March 1967
75¢

CQ

ICD

larrow Band-
he Next Step?

he Future of
oaxial Cable!

uild the
OMNIVERTER!"
onstruction details
age 14.

SIGNALS FROM SPACE

The Story of W9GFZ,
Father of Radio-Astronomy!

The Radio Amateur's Journal

The Right Shoe

Feel like you're running barefoot? If so, it's time to try on Collins' 30L-1 Linear Amplifier. Conservatively rated, the 30L-1 provides 1,000 watts PEP on SSB and 1,000 watts average on CW. It gives your KWM-2 more talk power. Does wonders for other 70-100 watt SSB/CW exciters, too. You also get RF inverse feedback, automatic load control, instant warm-up and automatic antenna transfer. See the 30L-1 Linear Amplifier at your Collins distributor.

For further information check number 38 on page 110

COLLINS

...so who needs a dummy load?

DUMMY LOAD/WATTMETERS

Model 374. Reads power output to 1500 RF watts over 2 to 30 MHz. Warning light signals excessive temperature. 4 calibrated scales.

Model 334. Indicates RF power to 1000 watts from 2 to 230 MHz. 3 calibrated scales for accurate readings. Red warning light.

DUMMY LOAD

Model 384. Dummy Load handles to 1500 watts from DC to 230 MHz. Combines with Waters Reflectometer to operate as Dummy Load/Wattmeter.

If you're a Heterodyne Harry out for a 'Most Unpop Op' award . . . forget the dummy load. And win in a walk! But if you realize that a consistently clear signal requires constant checking, tuning and measuring . . . you'll check, tune and measure into a dummy load and keep the heterodynes harmless. We make darn good dummy loads at Waters. Three of them, in fact!

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

CANADIAN HAMS: You may now order direct from M. J. Howard and Co., Ltd., 1300 Carling Ave., Ottawa, Ontario.

See you at the SSB Show, Statler Hilton Hotel New York City March 21st

For further information, check number 2, on page 110

CQ

MARCH 1967 VOL. 23, No. 3

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 Garden City, New York. 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. Please allow six weeks for change of address. Printed in the United States of America.

EIMAC 15 kW tetrode offers high power gain for advanced transmitters

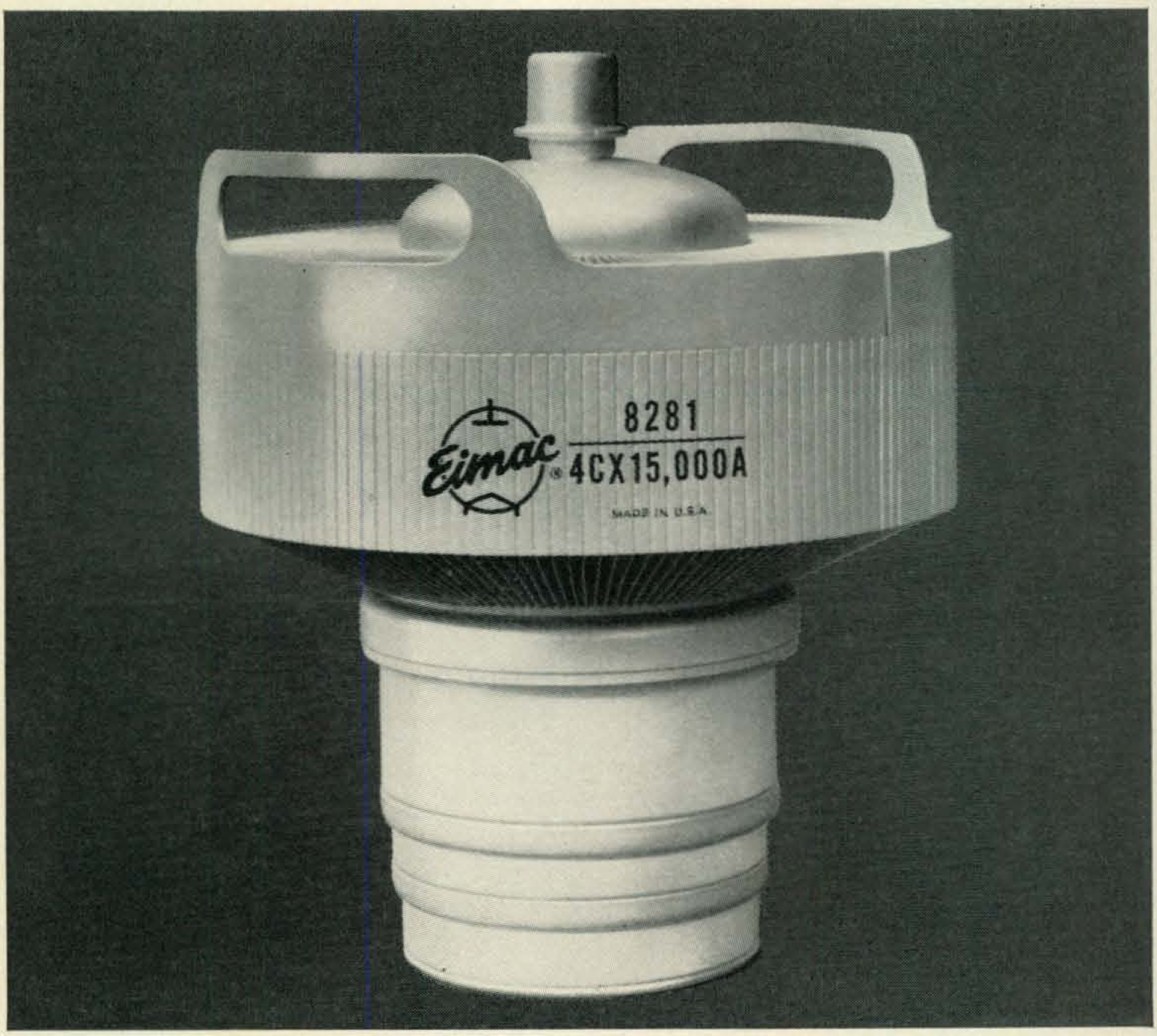
Most new high-power 20 kW FM transmitters use the EIMAC 4CX15,000A tetrode for service as a Class-C amplifier. The tube features a new internal mechanical structure which minimizes rf losses, and is capable of operation at full power ratings to 110 MHz. EIMAC also recommends the 4CX15,000A for 220 MHz operation at lower power levels for VHF-TV transmitters. ▪ EIMAC's long experience in tube technology and ceramic-to-metal sealing leadership have combined to produce a tetrode of optimum design and structural integrity. That's why the 4CX15,000A is used in more new transmitters than any other ceramic tetrode with similar characteristics. For more information write Product Manager, Power Grid Tubes, or contact your nearest EIMAC distributor.

RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telegraphy or FM Telephony (Key-down conditions)

MAXIMUM RATINGS	
DC PLATE VOLTAGE	10,000 MAX. VOLTS
DC SCREEN VOLTAGE	2,000 MAX. VOLTS
DC PLATE CURRENT	5.0 MAX. AMPS
PLATE DISSIPATION	15,000 MAX. WATTS
SCREEN DISSIPATION	450 MAX. WATTS
GRID DISSIPATION	200 MAX. WATTS

EIMAC
Division of Varian
San Carlos, California 94070



"See the World of Varian at 1967 IEEE Booths 3F01-3F17 through 3F18

For further information, check number 4, on page 110

ZERO BIAS

LAST month we were proud to be able to publish an article which, if given a chance, could reshape the future of amateur radio in the U.S. The article to which we refer is "A Radical Proposal" by Raphael Soifer, K2QBW, one of the current crop brilliant young amateurs to whom we will look in the future for guidance.

Although the idea presented is rather radical to most amateurs—that of a code-free amateur license with limited privileges in certain select v.h.f. bands—similar ideas have circulated behind the scenes for several years. It seems, however, that most such proposals have not come from within the noncommercial, purely amateur majority of our amateur society, but have come instead from sources tainted by commercialism: CB manufacturers, and of course, ham magazine publishers. None of these proposals have been favorably received by amateurs—indeed, none have been greeted with great enthusiasm even by a commercially published magazine like *CQ*. Why? It's quite obvious that amateurs are proud of their history of keeping their own house in order, and feel rather offended when an outsider —a commercial one at that—dares suggest that it might have something constructively critical to say about *our* bands and *our* hobby, regardless of the merit of the criticism.

It's not surprising, therefore, to note that early response to K2QBW's "Radical Proposal" has been so pleasantly favorable. Here at last, is a thoughtful self-analysis of our hobby, with thoughtful—albeit sweeping—suggestions for the improvement of our hobby, presented by an amateur, with no motive other than the betterment of the hobby. And the hams have read and studied the analysis and suggestions, and registered their approval, with a relatively small amount of dissent.

From time to time—again behind the scenes—furtive discussions have taken place among active amateurs, ARRL representatives, all with the same fundamental thought. The acceleration of growth of American amateur radio through the institution of an amateur license within the immediate grasp of the layman. Outside of an occasional flirtation with the idea in print, neither ARRL and *QST*, nor *CQ*, nor *73* have ever dared to editorially support the "code-free" idea. I'm a little ashamed to admit that we've been terrified by the possible repercussions within the readership, and the resultant "pain in the pocketbook." I honestly believe that all three publications have been selling short the ability of the amateur public to accept the truth and react to a radical proposal. Amateur radio is sufficiently mature to accept the challenging opportunity offered by a properly conceived and legislated code-free class of license. The K2QBW proposal is the seed of that license class, which, properly cultivated, could extend the horizon of American amateur radio still further, opening up the pleasure, satisfaction, and challenge of our hobby to hundreds of thousands of citizens now ignored.

At every level of interest, from the Federal Communications Commission—to ARRL—to the amateur industry—to the average intelligent amateur, the need for such a license class is admitted, but only privately. Isn't it time that ARRL, and others, stopped whispering behind closed doors about just such a license and came out in open support of it if that is their inclination?

Prior to publication, copies of the Soifer article were circulated to various interested parties for comment. The resulting replies amazed us with their *completely* non-committal attitude. *No one* would so much as say they candidly approved or disapproved of the concept! It is this reluctance to reach a decision; this reluctance to even consider a change which has hampered progress in American amateur radio over the past several years. Yes, there has been progress, but progress largely *in spite of* leadership rather than *because of* it! (Witness: Project OSCAR).

The point is this: We have at hand an excellent avenue of approach to the problem of dwindling growth figures in amateur radio, as well as the dilemma posed by hobby use of CB. We can either capitalize on it or ignore it. Whether or not we are *able* to capitalize on it depends upon the attitudes of amateur radio's leadership: ARRL, *CQ*, *73*, the equipment manufacturers and amateurs themselves. You know *our* attitude.

Isn't it about time we stopped just thinking about that next step in our development—and took it?

73, Dick, K2MGA

OUR READERS SAY

A Radical Proposal

Editor, *CQ:*

The not so "Radical Proposal" by Raphael Soifer, K2QBW (*CQ*, February 1967, p. 19) is one of the few realistic appraisals of the s.w.l./CB/ham dilemma that I have seen in print.

It's time that cognizance was taken of the code-free ham license possibilities above 144 mc. Unfortunately, it may be too late. CB is like Pandora's box with the unusual exception that in turning CB loose, the FCC climbed into the empty box and shut the lid.

I believe the Soifer "Proposal" would benefit amateur radio, restore CB to its intended usefulness and let the FCC come out of hiding—but, who is going to convince the die-hard ham that it's 1967, not 1937?

Oliver P. Ferrell
Editor, *Popular Electronics*
New York, New York

Editor, *CQ:*

The article, "A Radical Licensing Proposal" (Feb. 1967) is consistent with your campaign to open amateur radio to the Citizen Band license holder. All such plans seem based on the same premise: Since the Citizen Bander will not meet amateur standards then lower amateur standards to his level.

The article proposes to create a *codeless* Novice type license for the Citizen Bander, and the amazing justification for this is primarily because the Citizen Bander does not feel the code is necessary.

There is not much doubt that the FCC and the vast majority of amateurs believe that the present requirements for the Novice and Technician class licenses represent the *minimum* standards necessary for *proper* operation with amateur frequency assignments. If a Citizen Band license holder is unwilling to exert even this minimum amount of effort to qualify for an amateur license, then he would represent a detriment to amateur radio if amateur requirements were lowered to allow him to enter.

This proposal, as do others like it, speaks of the Citizen Banders as representing a "vast reservoir of technicians." It neglects simple facts such as how many Technician class licenses move up to the General Class. The only Citizen Banders really available for the amateur ranks or those who are using the Citizen Band for hobby purposes in violation of the FCC regulations. If they will not learn even the rudiments for the Novice or Technician licenses, how can it be hoped that they will use this new "license" in amateur radio to progress? The reasoning is specious.

It is all beating of a dead horse in any case. The FCC is already on record that amateur standards are too low! There is no chance they will lower them further to permit entry of members of a license class which gives them more trouble in rule violations than all other services combined!

Stewart L. Brummett, WA4WAO
Huntsville, Alabama

Editor, *CQ:*

The proposal for a Restricted Class license, advanced by Raphael Soifer, has much merit. He should, however, in his proposed scope of examination have made specific mention of one more, and quite vital, element. The examination should include a wide variety and generous number of questions on the Rules and Regulations of the FCC that relate to operating practices. Recruits from the *C*riminal *B*and, where over 90% of all operation is in direct violation of applicable FCC Rules and Regulations, should be made quite vividly aware that they are not to be expected to carry their criminal proclivities into amateur operation.

One would assume, since he tied the proposal to the Incentive Licensing docket, that he would advocate assigning a distinctive call to the Restricted Class licenses. This would discourage the popular sport of sneaking into bands reserved for other classes of licensees.

Carl C. Drumeller, W5EHC
Oklahoma City, Okla.

> "Our Readers Say" welcomes letters about nearly anything of interest to amateurs, whether about *CQ* itself, the state of the hobby, or whatever else you have on your mind. The most interesting letters will be selected for publication each month; just keep them legible, keep them short, and above all, keep them clean! Something bothering you. We're not mind readers, OM, so drop us a line.

Live and Let Live

Editor, *CQ:*

I wish *CQ* readers could take the longer view on personalities. It is disturbing to see letters criticizing people.

Let's bomb the equipment, manufacturers, prices, procedures, FCC, etc., even the weather. But let's let people, that is, personalities with the same daily problems as you and I, alone.

Let's face it—if everyone could write an article for *CQ*, there would be a scarcity of readers. Of the three big rags in the field I picked *CQ* as the one to subscribe to, and I thought it over very carefully before I plunked down the price of next Sunday's roast and sold the family on eating another tuna casserole.

CQ made no claim to be my spokesman, nor was their editorial staff on a witch hunt. Let's keep it that way.

Whether I like Sylvia, or Wayne, or the West Hartford group, or not, is my own business. I will give my opinion, if asked, but never having met any of them personally, and not knowing their attitudes, problems, fears, and hopes, I scarcely feel qualified as their psychiatrist, and doubt that any of their detractors are so qualified either.

Keep it clean. There is a forum for the experts in bombing people, edited by a member of the same snob club that I hold an equal membership in, and this mag seems dedicated, apparently, to ego puncturing. I suggest forwarding critical comment on people to this magazine, or to the nearest file "13" and it really doesn't make much difference. Just keep *CQ* in it's status as a friend, not as a challenger or a champion, of the people who make up amateur radio.

Walter T. Stevenson, Sr., KØOFO
Independence, Missouri

Encyclopedia Anyone?

Editor, *CQ:*

Last week I received in the mail a letter advising me that *CQ* could make available a "special bargain price" deal on the Encyclopedia Britannica. It's bad enough to be bothered by junk mail with all sorts of deals and special bargains, but your letter didn't even include any hint as to what the price is, how much I'd save, what the bonus offer includes, etc.

In the future, please refrain from sending me bargain offers unless you at least have the courtesy to spell out just what the bargain is.

Name withheld upon request

All told, we've received about half a dozen similar letters, so we feel that an explanation is due our subscribers. Several months ago a representative of Encyclopedia Britannica contacted our publisher and informed him of a special reduced-rate package being made to fraternal groups, charitable organizations and other similar associations. Britannica felt that radio amateurs, being technically inclined, might wish to avail themselves of such a program, and asked to use the *CQ* subscriber list to reach the ham fraternity. Since Britannica offered not only a substantial cash saving to the customer, but a lucrative bonus as well, we saw no harm in using our mailing list for this program.

Britannica prepared the letter and paid the costs of handling, postage, etc. Some technicality in Britannica's policy prevented the actual price and bonus offer from appearing in the mailing piece, but readers who return the enclosed inquiry card will be contacted by a Britannica salesman who in turn will provide all necessary information to the amateur. So far, many hundreds of hams have shown interest in the program, and it appears that many more will do so as the months go by. At any rate, this program is a straightforward, honest promotion that will save the customer a sizable sum, so if you have any interest in one of the world's finest encyclopedia, I suggest you mail that card back before it gets lost.—*K2MGA*

Scratchi

Dear Scratchi:

Delighted to know you are still around after all these years!

Hope that Hon. Editor Hon. *CQ* Magazine gets his computer and your problem fixed, but not too soon because we like your letters and want to heer from you often.

Edward F. Erickson, W2CVW
South Amboy, New Jersey

Dear Hon. Ed:

Was opening up my December issue of Hon. Rag and being most SURPRISED. Me thinking at furst that I getting old issue—then I finally reelizing that it are new, but that a welcome ol' friend are finally returning! How wonderful this are being—to hearing from Hon. Scratchi again! Thanking yew, Hon. Ed., for bringing Scratchi back to Hon. Seek-You pages. Now are ankshusly waiting for each copy of Hon. Rag.

Mike Desch, K6TNA
Lafayette, California

Editor, *CQ:*

HURRAY! SCRATCHI IS BACK!

Send him the three cents so he will keep writing (I just got December issue, January 18 at newsstand. Must subscribe).

SP4 A. H. Bates, WA2RIN/F
APO New York 09128

Sylvia

Editor, *CQ:*

As a Britisher it may be slightly wrong for me to tell you how much we all enjoy the articles written by Sylvia Margolis.

It is unusual for a female to write in the way that she does and state the particular whims and hashards, as well as the good times, that can befall any "XYL's".

Fortunately, Sylvia has the humour to write in the correct strain to convey to the Great majority of the male "Hams" what she feels and I for one must take my hat off to her.

Arthur Yates, G3LB
Ripon, England

DXing: Lesson #1

Editor, *CQ:*

There is one idiosyncrasy of some amateur operators that is completely beyond my comprehension. We who have "mastered" enough radio theory and the Morse code to have passed the license examination should at least be of average intelligence, so one would assume. But when we tune across the c.w. portions of the DX bands, we begin to wonder if there aren't a lot of morons in our ranks.

How anybody with plain ordinary common sense could call "CQ DX", time after time, (thus cluttering up the bands with useless QRM) when right under their noses are DX stations—also calling CQ, is as I have stated above, beyond my understanding. For heaven's sake, fellas, *if you can't hear 'em, you can't work 'em.* It's the mark of a real lid to operate this way.

This has been suggested so many times before that it seems old hat to repeat, but for those who still don't know how to work DX, I would like to see it repeated again here:

When you hear other U.S. hams working DX, give a listen—a good listen. If you hear them at all, you will also hear some of them calling CQ. That's the time to call (and work them). If you can't *hear* the DX the other fella is working, why not have the courtesy (and common sense) to lay off that key until you do hear the DX?

J. Harvey Chase, WA4TPF
Alexandria, Virginia

For further information, check number 7, on page 110

For further information, check number 8, on page 110

Announcements

King City, California

The West Coast Amateur Radio Service, the fast-break 40 meter daytime monitoring and service net, held its second annual meeting on Jan. 7, 1967, during the SAROC convention at Las Vegas, Nevada. Outgoing President Dave Atkins, W6VX, installed George Lyle, K7ZAU, as President; Wayne Nail, WB6CBW, Vice President; Virginia Schooley, WA6PTU, Secretary; and Ed Conroy, WB6LIS, Treasurer. The 235 members monitor 7255 kc during the daylight hours every day for the purpose of providing service to the public and other amateurs by assisting in emergencies, handling traffic, and facilitating contacts.

Racine, Wisconsin

Jim Jindrck, WA9QYC, President of the Horlick High School Ham Radio Club in Racine would like to contact anyone interested in organizing a high school club net in his area (W9, W8 and eastern WØ). His address is 801 Florence Ave., Racine, Wisconsin, 53402.

Bridgeton, Missouri

It is with sadness we note the untimely passing in December of Wyman L. Pigg, WØQFG, originator of the famous Mosley Electronics Vest Pocket beam. Wyman had been employed by Mosley for the past year under the title of Field Sales Engineer.

Propagation Course Offered

Radio Nederland, the Dutch World Broadcasting System will conduct a Propagation Course in their English language broadcast, starting on the first Thursday in April, 1967. Presently, the transmitters from which this course will be broadcast, can be heard throughout the entire USA with excellent signal strength, daily, on 9.59 mc, between the hours of 0130 and 0220 GMT. These transmitters are located on the island of Bonaire, in the Dutch Antilles, just north of Venezuela. The course will deal with many problems related to shortwave propagation, among which are: Ground and Sky wave Propagation, The various ionospheric layers, Single and multi-hop trajectories, Signal strength in relation to radio noise Fading, The sunspot Cycle, Solar Flares and storms, Absorption, VHF Propagation, Influence of distance, season and time of the day.

Printed text material and dagrams will be made available free of charge to anyone who enrolls in, and actively participates in the course. Full details of the wavelengths of broadcasts and their times, will be sent to those who enroll in the course. Enrollment is accomplished by writing to: Propagation Course, c/o Mr. H. van Gelder, RADIO NEDERLAND, English Section, P. O. Box 222, Hilversum, The Netherlands.

Columbus, Georgia

The Columbus Amateur Radio Club will hold their annual Hamfest on April 1 and 2 at the Fine Arts Bldg., located at the Fair Grounds in Columbus, Ga. Bingo for the XYLs and Harmonics. Communications will be on 3.975 and 146.940 mc. For reservations or information contact Hal De Vaughn, W4FIZ at 3804 Conrad Dr., Columbus, Ga., 31904, or turn in to any GSN member.

Brookfield, Illinois

The annual auction of the Chicago Suburban Radio Association will be held on Wednesday, April 5 at National Hall, 3907 Prairie Ave., Brookfield, Ill. No admission—all interested in amateur radio invited. For more information contact: Bob Vlk, K9PEN, 3040 Forest Ave., Brookfield, Ill.

Ham Of The Year Award

The Federation of Eastern Mass. Amateur Radio Associations will once again present a cash award and a handsome plaque to an amateur in the first call district who has met one or more of the following qualifications:

1. Performed a meritorious public service to his community through the medium of amateur radio,
2. Made a major contribution to the science of amateur radio,

3. Helped greatly to stimulate interest in amateur radio in other persons.

4. Aided other radio amateurs to acquire a greater knowledge and skill in operating or building amateur radio equipment.

This award will be given at the Regional ARRL Convention on April 22, 1967 at the New Ocean House, Swampscott, Mass.

Please send all nominations to Eli Nannis, W1HKG, Chairman, Awards Committee, 37 Lowell St., Malden, Mass. All nominations should be as complete as possible. The closing date for these nominations is April 7, 1967.

Baltimore, Maryland

The B&O/C&O RRS Amateur Radio Club will have their 8th Annual Banquet at Gannon's Restaurant, 3141 Frederick Ave., Baltimore, Md. on April 29, 1967. Registration 4:30 P.M. and dinner at 6 P.M. Tickets are $4.00 each and may be purchased from William T. Heller, W3BVL, or Joseph W. Zorzie, W3LBC, 7388 B&O Central Bldg., Baltimore, Md., 21201.

Birmingham, Alabama

The Birmingham Amateur Radio Club is again sponsoring their annual Birminghamfest on April 29 and 30. For complete details, write the Birmingham Amateur Radio Club, Box 603, Birmingham, Alabama.

Corrections

In the article "The Ultimate SSB Exciter," *CQ*, Feb., 1967, p. 24, the dropping resistor for the v.r. tubes in fig. 5 should be 15K not 5K as shown.

Lafayette, Indiana

The Mid-West YL Convention will be in Lafayette, Indiana, at the Holiday Inn on May 19, 20 and 21. It is sponsored by the H.A.W.K.s. A special pre-registration fee of $2.00 is open until April 15. There will be a free gift to all those who do pre-register. Camping facilities are available within walking distance. Address all inquiries or fees to either Mary Alice Koctuh, K9BWJ, 3116 Backmeyer Road, Richmond, Indiana, 47374, or Evelyn Tibbits, W8DQA, 3415 Riggs Road, Oxford, Ohio.

LICENSE EXPIRATION NOTICE SERVICE

Available To Anyone Anyplace In The World.

1. Address a postal card (no other form accepted) to yourself.
2. Write anything you wish to tell yourself on the card.
3. At the top of the correspondence side (when placed horizontally) write a date (month and year only) when you want the card mailed.
4. When this month arrives, the card will be mailed.

The Foundation for Amateur Radio, sponsor of the service, accepts no responsibility, if, for any reason, the card is not mailed. The Foundation does agree, however, to maintain this service as long as volunteers are available. Mail your card today to:

Joan Machinchick, K3KBI
Lake Drive, Cape St. Clair
R.F.D., Annapolis, Md. 21401

For further information, check number 9, on page 110

Feenix, Ariz.

Deer Hon. Ed:

Boy oh boys are Scratchi having 1/c mess on his hands, so pleese, Hon. Ed., getting feets off desk, sitting up strate, paying atenshun, and helping me somehow. I sending this letter airmale speshul delivery on acct. I maybe in reel big trubble. On other hand, may be big hero. Needing your help to finding out.

Are you knowing who I can calling to find out if SAC or NASA are noticing anything funny happening? Or you knowing anybuddy with 100 inch telescope I can borrowing? Or maybe you can calling AP or UP wire services to seeing if they heering about it?

Hackensake! I in such big dither I not making sense. But, if this happening to you, Hon. Ed., I'll bet you are all ates and nines also. Letting me starting at beginning and telling you hole story.

Resently I desiding that I wanting to having rig that will pound in at S-9 plussedy-plus all over world. To doing this, natchyourally, I needing reel deluxe antenna. Not just ordinary kind deluxe antenna that most hams having, but something like no other amchoor are having.

So, I doing lots and lots of thinking on subject, and finely coming to conclusion that I needing reel high rotary beem. As first step I doing lots of looking round, and are lucky as finding old 80 foot high oil-well drilling tower. Are making deel for it and arranging for it to be moved and put up again on south forty acres of Hon. Brother Itchi's ranch here.

Are also at same time buying 160 feets of sturdy drilling pipe, and making plans to mounting it thru bearing at top of tower, so when extending it up thru bearing, I having nice antenna mount 240 feets up in the air. Next are spending lotsa bux on eleventeen element beem antenna.

At this point having one tiny problem. Tower not neer Hon. Shack, but cupple miles from it. Not wanting to run long transmishun line, so instead desiding to trying out sooper beem on sooper tower with small transmitter I mounting on top of tower.

I bilding nice little solid-state 5 watt see-w rig and mounting it on beem. Also, on acct. not having any a-c at tower, I fixing up rechargeable battery and some solar cells to charging battery, and putting them with 5-watt rig on beem.

Also bilding little reseever to putting with transmitter so can turning it on and keying it by remote control. That way, I can be cupple miles away in shack yet be able to use rig on top of tower.

Coming big day, well-digger peeples are coming out and taking 160 feets of pipe, with beem and rig on top of it, and they putting it on 80 foots high tower. They also installing a mechanical rotator at top of 80 foots tower, and hanging ropes down to ground, so when I wanting to rotate beem, I can pull on ropes and beem 240 feets up there in air are rotating to desired direckshun.

When everything are in place, I driving back to Hon. Shack and going on air. Hon. Ed., you not buleeving how it working. For next cupple days, I getting sooper reports from all over world. Are finding it a little trubble to changing direckshun of beem, as having to drive out to tower in jeep each time wanting new direckshun.

Howsumever, I making plans to bringing in a-c line, bilding shack at base of tower, buying nice Arizona kilwatt rig and feeding beem with that. Boy oh boys, won't that putting out signal!! Before I can doing that, though, something happening. Hackensake! something are reely happening.

One afternoon I driving out to changing direckshun of beem to working some Europe dee-x. When trying to pull on ropes to turn beem, ropes seem to be stuck and not pulling. I yanking hard like sixty, and still nothing happen. So, tying rope to jeep, and then slowly driving away. At this point, Hon. Ed., everything becoming chaos.

I heering funny noise, and looking at top of tower, I seeing that the 160 feets long pipe not turning, but are slipping down thru bearing on top of tower. Making screeching noise like crazy, hole length of pipe keep coming down and down and down. It going at reel good clip when it hitting ground, and it keep right on going down, down, right into ground.

When it maybe fifty or sixty feet in ground are heering new noise, sounding like escaping steem from locomotive. All of sudden, pipe stop going in ground, and (you not buleeving this, Hon. Ed) then it slowly start coming back up, out of ground!

Then steem-like noise getting louder, and pipe start moving faster and faster and faster, then there are big flash of fire and pipe comes shooting up out of ground like rocket, fire streeming from end of it, and it going up and up and shooting right out of end of tower, and goodness to gracious, it keep right on going up and up until it disappearing from sight!

Although are in slite state of shock from such a happening, I figyouring what happening are this. Pipe are going so far in ground it hitting pocket of gas, which igniting when pipe making spark on rock, then gas going up inside pipe, and pipe taking off like rocket.

[*Continued on page 102*]

This Heathkit® SB-101 Can Outperform Any Other SSB Transceiver On The Market

And Here Are The "Specs" To Prove It!

SB-101 SPECIFICATIONS — RECEIVER SECTION: Sensitivity: Less than 1 microvolt for 15 db signal-plus-noise to noise ratio for SSB operation. **SSB selectivity:** 2.1 kHz minimum at 6 db down, 5 kHz maximum at 60 db down — 2:1 nominal shape factor — 6:60 db. **CW selectivity:** (with optional CW filter SBA-301-2 installed) 400 Hz minimum at 6 db down, 2.0 kHz maximum at 60 db down. **Input impedance:** Low impedance for unbalanced coaxial input. **Output impedance:** Unbalanced 8 and 600 ohm speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 db. Internal spurious signals below equivalent antenna input of 1 microvolt. **TRANSMITTER SECTION: DC power input: SSB:** 180 watts P.E.P. continuous voice. **CW:** 170 watts — 50% duty cycle. **RF power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 ohm nonreactive load). **Output impedance:** 50 ohms to 75 ohms with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 db below rated output. **Harmonic radiation:** 45 db below rated output. **Transmit-receive operation: SSB:** Push-to-talk or VOX. **CW:** Provided by operating VOX from a keyed tone, using grid-block keying. **CW side-tone:** Internally switched to speaker in CW mode. Approx. 1000 Hz tone. **Microphone input impedance:** High impedance. **Carrier suppression:** 50 db down from single-tone output. **Unwanted sideband suppression:** 55 db down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 db down from two-tone output. **Noise level:** At least 40 db below single-tone carrier. **RF compression (TALC):** 10 db or greater at .1 ma final grid current. **GENERAL: Frequency coverage:** 3.5 to 4.0; 7.0 to 7.5; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 Hz per hour after 20 minutes warm-up from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial accuracy — "resettability":** Within 200 Hz on all bands. **Electrical dial accuracy:** Within 400 Hz after calibration at nearest 100 kHz point. **Dial mechanism backlash:** Less than 50 Hz. **Calibration:** 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz ±3 db. **Phone patch impedance:** 8 ohm or 600 ohm receiver output to phone patch; high impedance phone patch input to transmitter. **Front panel controls:** Main (LMO) tuning dial; Driver tuning and Preselector; Final tuning; Final loading; Mic and CW Level Control; Mode switch; Band switch; Function switch; Freq. Control switch; Meter switch; RF gain control; SSB-CW filter switch; Audio Gain control. **Internal controls:** VOX Sensitivity; VOX Delay; Anti-VOX; Carrier Null (control and capacitor); Meter Zero control; CW Side-Tone Gain control; Relative Power Meter Adjust control; P.A. — Bias; Phone Vol (headphone volume); Neutralizing. **Rear Apron connections:** CW Key jack; 8 ohm output; SPARE A; SPARE B; Phone patch input; ALC input; Power and accessory plug; RF output; Antenna switch; Receiver Antenna. **Power requirements:** 700 to 800 volts at 250 ma; 300 volts at 150 ma; —110 volts at 10 ma; 12 volts at 4.76 amps. **Cabinet dimensions:** 14⅞" W x 6⅝" H x 13⅜" D.

The New SB-101 80-10 Meter SSB Transceiver Improves On the SB-100 . . . Now With Two New Unique Features It Moves Far Ahead Of The Field — To Surpass Every Other Make Of SSB Transceiver . . . Regardless Of Price!

CW FILTER PROVISIONS The new SB-101 features a front-panel switch for selection of the standard USB/LSB 2.1 kHz SSB filter or the optional SBA-301-2 400 Hz CW filter — the only SSB transceiver on the market with full CW provisions.

VERSATILE EXTERNAL LMO PROVISION When employed with the coming SB-640 external LMO, a front panel switch on the SB-101 permits transceive frequency control using *either* the SB-101 LMO or the external LMO in addition to independent operation with the SB-101 LMO controlling the receiver and the external LMO the transmitter. This unique versatile feature is like having a second receiver for DX work. In addition, the SB-640 will have provision for crystal control of two favorite operating frequencies. The SB-640 external LMO will be available in May at a price to be announced.

Order The SB-101 For The Best Value In SSB Transceivers . . . Regardless! The SB-101 features the famous Heath pre-built LMO (Linear Master Oscillator) for superior tuning characteristics, USB/LSB selection, TALC, built-in VOX and calibrator, low cost power supplies, plus all the other proven features and performance already established by the SB-100. Minor layout changes also make the SB-101 easier to assemble.

See next page for a discussion on value from Al Robertson, Heath Company Communications Product Manager. Then, if you need further convincing, order the assembly manual (only $2.00), and make a detailed comparison.

Kit SB-101, 23 lbs., $36 dn. $31 mo. **$360.00**
SBA-301-2 Optional 400 Hz CW crystal filter, 1 lb. **$20.95**
Kit HP-13, DC Power Supply, 7 lbs., no money dn., $6 mo. **$64.95**
Kit HP-23, AC Power Supply, 19 lbs., no money dn., $5 mo. **$49.95**
Kit SBA-100-1, Mobile Mounting Bracket, 6 lbs. **$14.95**
Kit SB-600, Speaker, 5 lbs. **$17.95**

A Message On Value!

Why is the SB-101, at $360.00 in kit form, a better value than factory assembled five-band transceivers in the same price range? This question is frequently asked and now has become a key point in other manufacturers' transceiver promotions. Therefore, it is appropriate at this time that we further detail the two basic reasons why the SB-101 is your best buy.

First, when considering the purchase of an SSB transceiver, price is significant only when comparing "apples with apples". Does the assembled product have upper and lower sideband selection, built-in VOX circuitry, and truly linear tuning with 1 kHz calibration? Does it have a built-in crystal calibrator? Does the assembled product employ a single, stable, low frequency VFO and a crystal controlled front end? Is there provision for a CW filter to be installed and is VOX operated break-in CW operation offered? Has provision been made for an external VFO featuring transceive frequency control from either the internal or external VFO in addition to independent control of receiver and transmitter (a DXer's dream!)? Does the manufacturer of the assembled transceiver publish guaranteed specifications as complete as those for the SB-101 on these pages? Finally, what are the prices of the fixed and mobile power supplies? One manufacturer does not even offer a mobile supply; if you found this out too late, we have one for you. Considering the foregoing, it is obvious that you cannot make a decision regarding the purchase of a new SSB transceiver on the basis of "advertised" price alone.

The second, and more subtle, reason why the SB-101 is today's best SSB transceiver value is "pride of authorship". There is a sense of accomplishment in assembling a fine piece of communications equipment like the SB-101. The feeling is difficult to describe but appeals to and has been experienced by most every amateur radio operator. The familiarity you develop with the SB-101 during assembly will ease the sense of frustration the other fellow has when his assembled "appliance" breaks down. Kit building is not "homebrewing" but it's the next best thing in this age of sophisticated electronic equipment.

With the introduction of the Heath SB-100 Transceiver in December of 1965, there was only one other SSB transceiver available at that time which could be considered comparable and its price was more than three times that of an SB-100. Now, with the addition of two unique features in the new SB-101, at no additional cost, there is no comparable transceiver at any price. We invite you to join the thousands of amateur radio operators who have found this kind of value and industry leadership to be typical of Heath Company.

Al Robertson

Al Robertson, K8BLL
Product Manager, Communications

P.S. Despite our appreciation of the advantages of kit-building, we are also aware that some amateur radio operators have vocations which do not leave them time to assemble an SB-101. Those of you with this problem who like what they see in this new transceiver will be pleased to learn that limited production of assembled SB-101 Transceivers (as well as SB-200 Linear Amplifiers, HP-23 AC Power Supplies, HP-13 DC Power Supplies, and SB-600 Speakers) will be available later this year. Watch our flyers and ads for availability and prices.

FREE CATALOG

Describes these and over 250 other Heathkits. Save up to 50% by building them yourself. Use coupon and send for your FREE copy!

HEATHKIT

HEATH COMPANY, Dept. 12-3
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-177

For further information, check number 13, on page 110

All-Band Coverage from the Ham-Band-Only Receiver:

The OMNIVERTER

BY WILFRED M. SCHERER,* W2AEF

Part II — Construction

LAST month we presented the Omniverter, a 14 kc-21.5 mc general-coverage converter for use with a ham-band-only receiver. It's construction will now be described with as many mechanical and wiring details as deemed necessary to make the work easier for the builder. Since some components may be hard to locate, a source for such is also given. If you like this type presentation, please let us know.

Omniverter Construction

The Omniverter is built on a standard aluminum chassis size 8″ × 10″ × 2½″. Dimensions for the location and the size of holes to be drilled are given at fig. 2. Where the measured location for a hole is not given, it will later be located using the associated component as a template.

Panel details are shown at fig. 3. When the panel is completed, clamp it to the front of the chassis with the bottom edge of the panel and the chassis aligned together and with the chassis centered as indicated by the dashed lines. Holes 1, 2, 3 should fall closely in line with those on the chassis. Then drill the front of the chassis through the four *C* holes using the panel as a guide template for exact alignment of all four holes in both the panel and the chassis.

Next, make all the brackets and the synthesizer panel as indicated at figs. 4, 5.

Assemble the r.f. range switch[1] with brackets "A" and "B" as shown at fig. 4. The exact spacing between the switch wafers is not critical; however, dimensions *X* and *Y* should be followed as nearly as possible. Orient the switch wafers as shown at fig. 9

Mount the assembly in the chassis as shown in the photo, temporarily fastening it at hole 1 on the front of the chassis using a nut threaded on the index bushing on *each* side of the mounting hole. Adjust the two nuts so that bracket "A" is positioned midway between the holes for L_4 and L_{11}. The C holes with a notch near the bottom of the brackets are for spade lugs that will secure the brackets to the chassis. Opposite each one of these holes and under the edge of the brackets mark a point on the chassis. Place bracket "C" in position as shown at fig. 4. Mark its flange from through the C hole at the front of the chassis and mark the chassis for holes required for spade lugs to be attached on the bracket at the holes by the notches.

Remove the switch assembly and bracket "C." On the flange of bracket "C" drill a #36 hole at the point marked. Drill #26 holes at the points just marked on the chassis. NOTE: when spade lugs are to be fastened to the brackets, make sure they are placed so that the bottom edge of the brackets will rest tightly against the chassis. Set the assembly and bracket aside.

Assemble the i.f. output switch[2] as shown at fig. 4. Orient the wafers as shown at fig. 9. Mount this assembly in the chassis as shown in the photo, temporarily fastening it at hole 3 on the front of the chassis with a nut threaded on the index bushing at *each* side of the mounting hole. Using the brackets as templates, mark the location of their mounting holes on the chassis.

Remove the assembly. Drill #36 holes in the chassis at the points just marked. Temporarily install the assembly and temporarily fasten bracket "E" to the chassis with #6 self-tapping screws (this size will be used throughout). Now, place bracket "F" in the chassis as shown at fig. 4 At the corresponding holes at the rear of the chassis (fig. 2) mark the flange on bracket "F." Remove the bracket and the assembly. Drill #36 holes at the points marked on the bracket. Set the bracket and assembly aside.

Temporarily mount the calibrator[3, 4] at the left rear corner of the chassis as shown at fig. 2. Use self-tapping screws. From underneath the chassis mark a point for the #26 and the ¼″ hole at the bottom of the calibrator case through the corresponding holes in the chassis. Remove the calibrator and drill a 5/16″ hole at the points marked on the calibrator. Set the calibrator aside.

On the synthesizer switch[5] substitute the synthesizer panel for the third wafer from the front of the switch. In doing so, install the panel so that the terminals which go to the switch wipers (term. 2) on each wafer are oriented as shown at fig. 10. There will now be 2 switch wafers at the front of this panel and one at the rear.

Install bracket "H" on the synthesizer switch using a nut on the bushing of the index placed

*Technical Director, *CQ*.

at the rear of the bracket and a nut and lockwasher at the front side. In doing so, align the foot of the bracket with that of the synthesizer panel.

Place the assembly on the chassis and temporarily fasten the bracket with self-tapping screws at the indicated location at fig. 2. Make certain that the switch shaft is at a right angle to the front edge of the chassis (looking from the top) and that the center of the shaft is 2¼" from the center-line of the chassis. If necessary, the bracket mounting holes may be slightly enlarged to enable proper positioning.

Using the synthesizer panel ("I") as a template, mark its mounting holes on the chassis. Remove the assembly and drill #36 holes at the points just marked.

Mount the tuning capacitor[6] on ¼" metal spacers[7] as indicated at fig. 2. When doing so, install two solder lugs under the chassis at the rear screw and one lug at the other screws. Mount a Jackson planetary drive[8] on the rear side of bracket "J" with the shaft through the bracket hole. Insert a 1¾" length of ¼" diameter rod at the rear of the drive unit. On the other end of the rod install a flexible coupling.[9]

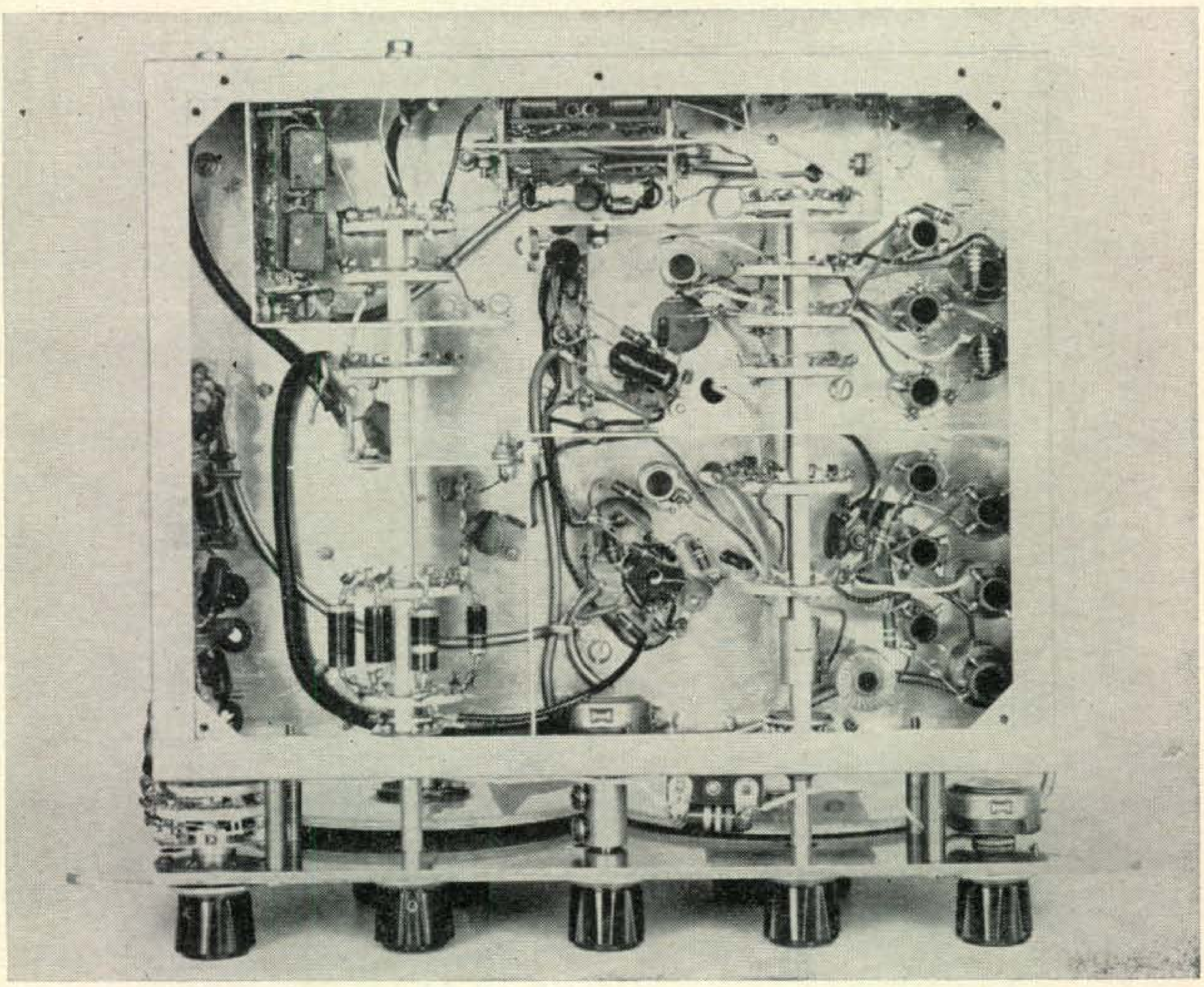
Slide the other end of the coupling on the capacitor shaft (do not tighten any set screws yet) and fasten the bracket to the chassis with self-tapping screws at the indicated location, fig. 2. Be sure the drive unit, coupling and capacitor shafts are properly aligned when the bracket is secured. This also requires that the center of the drive shaft is 2¼" from the center-line of the chassis and that the shafts are at a right angle to the front of the chassis. If necessary, enlarge the bracket mounting holes or those of the capacitor for proper positioning.

Temporarily mount the panel on the chassis using 1½" 6-32 screws (and nuts) passed through 1" × ¼" metal sleeves[10] between the panel and the chassis.

The cabinet is one made for the Heathkit HW-12 transceiver,[11] but it must be increased in height. This requires cutting it in two halves around the center of each side and the rear.

After accordingly scribing a guide line around the case, do as much of the cutting as possible with a hacksaw held in its frame. The remainder of the job will require removal of the saw blade from the frame and operating the blade alone by hand. Friction tape, wrapped around one end of the blade, will serve as a handle to make operation easier without wear and tear on fingers. If the cut turns out a bit wavy, don't worry, as the edges eventually will be covered out of sight.

The dials are made from ⅛" thick plexiglass as shown at fig. 11. The edges will not be seen when the dial is installed, so you can roughly



Under-chassis view of the Omniverter. The 21.5 mc l.p. filter (FL_5) is on the left inside. Next is the i.f. output switch. The i.f. inductors are mounted between the two front sections of the switch. The second section (from the front) of this switch is S_{1D} which is used only as a tie-point for the B+ ends of the i.f. coils, and is thus not shown on the schematic. FL_1 is on the bracket at the rear left of the switch. FL_3 and FL_4 are on the bracket at rear center. The r.f. range switch and r.f. inductors are at the right. The panel is mounted to the chassis on 1" spacers.

Fig. 1 (Facing page)—Circuit of the Omniverter. Unless otherwise noted, resistors are ½ watt, capacitors are in mmf, and inductors in µh. Capacitors are disc ceramic, except as noted below. Before assembling filters, use g.d.o. to check resonance with components connected in parallel as indicated. Keep leads short. For C_{36-40} use 1.5-20 mmf trimmers at 19-21 mc range (see fig. 10); 8-60 mmf at other positions (C_{41-54}); at 12-14 mc shunt trimmers with 39 mmf dipped mica capacitors.

C_1—3-gang, 12-367 mmf per section.[6]
C_5—0.1 mf, 200 v. Mylar paper.
C_8, C_{15}, C_{21}, C_{22}, C_{24}, C_{25}, C_{30}—tubular ceramic.
C_{12}—dipped mica.
C_{18}—10 mf, 450 v. elect., Sprague Atom.
C_{19}, C_{20}—10-10 mf, 450 v. elect., Sprague Atom.
C_{33}, C_{34}—Dipped mica or tubular ceramic.
C_{101}-C_{120}—Small dipped mica or tub. cer., 5%.
RFC_1—1.2 mh—Millen J300-1200, Miller 70F123AI.
S_1—5 sections, 5 poles, using 9 positions.[1, 2]
S_2—6 sections, 6 poles, using 8 positions.[1, 2]
S_3—3 sections, 3 poles, using 20 positions.[5]
S_4—2 sections, 4 poles 4 positions.[18]
T_1—Power trans. 125 v.a.c. @ 50 ma, 6.3 v.a.c. ½ 2 a. Allied Radio #54A1411, $3.53.
L_1—150-500 kc, Miller X-5495-A.
L_2—0.5-1.6 mc, Miller A-5495-A.
L_3—1.6-5.5 mc, Miller B-5495-A.
L_4—5-17 mc, Miller, C-5495-A.
L_5—17-36 mc, Miller D-5495-A.
L_6—36-52 mc, 6 t. #22 e. space wound on ⅜" dia. ceramic slug-tuned form (Miller 4400W) with 2-turn link (hookup wire) at bottom end.
L_7—15-50 kc, Miller 9008.
L_8—50-150 kc, Miller 22A222RBI.
L_9—150-500 kc, Miller X-5495-RF.
L_{10}—0.5-1.6 mc, Miller A-5495-RF.
L_{11}—1.6-5.5 mc, Miller B-5495-RF.
L_{12}—5-17 mc, Miller C-5495-RF.
L_{13}—17-36 mc, Miller D-5495-RF.
L_{14}—36-52 mc, 6t. #22 e. spacewound on ⅜" dia. ceramic slug-tuned form (Miller 4400W).
L_{15}—3.5 mc, 56 µh, Miller 72F565AP or equiv.
L_{16}—7 mc, 18 µh, Miller 72F185AP or 70t. #34 enam. on 47K 2-watt resistor.
L_{17}—14 mc, 40t. #28 e. on 47K 2-watt resistor.
L_{18}—21 mc, 22t. #28 e. on 47K 2-watt resistor.
L_{19}—29 mc, 20t. #28 e. on 47K 1-watt resistor.
L_{20}-L_{23}—15-30t. #28 e. on 1-watt 100K resistor. See text.
L_{24}-L_{28}—10-20t. #28 e. on 1-watt 100K resistor. See text.
L_{29}—37t. #30 e. on 1-watt 100K resistor. See text.
L_{30}, L_{40}—16t. #28 e. on ¼" dia. slug-tuned form (Miller 4500).

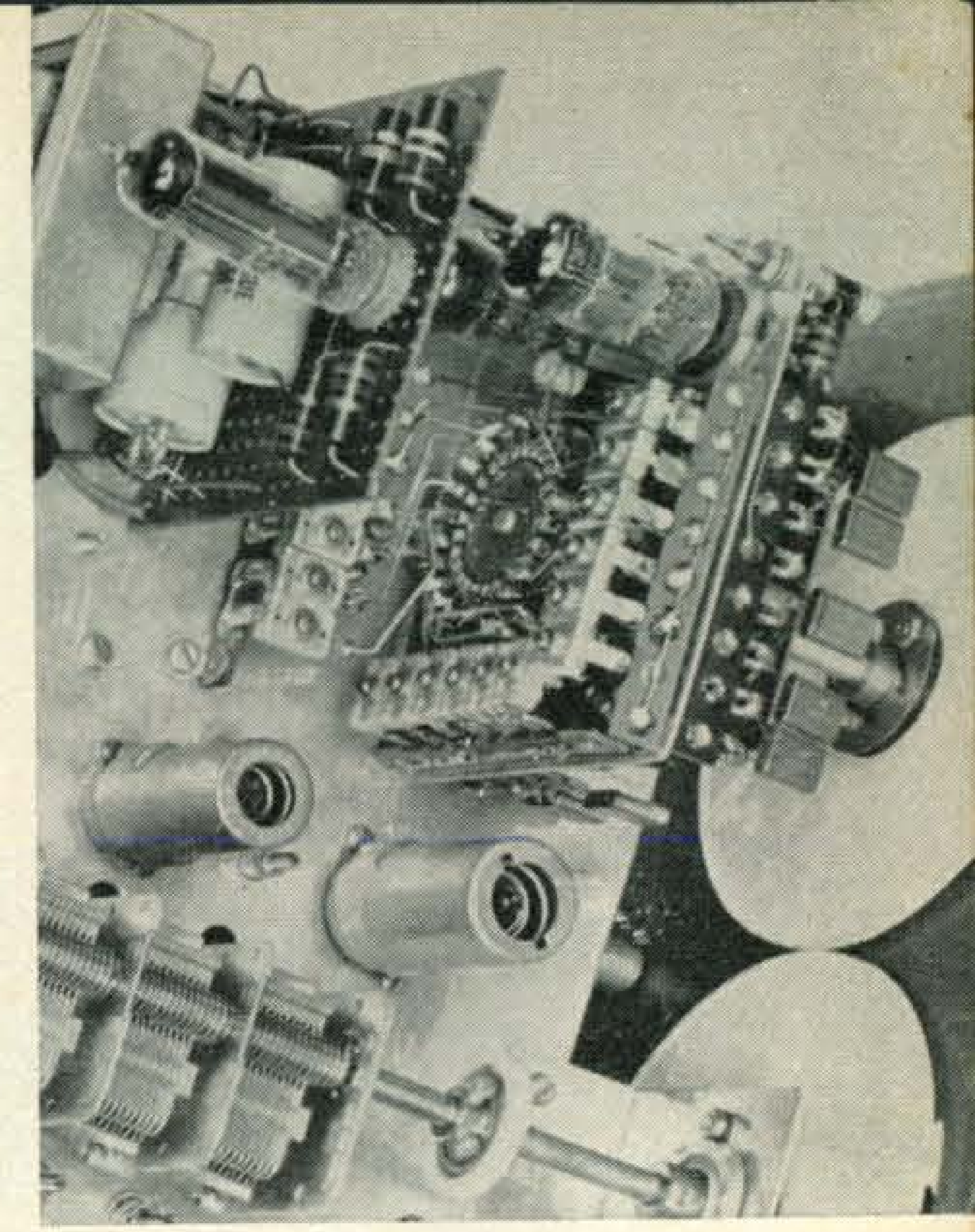
FILTER FL_1:
L_{101}, L_{103}—16t. #22 e. ¼" i.d. air-wound.
L_{102}—7t. #22 e. ¼" i.d. air-wound.
Resonate: $C_{101}/C_{102}/L_{102}$ at 22.5 mc; C_{103}/L_{101} at 14 mc; C_{104}/L_{103} at 14 mc; completed filter at 17.5 mc (g.d.o. at L_{102}).

FILTER FL_2:
L_{104}, L_{105}—Millen J302-3300, Miller 70F333AI.
L_{106}—Millen J300-2500, Miller 70F253AI.
L_{107}, L_{109}—Millen J300-2200, Miller 70F223AI.
L_{108}—Two 2.2 mh in parallel, Millen J300-2200, Miller 70F223AI.

FILTER $FL3$:
L_{110}, L_{111}, L_{112}, L_{113}—14t. #22 e. ¼" i.d. air-wound.
Resonate: C_{109}/L_{112} at 21 mc; C_{111}/L_{113} at 21 mc; C_{110}/L_{110} at 10.5 mc; completed filter at 17.5 mc (g.d.o. at L_{110} or L_{111}).

FILTER FL_4:
L_{114}, L_{116}—11t. #22 e. ¼" i.d., air-wound.
L_{115}—4t. #22 e. ¼" i.d. air-wound.
Resonate: C_{114}/L_{114} at 29 mc; C_{115}/L_{116} at 29 mc; $C_{112}/C_{113}/L_{115}$ at 46 mc; completed filter at 36 mc (g.d.o. at L_{115}).

FILTER FL_5:
L_{117}, L_{120}—28t. #30 e. on 100K 2-watt resistor.
L_{118}—66t. #30 e. on 100K 2-watt resistor.
L_{119}—45t. #30 e. on 100K 2-watt resistor.
Resonate: C_{116}/L_{117} at 26.5 mc; C_{121}/L_{120} at 26.5 mc; C_{118}/L_{119} at 28.5 mc; C_{117} and C_{119} in series across L_{118} at 10.75 mc; completed filter at 21.5 mc (g.d.o. at L_{118}).



Rear view of the crystal frequency synthesizer on the Omniverter showing how the heterodyning-frequency trimmers are mounted on terminal strips around the selector switch. The circuit board with the power supply is in the foreground. A piece of cardboard should be taped to the rear of the board to prevent accidental bodily contact with the wiring when the trimmers are being adjusted.

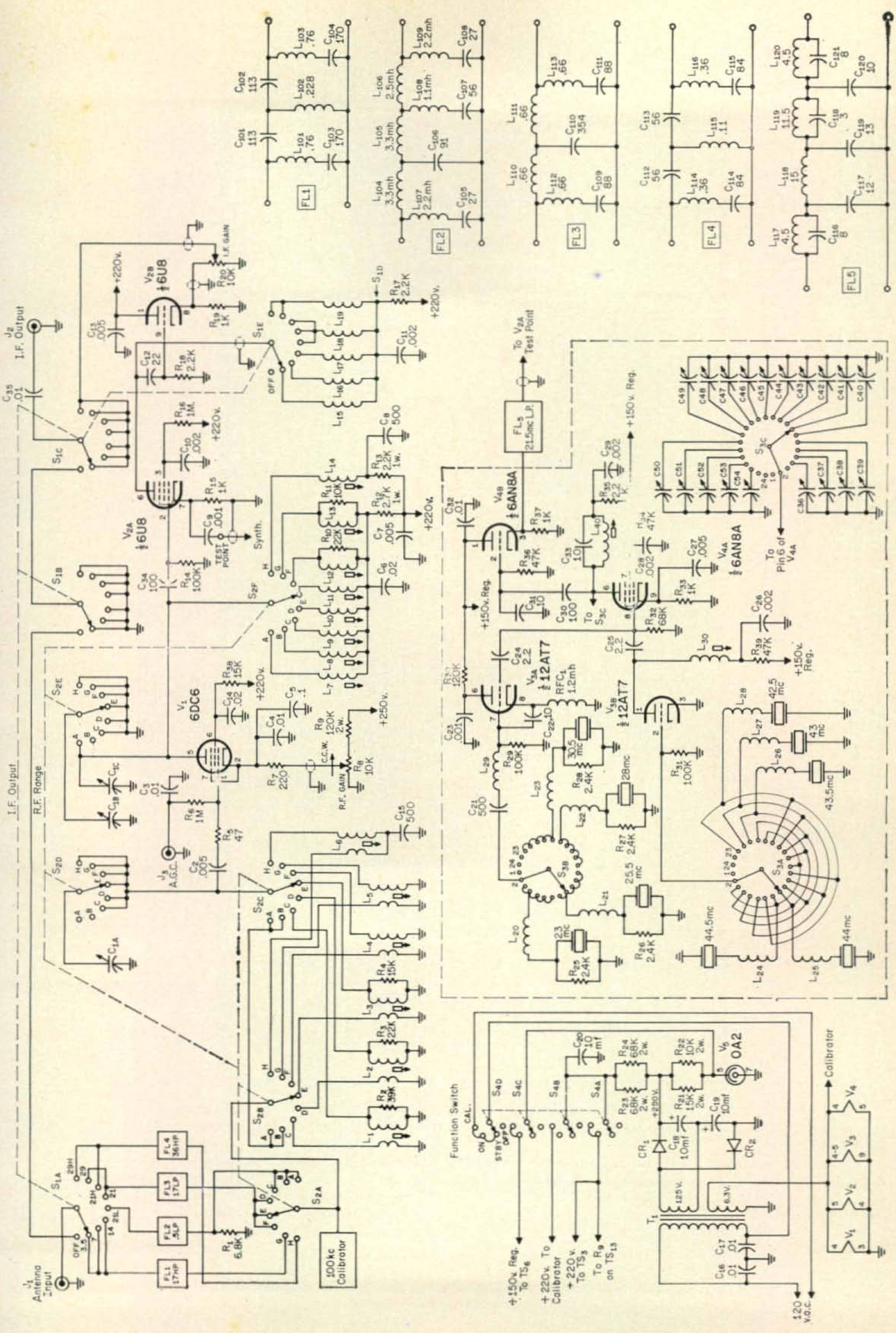
cut them out with a coping saw or other means, and then trim them up with a file. The preselector dial mounts directly on the capacitor-drive unit. The synthesizer dial may be fastened to the switch shaft by means of a "spider" obtained from a flexible coupling.[12]

Filter Construction

Assemble the 0.5 kc low-pass filter (FL_2) as described at fig. 7. This may be done on a circuit board.[13, 14] Mount the completed filter on ¼" spacers in the rear of the chassis as indicated at fig. 2. Position it with the grounded side toward the chassis deck.

Wind the inductors for the 21.5 mc low-pass synthesizer filter (FL_5) as indicated at fig. 1. The capacitors should be mica (dipped) or tubular ceramics with a tolerance of 5% or better. Disc ceramics may be used if a bridge is available for selecting those that measure within tolerance. Where standard value capacitors do not come close enough to the target sizes, two units of lower value which add up to the desired amount may be connected in parallel.

