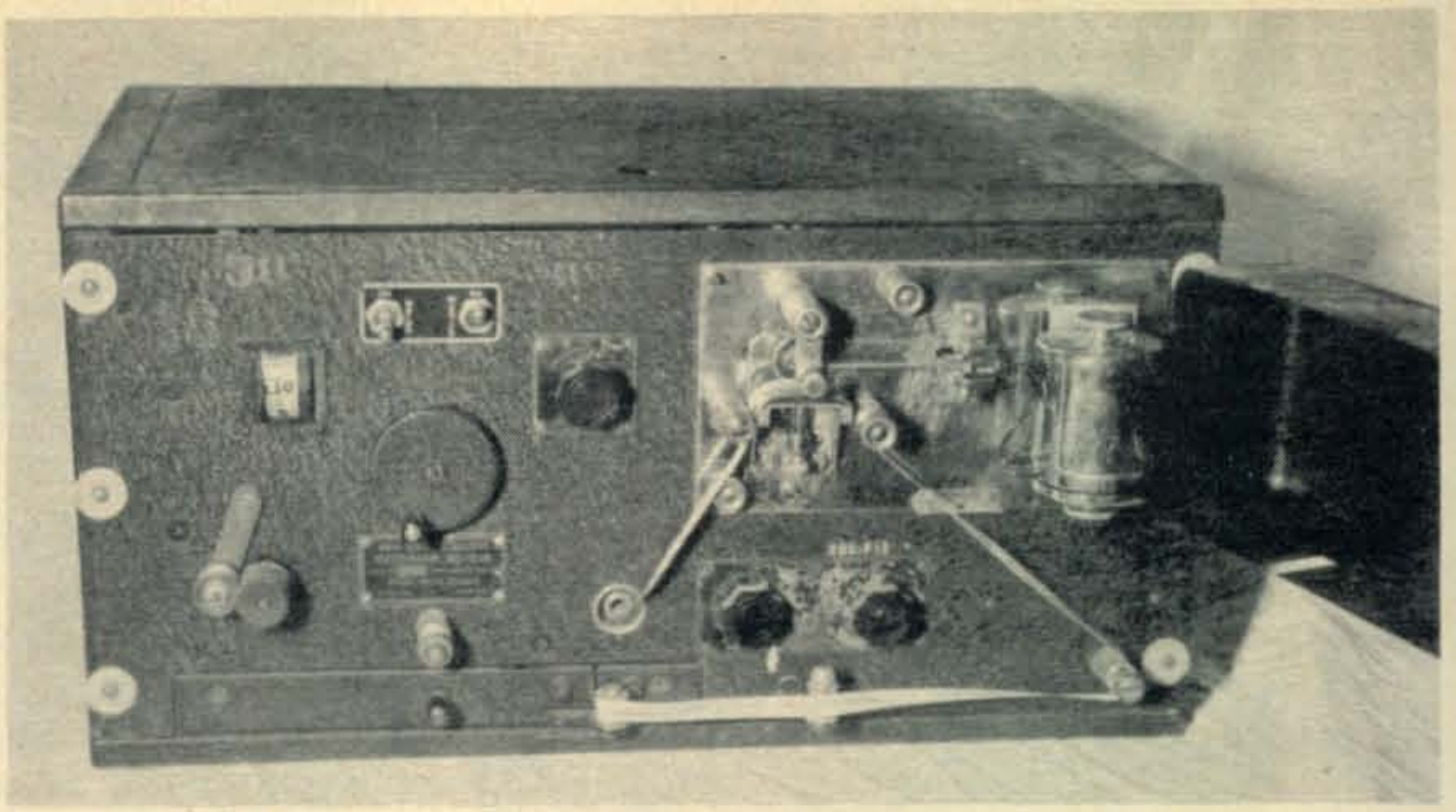


Fig. 3—BC-1016 recorder, a version of the McElroy ink recorder. This was produced in 1943, and was used as recently as 1954, by the U.S. Army.

cago area have tied together a repeater operation, with leased telephone lines and late-design multiplex equipment, in one of the largest civil defense nets in the U.S., almost all of it through commercial or military surplus electronics. This we need more of, in the amateur fraternity.

With that off my chest, I am going to go back through my Time Machine to the dark ages and talk about automatic c.w. this month.

Back in the 1920's, when radio was coming of age, high-speed manual Morse became something of a fad, with competitions among the faster operators for the title of "world's fastest radio telegraphers." One of the title holders was Theodore R. McElroy, of Boston. His record exceeded 100 words per minute, an almost fantastic speed, and one that could not be maintained by even normally competent, but less gifted, operators.

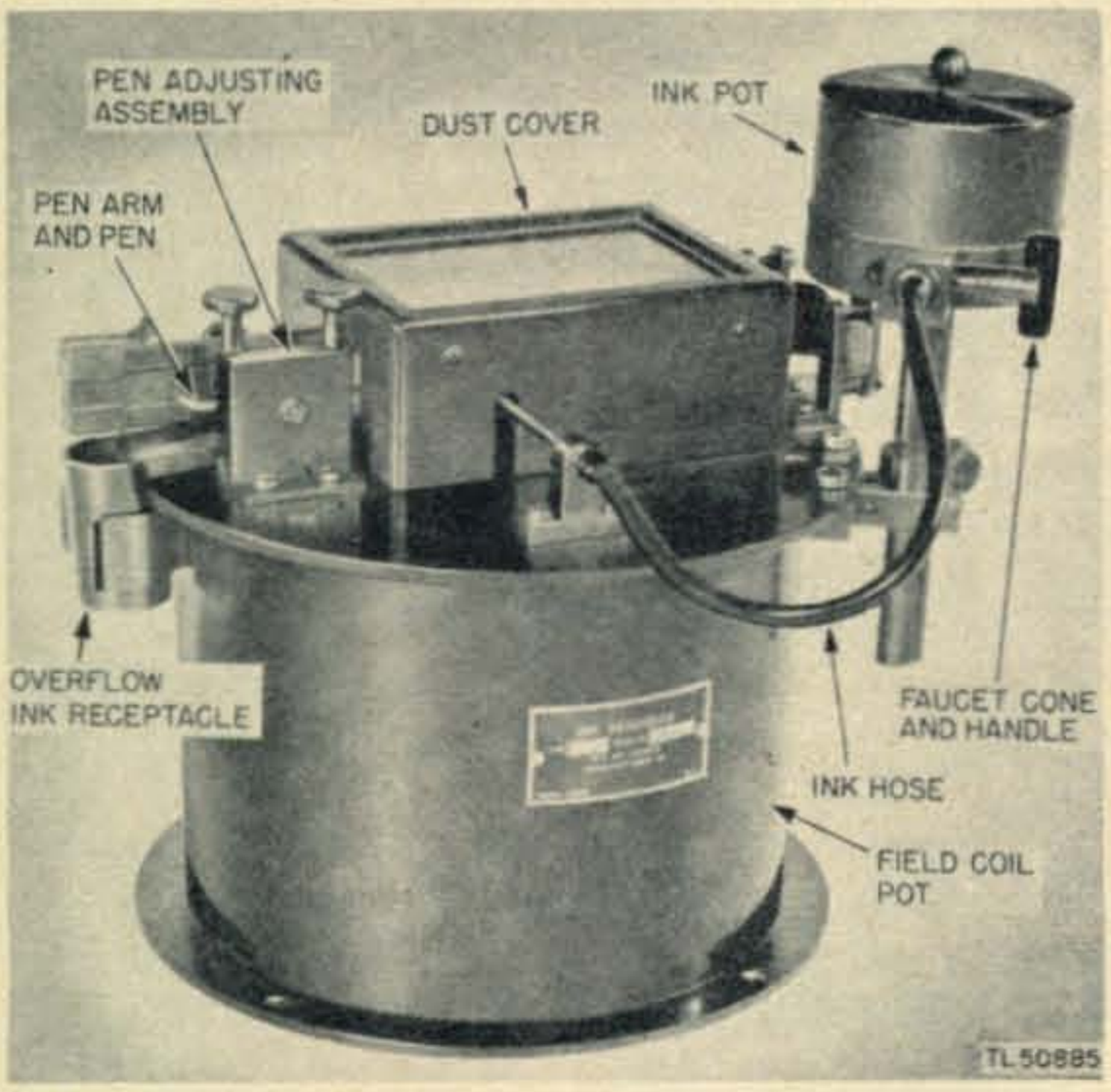


Fig. 4—Boehme ink recorder.

McElroy sponsored a mechanical device to do electrically what he had done by hand—my records do not indicate whether McElroy designed the unit or merely put his name on it for advertising purposes—and high-speed morse radiotelegraphy was born. Actually, relatively high-speed code had been used on wire lines for many years, but McElroy apparently was an early instigator of its use via radio. Wheatstone equipment was a competitor for the radio and cable equipment market, and through a complex of corporate reorganizations, Wheatstone material was, from time to time, manufactured by the Teletype Corporation, a subsidiary of American Telephone and Telegraph, and by the H.O. Boehme Company. Boehme eventually took over the entire Wheatstone business, though you may see a lot of automatic c.w. equipment bearing Teletype Corporation nameplates.

Today Boehme is a corporate shell, no longer making Morse equipment, but Ralph Reinhardt showed me an attic full of the old units at the Boehme plant in Westbury, L.I., last year, and he apparently has a stock of spares for those who have such needs.

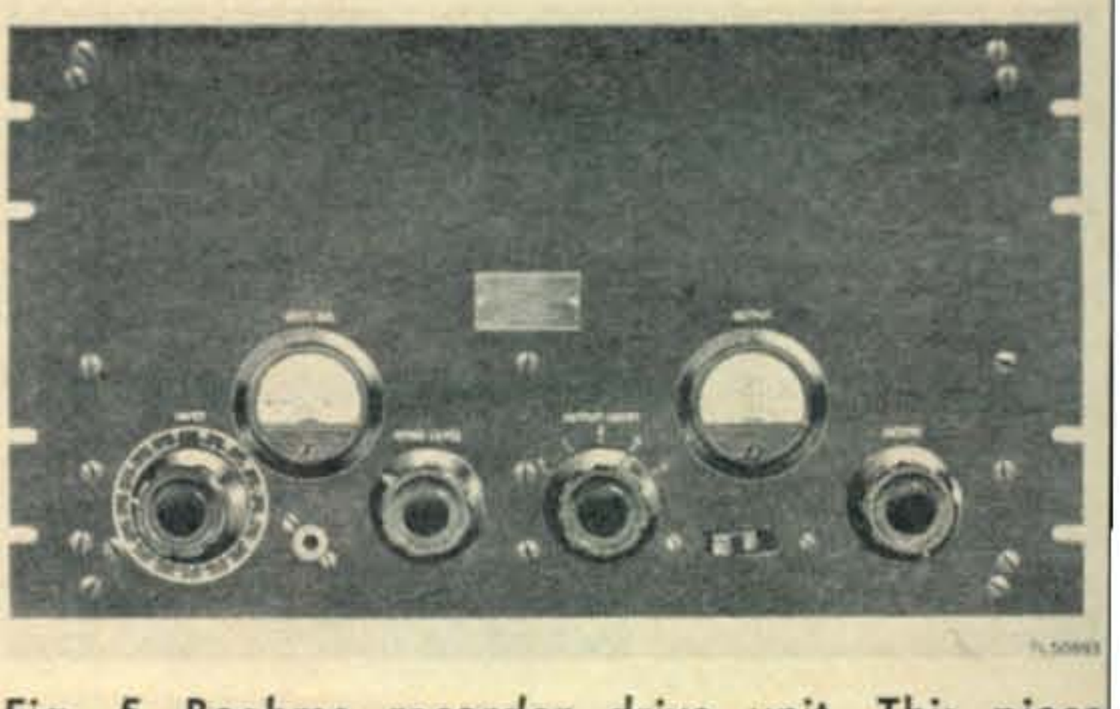


Fig. 5—Boehme recorder drive unit. This piece of equipment converts the audio signal to a d.c. impulse to drive the recorder magnets.