Before assembling the filter (or the following



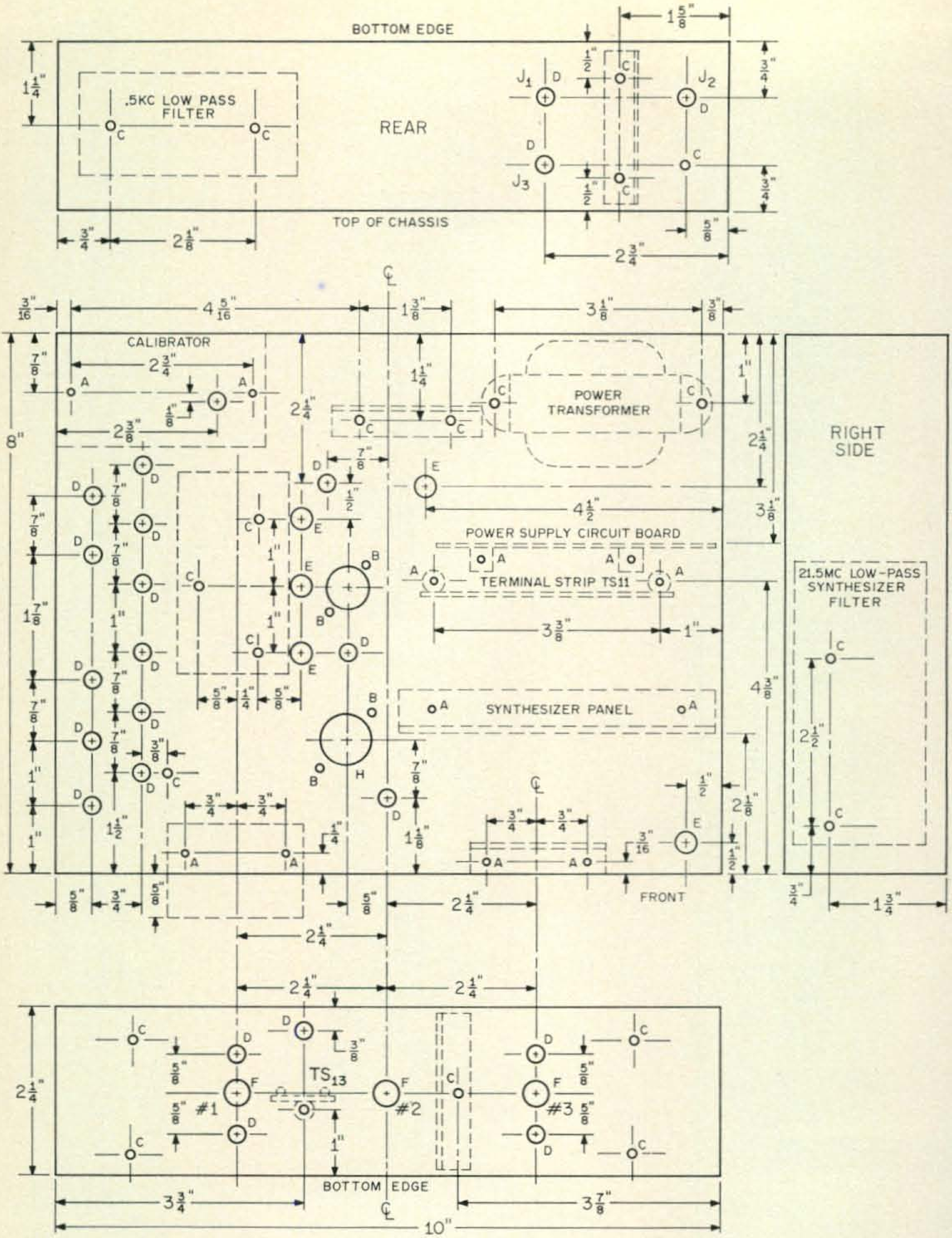
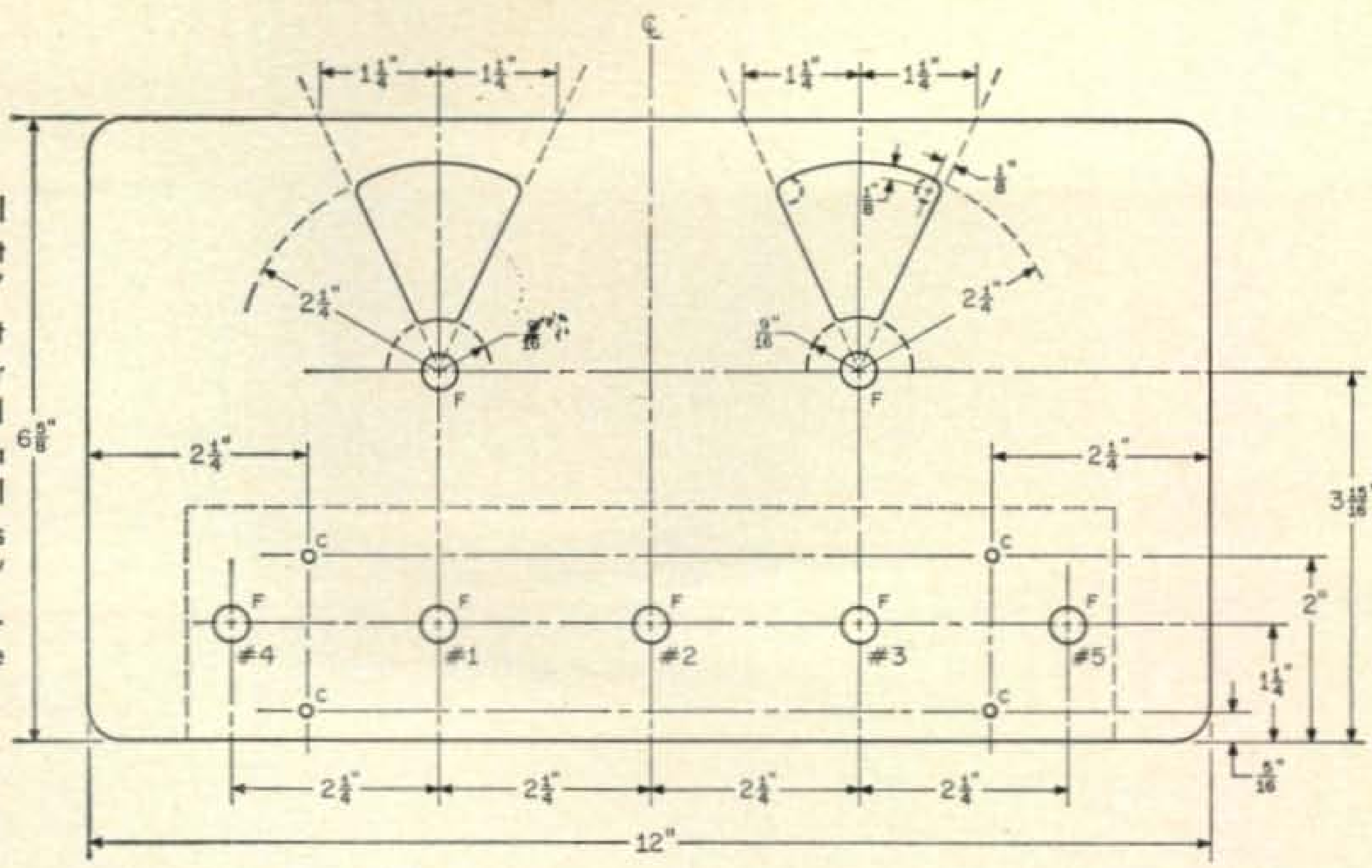


Fig. 2—Chassis layout and dimensions. Where locating dimensions are not given, hole will be located later using component for a template. The D holes on the chassis rear are for phono Jacks (J_1—antenna input, J_2—i.f. output, J_3—a.g.c.). The fourth hole is for a 6-32 screw used as a ground terminal. Drill sizes for holes are: A—#36, B—#30, C—#26, D—¼", E—5/16", F—⅜", G—⅝" (punch), H—¾" (punch), I—3/16".

Fig. 3—Details for panel made of ⅛" aluminum. At dial-window cutouts drill ¼" holes at each corner; then cut sides using a coping saw or a series of closely spaced holes. Smooth edges with a file. Center chassis with panel as indicated by dashed lines to accurately locate the "C" holes on front of the chassis. The "F" holes at #4-5 are drilled on the panel only.



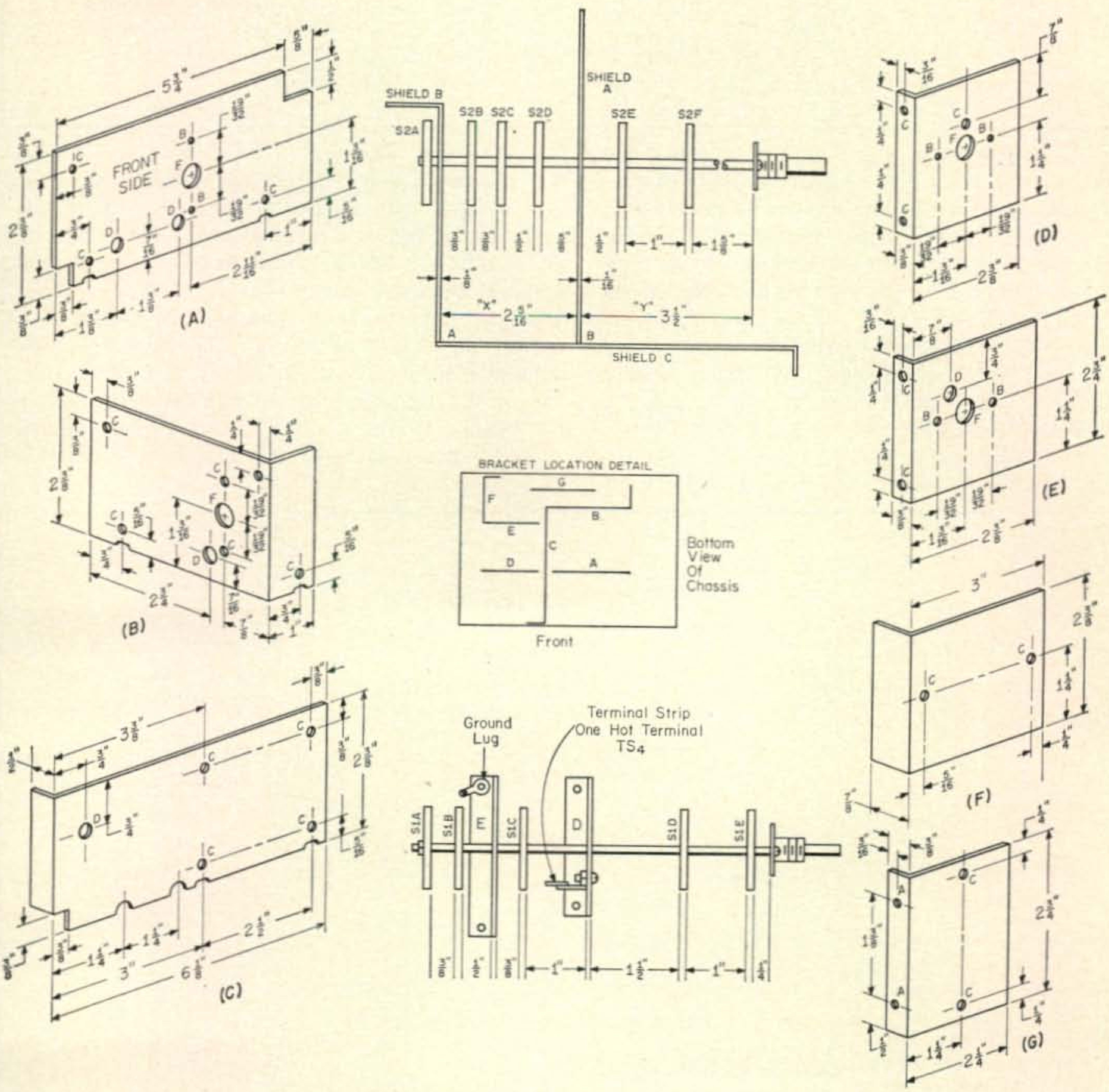


Fig. 4—Dimensions for brackets used below the chassis. The r.f. range switch is mounted on brackets A and B as shown at top center where the spacings are not critical, except at dimensions "X" and "Y" which should be maintained as nearly as possible. The notches at the bottom of brackets may be filed to clear spade lugs and leads. TS_4 (on D) should read TS_5. Filters mount on F and G. When shield C is permanently installed, mount pairs of solder lugs at corners A and B (as shown at top center). Solder lugs together to ensure good electrical contact between brackets.

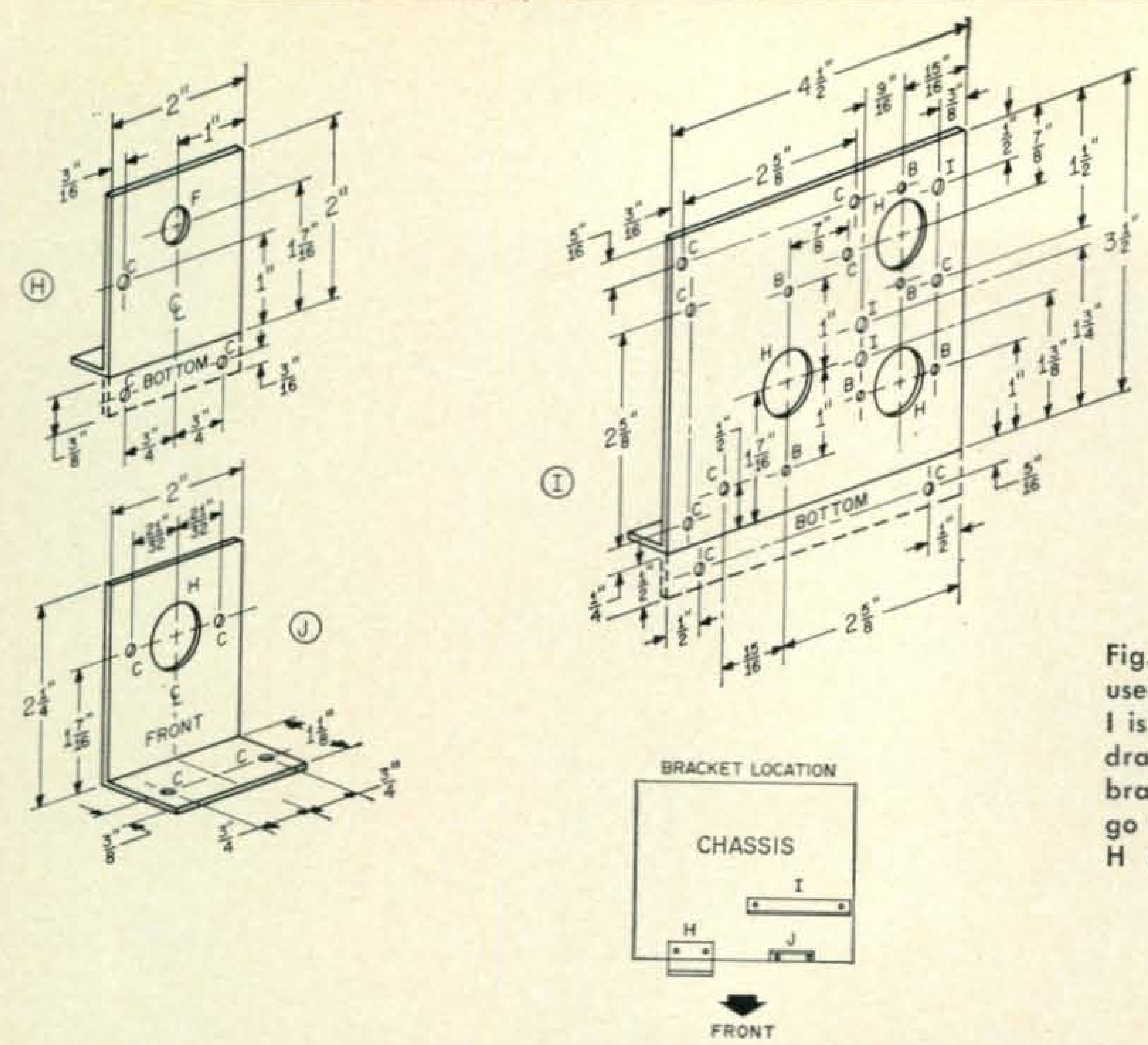


Fig. 5—Dimensions for brackets used above the chassis. Bracket I is the synthesizer panel. At the drawing for the bracket locations, bracket J (for dial drive) should go where H is indicated, bracket H (for synthesizer switch) goes where J is indicated.

ones), if possible use a grid dipper to check the resonant frequency of the various sections as indicated. Keep leads as short as possible when this is done. Where correct resonance does not occur, use a slightly different value capacitor or alter the inductor by moving turns apart or by adding turns.

Assemble the filter on a circuit board as shown at fig. 7. When completed, the filter should resonate at 21.5 mc (g.d.o. coupled to L*X*). During this measurement, check the exact frequency of the g.d.o. as heard on a receiver. Mount the filter on ¼" spacers on the side of the chassis as indicated at fig. 2. Position it with the grounded side nearest the chassis deck.

Wind the inductors for FL_1, FL_3 and FL_4 as indicated at fig. 1. Before assembling the filters, check the resonant frequencies as described above. Assemble each filter on a 1¾" W. × 1⅜" H. circuit board as indicated. Mount FL_1 on the side of bracket "F" that will face the center of the chassis when the bracket is installed. Mount FL_4 on the side of bracket "G" (above the bracket foot) so that FL_4 will face the r.f. switch bracket "B." Mount FL_3 on the other side of bracket "G."

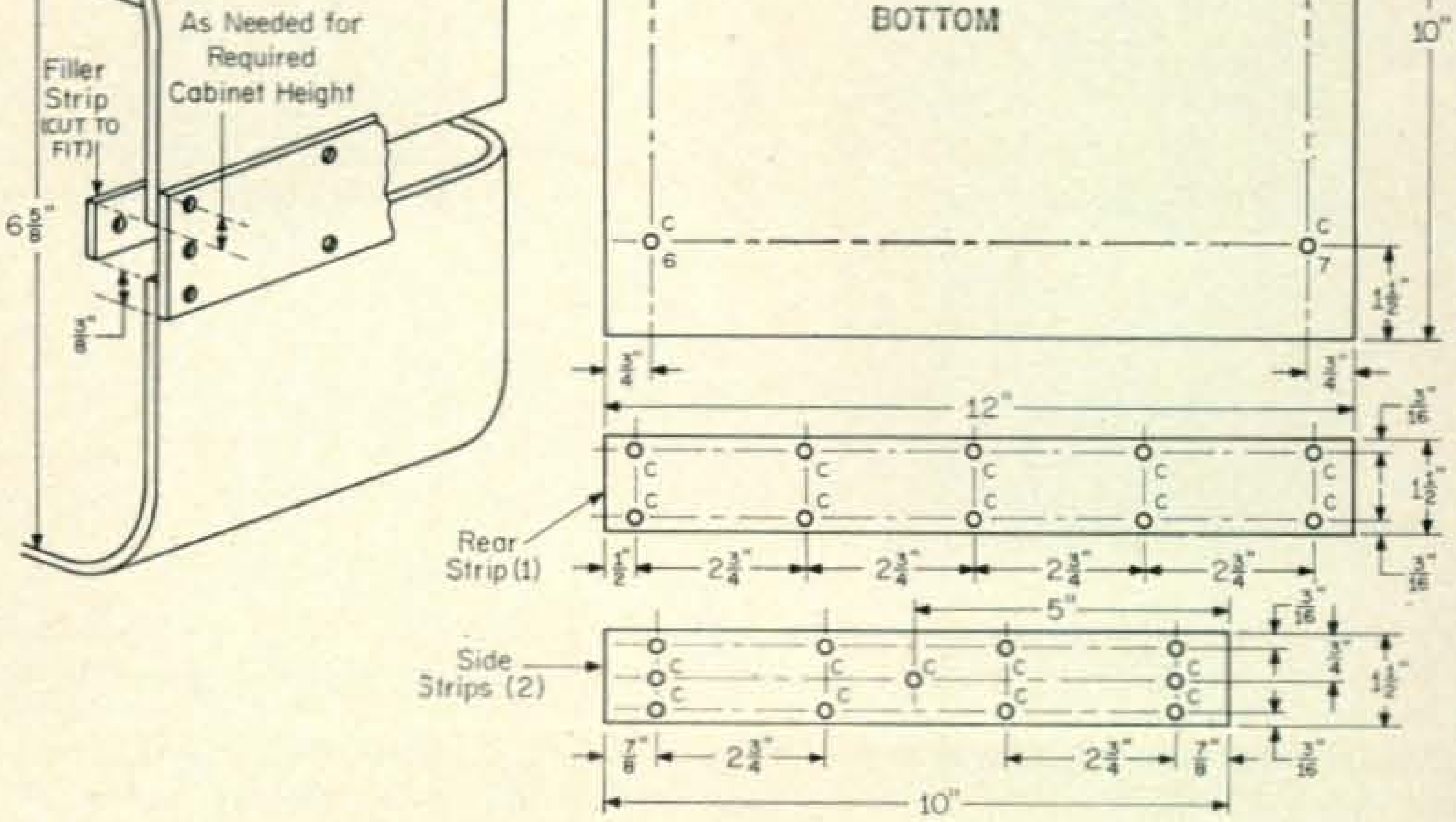


Fig. 6—Details for altering the HW-12 cabinet which must be raised to an inside height of 6⅝". The strips are made of 1/16" thick aluminum. Fasten chassis to cabinet using holes 1, 2 and 3. Mount feet at 4, 5, 6 and 7.

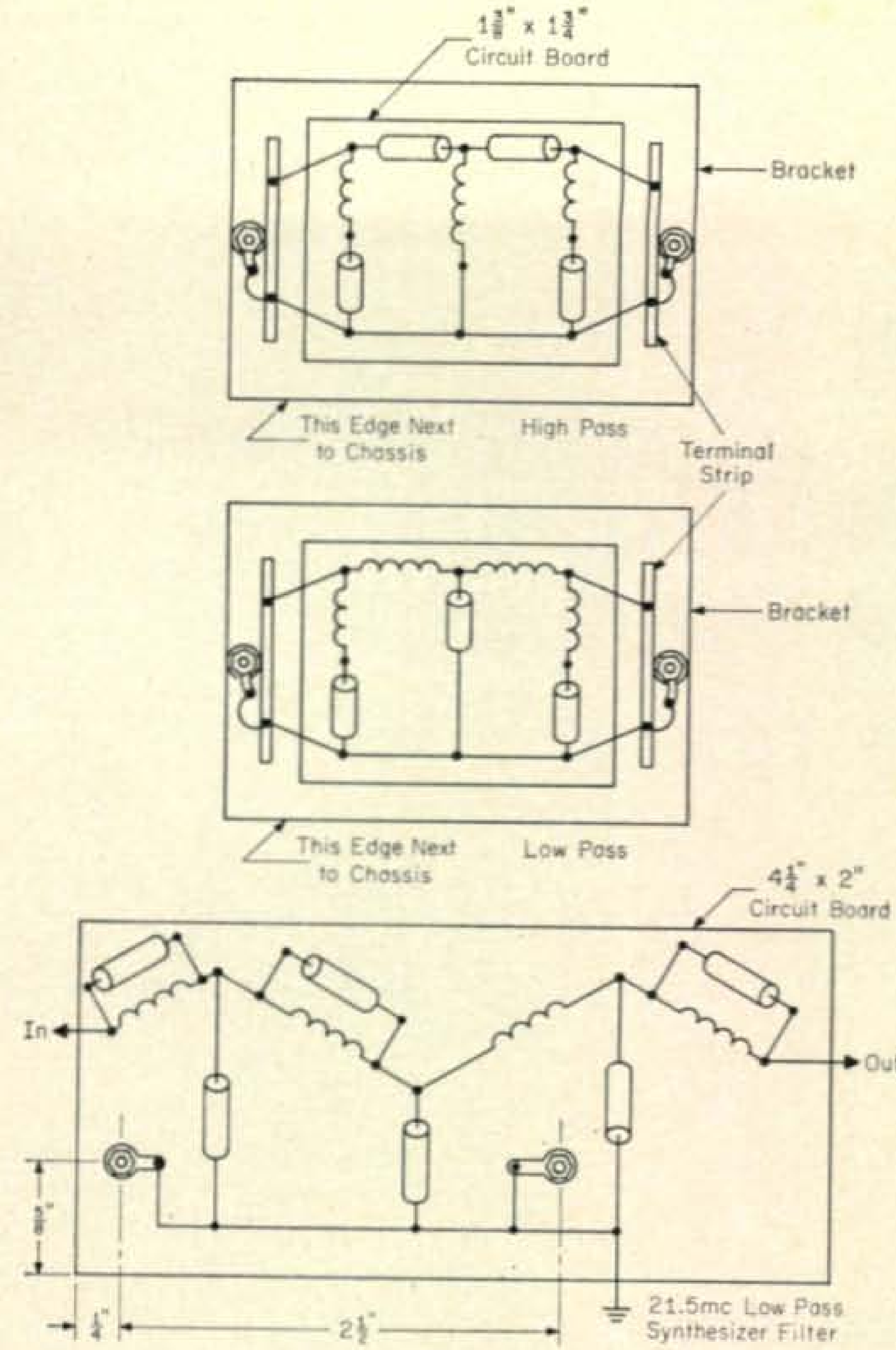


Fig. 7—Filter construction. Parts are installed as shown on circuit boards (such as Veroboards) and in the same relation as shown at fig. 1. The tubular components are the capacitors which may be small micas or ceramics. The small filters are supported by leads between the board and two-point terminal strips fastened to the associated bracket. On the 21.5 mc l.p. filter, the coils should be placed at approximately 90° to each other. The filter is mounted to the side of the chassis on ¼" spacers with screws through the soldering lug holes.

The 0.5 kc filter (FL_2), not shown here, should be assembled on a 3¼" × 1½" circuit board and mounted at the rear of the chassis as shown at fig. 2. L_{104}, L_{105}, L_{106} may be placed in line.

Mount and wire the power-supply components on a 3⅜" W. × 3½" H. circuit board as shown at fig. 8. Do not connect the power transformer until after the board is later mounted on the chassis. On the rear of the board and at its base install right-angle brackets for securing the board to the chassis as indicated at fig. 2.

Mount the power transformer as shown at fig. 2, installing terminal strips TS_A and TS_B as indicated at the mounting screws (fig. 8). Set the circuit board vertically in place as indicated at fig. 2 with the larger size filter capacitor spaced about ⅛" from the transformer winding. Using the mounting brackets as a template, mark the point for the mounting holes on the chassis. Remove the board and drill #36 holes at the points just marked. Set the board aside.

Referring to fig. 9, on the r.f. and i.f. switch assemblies install and solder the jumper connections between the switch-wafer terminals, including those made to adjacent wafers. Also install leads required for connections to other components, except those indicated by dashed lines. The leads should be about 3½" long and the component-end should be left free until after

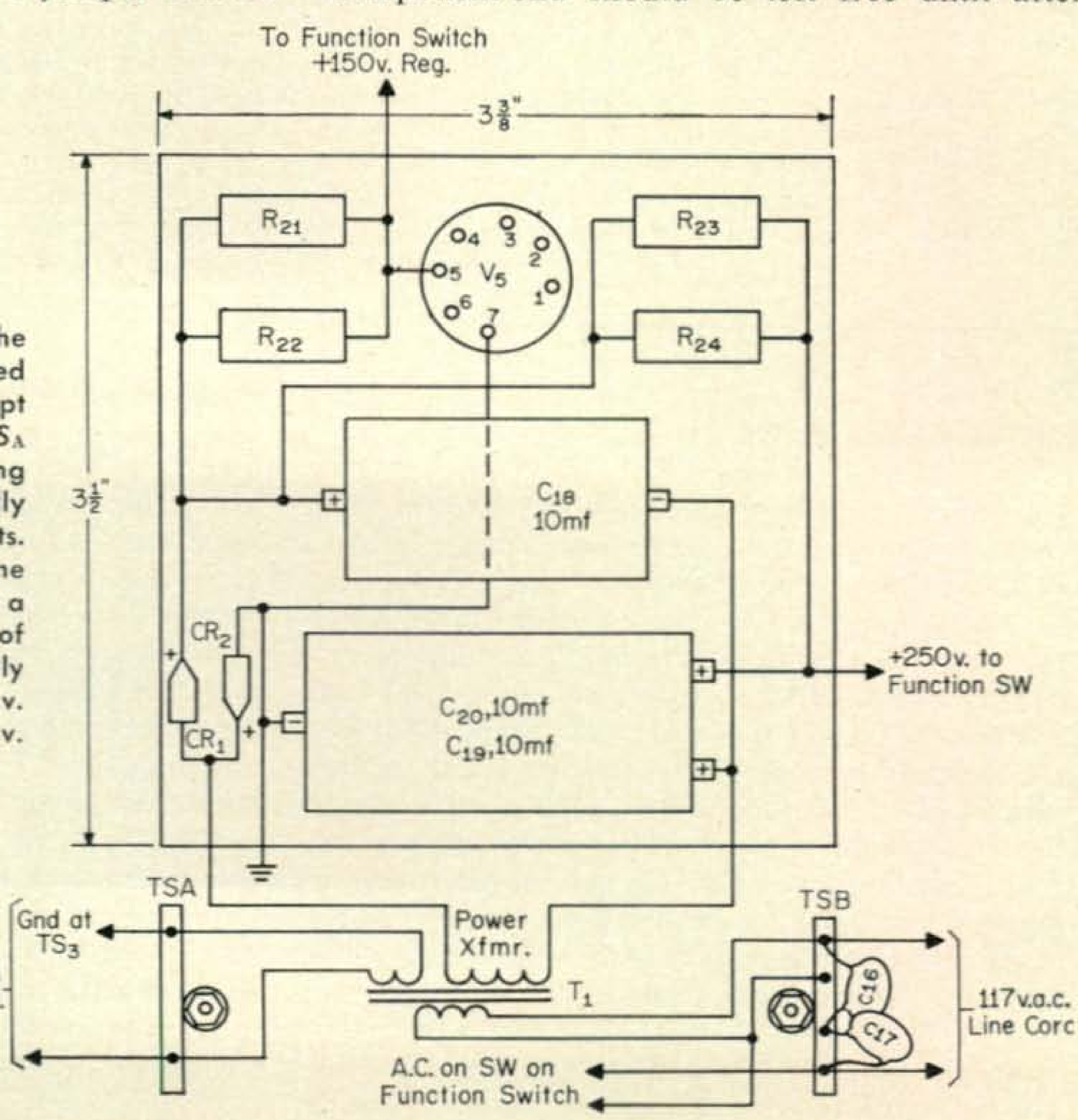


Fig. 8—Layout and wiring of the power supply. Parts are assembled as shown on a circuit board, except transformer T_1. Terminal strips TS_A and TS_B are held by T_1, mounting screws. The board mounts vertically using two right-angled brackets. Connect the ground lead to one bracket. When completed, fasten a piece of cardboard over the rear of the circuit board to prevent bodily contact with the h.v. circuits. H.v. output should be 220 v., *not* 250 v. as shown.

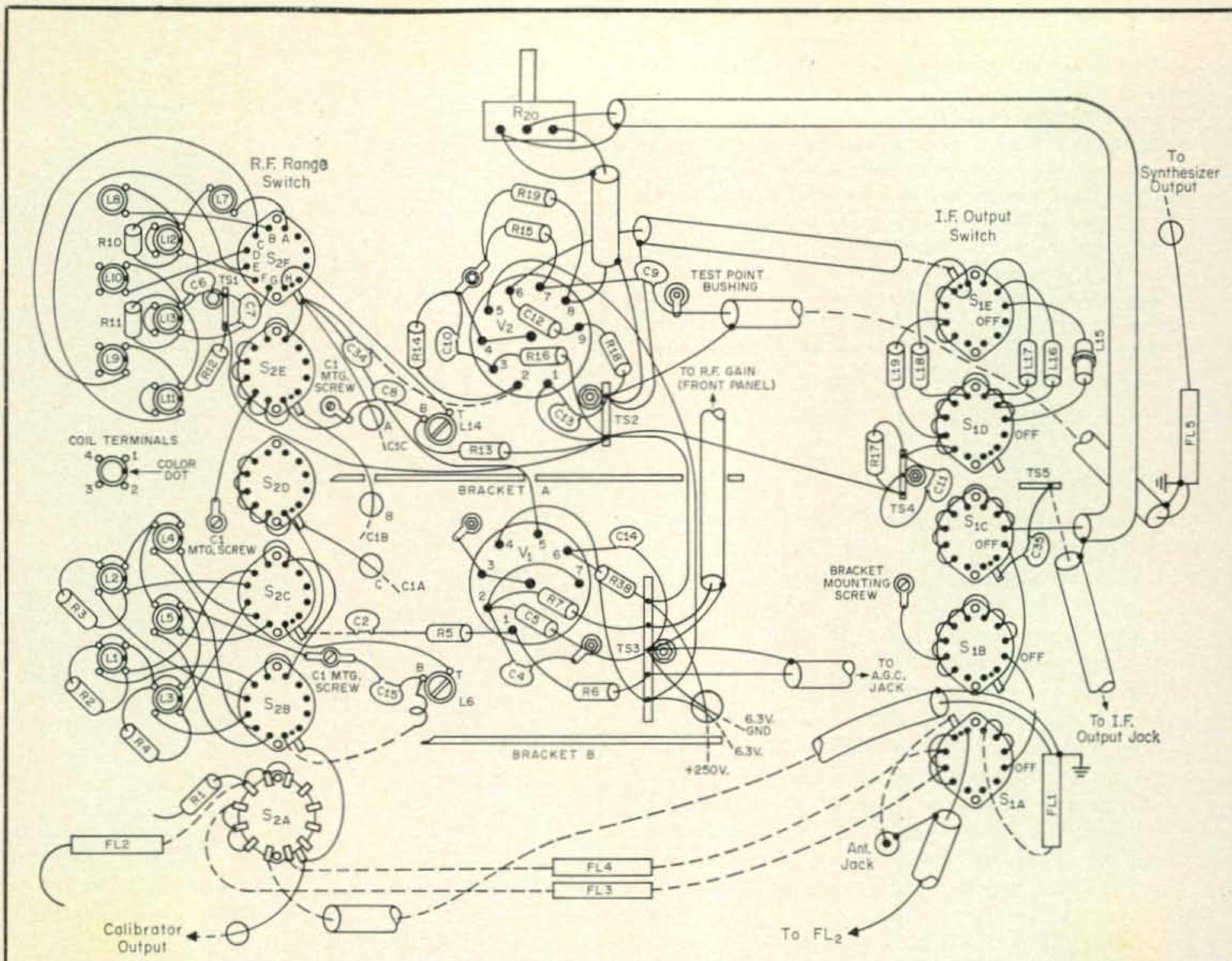


Fig. 9—Wiring diagram. See text. The switch sections are shown as viewed from the rear and with the bottom edge of each facing the chassis deck. When assembled, the wiper terminals (the ones shown with a tab) should be oriented as indicated and with the wiper rotors positioned uniformly on the shaft, so all the wipers engage the same relative contact positions. On the i.f. switch, the wipers should engage all the off-contacts at the same time. Connect all grounds at the indicated points. Leads shown in dashed lines should be connected after the switches are installed. The shielded lead from TS_3 goes to the r.f. gain through hole D on the front of the chassis. TS_5 mounts on bracket D as in fig. 4. The free end of R_1 should be connected to a solder lug at the hole above S_{2A} on bracket B. The antenna, i.f. out and a.g.c. jacks mount on the rear of the chassis. Bypass the a.g.c. lead at the jack with .01 mf. On L_6 & L_{14} T indicates top terminal; B, bottom. The coil drawn next to L_6 is a two-turn link wound at the bottom of L_6. FL_2 mounts inside the rear of the chassis (behind S_{2A}). Bracket C may be installed after the work is completed.

the switch assemblies are installed.

On the r.f. switches, bend the leads, intended for connecting the inductors, upward and install the switch assembly as temporarily done before, but this time use a lockwasher under the nut at the front side of the chassis apron and secure the spade lugs with lockwashers and nuts on top of the chassis. Be sure the switch wafers are aligned so that each wiper seats properly at the contacts. If necessary, the assembly can be re-aligned by loosening the tie rods with a screw driver inserted through holes provided on the front apron of the chassis. As the assembly is being set in place, route the leads through holes A, B and C as indicated. After the assembly is installed, solder these leads to the stator terminals of the associated capacitor sections.

Mount all the r.f. inductors with the color dot (where provided) oriented as shown. Install components at TS_1 and connect them to L_{11} and L_{13}. Wire the r.f. inductor terminals and associated resistors. Route and trim the leads from the switches as needed.

Mount the test-point feedthrough bushing[15] with a solder lug held by the screw head on the underside of the chassis. Fasten it with a nut and lockwasher on the top side. Mount all the other components, except the i.f. switch assembly and brackets "F" and "G." Do as much of the wiring as possible.

Install the i.f. switch assembly as before, but this time use a lockwasher under the nut at the front side of the chassis apron. Use self-tapping screws to secure the brackets. Complete the underchassis wiring.

On the synthesizer switch install and solder the jumper connections between the terminals on wafers S_{3A} and S_{3B} as shown at fig. 10. This is

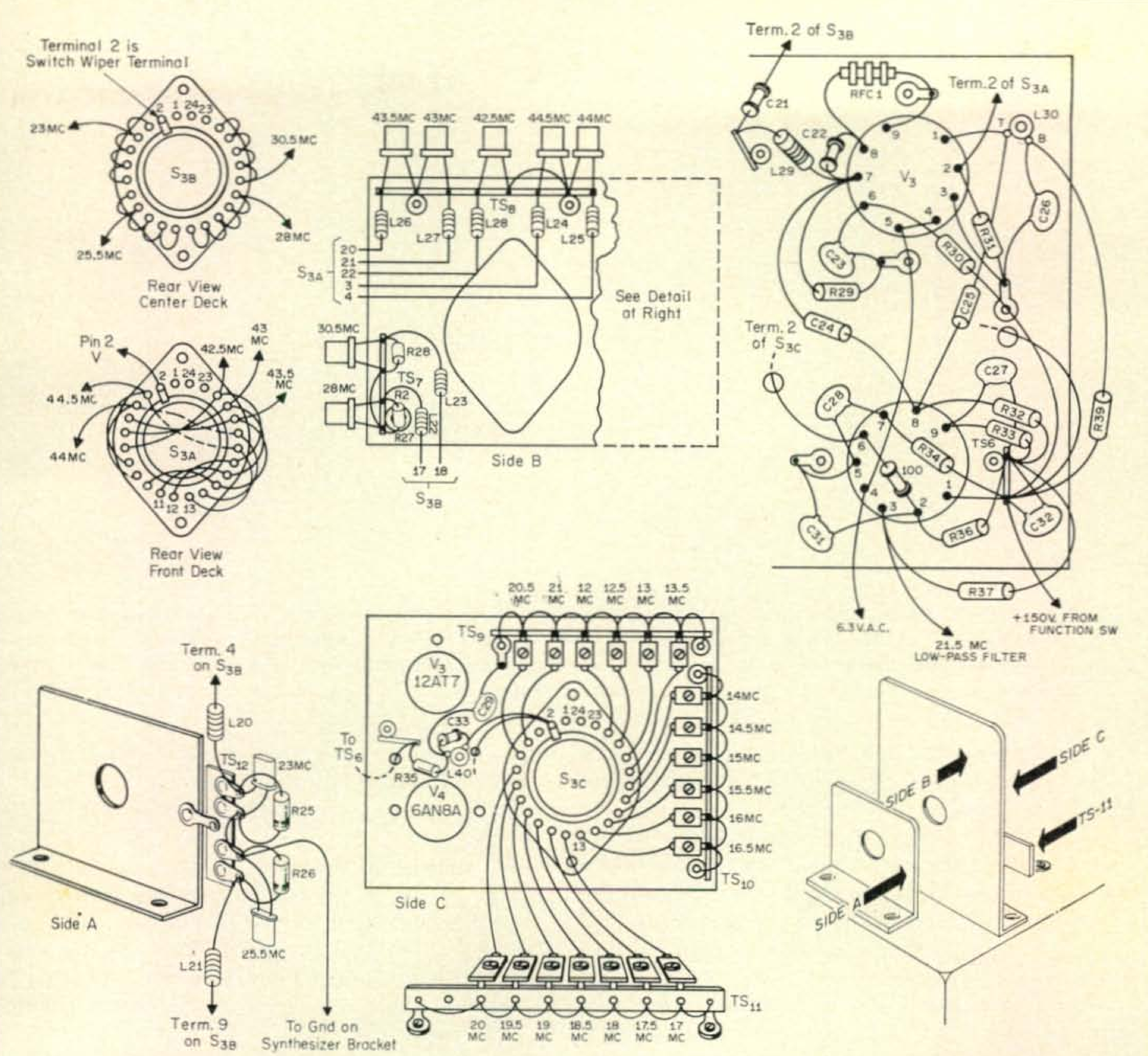


Fig. 10—Wiring of the frequency synthesizer. Jumper connections on S_{3A} and S_{3B} should be made before the switch is assembled. On S_{3A} use insulated wire. The connections shown in dashed lines should be made on the opposite (front) side of the switch wafer. Instead of L_{20} through L_{28}, use a straight piece of wire to connect the crystals to the switch. The inductors will not be needed unless the crystals are to be rubbered as will be described later under "Alignment." In any event, L_{23} will not be needed. On TS_{12}, bend the mounting foot down so that TS_{12} can be positioned in the same plane as the bracket. Install TS_{12} after the other work is done. Install crystals last as described in the text. The lower socket is V_4. The stator (ground) lugs of the trimmer capacitors should be soldered directly to the terminal strip lugs. Trimmers should be installed on TS_{11} so that they will be parallel to the chassis when TS_{11} is mounted after the synthesizer is in place.

easiest done by disassembling the switch and working on each wafer separately by itself. After the work is done, reassemble the switch (with the synthesizer panel). Mount the tube sockets, terminal strips, solder lugs and inductors on the synthesizer panel as shown at fig. 10. Wire the front of the panel as indicated. At this time do not install the inductors as shown between the *crystals* and the *switch*, but make the connections with bare wire instead. The inductors will be installed later if needed. Solder the crystals[16] in place last and when doing so, hold their leads with pliers to serve as a heat sink during the work. Spot soldering the crystal leads should be sufficient.

Do not wrap the B-plus end of R_{30} *and* R_{39} at the terminal strip. Spot solder them, as they will have to be disconnected during alignment.

Wire the rear of the synthesizer panel. The stator lugs of the trimmer capacitors[17] should be soldered directly to the terminal-strip lugs. Use #16 or #18 tinned wire to connect the trimmers to the switch. Do not connect the trimmers associated with terminals 6-12 on S_{3C} at this time. The fixed capacitors across some of the trimmers may be installed behind the trimmers.

Mount the synthesizer assembly on the chassis using self-tapping screws, but before doing so, run a screw through each mounting hole in the chassis to thread it and make it easier to install

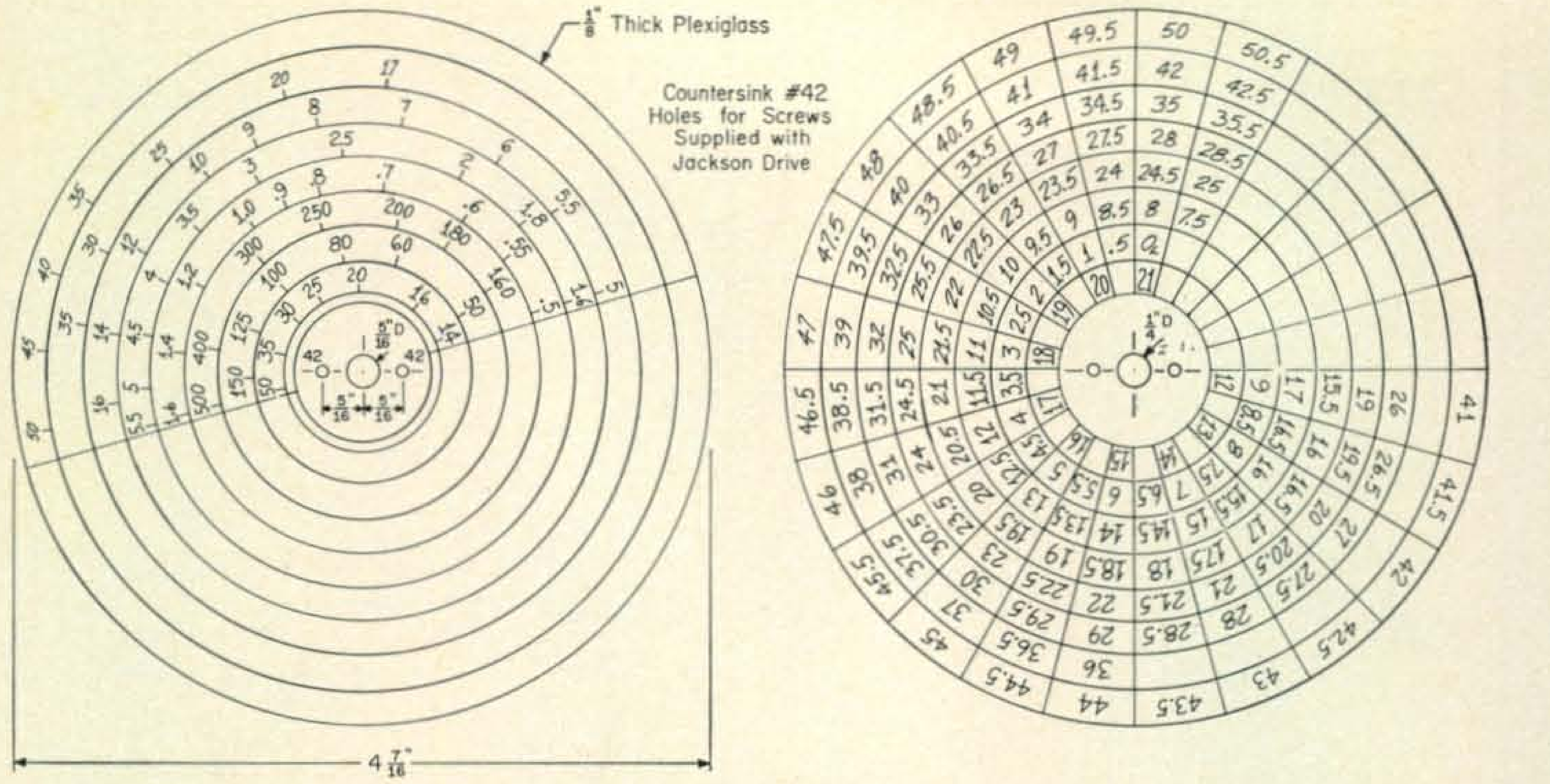


Fig. 11—Dial scales for the Omniverter. At the left is the pre-selector dial; at right is the synthesizer switch scale. To ease fabrication of the scales, it is suggested that full size positive photostats be made directly from these illustrations and cemented to the plexiglass backing plates. Note the hole differences between the two backing plates.

the screws when the panel is in place. A long thin screw driver will be needed to turn the screw under the right-hand trimmers.

Mount TS_{11} on the chassis as indicated at fig. 2. Then solder the stator lugs of the capacitors to the terminals as shown at fig. 10 and position the trimmers parallel with the chassis as seen in the photos. Connect trimmers to the switch as indicated.

Mount the power-supply and the calibrator using self-tapping screws. Connect all the power leads, including those of the power transformer as shown at fig. 8. Connections to the function switch[18] are quite straight-forward and may be determined according to the schematic diagram. Run the power leads from the calibrator, along the rear edge of the chassis and to the required points. Similarly, power leads to the function switch may be run along the side edge of the chassis.

R_9 should be installed on TS_{13} on the front apron of the chassis. The function switch and the r.f. gain control mount directly on the panel; however, they can be wired when off the panel while placed approximately where they will be located when they will be installed on the panel.

This concludes the major assembly of the Omniverter. Next month's final installment will cover alignment and final assembly of the dials. (We assume that the average constructor will require a full month to accumulate parts and materials, and reach this stage of assembly). ■

[1, 2]Use 6-section switch for r.f., 5-section one for i.f. Assemble each on Centralab index assembly PA-302 (Allied no. 56-D-5094, price $2.58) using ceramic sections, each with 1 pole, 2-12 positions, non-shorting, Centralab PA1 (Allied no. 56-D5045, 11 sections for $.99 each) or phenolic sections, 1 pole, 2-11 positions, non-shorting, Centralab PA-31 (Allied no. 56-D-5085, 11 sections for $.72 each). If latter type are used, terminals will be positioned slightly different than shown at fig. 9. Stop plates need not be used on assemblies.

[3]Knight-Kit X-10 (kit), Allied no. 22-A-3256W, $10.95.

[4]It is assumed that the calibrator kit has already been assembled.

[5]4-section, 4 poles, 2-23 positions, non-shorting, Centralab PA-4007 (Allied no. 56-D-6247, $4.98).

[6]3-gang, 367 mmf per section, Allied no. 43-A-3522, $2.31.

[7]H. H. Smith no. 2100 (Allied no. 47-D-4724—$.33 for pkg of 10).

[8]Jackson Planetary Drive, Model 4511 DAF, $1.50 at Arrow Electronics, 900 Broad Hollow Road, Farmingdale, N.Y. 11735.

[9]Millen type 39016 (Allied no. 47-A-3214, $.60).

[10]H. H. Smith no. 2104 (Allied no. 47-D-4729, $.72 for pkg of 10).

[11]Heathkit part no. 90-265, price $5.80.

[12]Such as National, TX-9, TX-10, TX-19, Hammarlund FNC-46S.

[13]Perforated type or preferably "Veroboard" for better anchoring components. If latter is used, remove all unused circuit strips. "Circuit Boards—Quick and Easy," *CQ*, Dec. '65, page 35.

[14]For alternate filter: "Low-Pass Filters for 5-500 kc Receivers," *CQ*, Jan. '66, page 46.

[15]Millen type 32102 steatite bushing for 1/4" hole.

[16]"TEX-5 Converter Kit" (all nine crystals as specified). Available for $22.50 from Texas Crystals, 1000 Crystal Drive, Fort Meyers, Florida 33901.

[17]Arco Elmenco type 402, 1.5-20 mmf (Allied no. 43-A-7088, $.23 each) and type 404, 8-60 mmf (Allied no. 43-A-7090, $.27 each).

[18]Use Centralab index assembly PA-300 (Allied no. 56-D-5092, $1.50) with 2 sections, each with 2 poles, 2-5 positions, non-shorting, phenolic, Centralab PA-33 (Allied no. 56-D-5086, $.96 each). Assemble to maximum overall depth (behind panel) of 15/16". Stop plate not needed. Bend terminals up to avoid contact with chassis when installed. Cut off excess shaft length.

[19]Small knbs: Heathkit part no. 462-191, price 70¢ ea.; large knobs: Hallicrafters part no. 015-001593.

[20]The panel should first be painted which may be done by spraying with paint available in pressurized cans.

[21]Datak "Letraset," "Tools and Workshop," *CQ*, Nov. '63, last paragraph page 54.

DELUXE ADDITION TO THE SWAN LINE

5 BANDS—480 WATTS

HOME STATION—PORTABLE—MOBILE

It is with great pride that we announce the development and production of the newest addition to the Swan Line. The Swan 500 is a most fitting deluxe companion to the classic model 350. Improved circuit efficiency provides increased power ratings of 480 Watts P.E.P. on sideband; 360 Watts CW input and 125 Watts AM.

At the top of the Swan Line, the 500 offers many extra features: Selectable upper and lower sideband, 100 kc crystal calibrator, automatic noise limiter, provision for installation of an internal speaker (the best solution for the mobile installation), and a factory installed accessory socket for the addition of the model 410 external VFO.

As a receiver, the new 500 will satisfy the most critical operator. Sensitivity is better than .5 uv and the precision tuning mechanism is easily the smoothest you will find on any piece of amateur gear. Improved production techniques result in even better VFO stability. A new product detector circuit provides you with superior audio quality, and a new AGC system responds more smoothly to wide variations in signal strength.

The new 500 is equipped with the finest sideband filter used in any transceiver today. With a shape factor of 1.7, ultimate rejection better than 100 db, and a carefully selected bandwidth of 2.7 kc, this superior crystal filter combines good channel separation with the excellent audio quality for which Swan transceivers are so well known.

Frequency coverage of the five bands is complete: 3.5-4.0 mc, 7.0-7.5 mc, 13.85-14.35 mc, 21-21.5 mc, 28-29.7 mc. (In addition, the 500 covers Mars frequencies with the 405X accessory crystal oscillator.)

Along with higher power, improved styling and many deluxe features, the new 500 has the same high standards of performance, rugged reliability and craftsmanship that have become the trademark of the Swan Line. Backed up by a full year warranty and a service policy second to none, we feel that the Swan 500 will establish a new standard of value for the industry. Our new "Star" is now in production.

$495 amateur net.

ACCESSORIES:

MATCHING AC SUPPLY
With speaker and phone jack.
Model 117XC . . . . **$ 95**

12 VOLT DC SUPPLY
For mobile or portable operation.
Model 14-117 . . . . **$130**

MARS CRYSTAL OSCILLATOR
Five crystal-controlled channels with vernier freq. control.
Model 405X (less crystals) . . . . **$ 45**

FULL COVERAGE EXTERNAL VFO
Model 410 . . . . **$ 95**

DUAL VFO ADAPTOR
Provides for separate control of transmit and receive frequencies.
Model 22 . . . . **$ 25**

PLUG-IN VOX UNIT Model VX-1 . . . . **$ 35**

See your Swan dealer today.

Swan speaks your language.
Ask the ham who owns one.

SWAN
ELECTRONICS Oceanside California

For further information, check number 41, on page 110

International Mission Radio Association News

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

For the last two months, I have been telling you something of the story of IMRA. I am sure, from your comments, that you agree that IMRA has a real story to tell.

Let me introduce you to a few more of our members.

7XØWW, Père D. Porta, of El-Biar, Algeria, is a new comer to IMRA. He is not, however, a recent addition to the Amateur world. In 1938 Père used the call FA3WW, then 7X2WW in 1964. Père Porta a native of France, uses his home brew 70 watt c.w. and a.m. transmitter to keep in contact with his family in Europe and with his fellow missionaries in Africa.

Père Porta has been working in Algeria for over thirty years. He is now leading the quiet life of a professor and expects to remain at his work for the rest of his life. Père is looking around for DX contacts, so look for him on c.w. IMRA would like to build up his station if possible; perhaps 150 watts on s.s.b. Caution—Père reads English very well, but he answers letters in French.

Here is an interesting story from one great man. Lionel Ducharme, VE8OX has been working hard for 45 years in Eskimo Land and is still going strong. He is very interested in IMRA, and looks forward to participating in IMRA's international communications service.

The story of this man, I think, tells you about the hundreds of people IMRA wants to aid. I received this letter from him last December.

"I am one of the pioneers in radio in the North West Territories. This goes back to 1927, when I was first licensed. The reason for joining the ranks of Hams was to try to bridge the formidable distance between Chesterfield Inlet, where I was then stationed, and my friends and relatives at least a thousand miles south. Chesterfield, Latitude 63°, Longitude 91°, was isolated We had only one regular mail service per year, in the summer when the Hudson Bay company ship would bring our supplies. Occasionally we had a small mail in the Winter, it came over twelve hundred miles by dog sled."

"I started to operate under the call VE5FX. Scheds had been prearranged with Montreal and Ottawa on the 20 and 40 meter bands. I had then only a 5 watt transmitter, not much of a receiver. The equipment was made by friends. Of course results did not come up to expectations. So, I was almost ready to give up."

"In 1930, away for my holidays after 9 years in Eskimo Land, I was very fortunate to meet two enthusiastic radio amateurs, Father Verreault and John Stadler. hey decided to equip me with something new. More power; a 10 watt push-pull, plus an NC receiver. My first try for Montreal brought Ascension Island to the door! With these results, I figured Montreal would be my neighbor. I still remember going back to Chesterfield in April 1930."

"We were prepared and ready to make the long trip. I had my equipment packed in a box. I had to cover 400 miles by sled with an Eskimo guide and poor dogs. On top of everything we had the mail; a load of over 800 pounds. We had to build an igloo every night, face the wind and storms. The weather was very unpleasant. We took 30 days to cover the distance. Often, my guide suggested that we leave part of the load, especially my box. He could not guess the contents of the box, nor could he estimate its value and purpose. Indeed, it would have broken my heart if we had to leave the box. After all, I had a sched in June, and I felt sure this time it would be blessed. We walked; we helped the dogs; we worked harder. Finally after 30 days, we made it."

"Immediately, the equipment was installed. Really, as expected, a new world was opened at Chesterfield Inlet. I was not fortunate to connect with VE2's or VE3's; in fact any VE. But at the end of the c.w. line were W8, W9. Incidentally the 8 and 9 calls in those days were New York state, Connecticut, Rhode Island, etc. Great sports and very obliging were the Hams at the other end. They copied messages, forwarded them, solicited answers, re-forwarding them to myself and my neighbors. I still owe them many thanks. I have not forgotten their services or valuable assistance. I have kept a record of those feats."

"In 1942 I had to leave my station for a longer period of time than I had expected. Frost in the attic damaged everything beyond recognition, except the transmiter which I still have as

*Mary Immaculate Friary, Garrison, New York.

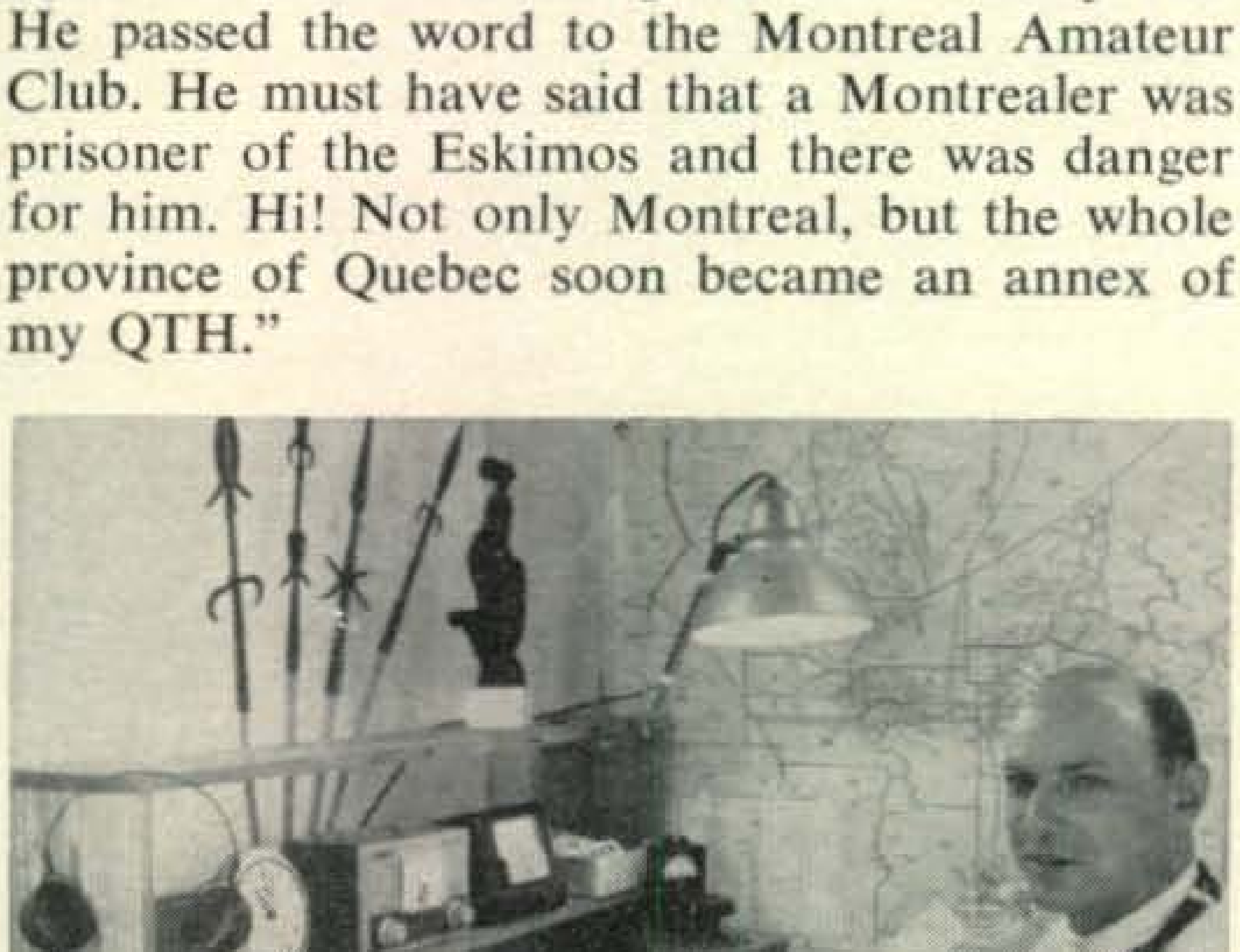
a souvenir of the good old days when no distance existed between the frozen solitary Arctic and the South, thanks to amateur radio."

"World War II had come. All amateurs had to dismantle everything. It had to be so. With my friends off the air, I had to go back to solitude."

"After the war, it seemed that the line was not the same. Conditions gradually improved. Phone was invading the bands. The 10 meter band was opening. I was not equipped. I thought that the expenses were beyond my means. I had to be simply a s.w.l."

"I was an s.w.l. until 1956. I was then stationed at Eskimo Point. There came another amateur, VE8PC, who was also an s.w.l. Bill Gallagher's old transmitter needed too much repair. We were often listening together. One night, the 10 meter band was loaded; VE8, VE3 and especially one VE2 were pounding in like locals. We were smiling, amazed. Suddenly we looked at each other and with one mind—do we go back to the air again? Yes, sure. . . . We took the Handbook; saw an advertisement for a Globe Scout. The price was fair. We immediately ordered two. I was hoping my friends would pay for the kit. Shortly after receiving my kit, it was assembled. A CQ, "This is VE8OX," my new call. Immediately came K9AEC, Clarence Ennis of Chicago. It was also Clarence's first try! I said this is a polar bear from Eskimo Land. Clarence adjusted his gun, shot and hit my antenna! The thrill and the fun we had. A new pipe-line was opened. Incidentally, Clarence and myself are still visiting each other on the air. We average each year, one hundred QSO's."

"Undoubtedly, I tried to reach the VE2's. My S-40B was not very selective. However, one day, November 25th, 1956, I had decided to aim at Montreal's mountain until I would land some Montrealer. Most of my relatives are living in Montreal. After an hour or so of "CQ Montreal" comes VE2AXC. Harold was the one to open the door and bring me close to my kin. He passed the word to the Montreal Amateur Club. He must have said that a Montrealer was prisoner of the Eskimos and there was danger for him. Hi! Not only Montreal, but the whole province of Quebec soon became an annex of my QTH."