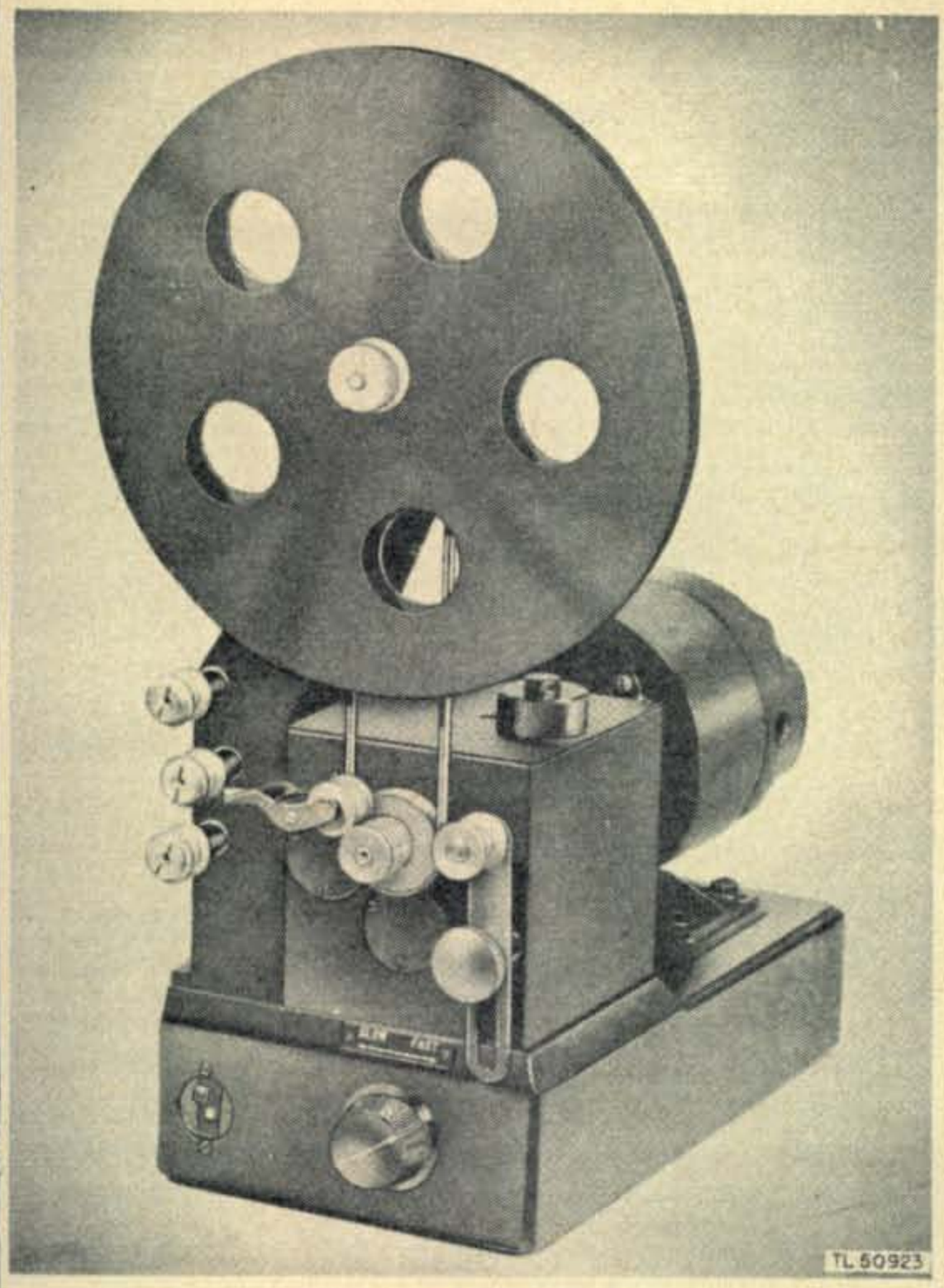


Fig. 6—Boehme tape puller—a motorized reel that takes up the tape after it passes through the recorder.

The address is 200 Shames Drive, Westbury, N.Y.

The automatic morse equipment as used on both commercial and military circuits for many years was capable of pouring out c.w. at a rate of 400 words per minute, possibly faster, though slower speeds that could be copied manually were more common, particularly in ship-to-ship and lower echelon stations.

The outgoing traffic was prepared by perchine, then running it through a keyer, much as is done today with RTTY tape equipment. The tape used was only one-half forating paper tape on a typewriter-like ma- inch wide, and carried only two rows of perforations compared to RTTY tape which commonly has five information perforation rows, and is 11/16 inch wide. A typical Wheatstone tape is shown in fig. 1.

Reception of automatic morse was recorded on similar tape by a pen, driven by a magnet system, through an audio amplifier from the radio receiver. The resulting "copy" looked much like fig. 2.

Though used by the cable companies earlier, Boehme equipment first came into use in the military in 1931, and was installed on the important Seattle-Anchorage circuit

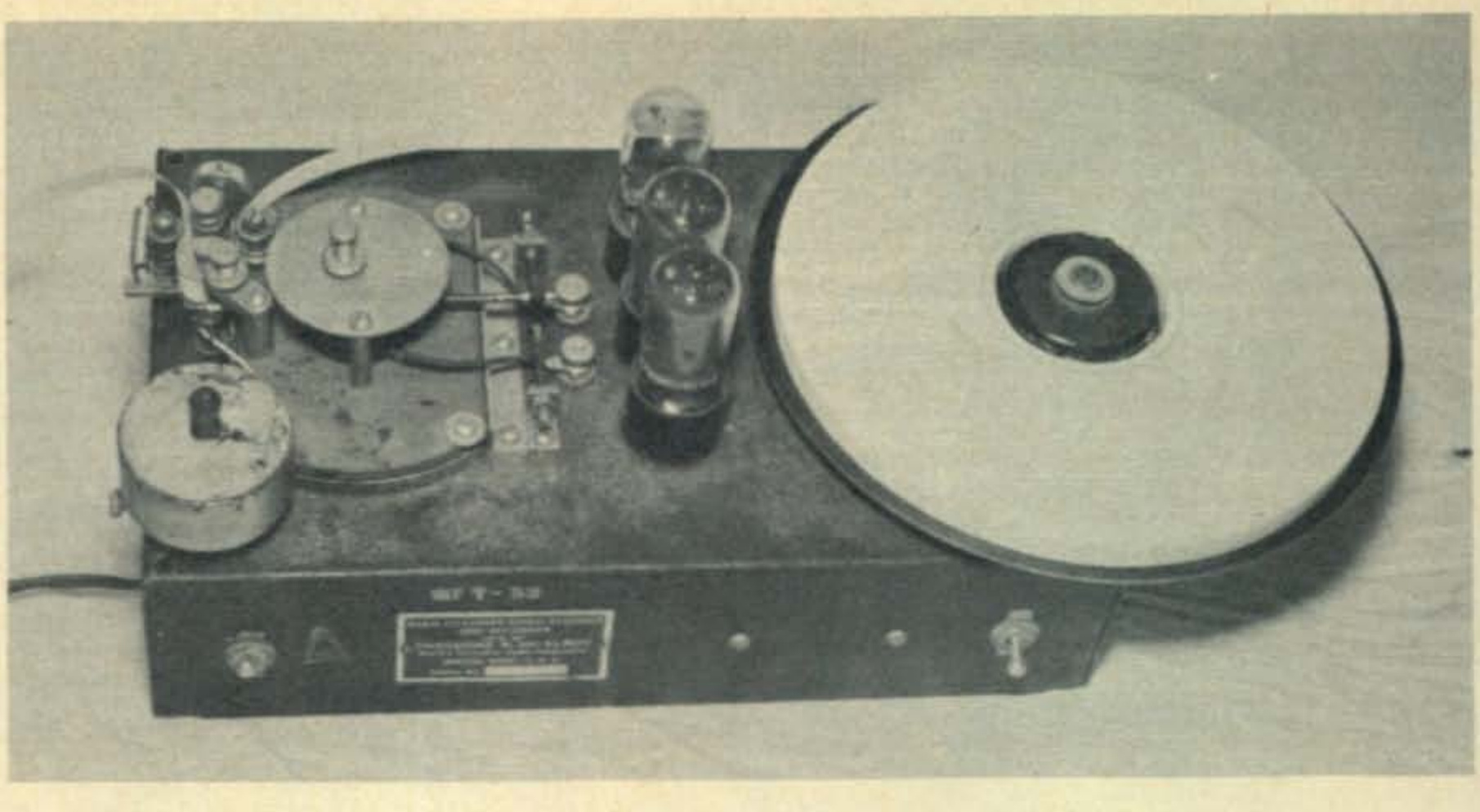


Fig. 7—Lightweight McElroy Recorder.

in June, 1933. Throughout the between-the-wars period, Boehme equipment was a synonym for high speed morse, and was more highly developed when the U.S. entered World War II than either radiotelephone or teleprinter. Teletype, in fact, was not installed at the Army's main station, WAR, until 1937, and then on a limited basis.

After Pearl Harbor, Boehme, McElroy, and others, built several automatic c.w. units, the most common McElroy equipment being tape inkers, which are still found on the surplus market. Boehme's Wheatstone Perforators and keying heads, plus the 4-C recorder driving amplifier, and the 4-G recorder, are found occasionally now, and are in some demand for code practice work. They have obvious amateur applications still.

There are several versions of the McElroy tape inker and keyer units, the BC-1016 recorder for instance being built during the War by the Waters Conley Company, Rochester, Minnesota. (see fig. 3)

The set may be either cabinet-mounted, or attached to a standard 19 inch equipment rack. It accepts audio signals from a receiver or wire line, and records them on ⅜ inch tape. Top speed is 400 words per minute. The unit uses 8 octal base tubes, in power supply and amplifier sections. Weight is 80 pounds.

Impedance of the recorder is nominally 1,500 ohms, though matching is not at all critical. D.c. however, must be kept off the input circuit, with a blocking capacitor if necessary.