REV. Paul Y. De Smet talks with his folks and other missioners of IMRA from his post in Burundi, Africa.

"I surely enjoyed the many QSO's, and later the phone patches. Too bad the 10 meter band went on a long sleep. I have lost my friends since the 10 meter days. And of course, I had less time to go hunting on the air because of many major obligations here. Yet, K9AEC, VE2VR, VE2KB, are still sounding in my ears. They were wonderful friends and provided valuable service."

"VE8PC left me his Viking Ranger II. A friend supplied me with an SX-99. God bless these generous souls. Hamming has kept me alert and young. I meet friends everywhere and am able to exchange cheerful talk with my family. We do have a better mail service now; yet nothing like the almost "in person" meetings on the air. I have contacted people of all trades; other priests, ministers, doctors, lawyers, teachers, newspaper men, authors, Army personnel, police, traders, farmers, YL's etc. I always find these meetings very cheerful and friendly. I have highly appreciated my visitors or entertainers. I have received signs of appreciation of my visits too."

"May I say a word of encouragement to any one at a distance from home. He should try to explore the realm of amateur radio. He will discover a world of friendship, unique and most interesting. The real Amateur is a Globe Trotter, with exquisite taste and good manners."

"Once an IMRA net is established I would be able to join you and break the montony of the solitude at this latitude. I am on the air from 1700 to 1900 GMT almost daily. Look for me around 14.160 or 28.3 mc. Although the mail service to Eskimo Point is better now than it was thirty years ago, conditions here will not change for many years to come. There are no resources here other than hunting and fishing. I wish you well and hope for the success of IMRA."

For men and women like Lionel Ducharme, amateur radio is not the superfluous commodity of an affluent society, but a real necessity. There are hundreds of people with this mission, to serve their fellow men in foreign countries. They are working in underdeveloped areas all over the world. They need and want the help of IMRA. Please join us to provide them with a communications service and possibly supply some of them with good equipment.

Lionel's story tells you much better than I can, just how much communication with the folks back home can mean. At times too, beyond the morale building factor of amateur radio, it can be a life saver in emergency situations.

If you think IMRA is a worthwhile project let's hear from you. Your favorable comments will allow me to continue to bring you the story.

Here is another story to show you why IMRA needs you. Paul DeSmet, 9U5DP, left his native Belgium 13 years ago to teach math and science to the natives of Burundi, Africa. At present, Paul runs his maximum limit of 50 watts on

[*Continued on page 102*]

The homebuilt all-electronic APT read-out gear used by I1PDN and I1DV. The signals are played back from the tape recorder to produce the slow-scan pictures on the c.r.t., at the right, from which they are photographed by the camera using a 200-second time exposure. The chassis in the center contains the stages shown in the block diagram. The oscilloscope and the meter at the left monitor the video signals. A regulated power supply is at the right of the tape recorder. The phasing and Miller-oscillator switches are hanging at the front of the table.

I1PDN and I1DV Copy Italy's Only Weather Satellite Pictures

BY WILFRED M. SCHERER,* W2AEF

Quite a few radio amateurs have been obtaining APT pictures from the Essa and Nimbus weather satellites. Among those doing so are Dr. Ettore Cerulli, I1PDN and Ugo Sartori, I1DV of Padova, Italy. They are operating the only two APT receiving stations in Italy, commercial, governmental or otherwise. Their pictures, unlike those we've seen so far, are obtained using a homebuilt all-electronic system and thus should be of interest to other amateurs, especially since they also show identifiable land areas as well as cloud formations.

Among the cloud formations are two of historical significance in that one shows the storm of Nov. 4, 1966 that was responsible for the devastating flooding of Florence and other localities in Italy; while the other picture shows the cyclonic storm which caused the sudden and tragic sinking of the 8900-ton Greek ferry *Heraklion* in the Aegean Sea between Crete and Greece on the night of Dec. 7, 1966 with a loss of 220 lives.

These shots are shown at figs. 1, 2 and 3. The picture at fig. 1 was taken at the peak of the storm over Italy. The location of various Italian cities, many of which were flooded by the storm, are identified by the numbers marked on the photos.

Figure 2 and 3 show a "tropical cyclone" spiralform phenomena about 300 miles West of Crete. This is a rare occurence in the Mediterranean vicinity, such formations being more commonly found over Carribean or Japanese waters. Twelve hours after these photos were obtained from Nimbus II, the storm, which had moved Eastward, overtook and sunk the *Heraklion*. The photo at fig. 3 was taken by the satellite a little less than 4 minutes after that of fig. 2, in which time the satellite had passed over the earth's surface by about 800 miles on its northbound orbit.

The frame at fig. 2 is centered on Syrte, Libya. The North-African Coast between Syrte and Tunis can be seen sloping North-Westerly from the center. Fig. 3 is centered on Rome. In both cases the eye of the disturbance is centered at about 36° N. Lat., 19.5° E. Long. or about 300 nautical miles west of Crete which is located (not visible) near the fringe-area of the storm at the upper right of fig. 2.

Terrestrial Features

In fig. 4A the following areas may be seen as identified in Fig. 4B: Sicily, the Italian Boot, the

*Technical Director, *CQ*.

Fig. 1—The storm of Nov. 4, 1966 that caused the historic and devastating flooding of Florence and Venice. Italian localities (not visable) are: (1) Venice; (2) Florence; (3) Rome; (4) Naples. Padova, the QTH of I1PDN and I1DV is about 20 miles west of Venice above (2).

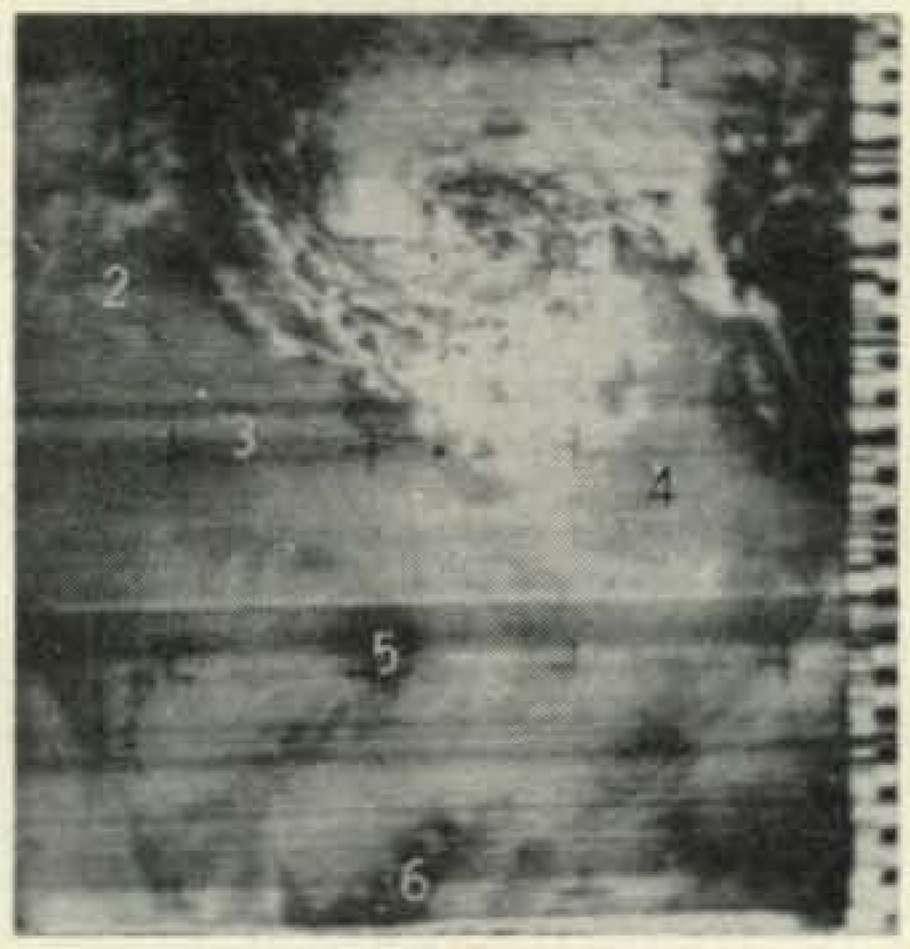


Fig. 2—The "Tropical Cyclone" or hurricane of Dec. 7, 1966 that sank the Greek ferry Heraklion between Crete and Greece with a loss of 220 lives. Features are: (1) Crete in No. Africa (not visible); (2) Tunisia; (3) Libya; (4) Cyrenecia; (5) Gebel (Mtn) el Assued in Libya; (6) Tibesti Mts in Chad.

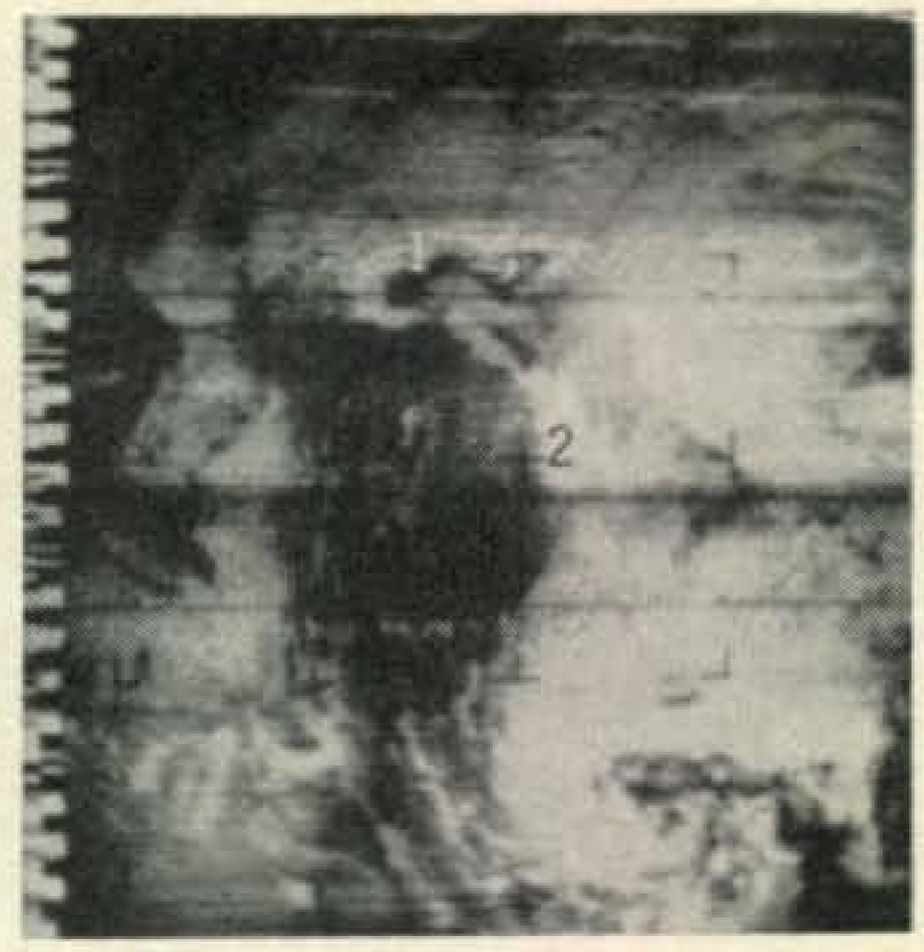
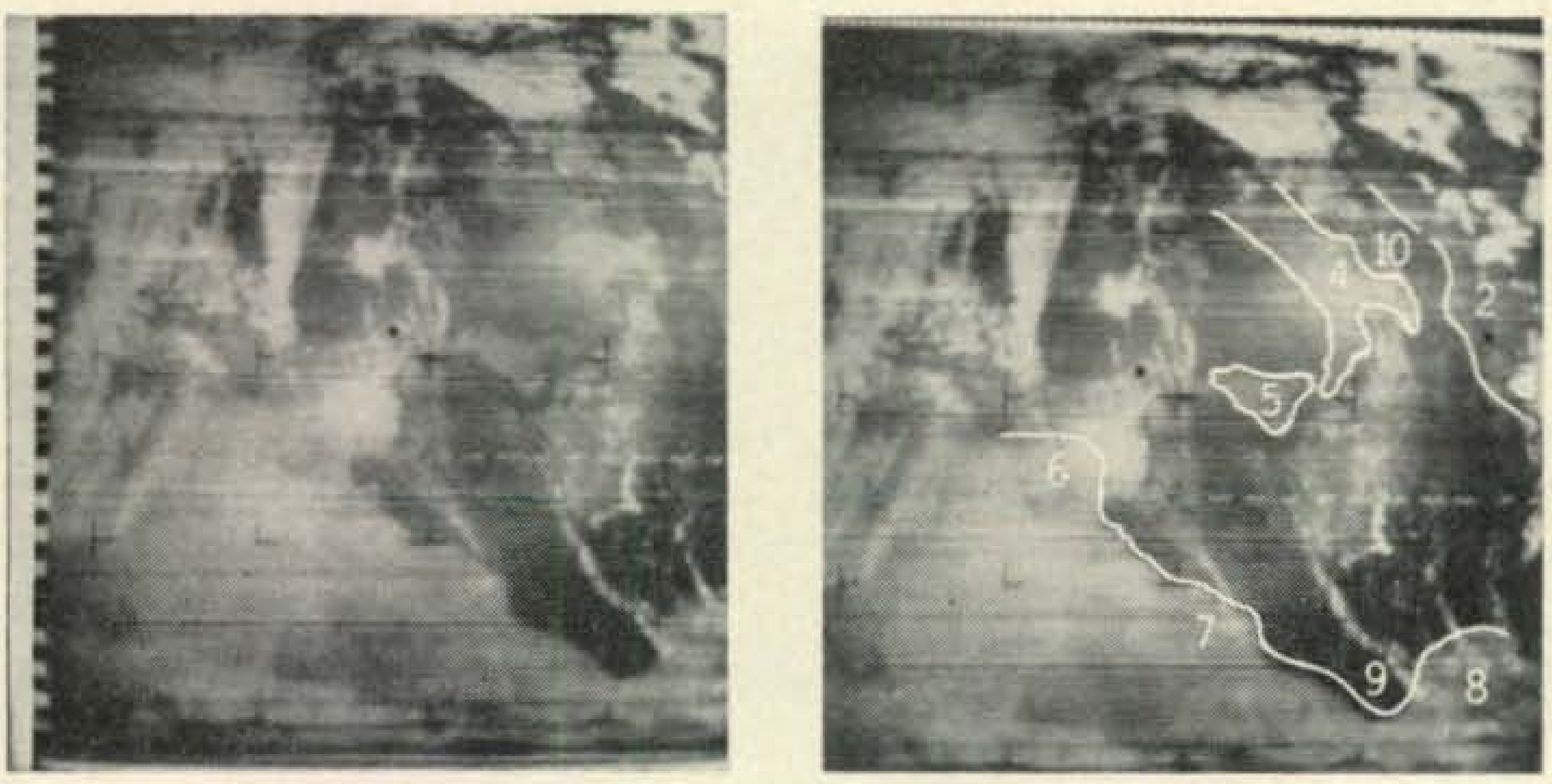


Fig. 3—The Tropical Cyclone of fig. 2 photographed by Nimbus II 4 minutes later. The spiralform is now at the lower right photographed from a different angle, since the frame is now centered on Rome at (2). The arch of the Italian Alps is at (1). View this picture at arm's length and the storm area will appear as the demon it was.



(A) (B)

Fig. 4—At (A) Sicily and Italy as viewed with relatively little cloud cover. (B) The features of (A) are outlined as: (1) Yugoslavia; (2) Albania; (3) Greece; (4) Italian Boot; (5) Sicily; (6) Tunisia; (7) Libya; (8) Cyrenecian Peninsula; (9) Gulf of Sidra; (10) Adriatic Sea.

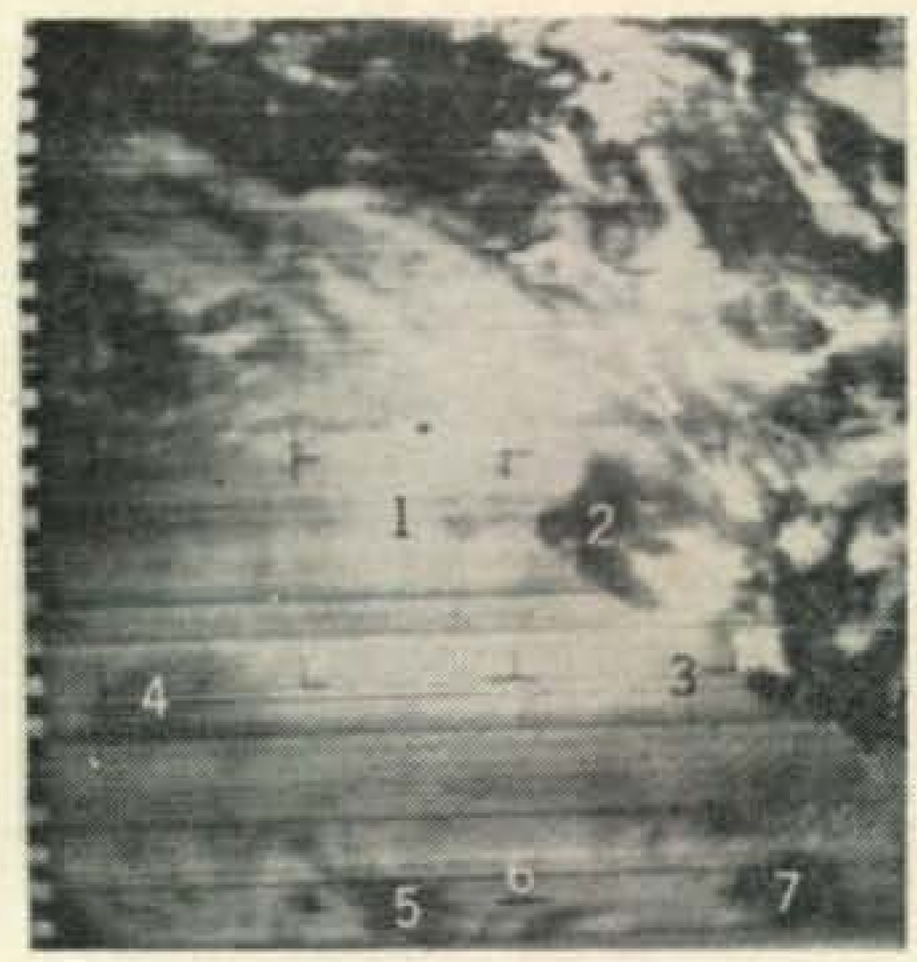
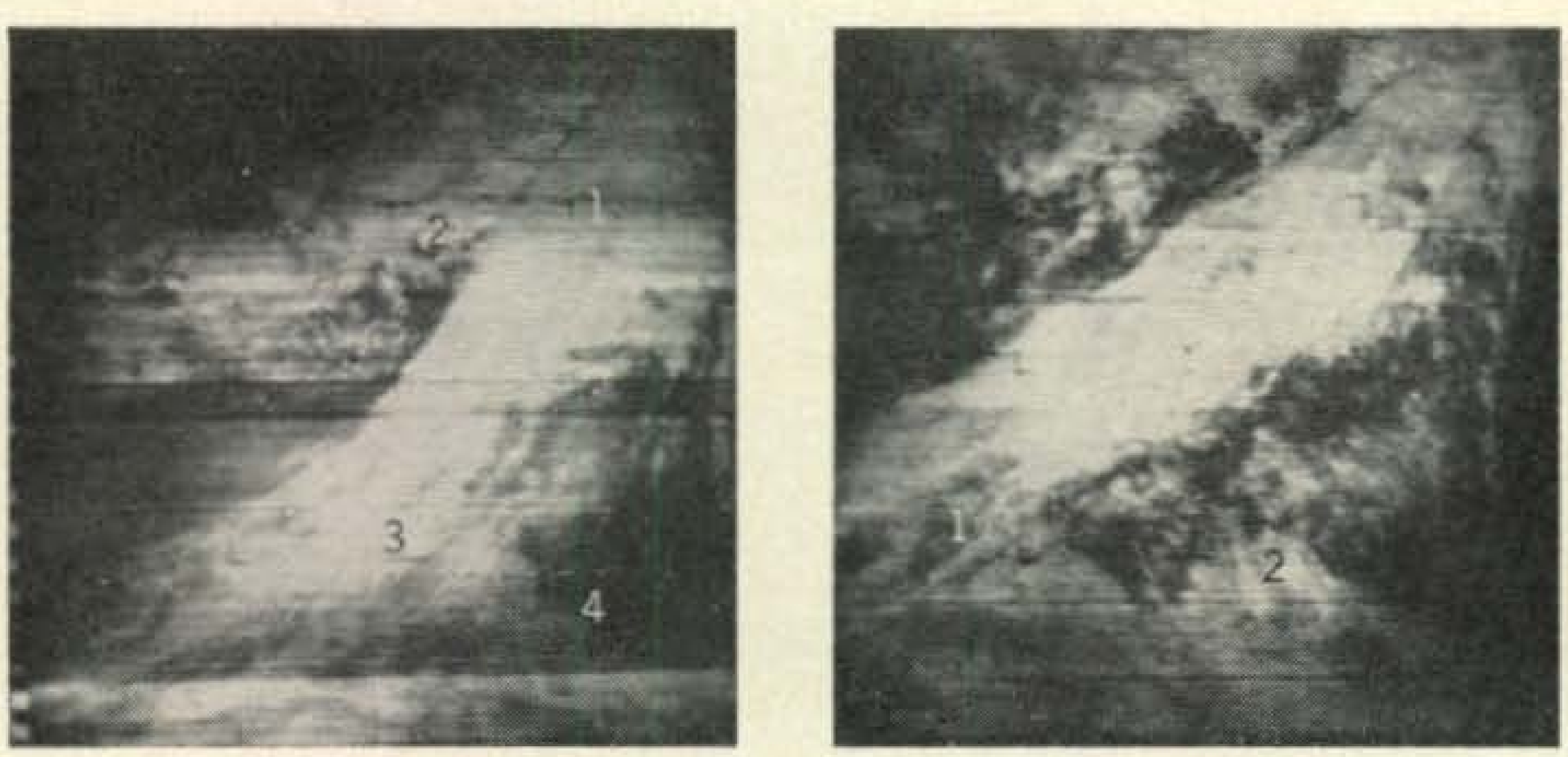


Fig. 5—Some small features in North Africa. (1) Schott Lake el Djerid (dark spot at the right) in Tunisia; (2) Djerba Island (the light dot at the left); (3) Libya; (4) Plateau de Tadmait in Algeria; (5) Tassil Plateau n' Ajjer in Algeria; (6) Ergs (sand seas or desert) Idehan and Murzuk in Libya; (7) Gebel Mountain el Assued.



(A) (B)

Fig. 6—(A) The frontal cloud from Yugoslavia and Italy at (1) to Tripolitania at (3). Syrte is at (4). At (2) is what appears to be a jet stream. (B) The same cloud the next day. Only part of the jet stream remains. At (1) Syrte; (2) Cyrenecia.

Fig. 7—A good view of the North African Coast with areas made famous during World-War II. At (1) Tripoli; (2) Syrte; (3) Benghazi; (4) Derna; (5) Tobruk; (6) Tassili n' Ajjer; (7) Gebel el Assued.

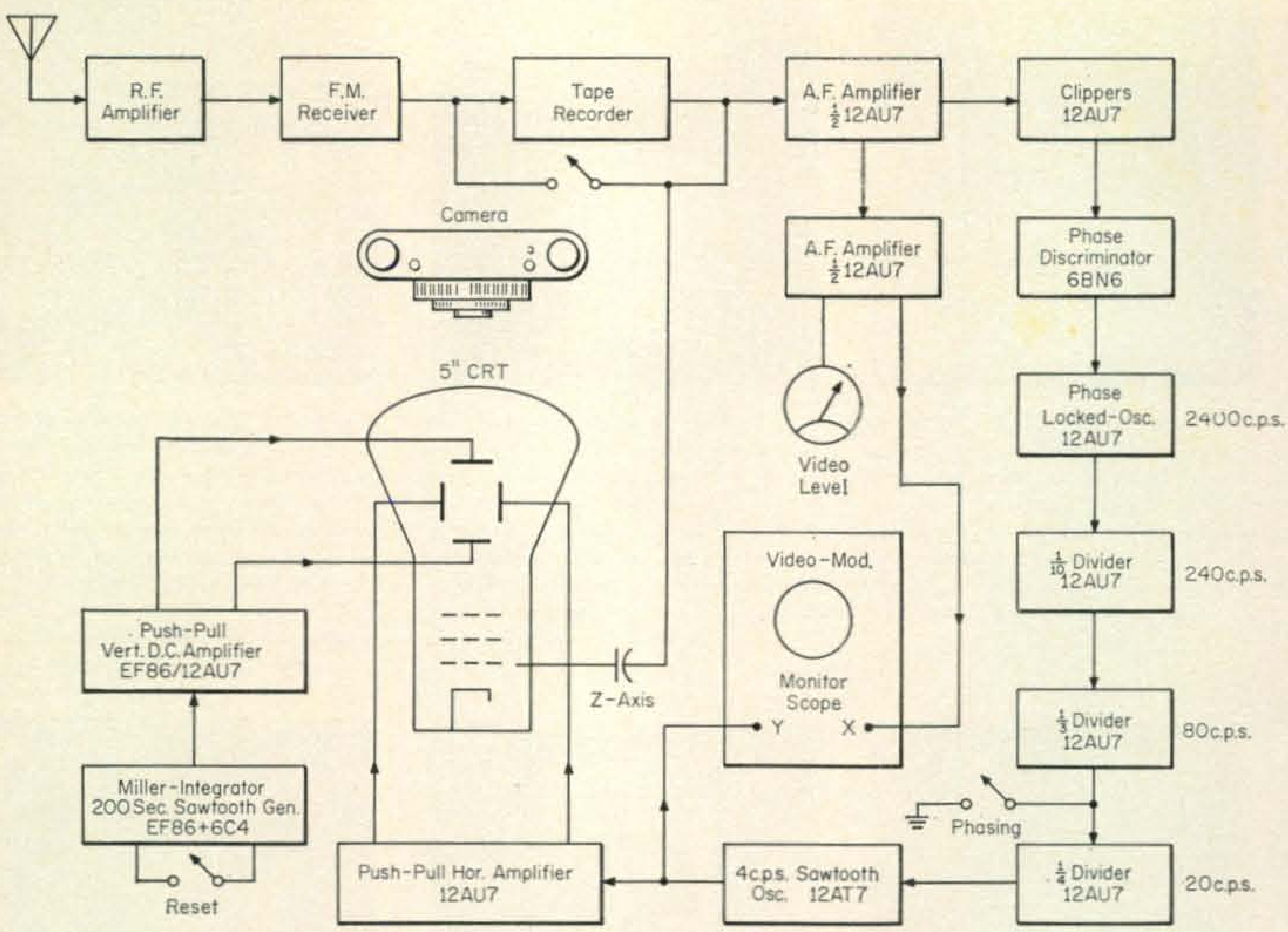


Fig. 1—Block diagram for APT readout setup used by I1PDN and I1DV. See text for explanation.

coast line of Yugoslavia, Albania and part of Greece, the Adriatic Sea, the North-African coastal areas of Tunisia and Libya (Tripolatania and Cyrenecia).

Figure 6A shows a large cloud formation, with a jet sream, stretching from over Italy and Yugoslavia (not visible) at the upper right to Tripolatania and other portions of Libya just below center. Figure 6B shows the same cloud as photographed by Nimbus II the following day. Only a little of the jet stream remains. The southern end of the cloud is now between Syrte, Libya and the Cyrenian Peninsula.

Figure 5 is interesting in that certain other terrestrial features can be identified as indicated also in fig. 7. These are Djerba Island off the coast of Tunisia and the inland lake, Shott el Djerid, also located in Tunisia. Figure 7 shows a good view of the Libyan Coast and the Cyrenecian Peninsula.

The APT pictures encompass an area of approximately 1200 × 1200 nautical miles, making each square section between adjacent fiducial markings (the T's and L's) about 300 miles. The alternate black and white blocks along the side of the photos comprise a data-code system. Opposite the group that includes the 5 black squares at the bottom of the side are code bits that indicate the calendar day and the Universal Time, in hours, minutes and seconds, at which the transmitted picture was taken by the satellite (the indicated time on Nimbus II, by the way, is 4 seconds behind). Coding opposite the other squares provides orbital data for a later pass.

A block diagram of the setup used by I1PDN and I1DV is shown at fig. 8. A photograph of one of the installations also shows how the equipment is arranged for photographing the slow-scan APT pictures from the screen of a cathode-ray tube.

A 136.95 mc converter ahead of an f.m. receiver feeds the picture signals directly to the APT readout equipment or a tape recorder. Use of the tape recorder permits full attention to be centered on tracking and obtaining the best signal from the satellite during a pass. Playbacks of the tape then may be made any number of convenient times as may be needed for optimizing equipment adjustments and synchronization in order to realize the best results.

The APT signals, thus obtained, are applied to audio amplifiers V_1 and V_2. The output of V_1 feeds the 2400 c.p.s. sub-carrier tone to a two-stage clipper and a phase discriminator which controls a 2400 c.p.s. phase-locked oscillator. Except for the tubes, the arrangement is like that used by K2RNF.[1]

A chain of frequency dividers, dreamed up by I1PDN and using astable multivibrators, reduces

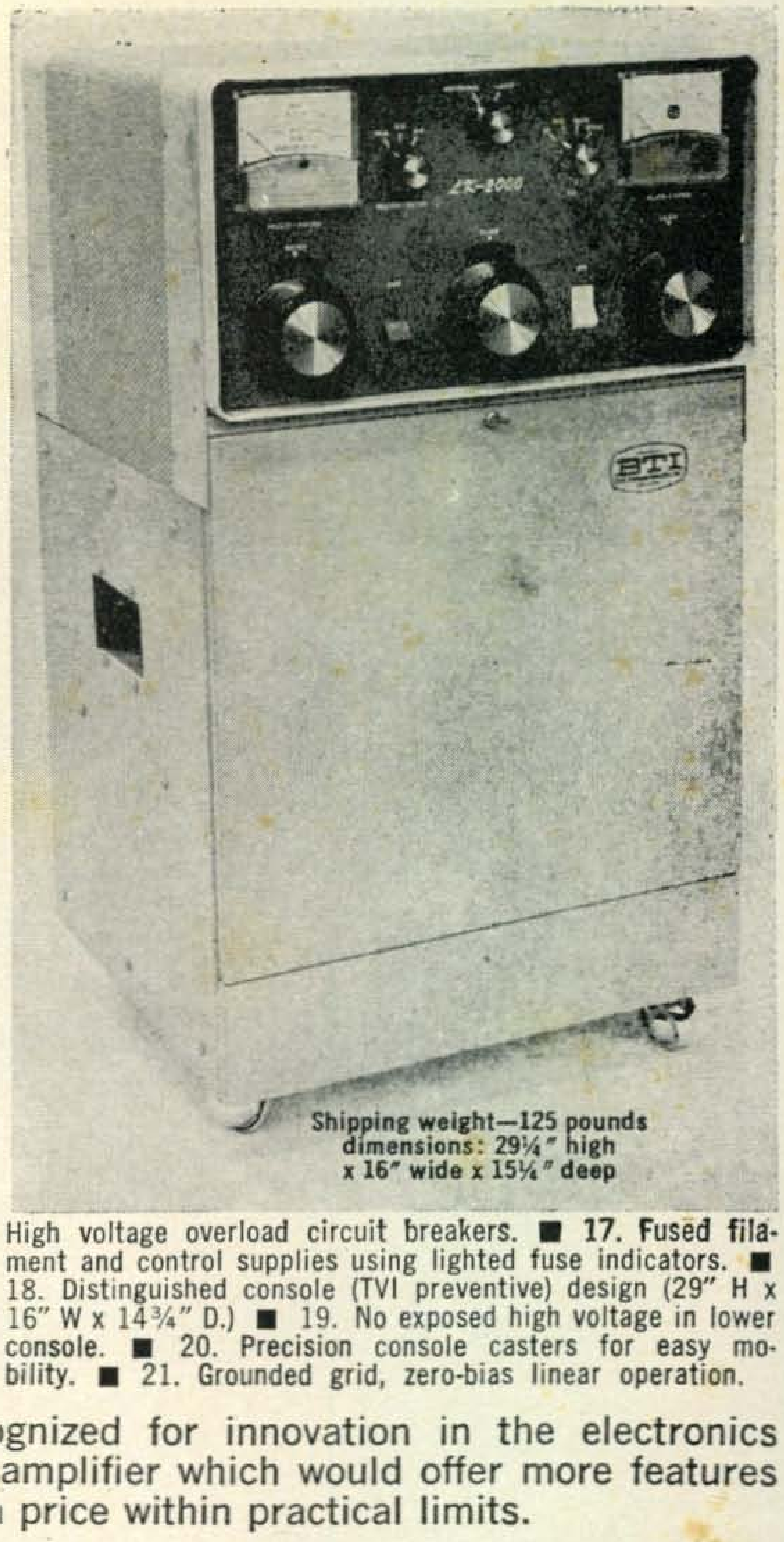
[*Continued on page 94*]

[1]W. G. Anderson, K2RNF, "Amateur Reception of Weather Satellite Pictures," *QST*, Nov. '65, page 11.

NEW B. T. I. LINEAR STOPS THE SHOW

At Ham Conventions Everywhere

Thousands marveled at important and advanced features built-in the brand new



BTI LINEAR AMPLIFIER

MODEL LK-2000

YOU'RE THE EXPERT—CHECK FOR YOURSELF

■ 1. Designed for maximum legal input all modes. 2000 watts PEP SSB—1000 watts CW-AM-RTTY. ■ 2. Full 1000 watts plate dissipation using Eimac 3-1000Z. ■ 3. New tank circuit design provides greater output on higher fre- uencies including 10 meters. ■ 4. High Reliability Solid State Power Supply using Computer Grade capacitors for continuous duty. ■ 5. Instant transmit—no warm up—accomplished by BTI Solid State Supply and use of thoriated tungsten filament in 3-1000Z. ■ 6. Longer tube life because of exclusive after off cooling. ■ 7. A.L.C. output provides higher audio level without flat topping. ■ 8. Tuned cathode input for minimum distortion and higher efficiency (50 ohm inp.). ■ 9. Choice of Line Voltages—220V AC @ 10 amps or 115V AC @ 20 amps (Solid State Supply permits efficient 115 VAC operation). ■ 10. Metered relative R. F. watts output to antenna. ■ 11. Built in metering and switching for Dummy Load accessory which when attached provides dummy load for linear or exciter. ■ 12. Meter overload protection. ■ 13. Changeover relay feeds exciter direct to antenna when linear is off. ■ 14. All relays have D.C. coils for hum free operation. ■ 15. Safety switch and shorting bars for personal safety and component protection. ■ 16. High voltage overload circuit breakers. ■ 17. Fused filament and control supplies using lighted fuse indicators. ■ 18. Distinguished console (TVI preventive) design (29" H x 16" W x 14¾" D.) ■ 19. No exposed high voltage in lower console. ■ 20. Precision console casters for easy mobility. ■ 21. Grounded grid, zero-bias linear operation.

BRAD THOMPSON INDUSTRIES, long recognized for innovation in the electronics field, realized the need for a quality linear amplifier which would offer more features with reliable and rugged construction, at a price within practical limits.

Well-engineered, foolproof, simple operation, reasonably priced, fully guaranteed, the B. T. I Linear Amplifier provides the signal impact you've been wanting.

B. T. I. (Amateur Division)
83-810 Tamarisk Street—P.O. Box CCCC
Indio, California 92201

Write immediately for free 4 page illustrated specifications brochure or Contact your local distributor NOW.

$795

COMPLETE READY TO GO!

For further information, check number 37, on page 110

THE FUTURE FOR COAXIAL CABLES

BY BARRY A. BRISKMAN,* K2IEG

New plating techniques can extend the usefulness of coax into the microwave frequencies.

NO AMATEUR denies that an antenna system is one of the most, if not *the* most important part of an efficient station. Where v.h.f. and u.h.f. operation is contemplated, the antenna system is more than important—it is primary.

When selecting antennas for 50 mc and up, array gain, front-to-back ratio and beam width requirements depend, more or less, upon the type of operation planned. Nevertheless, in any application above the 6 meter band, getting as much of the transmitted r.f. energy as possible into the antenna is vital, since even the best array cannot radiate power lost through attenuation or s.w.r. in the coaxial feedline. For this reason, the type of feeder chosen is important, and it is a choice that normally depends not only upon electrical, but also on physical requirements.

Cables In Use

Present coaxial cables for amateur use at 50 mc and above are most often selected as a compromise between low attenuation and practical economy. While the ultimate technical choice would be the best bet, we can seldom afford the luxury of very-low loss air or foamed dielectric cables like Heliax®[1] or Foamflex®[2], normally

*41 Balsam Drive, Dix Hills, Huntington, N.Y.

[1]Heliax is a trademark of the Andrews Corp., Chicago, Ill.
[2]Foamflex is a trademark of Comm. Prod. Co. Div. of Phelps Dodge.

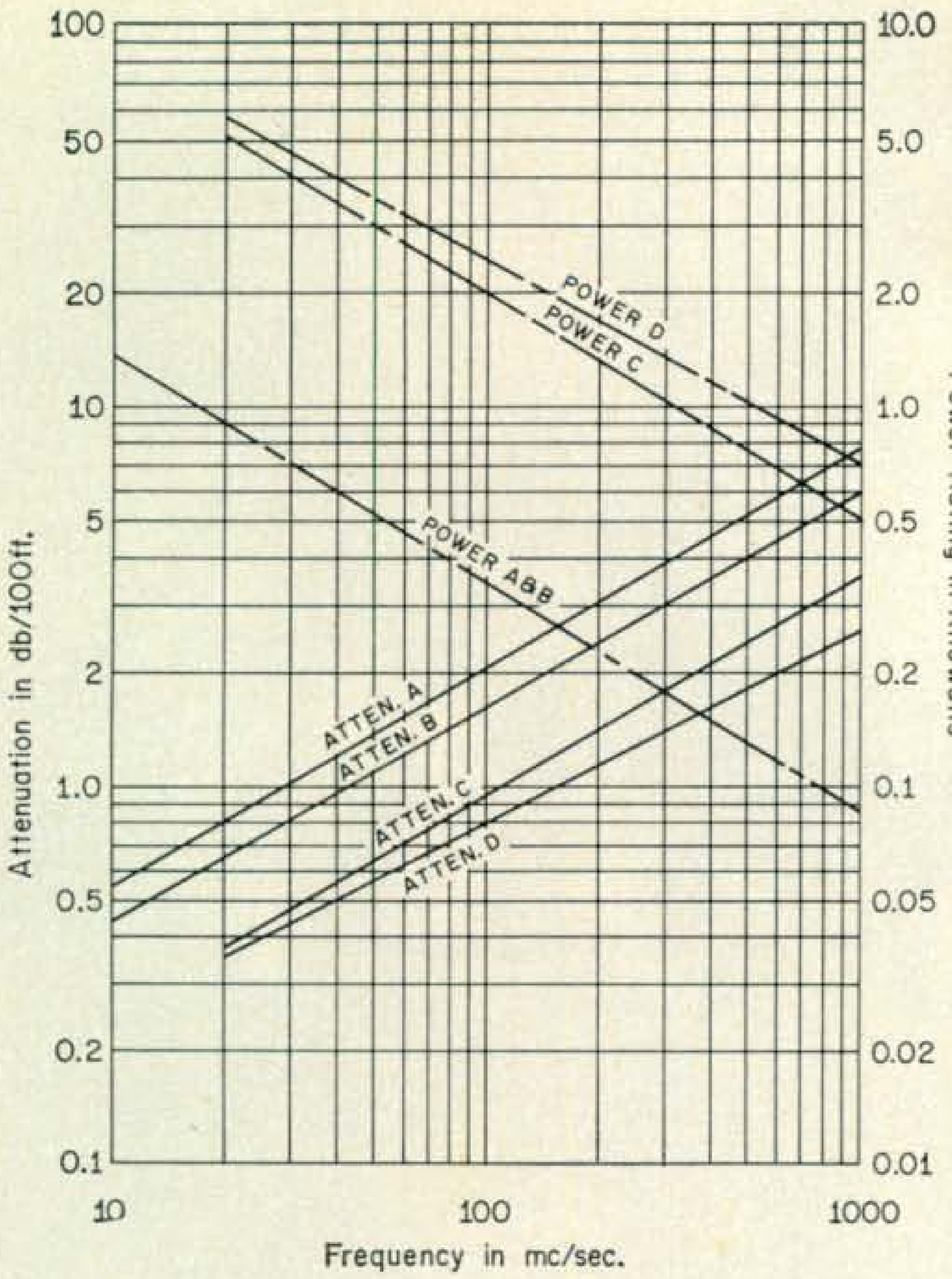


Fig. 1—Comparison of attenuation and power handling capabilities of:
A—RG-8A/U
B—Foam dielectric, RG-8A/U type
C—½" Foamflex, cable.
D—½" Styroflex cable.

selected by the commercial user. Common cables like RG-58 and 59, and RG-8 and 11 are best known and most widely used for amateur applications because of ready availability and a moderate price. At frequencies above 50 mc, however, familiar lines begin to exhibit prohibitive losses which increase with frequency. To assure maximum power transfer to the antenna in these higher bands, an amateur must either deplete his piggy bank or choose some compromise feed system like open wire line.

Open wire line, unfortunately often seems like one of the great inequalities of life, for most compact, high-gain arrays have low impedance feed points necessitating tricky matching and balancing schemes to fit the higher-impedance open-wire feeder. Transmitter output impedances must also be matched to the Hi-Z open line, and they are typically 30-300 ohms. The losses in these matching systems, unless they are very carefully constructed, can meet or exceed those resulting from high attenuation in familiar coaxial lines.

The construction techniques employed by fabricators of our common coax cables are well known. A dielectric material like polyethylene is extruded over a solid or stranded copper center conductor, and the entire assembly covered with a braided-copper shield and a vinyl jacket. Flexibility is excellent and a wide variety of standard connectors are available to fit system needs.

To achieve lower losses, commercial lines usually have larger diameter and solid copper or aluminum cylindrical jackets that greatly reduce flexibility and ease of handling. Morever, coaxial fittings are often of a specialized nature requiring even greater expenditure in the antenna system. Figure 1 graphically compares the attenuation of 100 feet of line *vs*. frequency for RG-8/U and ½ inch foam and air lines. Note the drastic improvement achieved in the latter. Power handling capability also shows considerable increase. Additional advantages in shielding effectiveness is another plus available in the higher-priced lines, but is of small concern in most amateur applications.

Plated Lines

A new development by the Plaxial Cable Division of United-Carr, Inc., may spell doom for the great inequality. This company's engineers have come up with a scheme for plating a ductile and adherent copper film directly onto the cable dielectric. This has been attempted many times in the past, but has always met with failure because the resultant copper coating lacked ductility and adherence, and failed quickly under flexure.

The new plated cable, dubbed RG-371/U, has a nominal overall diameter of 0.142" and, though its copper outer conductor is solid, the line is sufficiently flexible to literally be tied in knots. Figure 2 graphs the attenutation of this new coaxial line on the same graph with conventional braided RG-122/U, and 0.141" semi-rigid cable chosen for this test because their physical and electrical characteristics most closely parallel those of the new line. Figure 3 shows a comparative test in shielding effectiveness, and Fig. 4 graphs flex life. Figure 5 is a drawing of the line illustrating the construction technique employed.

Fabrication Technique

It is obvious why solid-shield cables can't equal up to braided constructions in terms of flexibility. With a braided shield, produced of many tiny interwoven copper wires, these wires

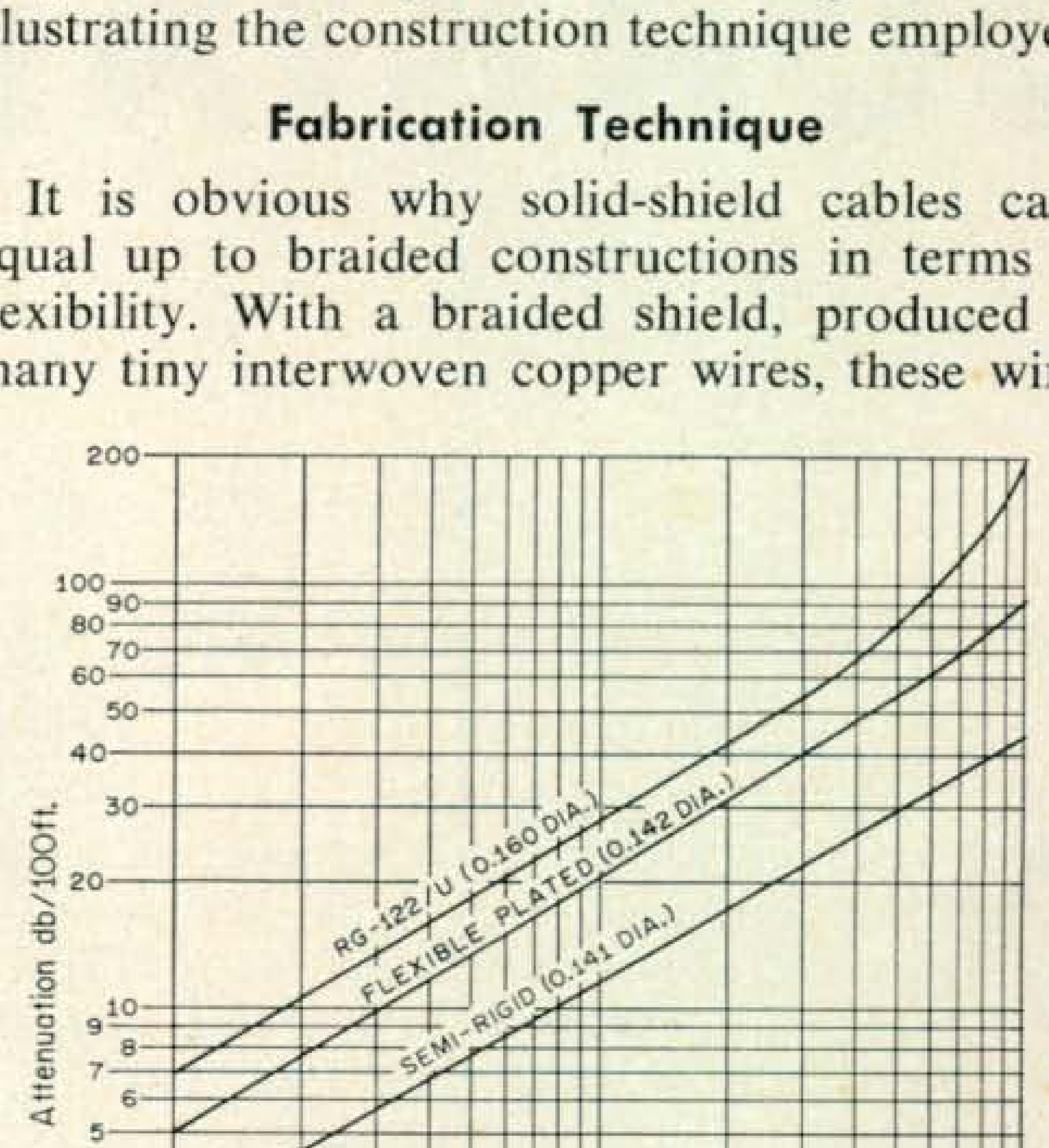


Fig. 2—Attenuation comparison between the new flexible plated coax (0.142" dia.), RG 122/u (0.160" dia.) and semi-rigid coax (0.141" dia.).

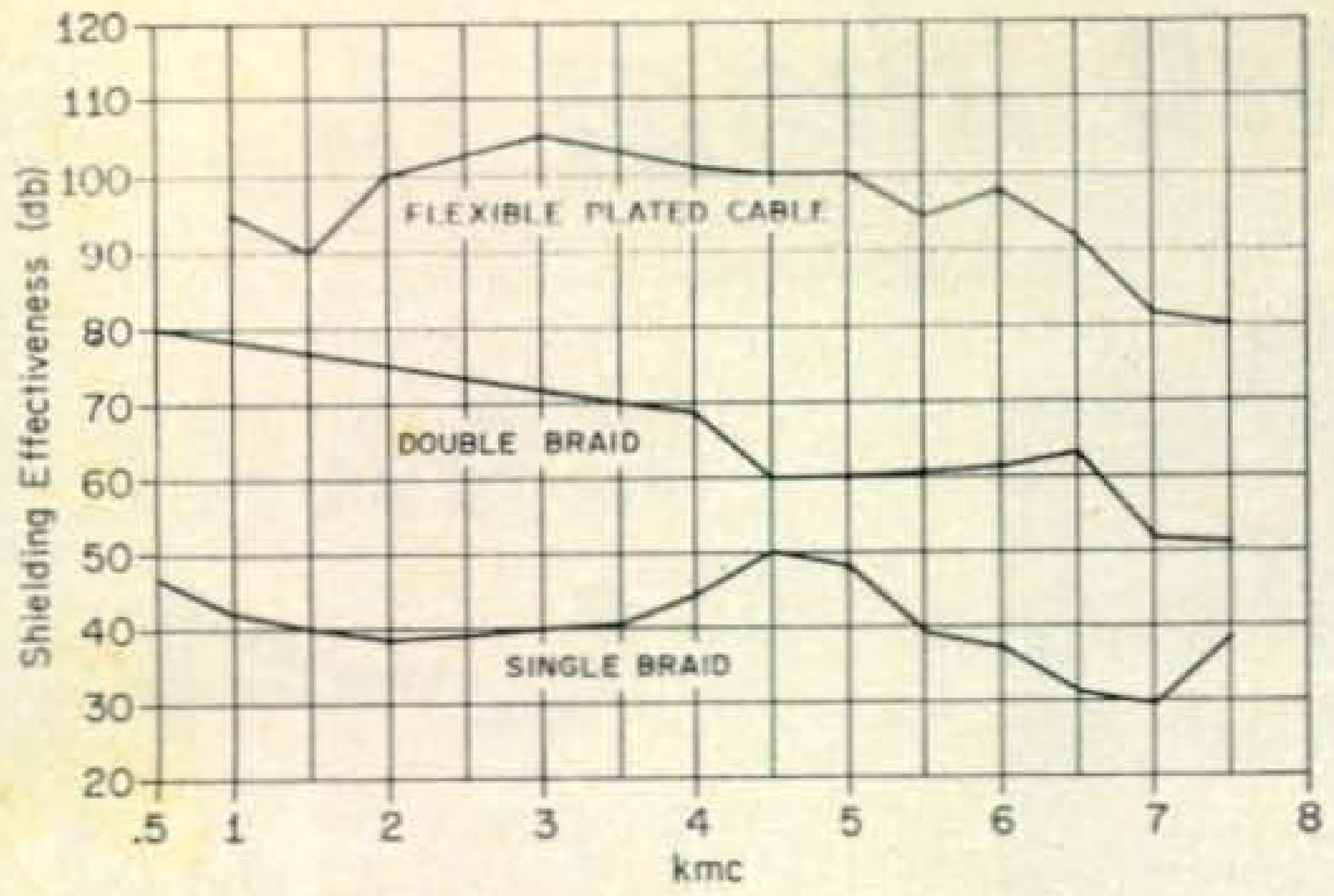


Fig. 3—A comparison of the shielding effectiveness of the two presently available types of coax and the new plated type.

tend to separate at the outside of a bend area and come together at the inner part of the bend. Great for flexibility, but poor for holding the characteristic impedance constant. With the solid shield, this problem is eliminated, but a few small-diameter bends usually rupture the outer conductor due to metal fatigue.

United-Carr's cable utilizes the solid shield too, but a novel mechanical twist in the form of a bellows-like groove cut into the dielectric by pulling it through a rotating hot die prior to plating, assures that rupture due to flexure is eliminated. Using this method, virtually unlimited lengths of reliable cable can be produced.

Even with the grooved configuration, getting a reliable copper-film coating that is ductile and adherent under flexure requires a high degree of chemical and mechanical process control. Purity of materials used in the plating process and careful control of factors like temperature, solution acidity or alkalinity and time can drastically effect the outcome of the process. The copper anodes selected, for example, are OFHC®[3] brand copper, a high-conductivity (oxygen-free) copper material, with less than 100 p.p.m. impurity content which is the purest commercially available. This particular anode was selected because it assured that a minimum of impurities would enter the plating bath during fabrication.

While a lengthy discussion of the many steps in the fabrication technique could follow, these extensions of basic plating technology are largely chemical, and of little interest to the end user. The point here, is that this cable looks like the first "better mousetrap" in the cable field and that the development seems likely to expand into a line of new and better coaxial cables offering the advantages of more expensive commercial lines at prices within the grasp of the amateur's pocketbook.

There is another big advantage to a plated line in that those little extra-long pieces of wire that often end up shorting out inside the connector are no longer a threat. The solid shield is a one piece structure and the poorest assembler will find it difficult to err in the connector department.[4]

While the only cable presently produced on a commercial scale is the one 0.142" type, other

[3]OFHC is a trademark of American Metal Climax, Inc.
[4]The commercial cable now available is supplied with connectors affixed.

[*Continued on page 102*]

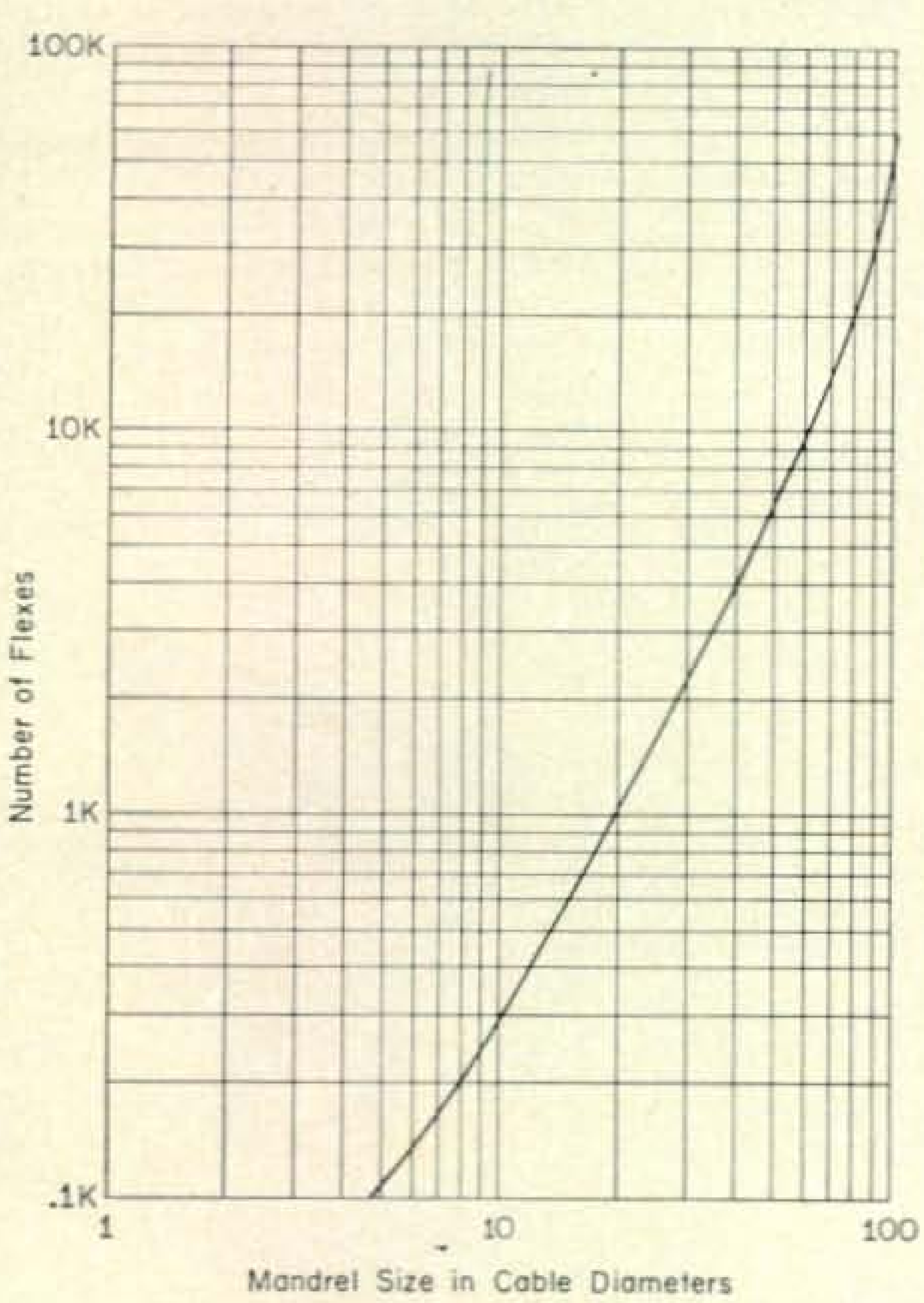


Fig. 4—A plot of the number of flexes before failure occurs. A failure is indicated when the d.c. resistance of the outer conductor increases by 10% or there is a 20% reduction in high frequency response.

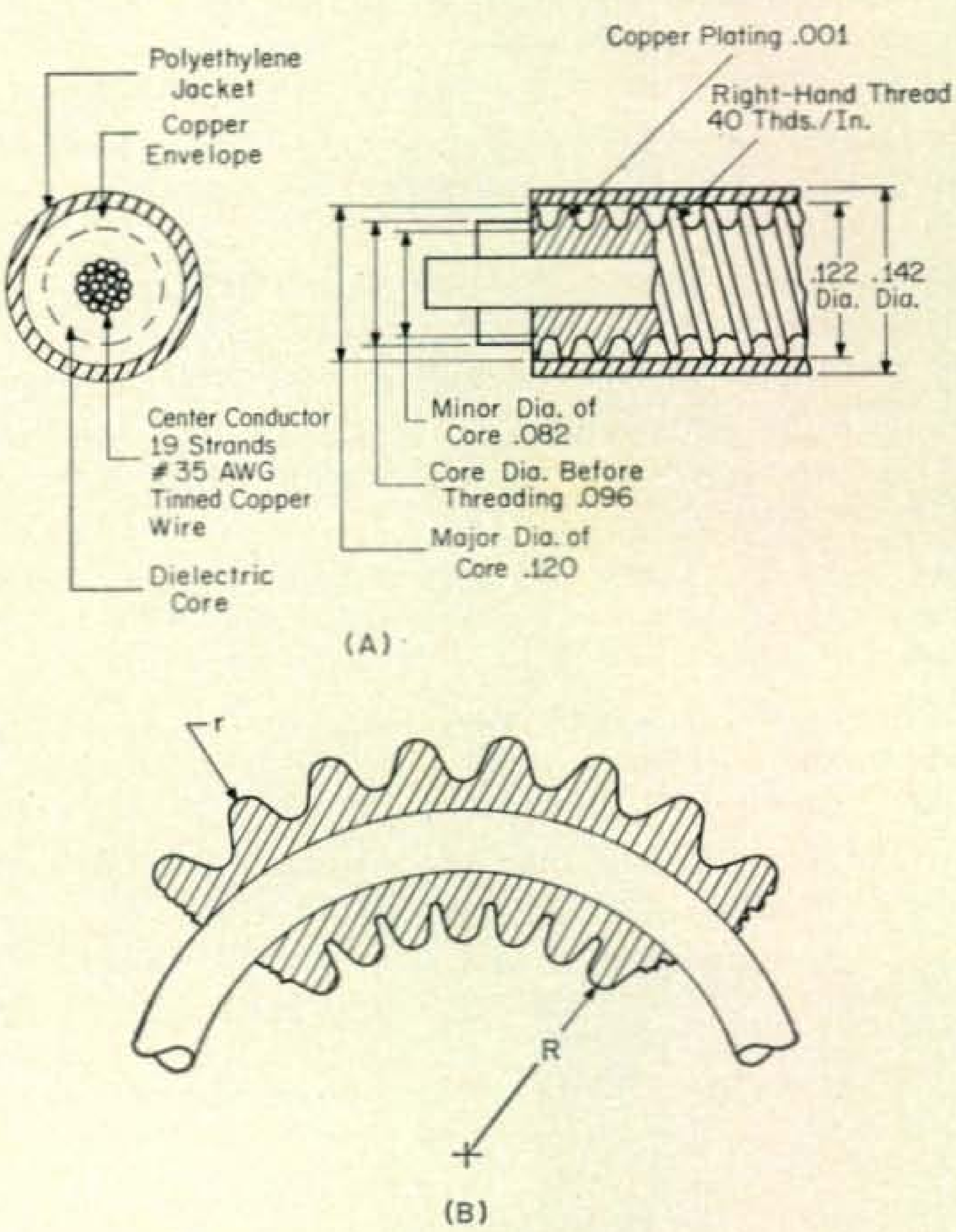


Fig. 5 (A)—An axial and lateral section view of a typical plated coaxial cable section. Note the threaded dielectric material that permits cable flexing as shown in (B).

Nothing halfway about the

DRAKE L-4 LINEAR AMPLIFIER

built for continuous duty at full capacity

- 2000 watts PEP SSB—1000 watts DC input power on CW, AM and RTTY. Massive plate transformer, large heavy duty plate tank components and voluminous cooling system insure continuous operation at these ratings.
- High efficiency Class B Grounded Grid circuit uses two 3-400Z or 8163 zero bias triodes. These two tubes have a total plate dissipation rating of 800 watts and their rugged construction withstands abuse.
- A broadband tuned input circuit is employed on each band for minimum distortion, higher efficiency and a 50 ohm input impedance.
- The L-4 Linear Amplifier matches the TR-4 Transceiver and the T-4/T-4X Transmitters in appearance and drive requirements to run the maximum legal input power. Any exciter that can deliver 100 watts PEP SSB and 75 watts on CW will be able to drive the L-4 to the maximum legal input power. An advantage of the Grounded Grid Circuit is that most of the driving power adds to the output power.
- RF negative feedback decreases distortion to better than 35 db and tends to equalize tube characteristics from tube to tube and from brand to brand.
- A transmitting AGC circuit controls the exciter gain to allow a higher audio level without peak clipping. An adjustment is provided to set the threshold level for optimum operation of different exciters.
- Rapid heating filaments and the solid state power supply allow the L-4 to remain off until its use is required. It needs only 3 seconds from switch on to 2000 watts.
- Two taut-band suspension meters indicate plate current, grid current, plate voltage, and relative RF ouput power. The frictionless suspension eliminates sticking and improves accuracy.
- An internal changeover relay feeds the antenna through when on receive or when power is off. A pair of relay contacts bias the output tubes to cut off, eliminating any diode noise when receiving.
- A quiet, low velocity, high volume internal blower effectively cools tube base seals, envelopes and plate seals.