Controls are simple: After the set is warmed up briefly, the pen should be ad-

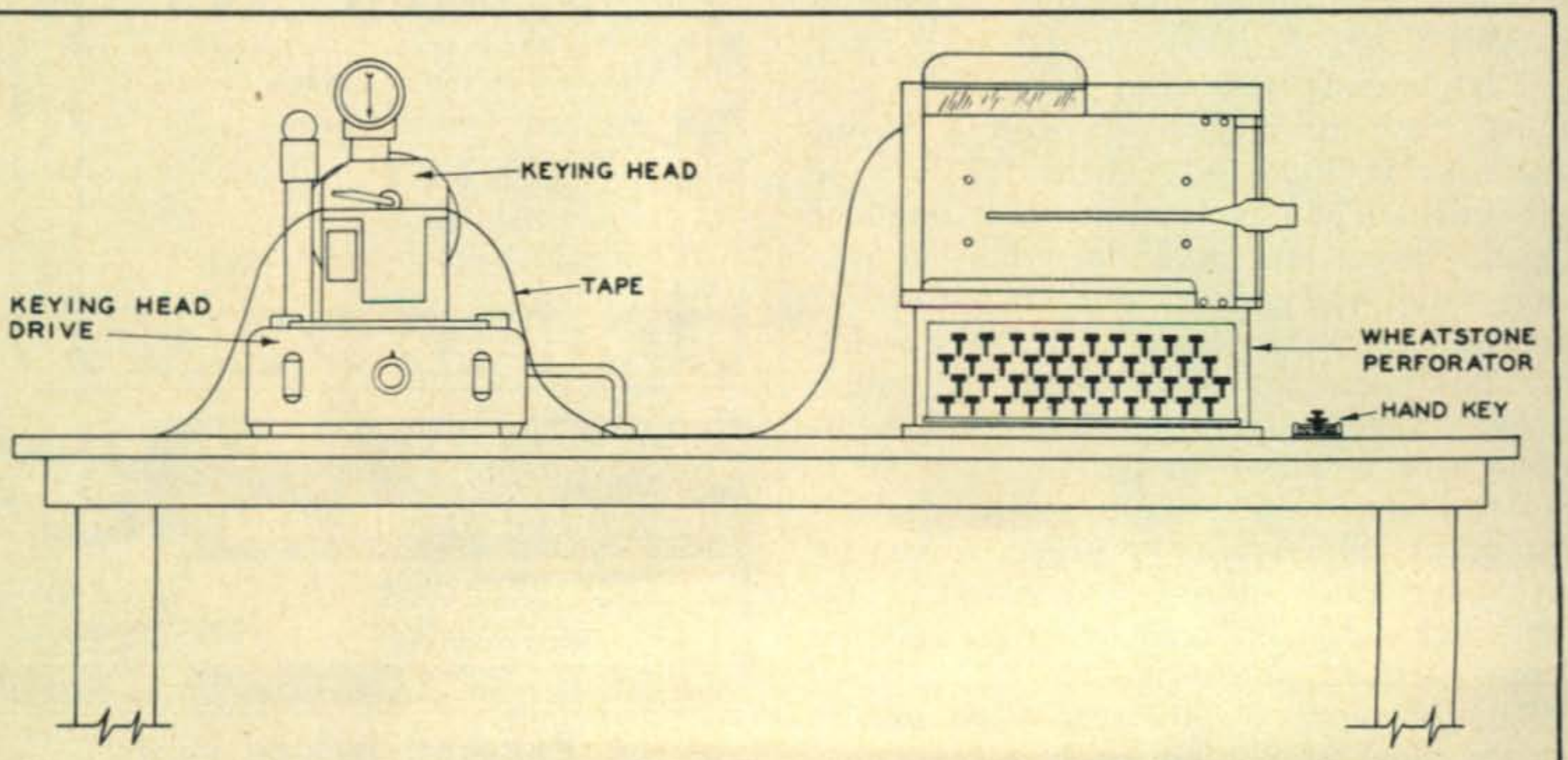


Fig. 8.—Drawing of perforator-keyer setup for preparation of punched tapes and subsequent automatic transmission at higher speeds than a human operator could send.

justed by the knurled knob to get a consistent fine line on the tape, assuming ink supply, pen, etc, are in working order. With an incoming signal, the threshold control is adjusted to the point where the signal moves the pen. The slope knob governs the speed of the pen swing across the tape, and thus the spacing between the mark and space lines. (for c.w. reception, the dots and dashes are read on the mark level, with the space line merely representing the key-up intervals.)

The discriminator control may be used to reduce the influence of noise on the recorded signal. This adjustment tends to lower the maximum speed at which the recorder will operate satisfactorily, so this is of use chiefly on slower signals. Advancing the discriminator inserts additional capacitance in the plate circuit of the bridge tube, thus bypassing short-duration impulses to ground.

The tape speed control adjusts the passage of the recording tape, and may be used to get a conveniently readable display, as it is independent of the actual signal speed. Higher tape speed tends to spread out the recorded dots and dashes, which may be quite crowded when run at higher signal speeds.

The Boehme counterpart for recording incoming signals in the 4-G, a barrel-shaped device which operates much like the McElroy BC-1016. It is strictly a d.c. device, and requires the 4-C drive amplifier and the 4-F tape puller to convert audio signals to direct current, and then wind the paper tape through the pen device. All this equipment begins to become a bit ponderous for amateur use. See figs. 4, 5, and 6.

A less elaborate McElroy recorder was produced—the nomenclature has been lost —but the unit is shown in fig. 7. This set mounts a roll of ⅜ inch tape on the right, and contains the audio driver and discriminator circuits which may be connected directly to a receiver output.

On the transmitting side of automatic c.w. were the perforator and the keying head. Both were primarily Boehme products, though Teletype made some of the perforators. The setup is shown in fig. 8.

Sources for automatic Morse equipment today include Atlantic Surplus, 250 Columbia St., Brooklyn 11231, and Jim Cooper, 834 Palmer Avenue, Maywood, N.J., Manuals for the BC-1016 and the Boehme equipment are TM 11-4441 and TM 11-377. ■

Match Patch [*from page 83*]

elaborate filter might be required as shown in fig. 2. Other reasons for the r.f. should be investigated first, such as poor station grounds, poor s.w.r. on the antenna, antenna too close to the phone drop, etc. First the patch should be checked on all bands with a local friend or ham to assure that no problems crop up.

In our patch, which was made completely from the junk box parts including the used utility box, we used a universal output transformer for the receiver match and a surplus 600 ohm to 100K transformer for the transmitter match. See the parts list for a choice of transistor transformers that will match the impedance.

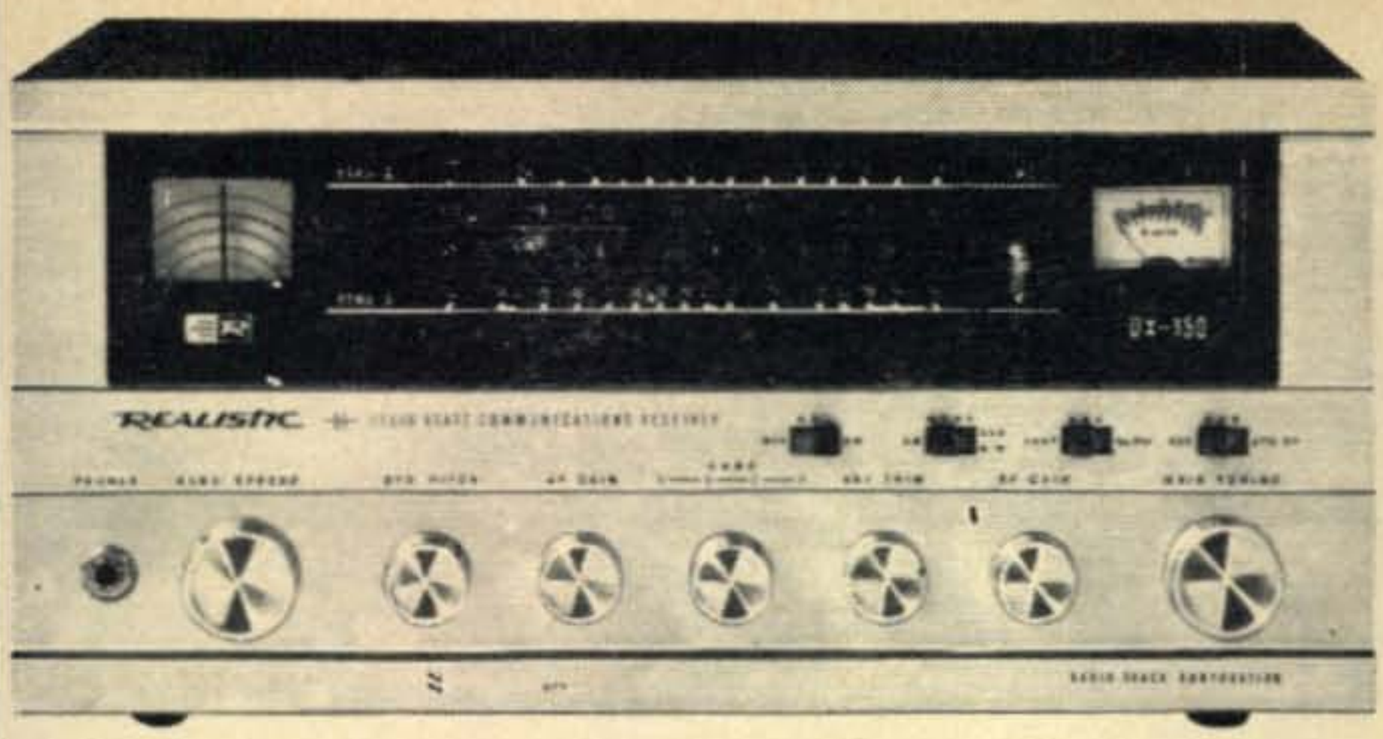
Operation

The patch potentiometer is used to control the gain on transmit. Leave the transmitter audio gain control set at its normal position to allow close to 100% modulation. The patch will have more output than the input circuit of your transmitter can handle. By adjusting the potentiometer on the patch the correct level can be set to allow the transmitting party to modulate close to 100%. You may also talk over the mike of your phone but a soft speaking voice should be used as you can easily overmodulate.

On receive use the phone to monitor the level on the line. A level that is comfortable to your ear should be satisfactory for the party at the distant end. This level is controlled by the audio gain on the receiver, but beware of overloading the line with too much audio.

Operating Standards

There are certain ethical standards to which one should adhere when using the patch and these are: keep dialing, ringing, and patch explanation off the air. Have this all taken care of and then connect your patch. Obtain all the necessary information from the calling party. State that you are placing the call for the calling party and that it is a collect call from him. At any rate don't get off on a wild technical tale of woe. State the facts. Be brief and courteous. It is not your call. Someone else is paying for it. Write down all the facts in neat order if you can't remember what you wish to state. If a person is not patch quality say so. Keep a good station and be of service. You will be richly rewarded. ■



RADIO SHACK

BREAK THRU!!

ALL SOLID STATE

The World's First 117V/12V All-Transistor Communications Receiver Is Available Now In 150 Radio Shack Stores Coast to Coast!

THE REALISTIC® DX-150

- *Over 30 semiconductors — no tubes, no nuvistors — the DX-150 is 100% solid state!*
- *SSB/CW/AM reception, covering 535KC through 30MC in 4 slide-rule bands!*
- *Product detector for SSB/CW, plus fast and slow AVC; variable-pitch BFO!*
- *Illuminated electrical bandspread fully calibrated for the Amateur and CB bands!*
- *Cascade RF stage; ANL for RF and AF; zener-stabilized; OTL audio; illuminated "S" meter!*
- *Built-in monitor speaker plus front-panel jack for external (optional) matching speaker!*

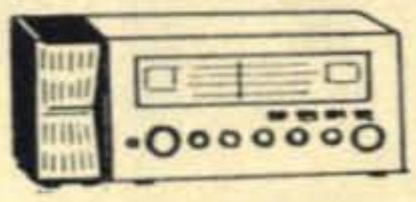
ONLY 119.95

New, big, exciting, professional — the Realistic DX-150 obsoletes tube receivers and warm up, banishes forever your dependence on house current to stay in operation. For example: **the DX-150 will run 100 hours on 8 D-cells** if current fails, or isn't available, or on field day. Additionally, it will operate from a car's cigarette lighter or any other mobile or base 12VDC source! Of course a 117VAC power supply is built in. DX-150 is a husky brute: 14⅛ x 9¼ x 6½", with a massive silver extruded front panel, solid metal knobs, grey metal cabinet, 14 pounds of quality.

A NEW STANDARD OF RECEIVER VALUE!

Priced Radio Shack's way (factory-to-you) the DX-150 saves you about $100 off traditional pricing methods. Yet it offers 11 front controls; dual power supply; 12¼" slide-rule dial in 5 colors; **continuous coverage** from 535KC through 30MC, including 160 through 10 meters; separate detector circuits for AM (diode) and SSB/CW (4-diode bridge); sensitivity good to 0.5μv at 30MC. Nobody **but nobody** but 44-year-old Radio Shack could have created this unique product for $119.95. You better believe it!

REALISTIC DX-150 CUSTOM ACCESSORIES



Exact-match external Voice-Frequency speaker cuts out built-in monitor, includes lead and plug. 20-1500: $7.95 (4 lbs.)

12VDC portable pack with all cables, plugs, 8-long-life batteries; includes plug-to-plug and plug-to-lighter cord sets. 20-1501: Only $7.95 (wt. 4 lbs. w/batteries)

THERE'S A STORE NEAR YOU!

ARIZONA — Phoenix
ARKANSAS — Little Rock
CALIFORNIA — Anaheim, Bakersfield, Covina, Downey, Garden Grove, Inglewood, La Habra, Long Beach, Los Angeles, Mission Hills, Mountain View, Oakland, Pasadena, Pomona, Reseda, Sacramento, San Bruno, San Diego, San Francisco, Santa Ana, Santa Monica, Torrance, West Covina
COLORADO — Denver
CONNECTICUT — Hamden, Manchester, New Haven, New London, Orange, Stamford, West Hartford
FLORIDA — Jacksonville, Orlando
GEORGIA — Atlanta
ILLINOIS — Chicago
KANSAS — Wichita
LOUISIANA — New Orleans
MAINE — Portland
MARYLAND — Langley Park
MASSACHUSETTS — Boston, Braintree, Brockton, Brookline, Cambridge, Framingham, Lowell, Medford, Natick, Quincy, Saugus, Springfield, Waltham, West Springfield, Worcester
MICHIGAN — Detroit
MINNESOTA — Minneapolis, St. Paul
MISSOURI — Kansas City, St. Joseph, St. Louis
NEBRASKA — Omaha
NEW HAMPSHIRE — Manchester
NEW JERSEY — Pennsauken
NEW MEXICO — Albuquerque
NEW YORK — Albany, Binghamton, Buffalo, New York, Schenectady, Syracuse
OHIO — Cincinnati, Cleveland
OKLAHOMA — Oklahoma City, Tulsa
OREGON — Portland
PENNSYLVANIA — Philadelphia, Pittsburgh
RHODE ISLAND — Providence, East Providence
TENNESSEE — Memphis, Nashville
TEXAS — Abilene, Arlington, Austin, Brownsville, Corpus Christi, Dallas, Fort Worth, Houston, Lubbock, Midland, San Antonio, Sherman, Waco
UTAH — Salt Lake City
VIRGINIA — Arlington, Virginia Beach
WASHINGTON — Seattle

ORDER BY MAIL! IN PERSON! FREE FOLDER!

RADIO SHACK
East: 730 Commonwealth Ave., Boston, Mass. 02215
West: 1515 So. University Dr., Ft. Worth, Tex. 76107
Dept. CQ

Please rush me the item I've checked below.
I enclose $_____, plus 50¢ for postage and handling:

- ☐ FREE 1968 Catalog
- ☐ FREE DX-150 Folder
- ☐ Receiver, 20-150, $119.95*
- ☐ Matching Speaker, 20-1500, $7.95*
- ☐ 12 VDC Power Set, 20-1501, $7.95*

** Plus Shipping Cost: 14 lbs., 4 lbs., 4 lbs.*

Name (print)_____
Street_____
City_____ State_____ Zip_____

For further information, check number 11, on page 126

Diode Attenuator [*from page 60*]

With the control potentiometer set for maximum attenuation, as in fig. 4(B), the diode states are reversed. Diodes CR_1 and CR_2 are reverse biased and CR_3 is forward biased. Diodes CR_1 and CR_2 are effectively an open circuit and the only r.f. that will pass from input to output will be through the diode capacitance.

Reference Voltage

The reference voltage setting is fixed but depends upon the characteristics of the diode being used and the taper of the control potentiometer. The reference voltage should be set to obtain the widest attenuation variation. The reference voltage should be obtained by a voltage divider (two 47 ohm resistors, for instance) across the control voltage source. Therefore, if the control voltage source varies in value slightly, attenuator performance will not be effected since the control and reference voltages maintain the same ratio. A linear taper for the control potentiometer will probably prove the easiest to use although it is not critical. Normally, the potentiometer used for the r.f. gain control in a receiver, if used to control the attenuator, will prove satisfactory.

Construction

The photograph shows a model attenuator with which the author experimented. The components are simply mounted on a piece of vector-board. The r.f. chokes shown are certainly not any good example of miniaturization. The size of the unit can be reduced by half with the use of Millen 6302 chokes or other equivalent sub-miniature types. One mh or 2.5 mh values should suffice for 80 through 10 meters while 100 μh and 50 μh types would be suitable for 6 and 2 meters. The leads between the diodes, from the diodes to the r.f. chokes and the bypass capacitor leads should all be short.

Conclusion

In conclusion, for those bothered with receiver cross-modulation problems due to high signal intensities entering the antenna terminals of the receiver, the electrically variable attenuator offers an effective, low-cost solution without requiring any extensive modification work and often at a cost comparable or lower than that using conventional components. ■

Spinner Knob [*from page 61*]

bench while you do the drilling by hand. Your assistant also can guide you for properly maintaining alignment with the hand-drill.

4. Thread the hole with a 6-32 tap, keeping the tap in as near a 90° plane to the top of the knob as possible.

5. Pass a ¾" × 6-32 screw (binding-head type preferred) through a ½" long × ¼", 5/16" or ⅜" diameter sleeve. The ⅜" diameter size will be best. Metal sleeves are commercially available, or you can make your own from aluminum or plastic rod. To do so, cut off a ½" piece and drill a #26 hole axially through it.

6. Thread a 6-32 nut on the screw *almost* up to the sleeve.

7. Thread the screw into the hole in the knob and lock with the nut. In doing so, the nut should be adjusted to firmly hold the screw in place while at the same time the nut is positioned to allow the sleeve to rotate freely on the screw without excessive play.

The new "crank-up" knobs made and installed on our SB-300 receiver, SB-400 transmitter and SB-110 transceiver have added more pleasure and convenience to the operation of the gear and have withstood the rigors of many months of hard usage.—*W2AEF*

Ranger I on 50 mc [*from page 81*]

each the cover to the chassis.

This completes all mechanical and electrical modifications necessary to make the Ranger I equal to the Ranger II. The transmitter is now ready to be tuned up and put on the air. Typical loading into a purely resistive load of 52 ohms should give the following approximate dial readings at 50 mc.

Buffer tuning	15
Final tuning	82
Auxiliary coupling	7
Coupling	5
Plate current	130 ma

Now, transmitter is usable for local contacts, thus reducing QRM on the DX bands. ■

PLEASE include your ZIP code number on all correspondence.

YL News [*from page 88*]

president, and she is active on several nets. She also finds time to serve as secretary of the official board of the Plain City Methodist Church, as defense chairwoman for the local chapter of DAR, and she is a board member for the Plain City library.

New QTH for WAS/YL Custodian

When applying for YLRL's WAS/YL Certificate, please note this new QTH for Custodian Grace Ryden, W9GME: 3635, North Neva, Chicago, Ill. 60634.

OK2BII

Idena Vondrakova operates OK2BII at Havirov. Her OM is OK2VF, and they have an 8-yr. old jr. YL, also Idena. On the air since 1959, Idena operates cw and phone on all bands. Despite her low power (30 to 50 watts input), she has over 100 countries confirmed and holds many awards with a number that she needs only to apply for.

Idena describes Havirov as a large and nice town, the youngest in Czechoslovakia. The radio club, OK2KHF, has its own building and there are a lot of hams, including three YL-OM families. She adds there are quite a number of OK YL operators and they held their own YL contest in March. Look for Idena especially on 14 or 21 mc c.w. during night or morning hours.

Propagation [*from page 101*]

West & Central Africa	10-12 (1) 12-14 (2) 14-16 (1)	07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	01-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-18 (3) 18-20 (4) 20-23 (3) 23-01 (2)	22-00 (1)
South Africa	08-11 (1) 11-12 (2) 12-14 (1)	06-08 (1) 08-11 (2) 11-13 (3) 13-15 (2) 15-17 (1)	00-05 (1) 05-07 (2) 07-13 (1) 13-16 (2) 16-18 (3) 18-19 (2) 19-21 (1) 21-00 (2)	19-21 (1)
Central & South Asia	08-10 (1) 17-19 (1)	07-10 (1) 15-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-20 (1) 20-22 (2) 22-00 (1)	05-07 (1) 20-01 (1)
South-east Asia	08-11 (1) 16-19 (1)	08-09 (1) 09-12 (2) 12-15 (1) 15-16 (2) 16-18 (3) 18-20 (2) 20-21 (1)	23-00 (1) 00-01 (2) 01-03 (3) 03-05 (2) 05-08 (3) 08-10 (2) 10-12 (1)	00-02 (1) 02-05 (2) 05-07 (1)
Far East	14-16 (1) 16-18 (2) 18-20 (1)	08-10 (1) 13-14 (1) 14-18 (2) 18-20 (3) 20-22 (2) 22-23 (1)	06-07 (2) 07-09 (4) 09-11 (3) 11-13 (2) 13-18 (1) 18-21 (2) 21-23 (4) 23-01 (3) 01-03 (2) 03-06 (1)	00-02 (1) 02-07 (2) 07-08 (1) 02-06 (1)*
Samoa, Pacific Islands & New Zealand	11-15 (1) 15-19 (2) 19-21 (1)	07-09 (1) 09-11 (3) 11-18 (2) 18-21 (4) 21-23 (3) 23-00 (2) 00-01 (1)	05-06 (2) 06-08 (4) 08-10 (3) 10-12 (2) 12-16 (1) 16-18 (2) 18-20 (3) 20-00 (4) 00-02 (3) 02-03 (2) 03-05 (1)	21-22 (1) 22-05 (3) 05-07 (2) 22-01 (1)* 01-04 (2)* 04-06 (1)*
Australia	10-13 (1) 13-16 (2) 16-19 (3) 19-21 (2) 21-22 (1)	06-07 (1) 07-08 (2) 08-09 (1) 12-17 (1) 17-19 (2) 19-21 (4) 21-22 (2) 22-00 (1)	18-20 (2) 20-22 (3) 22-02 (4) 02-04 (3) 04-07 (2) 07-09 (3) 09-12 (2) 12-18 (1)	00-01 (1) 01-02 (2) 02-05 (3) 05-07 (2) 07-09 (1) 01-03 (1)* 03-05 (2)* 05-06 (1)*
Northern & Central South America	08-10 (1) 10-12 (2) 12-14 (4) 14-16 (2) 16-17 (1)	06-07 (1) 07-09 (3) 09-11 (2) 11-15 (3) 15-18 (4) 18-20 (2) 20-22 (1)	05-08 (4) 08-10 (3) 10-15 (2) 15-17 (3) 17-23 (4) 23-01 (3) 01-05 (2)	18-20 (1) 20-00 (3) 00-02 (2) 02-06 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Southern Brazil, Argentina, Chile & Uruguay	06-08 (1) 08-11 (2) 11-13 (3) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-08 (3) 08-13 (2) 13-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	05-14 (1) 14-16 (2) 16-18 (3) 18-22 (4) 22-02 (3) 02-05 (2)	20-00 (1) 00-02 (2) 02-04 (1) 00-03 (1)*
McMurdo Sound, Antarctica	12-16 (1) 16-18 (2) 18-20 (1)	07-08 (1) 08-11 (2) 11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-09 (1) 16-18 (1) 18-19 (2) 19-23 (3) 23-02 (2) 02-03 (1)	00-05 (1)

QRR on 40 [*from page 21*]

ance of the complete unit will cost about fifty dollars if only one sideband is used or about seven dollars more if two are included. In our aircraft version we are using the same control head described here, a Heath HP-13 mobile power supply and a 3-1625 class AB_2 linear running about 250 watts p.e.p. input. The cost of this model is about the same as the above but, of course, it is not as compact. We also have a commercial model on the bench using similar but more elaborate circuitry, silicon transistors, potted r.f. coils, a six crystal filter and a solid state 30 watt linear but the cost of this combination is considerably more than the unit described in this article. ■

Scratchi [*from page 11*]

ing pencil, even though turning house upside down. Each nite I going on air, but not being able to work a single new county.