◀ The solid state Power Supply provides excellent dynamic and static voltage regulation. The Power Supply is separate to keep the weight off the operating desk and to make a more flexible installation.

The buy of a lifetime... to last a lifetime... only

\$695.00 Amateur Net

including Power Supply

SPECIFICATIONS

Frequency Range: Ham bands 80 thru 10 meters. All frequencies 3.5 to 30 Mc may be covered with some retuning of input coils.

Plate Input: 2000 watts PEP-SSB, 1000 watts DC on CW, AM, RTTY and Tune.

Drive Requirements: 100 watts PEP-SSB, 75 watts CW, AM, RTTY and Tune.

Input Impedance: 50 ohms.

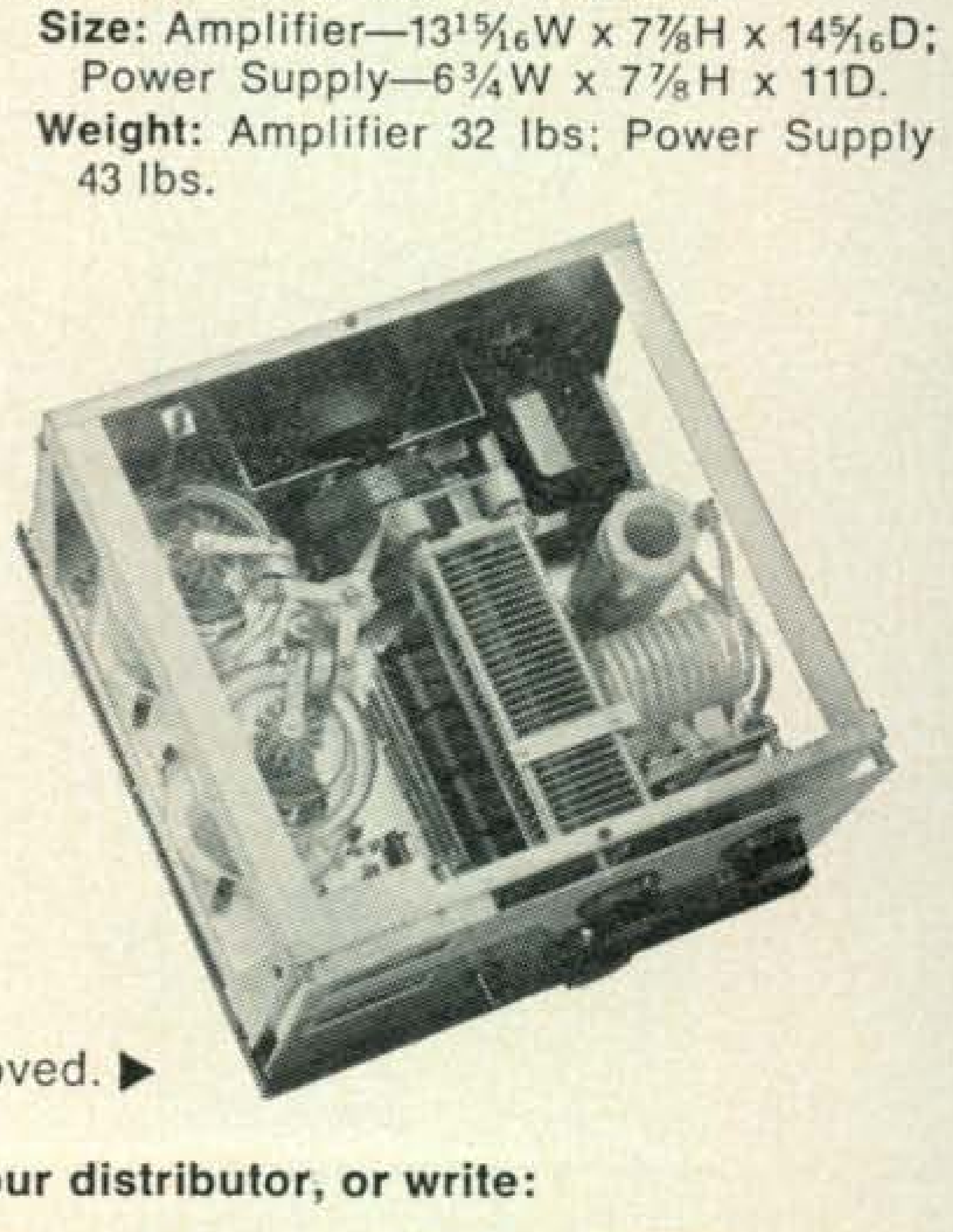
Output Impedance: Adjustable Pi-Network matches 50 ohm line with SWR not to exceed 2:1.

Power Requirements: 230 volts, 50-60 cycles, 15 amperes or 115 volts, 50-60 cycles, 30 amperes.

Tubes: Two 3-400Z or two 8163.

Size: Amplifier—13 15/16 W x 7 7/8 H x 14 5/16 D; Power Supply—6 3/4 W x 7 7/8 H x 11D.

Weight: Amplifier 32 lbs; Power Supply 43 lbs.



L-4 Linear Amplifier with cover removed. ▶

For more information, see your distributor, or write:

R. L. DRAKE COMPANY, Miamisburg, Ohio 45342

For further information, check number 36, on page 110

Not On Our Transmitter You Don't Say "Drop Dead"

(or Come to Swingin' London)

BY SYLVIA MARGOLIS*

THREE thousand years ago, before the days of single sideband, an ancient Briton swung down from a tree on the banks of the Thames and made a quick buck ferrying a traveller across the river in his coracle.

The place attracted tourists. First came the Romans and they called it LONDINIUM and stayed a long time. Then the Saxons came and the Vikings and that was a lot of fun for the girls, like when the Navy comes into port. The Normans arrived, made a successful take-over for the business and built a fortified Hilton, later known as the Tower of London.

By the twentieth century London was not only the biggest city in the world, the most exciting city in the world and the biggest port in the world, but it found itself in the slightly embarrassing position of being the tourist center of the world.

This is just dandy and we in London love the "Bundles for Britain" that come in the form of visitors' dollars and francs and deutschmarks and pesetas. The privilege does, however, throw a certain burden of responsibility on the citizens, even if that involves nothing more than devising ways to jostle tourists to the back of the bus queue in the rush hour. When those same citizens are radio amateurs, with their educated consciousness of a world outside Britain, London's new and profitable role becomes even more demanding.

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

Her radio amateurs cope with the problem in widely varying ways. Ours is, frankly, masochistic.

Because my husband and son prefer DX operation to local, because we are naturally gregarious, because we live not far from the center of London and because I open my big mouth far to often, we have lots of overseas visitors. The limit might be said to have been reached the icy, wet, July night, when, just as we were going up to bed (at least it was warm there,) a taxi pulled up and out staggered an F2, decked overall with baggage and cameras.

"My friends tell me this is an 'otel. . . ."

The last train had gone back to town, so we made up a bed and he stayed a week and taught me how to cook.

Most of the encounters are successful and well worth the chaos they cause. Sometimes, though, we fall flat on our faces. There was the amateur who visited us, then went on to the U.S., taking a list of our favorite contacts there, so that he could call on them, free-loading in our name! There was another who passed us a rubber check. And one who brought his girl and wanted to live in sin, right there in our home. We considered the educative value this might have for the children and the entertainment it might have been for us, then said no. Another guest used our home to quarrel with his wife by long-distance telephone. This was a novelty for the children. Ours is a family with no quarrels, because

Edgar Wagner, G3BID, and his Bentley. Photo taken in Belgium where he operates ON8ID/M.

I give in every time. They listened, enchanted. It was better than Batman. And there was a K6 who contracted bronchitis and had to be put to bed and nursed and reassured that we still loved him and the local ham fraternity came and ate the grapes I had bought and talked about all the DX he was missing, so that his temperature went up and we were back to square one. Or there were the nuts, like the DX-er who, when we were talking of the distinguished amateur who didn't become President of the U.S., wanted to know "HAS HE WORKED ME?"

A routine has developed for processing visiting amateurs who are in London for a few days, or hours, and want to see everything. We try to meet them at airport or station and transport them to their hotel, taking a route that lets them see most of the sights of London, thus saving time for important things like meeting radio amateurs. We can do the lot, including St. Paul's, Westminster, Buckingham Palace, Piccadilly, Trafalgar Square, Tower of London, Marks & Spencer, Bloom's Restaurant and R.S.G.B. Headquarters in forty-three minutes, depending on the density and bloody-mindedness of the traffic.

Sometimes we don't know they are here until they call. Then we get busy with phone and local 2 meter net and rustle up a party. This is known as a HAPPENING and it can happen once a week during the tourist season. On occasions like the London SSB Dinners and the time we married off K6IWG (all described in previous issues of *CQ* Magazine,) we have entertained 50 people in 375 sq. ft. of living room floor space.

Our open-house reputation earnt my husband an R.S.G.B. award in 1966, the "Calcutta Key." Contrary to popular belief, this is not the freedom of the City of Calcutta, but a tribute for service to international friendship in amateur radio.

Ours, though, is an individual effort, by an individual and slightly dotty family.

Another famous practitioner of sweetness and light to overseas guests is G3BID, Edgar Wagner. He has the advantage of two cars, one of them a Bentley, and two homes, one in London's most sumptuous suburb, Hampstead, the other a cottage on the wild, lonely coast of Dorset, with no neighbours and no T.V.I. Here he entertains privileged visitors, flying their national flag from the flagstaff and living the simple life, between QSO's, with *filet mignon* and *Volnay '47*.

Yet another noteable entertainer is Joe Steele, G3KZI. Wednesday night is traditionally Joe's Night, when local amateurs gather to eat Frances' smoked salmon ("lox") and drool over Joe's sheepskins. It's surprising how many overseas visitors manage to be in London Wednesdays.

It was Joe Steele and Norman Fitch, G3FPK, who, in 1963, organized the First London SSB Dinner, for no reason other than that somebody had to do it and no official body would attempt such a revolutionary, extravagant scheme. Joe and Norman always tend to think big and this was the biggest think of all. The First Dinner was a success, the Second was a sell-out. The Third London SSB Dinner will take place on May 20th at the new superb Royal Garden Hotel. It promises to be the biggest world Radio event of 1967.

All of us learnt quickly the facts of life on how to entertain radio amateurs.

Never try to mix ages or interests. The 16-year-old will bore his middle-aged hosts as much as they bore him. The Professional Old Timer, who looks back constantly on past glories and does nothing but criticise new trends, will antagonise the enthusiastic newcomer. The s.s.b. DX-fan and the Top Band c.w. Man are as much apart as if theirs weren't the same hobby. Then you must never over-organize your guests. Unnatural as it may seem, it might just be that their purpose in visiting your city is to keep business appointments, look up relatives they haven't seen in thirty years or indulge in a theater-concert-museum-shopping orgy, rather than to sit in the shack watching your oscilloscope, or be dragged like some war booty from amateur to amateur. And never, never squabble with other amateurs in your community over a visitor. We have been on the receiving end of this and know how embarrassing it can be.

Edgar's cottage in Dorset, where he entertains privileged guests.

No official effort at entertaining overseas guests had been tried until 1963, when a splendid hospitality project was organized by the Radio Society of Great Britain to celebrate its Golden Jubilee. It was a pity this had to be followed by yet another two fallow years.

At last, in 1965, for the International Radio Communications Exhibition, a Reception was given by R.S.G.B. for foreign visitors. This was so successful that it was repeated in 1966 on a much larger scale (see "Pussy Cat, Pussy Cat, Where Have You Been?"—Feb. issue,) with another enterprising idea—a tour of London by chartered bus for 19 guests, most of them Belgians, with a commentary in French by a British amateur who is un-British enough to speak several languages.

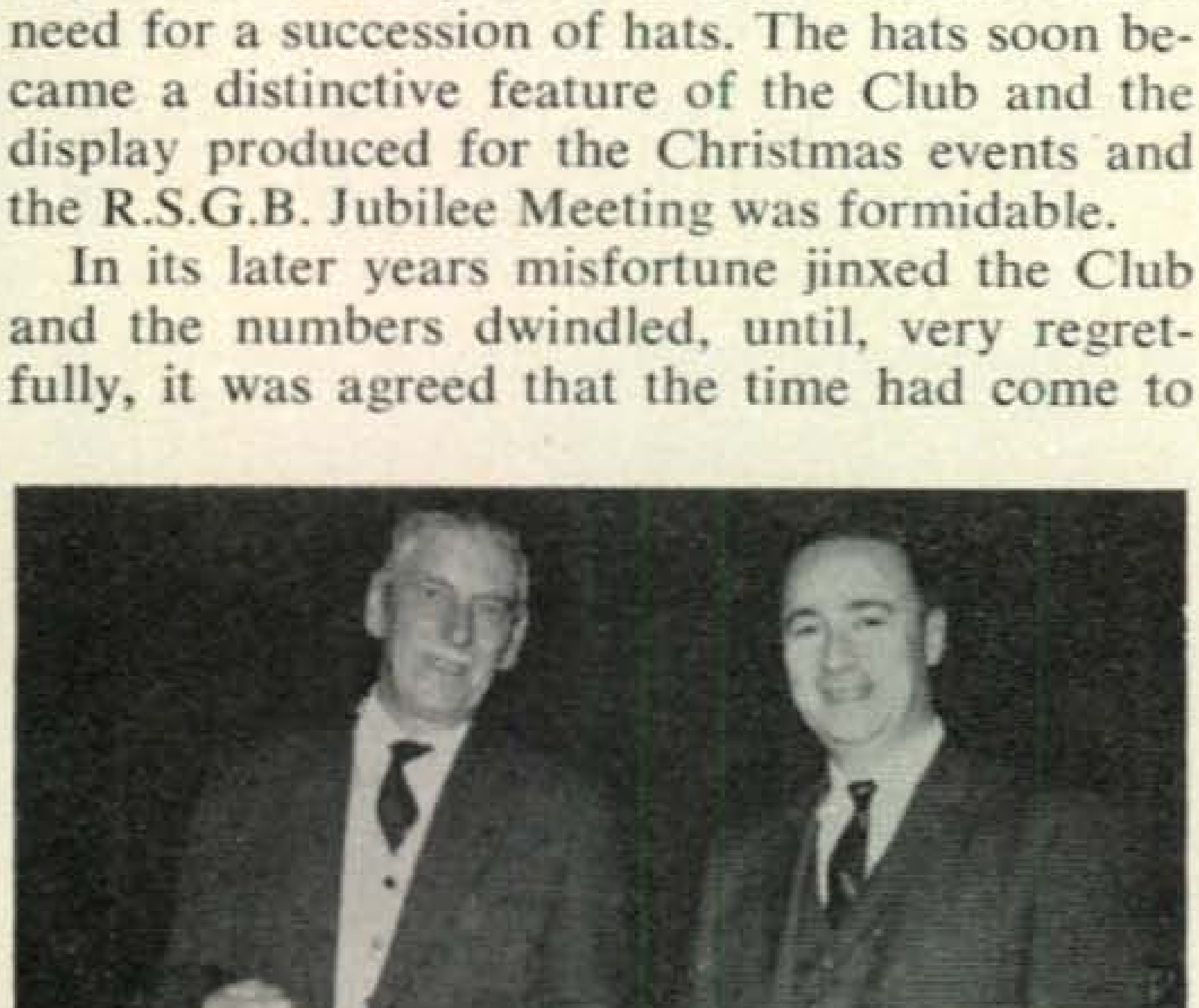
For many years, though, there had existed the Luncheon Club. In the early 1950's, a group of far-seeing G's, with Frank Fletcher, G2FUX, prominent among them, started the London Members' Luncheon Club. The Members were members of R.S.G.B. but the Luncheon Club, in all its sixteen successful years, in which it became one of the most famous features of international amateur radio, was never an official Society activity. Not once did it have to call on R.S.G.B. for financial assistance. This was a miracle, for it was a Club without a list of members, with no rules, no subscription. Anybody could join, just by coming to one of the meetings. Once a month it met in a small London hotel to eat lunch.

With no formal backing it was an *amateur* system for radio amateurs, but the British love amateurism and admire it, especially when it works.

This worked. During its existence it entertained 576 visitors from 93 countries! Traditions grew with the years, carefully followed and lovingly sought after by overseas visitors, who would return again and again.

The Club was one facet of amateur radio that wives supported with enthusiasm and verve. A regular date each month meant an excuse for a day in town and proved to their husbands their need for a succession of hats. The hats soon became a distinctive feature of the Club and the display produced for the Christmas events and the R.S.G.B. Jubilee Meeting was formidable.

In its later years misfortune jinxed the Club and the numbers dwindled, until, very regretfully, it was agreed that the time had come to



W3INH, Harris Nadley (right) with G2FUX, Frank Fletcher.

G2BVN, Roy Stevens, 1966 President of R.S.G.B., at the First Meeting of the new Dinner Club. On his right are Mr. & Mrs. Harris Nadley, W3INH, and on his left the Fletcher family, G2FUX.

call it quits.

London radio amateurs, though, had had a taste of honey. The Luncheon Club had given them a chance to see a vital, and, some judged, the most attractive side of amateur radio—the opportunity to put a face to a callsign. Momentous personal confrontations had taken place, old friendships had been consolidated and new ones formed. It was at the Luncheon Club, for instance, that we first met K6IWG, and look where that led us! Wives the other side of the "XYL Barrier" had been disarmed by the entirely social, non-technical atmosphere and had discovered, through the Club, that radio amateurs are human too, more or less, a premise that many of them had reason to challenge until they experienced this novel, amiable and sophisticated organization.

Now there was nothing.

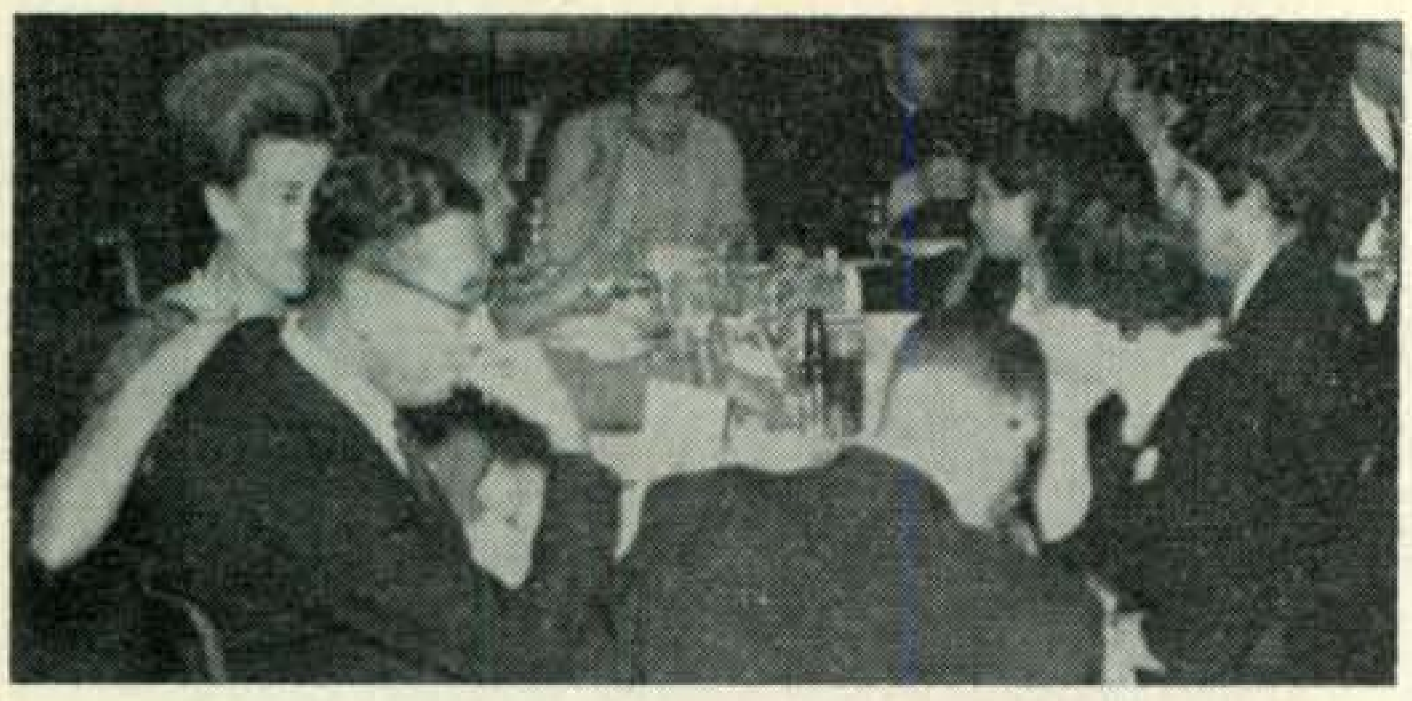
To Roy Stevens, G2BVN, the 1966 R.S.G.B. President, this was an untenable situation. Here was Swingin' London, as cold and inhospitable as a broken heater chain.

At his instigation a new venture was attempted. The R.S.G.B. Dinner Club was an official function—and about time too, growled some of the members. It was planned as an evening event, to avoid the appalling parking congestion that had been one of the factors that stopped people attending the mid-day Luncheon Club.

A few days before the Day it looked as if eight people were going to attend the Opening—the organizers. Here, again, the British genius for procrastination was displayed in all its tatty glory. To be impetuous is to be presumptuous!

But we started with forty people, including three of our New Limeys, the G5+3's, two of them in the U.S.A.F., one a German teacher living in Britain, where he taught *English* at a boys' public school! At the last minute Harris Nadley, well-known DX-er W3INH, and his wife jetted into town and called us from the very decent pub, the Savoy Hotel where they were staying. We said "COME" and they came.

After the Dinner we had an informal, friendly discussion on the Club's future, with the usual departures into irrelevancy, the Good Old Days, personal invective and the war-between-the-sexes



The author, center, eating soup. On her left is DJ5SJ, Rev. Fr. Rae Sturzenhecker, S.J.

that characterises all amateur radio transactions. Don't get the idea that G's are without passion. Beneath our stiff upper lips and above our starched shirts hearts have been known to beat, even if it takes Don Miller to go and sit on a bit of rock in the Indian Ocean to get us going. Eartha Kitt, singing that the Englishman needs time, doesn't always refer to the G waiting for his linear to warm up.

It began to sound like a DX pile-up on 80 and one participant had to go outside for a breath of smog. Then Harris Nadley interrupted the argument he was enjoying with Joe Steele about whether a recent sensational DXpedition was a bum steer or not, to tell the company of the exactly parallel problems experienced in some American ham communities. He went on to say that Wayne Green was the best thing that ever happened to A.R.R.L., which, although not entirely to the point, made us all very happy indeed.

Finally it was agreed that the Dinner Club meet quarterly. This presented the 64,000 dollar question—what happens to those tourists who are unfeeling enough to arrive between meetings? Should they be told go home and come back in time for the next meeting, or encouraged to stay three months, just to take in the next Dinner Club?

A compromise was reached which is likely to give rise to all sorts of situations.

A "Welcome to London" Scheme will be operated by a panel of hosts, whose phone numbers will be relevantly publicised, and to whom R.S.G.B. Headquarters will refer enquiries. Visitors who want to meet British amateurs can call one of these numbers and suitable arrangements will be made for their reception. Four enthusiastic amateurs' wives volunteered to serve on the panel, which was promptly named the R.S.G.B. Callgirl Scheme by somebody, but he was no gentleman. This name will *not,* repeat, NOT, be used.

I can see untold complications developing on these lines, some of them very interesting indeed, but hardly within the terms of the licence.

The First Dinner Club ended rather nicely, and full of promise for the future. Harris Nadley asked if he could come home with us to see if there were any W3's coming through on 40, as a neighbouring ham had promised to be on the lookout for G3NMR that night. It was past midnight, but we drove the ten miles home, pointing out St. Paul's and the Tower of London and Bloom's Restaurant en route.

At 2:30 A.M. Barbara Nadley suggested, gently and reasonably enough, that it was time to go back to the Savoy, to bed, but Harris said:—"I must find out if everything at home is O.K. and the band is just opening up."

"Sure, honey," agreed his wife, "I'd love to know how the kids are." "*Kids*?" asked Harris, "I want to know if the *beam* is still standing!" Which proves it's a question of getting your priorities right.

They stayed until 3:30, when I said:—"Why leave now? I'll cook breakfast and you can get the first train back to town and save the taxi fare."

Next weekend Harris came out to our home again to operate his G5AFN call in the *CQ*-CW Contest. Already the Dinner Club was beginning to establish its identity by broadening our knowledge of amateur radio, because this was our first experience of a c.w. contest.

A nut like this we hadn't had yet, a c.w. fanatic. He knocked off about 200 contacts in an hour with his equipment, which he swore was better than ours, using the obligatory /A suffix. He said it added allure to his call.

Allure? Like a hole in my head! We don't use c.w. much, preferring less primitive means of communication, but we admit that the pioneers crossing Pennsylvania in their waggon trains, might very well need a key to call for help when attacked by Indians, because the whoops of the savage hordes might trip the v.o.x. if they used s.s.b.

Harris kept entirely within the terms of the British licence—we darned well made sure he did—and behaved quite beautifully in the queue for Don Miller, who was getting his feet wet in yet another unlikely place. That man is going to catch his death of cold, going on the way he does!

Some people in the queue were rather impolite and their behaviour seemed to me to be a novel interpretation of the ham spirit. But then, I know, I've got lots to learn still about amateur radio.

But I do think that, in c.w., drop dead sounds most inelegant! ■

"Yeah, the VR9 called you, on 80 yet!"—DX-ers G3NMR, G3BXI and G3KZI exchange fishing stories. G5AAA/KØJBA, right, doesn't wanna know!

For further information, check number 3, on page 110

NARROW BAND, THE NEXT STEP AFTER SIDEBAND?

BY JOHN J. SCHULTZ, W2EEY/1

Part I

In a two-part article the author describes the background and basic theory of newly developed "narrow-band" voice transmission techniques. These techniques permit the transmission of a normal voice channel, 300 to 3,000 cycles, in only a few hundred cycles of bandwith! The techniques are not theoretical; practical systems using "narrow-band" voice transmission equipment are already in operation. Although the principal user of such equipment is presently the military, more widespread use is bound to come about in future years.

ONE of the profound changes that can be expected in h.f. and v.h.f. communications in the next decade or so is the general adoption of narrow-band, digital voice transmission to replace present-day s.s.b. The continued crowding of the amateur and commercial phone bands will accelerate the adaption of narrow-band voice transmission. Also, an additional advantage is that such transmission, with the use of digital techniques, will improve signal levels by 10 to 20 db as compared to s.s.b., for the same average transmitter power. This is at least the same order of magnitude improvement in signal level as exists between a.m. and s.s.b.

Narrow-band voice transmission equipment exists now, in many forms, and the basic techniques used have been well proven. Those amateurs who also work in the electronics field are probably already acquainted with such terms as "vocoders," "formant vocoders," "2,000 bit per second speech compression," etc. However, amateurs in general should also start to become aware of the meaning of these terms, since in the future they will become more and more commonly used in the communications field.

The basic purpose of this article is to acquaint the amateur with the general concepts behind narrow-band voice transmission. The first part of this article deals with the background behind the development of present techniques and an explanation of how normal voice information is converted into narrow-band form, which can then be sent over a wire circuit or fed to the input of a modulator. The second part of the article deals mainly with the modulation techniques which can be used for transmission over a radio circuit.

Very few amateurs would probably be equipped to immediately do any experimenting with narrow-band voice techniques. Therefore, no detailed circuits are included in this article. However, some references are given at the end

*40 Rossie Street, Mystic, Connecticut 06355.

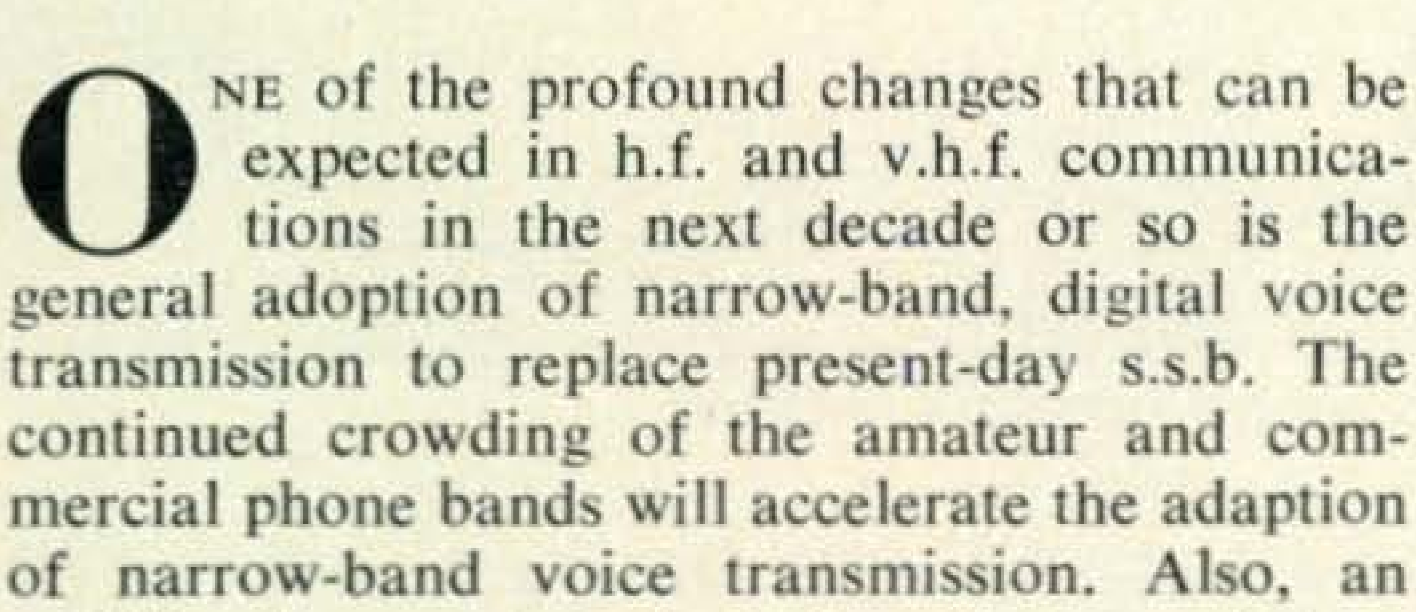


Fig. 1—Basic sequences in the transmission of digital, narrow-band voice.

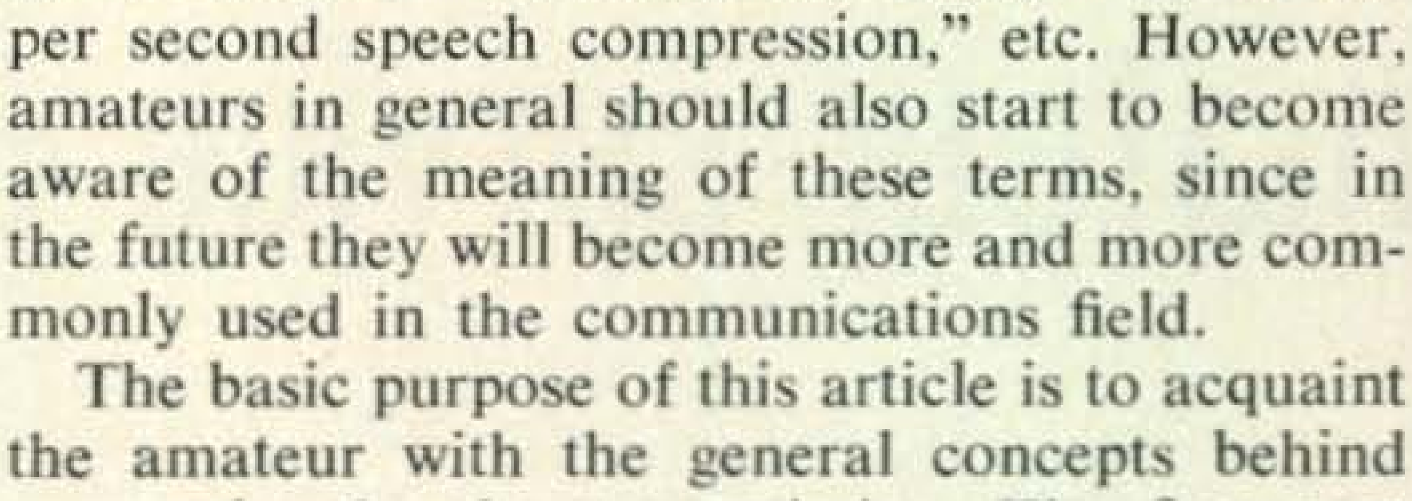


Fig. 2—An example of how phonemes might be encoded in a manner similar to a teleprinter code.

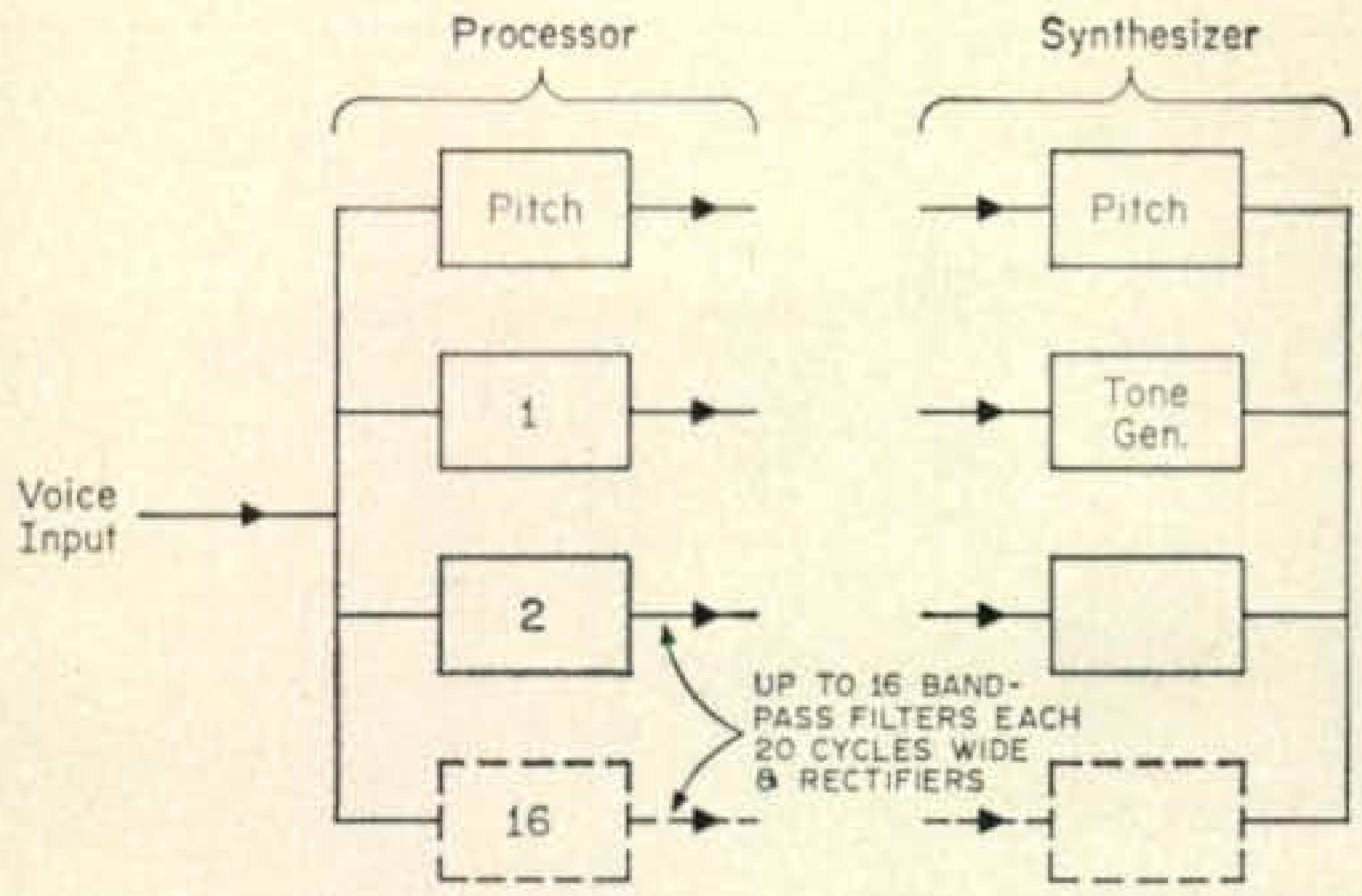


Fig. 3—Basic components of a channelizer type of speech processor. A control voltage is generated each time the input signal contains a frequency within the passband of a channel filter. The control voltage, in the synthesizer, determines the level of a generated audio tone.

of the second part of the article for those who would like to delve deeper into the mechanics of "narrow-band" hardware.

No common standards exist yet for "narrow-band" transmission over radio circuits, in the same sense as s.s.b. standards or the standard teleprinter codes. Most of the equipment already developed has been primarily designed to be able to communicate only with equipment of similar type. However, as such equipment is more widely used, standards will be developed. Also, as equipment designs become more simplified and as the operating characteristics (stability, in particular) of amateur equipment is improved, there may exist an excellent opportunity for amateur radio to participate in the experimentation necessary to help set future, practical standards for the common usage of "narrow-band" voice transmission.

Background

Experiments with narrow-band voice transmission are not new, although practical systems were mainly developed only in the last few years. The Bell Telephone Laboratories, for instance, worked on such systems in the 1930's. However, the economics involved, because of the development state of electronic components then, versus the need then for such a transmission means, prevented it from being fully developed.

In recent years, the need for providing more voice channels within the relatively narrow bandwidth of some relay satellites and work in ciphony (coded speech transmission) probably provided the main impetus for development work on "narrow-band" techniques.

As far as ciphony is concerned, "narrow-band" allows voice information to be transmitted in a form similar to a teletype signal. Therefore, all the sophisticated techniques developed for coding teletype transmissions are basically usable. The degree of security thus obtained is certainly far greater than in scrambled voice transmissions where the voice-frequency band is divided into multiple segments which were then exchanged (frequency translated), with or without inversion of the individual segments.

Another advantage to "narrow-band" is that it allows a large amount of voice traffic to be handled through a so-called data communications system. Military agencies are planning in the future decade, 1970-1980, to have a unified data or digital communications system. That is, information of any sort—voice, teletype, facsimile, punched cards, etc., will be converted into digital form. The digital signals will be routed through radio transmitting, switching, relay and receiving equipment which always operates in the same mode. The only equipment that will not be standard is the ultimate terminal equipment which converts the digital signals back into the desired form.

Basic Concept

Narrow-band speech transmission is really three separate operations as illustrated in fig. 1. First, the speech band of 300 to 3,000 cycles must be examined and only those portions of it which are necessary to transmit understandable speech are extracted. The result of this first process might be from 5 to 10 relatively slowly varying voltages of 20-40 cycles bandwidth each.

These voltages are in analog form; that is, they vary exactly as some function of the speech information. The next process is to convert the analog voltages into digital form. All the voltages are scanned, in order, at some given rate, and a code group is formed similar to a teleprinter code. In the last process, the digital signal is used to modulate a transmitter. At the receiving end, essentially the reverse process takes place, the same as for any other modulation system.

The outputs of the speech processor might be transmitted by means other than digital transmission—for instances as a narrow-band a.m. or s.s.b. signal. However, the signal to noise advantage of digital transmission is one of the main factors which makes the overall concept of narrow-band speech transmission so valuable.

Speech Processing

The objective of speech processing is to take a voice input and extract only those values which are necessary to preserve intelligibility. This process is also called "compression" sometimes, but in the sense of "frequency compression" since the original 300 to 3,000 cycle speech bandwidth is "compressed" into a fraction of the original bandwidth.

The ideal speech processor would be able to recognize each of the approximately 50 phonemes which make up the English language as Americans speak it. Phonemes are what linquists consider to be speech components that can be individually distinguished. In a sense, it is what linquists consider to be the sound alphabet of speech. If such a phoneme processor could be built, speech could be transmitted by a six unit code very similar to the present 5 unit teleprinter code. An example of how some phonemes might be encoded is shown in fig. 2. A six unit code is necessary since it provides 64 combina-

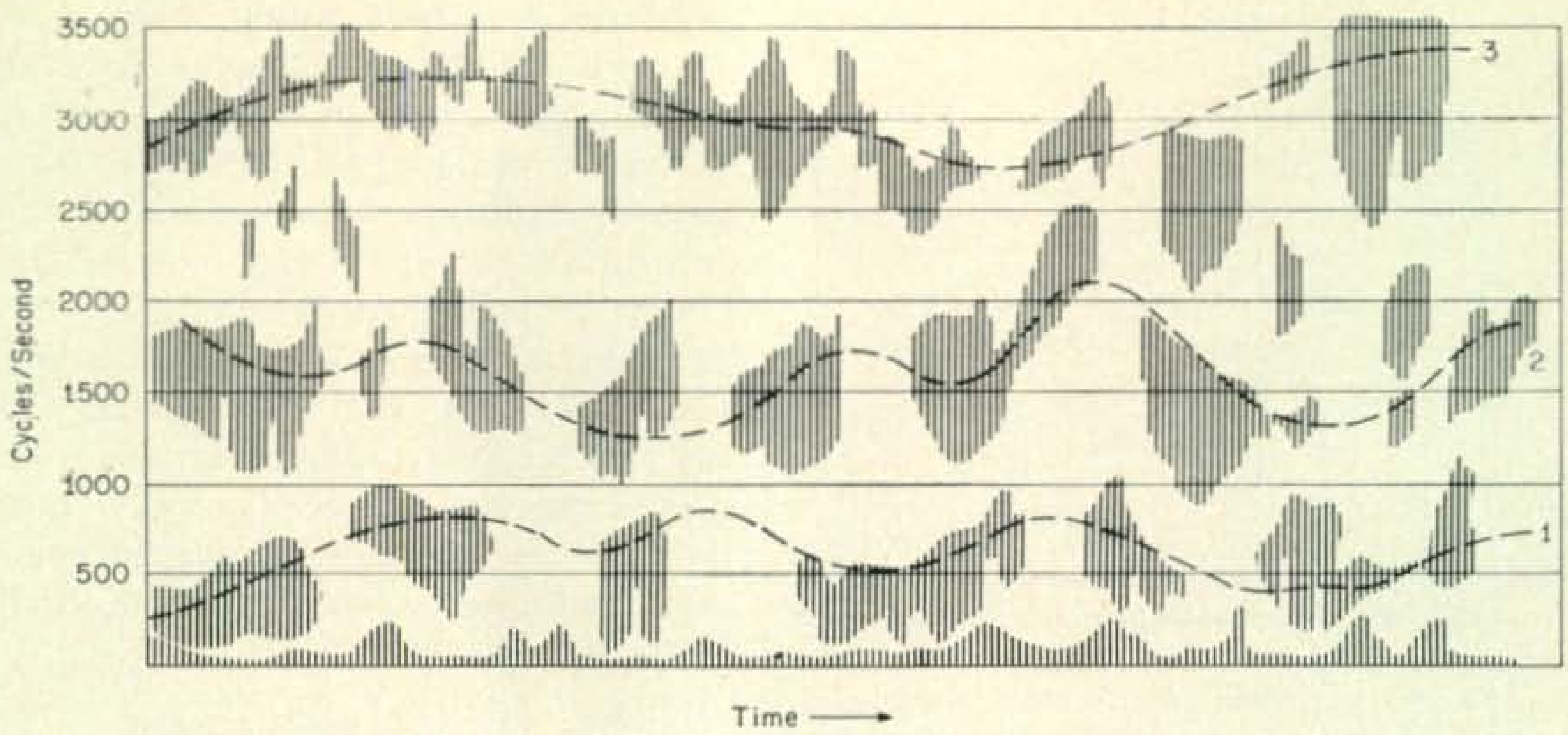


Fig. 4—A representation of a spectrogram of a speech waveform. Three formants are shown.

tions while a 5 unit code is limited to 32. Since in actual speech, phonemes occur at about the rate of 10 per second, the six unit code would have to be transmitted at the same rate. This would be equivalent to 120 words/minute teleprinter transmission.

In actuality, a phoneme processor is very complex to build, at least one that will respond to speakers with different dialects. It also has the disadvantage of being limited to one language unless an additional phoneme equivalency converter is used. Then, of course, it offers the possibility of automatic language translation! Although phoneme processors would be the ideal, they are still highly experimental. However, practical processors have been built using two other methods-channelizers and formant tracking.

Vocoders

One of the earliest approaches to building a so-called *vocoder* or voice coder utilized the channelizer principle. The basic idea was to extract selected, very narrow bandwith channels from the voice frequency range as shown in fig. 3. It was also necessary to produce a signal related to the pitch or fundamental frequency of a person's voice. With sufficient channels, a somewhat rough but very intelligible voice signal could be produced. The voice bandwidth could be "compressed" to a minimum of about 500 cycles.

The number of channel filters needed could be reduced by making the pitch channel cover a wider frequency range. If the pitch channel extended to 1,000 cycles, for instance, probably 6 or 7 channel filters would suffice. This would result in a bandwidth "compression" to about 1200 cycles.

Formants

The other main approach to speech processing is *formant* tracking. Scientists examining a specterogram or photograph of speech patterns (fig. 4) noted that speech grouped itself into discrete bands of frequencies called formants. The frequency excursion of these formants vary according to individual voice characteristics; however, they are always recognizable as discrete bands in speech patterns.

Formant tracking speech processors work on the principle that the first three formant bands are the most important for speech intelligibility. For each of these bands they produce two signals; one proportional to the energy content in the band and one proportional to the center frequency of the band.

Therefore, a total of six outputs is basically required. This is a considerable savings as compared to up to 16 outputs from a channelizer type processor, most of which are not active anyway except when a speech input contains a frequency falling within the bandpass of a specific channel filter.

A formant-tracking speech processor must also have a pitch channel but its bandwidth need only be 40-50 cycles. The three formant bands might be arranged, for example, to cover 100 to 600 cycles, 600 to 2,000 and 2,000 to 4,000 cycles.

Each output (amplitude and frequency) would require 30-40 cycles bandwidth. Therefore, the entire speech signal can be transmitted with a maximum bandwidth of 280 cycles. Actually, these figures are somewhat generous; systems have been built with bandwidths of almost half those indicated. Figure 5 shows a formant-tracking processor arrangement.

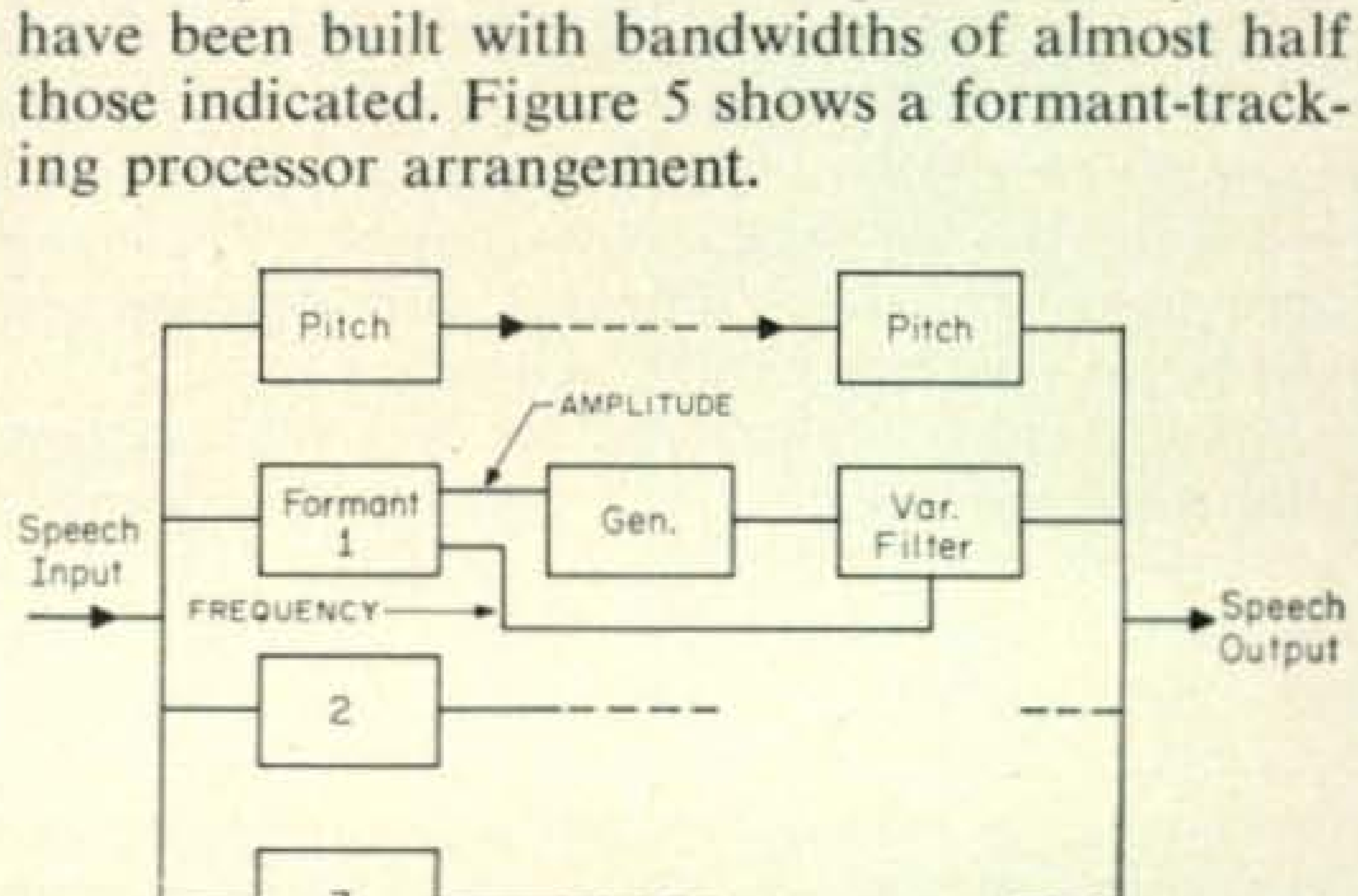


Fig. 5—Basic components of the processing and synthesizer terminals using a formant-tracking system.

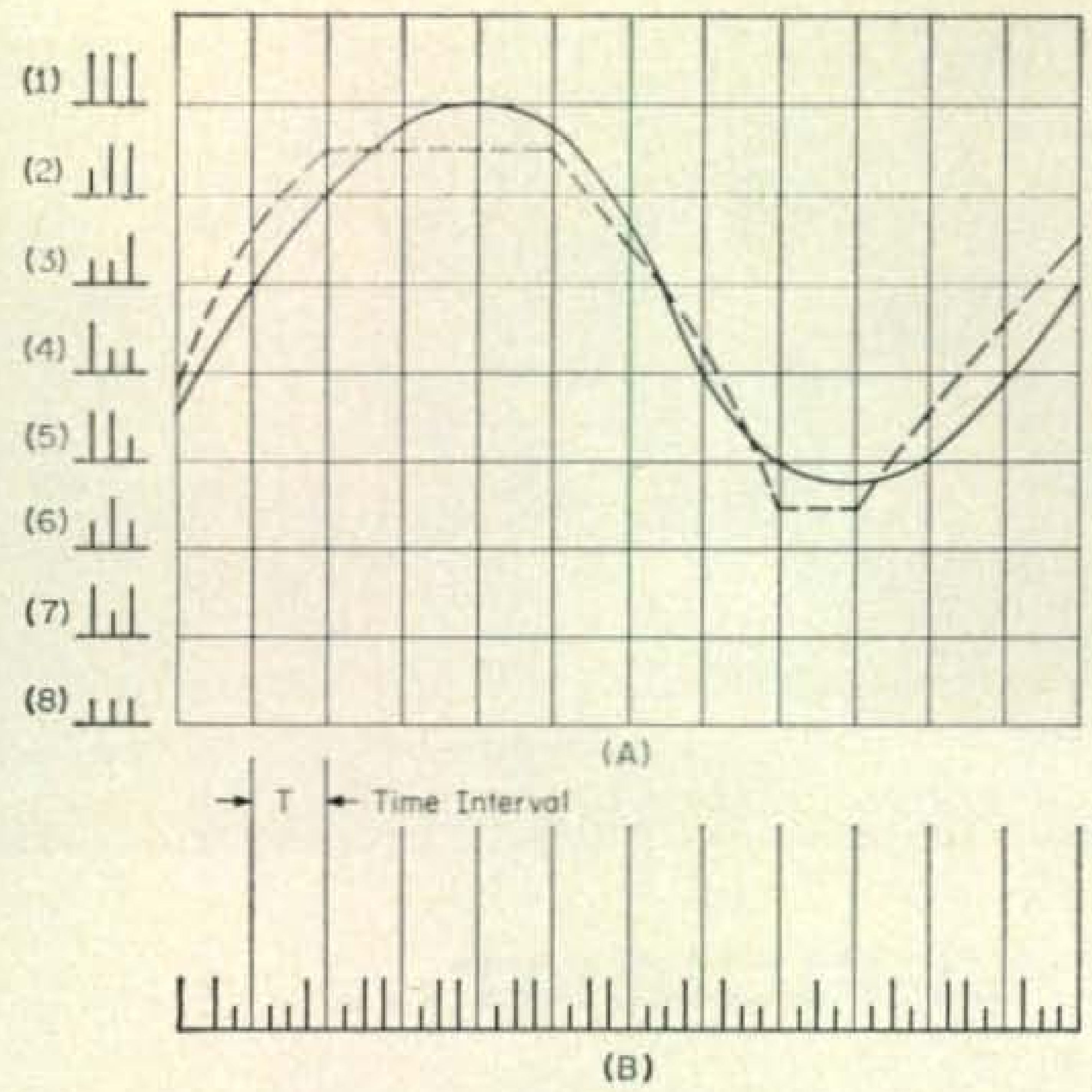


Fig. 6—Quantization of a sine wave. The 3 unit code shown in (A) produces a unique output for each of 8 levels. (B) shows the wave transformed into digital form. The dotted waveform in (A) is the reconstruction using the digital signal of (B).

Analog Modulators

The outputs of either channelizer or formant processors are analog signals; that is, they are proportional at every instant to some characteristic of the input signal. The outputs of a speech processor might be frequency translated to produce a narrow-band audio signal which can then be transmitted over any transmitter like a normal, full width voice signal. At the receiving end, audio filters could be used to separate the signals so they could actuate a speech synthesizer.

As will be seen later, this is not the most efficient way to transmit such a signal but, it would work and would provide a tremendous increase in the number of frequency channels available for phone work. Amateur experimentation with narrow-band speech transmission might well use this approach initially although it would require special FCC permission to transmit such signals.

Analog To Digital Converter

The speech processing unit has converted the original speech signal into a group of analog signals which occupy a far narrower bandwidth. The analog to digital converter is a device for converting these signals into a form similar to a teleprinter signal in order to take advantage of the better signal-to-noise ratio of digital transmission. The original unprocessed speech input might also be run directly through a digital converter but, as will be seen later, this would have no advantage since the transmission bandwidth is increased; it would only be done in a ciphony system.

The process of transforming a continuous wave into discrete, standard values is called *quantization*. The sine wave in fig. 6(A) is shown quantitized into 8 levels. The presence of the wave in each square produces a different coded output. Since 8 discreet levels must be coded, a 3 unit code is suitable since this gives 8 on-off combinations. The wave shown is transformed into a series of pulses as shown in fig. 6(B). Used to re-construct a wave, the result would be the dotted waveform in fig. 6(A). The more quantization levels used, of course, the more faithful will be the re-construction. Sixteen levels are commonly used in practice.

The length of the time intervals, T in fig. 6(A), used to sample a wave should obviously be related to how fast the wave is changing. A mathematical theorem, the Nyquist theorem, states the sampling rate should be twice the highest frequency contained in the wave. For instance, a wave of 100 cycles/second would be sampled 200 times a second. If it were quantized into 16 levels, a total of 4×200 or 800 on-off pulses (or "bits") would be produced every second. Standard 60 w.p.m. teleprinter transmission, for comparison, requires 35 bits/second.

There are seven outputs from the formant-tracking speech processor shown in fig. 5 (pitch plus amplitude and frequency for each formant range). Assuming, for simplicity, that each output has a frequency range of 30 cycles, we need to scan each output 60 times a second. Quantized at 16 levels, each output requires a 4 unit code. The total result if we transformed all the outputs into digital form would be a 28 bit code word (4 unit code times 7 outputs) transmitted 60 times a second or a 1,680 bit per second total. Practical systems, including additional bits for synchronization purposes, have required from 1,000 to 2,000 bits per second.

A quick comparison to the digital transmission of unprocessed speech shows the tremendous transmission advantage of processed speech. Unprocessed speech, extending to 3,000 c.p.s. would require 24,000 bits/second ($4 \times 6{,}000$) in digital form.

The digital signal produced by an analog to digital converter can be transmitted over wire lines, the same as any other on-off pulse information-teleprinter or punched card data, for instance. How digital transmissions can be handled over radio circuits is discussed in the second part of this article.

[*To be continued*]

"Give me ten minutes and I'll QSY to the other end of the band."

For further information, check number 5, on page 110

OPTIMIZE YOUR TOUCH-KEY

BY ALBERT H. JACKSON,* VE3QQ

The opportunity for improvement always exists and so here are some minor alterations that will increase the sensitivity of the Touch-Key and thus improve its performance.

WHILE the original Touch-Key[1] has given a good account of itself in regular c.w. operation, under certain circumstances skin dryness and lack of conductivity have remained something of a problem. The use of glycerine on the fingers has been one solution, but a sufficient increase in the key's sensitivity should make this unnecessary in all but the most extreme cases. Fortunately, such an increase is not hard to obtain, though the means of doing so did not occur to the writer until recently.

Touch-Key sensitivity depends upon how easily its oscillators can be stopped by body capacity, and this is governed to a large extent by the amount of feedback provided by the circuits. Minimum feedback, consistent with stable oscillation, gives the greatest sensitivity, and vice versa. In any oscillator, there are several ways of adjusting the feedback coupling, some of which can be more readily applied to a given design than the others. Two methods of controlling oscillator coupling, and therefore the sensitivity of the Touch-Key, are described below.

Method No. 1

This method gives the best results by providing maximum sensitivity and control, but necessitates changing the Touch-Key coupling capacitors C_3 and C_4 to smaller, variable, 9-35 mmf units. Sub-miniature ceramic types (Erie N-650 538-000-94R or equivalent) may be used.

*12 Third Ave., Box 453, Arnprior, Ontario, Canada.

[1] Jackson, A.H., "The Touch-Key," *CQ* November 1964, page 28.

Upon completing the change, set both capacitors at the middle of their ranges, then adjust the coil-slugs to bring the respective oscillator frequencies to 1500 and 1600 kc as in the original article. With a non-metallic screwdriver, decrease each capacity until oscillation ceases, then increase to the point where oscillation just begins. This will produce maximum sensitivity, and the key will probably trigger before actual finger contact is made with the paddles. However, this condition is likely to be unstable and may lead to interaction between the dot and dash sections. Both capacities should be increased to ensure reliability along with the desired touch sensitivity. Replacing the metal cover-can may necessitate some further adjustment for optimum conditions, unless access holes are provided and the whole operation done with the cover installed.

Method No. 2

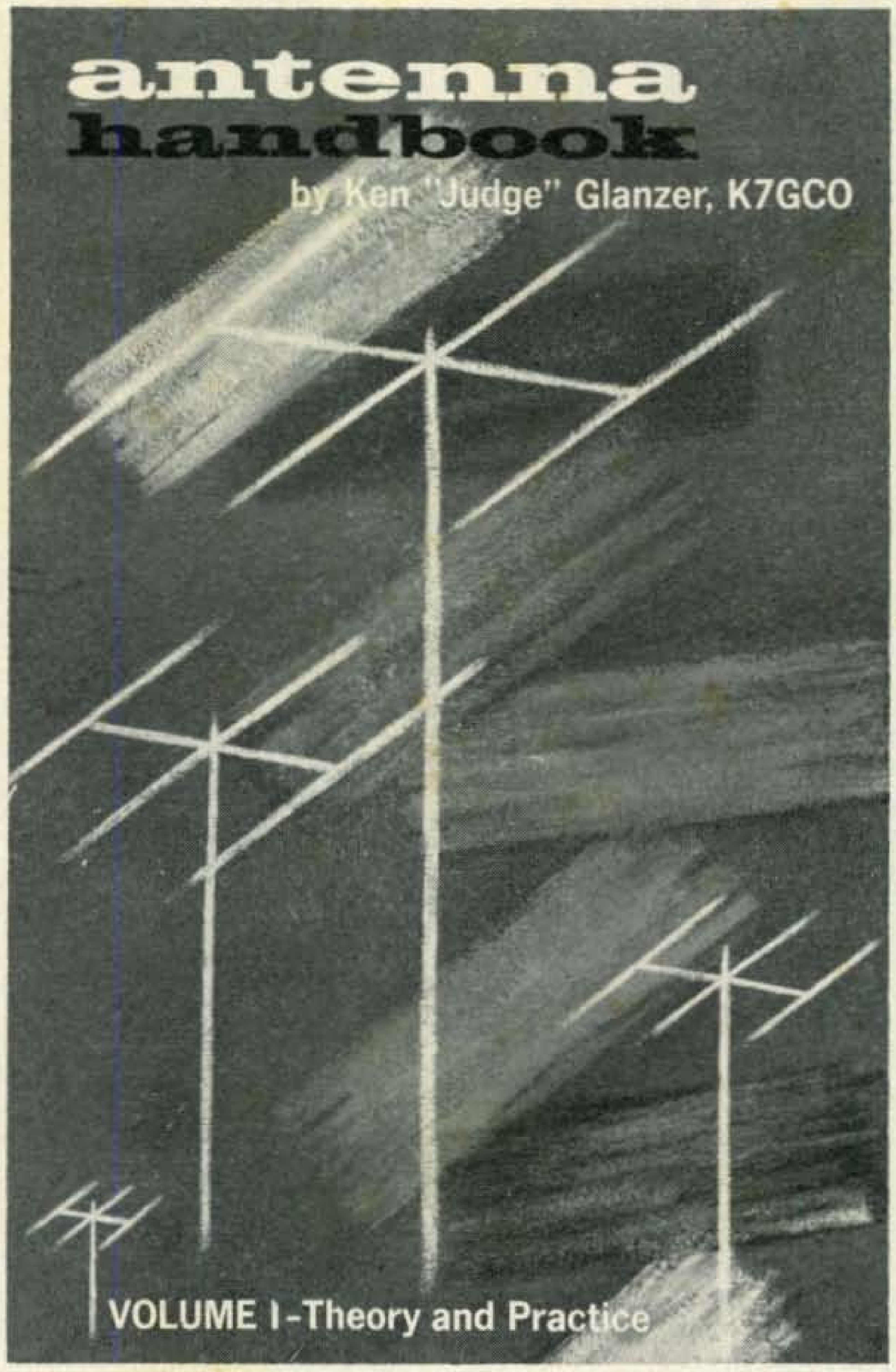
Method No. 2 is very easy, and in most cases will work almost as well as Method No. 1: just *lower the frequencies of the Touch-Key oscillators.* Turn one slug fully into its coil, or if oscillation stops, back off until stable oscillation is again obtained. Check the frequency, and set the other oscillator about 50 kc above this in the same way. These simple changes give a rather surprising gain in sensitivity, probably because of a reduction in coupling caused by the entry of the brass coil-slug adjusting screws into the respective fields of L_1-L_3 and L_2-L_4.