Finely, in desperayshun, I asking Hon. Brother Itchi if he knowing where my pencil might be. He saying sure, he seeing it on my desk, thinking what fine pencil it being for keeping his golf score, so he borrowing it!

Hokendoke Hackensaki!! I rushing to his golf bag, finding pencil, and rushing to shack. Now I seeing if there anything to this sooperstishun thing. Writing in log, calling seek-you, and back coming nice feller in Leelanau county, Michigan. Gracious to goodness, what a wonderful feeling!

As fast as can seek-youing, I getting Le Sueur in Minnesota, Kootenai in Idaho, Klickitat in Washington—boy oh boys, what a grand and glorious feeling. Hon. Ed., now Scratchi are reely sooperstishus.

So, I leeving it to you. Are you thinking there such thing as lucky pencil, or not? Not needing to answer, as Scratchi knowing what he knowing.

Only got one problum now. Pencil only about one inch long, and I not knowing if it lasting long enough so I can working all counties.

Respectively yours,
Hashafisti Scratchi

PLEASE include your ZIP code number on all correspondence.

Pre-Amp [*from page 63*]

instability in the amplifier when the d.c. control voltage is raised sufficiently to energize the relay. The relay used in the model shown in the photograph is a simple d.p.d.t. power type with a 24 v.d.c. coil. Any similar relay can be used. If a relay with more contacts is available, the extra contacts can be used to disconnect power from the amplifier and/or ground the gate of the F.E.T. when the relay is in the bypass position. The r.f. choke used to isolate the d.c. and r.f. paths should be of a low resistance type and not of the usual 1 mh or 2.5 mh variety. The latter types have too high a d.c. resistance and will cause too great a voltage drop to prevent the relay from operating unless a d.c. voltage of 40+ volts is used.

The d.c. voltages at the preamplifier can be derived from the receiver itself or a separate power supply can be used. Only a few milliamperes are necessary for the amplifier. The current necessary for the relay is about 200 milliamperes if a 24 volt relay with 130 ohms coil resistance is used but can be made lower by using a higher coil resistance relay. Although the span between the 15 v.d.c. placed on the coaxial line for amplifier operation and the 24 v.d.c. required to energize the relay should provide positive relay action, some relays tend to remain pulled in even though the energizing voltage is reduced considerably below their nominal value. Therefore, there should be a definite break before making d.c. switching contact arrangement used in the power supply so the relay falls out before 15 v.d.c. is placed on the line to power the amplifier.

Construction

As shown in the photograph, the amplifier is assembled on a small piece of vectorboard stock. The only precaution to observe in construction is to provide maximum isolation between the input and output circuits. If any instability is evident, a metal shield to isolate the output circuit from the transistor and input circuits should be tried. The location of the ground connections for the various amplifier components should be centralized if possible. This can be done by running a small length of number 12 tinned wire under the vectorboard as a main grounding line. The coils, L_1 and L_2, after they have been resonated should be covered with a light coating of Krylon spray or coil dope so they maintain a fairly stable position.

The entire preamplifier with its bypass relay can be packaged in an approximate 3½" × 1½" × 1¾" aluminum utility box, with just a coaxial connector at either end necessary, the enclosure makes an extremely small unit that can be mounted on any antenna mast. The enclosure can be easily weather proofed by sealing its edges with an expoxy type cement.

Results

The model constructed for 10 meters performed very well and signals which could not easily be heard without the preamplifier were received easily when the preamplifier was switched in the circuit. Power for the preamplifier was supplied simply by using a voltage doubler circuit on the 12 volt a.c. filament circuit of the receiver and by using a voltage divider of two 47 ohm 2 watt resistors on the output of the supply to develop 15 volts dc.

Some tests were made using a low power transmitter. Of course, the relay switching must be arranged so that the bypass relay in the preamplifier is activated during transmit periods. With low power transmission (75 watt P.E.P.), there appeared to be no problem with possible damage to the amplifier nor usage of the d.c. control voltage to keep the relay in the preamplifier in a bypass connection during transmission periods. With high-power transmissions, these factors may become a problem unless the amplifier circuit is de-energized and grounded during transmission periods and the relay voltage is raised so that the r.f. voltage does not affect the relay circuit.

One suggestion which was made which seems to have merit was to arrange the bypass relay circuit so that in its deactivated position, the amplifier is bypassed. This would insure always having an antenna connection should the relay switching or power circuit somehow fail. It would also relieve the input of the amplifier from being connected to the antenna when the station is not in use and possibly being damaged from stray charges developed on the antenna. ■

PLEASE include your ZIP code number on all correspondence.

Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbreviations and addresses. Commercial and organization ads, 35¢ per word. **Minimum Charge $1.00.** No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day of the second month preceding date of publication.

Because the advertisers and equipment contained in Ham Shop have not been investigated, the publishers of CQ cannot vouch for the merchandise listed therein.

Direct All Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050.**

ADARS Wanted: Radar equipment of all kinds bought. Write: . Cemprola, 550 Fifth Avenue, New York, New York 10036.

OVERNMENT surplus picture catalog 25¢. Meshna, Nahant, ass. 01908.

REE CATALOG: Electronic parts, tubes, wholesale. Thousands items. Unbeatable prices. Areturus Electronics Corp., 502 2nd Street, Union City, New Jersey 07087.

SL's by RUTGERS VARI-TYPING SERVICE, Thomas Street, Milford, .J. 08848. Free Samples.

UADS: Proven sensational! All metal (except spacing insulator owels): full size; two element; absolutely complete with boom, l hardware, wire and fittings; terrific gain and directivity; no amboo or fiberglass; uses single 52 ohm coaxial feedline. 10-5-20 quad, $35; 15-20 quad, $32; 10-15 quad, $30; 20 meter uad, $25; 15 meter quad, $24; 10 meter quad, $23. Remit with rder, shipped charges collect same day. Gotham, 1807 Purdy ve., Miami Beach, Fla. 33139.

OT-SHOT CARD. Designed for clubs and individuals engaged in mergency communication, this 4" by 5" red card with black inting may be placed in your mobile unit's window to identify ou as an "Emergency Radio Unit." Card is on a heavy Bristol oard stock and is almost identical to those issued to regular mergency vehicles by many agencies. 50¢ each, ppd, or available in bulk amounts of 25 cards for $6.25. Order now frcm OT SHOT CARD, c/o CQ's Ham Shop, 14 Vanderventer Ave., ort Washington, L.I., N.Y. 11050.

ED or WHITE, die cut Scotchlite letters. Day-Night Visibility. ostpaid/letter, 2"-15¢, 2½"-20¢, 3"-25¢. Portage Industries c., Dept. B, Box 188, Portage, Ind. 46368.

OLICE—fire—aircraft—amateur calls on your broadcast radio! une the band with TUNAVERTER. Free catalog. Salch Company, ept. CC, Woodsboro, Texas 78393.

UBBER ADDRESS STAMP including call letters. Three or four ne text $1.50. Signature stamp $2.88. Free catalog. Jackson tamps, 1433 Winnemac, Chicago, Illinois 60640.

HIELDING Systems, Kits, accessories. Eliminate mobile intererence. Estes Engineering, 1639 West 135th, Gardena, Calif. 0249.

SLs—BROWNIE—W3CJI—3111 Lehigh, Allentown, Pa. 18103. amples 10¢ with catalog 25¢.

.J. Bandmaster all Coax antenna, the traveling hams dream. ortable. Quiet reception, broad band. Write: Endres Electronics ystems, Rt 178, Lake Isabella, Calif.

IGHLY Effective home study review for FCC commercial phone xams. Free Literature. Cook's School of Electronics, P.O. Box 6185, Houston, Texas 77036.

ANTED—QST's—Last four issues needed to complete private ollection. 1916—FEB., MAY, JUNE, JULY. Any reasonable price aid. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washngton, L.I., New York 11050.

ANTED: Silver Dollars any date. Must see actual coin before I an make a firm offer. If interested in making a profit on your ollars send your silver dollars to me by insured mail. I will eturn any and all postage even if we can not come to terms. oins not accepted will be returned immediately by insured ail. Send to HAM SHOP, c/o CQ MAGAZINE, Box CESR, 14 anderventer Avenue, Port Washington, L.I., N.Y. 11050.

SL CARDS. Samples 25¢ Malgo Press, Box 375, Toledo, Ohio 3601.

,000 gummed address labels, 50¢. 3 sets, same or different ames, $1.25. Mart's, Box 454-F, Mackinaw, Illinois 61755.

TTY gear for sale. List issued monthly. 88 or 44 Mhy toroids, ncased, five for $1.75, postpaid. Elliott Buchanan and Associates Inc., Oakland, California 94610.

LUB EMBLEMS reproduced as embroidered patches. Send ketch, colors, size, quantity for quotation. Alabama Sportswear, Box 1505, Decatur, Alabama 35601.

FREE! Ham Shop Ads

Beginning with the March issue, CQ will offer a new free service, on a trial basis, to its subscribers. What's the deal? Simply this: If you are a regular subscriber to CQ, you will be offered a FREE Ham Shop ad in the very next available issue of CQ, and *every* issue during the duration of your subscription! No strings attached! It's just one more little way we feel we can better serve our regular readers.

How does it work? Just **type** or print your ad, (limit: 3 lines or about 150 characters), on a **POST CARD,** attach your mailing label from your latest issue of CQ, and mail it to: **(POST CARDS ONLY)**

FREE Hamshop Ads
CQ, The Radio Amateur's Journal
14 Vanderventer Avenue
Port Washington, L.I., N.Y. 11050

That's all there is to it.

A few logical limits have to be imposed: Due to space limitations, only six columns per month can be allocated to the New Free Ham Shop, so ads must be run on a first-come, first-served basis. Postmark will be the determining factor. If, because of late arrival, your ad can't make a given issue, it gets first preference for the very next issue, but still you'll want to get your ad in early. Only one ad per subscriber per issue. Your mailing label is an absolute **must;** no label, no free ad.

Oct. CQ is the next issue you can make. Deadline is Aug. 5. Mail your ad today.

No ads from commercial enterprises, please. This service is designed to aid the cash-tight **amateur** only!

The publisher reserves the right to refuse any ad he feels is unfairly deceptive or unsuitable for an amateur magazine. He also reserves the right to withdraw this offer without notice.

YOUR Card in glittering raised 3-D on blazing backgrounds becomes a beautiful collector's item. Samples 25¢ (refundable). 3-D QSL Co., Monson, "4", Mass. 01057.

SOLID STATE SALES would like to send you one of their catalogs. They have for sale transistors, rectifiers, zeners, SCR's diswitches and many other semiconductor devices in large and small quantities. All devices are checked and guaranteed. Integrated circuits (JK, SR, SRT, Flip flops and gates) with checked imputs and diagrams are available. Include 20¢ for handli g which will be deducted from your first order. Solid State Sales, Box 746, Somerville, Mass. 02143.

HUNDRED QSL's. $1.00 Samples, dime. Holland Printing, R3, Box 649, Duluth, Minn. 55803.

HAM'S SPANISH-ENGLISH Manual K4BZY. 1329 N.E. 4th Ave., Fort Lauderdale, Florida.

NCX-5 Mark 2 National Transceiver—bought one myself and received one at same time from XYL for birthday April 1967—will sell one in original unopened carton for $360.00—also NCX-A power supply $80.00 and XCU-27 calibrator $20.00—W3NEC, Dick Ache, 707 Barclay Lane, Brcomall, Pa. 215-353-(226.

THE FRIENDLY Favorite-Warren, Ohio A.R.A. Hamfest. August 27, Newton Falls, Follow arrows from Rt. 534 and Turnpike Exit 14. Contets, swap shop, XYL-YL program.

WANTED: Rheem Califone AR-300 tape recorder with manual. KWM-1 in excellent to mint condition with manual. For Sale; Custom built Heathkit SB-300 receiver. Black crackle panel and cabinet. White lettering. SSB and CW filters. Mounted in 10½" x 19" relay rack panel with oblong speaker above receiver. Panel easily removed. Larry Kleber, K9LKA/W9CPD, 529 South State, Belvidere, Illinois 61008.

HEATHKIT KS-1 Kilowatt power supply wanted. Send price and condition. Sell or trade new Keogg 99'er, $85.00. Don Johnson K6MIM, 76 LaVerne Avenue, Ventura, Calif. 93003 Phone 805-642-5338.

SALE: SX-100, $125; Gonset mobile "Twins" G66B and G77A, $130; Viking II, $80. Make Offer. David Hoff, K4NUZ, Rt. 3, Box 338-C, Durham, N.C. 27707.

FAIRBANKS, Alaska Centennial Exposition, KL7ACS official Station. Commeorative QSL's sent. Visitors call on 3866 or 145350. Informal get together, KINGS KUP, Noble Street, noon Saturdays.

CB, SWL, WPE, Cards/embossed or regular. Free samples! AECD Printing, P.O. Box 658, Edgewater Branch, Cleveland, Ohio 44107.

SAROC Sahara Amateur Radio Operators Convention 4-7 January, Third Annual fun convention hosted by the Southern Nevada Amateur Radio Club. Designed for exhibitors and participants at Hotel Sahara, Las Vegas, Nevada. MARS seminar, Army, Air Force and Navy representatives Ladies luncheon with cra y hat contest, hat should convey amateur radio theme. Plus fabulous entertainment only "Las Vegas" can present. Registration fee includes, three cocktail parties, Hotel Sahara show, hunt breakfast, technical sessions, admission to leading manufacturers and sales exhibits. Advance registration closes one January. QSP QSL with ZIP and telephone number for details to Southern Nevada Amateur Radio Club, Box 73, Boulder City, Nevada 89005.

QSLS: 125 for $3.75 (2 color). Samples free. R. A. Larson Press, Box 45-A, Fairport, New York 14450.

LOUISVILLE Ham Kenvention—Sept. 8-9, 1967. Beautiful Executive Inn Motor Hotel, Waterson Expressway at State Fair Grounds, Louisville, Ky Participate in the technical sessions, forums, prizes, banquet and flea market. Bring XYL for day of women's activities. For information write Louisville Ham Kenvention, Box 20094 Louisville, Kentucky 40220.

"HOSS-Trader, "Ed Moory offers two each of the following equipment opened and displayed at our store and at Ham-Fests with factory warranty. SB-34, $309.00; NCX-5, $439.00; TR-4, $479.00; T4-X, $339.00; R-4A, $338.95; L-4, $549.00; Swan 350, $339.00; Swan 500, $398.00; new NCL-2000 Linear Reg. price, $685.00—CASH PRICE $488.00. Sorry, no New Collins equipment below their advertised price: We will cooperate. Package Deal: New Mosley TA-33 Beam and Demo HAM-M Rotator $195.00; SPECIAL "ROHN 50 ft. heavy duty fold over tower prepaid, $189.95. Demo-Ham-M Rotator, $89.50. Used Swan 500 $375.00; Used Ham-M $85.00. Used Gear; Drake 2-A, $145.00; Ranger 1, $75.00; "Ed Moory Wholesale Radio Co., Box 506, DeWitt, Arkansas. Area Code (501) 946-2820.

FOR SALE: Vy cln Apache & SB-10. HQ 170 ac 7 mo. old. Heath 2 mtr conv. for 50 mc. Millen 65W exc. Mod pwr sly in rack. W9EOA, 1715 Adams, LaCrosse, Wisc. 54601.

QSL'S, SWL's, CB 10¢. N & S Printery, Box 11184, Phoe Arizona 85017.

ELECTRONIC library and parts for sale. Jim Nesbit, 4227, N 24th St., Phoenix, Arizona.

FOR SALE. Complete set UTC Linear standard series tra formers including filament, plate, modulation, bias, cho etc., from one kilowatt output broadcast transmitter. F supply rated at four thousand watts. Modulation transfor handles one thousand watts audio. For list and discount pri write Geo. W. Smith, Jr., Pottsboro, Texas, 75076.

LICENSE Plate with call letters only $1.00. With reflective pa $1.50. Guaranteed. Permanent. Impressive. Special club ra E. L. Crouch, K4ANE, 2040 Broad Street, Paducah, Kentucky.

SALE: Collins KWM-2 516F, 30L1, with speaker & phone pat Cabling & manuals, complete $1,200.00. W4DNT, D. F. Fleshn 7305 Valley Crest Blvd., Annandale, Va. 22003. Ph. 703-5 3604.

WANTED: Military, Commercial, SURPLUS. Airborne, Grou Transmitters, Receivers, Testsets, Accessories. Specially lins. We Pay Cash and Freight. RITCO, Box 156-8, Annand Virginia. PH 703-560-5480 COLLECT.

FOR SALE: Mint hardbound volumes CQ 1945 through 1957 QST 1926 through 1957. All offers and inquiries answered. Sandberg, K6YPU, 1138 E. Rustic Road, Escondido, Cal. 920

QSLS. second to none. Your personal combination from larg selection, glossy reds, blacks, calypso, pinecraft, vellum, crystallon. All ink colors. Many card styles. Fast serv Samples 25¢. Includes your call in beautiful 4½ inch lett Ray, K7HLR, Box 1176, Twin Falls, Idaho 83301.

WRL's used gear saves money; guaranteed; trial. Without tra —Galaxy V—$269.95; Galaxy III—$179.95; SR150—$299. Thor VI & AC—$219.95; EICO 753—$149.95; NCX3—$179. King 500A—$169.95; Champ 350—$149.95; SB400—$259. SB300—$259.95; HQ170AC-VHF—$299.95; 2B—$199.95; 51J $449.00; 6N2 Thunderbolt amplifier—$449.95—hundreds m free list. WRL, Box 919, Council Bluffs, Iowa 51501.

BEST reasonable offer takes CQ Magazines 1947 to 19 HG-10 VFO, large converted prop pitch motor. W3EPV Rob Stoner, 817 Hamilton Blvd., Hagerstown, Md. 21740.

VACUUM Variable Capacitors, Jennings UCS 10-300MMFD, 7. 5 complete with gear drive train, mounting bracket, brand n $27.50 postpaid-insured. Supply limited, satisfaction guar teed. Bill Slep Company, Drawer 178CQ, Ellenton, Florida 335 Phone (813) 722-1843.

NOISE BLANKER eliminates ignition and power line nois Insert between converter and receiver. Free brochure. WESTC Engineering, Box 1504, San Diego, California 92112.

QSL's, 100, $1.25 post-paid. Samples, dime. Holland, R3, 649, Duluth, Minn. 55803.

DISCOUNT prices and time payments. New equipment in fact sealed cartons at discount prices. Pay only 10% down, mont payments as low as $10. Swan SW-350 $365, SW-500 $4 SW-250 $286, Ham-M $99.95, Drake TR-4 $511, R-4A $349 T-4X $349.50, L-4 $599, Galaxy V MK II $365, SB-34 $3 SBS Linear $219, Save up to 25%. Write for quotes before purchase. Reconditioned bargains. NCX-3 $199, SW-240 $1 Rico 753 $159, SB-33 $159, SW-350 $299, Galaxy V $2 HT-37 $179, HT-32 $179, CSB-100 $125, SX-117 $199, Send list. Bryan, W5KFT, Edwards Electronics, 1320-19th St. Lubbe Texas PO 2-8759.

TELETYPE TEST SET I-193C. Brand new surplus. Tests R transmitters, converters, relays. $24.95, F. O. B. Harrisbu Pa. Telemethods International, P. O. Box 18161, Clevela Ohio 44118.

SURPLUS SPECIALS. Oscilloscopes 3" CRT, for 19" Rack MT $39.50. Regulated PWR Supplies, (3) Voltages Max 225-250V 550MA. $39.95. Write for complete details on these and ma other interesting items at bargain prices . . . Electron Surplus Co., PO. Box 1225, Boston, Mass. 02104.

TELETYPE EQUIP. FOR SALE. Polar relays $2.50. PR sock $1.75. 3-Headed TD with sync motor $60. Sync motor $ Other parts available. B. L. Ferris, PO Box 672, East Flat Ro N. C. 28726.

POLICE RADIO. Hear all police calls, fire departments, Sheri taxis, ambulances, Highway Patrol. New 5 band portable ra and direction finder. Free Booklet. NovaTech, Dept. 243, dondo Beach, Calif. 90278.

For further information check number 26 on Page 126

COLLINS 75A4 excellent condition #4297 $300.00. W5YRC, 2510 Kenmore Court, Austin, Texas.

JOHNSON thunderbolt linear 2KW PEP excellent condition $250.00. E. H. Kugligowski, 63 Connecticut Ave., Massapequa, N.Y. 11758.

FOR SALE, complete station, HT-37 exciter, ($225). GSB-201 Linear Amp., $225, Collins 75s3A receiver $475. Transtenna 102A TR switch $40. All clean and perfect condition. 10% off for sale of complete station. D. J. Stein, K6TTH, 22432 Shadycroft Ave., Torrance, Calif. 90505.

WANT 75A4 1.5Kc filter F455J-15. Sell frequency meter TS-173/UR, 90-540mc. $175.00. F. N. Saltus—K6AVF, 10074, Cristobal Dr., Spring Valley, Calif. 92077.

HT 44, WIPS150 AC & Spkr console, SX 117 receiver w/transceive cables, original cartons, w/manuals, mint condition, going mobile $490.00. WA8IUF, W. McAdam, 2706 Thomas St., Flint 4, Mich. 48504.

FOR SALE: Heath HG-10 Vfe and Knight R-55 receiver. Make offer on either or both. G. J. Cotellis, Jr., 1903-32nd St. W., Bradenton, Fla. 33505.

WANTED: 2.1 KC and 1.5 KC mechanical filter for Collins 75A4 Rec. Please state price and condition, all replys answered. Lee Beyer, WA8HNM, 10 W. 35th, Holland, Mich.

NOVICES—Knight T-60 Trans, Heath HR-10 Revr with calib, DK60B Ant. Relay, 4 crystals, all cables. $115. J. D. Saik—WA9SSZ, 1528 Edwardsburg Rd., Elkhart, Indiana 46514.

WANTED: Lakeshore "Bandhopper" VFO or equivalent (9mc) will pay cash. Must be in good shape. T. Ginkel—WAOAHV, 832 So. Payne St., New Ulm, Mn. 56073.

MINT CONDX w/orig box 80-10 SSB-CW-AM 130w Sommerkamp FL-200B Transmitter $285.00. R. O. Goodwin—W50JX, RT 2, Box 70, Carriere, Miss. 39426.

FOR SALE: Knight T-150 xmtr (with Knight modifications). R-100 rcvr., spkr., xtal-calib., S-mtr. Both $110. Capt. Tanaka, Box 7060, USAF Hosp., APO San Francisco, Calif. 96323.

SELL or TRADE W6SAI type 3 element 14mc Beam, Gamma Matched. Prop Pitch Motor es 110V AC indicators, map, cables. Exclnt. Condx., now in use. All offers answered. Geo. S. Maxey—W6BIL, 805 Lincoln Street, Redding, Calif. 96001.

JR3 and AC power supply—$400.00. Unused after factory reconditioning. You pay shipping. H. S. Lair—WIMBQ, Tashmoo Ave., Vineyard Haven, Ma. 02568.

WANTED: Antique receiving and transmitting tubes, made prior to 1920. S. M. LaDage, 431 Oakland Ave., Maple Shade, N.J. 08052.