Neither scheme is very difficult to try on an existing Touch-Key and, for new construction, Method No. 1 is recommended. Either way, the improvement in perfornamce is worthwhile. ■

Something <u>Really</u> 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

A $\frac{5}{8}$ WAVE VERTICAL ANTENNA FOR 440

BY BYRON H. KRETZMAN,*
W2JTP

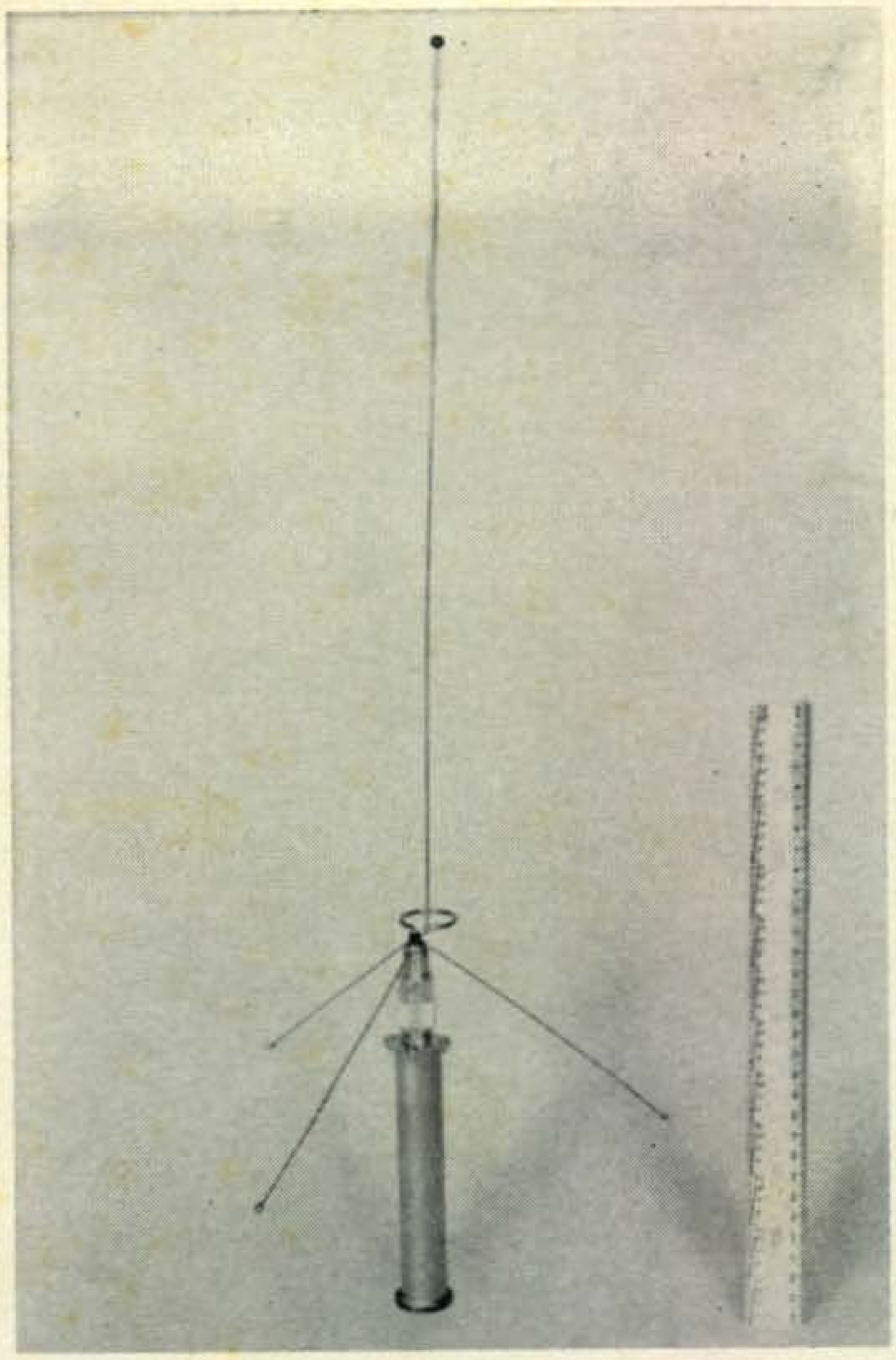
It's probably news to most hams, but the 420 to 450 mc band *is* used for something else besides occasional long distance DX-chasing via meteors. It is used by the f.m. operators when it is desired to have a "private" channel, free from the big ears with the tunable gooney boxes. It is also used by certain other groups, such as DX associations, particularly in large metropolitan areas, who have found that their "private" continuously monitored channels on 2 meter f.m. were not quite private enough.

Equipment in most general use on the 420/450 band is Motorola (T44A), Link, or RCA, ex-mobile two-way f.m. radio gear, operated usually with home-brewed a.c. power supplies. Antenna polarization has been standardized upon as vertical, mainly because a vertical is omnidirectional, and secondly because operation with mobiles is sometimes required. (Mobile on 420/450? Yes, indeed. Remember, these f.m. sets were mobiles in commercial service.) Thirdly, it is possible to build gain into a vertical omnidirectional antenna without getting into a massive complicated structure.

A ⅝-Wave Antenna

Although the f.m. gear used on the 420/450 band puts *out* about 20 to 30 watts, operators soon find that, if they use simple ground plane antennas, their range is considerably less than it was on 2 meters with about the same amount of power. The obvious solution is to increase the antenna gain, remembering that this works both ways, receiving as well as transmitting, and, is omnidirectional.

The ⅝-Wave "ground plane" vertical[1] is in wide use on 2, thanks to W9EGQ. This type of antenna provides almost 3 db gain; as if you doubled your power. Why not build a ⅝-Wave vertical for the 420/450 band? It struck us that such an antenna could be built simply, with basic hand tools such as an "egg-beater" hand drill and a soldering iron. We found that it could.



A ⅝-Wave Vertical Antenna for 440 mc f.m. This little "ground-plane" provides almost 3 db of gain.

Construction

Our ⅝-Wave antenna was built around the common readily-available u.h.f. coax cable male plug, the PL-259 (Amphenol 83-1SP). Also used was the equally common and available UG-176/U adapter, used normally to adapt the PL-259 to the thinner RG-59/U cable. Figure 1 shows an exploded view of our antenna. The whole assembly plugs into a standard SO-239 female chassis connector equipped with a UG-106/U hood.

The most complicated, if you could call it that, part of building this antenna is drilling, with a #37 drill, a hole through the center of the ¼ inch, 1¼ inch long, piece of bakelite or polystyrene rod. The piece of #12 copper wire that passes through the rod is soldered into the pin of the PL-259 connector. Be sure that the sleeve cap is over the bottom part and that the UG-176/U Adapter is screwed all the way in. The adapter is drilled with a #60 drill, holes roughly 120° apart, for the three #18 wire radials which are soldered in. Incidentally, the radials don't *have* to be copperweld, but the copperweld does make a much more rugged antenna than if soft drawn copper were used. Right at the point where the #12 wire comes out of the bakelite rod, 3 inches of the wire is bent into a horizontal circle about 1 inch in

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

[1]Brier, H S., "A ⅝-Wave Vertical for 2," *CQ* Feb. '64, pg. 45.

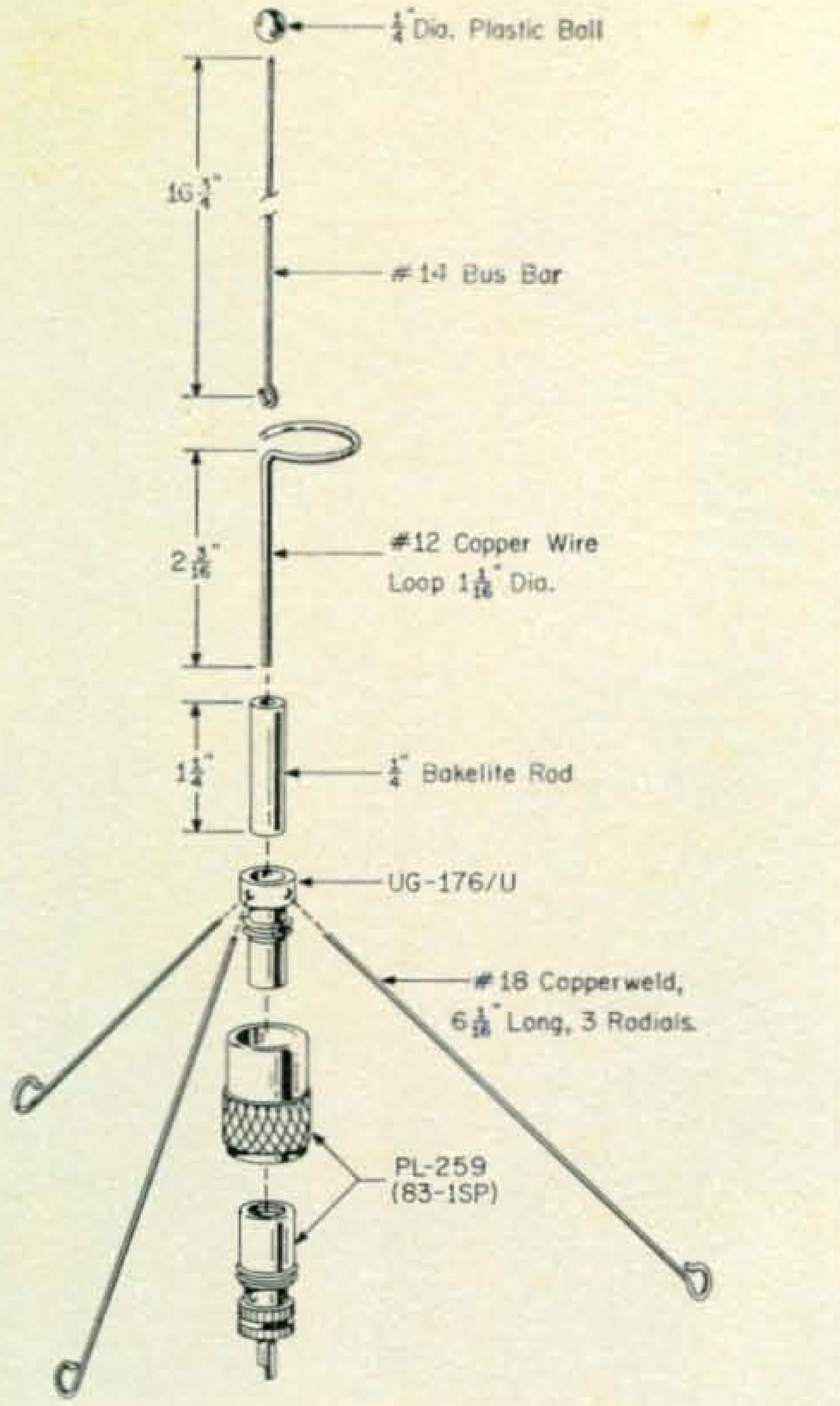


Fig. 1—Exploded view of the ⅝-Wave vertical for 440 mc f.m.

diameter, leaving an opening of about ⅛-inch at the end of the loop.

The vertical ⅝-Wave radiator, total length 16¾ inches, is made from a length of hard-drawn #14 bus bar and a small loop is bent into the bottom end to go over the open end of the #12 wire loading coil loop. This connection is carefully soldered, avoiding a cold joint and excess solder. The top of the radiator has a plastic ball attached, mainly for safety's sake (to prevent poking the eye); however, lacking such a gimmick, the top should be bent into a small loop, as in the manner of the radials which are so treated for the same reason.

Installation

As we said, the assembled antenna plugs into a standard u.h.f. SO-239 chassis connector to which the coaxial cable is fastened through a UG-106/U Cable Hood. The hood is then bolted to the chassis connector and soldered into a short piece of ¾-inch (i.d.) copper pipe, through which the coax is run. The pipe is then clamped to a standard 10 foot length of aluminum TV masting, taping the coax to the outside of the mast.

It is recommended that a foam-type of coax, similar to RG-8/U, be used, and that the run be kept as short as possible even though maximum antenna elevation is *very* important on this band. Should a long run, say around 100 feet, be necessary, it is recommended that a solid-wall coax, such as the Communications Products Company Type 348-509, be used, or perhaps the surplus ⅞-inch diameter RG-17/U, although finding connectors at a reasonable price for this cable can be a problem.

After the antenna mounting pipe is strapped to the mast it is suggested that it be weatherproofed with a heavy polystyrene coil dope, such as the Walsco No. 152, particularly around the point where the bakelite rod comes out of the connector.

Performance

Operation on f.m. in the 420/450 mc band is usually confined to the upper 10 mc, 440 to 450 mc. The main reason is that the commercial equipment used was designed for 450 to 470 mc, and the low-pass filter (u.h.f. TVI?) in the output circuit of some transmitters causes output to drop off the lower we go. Our ⅝-Wave vertical is therefore tuned up for the high end. We used the Allied P2 Standing Wave Ratio Bridge, which performs quite well at these frequencies, and bent the loop for the lowest v.s.w.r. at about 448 mc. We also found that the best v.s.w.r. was obtained with the three ground radials bent down at about 45 degrees. The end result was a v.s.w.r. which was less than 1.5 to 1 over a frequency range of 440 to 450 mc.

Many different types of antennas were tried by our local group on this band. The rotatable beam, of any type, was found impracticable because of the desire to continuously monitor from all directions. The ordinary ground plane, using a 16 inch aluminum transcription disc as the ground plane, was just not efficient enough. The discone was handy in some locations as a single antenna for three bands (144/148, 220/225, 420/450) but its efficiency of only 80% made it not very good for our purpose. The improvement was strikingly obvious to all who changed over to the ⅝-Wave vertical.

Thanks go to W9EGQ for the original inspiration and to K2IEG who built the first model of the ⅝-Wave vertical for 420/450 mc.

Appendix

1—Channels: Like the 6 meter and the 2 meter bands, f.m. general practice has resulted in a standard channel allocation and a separation of 120 kc between channel centers. Starting at the upper end, the first is 449.88, the second 449.76, the third 449.64, *etc*. This procedure avoids adjacent channel splatter, and permits swapping of crystals among the different groups and individuals.

2—Equipment: Motorola T44A equipment is available from FM Surplus Sales, 1100 Tremont Street, Roxbury, Massachusetts 021120. They also have available, for $3.95 postpaid, the FM Schematic Digest, which is a collection of invaluable schematics and other important information on all the Motorola f.m. sets which have become so available these past few years. The Link equipment, with 5894 finals, may be available from Selectronics, 1206 South Napa Street, Philadelphia, Pennsylvania. ■

GRUMBLES

by Sam

A FEW nights ago conditions on 20 were at their usual level, the California kilowatts were in full charge, the 50 watt diehards were busy calling endless CQ's, and the DX stations were reaping the harvest. I decided that it might be novel to run down a few mc to see what else was doing in the world and I eventually ended up in the 25 meter shortwave broadcast band. Twenty, by comparison, was like 11 used to be; 25 was a shambles! After a few minutes I was ready to slip quietly back to the solitude of 14 mc/s and be happy that we've got things so well.

Taking a tranquilizer I then picked up the February issue of *CQ* and came across the views of shortwave broadcasting by Chuck Schauers, W6QLV. That sure gave me the incentive to vent my spleen on the subject, and if you agree or disagree with me, I'd be happy (or unhappy) to hear from you.

Schauers' analysis of the crowded SWBC spectrum problem was that "shortwave broadcasting does have a place" but should be controlled by "time sharing." That's a wonderful magic-wand but I think that Chuck is a very naïve fellow.

Somewhere along the line, amidst all of the howls about SWBC operations within ham bands and demands for time sharing, most people seem to be overlooking the point that there is very, very, little justification for the whole mess to exist at all when you consider the important facts. This is especially true of those broadcasts which are beamed to the United States.

Think about it. How many people in the United States, other than hams and hobby s.w.l.'s, even *own* receiving gear capable of tuning these bands? Few. Hams have the bands as a bonus on their general coverage receivers and many of the better receivers we use don't even cover the SWBC bands. S.w.l.'s listen to SWBC stations only long enough to jot down sufficient program data to dash out a reception report which will earn them a QSL card; they couldn't really care less about the station's politics, culture, folk music, agriculture, or the rest of the drivel which these stations pump out in an endless barrage.

Most broadcasts to North America don't just arrive here on a single frequency, mind you. Stations in Norway, Sweden, Germany, Britain, and many others (including just about every so-called "Iron Curtain" country) can be heard by American listeners simulcasting on a multitude of frequencies, each one louder than the next. Our own Voice of America (including the VOA's relay stations throughout the world) can be heard holding down the fort on more frequencies than Carter has liver pills.

"Why?" you may ask. You'll never get the same answer to this one from any two people in broadcasting. The plain and simple truth is that international broadcasting, in its present state, is a tremendous political farce. Each country feeling a compelling need to "tell its story" to the world, adds a few new frequencies with each new political crisis. It's a matter of the country with 25 transmitters in use being able to shout down the one with only 18 or 20 on the air. When the 18 transmitter country increases its shouting power to 25, then the rival country can up its total to 27 or 30. It's a vicious circle and the cost of this tomfoolery is simply tacked onto the seemingly limitless propaganda budgets of the government involved, the money possibly appropriated from a public welfare or education program.

Being propaganda tools, SWBC stations have long been subject to the ravages of spectrum consuming jamming operations, thus creating additional waste and confusion. When standard "noise-transmission" jamming became even too obvious for today's subtle international relations, many countries dropped this in favor of "adjacent-channel" type jamming. This method calls for the establishment of a broadcast transmitter only a few kc away from the one to be jammed, thus creating about 30 kc of babble and heterodynes.

And when you boil the whole silly thing down to the basics, quite frankly, who cares? Sure, it gives the propaganda agencies of the governments involved something to include in a report each month to further justify their bureaucratic

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

existence. I have a great picture in my mind of a room in the inner reaches of a government office building. Hanging on the wall is a large graph showing the air pollution capabilities of all of the rival countries. With each new transmitter jammed or otherwise squashed, great cheers arise from the strategists. A new round in the war of words has been won.

If the stated purpose of all of this broadcasting is to disseminate facts, then why is all of the news of any value also sent out of these countries via commercial RTTY circuits to the news services, only to be reproduced in the world's headlines the next day? With the possible exception of war zones, areas of major natural disasters, and countries whose constantly changing political scenes affect the tranquility of the world, there is little news of any truly urgent nature worth the VIP treatment of shortwave broadcasting.

Entertainment? Hah! If you are that interested in hearing the folk music of, say, Pakistan, you could run over to your nearest record emporium and order a Folkways disc on the topic. This would save about 15 broadcasting channels right there; and you'd not only have better sound quality, no QSB or QRM, but also a permanent record to play to your little heart's desire. I don't mean to put down Pakistan in particular, I'm just using it as an example.

By now you're saying that if it wasn't for the Voice of America then many people throughout the world would probably never get a chance to have the advantages of a free press. Maybe that's true, but it seems that we could manage to do it on fewer channels (VOA operations in the 40 and 80 meter bands certainly don't earn us as many friends as they lose).

What great services to humanity or the state of the art of communications have been wrought by current international broadcasting? I think few or none. When you match the accomplishments and inequities of international broadcasting against those of ham radio, shortwave broadcasting seems amusingly absurd. What's even more ludicrous is the FCC's harranguing about the jamming and crowded conditions in the CB service (with 5 watt rigs) while our government cleverly ups the wattage and talk power of our own international voices.

My personal opinion is that the world would be a better and quieter place with all of this childish and idiotic nonsense removed entirely from the airwaves. As a substitute program, it might be great to have the number and assignment of frequencies, the schedules, and outputs (10 kw, a good sky hook and some snappy propagation planning can do wonders) strictly regulated by an international control body. Obviously all of this is impossible; it's a situation which will neither end nor even subside, it's too far gone now.

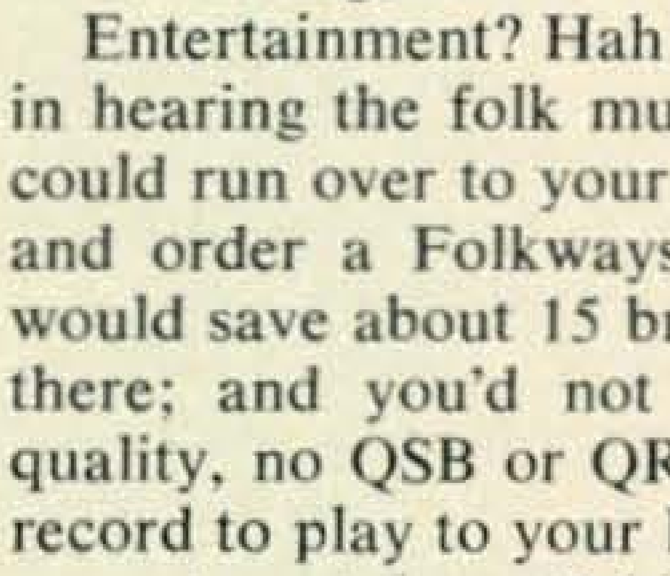
The shame of it all is that many necessary communications services are going begging for frequencies, and because governments seldom seem prone to curtailing any of their own self-perpetuating agencies or policies, the government controlled broadcasters seem perfectly content to sit by and watch ham radio bear the brunt of the problem. With each frequency allocation conference we bearly escape by the tips of our fingernails, and it's getting worse. Ah well, as they say, go fight city hall.

. . . Just another of those little touches of human nature which makes life worth living.

73, Sam

New Amateur Products

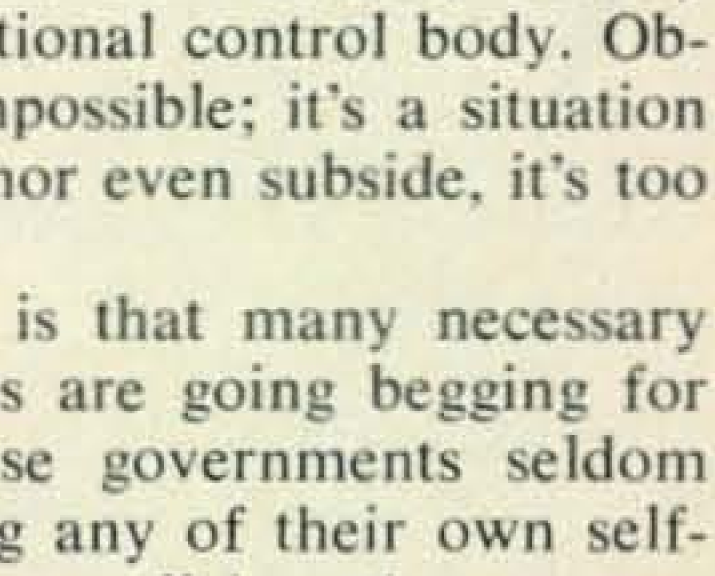
Galaxy



Galaxy Electronics, Manufacturers of Amateur and Commercial Equipment, announces the new Galaxy V Mark 2 model of their 80 through 10 meter transceiver.

The new Mark 2 model is available for mobile or fixed station use. Major improvements include: new 400 watt power, new precise vernier logging scale, new solid state v.f.o., new c.w. sidetone audio, new c.w. break-in option and new c.w. filter option. The Mark 2 retains compatability of all accessories. This compact, 5 band transceiver, with all the new features is still competitively priced at $420. A free brochure with all specifications and accessories is available. It may be obtained by writing Galaxy Electronics, 1-South 34th Street, Council Bluffs, Iowa, 51501, or circling 73 on page 10.

Eico

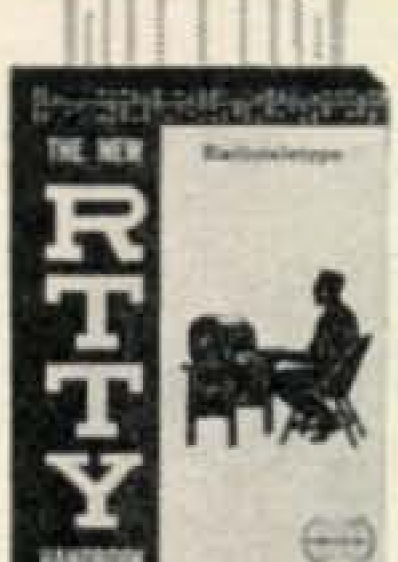


Eico introduces a new receiver for the beginner or s.w.l. Called the "Space Ranger," the Model 711 receiver tunes 550 kc through 30 mc in four wide view illuminated tuning bands. It covers 160 through 10 meters in addition to SWBC ranges. It is 6" × 13½" × 9" and weighs 17 lbs. The receiver is offered in kit form at $49.95 and factory assembled at $69.95. It uses four tubes and two diodes in a superheterodyne circuit built with printed circuit construction. Other features include built-in ferrite rod antenna, S meter, b.f.o. input provision for Q multiplier, earphone jack, transformer power supply, and built-in four inch speaker. For complete and detailed information write to EICO, 131-01 39th Ave., Flushing, N. Y., 11352, or circle 74 on page 110.

CQ BOOK MART

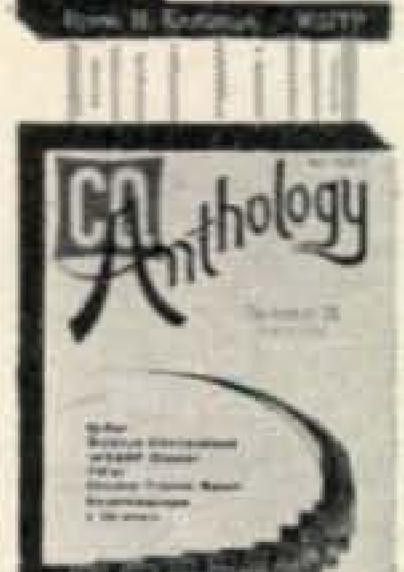
ANTENNA ROUNDUP Vol. II

Cat. #119-2. Here's your chance to get a copy of one of the most comphensive books on antennas ever offered to the Amateur. Ten big theory articles backed up by 82 detailed and illustrated construction projects for VHF on into microwave, from long-wires to 17 element beams and Sterba Curtain arrays.



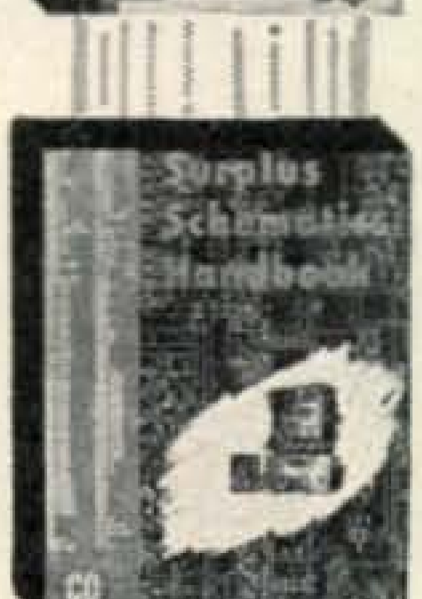
THE NEW RTTY HANDBOOK

Cat. #116. A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, written by Byron Kretzman, a well known authority in the field.



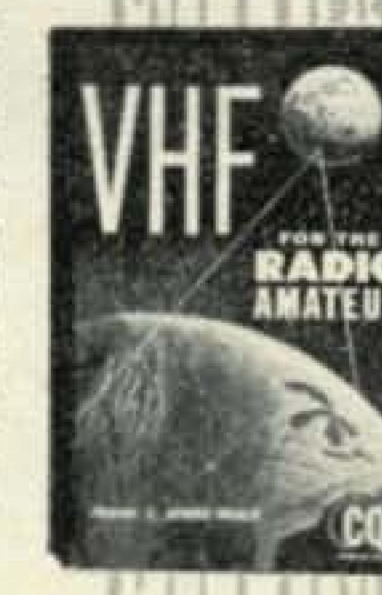
CQ ANTHOLOGY I

Cat. #102-1. We've looked back through the years 1945-1952 and assembled all in one place the articles that have made a lasting stir. The issues containing most of these articles have long ago been sold out and are unavailable.



SURPLUS SCHEMATICS

Cat. #117. This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available.



VHF FOR THE RADIO AMATEUR

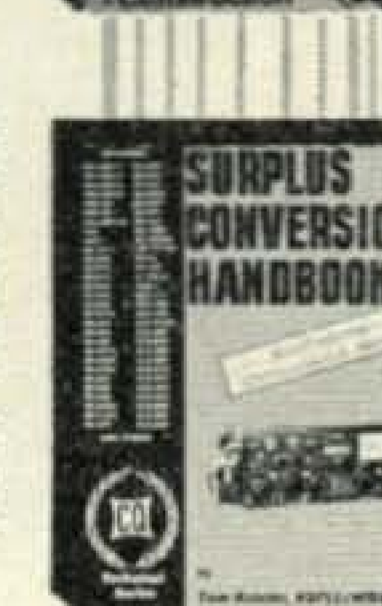
Cat. #115. If you are, or are planning to be a VHF operator you can't afford to be without this dynamic new handbook written especially for you. Filled from cover to cover with all new and original construction material presented so you can understand it.

ANTENNA ROUNDUP Vol. I

Cat. #119. A common denominator for all ham stations is the antenna. Here at last is the cream of antenna information packed into a 160 page book. Forty-seven information-packed articles that will dispel much of the mystery surrounding antennas.

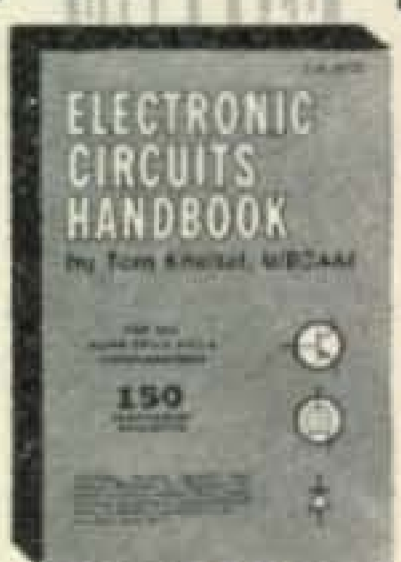
SIDEBAND HANDBOOK

Cat. #103. One full year in the preparation of this terrific volume. This is *not* a technical book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff, gadgets, receiving adaptors, exciters, amplifiers.



SURPLUS CONVERSION HANDBOOK

Cat. #122. Contains 192 pages of conversion articles including the famous Command Set's plus a whole slew of the most popular military surplus gear including such gems as: SCR-522, ART-13, BC603, BC659, ARC 1, ARC 3, etc. Actually, it covers almost every piece of surplus gear worth the effort to convert for ham use.

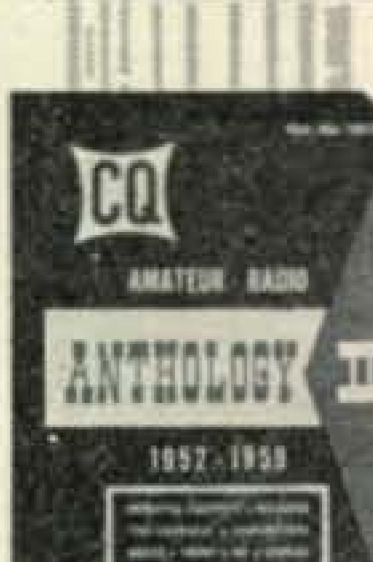


ELECTRONIC CIRCUITS HANDBOOK

Cat. #121. Describes and discusses in detail 150 of the most often needed circuits around the shack. Novices and old-timers alike will find many valuable circuits here ideal for construction projects. Eleven great chapters cover a multitude of circuits for all.

SHOP & SHACK SHORTCUTS

Cat. #120. Here is a collection of hundreds of hints, kinks and short cuts which should be part of the library of every experimenter ham and CB'er. A veritable gold mine that will help save time, improve their shop techniques, dress up their shacks, and increase the efficiency of their equipment.



CQ ANTHOLOGY II

Cat. #102-2. Top favorite CQ articles from 1952 to 1959 . . . including some you may have missed . . . compiled into one new information-packed book! No more need to try to locate sold out back copies of CQ. This Anthology includes past articles of lasting interest to every amateur radio enthusiast. Over 250 pages of text.

ELECTRONIC CIRCUITS HANDBOOK VOL. II

Cat. #121-2. Tom Kneitel, K2AES, does it again with this sequel to his best selling Volume I. This time it's 159 additional circuits which will appeal to all. Every shack will have a spot for this book. All circuits fully described in text with complete detailed construction steps plus schematics.

NAME ______________________

ADDRESS ______________________

CITY ______________________

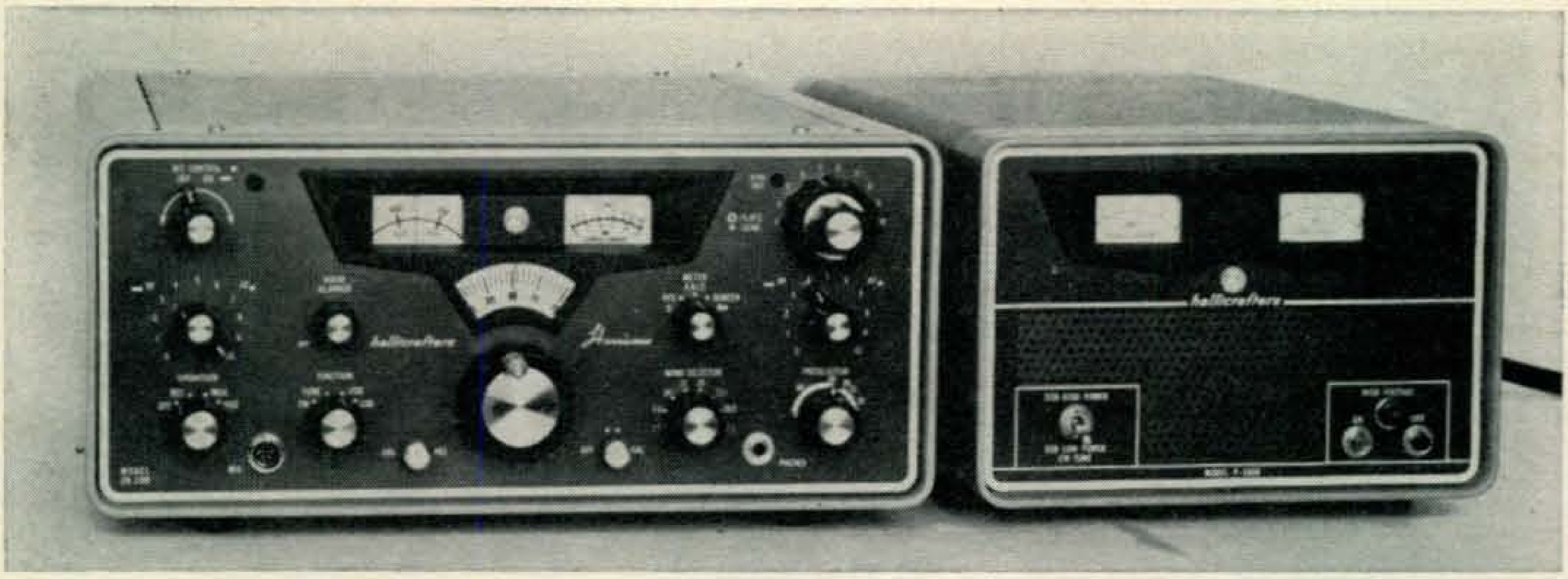
STATE ______________________

Zip Code ______________________

Cat. No.	Name	Price	Order	Cat. No.	Name	Price	Order
99	TVI Handbook	1.75		115	VHF for the Radio Amateur	3.50	
102-1	CQ Anthology vol. 1	2.00		116	The New RTTY Handbook	3.95	
102-2	CQ Anthology vol. 2	3.00		117	Surplus Schematics	2.50	
103	New Sideband Handbook	3.00		119-1	Antenna Roundup vol. 1	3.00	
105	New Mobile Handbook	2.95		119-2	Antenna Roundup vol. 2	4.00	
109	Ham's Interpreter	1.50		120	Shop & Shack Shortcuts	3.95	
112-A	Reg. Ham Log Sheets, per C	1.00		121-1	Electronic Circuits Handbook vol. 1	3.00	
112-B	SSB Ham Log Sheets, per C	1.00		121-2	Electronic Circuits Handbook vol. 2	3.00	
113	CQ Binders (Indicate year)	4.00		122	Surplus Conversion Handbook	3.00	

New York City and State residents must add sales tax applicable to your area.

COWAN PUBLISHING CORP. Book Div. • 14 Vanderventer Avenue • Port Washington, L.I., N.Y. 11050



The Hallicrafters SR-2000 Hurricane shown with the P-2000 power supply. The frequency-readout dial in center is linearly calibrated in 1 kc steps. The meter in the right window above the dial reads S-units/r.f. output, a.a.l.c. or p.a. screen current. P.a. plate current and plate voltage meters are on the power supply at the left lower corner of which is the high-low power switch. On-off buttons and indicator lamp are at the right.

CQ Reviews:

The Hallicrafters SR-2000 Hurricane Transceiver

BY WILFRED M. SCHERER,* W2AEF

CHICAGO is known as "The Windy City," but this is the first time we've heard of a hurricane coming out of it. Yes, that's what has taken place at the Hallicrafters plant with the production of the SR-2000 Hurricane S.S.B./C.W. Transceiver, and quite a force it has too—packing a wallop of 2000 watts p.e.p.

Outstanding features are: noise blanker, exceptionally high sideband suppression with 2.1 kc 6-pole crystal filter, 1 kc linear calibrations, electronic indexing for calibration, receiver incremental tuning (RIT), dual-speed blower, and special safety measures to prevent amplifier-tube damage.

Besides these, the Hurricane includes full band coverage on the 3.5-30 mc amateur bands in 500 kc segments—there are no extra crystals to buy, s.s.b. operation on upper or lower sideband on any band, m.o.x. or v.o.x. built in, c.w. operation with m.o.x. or v.o.x. type of break-in, keyed sidetone for monitoring c.w. on headphones or loudspeaker, 100 kc crystal calibrator built in, fast-attack slow-release a.g.c., amplified automatic level control (a.a.l.c.), excellent frequency stability and constant tuning rate (in the same direction on all bands), preselector tuning, adjustable Pi-network for 40-70 ohm loads, hi-lo power switch for choice of 1 or 2 kw p.e.p. operation, metering facilities for receiver S-units, transmitter relative-power output, a.a.l.c. level, final-amplifier screen current, plate current, and plate voltage.

*Technical Director, *CQ*.

Designed for table-top use, the Hurricane has all these features wrapped up in a package not much larger than the conventional lower-powered transceivers. A power supply/speaker console is a separate unit. The whole affair occupies less space then an individual transceiver and separate linear amplifier with the associated power supplies.

Technical Details

The Hurricane employs dual conversion throughout as may be seen from the block diagram at fig. 1. Although the crystal filter and two of the i.f. stages are used both on receive and transmit, the complete lineup for each mode of operation is shown individually, in order to make the setup easier to follow.

The conversion scheme on receive consists of heterodyning the received signals (at V_{2A}) to produce a 6.0-6.5 mc i.f. which in turn is heterodyned at V_{4A} with a 4.350-4.850 mc v.f.o. (V_{13}) to produce an i.f. of 1650 kc. This signal is passed through the crystal filter (FL_1) for selecting the proper sideband and on to the product detector (V_{9A}) where it is demodulated by the 1650 kc b.f.o. signal from V_{14A} to deliver audio output through the a.f. amplifiers.

Table 1—Heterodyning Osc. Frequencies

Band (mc)	Crystal Freq. (mc)	Hetero-dyning Freq. (mc)
3.5	10.0	10.0
7.0	13.5	13.5
14	10.25	20.5
21	13.75	27.5
28	17.25	34.5
28.5	17.5	35.0
29	17.75	35.5
29.5	18.0	36.0

On transmit the conversion goes in reverse with the a.f. speech input applied to the balanced modulator where the 1650 kc signal from V_{14A} is modulated (and the carrier suppressed). The suppressed-carrier signal then goes to the 1650 kc filter which attenuates the unwanted sideband, leaving an s.s.b. signal to be heterodyned at V_{2B} by the v.f.o. signal from V_{4B} to produce a 6.0-6.5 mc signal. This is then heterodyned by the crystal-controlled oscillator (V_{12}) to produce an s.s.b. signal in the desired amateur band at the transmitter driver and p.a.

The heterodyning frequencies for each band are given at Table I. The fundamental frequency of the crystals is used for 3.5 and 7 mc operation, while on the other bands the second harmonic of the crystals is used. The oscillator is a pentode operating in an electron-coupled Colpitts circuit using the grid and screen with output taken from the plate. When required, doubling is accomplished in the plate circuit.

The v.f.o., circuitry for which is shown at fig. 2, uses a 12BA6 in a conventional electron-coupled pentode circuit with the plate untuned; however, r.f. output is taken from the cathode and applied to a triode amplifier (V_{4B}) which serves as a buffer and matching device to V_{4A} and V_{2B}.

A variable-capacitor diode (Varicap) controlled by a variable d.c. voltage is used to vernier-tune the v.f.o. to frequency to accomplish dial calibration electronically, rather than mechanically as often done by repositioning the hairline fiducial at the v.f.o. dial.

When the RIT control is switched on, the d.c. voltage on the Varicap can then be varied by the RIT control on the panel to offset the receiver frequency by about ±2 kc from that used during transmit, in order to enable a c.w. beat note to be heard on the received signal while the transmitter is at zero-beat with the c.w. signal, or to receive s.s.b. signals that may be slightly off the

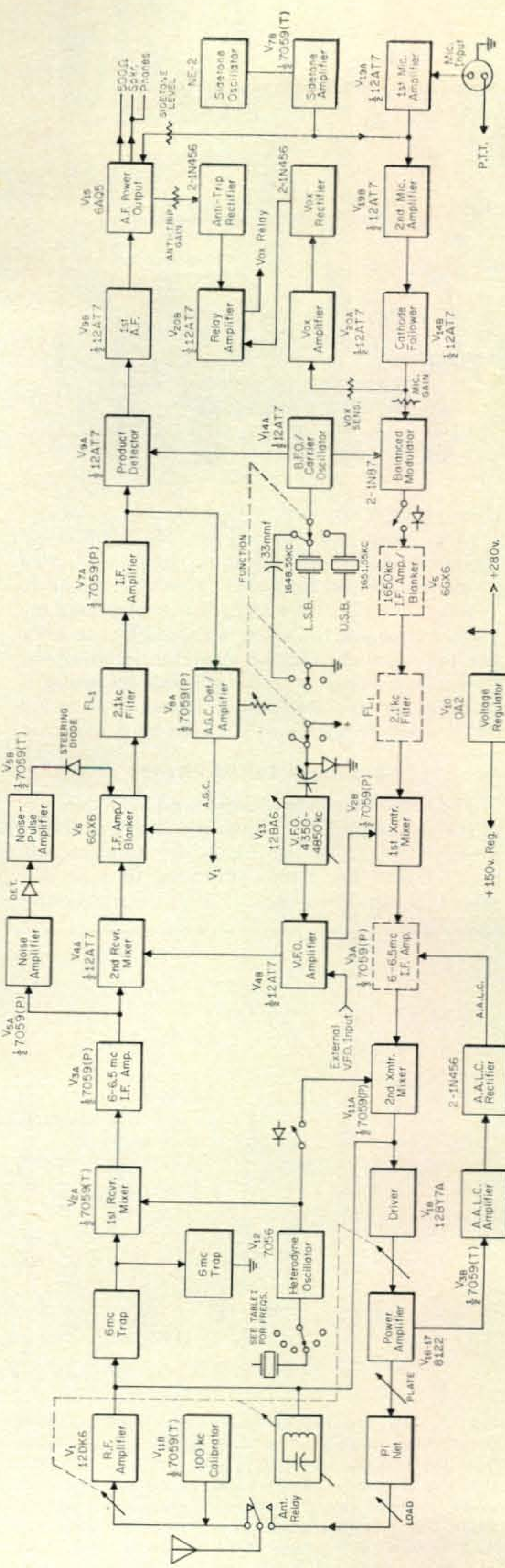
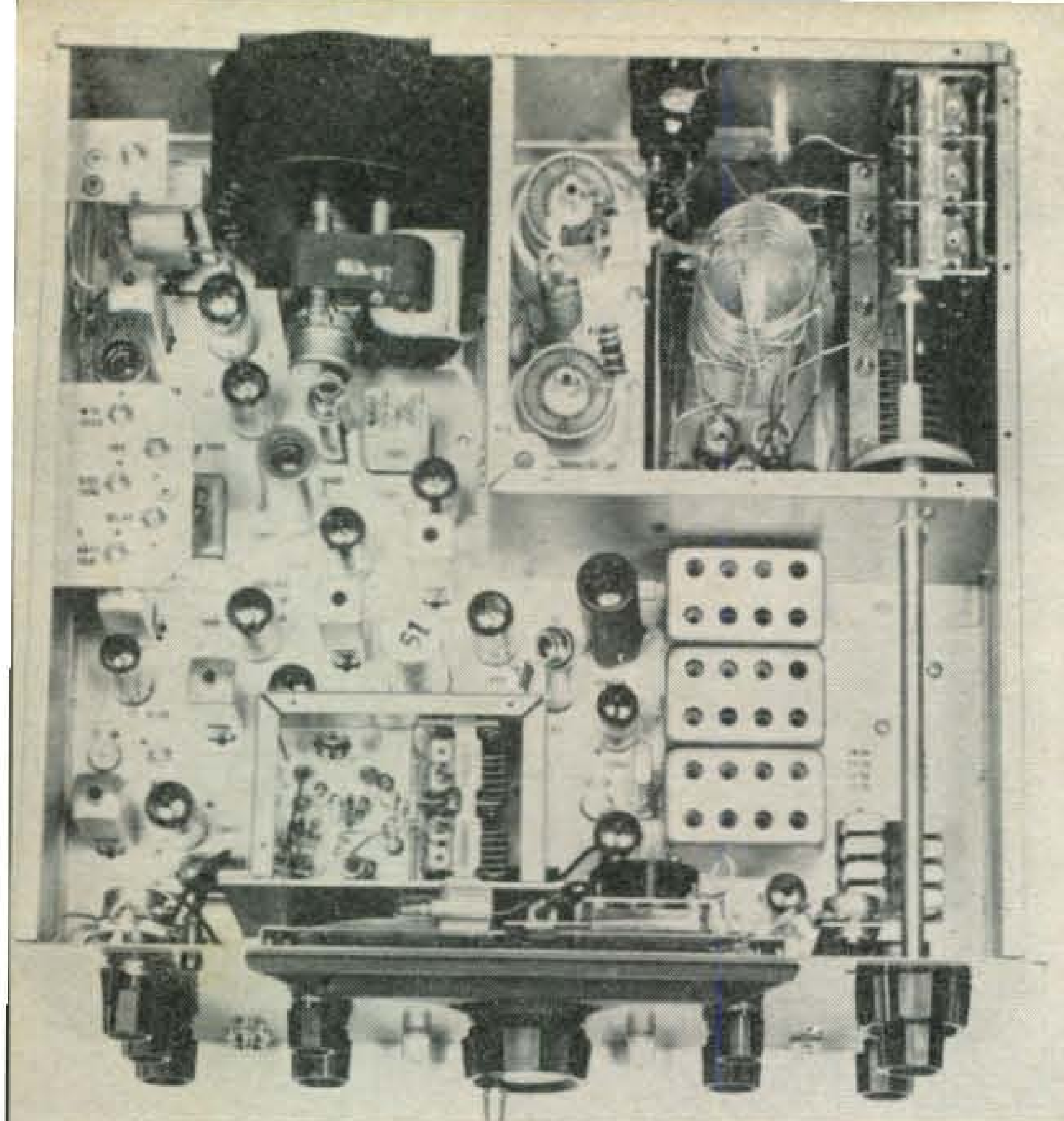


Fig. 1—Block diagram for the Hurricane transceiver.



Top view of the Hurricane, removed from the cabinet, showing the sturdy side and rear brackets. The air blower is the dark object on the rear at upper left. The p.a. at upper right is shown with the enclosure cover removed. The p.a. tubes are installed in air-system sockets at the left of the compartment at the left-front corner of which is the actuating button for the interlock that prevents application of power when the cover is removed. Near the panel at left is the v.f.o. compartment from which the cover has been taken off. The oscillator tube is mounted horizontally on the left side of the v.f.o. box.

transmitter frequency. When the RIT is at ON, a panel lamp lights up. At OFF the lamp is extinguished and the frequency control is returned to the normal on-frequency transceive mode.

When sidebands are switched by changing the b.f.o. frequency, the v.f.o. is shifted by the same amount to eliminate the need for retuning the transceiver. This is accomplished by using a diode switch to cut a trimmer capacitor in or out of the cathode section of the v.f.o. tank inductor.

Bi-Lateral Tuned Circuits

The same tuned circuits are used for the plates of the r.f. amplifier (V_1) and the 2nd transmitter mixer (V_{11A}). The two plates are connected in parallel with the B-plus shunt-fed through a 1 mh r.f. choke. The plate circuit of the transmitter driver (V_{18}) and the grid of the receiver r.f. stage (V_1) have individual resonant circuits which are gang-tuned along with the V_{18}-V_1 circuit by means of a 3-section variable capacitor. Tuning the receiver thus automatically peaks up the transmitter-driver circuits, and visa versa.

The 6.0-6.5 mc i.f. amplifier (V_{3A}) has fix-tuned broad-band transformers at the input and output. The plates of the 1st receiver-mixer (V_{2A}) and the 1st transmitter-mixer (V_{2B}) are parallel-connected at the primary of the input transformer. The grids of the 2nd receiver-mixer (V_{4A}) and the 2nd transmitter-mixer (V_{11A}) are parallel-connected at the secondary of the output transformer.

The heterodyning-oscillator signal is injected at the cathode of the 1st receiver-mixer (V_{2A}). It also is applied to the grid of the 2nd transmitter-mixer (V_{11A}), but since this grid also goes to the output of the 6.0-6.5 mc i.f. amplifier (V_{3A}), on transmit a diode switch disconnects the heterodyning-oscillator output from V_{11A} grid to prevent interference with operation of the noise blanker.

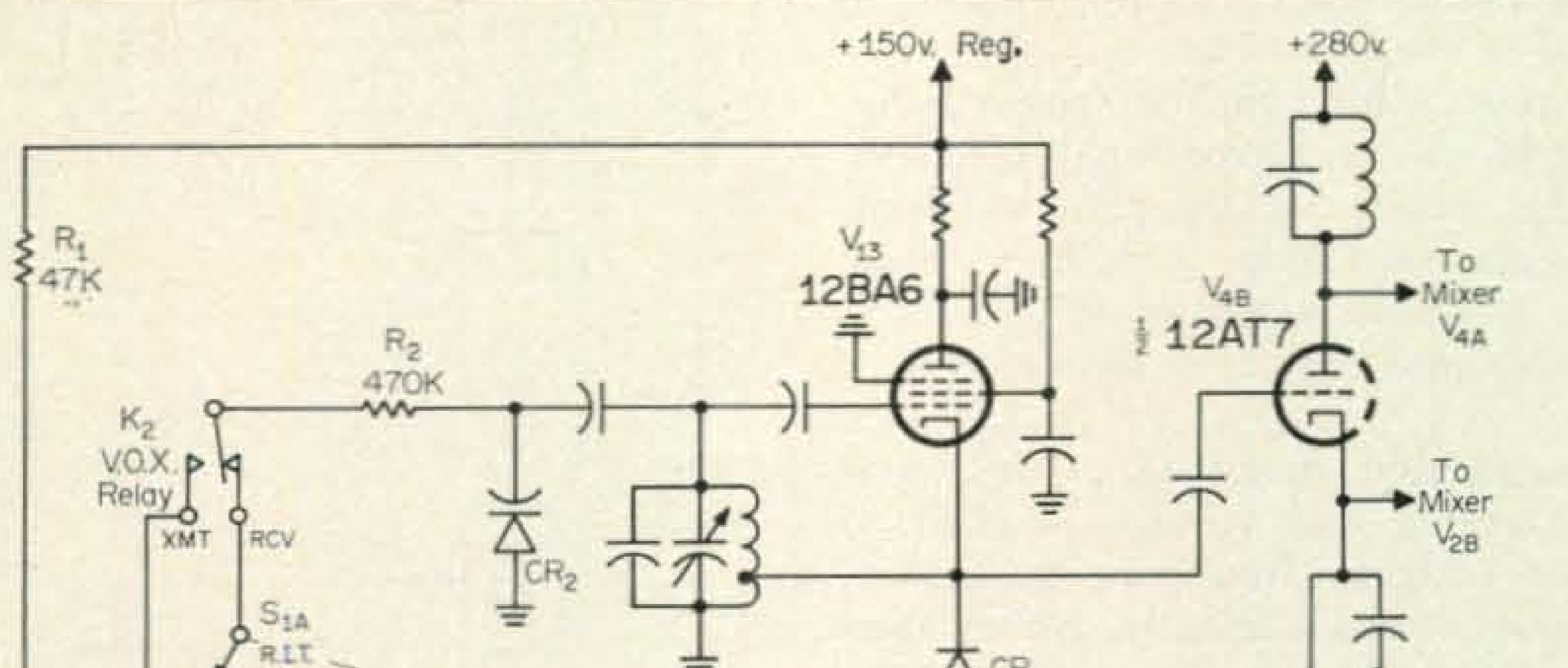


Fig. 2—V.f.o. circuitry as used in the Hurricane. It is an electron-coupled affair with the r.f. output taken from the cathode and fed to the mixers by amplifier V_{4B}. The calibration is electronically set by varying R_3 which changes the d.c. potential applied to varicap diode CR_2 and thus alters its capacitance. When the R.I.T. is used, S_1 is placed at ON, indicator NE-2 glows and R_4 is substituted for R_3 to vary CR_2. The receiver then can be tuned about 2 kc either side of the initial frequency to allow off-frequency reception without altering the transmitter frequency which is maintained (as originally calibrated) by reinserting R_3 through the transmit contacts on K_2. To compensate for the change in b.f.o. frequency when l.s.b. is used, diode switch CR_3 cuts in C_1-C_2 to automatically retune the v.f.o. accordingly.

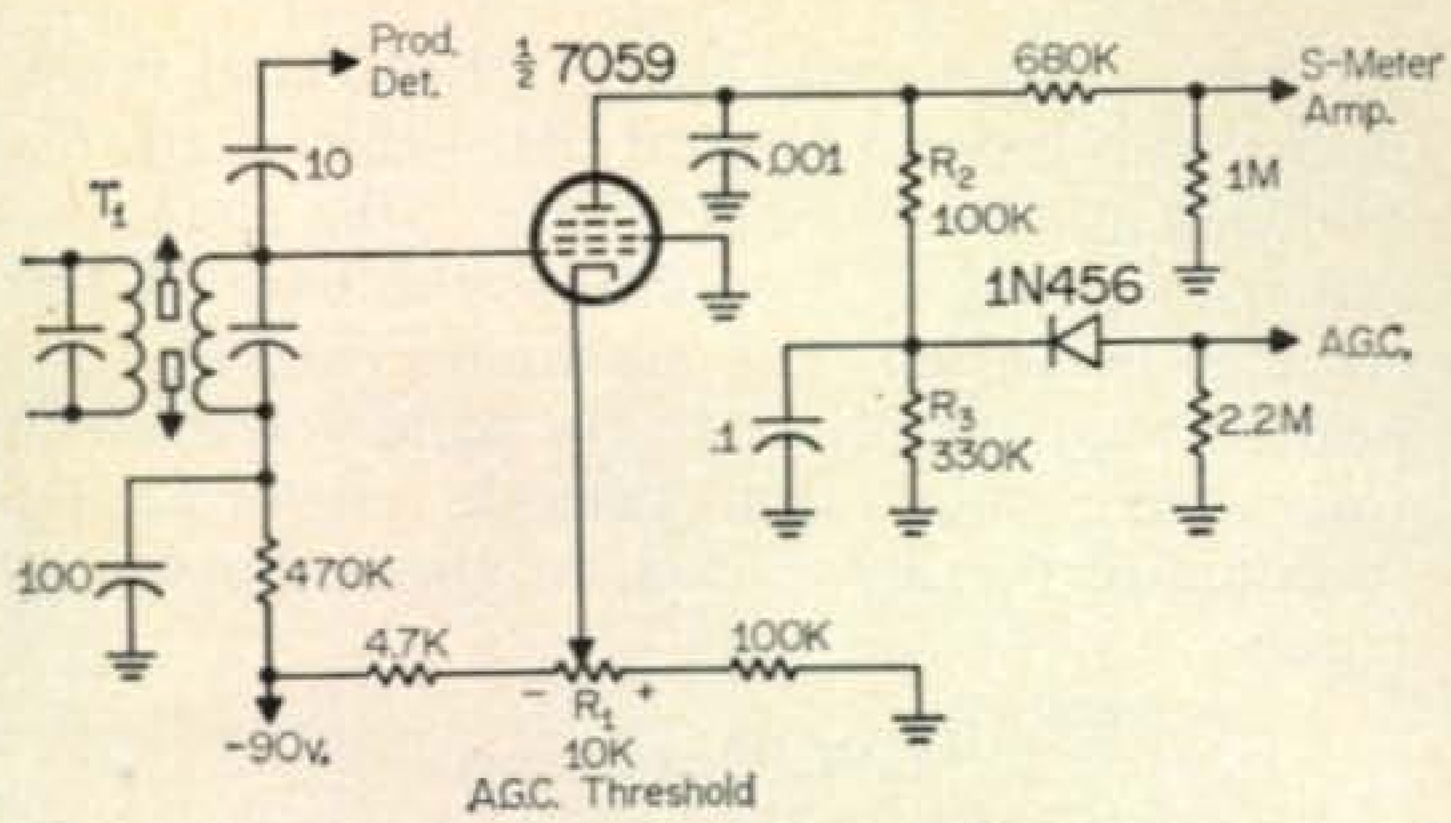
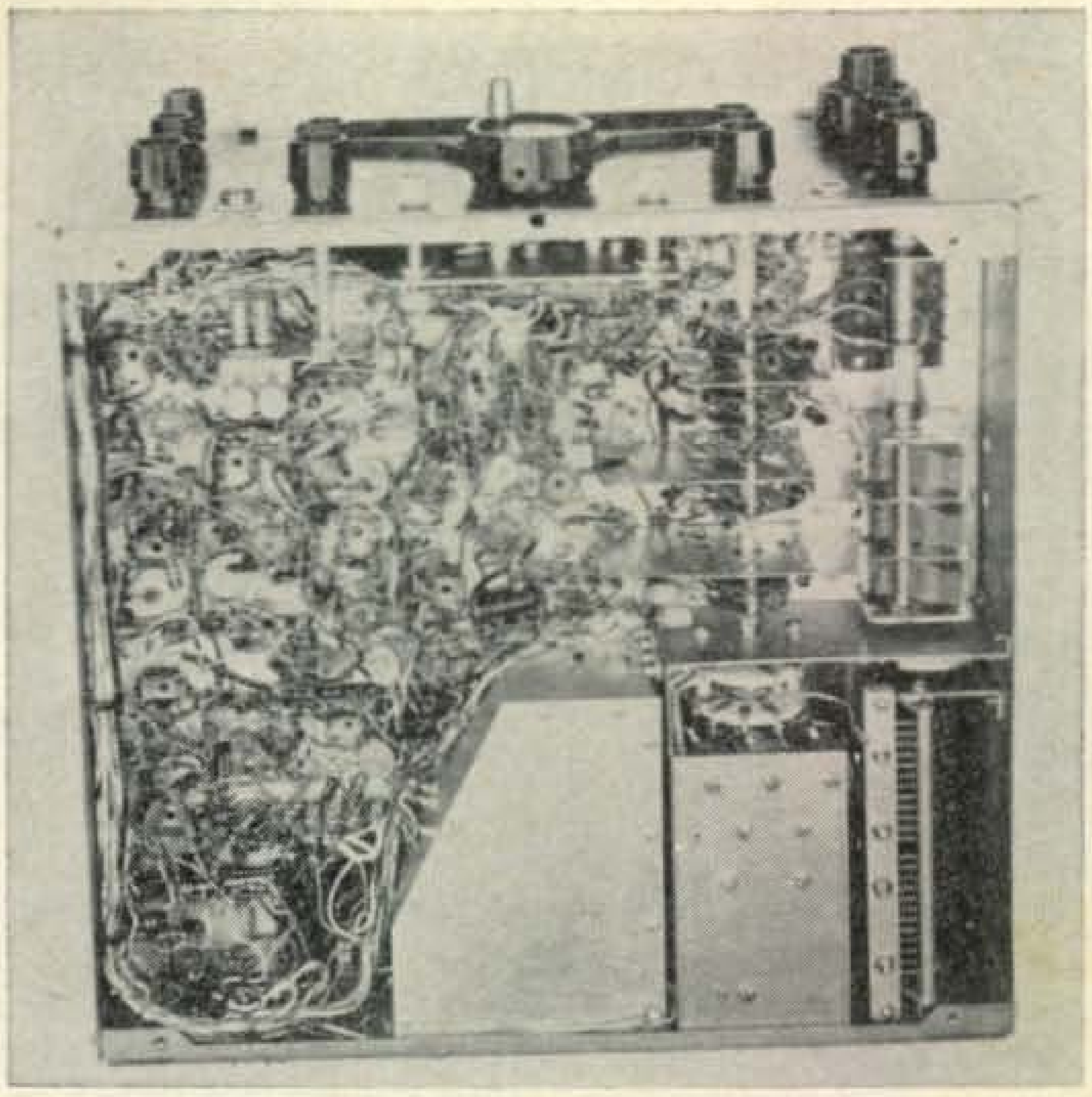


Fig. 3—A.g.c. amplifier for the Hurricane. At first glance it appears as if there is no B-plus applied to the screen and plate of V_{8A}, but examination of the circuit will reveal that the cathode obtains a negative voltage from R_1 and thus is negative with respect to the applied voltages for the screen and plate. The grid is slightly negative with respect to the cathode. When a signal is applied from T_1, a voltage drop occurs R_2 and R_3 depending on the signal level. This voltage is then used for the a.g.c. CR_1 functions as a steering diode to permit only the negative component of the output to be applied to the a.g.c. bus. Peaks at the audio rate actuate the S-meter. Any r.f. component from the output of the tube is filtered out by the capacitors and resistors.