MODULATION TRANSFORMER wanted. 600 watts and up. Write: R. D. McCloud—W2CGM, Box 32, Esopus, N.Y. 12429.

MONTANA contacts on six KIWYS/7 50.11 USB 50.14 AM QSL Caros to Harry W. Blakeman, 341st MIMs, Box 556, Malmstrom AFB, Mont. 59402. Wanted maintenance manual for GE 4ER6 receiver.

FOR SALE: Hallicrafters SR-160 (3 bands) with crystal calibrator, cables, and PS-150-12DC mobile supply. $225.00. Dick Bamberger, K2CHW, 139-09 84th Drive, Jamaica, N.Y. 212-291-2653.

WANTED—Gonsett—3063—two meter linear amplifier. H. S. Blair, Box 704, Vineyard Havon, Mass.

FOR SALE: Hetrociter VFO described in April 1963 CQ $45, linear amplifier with 6146's power supply $40—Marriner W6BLZ, 528 Colima St., La Jolla, Calif. 92037.

WANTED: Antique Radio Tubes made prior to 1920. La Dage W2EZM, 431 Oakland, Maple Shade, N.J. 08052.

WAGNER Plate Transformers for sale: 3600-0-3600 volts at 1 amp 110/220 volt primary. $25 fob. 100 mfd 3.000 volt GE filter capacitor $25 fob. Rev. Paul E. Bittner, WØAIH, 814 4th St. So. Virginia, Minn. 55792.

SELL two meter transceiver, halo antenna, two crystals, mic, complete with AC and DC supplies. A steal at $39. Ron Durie, 4994 James Ave., No. Mpls., Minn. 55405.

WANTED: KWM-2/2A, 75S-3B/C, 516F-2, 312-B5, 30L-1 and accessories. Heinlein W7BIF, 107 Wyoming, Boulder City, Nevada 89005.

SELL Millen 90901 one inch meter style oscilloscope with plate and filament supply $30. Also 100 feet new Prodelyn solid aluminum coax, gas or dry air filled, half inch diameter $45. Gene Hubell, 6633 E. Palo, Verde Lane, Phoenix, Ariz. 85028.

FOR SALE: HQ180, $210; DB20 Preseletor $12; HD10 Keyer, $26.50; HCO 723, $30. All Operating, All prices firm. Receiver shipped freight collect. All others prepaid. A. G. Bauernfeind, 19600 Dubois Ave., South Bend, Ind. 46637.

JOHNSON Matchbox 275 Watt antenna coupler model 250-23. Excellent condition with instruction manual, sell for $25. Irwin Donadt. W210Z, 168 Cedar St., Cliffside Park, New Jersey 07010.

I NEED (2) 4CX250B tubes, new Eimac preferred. Harry M. Riddle W8EDL, 2661 Northwood Ave., Toledo, Ohio 45606."

NEED to complete my file: April and August 1916 QST and August 1945 CQ. W4ID Col A. R. Marcy, 461-3rd Ave., Eau Gallie, Florida 32935.

WANTED—Bird Wattmeter, SX-42 Receiver, 3 or 5 inch Labor Military Scope. Impedance Bridge. Sig Gen TS-497B/URR 2-400 MC. Pfalzer, 240 Beechwood, Granville, Ohio 43023.

FOR SALE 4X150A's NEW, $4.50 each post paid, Bill L. Nielsen, DL5KS, P.O. Box 47 Apo NYNY 09757.

HC-10 SSB converter: A. D. Stephens, K9KHU, Route 5, Box 140-D, Austin, Texas 78704.

WANTED—Pay cash or swap for KWM-2 with or without power supply. Clifford Ratliff W5DHE, 2938 Fairfields Ave., Baton Rouge, La. 70802.

SWAN 350/AC Supply 117-XC, Recent Models $425. Want Tri-Band Swan, Hallicrafters, etc and Gonset Communicator. III(2M) Damiano, 1243 Sycamore St., Turlock, Calif. 95380.

FOR SALE: Knight FM Monitor Police Receiver Model KG-221 tunes 152-174 mc/s $30. E. H. Marriner W6BLZ, 528 Colima Street, La Jolla, California 92037.

FOR SALE make offer; HP 416A, HP 610B, HP 400D, & TS 452 CU. $25 new HY-Gain 14 AVQ with roof mount. Schumachler WB6KCN, Apt 5, 11658 Mayfield Ave., LA 49, Calif.

SWAP: 35 mm Camera-PRAktiflex model FX single lens reflex with f 1.9 standard lens and interchangeable telephoto lens. Need medium power two meter XMTR or Mobile SSB Transceiver. Paull W9HWG 1 So. Evanston, Arlington Hts., Ill. 60004.

"FOR SALE BC221AA mint condition Original Calibration book & Xtal metal case built in pwr supply $65. H. Fulmer, 8252 So. 100st; Franklin, Wisc.

SX117—$170, SB200—$170, SB34—$319.95, 30LI—$335, 312B5—280, BTI-LK2000, save. F. Baker, Box 546, Mc Comb, Ohio.

FOR SALE: SCR-522 Transceiver (less tubes) $20. Want: W. B. Duck Catalogue. F. W. Chapman W8TKR, 1367 Villa Rd., Birmingham, Mich. 48008.

WANTED: Bird 43 wattmeter elements for high power VHF. What elements do you need? Schumacher, 11658 Mayfield Ave.,L.A. 49, Calif. 90049.

KWM-2A with 516 F, MP, and PM2 Pwr supplies CC2 carrying case ASM-1 Mike spare tubes and crystals—like new never mobile—$950. No trades—Cottrell W41WA, 21 Lancaster Ter., Hampton, Va., 23366.

WANT swan or heath 6 mtr Transceiver have to trade or sell SP 600, HR07, HT33A, BC221M, HB-KW Linears, Tubes & more tubes. Mech Filters, Vac. Varriables. W4IWA, Cottrell, 21 Lancaster Dr., Hampton, Va., 23366.

COLLINS KWS 1 SN 1260 $550., 75A4 SN 2312 with 3.1, 2.1, 0.5 Filters $395, SCS 101 matching control homebuilt $110., No shipping will deliver to 150 mi. Hoverman K6HZU, 10609 Chaney Ave., Downey, Calif. 90291.

"GERMAN-English Vocabulary" $1.00. "Illustrated Certificate Guide", 78 awards pictured & described. Chris Zangerl E9CZI, A-6850 Dornbirn, Austria. 1 Nachdauerstrasse.

MASTERS Research Report—Amateur Radio: Its Effect on Society. $1. M. Gauthier K6ICS, 10425 San Jose Ave., SOuth Gate, Ca. 90280.

WANTED: Thordarson Multi-Match modulation transformer T21M64. John Shiels-W30KP, 3212 Chestnut St., Murrysville, Pa. 15668.

RTTY wanted—Model 28 ASR, will consider KSR. SELL—15 Typing reperf with keyboard, 14 TD new, KY44B Keyer new. R. M. Mendelson-W2OKO, 27 Somerset Pl., Murray Hill, N.J. 07971.

TELREX 6 EL ZMTR Beam $10, ALliance Rot $10, Separate ZMTR & 6 MTR ZOW Trans with 12 W MOD $40, FMITRO 80D TX&RX Strips $20 ea. C. Copp WZZSD, 6 Northfield La., Westbury, N.Y. 11590.

SELL: DX-40, $25; SX-99, $50 with Manuals, Certified Check or money order. You Pay shipping. N. A. Ginga-WA3MTI, 21 Napoleon St., Newark 5, N.J. 07105.

WANTED RCA Model CX-9A 915 KC test oscillator. G. A. Baldauf W3JKH, 175 Wernersville Blvd., Wernersville, Pa. 19565.

WANTED: 50-100 FT. Tower with Rotor & Tri-Band Beam. S. J. Chmell, 2943 73 Ave., Elmwood Park, Ill., 312-456-3768.

BARGAINS—Unused HQ-170C—$300. Johnson 6&2 Meter Converter—$70, Both still in warranty. SB-400, Mobile Supply; Much More. Stamp for list. Watt—Ranger and HRO or BC-348. J. R. Shank-W3cns, 21 Terrace Lane, Elizabethtown, Pa. 17022.

HEATH Sozer W/PTT/Squelch $40. HB 6M Conv., Int. Xtal 2M, 7-11if's $5. ea. BC-1000, no tubes, $20. CQ's 47-50, $15. BC-603 Modified 30-45MC, $20. Want Motorola 2 Mtr FM, Reasonable SASE for List. E. F. Lankford-W4HHY, 511 Purnell Dr., Nashville, Tenn. 37211.

OLSON Transistorized Camera & Accessories $175; Hallicrafters HA-2, HA-6, P-26, $275; Heathkit TWOER $35; Electronic Sideman, HHF Gear, Stamp for list. C. E. Spitz-W4AP1, Box 4055, 1420 S. Randolph St., Arlington, Va. 22204.

SHACK Cleanout, new surplus BC454-ARC-4 ea $20, unused Eimac 4-250 $28, 304TL or a pr 4E27 $20. 809 $6 pr. New 7 tube 150MC "Fire Pal". F.M. rec. $35. Megeff, 5015 Weeks La., Flushing, NYC 11365.

READER SERVICE

NAME _____ CALL _____
(Please Print)

ADDRESS _____

CITY _____

STATE _____ ZIP CODE _____

Please send me more information on your ads in the July 1967 *CQ* keyed as follows:

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	Total Inquiries				☐

Void after August 31, 1967

CQ MAGAZINE, Dept. RS
14 Vanderventer Ave.
Port Washington, L. I., N. Y. 11050

advertisers index

WANTED—I want to buy early radio and wireless equipment for my amateur museum. Receivers, parts, loose couplers, tuners, early vacuum tubes. Call books and WIRELESS MAGAZINES. Erv Rasmussen W6YPM, 164 Lowell St., Redwood City, Calif. 94062.

CANADIANS: RTTY reperfs and TD units. R. M. Ronald VE 4RE Box 974, Brandon, Man., Canada.

WANTED: Old Time QSL cards before 1930. Also looking for four letter QSL, circa 1932. These were portable calls and looked like the following W1ZZAB. John Alley, W1DMD, 298 Taunton St., Lakeville, Mass. 02346.

WANTED: Reasonable. 60 to 150 watt linear, for 25 to 30 mc. Also want 10 mtr. Crystals. Jim Izarelli, 512 Fox St., Joliet, Ill. 60432.

WANTED: 50 to 60 ft Crank-Up tower. Plan to mount TA-33 and Ham-M. Write Price, Age, Condition to Lou Amorso, 180 Pleasant Avenue, Bergenfield, N.J. 07621.

WANTED—C.Q. Vol #1, thr Vol #6, will swap QST and 73 for them. Ernie Guimares, 17 West End Ave., Middleborough, Mass. 02346.

WANT: Johnson 250-23-3 Matchbox, TR Switch SWR meter. Info. on installation of towers. S. J. Chmell, 2943 73 Ave., Elmwood Park, Ill. 60635.

FOR SALE: Hallicrafters Transceiver SR-150, $275. A.C. Power Supply P-500-AC, $65. Both for $325. Splatter Guard HA-8, Fred Inniss, K6QBF, 1508 Dapple Ave., Camarillo, Calif. 93010.

TELREX Inverted V. Balun-IK1080, Shure 104A Carbon Mike—NEW—$10 Each postpaid. D. P. Croweill, WASOZP, 314 E. Main, Ada, Okla. 74820.

HQ 140 XA will trade for phone patch, keyer, paddle, etc.; Viking II will trade or sell; Heath VFo/w P.s., $20; Heath "Ten'er", $35; All offers Answered—Hi Q Inductor 1-80M, 1-160M, Both New, $5 each. D. R. Etheredge, K6UMV, 12040 Redbank St., Sun Valley, Calif. 91352.