Bottom view of the Hurricane. It is quite a "busy" affair. The odd-shaped box at the rear covers the bottom of the tube sockets and serves as an air duct for the blower.

Noise Blanker

Noise pulses, obtained from the output transformer of V_{3A}, are applied to a noise amplifier (V_{5A}), detected by a diode, amplified and shaped by a pulse amplifier (V_{5B}), held to negative-going pulses by a steering diode and applied to the i.f. amplifier/blanker (V_6). This stage is thus pulse-modulated and is momentarily cut off to interrupt the signal during each pulse, but since the pulse length is very short, no significant effect on the desired-signal level occurs. In this respect it should be noted that the blanker system functions at a point before the highly selective filter, so pulse lengthening that could impair the effectiveness of the blanker does not occur as might be the case if suppression were attempted after the filter.

Automatic Gain Control (A.G.C.)

The a.g.c. detector/amplifier is an unusual affair as shown and explained at fig. 3. A threshold control is provided in the form of a screw-driver adjustment. A.g.c. voltage is applied to the r.f. amplifier and the 1650 kc i.f. amplifier/blanker stage. It also activates the S-meter amplifier (V_{8B}) as shown at fig. 4 where the metering setup for the transmitter functions also is described.

Traps

High rejection of unwanted signals at the 6.0-6.5 mc i.f. is obtained by two traps. One is parallel-tuned series-connected at the 1st receiver-mixer (V_{2A}) grid, the other is a series-tuned circuit shunt-connected at the same grid, as shown at fig. 5. The product detector is a triode with conventional circuitry.

Transmitter

The two speech amplifiers are followed by a third stage which operates as a cathode follower to match the low-input impedance of the balanced modulator which is a shunt type employing two 1N87 diodes. It is coupled to the primary of a transformer at the input of the 1650 kc i.f. amplifier/blanker (V_6); however, on receive the secondary of this transformer is used as a single-tuned circuit at V_6 input. The balanced modulator is then disconnected with a diode switch from the transformer primary to eliminate the possibility of b.f.o. leakage that might otherwise impair receiver operation.

It is a most unusual sight to see a miniature receiving-type tube used as the driver for a 2 kw linear, but that's exactly the setup in the Hurricane! There is no waste of power using a 100-watt driver that often needs padding down, and there is no danger of damaging the p.a. tubes by overdriving and burning up their grids, as might be the case when a conventional setup is used with a 100-watt or more exciter for driving a separate linear amplifier.

Power Amplifier

The p.a. has two 8122 high-power tetrodes operating with grounded-cathode circuitry in class AB_1. It is operated with 2700 volts plate potential for 2 kw p.e.p. input on s.s.b. and with 1700 volts for 1 kw input on c.w. or low-power p.e.p. s.s.b. The output tank is an adjustable Pi-network for matching to 40-70 ohm essentially non-reactive loads. Capacitance-bridge neutralization is employed.

The amplifier is metered both for plate and screen current, the latter being especially indicative of proper tuning and loading at the required tuneup level, linearity and safe operation. The screen current is observed by switching the panel meter on the transceiver accordingly. Plate current is read by a meter which is permanently in operation and which is located on the power-

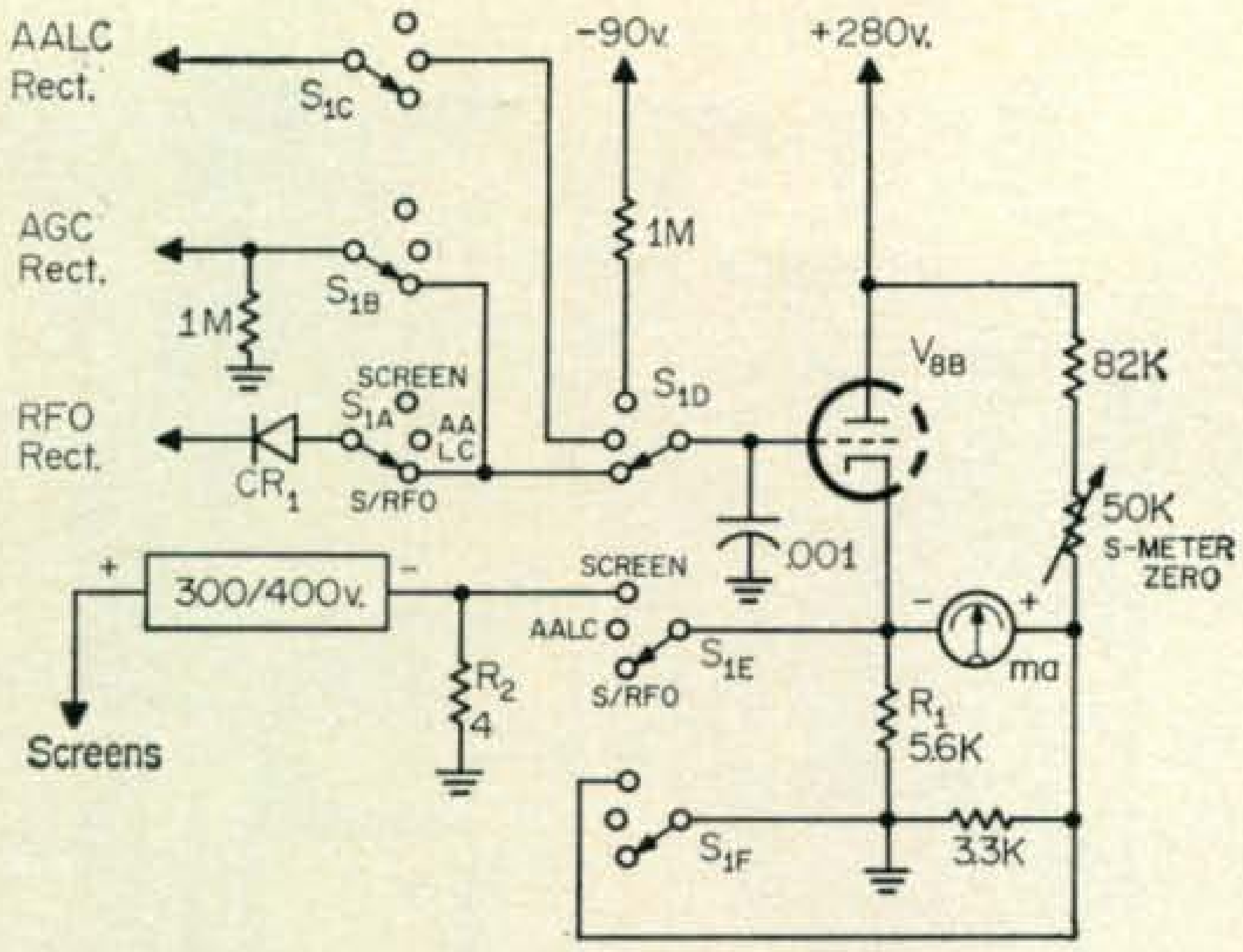


Fig. 4—Metering amplifier as used in the Hurricane. With the switch at S/RFO, the output of the a.g.c. amplifier and the r.f. output-power rectifier are applied to the grid of V_{8B}. The meter comprises one arm of a bridge in the plate circuit of the tube and thus functions as a v.t.v.m. CR_1 is a gating diode (or switch) which cannot conduct when the negative a.g.c. voltage is present, so it opens the circuit and prevents the a.g.c. line from being loaded down by the r.f.o rectifier circuit. On transmit, the negative voltage from the r.f.o. rectifier goes to the cathode of CR_1, thus placing it in a conductive state for applying this voltage to the tube. When the switch is set for a.a.l.c., the voltage from the a.a.l.c. rectifier is applied to the tube. When the switch is set for p.a. screen current, —90 volts cutoff bias goes to the tube grid and thus no tube current flows through the meter. At the same time, S_{1E} and S_{1F} connect the meter across R_2 which is in the ground return for the negative side of the screen-voltage supply. R_2 serves as a shunt for the meter which now indicates the screen current.

supply panel. A second meter on the power supply indicates the plate voltage. The transceiver meter also can be switched to read the relative-power output.

Amplified Automatic Level Control (A.A.L.C.)

Sampling voltage for the a.a.l.c. system is obtained by the usual manner of rectifying the audio component of a voltage developed across a resistor in the p.a. grid-return circuit when grid current commences to flow, but in this case the a.f. component is first amplified (by V_{3B}) and then rectified by a voltage doubler. The a.a.l.c. voltage thus obtained controls the gain of the 6.0-6.5 mc stage (V_{3A}) as needed to prevent overdrive and flattopping of the p.a. The advantage realized over conventional a.l.c. affairs is that the a.a.l.c. responds much sooner, requiring a smaller excursion into the grid-current region to obtain the required control and thus takes hold virtually before any flattopping has a chance to set in. The transceiver meter can be switched to read the a.a.l.c. voltage to determine the optimum mic-gain setting for maximum effectiveness and the cleanest signal.

R.f. drive for tuneup and c.w. is obtained by unbalancing the balanced modulator with a d.c. voltage and by switching in a 33 mmf capacitor across the 1648.55 kc l.s.b. carrier crystal to pull its frequency to within the passband of the sideband filter. The need for an extra crystal to do the job is eliminated. The r.f. drive level is adjusted with a panel control that is automatically switched into the cathode return of the 2nd transmitter-mixer (V_{11A}) to enable the gain of this stage to be varied. The maximum gain of V_{11A} also is automatically set by the bandswitch which inserts the required value cathode resistor needed to equalize the drive level on all modes for all bands.

C.W. Operation

Grid-block keying for c.w. is applied to the transmitter driver (V_{18}), the 2nd transmitter-mixer (V_{11A}) and a sidetone amplifier (V_{7B}). The sidetone oscillator, which is a neon-bulb type, runs continuously for the c.w. mode; only its amplifier is keyed to provide chirpless sidetone monitoring of c.w. keying on the loudspeaker or headphones. A sidetone-level control may be set to provide comfortable listening to suit the operator's taste.

The keyed sidetone signal also is fed to the 2nd mic amplifier (V_{19B}) to activate the v.o.x. system for switching back and forth between receive and transmit. V.o.x. type of break-in is thus available to a degree depending on the v.o.x. delay. The v.o.x. system, by the way, is a standard setup with the v.o.x. controls accessible when the cover of the cabinet is removed.

The v.o.x. relay transfers the transmit-receive lineups by switching the bias used for cutting off stages not required for the particular mode, and for operating the diode switches. Antenna transfer is handled by a separate relay actuated by the v.o.x. relay.

Power Supply

The separate power supply furnishes 12.6 v.a.c. for the tube heaters (all tubes, except V_6 and V_{15} are 12-volt types), —90 v.d.c. transceiver bias, —20/30 v.d.c. p.a. bias, 280 v.d.c. for the transceiver, 300/400 v.d.c. for p.a. screens and 1700/2700 v.d.c. for p.a. plates. A choice of 1 kw or 2 kw operation may be made with a switch that selects the low or high p.a. bias, screen and plate voltages.

Silicon rectifiers are used throughout. The 1700/2700 p.a. voltage is obtained from a voltage doubler using two 5 kv 1 a. rectifiers and a string of eight series-connected 90 mf 500 v. electrolytic capacitors.

[*Continued on page 96*]

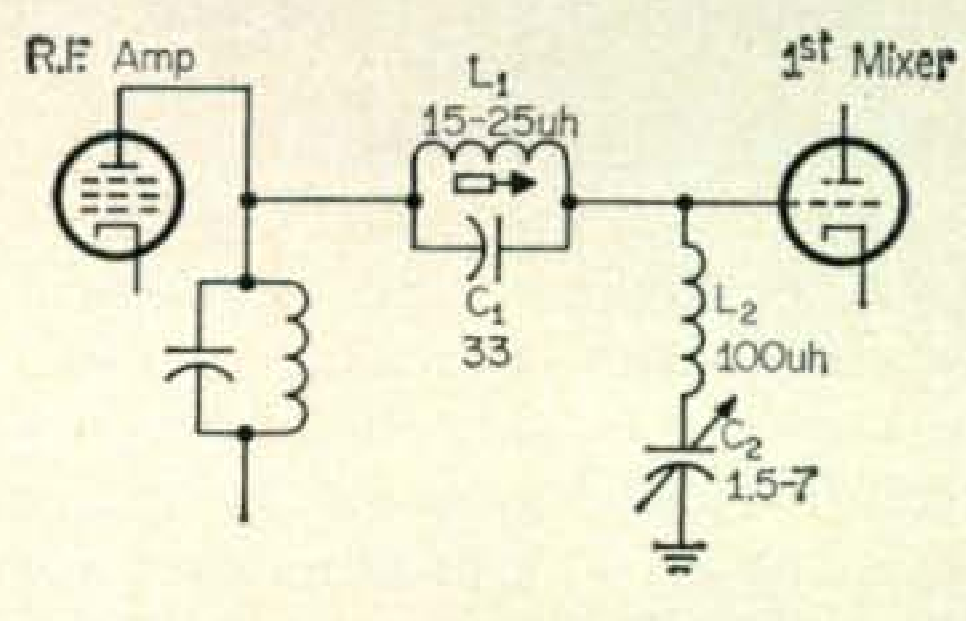


Fig. 5—Trap circuit for 6.5 mc i.f. signal rejection as employed in the Hurricane. L_2, C_2 functions as a low-impedance termination at 6.5 mc for the high-impedance trap L_1, C_1. The combination is more effective than the customary expedient of just the series-tuned shunt-connected trap (L_2, C_2).

The Latest Advance in Long Range Radio Communication

MOBILE

BASE STATION

BOAT

PORTABLE

LIST PRICE $385.00

THE NEW RF COMMUNICATIONS

Co-Pilot

Single Sideband Transceiver!

The RF Communications CO-PILOT SSB Transceiver was designed for long range communications in INDUSTRIAL, GOVERNMENT, POLICE, SEMI-MILITARY and PRIVATE applications.

HIGH PERFORMANCE—The Co-Pilot provides single channel operation. The channel can be specified anywhere between 2 to 12 Mc. Power output is 50 watts (can be reduced to 10 watts with rear panel switch for reduced battery consumption).

TRANSISTORIZED—All circuits except high power stages are transistorized. Instant heat tubes available for low battery consumption applications.

SIMPLE OPERATION—Only three front panel controls. An untrained operator can use the Co-Pilot with less than 5 minutes of instruction.

LOW POWER INPUT—The Co-Pilot operates from 12 volt D.C. power. Power consumption in receiver is about one watt (80 ma).

SMALL SIZE—The Co-Pilot measures 10x10x4 inches and weighs under 12 pounds.

QUALITY CONSTRUCTION—All materials and construction of highest commercial quality. Can be used in regions of high temperature and humidity, and under conditions of high shock and vibration.

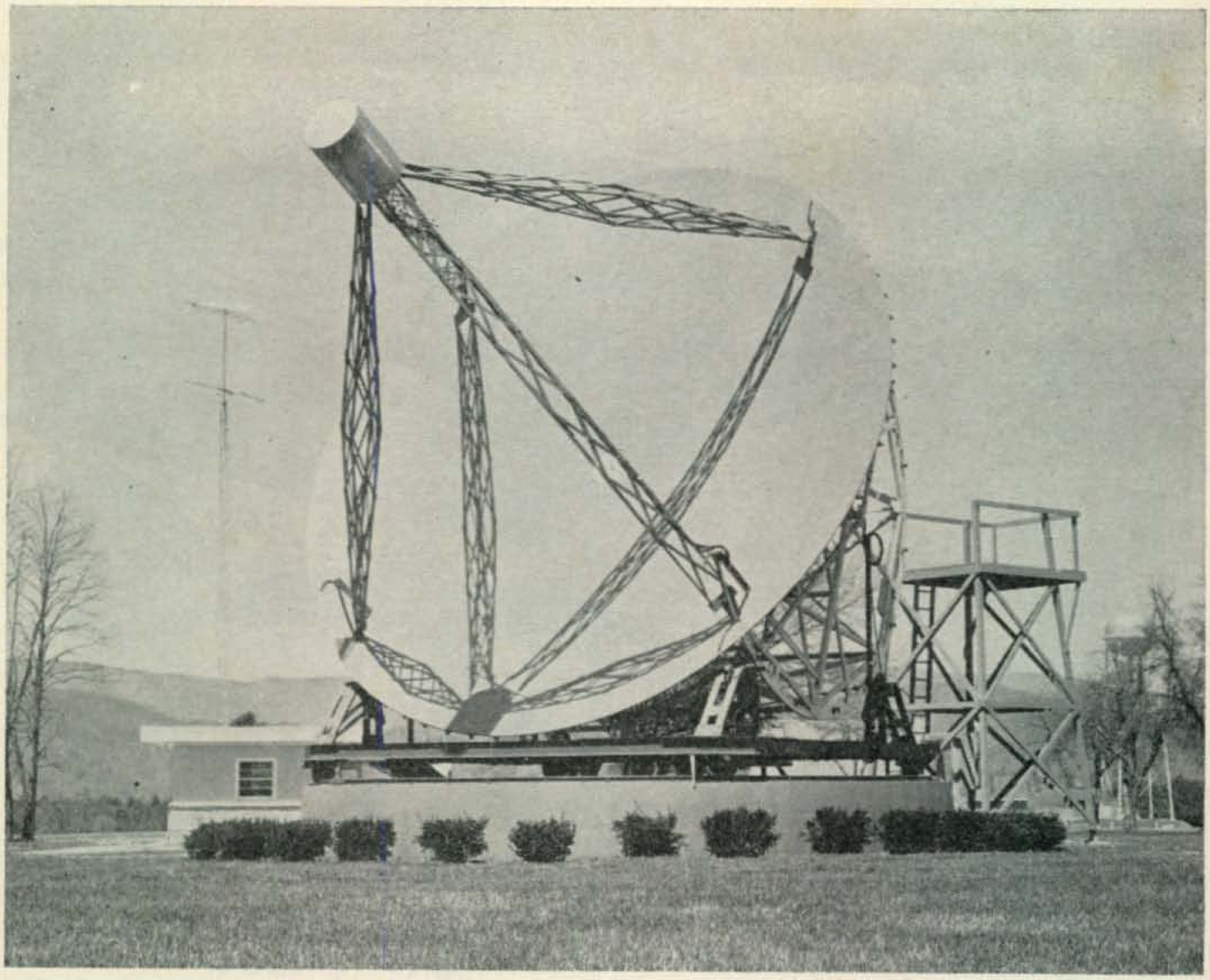
FULL LINE OF ACCESSORIES—Including base station and mobile antennas, rechargable battery kit, transceiver carrying case, battery carrying case, direction finding antenna, and others.

High Performance Commercial Grade Communications
At a Reasonable Price!

Please write for details

R F COMMUNICATIONS, INC.
1680 UNIVERSITY AVENUE • ROCHESTER, NEW YORK 14610

For further information, check number 6, on page 110



At Green Bank, W. Va., W9GFZ's original parabolic dish for listening to signals from space is not only shown to interested visitors, but is actually a functioning and integral part of the National Radio Astronomy Observatory's space radio exploration program. The can (which is kept at a constant temperature) contains the radio receiving gear and is mounted at the feed. Minor refinements have been made, but the dish is largely as state-of-the-art as any that have come since.

Signals From Space

The Story of Grote Reber, W9GFZ, The Father of Radio Astronomy

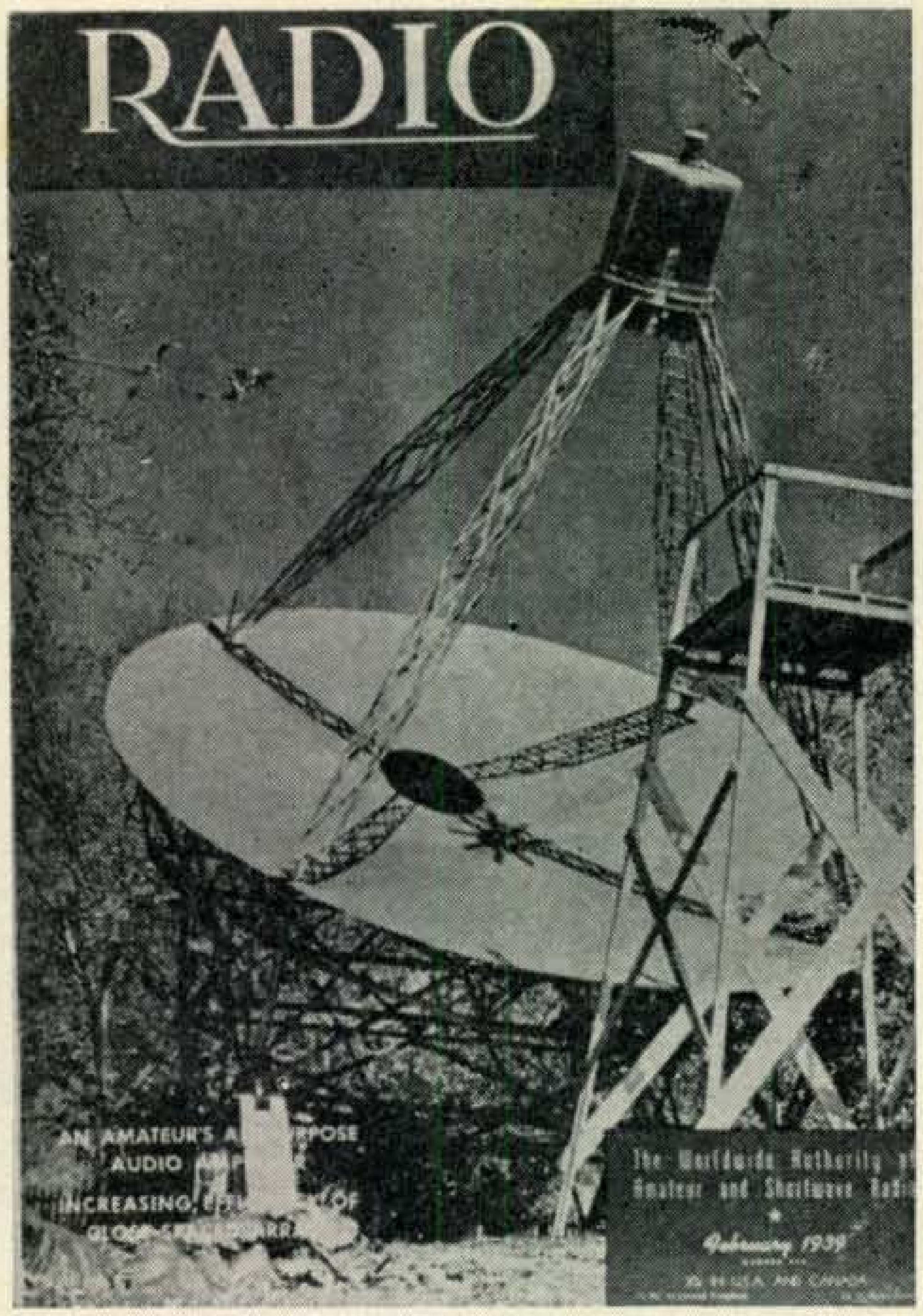
BY ROBERT M. BROWN,* K2ZSQ and ALLEN KATZ,† K2UYH

Few people realize that the person largely responsible for fathering the parabolic dish antenna—and the entire science of radio astronomy—was a curious ham with a WAC certificate. World famous in scientific circles, W9GFZ has gone unnoticed by most amateurs. This story attempts to rectify the situation.

THIS is a true account, compiled particularly for those skeptics who feel that radio amateurs make no significant contributions to the radio science. Contrary to the current belief that true achievement must be made by large groups of people in government or industry, Grote Reber, W9GFZ, went it alone.

Reber's career actually began with the work of a Karl Jansky, a young engineer with Bell Laboratories in the early 1930's. Jansky was

*19 Hillview Ave., Port Washington, L.I., N.Y.
†48 Cumberland Ave., Verona, N.J.



This cover of Radio magazine, circa 1939, shows W9GFZ's backyard parabola. Children clambered over it and it seemed to have a strange attraction for low-flying aircraft.

handed the assignment of tracking down the source of a noise that was creating havoc with Bell's attempts at transoceanic telephone communications. With nothing tangible to begin with, Jansky spent months conducting painstaking investigations before discovering that the interference (hash) coincided with the earth's rotation with regard to the stars. This time relationship, known as Siderial time, led him to conclude that Bell's noise was coming from outer space.

Soon after publishing his findings in 1932, Jansky was transferred to another project. In one of those curious quirks of modern technology, the discovery was promptly forgotten and began to gather dust.

It Started On 20 Meters

While all this was going on—or more accurately, laying dormant—W9GFZ was engaged in a practice not unfamiliar to today's hamming: chasing DX. After achieving WAC and amassing over 60 countries, Reber experienced something most of us go through at one time or another. To quote him: ". . . there were no more worlds to conquer." This same feeling has lead many of today's hams to v.h.f. and microwaves. And so it also led Reber.

Recalling Jansky's findings, and relating them to his own experiences listening to the "dead" 160-meter band, Reber remembered something. There had been more noise with the antenna connected to the receiver than when it was disconnected. Here was his new world to explore!

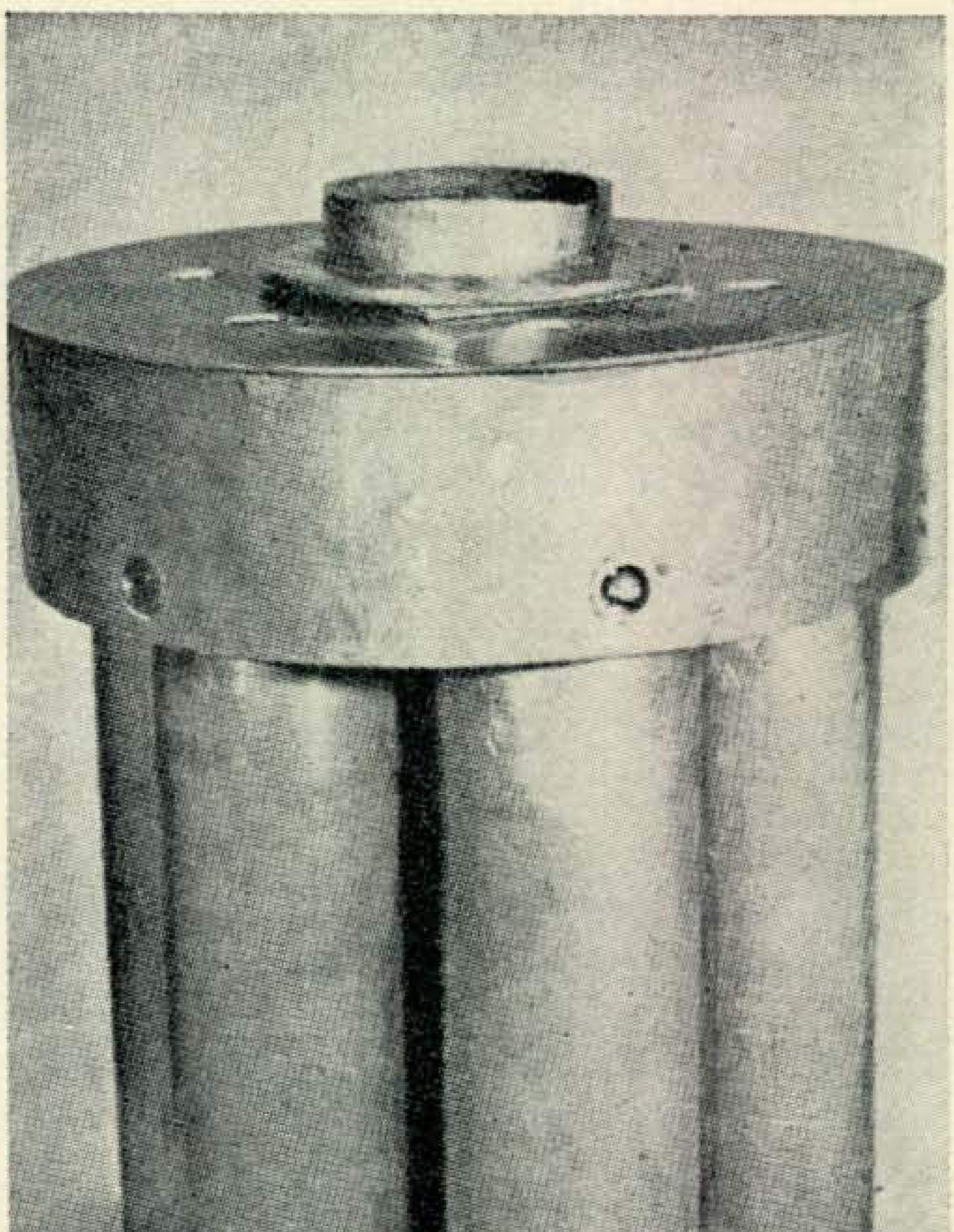
Having recently completed his formal education, the laws of physics were still fresh in his mind. In particular Reber recalled Plank's Law of Black Body Radiation, which inferred that the higher in frequency one went, the more radiation a body emitted. He also had learned that the higher the frequency, the greater the resolution (narrower beamwidth) a finite sized antenna would produce.

Though just a teenager, Reber reasoned that if a directive high frequency antenna could be constructed with a very narrow beamwidth, perhaps the location of the "noise in the sky" could be determined. For practical purposes, the higher the frequency, the better.

The Parabola is Built

Before anything could be measured, he'd have to have an antenna. He settled on the parabolic reflector, something of a departure in his day. His creation set the trend in radiotelescopes as we know them today.

Working independently and quite alone, he had to consider cost. A check with the American Bridge Co. resulted in an estimate of $7000 for a 50 × 10′ frame he'd need to begin the para-



A multi-stage 160 mc receiver used by Grote Reber.

Grote Reber, W9GFZ, fathered radio astronomy while a very young ham at his home in Wheaton, Illinois.

bolic. Needless to say, this was out of the question. He'd have to do it himself, somehow.

Primarily because wood was cheap and easy to work with, Reber formed his reflector frame from 72 radial wooden rafters. These were meticulously shaped to form a parabolic curve. The actual reflector he made from 36 pie-shaped pieces of 26 gauge galvanized iron, not exactly the easiest material in the world to lift. As best he could, Reber manipulated these sections one at a time and placed them over the rafters. He held them in place with conventional flat-head screws.

The final surface was 30 feet in diameter, with a 20-foot focal distance. It took him only four months to complete the dish, working completely alone, except for the actual mounting. This was accomplished (again because of financial limitations) in a transit mount, which limited Reber to only tilting the dish. He consoled himself by reasoning that the motion of the earth would be enough to take care of the other plane of rotation.

In all fairness, however, it should be stressed that although the world's first radiotelescope in a parabolic configuration was crude, it was sturdy. Indeed, *the antenna is still being used* for measurements at the National Radio Astronomy Observatory at Green Bank, West Virginia.

A "Kook" in the Neighborhood

It always seems true that whenever you're on the verge of a magnificent scientific discovery, someone starts a rumor that there's a "kook" loose in the neighborhood. Being somewhat more imaginative than most next-door types, however, Reber's Wheaton, Illinois, hecklers said it was a machine to control the weather. (This, of course, was only after a thunderstorm had hit the community). Others associated the dish with green men from Mars, which naturally intrigued the local children enough to scamper over it at the most inopportune moments. But the final indignity came when it was revealed that airplanes seem to have been attracted to it!

Despite these diverse reactions, W9GFZ carried on in the true amateur fashion. History doesn't record, unfortunately, his responses to verbal neighbors.

Cat's Whiskers

Grote's first tests were conducted on 3300 mc, a then almost unheard of frequency. The receiver used an RCA end-plate magnetron as the local oscillator and a piece of zinc sulphide as the crystal mixer, giving audio output.

The remainder of the receiver W9GFZ employed was a four-stage audio amplifier mounted directly behind the feed antenna on the parabola.

If At First . . .

During the spring and summer of 1938, Reber made a considerable number of observations on 3300 mc, pointing the parabolic first at the Milky Way, then the Sun, moon, planets and bright stars. Although minute noise fluctuations were encountered, overall results were inconclusive. If the black body theory had any merit, Reber should have heard Jansky's 15-meter "noise" at least 26,000 times more intensely. He tried various other oscillator/mixer combinations, including a complex Barkhausen tube oscillator, but the results were still the same: Nil. If anything could be concluded, it was that Plank's law did not take into account cosmic radiation.

When at first you don't succeed, move down the band. By reclaiming an old 410 gallon paint drum, Reber made a new feed antenna for his neighborhood conversation piece. The diameter of the empty drum determined the frequency of operation. He placed a dipole one quarter wavelength from the rear end of the drum, tuning it to 910 mc. He then obtained a 955 tube for his new local oscillator, coupled this together with his mixer and audio amplifier, and placed the entire receiving system again behind the antenna.

The autumn and winter of 1938 were spent concientiously taking a variety of measurements on 910 mc. Results: Nil.

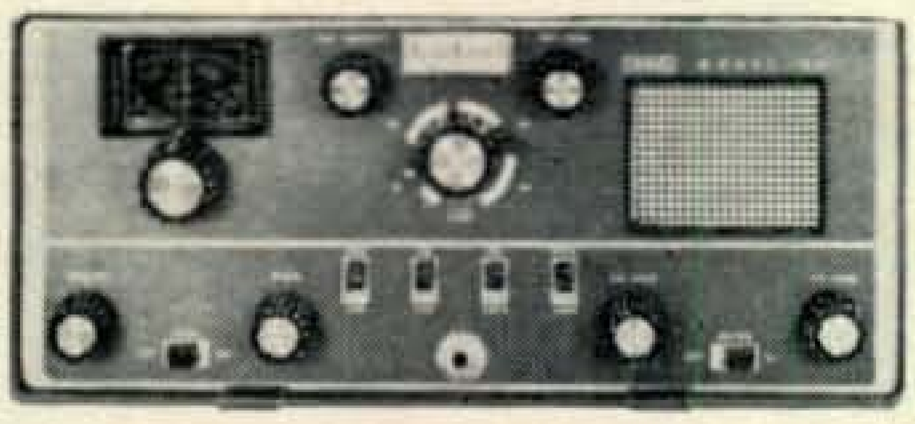
Realizing now that it was hopeless to stay in the microwave and u.h.f. regions, he decided to sacrifice resolution for sensitivity and go down to under 200 mc. From experience he obtained in industry, W9GFZ designed a multi-stage tuned radio frequency receiver which had the sensitivity of a superheterodyne without the bandwidth limitations. Alcoa fashioned an aluminum cylinder for the feed cavity for him, and a dipole was inserted. Once again the material determined the exact frequency—this time 162 mc.

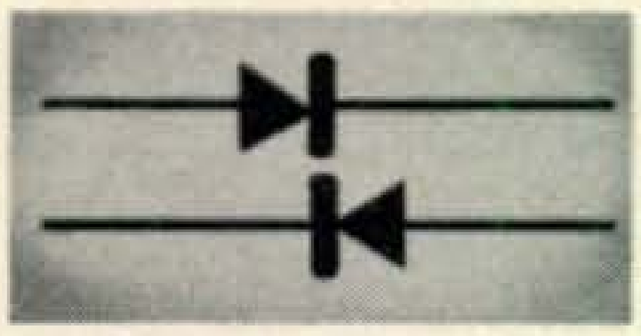
What He Heard Above 2 Meters

The receiver proved quite a shock right from the start. Something not even considered before appeared on the scene: ignition noise. Realizing that he'd somehow have to separate the space noise from the ignition pulses, he relegated most of his tests to after 10 P.M. and worked up a meter read-out device. This was accomplished

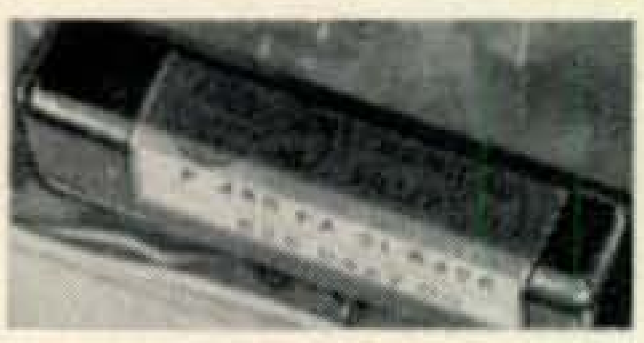
[*Continued on page 100*]

SBE





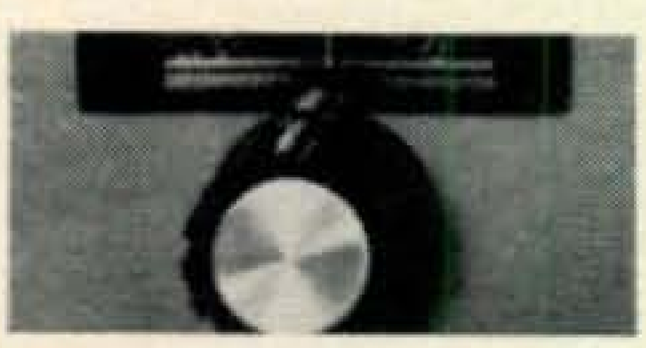
No relays—
Solid-state switching.



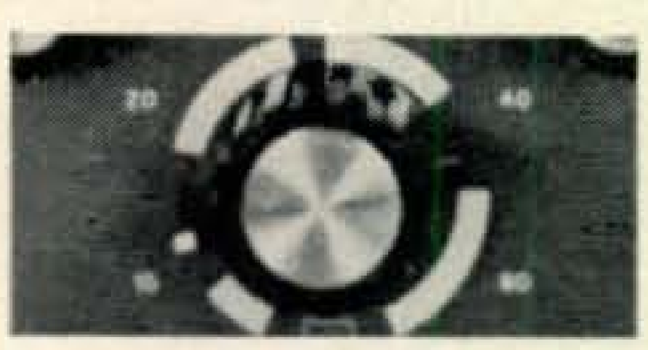
Collins
Mechanical Filter.

Panel switch
selects USB or LSB

Delta receiver tuning
plus/minus trans. freq.



Dual speed
receiver tuning



One knob controls band-
switch and exciter tune.

features for the future . . .

all present

It would be easy to reel off another dozen **SB-34** features, most of them solid-state—like bi-lateral 2-way circuits—many of them exclusive. But when you actually pick up this mighty miniature —heft its 19 pounds—you will realize how much solid-state components have helped to shrink the size and weight of the package. It would be only natural if you marvelled a bit about the fact that you have at your fingertips a powerful, full-fledged, 4-band SSB **station** in a package only 5"x11¼"x10".

Not shown in the film clip at the left is the all-important **handle** for the SB-34 provided to encourage you to take advantage of the utility of this fine transceiver—and to use it at home, in your car—or boat—or plane—or ski resort? Of course you'll also be packing the dual 117V AC and 12V DC power supply. But this time no extra handle—the supply is built right into the SB-34 cabinet. (and is included in the price of $419.00.) **Carry on!**

SBE, Sideband Engineers, 213 East Grand Ave. South San Francisco, California.

RAYTHEON

Export sales: Raytheon Company, International Sales & Services, Lexington 73, Mass. U.S.A.

For further information, check number 32, on page 110

Announcing

THE *CQ* WORLD WIDE SSB CONTEST

April 8-9, 1967

I Contest Period: 0000 GMT Saturday, April 8th to 2400 GMT Sunday, April 9th, 1967. Only 30 hours out of the 48 hours permitted for Single Operator stations. The 18 hours of non-operation may be taken in one, two but not more than three periods anytime during the contest. It need not be in equal periods, but must total a minimum of 18 hours and be clearly indicated on the log.

Multi-operator stations may operate the full 48 hour contest period.

II Bands and Participation: All bands 3.5, 7.0, 14.0, 21.0, and 28.0 mc can be used but operation is confined to two-way sideband emission only.

III Type of Competition: 1. Single Operator (a) All Band (b) Single Band. 2. Multi-Operator (a) All Band Only.

IV Equipment: Only one transmitter may be operated at any one time, and competitors may use the maximum power permitted under the terms of their license. (Multi-transmitter operation is *not* permitted in this contest.)

V Serial Numbers: The contest exchange will be the usual five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact.

VI Points: 1. Contacts between stations on different continents will count three (3) points.

2. Contacts between stations on the same continent but not in the same country will count one (1) point.

3. Contact between stations in the same country will be permitted for the purpose of obtaining a Prefix multiplier, but will have no QSO point value.

VII Multiplier: The multiplier in this contest will be determined by the number of different prefixes worked. A "prefix" is considered to be the two or three letter/numeral combination which forms the first part of an amateur station call. (W1, WA2, DJ2, DL4, GB2, 4X4, 5AI). Each different prefix may be counted only *once* during the contest.

VIII Scoring: 1. The score for a single band entry will be the total contact points on that band multiplied by the number of different prefixes worked on that band.

2. The score for an all band entry will be the total contact points from *all* bands multiplied by the total number of different prefixes worked on *all* bands.

3. A station can be worked once on each band for QSO point credit; however, prefix credit can be taken only *once* regardless of the band.

4. Those sending in a log for a single band will be eligible for a single band award only. If a log shows more than one band, it will be judged as an all band entry unless indicated otherwise.

5. A station will not be eligible for more than one award.

IX Awards: Certificates will be awarded to the highest scoring Single Operator station in each country and each call area of the United States, Canada, and Australia.

1. For the highest score on each Single band.

2. And for the highest score on all bands.

Certificates will also be awarded to the highest scoring Multi-Operator station in the same areas but for All band scores only. (Alaska and Hawaii will be considered as separate countries for both scoring and award purposes.)

X Disqualification: Violation of the rules and regulations pertaining to amateur radio in the country of the contestant, or the rules of the contest, or unsportmanship conduct, or duplicate contacts in excess of 3% of the total made, will be deemed sufficient cause for disqualification.

XI Log Instructions: 1. Indicate a prefix only the *first time* it is contacted.

2. Use a separate sheet for each band and also a tally sheet or report form.

3. All times indicated must be in GMT. And the 18 hour rest period must be clearly indicated.

4. All contestants are expected to compute their own scores. Logs should be checked for contact and prefix duplication and proper point credit before they are submitted. Unscored logs will be used as check logs only.

5. A prefix check list is not only desirable but a *must* for proper contest operation.

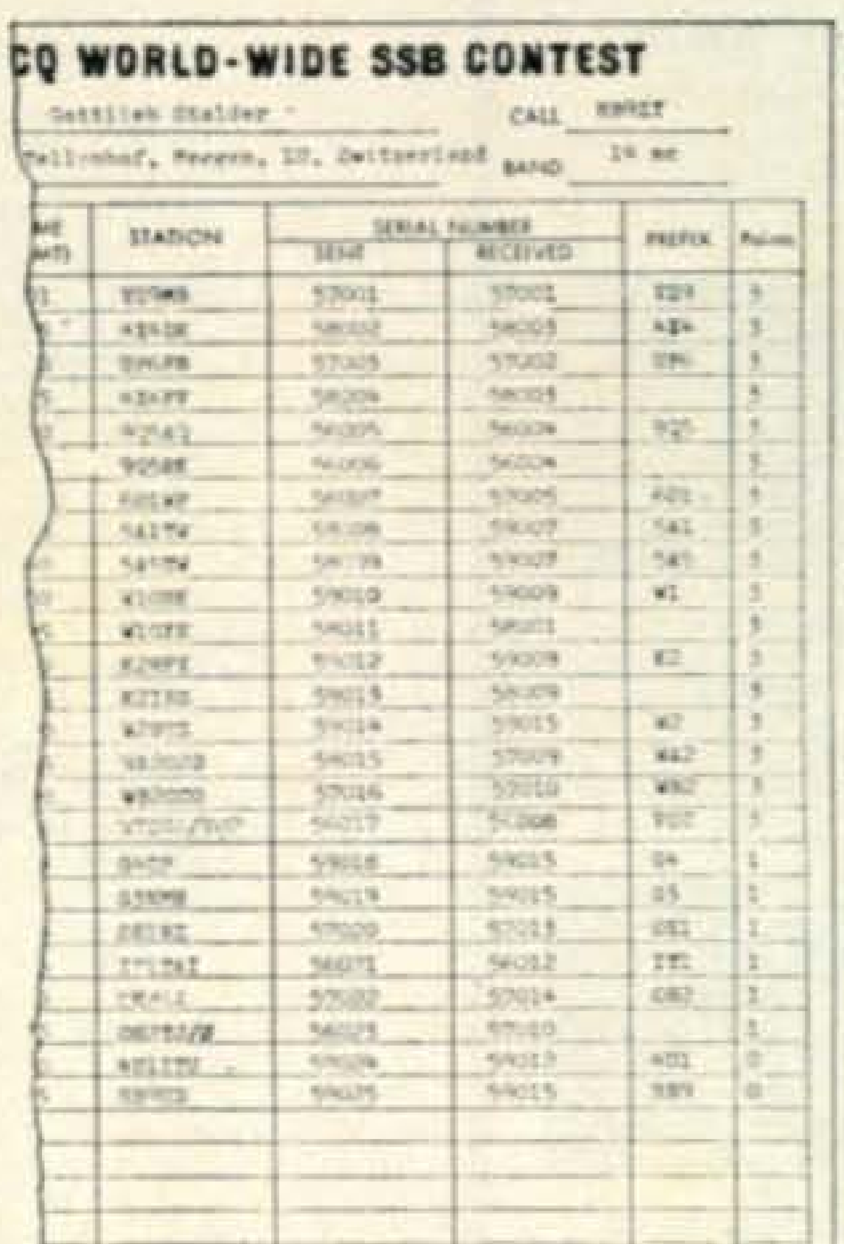
6. Make sure name and address is clearly shown on each summary sheet. *PRINT or TYPE.*

7. Each contestant must sign a pledge that all rules and regulations have been observed and that the report is a true one.

8. Official log forms are available from *CQ*. Send a large-size, self-addressed envelope with sufficient postage to cover your request. If official forms are not available use a duplicate form. The size is 8½ x 11" with 40 contacts to the page. (The same forms used in our World-Wide DX contest can be used.)

9. It is suggested that you send your prefix check-off list along with your log.

XII DEADLINE: All logs must be postmarked *no later* than May 15, 1967. Send logs to: *CQ*, 14 Vanderventer Avenue, Port Washington, New York 11050. Attention: WW SSB Contest.



A High Frequency Horn Antenna!

BY JOHN J. SCHULTZ, W2EEY/1

Several high-frequency antenna configurations have evolved from antenna forms originally developed for u.h.f. service, such as the variations of the horn antenna. This article presents some background on horn antennas and the authors experience with a type of horn antenna which can be used for broad-band, unidirectional use on the high frequency bands.

HORN-type antennas (fig. 1) have generally been considered as being useful only at u.h.f. frequencies, primarily as a waveguide termination device used either to illuminate a reflector or to act as an antenna by itself. However, at least two forms of horn antennas have already found some application below 30 mc as broad-band antennas, namely the discone and conical types. Generally, they have been used as vertically polarized, broad-band types covering all or several of the amateur h.f. bands. Another interesting form of horn antenna which can provide broad-band performance plus directivity and choice of polarization on the h.f. bands is the so-called pyramidal horn.

*40 Rossie Street, Mystic, Conn. 06355.

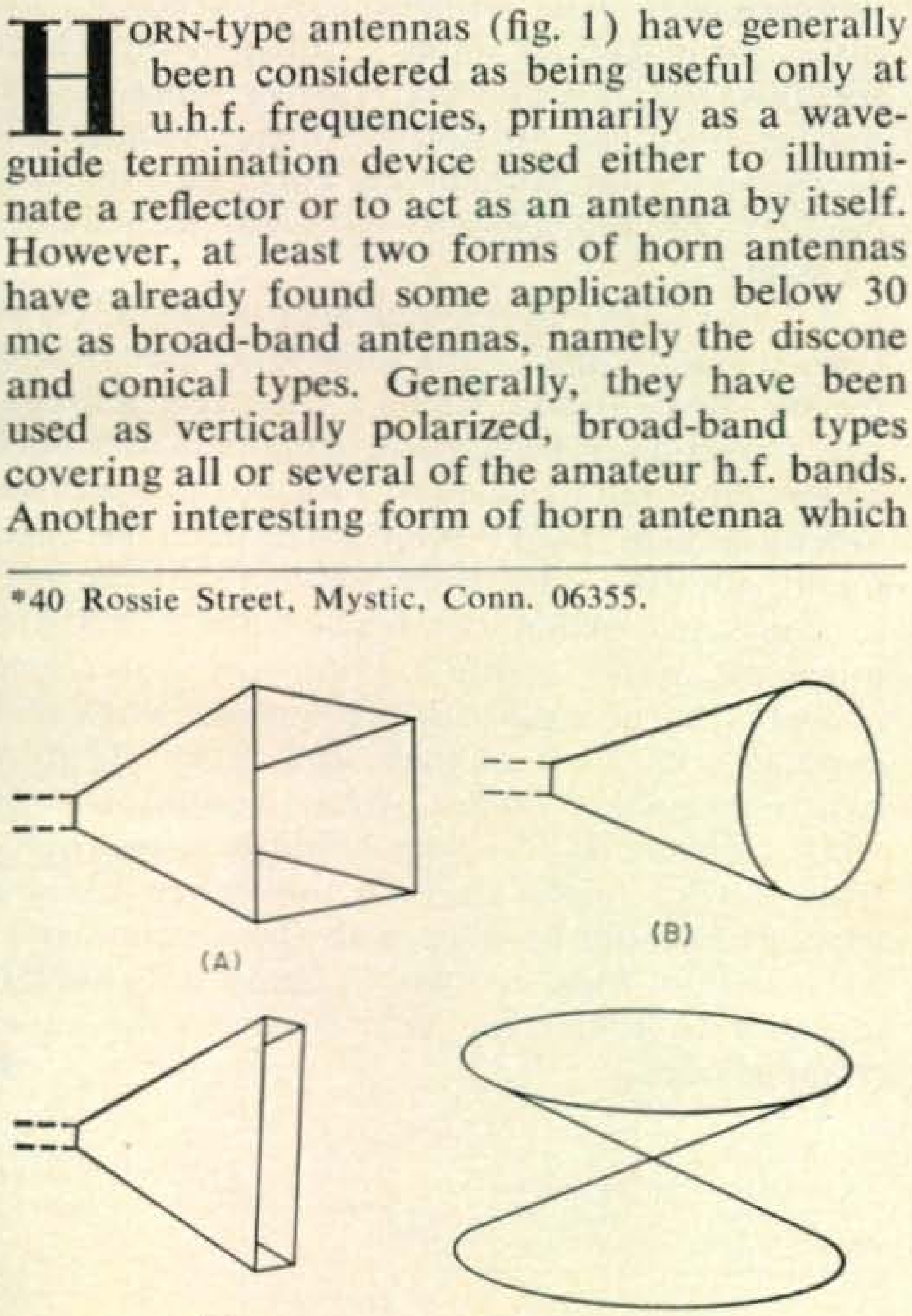


Fig. 1—Various forms of u.h.f. horn antennas. (A) Pyramidal; (B) Conical; (C) Sectoral; (D) Bi-Conical.

The pyramidal horn is a special case of a broad class of horn antennas where the side lengths are equal. One very interesting feature of the antenna is that if only two sides of the antenna are used, a choice of polarization and plane directivity can be obtained as shown in fig. 2. The minimum length of a side must be $\frac{1}{2}\lambda$ at the lowest frequency used. The antenna can be considered as a non-resonant, high-pass device where the $\frac{1}{2}\lambda$ side length determines the cutoff frequency.

Theoretically, the response should extend infinitely high but in practice because of structural and other discontinuities response is limited to something less than a 10 to 1 frequency range. The gain varies linearly with the side-length and is equal (in db) to about 8 times the side-length. Thus, the smallest horn ($\frac{1}{2}\lambda$) will have a gain of 4 db and one with side-lengths of 2λ will exhibit about 16 db gain.

Pattern

The radiation pattern is similar to that for a Yagi type antenna of similar gain. The front to back ratio is at least as high and the pattern is free from any pronounced minor responses. The feed-point impedance for a two-sided antenna is about 400 ohms. Although at u.h.f. frequencies the antenna is constructed of flat sheet metal such construction is impractical at lower

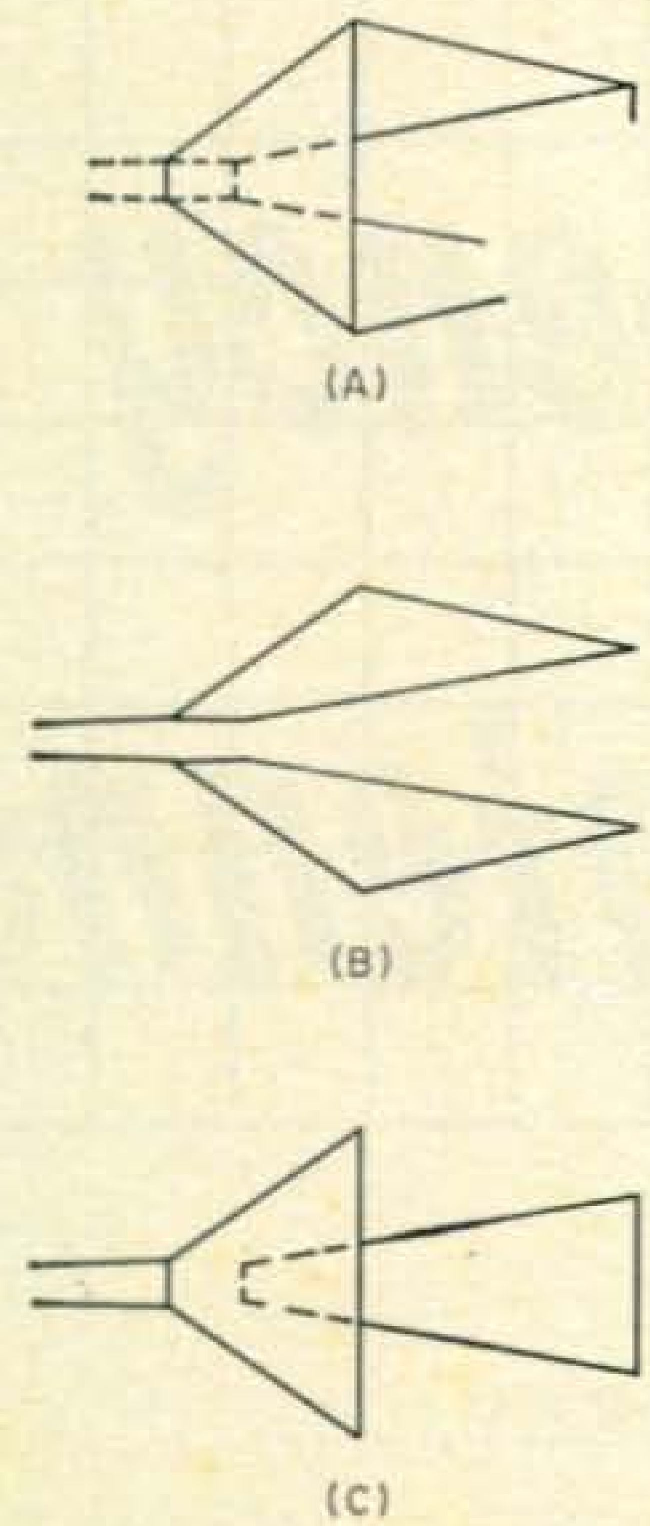


Fig. 2—If the 4 sided pyramidal horn is considered as 2 sided structure, the form at (B) will produce vertically polarized emmission while the vertically sided form (C) will produce horizontally polarized emmission. In (B) and (C) all angles are 60° and all sides are $\lambda/2$ or longer.

frequencies. One substitute is to use a grid of wires spaced 0.05λ at the highest frequency to be used. The 0.05λ spacing is used in a number of curtain and billboard type antennas where a grid of wires must form a reflecting surface and has been found to be an effective compromise between electrical performance and practical construction considerations.

Construction

In order to try out the performance of h.f. horn antennas, the author built the model shown in fig. 3. The dimensions were chosen to have a cut-off frequency of 20 mc in order to place it well below the low end of the 15 meter band. The antenna was constructed of #14 copperweld with a grid spacing of 1½ feet to correspond to 0.05λ on 10 meters. Actually, the antenna should be useful at frequencies far higher than 10 meters but the cost of sufficient wire plus the necessity of spacing the wires as close as ⅓ foot for 2 meters made the construction of a 15 to 2 meter model too complicated. In any case, the directivity such an antenna with side-lengths of 4λ on 2 meters would provide, would require that it be made rotatable for any sort of general usage. On the other hand, the broader directivity provided when the side-lengths are ½ to 2λ make it a good general-area DX antenna, to cover, for example, central Europe or northern Africa on two or more h.f. bands.

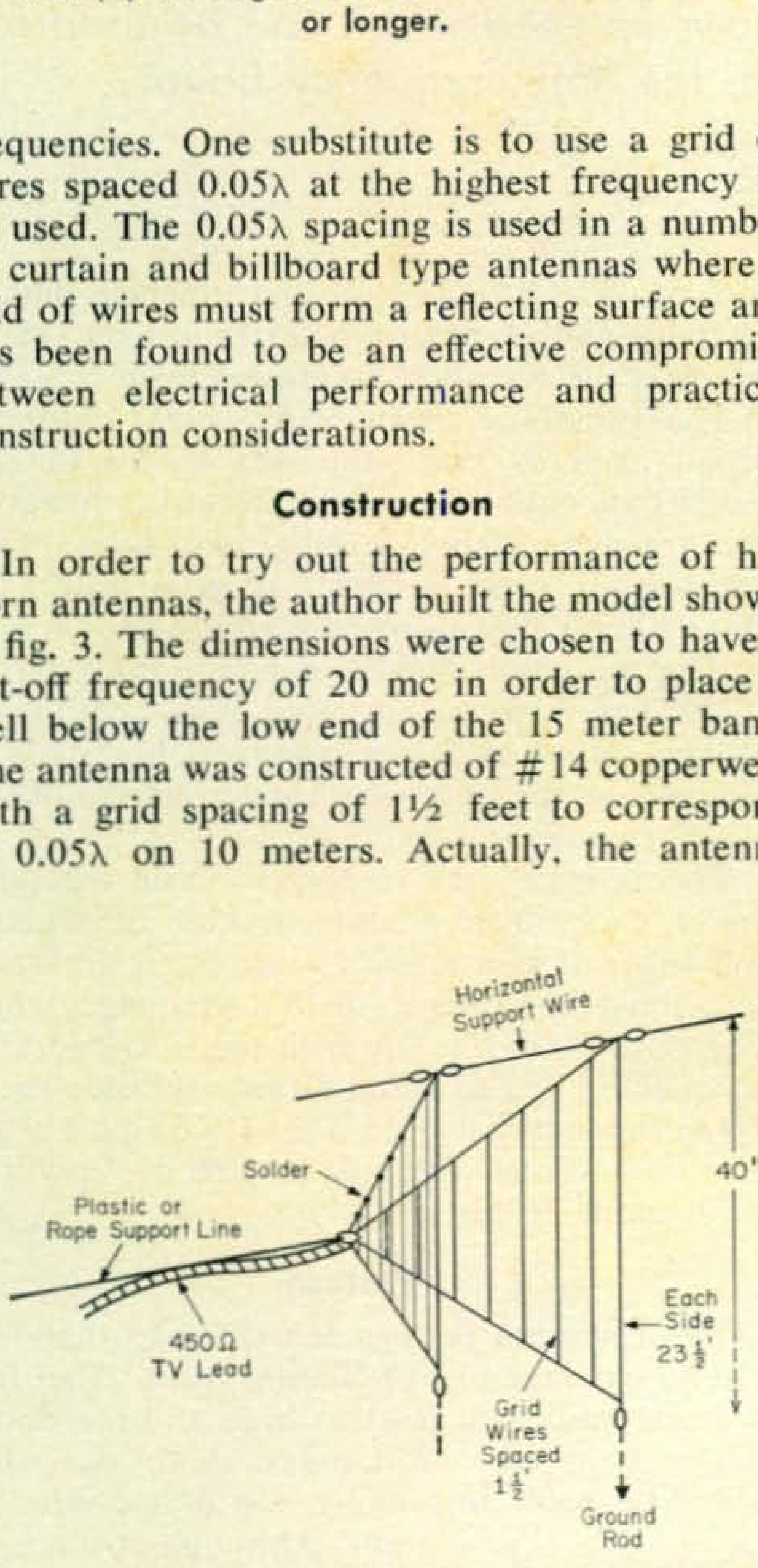


Fig. 3—Two sided horn with dimensions for use on 15 and 10 meters.

Feedline

The antenna was fed with standard 450 ohm open-wire television lead-in and a Transmatch. A quarter-wave matching section utilizing 150 ohm twinlead can also be used as shown in fig. 4 to transform the impedance down enough to provide a good match to 52 ohm coaxial cable. A possible alternative would be to feed the antenna directly with 300 ohm twin-lead which can then in turn be connected to a broad-band 300 to 75 ohm, balanced to unbalanced transformer. The approximate 1.3 to 1.5 s.w.r. which would result should not prove detrimental unless an exceptionally long transmission line is used. The 450 ohm line used by the author was supported on a plastic runner line which was pulled taut to stabilize the antenna.

The s.w.r. was quite low on both the 15 and 10 meter bands, never exceeding about 1.8 to 1. A check with a signal generator showed an unusual rise in s.w.r. at about 25 mc. but the reason for this was not checked further since it was outside both the 10 and 15 meter bands. The performance on both bands equalled that of a popular commercial tri-band beam with loaded elements.

All in all, the pyramidal horn with only two sides seems to offer some interesting possibilities for the amateur who wants a relatively inexpensive directional broadband antenna. Certainly when compared to structures such as log-periodic antennas with their complicated feed arrangements, the two sided horn seems relatively easy to construct. When constructed for lower frequencies, some additional support wires will probably be necessary to prevent the wires of a vertical grid, such as that used in fig. 3, from twisting together under windy conditions. On v.h.f. frequencies the sides could be constructed from a wire mesh. Construction when using a wire grid should be done with the antenna sides stretched out fully and with a heavy duty soldering iron to solder the grid wires to the outer triangle sides. ■

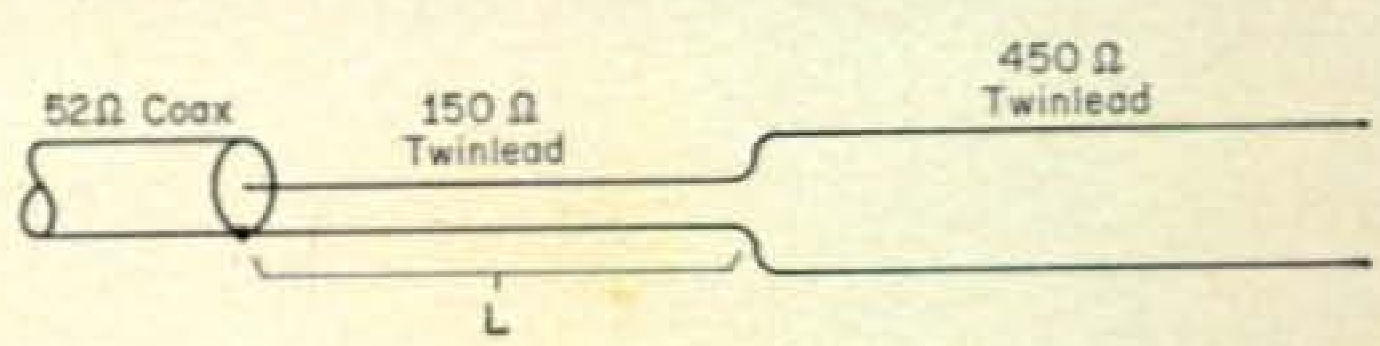


Fig. 4—Single-band matching transformer. *L* should be 101″ for 15 meters and 75″ for 10 meters based on $\lambda/4 \times$ velocity factor.

A PRODUCT DETECTOR FOR MILITARY RECEIVERS

BY JOE H. OWINGS,* KØAHD

During the last few years there have been some very fine receivers such as the Hammerlund SP-600 JX, the Collins R-388 made available to Air Force MARS members. These receivers do a good job as a.m., c.w. and RTTY receivers but leave something to be desired for s.s.b. operation as this mode has come onto the communications scene since these particular receivers were designed. The frequency coverage and stability are adequate but the envelope type detector and slow or delayed a.v.c. systems give only mediocre performance on s.s.b. Being lucky enough to come by these receivers I decided to try to improve the s.s.b. and even the RTTY performance of my receivers. The following are easy to make modifications which make these receivers perform as well as the later models which were designed for s.s.b.

A simple, solid state, product or linear detector is added and the a.v.c. characteristics are changed to a fast attack-slow release system as found in current s.s.b. receivers. Although the following installation data is for the SP-600 and R-388, the circuits are compatible with most any of the commercial receivers made without them. One advantage of these circuits is that no additional tubes or metal work is needed.

Also shown is a circuit to add a Collins mechanical filter to the R-388 which really completes the s.s.b. system. A mechanical filter may be added in the same way to the SP-600 but I did not as I only had a 500 kc unit as needed in the R-388. The 3.1 kc filter used is a Collins type 353C-31 mechanical filter adapter similar to the mechanical filter adapters used for the 75A receivers. The only difference is the intermediate frequency of 500 kc instead of 455 kc in the 75A series. Currently there are the Collins 455 kc experimenters mechanical filter and the less expensive filter made by Lafayette Radio, either of which would be a natural for the SP-600.

*10217 St. Daniel Ln., St. Ann, Missouri, 63074.

Modification for the SP-600 JX

The step by step instructions for adding a product detector to the SP-600 JX receiver are given below.

1) Disconnect C_{139} (15 mmf) from pin 7 of V_{14} (6AL5 det. and a.v.c.). Do not disturb any other circuit wiring on this socket.

2) Disconnect C_{143} (5100 mmf) from the junction of R_{64} (47K) and R_{65} (47K) and leave it in its original position. These components are located on a terminal board underneath the chassis by the i.f. output jack and parallel to the side chassis wall.

3) Connect both cathode ends of CR_1 and CR_2 together (as shown in fig. 1) with approximately ½" lead lengths. Leave the outer

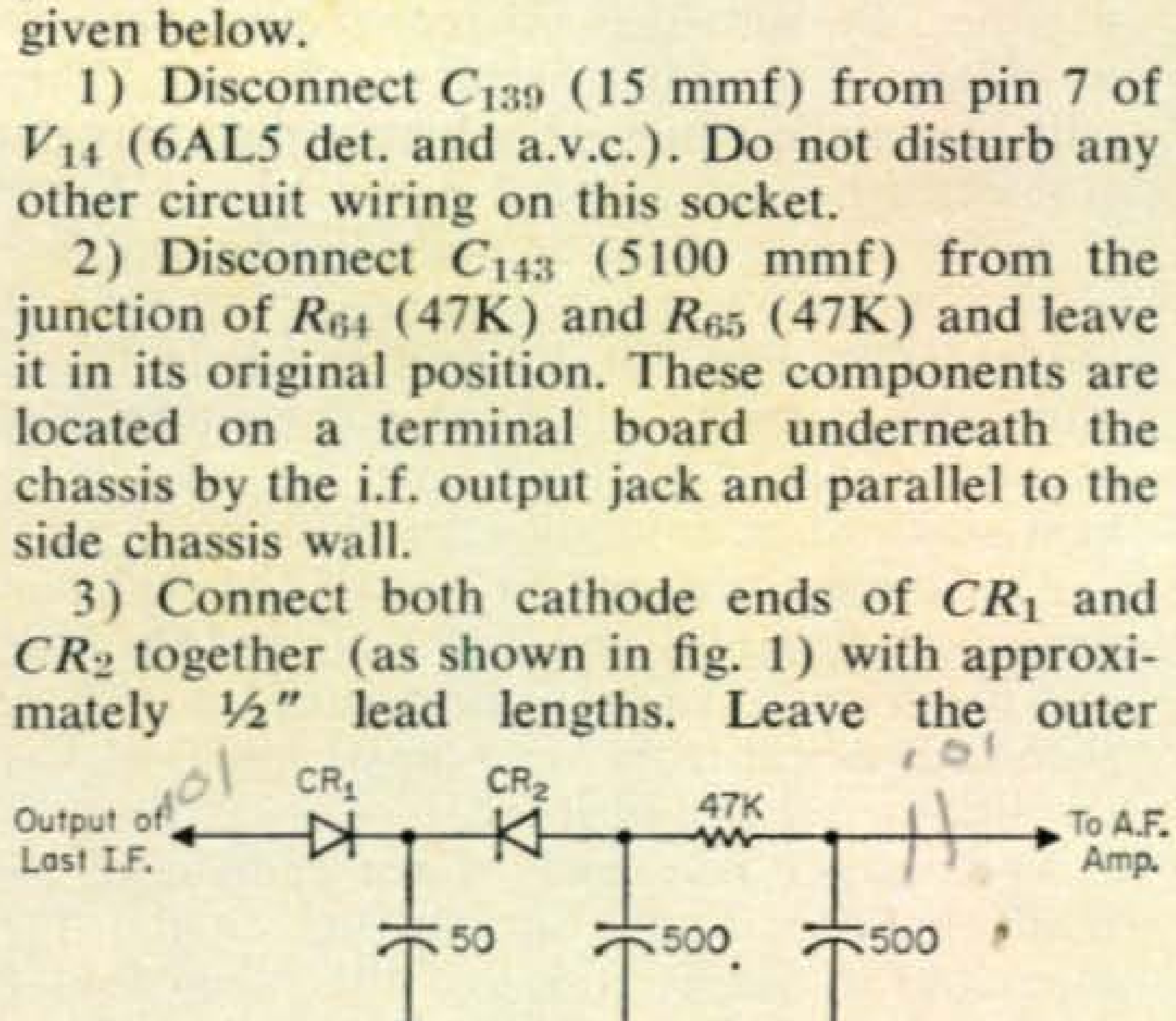


Fig. 1—Circuit of a simple product detector added to the two surplus receivers discussed in the text. The diodes can be 1N67, 1N38, 1N281, etc.

ends (anodes) approximately 1″ long. Be sure to use heat sinks on the diodes when soldering as heat ruins them.

4) Solder one end of a 500 mmf capacitor to the free end of C_{143} and the other end to ground. Also connect one end of the 47K resistor to this junction of the capacitors.

5) Solder the remaining lead of the 47K resistor to one end of CR_2. Connect the other 500 mmf capacitor from this connection to the nearest ground point.

6) Connect the free lead from CR_1 to the loose lead of C_{139} previously clipped from V_{14}.

7) Solder one end of a 50 mmf capacitor to pin 5 of V_{12} (b.f.o. buffer) without disturbing any other socket wiring and then connect the other end to the junction of the two diodes. This complete the product detector wiring, resulting in the circuit shown in fig. 1.

A.V.C. Modifications, SP-600 JX

To change the a.v.c. to fast attack-slow release, do the following:
Locate C_{137} (0.25 mf) which comes off the MOD-CW switch (S_7) and solder a 1.0 mf capacitor in place of it.

Modifications for the R-388

The step by step instructions for adding a product detector to the R-388 receiver are given below.

1) Disconnect the white with brown & green trace wire from the center terminal of T_{105} (term. #6) to pin 7 of V_{110} (detector-a.v.c.) at pin 7 and let it hang free. At this pin there is a small ceramic capacitor coming (C_{206}) from pin 5 of V_{114} (b.f.o.). Clip it at the pin 7 end and orient it so that it will not touch the chassis. This lead will be left hanging loose. Do not disturb any of the other socket wiring.

2) Clip R_{151} (33K) at pin 1 of V_{112} (limiter a.f. amp.) and R_{150} (68K) at pin 2. Bend both resistors straight up and solder their free ends together. Be sure that this connection does not touch any of the other circuit components. There will be only a white with black trace wire left connected to pins 1 and 2 now. Do not disturb this wire as it goes to the noise limiter switch.

3) Connect both cathode ends of the two diodes (CR_1 and CR_2) together (as in fig. 1) with approximately 1″ leads. The other leads (anodes) should be 1¼″ long. Be sure to use heat sinks when soldering the diodes.

4) Connect one end of one of the 500 mmf capacitors to pins 1 and 2 of V_{112} and the other end to ground. Connect one end of the 47K resistor (leads cut to ⅝″) to pins 1 and 2 of V_{112} leaving the other end loose.

5) Connect one lead of the remaining 500 mmf capacitor to the ground lug on the filter capacitor socket (C_{217}) and the other lead to the loose end of the 47K resistor. This resistor is oriented so as to run parallel to the rear chassis wall.

6) Connect one end of the diodes (CR_1 and CR_2) to the junction of the 47K resistor and the

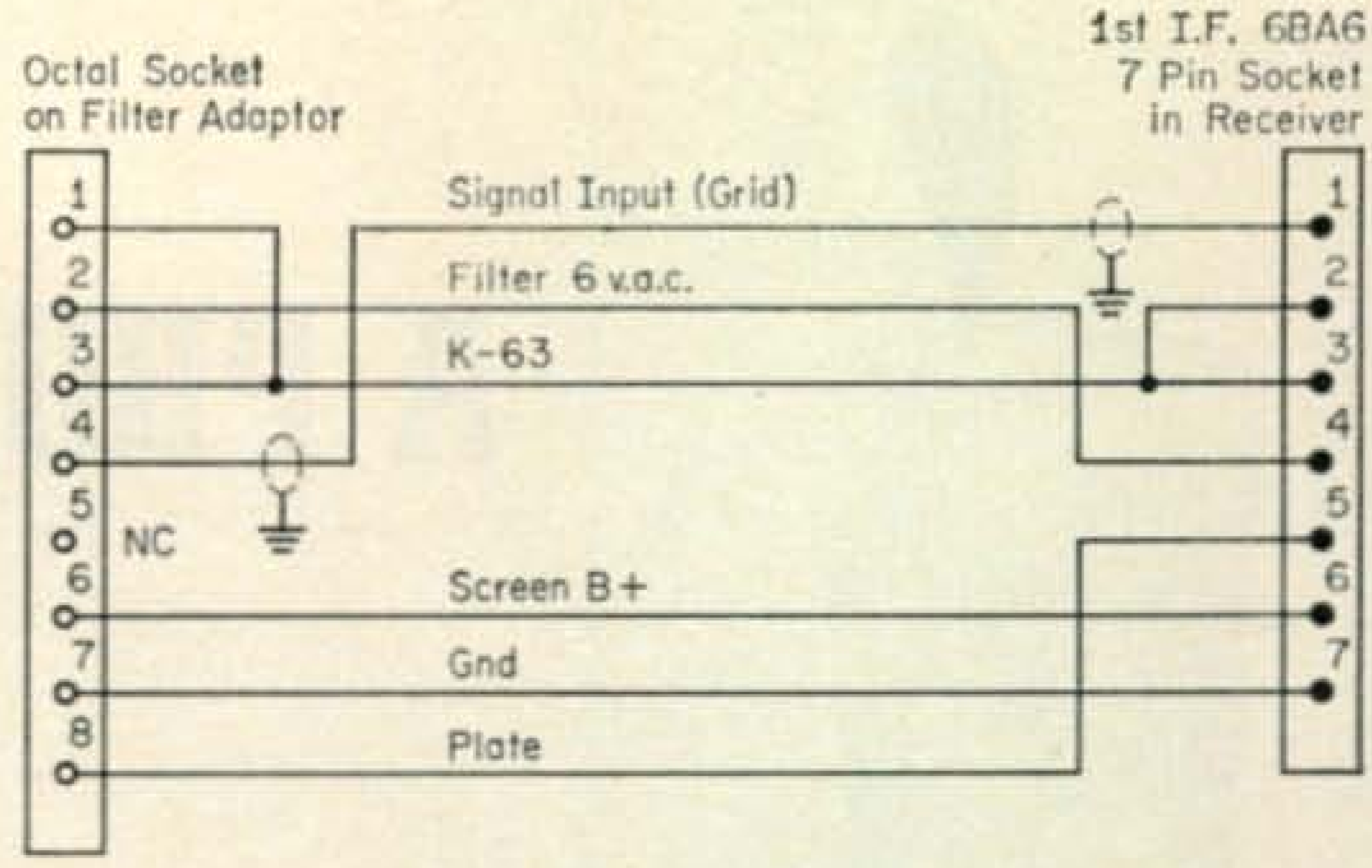


Fig. 2—Circuit of the adapter cable used for the Collins plug-in filter described in the text.

500 mmf capacitor. Orient the diodes so that they run parallel to the rear chassis wall and connect the loose end to the loose end of the wire coming from terminal 6 of T_{105}.

7) Clip the leads of the 50 mmf capacitor to approximately 1½″ and solder one end to pin 5 of V_{112} (b.f.o.) and the other to the junction of the diodes. Be sure to use heat sinks when soldering to the diodes to avoid heat damage. This completes the wiring of the product detector.

AVC Modification for the R-388

To change the a.v.c. action, do the following:

1) Locate C_{205}, a metal bathub capacitor on the rear chassis wall and clip the wire from the center terminal. Put a piece of tape on the loose end and orient it so it does not touch any other components.

2) Connect a 1.0 mf, 200 volt capacitor from pin 1 of V_{111} (a.v.c. amp-i.f. output) to ground.

Mechanical Filter

The addition of a mechanical filter is very simple if you can find one of the Collins mechanical filter adapters that have the input and output tubes included. This type adapter merely plugs in the 1st i.f. tube socket, replacing that stage and using the attendant transformer for output. Both the SP-600 JX and the R-388 have similar 1st i.f. stages using 6BA6 tubes, except that a 455 kc filter must be used in the SP-600 and a 500 kc filter must be used in the R-388. A word about these mechanical filters; the one I used had a 3.1 kc bandwidth because that was what I happened to find at a real cheap price. Most operators would recommend a 2.1 kc filter for s.s.b. and a 1.4 kc filter for RTTY. Whichever of these filters are used, equal results will occur, and if there are several available, all may be plugged in this adapter.

An adapter cable must be made for this filter as the Collins adapter unit is fitted with an octal plug and both receivers have miniature type tubes. This adapter cable is approximately 6″ long and is fitted with an octal cable socket on one end, and a Vector type P-7 plug on the other. Shielding at the receiver end is accomplished by slipping on a miniature tube shield with a rubber

[*Continued on page 102*]

Project OSCAR
A Progress Report

BY GEORGE JACOBS,* W3ASK

THE violent storms which raged throughout Europe during this past fall have caused a further delay in the OSCAR-EUROPA project. The European-built amateur radio communications satellite was scheduled for a balloon flight final check during either October or November, before it was to be shipped to Project OSCAR Headquarters in California. The test flights have been postponed because of the bad weather, and have been rescheduled for January or February, 1967. This means that the satellite won't be shipped to California earlier than March ,and probably won't be ready for launch until late spring or early summer.

From "down-under" comes news that the Melbourne University Radio Club (VK3ATM) has completed the OSCAR-AUSTRALIS beacon satellite. This satellite contains beacon and telemetry transmitters on both 10 and 2 meters, but will not be able to relay radio signals from amateur stations on the ground. By the time this appears in print, the Australian-built satellite should be on its way to California, where the Project OSCAR experts will put it into final shape for what may well be a springtime launch.

The race is still on for OSCAR V. At this moment, the Australian beacon transmitter appears to be ahead of the European relay transmitter. Project OSCAR Headquarters is confident, regardless of which one becomes OSCAR V, that both satellites should be launched before the end of the coming summer.

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

Project OSCAR Membership Drive

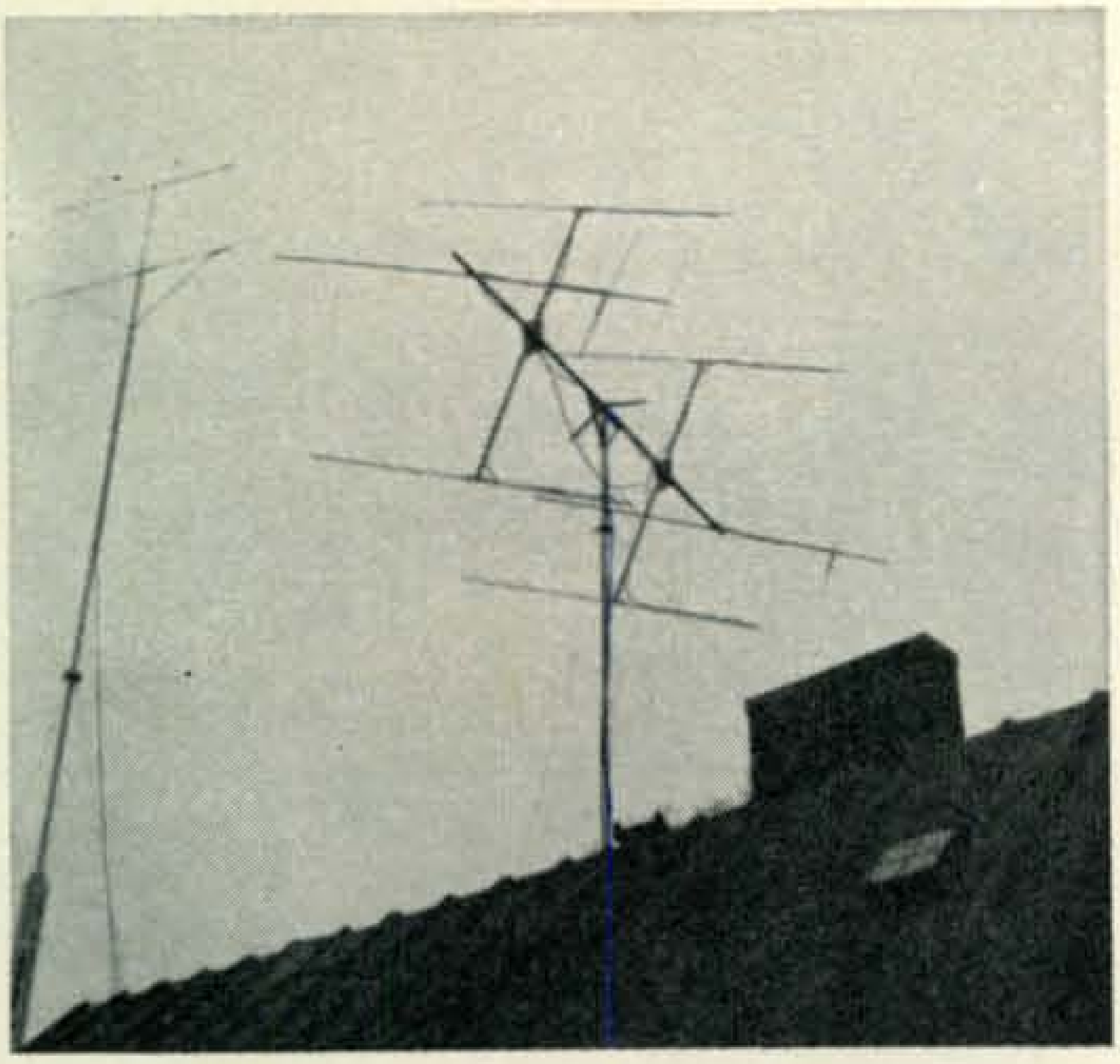
Project OSCAR Headquarters has begun its 1967 membership drive. Radio amateurs and experimenters with an interest in amateur space communications can apply for membership by writing directly to W6CYL, Robert C. Walton, 680 South 15th Street, San Jose, California, 95112. Bob is Treasurer of Project OSCAR. Annual dues are $5.

Financial support through membership in Project OSCAR helps pay for the OSCAR satellites. This is a wonderful opportunity to participate in an exciting amateur radio effort. Members receive advance information concerning OSCAR satellites through a regularly published newsletter, vote for project officers, have a voice in each project, and can participate in the design and construction of OSCAR satellites.

The Story Of SM7OSC

Amateur radio station SM7OSC, located on the shores of the Baltic Sea in the town of Trelleborg on the southern-most tip of Sweden, is responsible for leading Sweden into the age of space communications. This station, the work of a small group of space-minded Swedish radio

With his jr. op. looking on, Arne Nilsson, SM7AED is shown operating SM7OSC during an OSCAR III contact.



The long Yagi arrays used at SM7OSC for communicating through the OSCAR IV amateur radio communications satellite. The 432 mc array is to the left; the 144 mc array to the right.

amateurs, made communications history by being the first Swedish radio station of any type ever to communicate through an orbiting satellite. SM7OSC was also the first Swedish radio station to successfully comunicate via moonbounce, or the earth-moon-earth propagation path.

How the station was formed, and its successes with the OSCAR III and IV amateur radio communication satellites, as well as with moonbounce was related recently to W3ASK by Arne Nilsson, SM7AED, a member of the SM7OSC team. Here is the story in Arne's own words.

"SM7OSC is the callsign of the VHF Radio Club of southern Sweden. The callsign is a special one issued by the Swedish telecommunication authorities in recognition of the OSCAR satellites. The gang at SM7OSC consists of seven "old" v.h.f. radio amateurs; SM7BAE, 7BE, 7BCX, 7BOR, 7CLC, 7HZ, and SM7AED. In 1964, after reading in *CQ* about the plans for the OSCAR III satellite, the seven of us decided to form a club and participate in the project. Our knowledge of satellite communications at the time was zero minus. I suppose that is why we found the OSCAR project so exciting.

"A friend made available an old house in a very quiet location for us to use. To keep costs down, we formed the club with equipment we already had. Each member contributed the best of his equipment and soon we had assembled a rather nice station. All we had left to do was to design and build a new antenna.

"The antenna was completed and installed on the club's new QTH, but we kept the rest of the equipment in our houses so that we could operate normally on the v.h.f. bands while awaiting the launch of OSCAR III. We planned to bring all the equipment to the club's QTH about a week or so before the launch of the 2 meter transponder satellite.

"As luck would have it, we did not receive any advance notice of OSCAR III's launching. First word reached us by telephone late in the evening of March 9, 1965, when SM6PU called to tell us that the satellite was already in orbit and operating. You can imagine the excitement which followed as we ran, with equipment in our hands, to get SM7OSC on the air!

"It took us a day to get everything together, and we first heard OSCAR III during its 7th orbit. We made our first QSO on orbit number 30; what a thrill!

"You should have seen us during those first days. It was very, very cold in Trelleborg, with blasts of icy cold air blowing in from the Baltic Sea. The water pipes were frozen in the old house that was SM7OSC's QTH, and it wasn't possible to start a fire in the heating system because birds had built nests in the chimneys and this blocked the draft. But the excitement of communicating through space really kept our blood warm and saved us from freezing to death!

"In a few days we became familiar with OSCAR III's orbit, and knew exactly when to expect it to come into range of our station. The weather had warmed up a bit, and the station and the QTH both began to function normally. We had more time to test several different receivers and various tracking techniques. We also did some modifications on the antenna. By the time OSCAR III stopped operating (March 24, 1965), our station consisted of the following:

TRANSMITTER: Vfx-controlled, 500 watts input on 2 meters

RECEIVER: 2 meter converter with a 417A tube in the front-end

ANTENNA: 4 × 10 element long Yagi, horizontally polarized

"We had good results with this setup. In two weeks we successfully completed a total of 8 two-way contacts through OSCAR III. We worked stations in Sweden, Germany, Russia, Switzerland, England, and Czechoslovakia, and we heard many other stations, including W1BU in the United States.

"The next interesting project at SM7OSC was the moonbounce, or earth-moon-earth tests with KP4BPZ during July, 1965. Again, we didn't have much time to assemble the station. Anyway, using a newly-built 4 × 15 element long Yagi antenna, a 400 watt input crystal controlled 432 mc transmitter, and an AF 139 transistor r.f. stage built into the antenna with a second AF 139 stage of r.f. amplification in the converter, we managed to work KP4BPZ even though his signal was very, very weak in Sweden.

"We had some trouble with OSCAR IV. Although we heard about the launch of this satellite shortly after it took place on December 21, 1965, we could not receive any orbital information from W6EE because of poor propagation conditions to the States on the h.f. bands. Fortunately, we had the basic information about the satellite from the *CQ* articles, so we listened continuously for the beacon transmitter on 431.925 mc. We heard it weakly on several passes, and in a few days we were able to follow the satellite quite well, and we established its orbit. We redesigned SM7OSC so that we could use it with the 144-432 mc transponder aboard OSCAR IV, and we used the following equipment:

TRANSMITTER: 500 watts input on 144 mc.

TRANSMITTING ANTENNAS: 2 × 10 elements, long Yagi, vertically polarized, or 10 elements, long Yagi, horizontally polarized.

RECEIVER: Transistor r.f. stage (AF139) built into antenna, plus a second r.f. stage with AF139 in the converter. Noise factor, 5-6 db on 432 mc.

RECEIVING ANTENNAS: 4 × 15 elements, long Yagi, horizontally polarized, or
15 elements, long Yagi, horizontally polarized.

"At best, the signals from OSCAR IV were very poor in Sweden and we managed to make only a single two-way contact, with G3LTF in England. We also heard several other stations in Sweden, Germany and Czechoslovakia, but we did not work them. The signals through the translator were very hard to copy. For the most part they were nothing more than pings or bursts which lasted no more than 5 seconds, and often were only one second long.

"Now, we are waiting for OSCAR V. If it will be the OSCAR-EUROPA 2 meter translator satellite, we are all ready to go. If it is another satellite, it will probably take us a day or two to get set-up.

"This is a brief description of our club station, SM7OSC. While I have managed to tell you something about the station itself, no words can describe the great thrills we have all had communicating through the OSCAR satellites and by way of the moon. The only way to find out about this is to experience it yourself!" ■

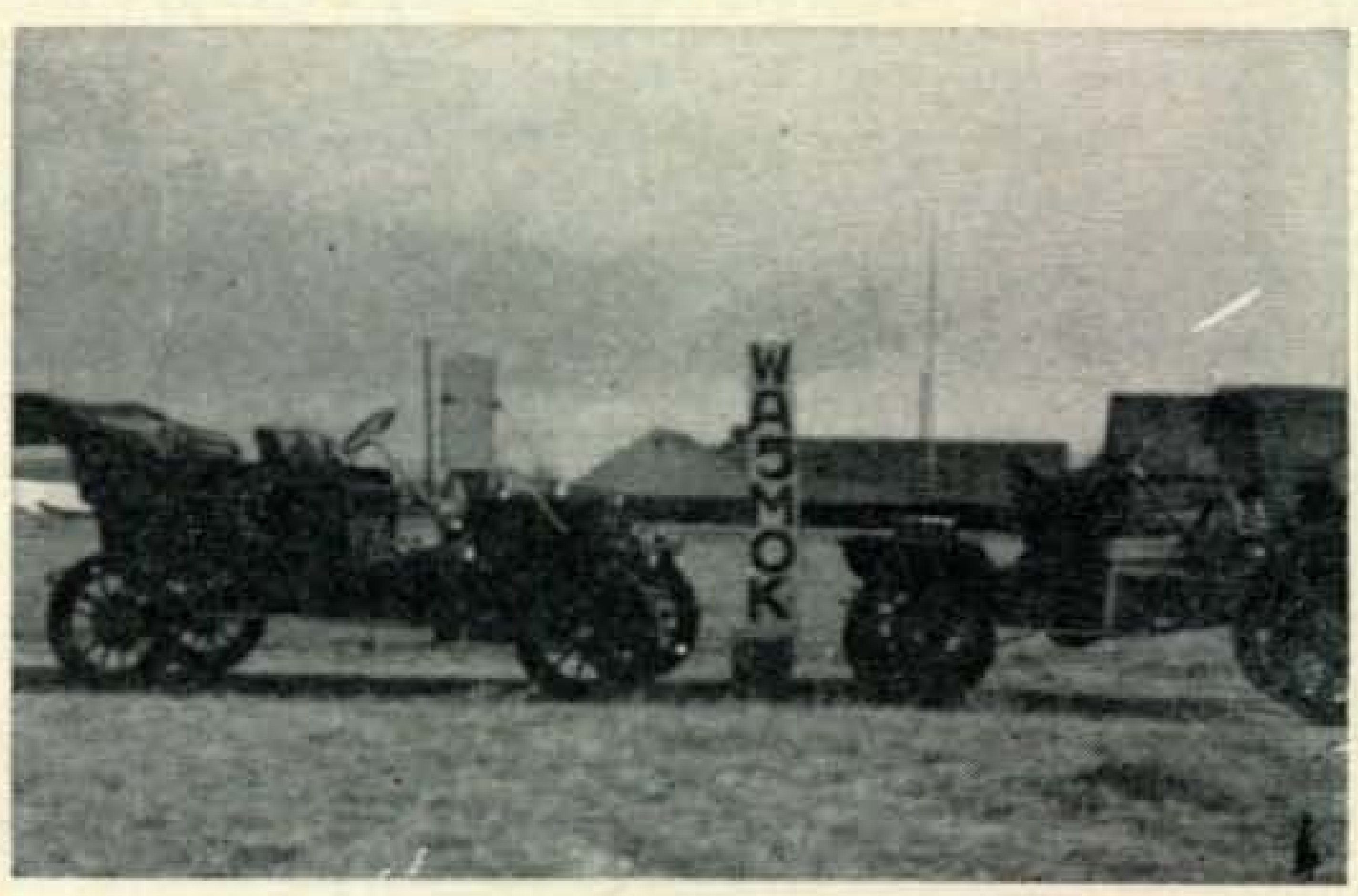
This is a view of the EMU Amateur Radio Club at Eastern Michigan University. At the left is Robert B. Waters, WA8AXR, a sophomore at EMU majoring in industrial education, and the president of the EMU A.R.C. To his right is Arthur Francis, K8KJP, assistant professor of industrial education at EMU and faculty advisor to the club.

At the Sixth Annual Holiday Dinner of the Communications Club of New Rochelle (NY), Harry Dannals, W2TUK, presented the annual Lawrence Kohlman (K2BVC) Award. The Award, citing "contributions to the hobby and the club," was awarded to the husband wife team of Gray and Cynthia Berry, K2SJN and WA2QEG, shown l to r are Henry Wymbs, WB2GMN, CCNR President, the award winners, and Harry Dannals, W2TUK, (photo courtesy of Westchester-Rockland Group Newspapers).

PEOPLE AND PLACES

Francisco Silva Jr., PY2CUB, (better known as Chico) of Sao Paulo, Brazil, has over 5000 confirmed QSOs with stateside stations. You can find him around 14270 almost every evening. The teddy bear (cub) on the wall was a gift from Texans living in Brazil.

This august body represents collectively over 320 years in amateur radio. From l to r: Ben Lazarus, W2JB, (58 years), Bernie Stahl, W2HL, (44 years), Frank Anzalone, W1WY, (45 years), Earl Lucas, W2JT, (47 years), Bob Morris, W2LV, (44 years), Ed Hopper, W2GT, (44 years), Wil Angermeier, W2MJ, (38 years).



When L. D. McMurry, WA5MOK, goes mobile, he really goes in style. Imagine having to choose between a 1906 Jackson Touring Car or a 1908 Reo Playboy Speedster.

DX

BY JOHN A. ATTAWAY,* K4IIF

DE EXTRA

The DX World is full of controversy these days—What is a country and what isn't???—Are certain DXpeditions on the up and up when they work some "big guns" but don't seem to hear others??—(Has everybody heard of the "Again Club?") etc., etc., etc. Fortunately at *CQ* our awards program isn't quite as affected by some of these antics as is the case for other less fortunate ham publications. A prefix is a prefiex is a prefix and a zone is a zone is a zone, and it really doesn't matter whether the station is a UA9 in the middle of Siberia or an HKØ reef 3 inches above sea level because we don't have to dignify a rock or a sandbar by calling it the Commonwealth of Bajo Neuvo, the Sultanate of Geyser, or the People's Republic of St. Peter and St. Paul's Rocks. Consequently our WPX and WAZ Awards are above this fuss and we're glad of it.

*P.O. Box 205, Winterhaven, Fla., 33881.

In a recent issue (#18) of his *The DXers Magazine,* Gus Browning—the world's leading DXer—had some interesting thoughts and suggestions. One suggestion we concurred with heartily because it involved the promotion of international good will in a very practical and down to earth manner. After all, international good will is still the best justification for the use of a lot of h.f. space for DXing. However, another suggestion we must reject because in a sense it is a contradiction of the first.

Here are the details: Gus proposed that our government take a specific interest in the dissemination of amateur radio information to the Communications Ministries of recently created countries. In most of these countries amateur radio is completely unknown,

This month we are breaking in a new DX editor, John A. Attaway, K4IIF. John was first licensed in 1959 and became an avid DXer in 1962. He was editor of the Florida DX Report, *the monthly publication of the Florida DX Club, during 1963-64. While not renowned as a DXpeditioner John has had experience from both ends of the circuit. He organized the VP2VD operation from the British Virginia Islands during the 1965* CQ *DX Contest and was one of the three operators along the K4CAH and G3SBP. He operated KV4AA during the 1966* CQ *DX Contest and has also operated from 4U1ITU.*

John plans to offer you a varied column each month. In addition to the usual DX tidbits and QSL information he will write a brief editorial piece, "DE EXTRA", which will reflect opinion on the current DX scene. Also in the works is slight updating of CQ's *DX award structure with addition of some new twists to WPX and WAZ. As an example, in the* CQ *SSB contest coming up in April a specially endorsed WPX certificate will be awarded to any single operator station working 300 prefixes. In last year's contest 10 single operator stations worked over 200 prefixes, and the multi-operator station 4U1ITU logged 312, so it can be done. Now for those of you who seek the impossible, WAZ during the contest will entitle you to a commemorative plaque. Complete details for submitting your entries will be given in the April issue.*

Another new innovation in the works is the WPNX Award for Novices only. More on this later.

Of particular interest to many DXers will be new procedures for the handling of WAZ applications, WPX endorsements and the SSB DX Honor Roll. We're as anxious as anyone to get these three programs into high gear again, but a few months will surely pass before the new machinery is working smoothly. In the interim, we beg the patience of those DXers who have material pending at the moment; certificates, endorsements, WAZ QSL's, etc. Nothing will be lost or forgotten, just delayed a bit longer.

John, of course, replaces our old stalwart Urb LeJeune, W2DEC, who served ably in the sometimes thankless position of DX editor since April 1959 for a total of 83 monthly columns adding up to nearly 400 pages of writing! We might add that a few thousand DX certificates were also authorized and issued during that same period. Urb, however, is no longer able to devote the great amount of time to the job that he once did; hence, our new DX editor. Our thanks and best wishes to Urb for a job well done.

and competent radio technicians are virtually non-existent. What better way could there possibly be to develop a supply of practical radio technicians than through amateur radio where individuals learn to construct, maintain, and operate their own gear in an atmosphere of helpful friendship and enthusiasm. At the same time we would be building a good argument for retention or expansion of our present frequency allotment. We believe that Gus's idea should be proposed to the proper authorities in our own government and steps taken to implement it. I can't think of a better expediter than ole' Gus himself if he had the necessary backing.

Now the point where we differ—Gus makes reference to an ARRL questionaire circulated in the SW Division which showed that 90% of those replying favored a rule requiring a minimum of 100 acres for DXCC country status. Gus took exception to this and asked "Do we want non-DXers setting the rules of a game DXers play?" We feel that the day has passed when we can look on our activities as purely a "game," although at times it certainly seems to be one. Our slice of the h.f. spectrum is much too important for just playing games. We can easily justify retaining every kc of our space *if* we continue to promote good will through genuine country to country contacts as we have in the past, and continue to advance new ideas for international cooperation such as the idea from Gus mentioned above. In today's crowded world he who doesn't go forward is going backward. There is no place for the man who stands still.

As we've said before, our WAZ and WPX awards are not affected by this argument over country status since our zones and prefixes do not rely on the designation of pebbles and sandbars as countries. However, we do have a stake in the country-status situation with our SSB DX Award. In the past, our country-status requirements for this awards program have very closely followed those of ARRL's DXCC. Look for a change in this area. Some other innovations in our WAZ and WPX programs are also being considered and will be opened to discussion before any final and irrevocable changes are made. More about this next month.

Late DX News

There will be some real goodies coming up soon for both prefix hunters and country chasers. In perusing the weekly DX nets and bulletins and scanning the frequencies we have come up with the following facts and rumors:

Recent dispatches received via the U.S. Mule have reflected concern in the WAZ fraternity over lack of activity in Zone 23. Anyone having solid information on activity in JT1-land and environs is invited to come forth. Some requests have also been received for data on stations in Zones 18 and 19, so listings of calls, times, and frequencies of stations active in these zones would also be appreciated.

EA9 Ifni & Rio de Oro: The DXpedition by EA7JQ and EA7GF is reported postponed. However, Justo, EA9EJ, is active daily on 21mc a.m. phone between 21200 and 21250kc. Bob, W4QCW, plans to ship a TA-33Jr beam to Justo via air freight and would appreciate contributions to help defray the expense. *(TNX DX-Press and West Gulf Bulletin).*

FO8 French Oceania: FO8BL is reported active on 14075kc c.w. around 0730 GMT.

KC4 Navassa: It was reported at the Tropical Hamboree in Miami that the K1IMP/KC4 operation from Navassa will not be counted by ARRL for DXCC. According to our information the Coast Guard Commandant has taken the position that while W9WNV and K1IMP had "docking Privileges" they did not have landing privileges. *(Tnx K4GRD).*

Lloyd & Iris: Should be in Africa by the time you read this. Some details of their proposed itinerary should be known by the next issue.

PYØ St. Peter & Paul's Rock: *Rumor* has it that the PYØXA operation will also be disallowed by ARRL because of failure to obtain proper government clearance. However, W9WNV is reported to be bringing papers to show that he did have proper clearance. *(Tnx K4GRD).*

SVØ Crete: Bill, SVØWL, is active around 28600kc on weekends. *(Tnx DXers Magazine).*

SVØ Rhodes: Don, SVØWU, should still be active. Some favorite times and frequencies include 1600 GMT, 21370 kc s.s.b.; 1630 GMT, 14030 kc c.w.; and 1730 GMT, 14275-300 kc s.s.b. on weekdays. On weekends he will also try 21370 and 28600 kc from 1400-1600 GMT. *(Tnx DXers Magazine).*

TF2 Iceland: TF2WKE, Bob, is reported to be active almost daily around 21330 kc between 1500 and 1700 GMT. *(Tnx Long Island DXA).*

VK9 Norfolk Island: W4CHA should be operating as VK2BRJ/VK9 around 14065 kc. However, he may be gone by the time you receive this.

VKØ Macquarie: Rod, VKØCR, has been reported around 14240 kc s.s.b. between 1000 and 1130 GMT.

VP1 British Honduras: VP1VR has a daily sked with W4VPD on 14007 kc at 2230 GMT on weekdays and 1430 GMT on weekends. *(Tnx DXers Magazine).*

VP2 Montserrat: That booming signal from VP2MK is none other than Golden Fuller, W8EWS, longtime QSL manager for Danny Weil's *YASME* operations. Golden will be QSLing from the home QTH later this spring.

YA1 Afghanistan: A host of YA stations are reported active on 14mc around and just below 14200. Some of the calls to listen for include YA1HD, YA1FV, YA3TNC, and YA5RG.

YK1 Syria: A new operator, Hikman, YK1AM is reported to have been worked on 14105 kc at 1530 GMT. *(Tnx West Gulf Bulletin).*

ZK1 Cook Islands: Trevor, ZK1AR, will be on the air during the ARRL DX Contest weekends.

[*Continued on page 98*]

FOR EXCELLENCE IN SHORT WAVE RECEPTION

SS-IBS

High Performance Communications Receiver explicitly designed for operation on the International Broadcast Bands

The SS-IBS International Broadcast Receiver is a completely new high performance communications receiver explicitly designed for use on the high frequency broadcast bands between 3.5 and 26.1 megacycles. The SS-IBS receiver is *unique* in its ability to receive weak signals located only a few kilocycles away from powerful broadcasts. The SS-IBS features unusual simplicity of operation, allowing relatively unskilled individuals to achieve results of professional quality; yet it provides performance characteristics and operating controls which will improve reception at the hand of an experienced operator. SS-IBS may be used with accessory speaker or headphones for monitoring and has suitable output connection for recording, direct rebroadcast, and visual band monitoring with the SS-IV Video Bandscanner. The SS-IBS is designed for use with an optional noise silencer (SS-IS) of extreme effectiveness on impulse noise.

SPECIAL FEATURES: Extreme Freedom from Cross Modulation and Overload • Unusual Frequency Precision with Digital Readout in Kilocycles • Rapid and Exact Tuning Mechanism with Motor Drive for Fast Traverse • 8.0, 5.0 and 2.5 kc. Selectivity with Sharp Crystal Lattice Filter • Choice of AM, USB, LSB or CW Modes • Provision for Exalted Carrier Reception

SS-1V, Video Bandscanner. This unique oscilloscope display unit, when used with the SS-IBS, shows all signals in the band in use, or any portion of the band can be expanded to full screen for detailed examination. Both linear and logarithmic displays are provided. A marker pip constantly shows the exact frequency to which the receiver is tuned. The sharp resolution of this unit permits observation and measurement of two AM sidebands displaced only 2.5 kc. from the carrier. Provision is made for transmitter monitor-or analysis.

PRICE: SS-IBS $1200, SS-1S $135, SS-1V $445

Squires-Sanders, Inc.

MARTINSVILLE ROAD / LIBERTY CORNER • MILLINGTON, N. J. 07946

For further information, check number 35, on page 110

Propagation

BY GEORGE JACOBS,* W3ASK

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for March

Days	Forecast Rating & Quality (4)	(3)	(2)	(1)
Above Normal: **3, 9, 12, 15, 26-27,**	A	A-B	B-C	C
Normal: **1-2, 4, 8, 10-11, 13-14, 16-17, 21-23, 25, 28-30**	A-B	B-C	C-D	D-E
Below Normal: **5, 7, 18, 20, 24, 31**	C	C-D	D	E
Disturbed: **6, 19**	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.

On the "Short-Skip" Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

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 Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase 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—These Propagation Charts are valid through April 30, 1967. These Charts 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.

DURING March, a continued seasonal decrease is expected in the range of frequencies that will propagate during most of the daylight hours, while an increase is expected during the later afternoon hours and the hours of darkness.

The following is an overall picture of h.f. amateur band openings forecast for March, 1967. For specific times of DX openings, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for March and April, as well as Charts centered on Hawaii and Alaska. The Short-Skip Charts contain propagation forecasts for circuits varying in length between distances of 50 and 2300 miles. For day-to-day propagation conditions expected during the month, see the "Last Minute Forecast," which appears at the beginning of this column.

10 Meters: While fewer DX openings are predicted, some fairly good ones should be possible during the daylight hours, especially to southern and tropical areas. A few fairly good short-skip openings are expected between distances of approximately 1000 and 2300 miles, peaking during the afternoon hours.

15 Meters: This band is expected to remain optimum for DX openings during the daylight hours. Excellent openings are forecast to most areas of the world during this period, with conditions peaking during the later afternoon hours. Excellent short-skip openings are also predicted for most of the daylight hours, between distances of approximately 1000 and 2300 miles.

20 Meters: With longer hours of daylight, 20 meters is expected to remain open for DX well into the evening hours. It is expected to be the optimum DX band during the sunrise period, and again during sunset and the early evening hours. The band is likely to remain open throughout the hours of darkness as well, to some tropical and southern areas. Excellent short-skip openings are predicted during the daylight hours, between distances of approximately 750 and 2300 miles, with many openings continuing through the evening hours as well.

40 Meters: Fairly good DX openings are forecast to many areas of the world from sundown through sunrise, with conditions peaking during the hours of darkness. Excellent short-skip openings are expected between a range of 50 and 750 miles during the daylight hours, and between 500 and 2300 miles at night.

80 Meters: Although some fairly good DX openings are forecast during the hours of darkness, the band is expected to be noisier during March as a result of a seasonal increase in static levels. Excellent daytime short-skip openings are forecast over a range of between 50 and 250 miles. During the hours of darkness the short-skip range is expected to increase to between 200 and 2300 miles.

160 Meters: No openings are expected during the daylight hours, but short-skip openings to

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

2300 miles, and an occasional DX opening should be possible during the hours of darkness and the sunrise period.

During the spring months in the northern hemisphere (autumn in the southern hemisphere), an improvement in propagation conditions is generally noted on long circuits between both hemispheres, for example, between the USA and Australia, southern Africa and South America. An improvement is expected to take place on all h.f. amateur bands, and should be most noticeable during the sunrise and sunset periods.

V.h.f. Ionospheric Openings

Auroral displays occur more frequently during March than during the winter months. During such displays ionospheric openings for distances up to approximately 1300 miles may be possible on the 6 and 2 meter bands. Check the "Last Minute Forecast" appearing at the beginning of this column for those days that are expected to be "disturbed" or "below normal" during March, since these are the days on which v.h.f. auroral-type openings are most likely to occur.

As the solar cycle rises, trans-equatorial scatter openings again should become possible during certain months of the year. Some 6 meter openings of this type may take place during March, between the USA and South America during the early evening hours.

Meteor-type ionospheric openings are expected on the v.h.f. bands during March 10-12 and March 20, when minor meteor showers are scheduled to take place.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a mean monthly sunspot number of 68 for December, 1966. This is the highest level of sunspot activity observed since July, 1961. The December mean number results in a 12-month smoothed sunspot number of 43 centered on June, 1966. A smoothed number of 71 is forecast for March, 1967, as the present sunspot cycle continues to rise. 73, George, W3ASK

CQ Short-Skip Propagation Chart

MARCH & APRIL, 1967

LOCAL STANDARD TIME AT PATH MID-POINT

(24-HOUR TIME SYSTEM)

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	*Nil*	08-10 (0-1) 10-15 (1-2) 15-20 (0-1)	08-09 (1-0) 09-10 (1) 10-13 (2-1) 13-15 (2) 15-17 (1-2) 17-20 (1)
15	*Nil*	09-16 (0-1)	08-09 (0-1) 09-10 (1) 10-16 (1-3) 16-18 (0-3) 18-20 (0-1)	07-08 (0-1) 08-10 (1-2) 10-18 (3-4) 18-20 (1-3) 20-22 (0-1)
20	*Nil*	07-12 (0-2) 12-18 (0-3) 18-20 (0-2) 20-07 (0-1)	06-07 (0-2) 07-08 (2) 08-10 (2-3) 10-12 (2-4) 12-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (1)	06-08 (2-1) 08-10 (3) 10-15 (4-3) 15-18 (4) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-06 (1)
40	06-08 (1-2) 08-10 (2-4) 10-19 (34) 19-21 (2-3) 21-23 (1-2) 23-06 (0-1)	06-08 (2-3) 08-15 (4-3) 15-19 (4) 19-21 (3-4) 21-23 (2-3) 23-02 (1-2) 02-06 (1)	06-08 (3-2) 08-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-21 (4) 21-23 (3-4) 23-02 (2-3) 02-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-17 (2-0) 17-19 (3-2) 19-23 (4) 23-02 (3-4) 02-06 (2-3)
80	07-08 (3-4) 08-11 (4) 11-18 (4-3) 18-21 (4) 21-23 (3-4) 23-01 (2-3) 01-05 (1-2) 05-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (4-2) 18-20 (4-3) 20-23 (4) 23-01 (3-4) 01-05 (2-3) 05-07 (3-2)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-01 (4) 01-05 (3) 05-07 (2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-01 (4-3) 01-05 (3) 05 07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours behind PST and 10 hours *behind* GMT or Z Time.

‡Indicates predicted 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.

*To convert to Local Standard Time in Alaska, *subtract* 8 hours in Pacific Standard Time Zone; 9 hours in Yukon Zone and 10 hours in Alaskan Standard Time, Zone, from times shown in Chart.

ALASKA

*Openings Given in GMT**

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	20-23 (1)	20-22 (1) 22-01 (2) 01-02 (1)	13-15 (1) 20-23 (1) 23-03 (2) 03-06 (1)	06-13 (1) 07-12 (1)‡
Central USA	20-23 (1)	20-22 (1) 22-01 (2) 01-02 (1)	22-01 (1) 01-05 (2) 05-07 (1)	07-14 (1) 08-12 (1)‡
Western USA	20-23 (1)	20-22 (1) 22-03 (2) 03-05 (1)	16-21 (1) 21-00 (2) 00-04 (3) 04-06 (2) 06-08 (1)	07-09 (1) 09-12 (2) 12-14 (1) 09-10 (1)‡ 10-12 (2)‡ 12-13 (1)‡

HAWAII

Openings Given In Hawaiian Standard Time†

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40/80 Meters*
Eastern USA	09-12 (1) 12-15 (2) 15-16 (1)	06-08 (2) 08-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1)	13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-07 (2) 07-13 (1)	18-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 19-21 (1)‡ 21-00 (2)‡ 00-02 (1)‡
Central USA	09-13 (1) 13-15 (2) 15-17 (1)	06-07 (1) 07-09 (3) 09-13 (2) 13-16 (4) 16-17 (3) 17-18 (2) 18-20 (1)	13-15 (2) 15-16 (3) 16-20 (4) 20-22 (3) 22-08 (2) 08-13 (1)	18-19 (1) 19-21 (2) 21-01 (3) 01-04 (2) 04-05 (1) 19-21 (1)‡ 21-01 (3)‡ 01-02 (2)‡ 02-03 (1)‡
Western USA	08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-18 (1)	06-07 (1) 07-08 (2) 08-11 (4) 11-15 (3) 15-17 (4) 17-19 (2) 19-21 (1)	15-19 (4) 19-21 (3) 21-04 (2) 04-06 (3) 06-11 (4) 11-15 (3)	17-19 (1) 19-20 (2) 20-23 (4) 23-05 (3) 05-06 (2) 06-07 (1) 19-20 (1)‡ 20-21 (2)‡ 21-04 (3)‡ 04-05 (2)‡ 05-06 (1)‡

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

March	4-5	ARRL DX Phone
March	4-6	B.A.R.T.G. Spring RTTY
March	11-12	YL/OM C.W. Contest
March	11-12	R.S.G.B. BERU
March	18-19	ARRL DX C.W.
March	26	EASTER
April	1-2	SP DX C.W. Contest
April	1-2	Florida QSO Party
April	**8-9**	**CQ WW SSB DX**
April	29-30	ONE LAND QSO Party
April	29-30	Missouri QSO Party
April	29-30	Ohio Intrastate Party
April	29-30	PACC CW/Phone Contest
May	**6-7**	**CQ Spring VHF**
May	13-15	Georgia QSO Party
May	20-21	YL Int. SSBers Contest
June	2-5	CHC/FHC/HTH QSO Party
June	10-11	New York State QSO Party

ARRL DX

Phone: March 4-5 **C.W.:** March 18-19
Starts: 0001 GMT Saturday. **Ends:** 2400 GMT Sunday in each instance.

Above dates are for the 2nd half of the ARRL Marathon so you should know the rules. January *QST* had all the details.

YL/OM C.W. Contest

Starts: 1800 GMT Saturday, March 11
Ends: 1800 GMT Sunday, March 12

The Phone portion has already taken place. Rules were in the January issue.

Your logs go to: Marte Wessel, KØEPE, P.O. Box 756, Liberal, Kansas 67901. Deadline March 20th.

RSGB BERU

Starts: 0001 GMT Saturday, March 11
Ends: 2359 GMT Sunday, March 12

This one has been around a long time, this being their 30th contest.

Unfortunately its only open to RSGB members residing in the United Kingdom and the British Commonwealth. This side of the Pond that means only the VEs and VPs, the rest of us can drool when we hear some of those juicy prefixes.

All inquiries and entries go to the R.S.G.B. Contest Committee, 28 Little Russell Street, London, W C 1, England

B.A.R.T.G. Spring RTTY

Starts: 0200 GMT Saturday, March 4
Ends: 0200 GMT Monday, March 6

Rules are same as in previous years. There are two divisions, single and multi-operator stations. The same station and country may be worked on each band for additional credits.

1. Use all bands, 3.5 thru 28 mc.

2. Exchange will be QSO number, report, GMT time and country.

3. Points: Contacts with stations in same country, 2 points; stations in another country, 10 points. All stations, a bonus of 200 points for each country worked, including their own.

4. Scoring: (a) Contact points multiplied by total countries worked. (b) Country points multiplied by continents worked. (c) Add items (a) and (b) for final score. (The ARRL country list will be used, plus KL7, KH6 and VO as countries.)

All entries must be in the hands of the committee no later than May 1st to qualify. Send to: Alan Walmsley, G2HIO, BARTG Sec., The Firs, 3 Trinity Close, Ashby-de-la-Zouch, Leicestershire, England.

CLAIMED SCORES

CQ WW C.W. DX Contest 1966

Single Operator All Band	
KZ5TW	1,105,190
W3GRF	1,012,320
W9IOP	892,392
W6ITA	771,316
KA7AB	701,435
W2BXA	580,599
K6ERV	530,385
W1MX	523,292
W1BIH	508,305
W5BRR	390,879
OE1ZDA	387,774
OA4PF	338,388
SMØCCE	306,000
28 mc	
G2BOZ	40,860
W9LKJ	32,494
VK2BKM	32,040
W2NEP	17,110
WA4WIP	14,784
21 mc	
JAØAIF	121,600
K5IIN	72,180
WA4GCS	69,600
ZE5JJ	59,094
WB2MZJ/3	56,133
K6CAA/KH6	50,032
SM3CXS	28,993
VE3GCO	23,966
14 mc	
W6GHM	234,393
YV5AGD	177,343
W2BOK	171,000
PY1BCA	149,850
W4YGY	148,356
VK2APK	114,837
DL8ML	100,311
WØKAW	59,262
7 mc	
VK3ADB	84,456
K3CYA	55,722
W9HUZ	32,643
YV5BKA	27,594
OH5UQ	27,324
I1AND	15,370
3.5 mc	
W8NBK	20,160
DL4RO	17,108
W1FZJ/KP4	8,040
K6BPR	2,997
1.8 mc	
VO1FB	4,165
OE1KU	500
Multi-Operator Single Transmitter	
WA2OJD	505,025
W4JD	316,332
DJ2XP	239,976
DLØFD	153,306
KL7JDO	149,694
Multi-Operator Multi-Transmitter	
K2GL	3,767,736
K6JIC/6	1,899,571
W6RW	1,366,992

*14 Sherwood Road, Stamford, Conn. 06905.

SP DX C.W. Contest

Starts: 1500 GMT Saturday, April 1
Ends: 2400 GMT Sunday, April 2

Its the world working the SP's on c.w. only in this one. Besides contest awards contacts may be also credited for other Polish awards. These awards are also available to s.w.l.s.

1. Use all bands, 3.5 thru 28 mc.
2. The serial number will consist of the usual six figures, RST report plus a progressive 3 digit contact number starting with 001.
3. Each contact counts 3 points and the same station can be contacted once on each band for contact and multiplier credit.
4. Your multiplier is determined by the number of SP call areas worked on each band, SP1-SP9, a possible maximum of 45. (In addition, special stations with the SPØ prefix can also be counted for a multiplier.)
5. The final score therefore will be the total QSO points multiplied by the sum of the multiplier from all bands.
6. There are two classifications: single operator and multi-operator, as well as s.w.l.s. (Multi-transmitter operation is not permitted.)
7. Awards will be made to the highest scoring stations in each classification in each country. In countries where the participation is high, awards will also be made for 2nd and 3rd places.
8. Use a separate log sheet for each band, show in this order: Date/time in GMT, station worked, number sent, received, QSO points and call area. (First time contacted only.) Also include a summary sheet, with the scoring, equipment description and your name and address in BLOCK LETTERS. Sign the usual declaration that all rules and regulations have been observed and your report is a true one.

Duplicate contacts in excess of 3% of the total made will be deemed cause for disqualification.

Mailing deadline for your logs is May 1st. They go to: The SP DX Club of the PZK, Contest Committee, P.O. Box 320, Warszawa 1, Poland.

Last year USA and VE winners were: W2JAE, K3NVO, W4SNU and VO1AW.

Florida QSO Party

Three time periods:
1500 - 2000 GMT Saturday, April 1
0000 - 0500 GMT Sunday, April 2
1400 - 2400 GMT Sunday, April 2

This is the 3rd annual party run by the *Florida Skip* magazine.

The same station may be worked on each band for QSO points. Phone and c.w. are separate contests and scored separately.

Exchange: GSO number, RS/RST and Qth; county for Florida stations; state, VE province or country for all others.

Scoring: Fla. stations: 1 point per QSO multiplied by number of states, VE provinces and country worked. (Other Fla. stations may be worked but for QSO points only, no multiplier, except as a state or WAFC credit.)

Other stations: 1 point per QSO multiplied by Fla. counties. In addition bonus points will be given for working Fla. counties as follows: First 15 counties, 100 points; second 15, 200 points; third 15, 500 points; all 67 counties, 1500 points.

Frequencies: **c.w.:** 1815, 3530, 7030, 14030, 21030, 28030. **phone:** 3930, 7230, 14230, 21330, 28830.

Awards: To the highest scorers in each state, Canadian province and foreign country, (5 or more contacts) and each Florida county. The top 3 USA or VE stations will receive a Ham Shack Guest Book.

Mailing deadline is April 30th to: Florida Skip Contest Chairman W4WHK, P.O. Box 501, Miami Springs, Fla. 33166. Include a 4¢ stamp for copy of results.

CQ WW SSB DX

Starts: 0000 GMT Saturday, April 8
Ends: 2400 GMT Sunday, April 9

Complete rules will be found on page xx of this issue.

Although we have received quite a few comments and suggestions regarding some rule changes, we feel that more study and planning is necessary before any drastic changes are made.

The two main factors were, one to stimulate activity on all bands, especially the LF bands, and two to retain the compulsory rest period.

Therefore one change is being made. The contest period is being extended to 48 hours. This will give longer periods of LF operating time, two full nights. However, the rest period is also being proportionally extended. It will now be 18 hours which can be taken in one, two but not more than three periods anywhere in the contest.

This is the *only* change being made. A prefix is to be credited only once regardless of the number of different bands used. The other rules are still the same as the past few years.

One Land QSO Party

Ends: 2400 GMT Sunday, April 30

This is a new one organized by the New England CHC Chapter. It would seem a bit superfluous since there was another New England QSO party only a few months ago, back in December.

Only 24 out of the 48 hours may be used for scoring. N.E. stations can work all stations, outsiders are limited to working N.E. stations only. The same station may be worked on each band and mode for contact points, and contacts with portables and mobile stations also count. Only single operator stations will be considered for awards.

Exchange: QSO number, RS/RST, county, state and your name for all stations.

Scoring: One point per contact, except DX contacts which are worth 3 points, and Novices 5 points.

Outside stations: QSO points multiplied by N.E. counties (max. 67) and again by N.E. states (max. 6).

N.E. stations: QSO points multiplied by the sum of different states and provinces, and again by the different countries worked. Canada and the U.S. also count as countries, KH6 and KL7 as both state and country.

S.w.ls are also invited to participate. They get double QSO point value if both sides of QSO is reported.

Frequencies: c.w.: 3520, 7060, 14080, 21050, 28020. **phone:** 3820, 7220, 14260, 21380, 28260. Plus all Novice frequencies.

Awards: Certificates to the 1st and 2nd places in each state, VE province, country and each N.E. county. The top Novice in each state and SWL in each state, province and country. (A minimum of 28 contacts must be made for an award.)