SELLING: Eldico SSB-100F. Quality SSB/CW transmitter with integral scope, originally $795, for $225. Want KW Matchbox. Marshall Jr., K2ZYR, 22 Clare Dr., E. Northport, N.Y. 11731.

$1. brings instruction Data for the Barb'wire Ant. sent to C. Lerey Kerr, Box 444, Montebello, Calif. 90641.

WANTED: 500 Cycle filter for 75A4. Also Have 1.5KC filter for Trade. Dennis McAlpine, Widye/1, RFD2, Box 120A, Dover, N.H. 03820.

VIKING Valiant Excellent cond. Make offer or will trade for KW linear Amplifier. Dr. W. W. Fulcher, K4RTA, 1400 Harwood Dr., Nashville, Tenn. 37206.

6&2 LINEAR Amp 500/W $50., TBS-50D $20., Swan #45 Mobile Ant. $20., Hy-Gain 40 Meter 2 El Beam $50., 120 FT-243 Crystals $20., 2400 MC Osc/Amp W/Tubes $10. James P/S 12-110V/350-550VDC New $35. W. J. Davis, K6KZT, 4434 Josie Ave., Lakewood, Calif. 90713.

TRADE Portable typewriter, camera, crystal calibrator or transistor power supply for ham or test equipment even if not operating. J. Boer K20YN, 449 Hill St., Boonton, N.J. 07005.

WANTED—Heath HX-10 Marauder, Short rise time square wave generator, Frequency counter variable voltage regulated power supply, EICO 710 Grid Dipper. D. W. Wismer VE3EHC, 260 Frederick Street, Kitchener, Ontario, Canada.

SALE: QST, CQ, other misc. Books, Mags. Bill Hayward, WOPEM, 3408 Monterey, St. Joseph, Missouri 64507.

FOR SALE—Cleaning out Shack. Send for list of Antique Radios, old magazines, Surplus Gear, Misc. D. T. McKenzie, 1200 W. Euclid Ave., Indianola, Iowa 50125.

WANTED: Early vacuum tubes with brass bases for my private antique wireless museum. Need DeForest round "AUD ON" like an orange with candelabra screw base, UV203, UV204, R. W. Schnedorf, 610 Monroe Ave., River Forest, Ill. 60305.

NEW JERSEY QSO Party August 19-20. See CQ contest Calendar this month for complete rules. D. B. Popkin-WA2CCF-WA2 UZH, 303 Tenafly Rd. Englewood, N.J. 07631.

COLLINS R388URR(51J3) For Sale, Make Cash offer or send stamp for information. Sale army Tech. Manuals. 4PR60A Tubes NEW $50 each. R. S. Blosser, 6545 Conway, Fairborn, Ohio 45424.

FOR SALE: Viking Ranger $125, RME 4350 RCVR with matching spkr $135. Manuals included. Both single owner and mint condition without a scratch. Ed. Cook, K5LNN, 8001 Iowa Dr., Little Rock, Ark. 72207.

WISH to buy or borrow June 1940 RADIO Magazine and to locate my pre-WW II QSL Card KA-1-LZ, Manilla, Philippines. My copies were destroyed during liberation of Manila in 1945. Contact (by air mail) Luis Zavattero, Via Elwonora Duse 12, Rome, Italy.

COLLINS 75A3 Sell for $240 with 800 cycle and 3.1 kc filters, Vevnier Knob, Homebrew calib. and NBFM adapter, prod det ben my article Oct 66 CQ, Very clean, perfect operation. C. A. Ebhardt, W4HJZ, 22 Rowan St., Raleigh, N.C. 27609.

THE NEW GALAXY V MARK 2

5 BAND TRANSCEIVER MOBILE OR FIXED STATION

NOW--even Better than Ever!

NEW 400 Watt POWER!

SIX WAYS BETTER!
Yet Still Only
$420.00

These NEW Features...

- New 400 Watt Power
- New Precise Vernier Logging Scale
- New Printed Circuit VFO
- New CW Sidetone Audio
- New CW Break-In Option
- New CW Filter Option

YOU CAN'T MATCH ALL THESE FEATURES ANYWHERE...*AT ANY PRICE!*

Plus all the great features that put the GALAXY V in a CLASS by ITSELF!

- **Smallest** of the High-Powered Transceivers. (6"x10¼" x11¼").
- **Great for either Mobile or Fixed Station.** No compromise in power.
- **Hottest Receiver** of any Transceiver — Special New Six-Crystal lattice filter.
- **Complete 80-10 Meter Coverage.** 500 KC on all bands, with 1 Megacycle on 10 Meters.
- **Both Upper and Lower Selectible Sideband.**
- **Highest Stability.** Drift less than 100 CY in any 15 minute period after warmup.
- **The personal drift chart** of every Galaxy that comes off our line goes with the unit to its new owner!

Write for free Brochure, complete specs on the GALAXY V MARK 2-

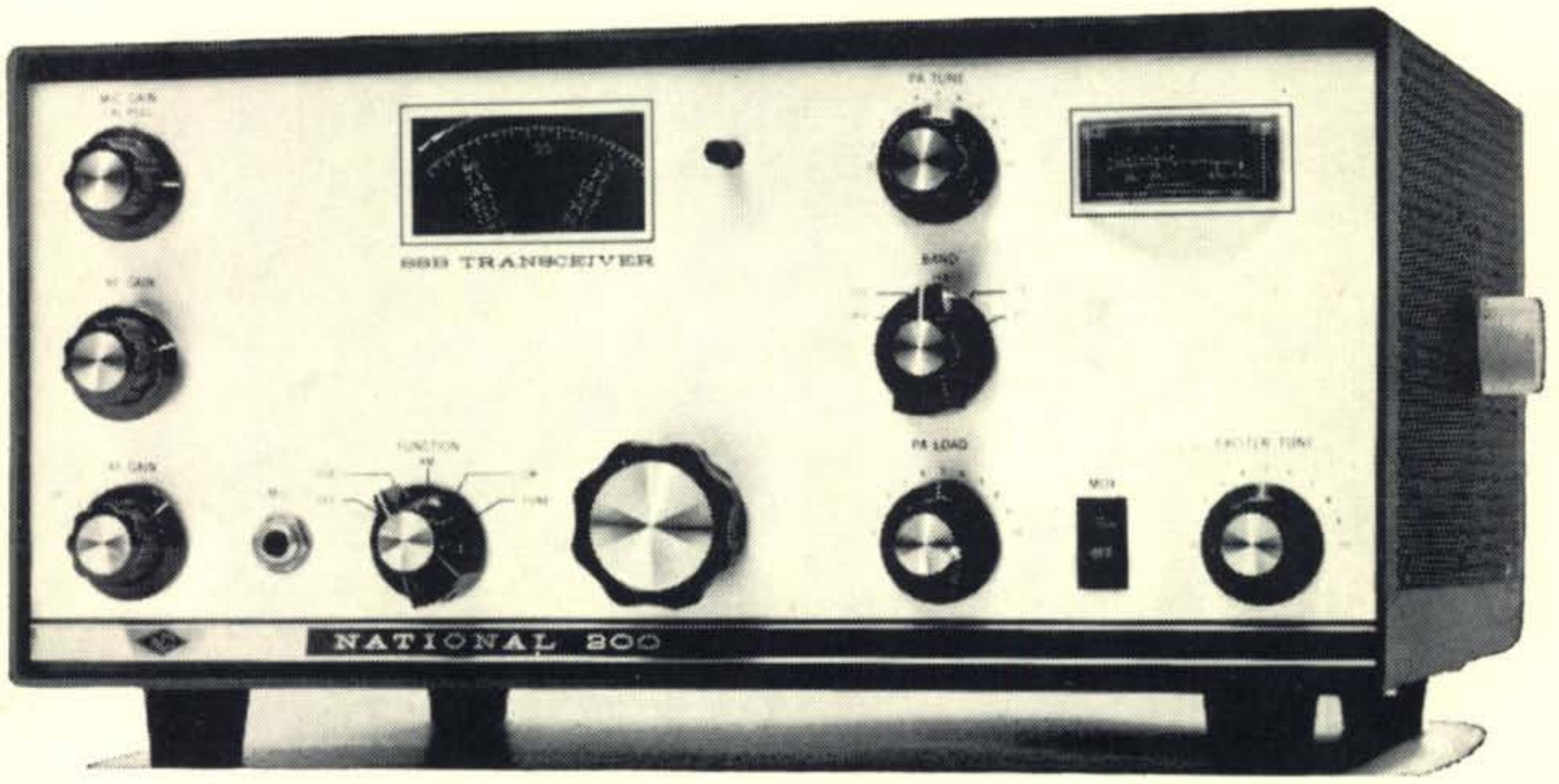
GALAXY ELECTRONICS

"Pacesetter in Amateur/Commercial Equipment Design"

10 South 34th Street • Dept. CQ-20Q • Council Bluffs, Iowa 51501

For further information, check number 37, on page 126

Join the National 200 club



Own the most versatile 5-bander on the market ...priced even lower than a kit rig!

National's new 200 is fast becoming the most popular 5-bander on the market . . . and it's no wonder! Here's an ideal rig for mobile, portable, or home operation . . . the fastest way to move up from single band or triband. The price? . . . an amazingly low $359! Performance? . . . here's what Jim Fisk WIDTY said in a recent issue of a noted amateur radio publication: **"When National came out with their new model 200 transceiver a few months ago at a lower cost than any other five band transceiver on the market, I just couldn't believe that it would perform as well as the more expensive models. But — after using it for several weeks in chasing DX, I find that they have done a superb job and it performs right along with the best of them. The sensitivity is fine, the selectivity afforded by the steep-sided crystal filter is excellent, and the audio reports, if I am to believe the fellows on the other end, have all been good. Reports of, 'tremendous audio quality,' 'really sounds good,' and 'very clean and crisp,' have been normal reports during the time I have had the 200 on the air."**

Feature this for $359! ■ Complete coverage of the 80 through 10 meter bands. ■ 200 Watt PEP input on SSB, plus CW and AM. ■ Separate product and AM detection plus fast-attack slow-release AGC. ■ Crystal-controlled front end and single VFO for high stability, and identical calibration and tuning rate on all bands. ■ Crystal lattice filter for high sideband suppression on transmit, and rejection of adjacent QRM on receive . . . plus solid-state balanced modulator for "set-and-forget" carrier suppression. ■ Operation from new low-cost AC-200 supply or from NCX-A or mobile power supplies. ■ ALC. ■ 45/1 planetary/split gear tuning drive. ■ Automatic carrier insertion in AM and CW modes. ■ Panel meter automatically switched to S-units on receive. ■ Universal mobile mount included.

ONLY $359.

with National's full One-Year Guarantee

National Radio Company

37 Washington Street, Melrose, Massachusetts 02176

For further information, check number 3, on page 126

Next to good band conditions you need this RCA "library"

Power Tubes • Receiving Tubes • Transistors

Here from RCA is Amateur Radio's most comprehensive "library" of tube and transistor references. You'll find a storehouse of technical facts on hundreds of RCA tubes and transistors: application hints; installation tips; pages of circuits; characteristic curves—helpful regardless of mode and band you operate, QRP or QRO, DX or rag-chewing. Next to good band conditions, these RCA publications can help you to better QSO's by maintaining equipment that's always at top efficiency. Get the manuals you want from your RCA Industrial Tube Distributor.

RCA Transmittin
Tube Manual TT
$1.00*

RCA Receiving
Tube Manual RC
$1.25*

RCA Transistc
Manual SC-12
$1.50*

RCA ELECTRONIC COMPONENTS AND DEVICES, HARRISON, N.J.

RCA The Most Trusted Name in Electronics ®

RCA Technical Bulletins on single types of power tubes, receiving tubes, transistor and silicon rectifier types are available from RCA Commercial Engineering Dept., Harrison, N.J. 07029

(*SUGGESTED RESALE PRICES)

CQ—Cover TV Color