Mailing deadline June 15th to: N.E. Chapter 32, att: Carl Porter, 19 Penniman Terr. Braintree, Mass. 02184. Include s.a.s.e. if results are desired.

Missouri QSO Party

Starts: 2300 GMT Saturday, April 29
Ends: 0300 GMT Monday, May 1

This is the 4th Missouri QSO Party sponsored by the Northwest St. Louis Amateur Radio Club.

There is no time limit or power restrictions, the same station can be worked all bands, phone or c.w. for additional contact credits.

Exchange: QSO number, RS/RST and QTH: county for Missouri stations, state, province or country for others.

Scoring: One point per QSO for Mo. stations, total contacts multiplied by states, provinces and countries worked. Out-of-state stations: two points for each Mo. contact, total contacts multiplied by number of different Missouri counties worked. (A maximum of 115 possible.)

Frequencies: c.w.: 3520, 7025, 14050, 21050, **phone:** 3950, 7225, 14330, 21350.

(Check 3950 at 0300, 7225 at 1600 and 14330 at 2000 GMT on April 30th for phone contacts.)

Awards: A certificate to the highest scorer in each state, VE province and foreign country. (Min. of 5 contacts.) Also Trophies to the Top single operator in Missouri and out of state station. The top 5 Missouri stations and top 3 clubs (no aggregate scores) also receive awards.

Logs must be received by May 31st. They go to: Bud Riegert, KØYIP, 1927 S. Compton St. Louis, Missouri 63104. Include s.a.s.e. for results.

PACC CW/Phone

Starts: 1200 GMT Saturday, April 29
Ends: 1800 GMT Sunday, April 30

This is the 11th annual PACC contest. Besides contest awards, contacts may also be credited for the PACC Award for working 100 different PA stations. c.w. and phone are separate contests and separate logs must be submitted.

1. All bands, 1.8 thru 30 mc. (On 160, PA stations are confined to 1825-1835 c.w. only.)

2. The usual 5 and 6 figure serial number, RS/RST report plus a progressive 3 digit QSO number starting with 001. The PA/PI/PE stations will identify their province by two letters after their serial number. (ie: 579/GR.)

Abbreviations for the 11 provinces are: GR, OV, NH, ZL, FR, GD, ZH, NB, DR, UT, LB.

3. Each QSO counts 3 points and the same station may be worked once on each band.

4. The multiplier for stations outside the Netherlands is determined by the number of provinces worked on each band a possible multiplier of 66. PA stations will use DXCC country list for their multiplier; in addition call areas of the following be considered a multiplier: w/K, VE/VO, PY, VK, ZL, ZS, CE, JA.

5. The final score will be, QSO points multiplied by the sum of provinces from all bands.

6. Certificates will be awarded to the highest scorers in each country and each call district as indicated above.

7. Logs should show in this order: Date/time in GMT station worked, serial number sent, received, multiplier column for each band, (fill only when it's a new multipler) and QSO points.

Include a summary sheet with your entry, with scoring and name and address in BLOCK LETTERS. The usual signed declaration is also requested.

Mailing deadline is June 15th to: P.v.d. Berg, PAØVB, Contest Manager, VERON, Keizerstraat, 54, Gouda, Netherlands.

Last year's USA and VE winners were: WA1AWR, K2KBI, W3BYX, K4BYN, W8KPO VEIAE, VE2IL and VO1AW.

Editors Notes

Answering a few of the many inquiries received with the c.w. contest logs of our World Wide contest back in November.

Many were regarding the operation by Don Miller from Geyser Reef, 1G5A. At this writing, the first part of January, this spot has no definite country status. At this point it is difficult to say if an extra country multiplier can be given for this contact.

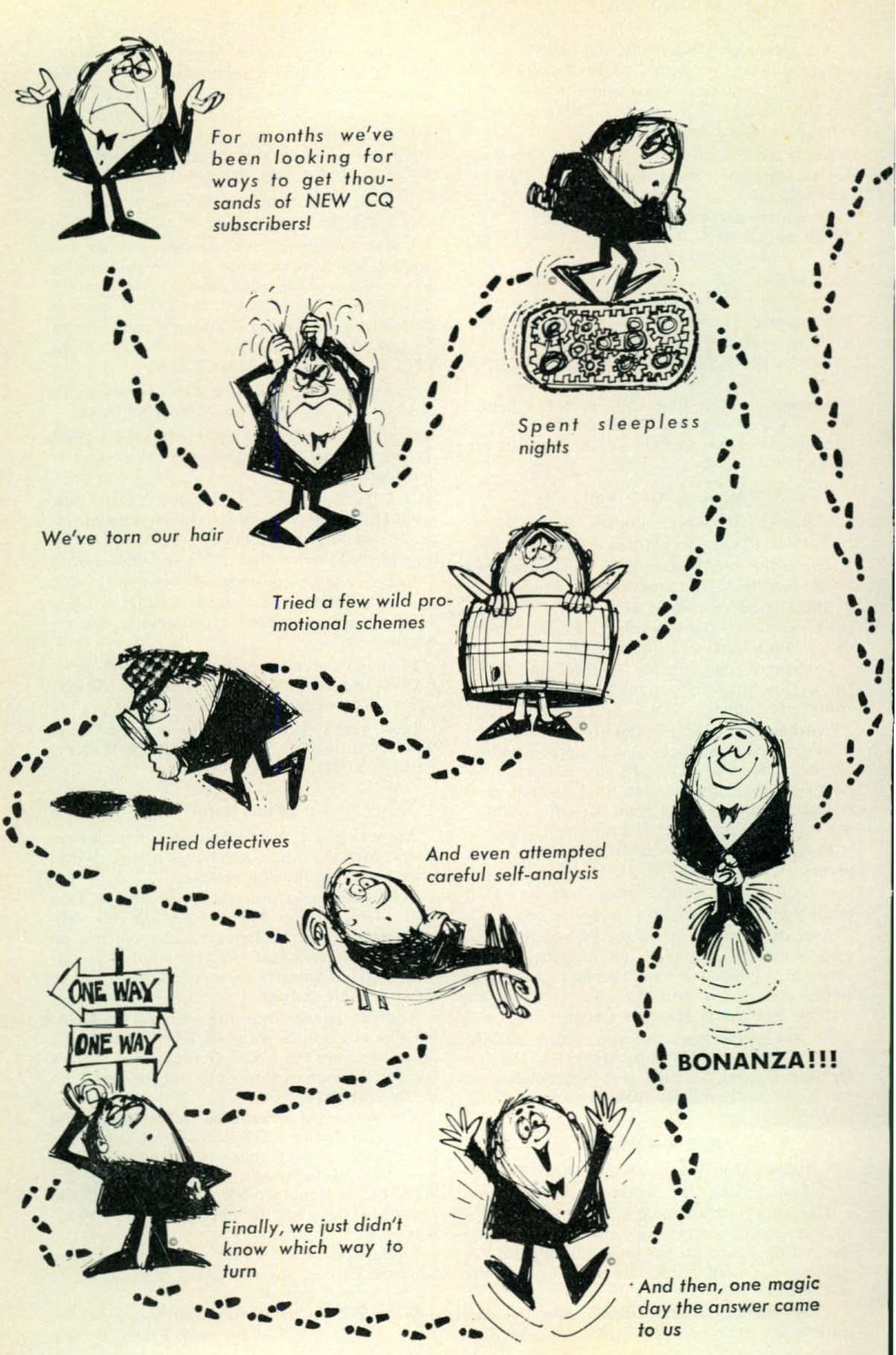
Another puzzler was the identity of 4L7A, but this was only a group of fellows from UP2 operating from the USSR Georgia area. A new one for the prefix chasers but just another UF6 in the contest.

The prefix 4M is assigned to Venezuela and it was activated by a DXpedition to Los Monges Is., 4MOA, an uninhabited island off the northwest coast of Venezuela. Another good one for WPX but just another YV for the contest, and possible extra credit for the Radio Club Venezolano.

There was some pirate operation reported from the Faroes. The legit OY2GHK was on 21 mc for a brief period.

We've got our hands full again this year.

73 for now, Frank, W1WY


For months we've been looking for ways to get thousands of NEW CQ subscribers!
We've torn our hair
Spent sleepless nights
Tried a few wild promotional schemes
Hired detectives
And even attempted careful self-analysis
ONE WAY
ONE WAY
Finally, we just didn't know which way to turn
And then, one magic day the answer came to us
BONANZA!!!

and here it is!!!

SPRING BONANZA
CQ's Giant Subscription Giveaway

These BONUS gifts are yours absolutely free with a CQ subscription received by us between March 1st and June 15th. With a one year sub you choose one free bonus prize; with a two-year sub, choose two bonus items, and with a three-year sub, any three prizes of your choice. Bonus items are all valued at a dollar or more, so you reap GIANT cash savings.

And remember, CQ subscribers still get up to twelve months of classified ads absolutely free! What ham magazine ever offered a better package than this? So don't wait. Send in your sub order today. We're giving away everything but the printing presses.

Incidentally, present subscribers may review existing subs and cash in on the giveaway.

1

W1DBM's
FAMOUS
"TVI"
HANDBOOK
$1.50 VALUE
FREE
WITH BONANZA SUBSCRIPTION

2

W9IOP's
FAMOUS
"Second Op"
$1.00 VALUE
DX Operating Aid
FREE WITH BONANZA SUBSCRIPTION

3

CALL LETTER BADGE
K2MGA 1" x 3"
Handsomely Engraved With Your Call
$1.50 VALUE
FREE
WITH BONANZA SUBSCRIPTION

4

100 UNIVERSAL QSL CARDS
Handsomely Printed in 2 Colors on fine quality stock
$2.00 VALUE
FREE WITH BONANZA SUBSCRIPTION

5

TEPABCO ***package of***
3 ***plastic*** **QSL** ***Holders***
Each Holds 20 cards
Fine for WAZ or WAS displays.
$1.00 VALUE
FREE WITH BONANZA SUBSCRIPTION

Rates: 1 Year... $5 ☐ 2 Years... $9 ☐ 3 Years... $13 ☐

Pan-American and Foreign Add $1.00 Per Year Postage.

NAME ______________________

ADDRESS ______________________

CITY ______________________

STATE ______________ ZIP ________

CHECK ONE BONANZA BONUS ITEM FOR EACH YEAR OF SUBSCRIPTION

1	2	3	4	5
☐	☐	☐	☐	☐

the USA-CA PROGRAM

BY ED HOPPER,* W2GT

THE March "Story of The Month" about Carl, WØKZZ after this information on awards issued. Joe, W2JWK received a mixed USA-CA-2500 award. Mixed USA-CA-1500 awards went to Walt, WA2HGL and Andy, WPE-9-ETT. Ed., W3BWU received a USA-CA-500 award endorsed All 50 mc, All A-3 (the 3rd such issued). Corwin, WAØLRQ received a USA-CA-500 award endorsed All 2 × s.s.b., All 75 m and All 1966. Frederick, K2VGR and Jan, SP6FZ received USA-CA-500 awards endorsed All A-1. Mixed USA-CA-500 awards went to Phillip, WAØEVO and Dick, VP9FK.

Carl W. Reed, WØKZZ

Carl was born in October 1918 in Minneapolis, Minnesota. Served in the Army from January 1942 to December 1945. Married "Bonnie" in October 1942. The amateur radio "bug bit" when a mutual friend took him to visit the famous WØGFQ, Leo, in Council Bluffs, Iowa.

In 1946, the Reeds moved to Fargo, North Dakota and the WØKZZ license came in 1952. As with most amateurs, many rigs came and went and always the typical remark by the XYL, "you told me that amateur radio did not cost much."

Then came that fateful day in October 1962 as Carl was mobiling on 75 meters from Minneapolis to Fargo, WA9FXJ told him that a bunch of fellows on 7223 would be happy for him to QSY to their frequency. Thus county hunting started for WØKZZ as on 7223 were K8CIR, K9EAB, WØMCX, K9UTI and others. So not only did Carl get involved with passing out the counties from his travels, but he was really trapped as he started collecting them himself, and has now collected over 2700 counties, of which about 2500 were collected while mobiling.

*103 Whitman St., Rochelle Park, N.J. 07662.

COUNTY HUNTER NETS

1300-1700 GMT- 7225 s.s.b.
1800-2400 GMT-14336 s.s.b.
0100- GMT- 3947 s.s.b.

C.W.

Monday-Friday 1900-2200 GMT 7035 kc
Saturday 1530-2130 GMT 7035 kc
Sunday 1730-2130 GMT 7035 kc
Monday-Friday—eves. 0000-0300 GMT 3523 kc

USA-CA HONOR ROLL

2500
W2JWK 18

1500
WA2HGH 55
WPE9ETT 56

500
WAØLRQ 601
K2VGR 602
VP9FK 603
W3BWU 604
WAØEVO 605
SP6FZ 606

In the following months and years, Carl has given out 48 of the 53 North Dakota counties; 44 of the 87 Minnesota counties; 18 out of the 67 South Dakota counties; and on vacation trips, 68 counties in 7 additional states. In passing out reports from these different counties, the number of contacts run into the thousands.

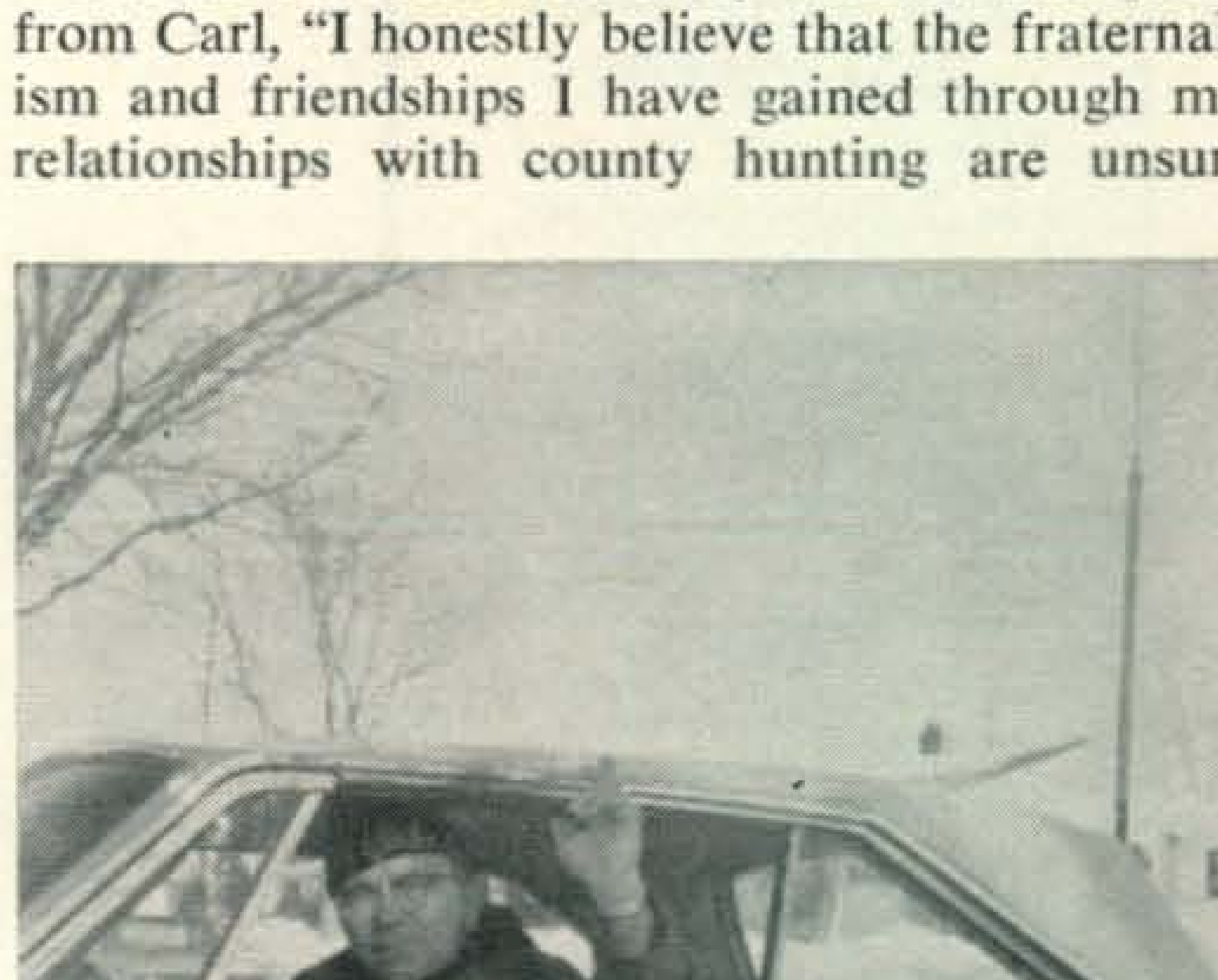
Then came St. Patrick's day, March 17, 1964, when WØKZZ became snowbound in Minnesota and the gang on 7223 (as Carl says—"The most wonderful guys in the world") effected comfort and eventual rescue for Carl and 7 other stranded motorists. (This story *CQ*, June 1965)

The present WØKZZ equipment for mobiling is a Swan 400 and Webster Top Sider antenna. The home equipment is a TR-3, 30L-1, and a 4 el. Hornet TB-1000/4 antenna. Carl also likes to chase DX and rag chew, and like most amateurs, he has other interests, namely philately, golf, bowling and horseback riding.

To keep the wolf from the door, Carl is employed as a traveling field engineer for a distributer of Westinghouse X-Ray Co. As a side line he is owner of the Reed X-Ray Technic Computer, a slide rule device for the calculation of x-ray exposure technics.

Bonnie and Carl are blessed with four wonderful children: Janet is a medical school student at U.N.D.: Nancy is a junior at N.D.S.U. in the school of Art: Chuck and Patricia are in grade school: plus hundreds of wonderful, wonderful friends, both in and out of amateur radio.

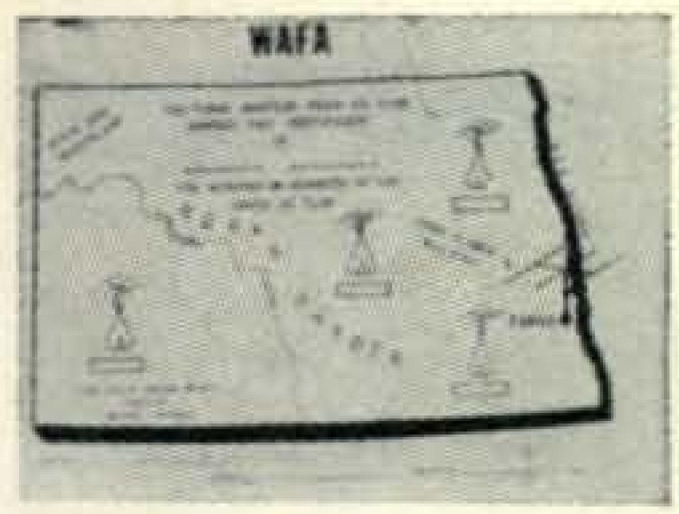
I could not close this story without this quote from Carl, "I honestly believe that the fraternalism and friendships I have gained through my relationships with county hunting are unsur-



Carl, WØKZZ

TASYL Award

Jackalope Award



WAFA

1000-Mile-Per-Watt

passed in the years I have been with amateur radio."

Letters

Ed, K6CAA/KH6/Kauai County, writes; "A few months ago I came to this garden island paradise to work and play. I now really enjoy DXing and feel that Kauai county is rare on the list of most county hunters. Although there are about 30 hams on this island, only 3 or 4 of us are real active on the DX bands and I seem to be the only one on c.w.

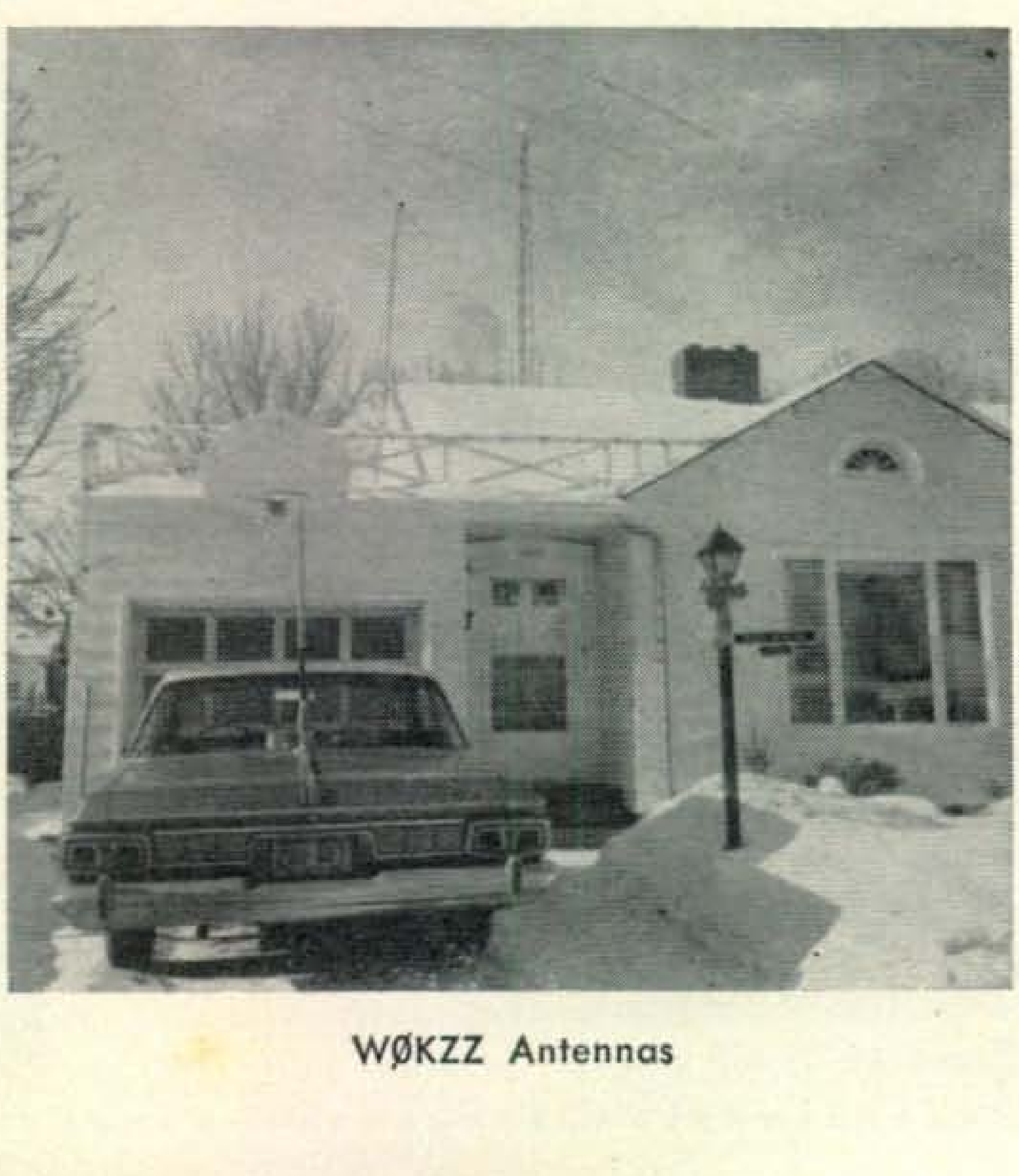
If enough interest is shown me, then I will stop chasing DX only and set-up a regular schedule to be on the county hunter nets and then work "Contest-style" if pile-ups occur.

I can operate 80-10 meters, c.w. and s.s.b. from 0400-0800 GMT. and weekends." Write Edward W. R. H. DeYoung, K6CAA/KH6, P. O. Box 435, Hanapepe, Kauai, Hawaii 96716.

John, W5OYG, writes; "Since I last wrote and applied for 500 counties, I have met many more fine County Hunters in person and had a great time giving out counties for the first time. I went on three special trips with *famous* county hunters, Hi. Gave out about 30 Oklahoma counties with K9BLX. Helped KØPJ give out 35 Arkansas and Missouri counties and just a few weeks ago WA5AEB, W4SKI/5 and myself went on a 21 Oklahoma County trip."

Awards

1000-Mile-Per-Watt Achievement Certificate: The QRP Amateur Radio Club International proudly offers this award to any amateur or s.w.l. who can demonstrate that he has either transmitted or received a low-power signal such that the distance between the transmitting and receiving stations divided by the input power of the low-powered transmitter equals or exceeds 1000 miles per watt. Separate certificates will be issued to anyone accomplishing this on different bands or using different modes. Send full data for the contact, including both QTHs, with a s.a.s.e. or 25¢ for mailing tube service to: Awards Manager, QRP A. R. C. I., Robert R. Henrich, WØGWT, 2928 Homewood Ave., St. Charles, Missouri 63301. May I suggest you send a s.a.s.e. to Robert for full details on the several other fine QRP Awards.



WØKZZ Antennas

Jackalope Award: This award issued by The Antelope Valley Amateur Radio Club of Lancaster, California. There are over 300 amateurs in the Antelope Valley (Lancaster, Palmdale, Lake Hughes, Rosamond, Edwards AFB and Mojave). Requirements are: Contact 1 member of the Antelope Valley A. R. C. and 4 other stations in the Antelope Valley. Contacts from January 1st, 1966 count. Send log data and $1.00 to Custodian, Russ Lietzow, WB6HCQ, 45337 7th Street East, Lancaster, California 93534. A weekly ragchew around 3900 mc, Wed. nights 8:30 to 9:30 P.M. PST will help get you the needed contacts. Also available to s.w.ls.

WAFA Award: This award is sponsored by the Fargo (N.D.) DX Association for QSOs of Jan. 1, 1966 and later with 4 of the 5 members of the association. If all 5 are worked a special endorsement is available. All bands and modes may be used. Cost: 5 IRCs for surface mail or 10 IRCs for air mail. Send list of stations worked giving date, time, freq., and mode to: Douglas H. Classon, WØCAQ, 445 Elmwood Ave., Fargo, North Dakota 58101. Association members are: WØCAQ, WØDIV, WØKZZ, WØRRW and KØSPH.

The TASYL Award: Sponsored by the Automotile State YLs (Michigan) for working club members, any band, any mode. Requirements:

Michigan amateurs need	30 pts.	DX (inc. KL7, KH6) need 6 pts.
Cont. U.S. & VEs	20 pts.	
Technicians	10 pts.	Charter members count 2 pts., all others 1 pt. each.
Novices	10 pts.	

B.C.-Canada-Centennial

Application: Send list of calls in alphabetical order, with club members number and full log data (GCR rules apply), plus 50¢ or 3 IRCs, to custodian, Patricia Pennock, K8TYK, 4523 East Shore Drive, Caledonia, Michigan 49316. May I suggest you send Patricia a s.a.s.e. for a list of the membership as it is now pushing the 100 mark.

British Columbia Canada Centennial Certificate: To help celebrate the 100th Anniversary of both the Province of British Columbia and Canada, the North and West Vancouver Amateur Radio Club will issue this free certificate for required *QSO*s made from January 1, 1967 to December 31, 1967. Amateurs in B.C. must work 10 separate N. & W. Vancouver club members. USA and other parts of Canada must work 5 and amateurs outside of N. America must work 3.

Members are: VE7AHX, AIO, AK, AKA, AOF, APC, ARO, ARU, ASV, BCW, BEA, BIU, BKD, BKS, BOA, BPY, BQL, BQN, BQU, BQY, BSU, BTW, BUK, CA, EQ, HJ, JN, JY, MQ, OF, QV, RR, VF and special member VE6JW. Send the list of members worked to: Don Short, VE7BQN, 1381 Oakwood Cres., North Vancouver, B.C., Canada.

Notes

High on my list of pet peeves are those who fail to answer their mail, even when one sends a s.a.s.e. For over 7 weeks I have been waiting for a reply from WA2EJF, secretary of Binghamton Amateur Radio Association who are the sponsors of the New York (State) Counties Award. Their former custodian has been a silent key for some time and I've been trying to get some information on a new custodian. Sorry I did not have room for the fine data on the c.w. Nets from K3WWP and the fine letter from Mid, W7ZC, so wait until next month. Many thanks to Mid, W7ZC and Richard, K9HSK for their offers of POD 26. Don't forget this is Canada's 100th Anniversary so many new Awards and contests will be forthcoming with their special calls. Million thanks for all your cards and letters —How was your month? 73, Ed., W2GT.

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

OVER the years since HAM CLINIC first appeared, it has contained many items; and believe it or not, we *continue* to receive inquiries on many of them. This is so we imagine because old issues of *CQ* have since disappeared or there are many newcomers on the ham scene.

The lead-off which has received the greatest number of comments was carried in the Dec. 1959 issue of *CQ*. Entitled: "Complaints to Distributors and Manufacturers" the article's theme is just as fresh as it was in 1959, so it is reprinted again here. One manufacturer of ham equipment (who advertises in *CQ* consistently) said in one of his letters to HAM CLINIC: "more hams, dealers, distributors and manufacturers should take this article out occasionally and read it. The message you convey is a good solid message and contains good advise helpful to the ham as well as the others concerned."

Other items which continue to bring in mail because of their interest or because they are popular are also reprinted this month.

Observation

The most powerful and modern nations in the world including the United States, Russia, England, France, Italy, Germany and so on recognize the worth of amateur radio. They know that those who are interested in radio communications and who take out the time to train themselves and to set up their own stations are a very important national *resource*. To this end they sanction and encourage amateur radio operations. The developing nations should remember this when considering their internal telecommunications requirements, for the ham of today is the telecommunications engineer of tomorrow.

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

Certainly the developing nations need industrial advice and assistance; certainly they need help in organizing their agriculture and their medical and telecommunications services, but they *also need* help in starting their radio amateur operations. They need ham radio clubs and they need equipment. The nations mentioned earlier above should help—through their own national member societies as well as the IARU (International Amateur Radio Union). Let us hope that none of us falls down on the task! Everyone's help is needed. Contact your national society and offer what you can.

Complaints to Distributors and Manufacturers

When a ham purchases a piece of radio gear he expects it to operate just as the manufacturer said it would—*under normal circumstances*. But sometimes something happens between final testing and a few hours operation after delivery.

Now, what is this "something"?

To begin with, every effort is made by every reputable manufacturer to insure that the parts supplied from outside factory sources are good and comply with engineering specifications. However, we all know that any electronic part can fail at any time. The premature failure of component parts in electronic equipment is the big headache of nearly everyone—including our missile makers. *No one*, I repeat NO ONE can predict failure of any man-made system or component 100%. This is impossible!

Very strict quality control procedures, rigid inspections and careful testing are the order of the day in any reputable manufacturing plant. Other than long *field testing* of a specific item, little else can be done to insure customer satisfaction.

When the finished product is packed and readied for shipment every possible precaution is taken. You can bet that when it leaves the factory it IS operable. However, the manufacturer has no control over what happens to the equipment on its way to the distributor. The equipment can be dropped a distance that is just "too much" for its packing.

After the equipment arrives at the distributor's or dealer's warehouse, the equipment stays in its packing until it is displayed or demonstrated to a customer. This is not a bad practice because if it is correctly packed by the factory it cannot be damaged by *normal* handling.

The distributor who sells a piece of equip-

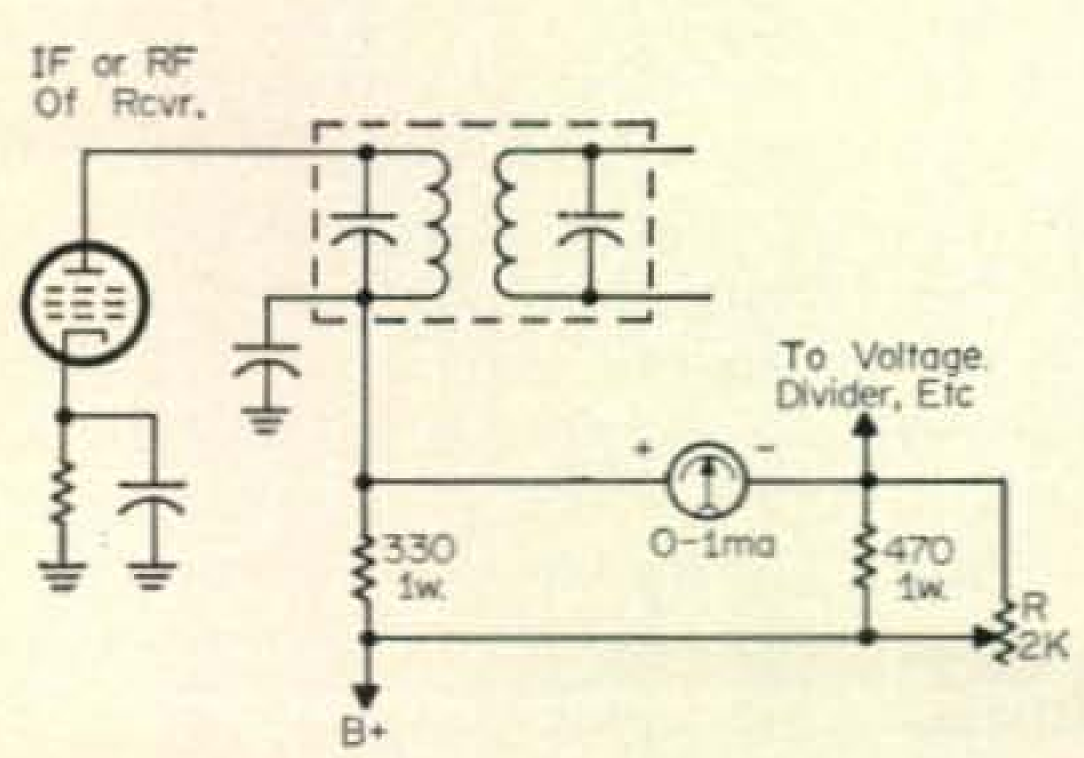


Fig. 1—Simple tuning indicator.

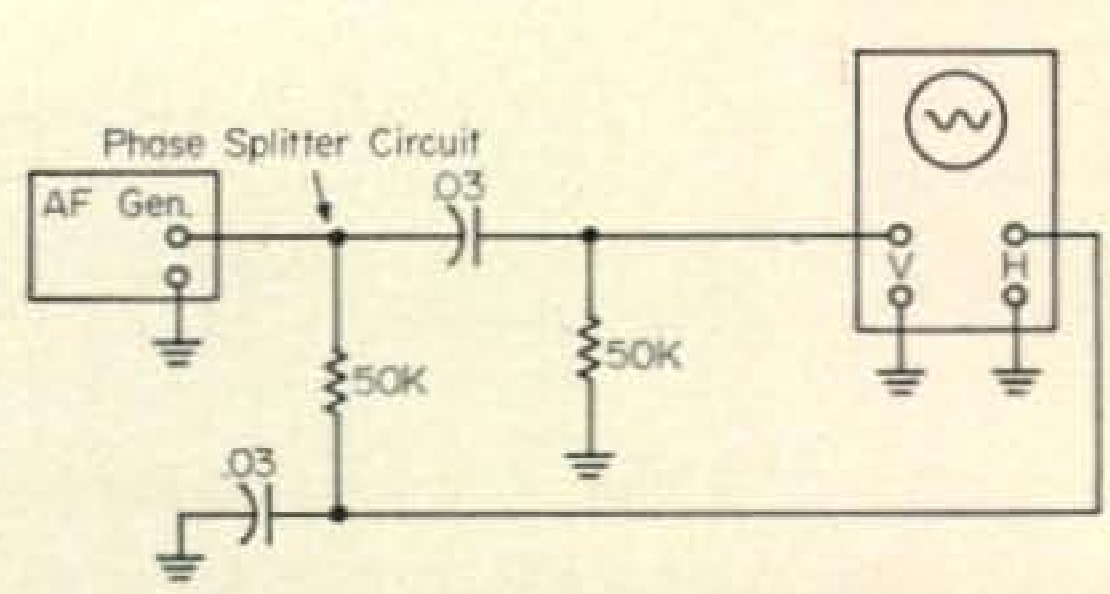


Fig. 2—Set up for elliptical scope pattern presentation.

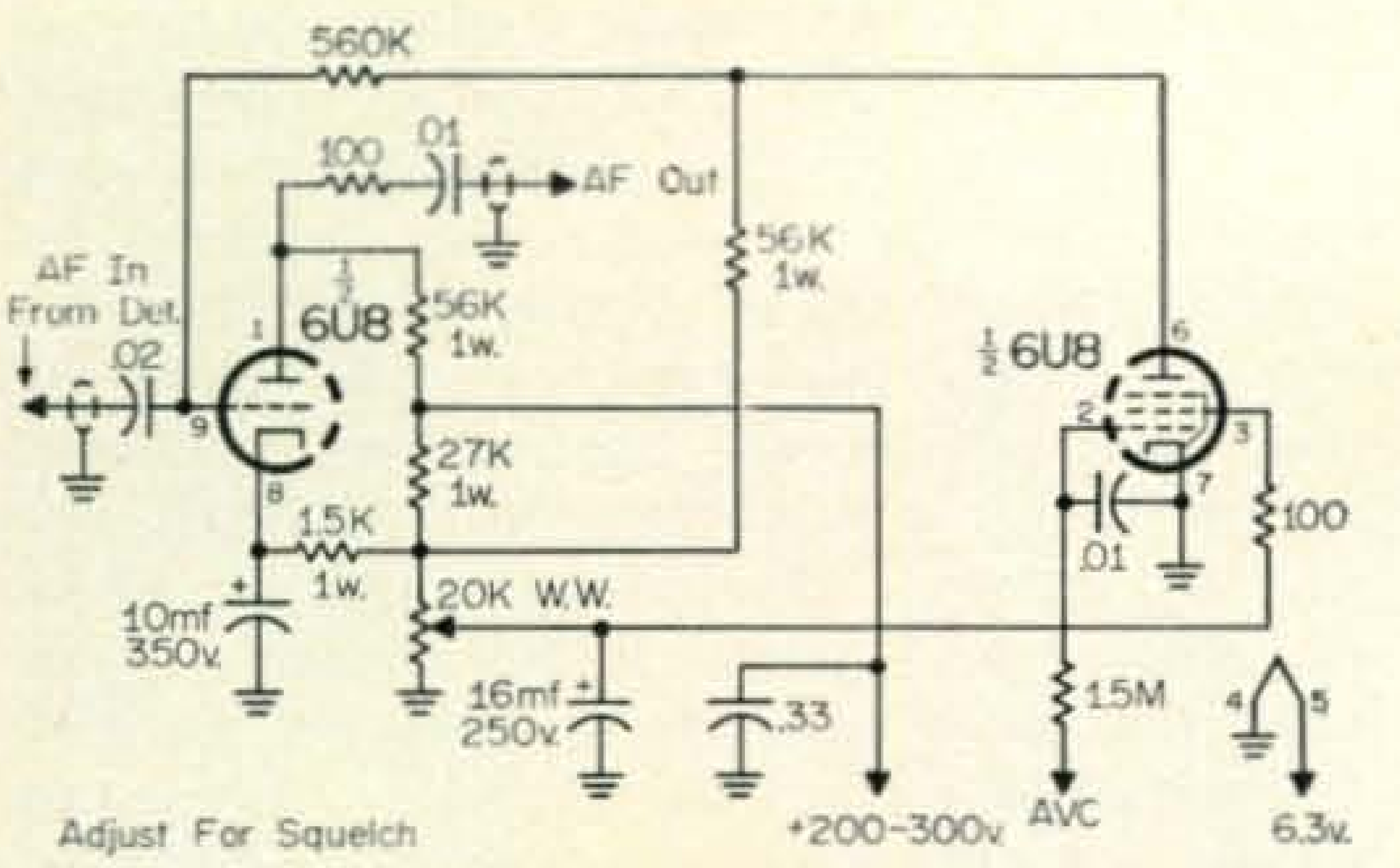


Fig. 3—Squelch Circuit Using One Tube.

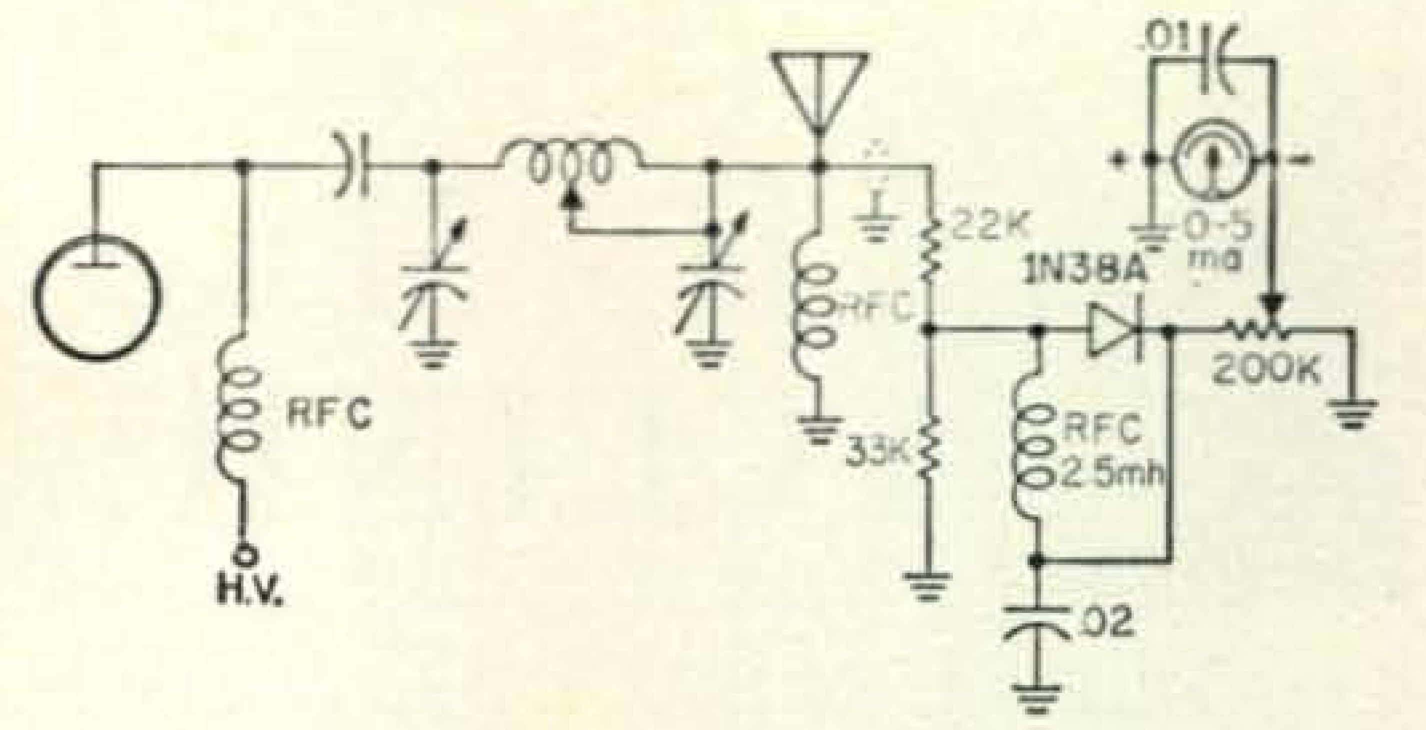


Fig. 5—Diagram of an r.f. voltmeter type tune-up indicator.

ment in the original packing without testing it prior to delivery to the customer, is making a mistake. Better that he should open the case in front of his customer and check out the set on a well equipped service bench. At the same time he can inspect for damage and possible mis-alignment.

Carefully checking into the overall "complaint situation" I have come up with some very interesting things.

First of all, the average ham *does not* know how to go about obtaining an adjustment on faulty merchandise! His first inclination is to write a nasty letter to the manufacturer—when in reality, he should be contacting the people from whom he purchased the set. Then to make adjustment more difficult for the factory people, he forgets to include essential information in his letter.

Writing either too much or too little, his anger clouds the real purpose of his communication. Admitted, describing symptoms (even to a doctor) is difficult, but it must be done and done properly. In the process of description however, one does not insult those who are ready, willing and able to help.

Getting a "lemon" out of a large barrel of "oranges" can and does happen! But before you lose your temper and threaten the manufacturer with everything under the sun, THINK! Remember, hundreds or even thousands of that same piece of equipment are operating properly in other ham shacks. To say on the basis of *your* one complaint that a particular receiver, transmitter etc., is no good—is first-rank childishness and shows a lack of intelligence.

Believe me, *some* of the letters received by Factory Service Managers (FSM) are not only insulting but downright mean!

Usually, manufacturers are ready to make reasonable adjustments *through* their distributors and dealers. But sometimes those who deal directly with the customer do not "carry the ball" and the factory gets blamed.

It is up to the dealer or distributor who sold the set to a customer to make certain that the equipment is operating properly prior to release.

Your first complaint then, should be directed to the man who actually placed the set in your hands . . . not the manufacturer. Why? Because he's handy—he has direct liaison with the manufacturer—he has service notes—and he has assumed the responsibility for the transaction and *your* satisfaction.

The time to contact the manufacturer is *after* your own dealer (distributor) has *not* intervened for you or given you the satisfaction you deserve.

Then the little matter of "over-expectation" comes into the picture. For example, one "Mr. Ham" buys a receiver in the $150 class and it seems terrific until he operates a $595 model in another shack. Then he starts to wonder. His reasoning (which, incidentally is wrong) goes like this: "maybe my receiver only cost me $150, but why should there be *so much* difference?" A few days later, a FSM gets a letter berating the product and suggesting improvements!

Here are a few excerpts (edited) from letters to FSMs.

"Dear Sir: I bought your XYZ Model (under $200) and find that the *avc* action is not half as good as that on a friend's 'Superwhooper' ($450). Seems to me, this feature should operate the same either in a low- or high-priced set. Am I correct?"

Another: "Dear Sir: I'm #"%&() sick and tired of writing letters relative to my Model ZZZ transmitter. I've done all that you suggested and my signals are still weak. I'm telling you right here and now there is something really wrong. If I don't get satisfaction I'm going to spread the word that your equipment stinks!"

"Dear Sir: your poor engineered sets should be sold to the enema (sic)."

"Dear Sir: my distributor told me to tell you that if you don't replace my receiver he is going to take his business elsewhere. As far as I am concerned, you are a bunch of crooks. Furthermore, how come this dern set won't stay on frequency?"

"Dear Sir: that TR switch I bought of yours

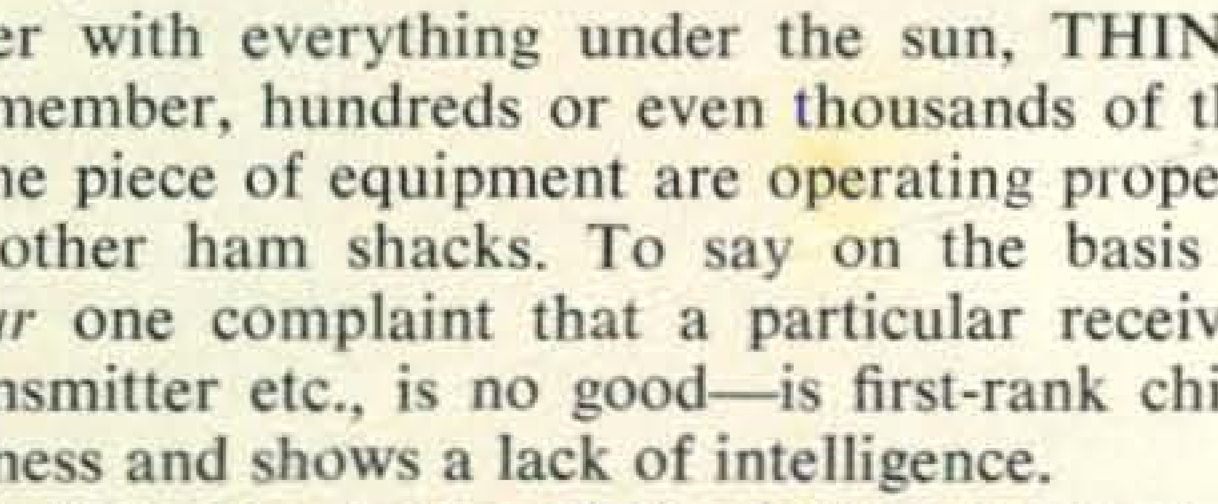


Fig. 4—Circuit of a c.w. monitor.

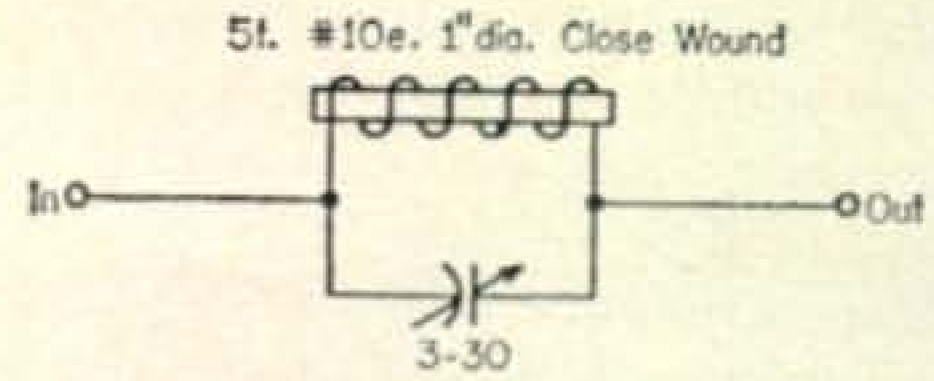


Fig. 6—Generator hash filter for 6 meters. Inserted in series with the generator field and tuned to 50 mc it will effectively suppress most generator noise.

is ill-designed because the rf leaks through no matter what I do—even with my transmitter OFF. Tell me, how come? Better send my money back."

"Dear Sir: reference your letter received yesterday. Listen, don't tell me I don't know if my set is operating properly or not. I happen to be a TV serviceman and know a heck of a lot more than some of your engineers. I shall send the scope back to your factory as you suggest tomorrow." (Note: this was a tough one for the factory too. Intermittent short in high voltage transformer caused by heat. When cold, meter readings were normal.)

Finally: "Dear Sir: I put that kit together *exactly* like the instructions called for, but no matter what I do, the set won't work. I've checked and re-checked my wiring. Now what do I do?"

Fellow hams—do complain if there is justification, but do be courteous—be sensible—be descriptive and not insulting or childish. Think of the guy "on the other end" trying to do his job to help you—he's only human too.

Your distributor/dealer and manufacturer are your friends. They *do* want you to be completely satisfied. Remember, they make it possible for you, the American ham to have the best equipped ham shack in the world!

One well prepared letter to the manufacturer or distributor giving the following facts will do more good than 20 others merely complaining or threatening to do bodily harm to an overworked FSM!

First, give the model of the set; serial number; date of purchase; name of dealer or distributor; approximate number of hours of operation; type of antenna and ground system (or other auxiliary apparatus used with receiver, transmitter etc.); what you have done in an attempt to correct the malfunctioning (Note! Be careful here—if the set is still in warantee—*do not touch it*—other than replacing tubes!); what you would like to do—symptoms in detail (what it does or does not do)———and please, say, 'thank you!" (Note: also follow this outline when submitting questions to HAM CLINIC)

Always make a copy of your correspondence. If you do not receive a reply from a manufacturer, send the copy along with your letter to HAM CLINIC—we'll see what we can do.

Never send equipment back to a manufacturer without first getting his permission. Also, contact your distributor/dealer and tell him what you are going to do—he may suggest another attack at the problem.

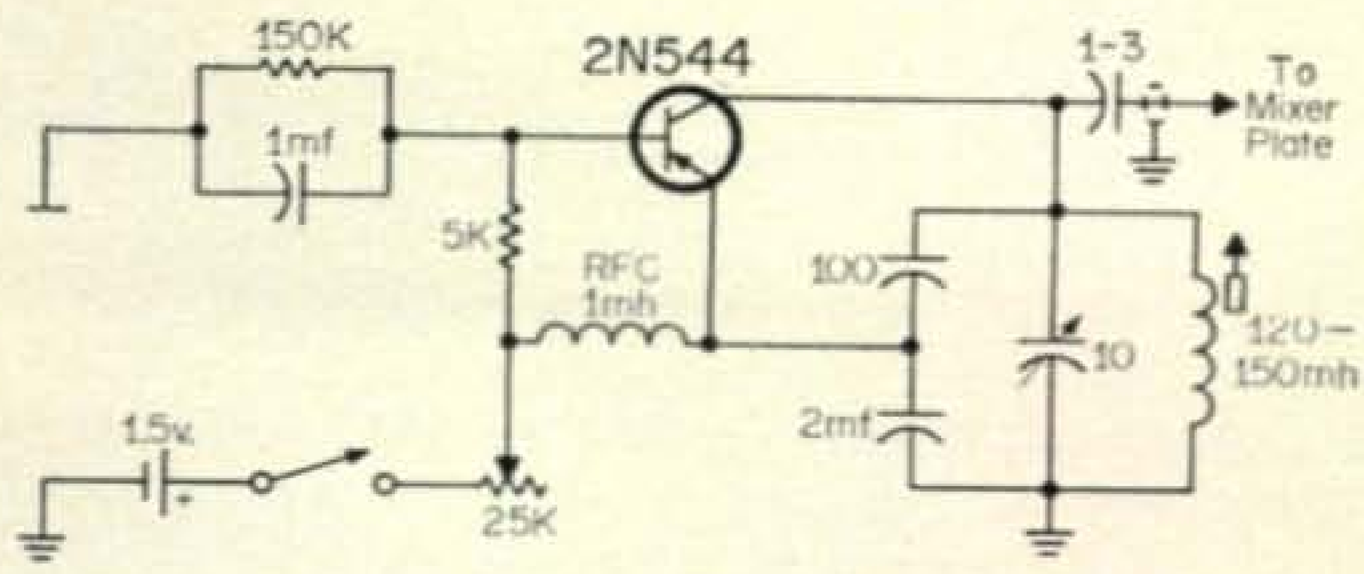


Fig. 7—Transistorized Q-multiplier for i.f.s. in the 1400 kc region.

Remember: Factory Service Managers are in existence to help you with your problems; they are human, courteous and will "bend over backwards" to give you satisfaction. They cannot help you unless you are factual and do not let your anger outweigh common sense.

HAM CLINIC cannot be "brainwashed" by any manufacturer regarding ham products. We call the shots as we see them; and our one main aim is to tell our readers what we know and/or think . . . to help them in the hobby. *No one* dictates our copy.

One final bit of advice: before you buy equipment, ask the man who owns some. Then try out the gear before you buy, either at the store, at home or in someone else's shack. Be satisfied!

All electronic equipment must go through a "settling down" period; you may or may not have trouble. Just remember that the warantee period backed by the manufacturer is your protection—and his—do take advantage of it, if necessary.

Technical Tip

Those of you who have old receivers (including the BC-348 etc.) may want to add a tuning indicator. See Figure 2 for this simple gadget which is easy to connect to nearly any receiver. R is adjusted for zero meter reading with manual gain on receiver set wide open.

Questions

GG-813s—"My 813s grounded grid *rf* amplifier seems to be plagued with parasitics. What suggestions do you have to offer?"

Barker and Williamson Inc. who make the FC-15 filament choke used in some of the best GG amplifiers say that they have found that the screen in tetrodes or pentodes should be fed through a center tapped coil ¾" diameter

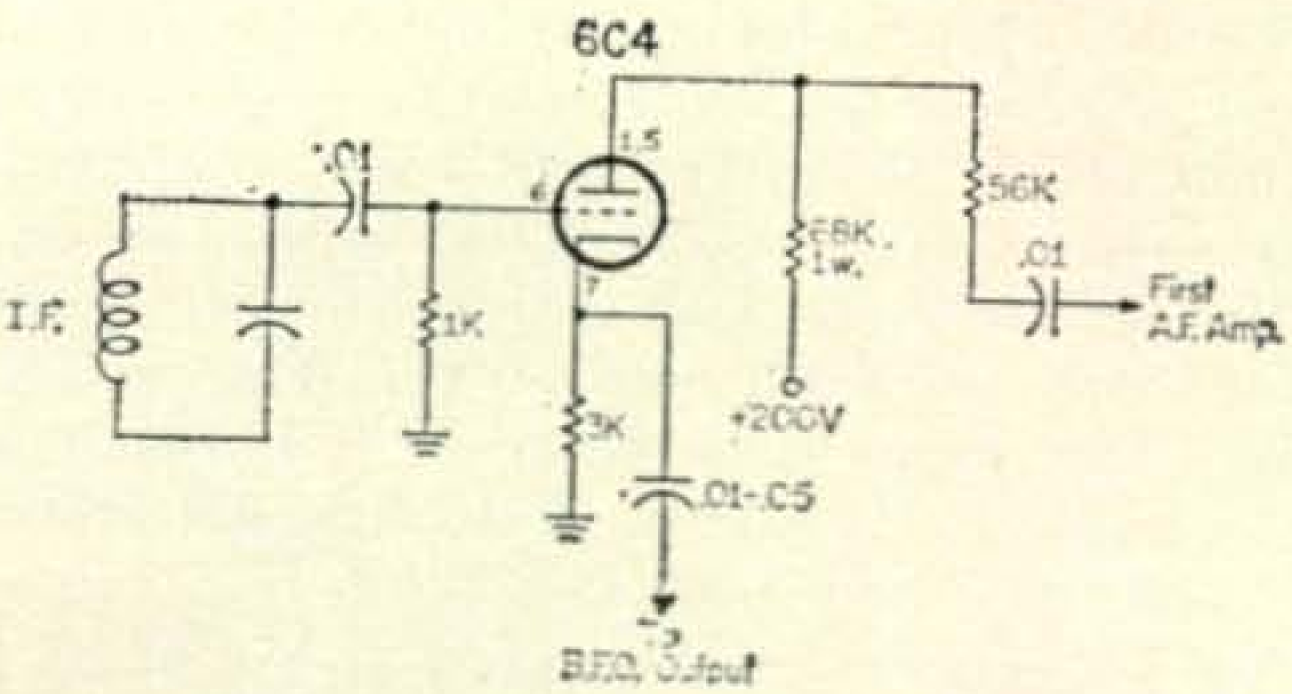


Fig. 8—A practical s.s.b. detector for nearly any receiver.

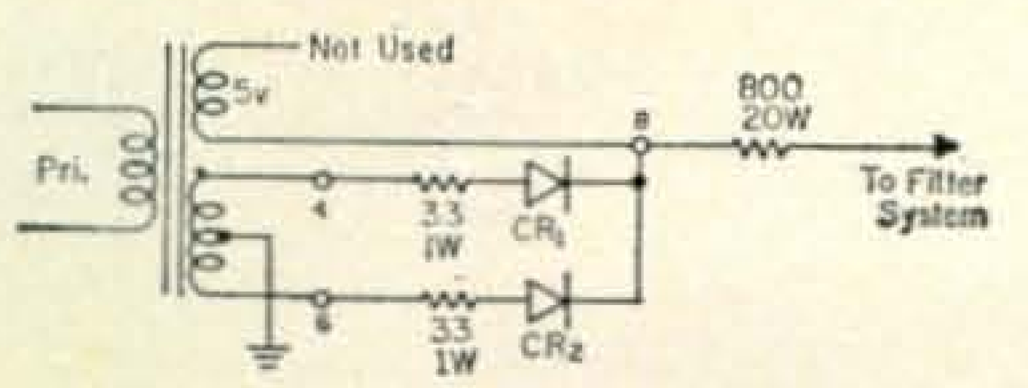


Fig. 9—Circuit illustrating how the 5Y3 rectifier in the 75A-4 may be replaced by silicon diodes to reduce ambient temperatures.

of 10 turns of #14 solid wire; a 360 ohm 2 watt resistor connected directly from screen to screen and each screen by-passed to ground with a .005 mf ceramic condenser mounted directly on the tube socket. This should help remedy the parasitic situation if normal precautions have been taken, viz., short leads; a minimum number of ground terminals for each separate circuit; a 100 ohm carbon resistor upon which is wound about 8 turns of #18 wire and inserted in series with each tube plate etc. Good luck!

Scope Matching—"Please give me the proper method for connecting up a scope to my af generator to give me an elliptical pattern."

See fig. 2. If you wish you can modulate either the vertical or the horizontal.

Squelch—"How about a diagram of a one tube squelch circuit that works?"

See fig. 3. This circuit uses only one tube, a 6U8. It must be used with a set having a.v.c. As you can see, this squelch is inserted between the 2nd detector and the a.f. volume control. Good filtered d.c. must be applied for proper action.

C.W. Monitor—"How about a real simple circuit using a transistor or two for a c.w. monitor?"

See fig. 4. Potentionmeter R_1 is adjusted for the desired tone. The pickup coil may be placed anywhere near or in the transmitter. If the gadget doesn't immediately "take-off" reverse the primary winding connections of the transformer.

Tuneup Indicator—"How about printing the diagram for a tune-up or relative output indicator for my home-made s.s.b. final?"

See fig. 5.

6 Meter Hash Trap (Mobile)—"Give me the circuit and construction information on a generator hash trap for 6 meters. My car generator is full of hash."

Before you install the filter shown in fig. 6, make sure that the brushes in your generator are riding properly on the commutator and that the commutator is clean.

Another Transistor Q-Multiplier—HAM CLINIC receives more questions relative to *Q*-multipliers than nearly any other "outboard" receiving accessory. The question most often asked is: "Please come up with a transistorized *Q*-multiplier for operation with an i.f. of around 1400 kc." Our effort is in figure 7. It is based on a design by H. J. Adami as it originally appeared in the ham mag, *OM*.

Although the original used an Amperex OC-170 transistor an RCA 2N544 was used with success as were a half dozen others.

The lead to the plate of the mixer stage in the receiver should be shielded. The coil used should be an iron core unit having a value of 120 to 130 microhenries. The resistor tied to the 25k pot will have a resistance of from 3k to 40k ohms depending on the transistor used, and the value must be obtained experimentally. Try a 5k unit with the RCA 2N544 transistor. You can also try 3 instead of 1.5 volts before changing resistors. If you are fortunate enough to have a Philco 2N1742 transistor on hand it will work extremely well in this circuit.

Simple S.S.B. Detector—"How about publishing a simple s.s.b. detector-circuit to work with any receiver having a stable b.f.o?"

See fig. 8. This can be a simple outboard device which does not disturb the set. Your regular detector can be switched in or out and the simple detector used, or not. A stable b.f.o. signal is required. This circuit will work with the following old receivers when the voltage to the b.f.o. tube is stabilized: SX-28, NC-183, SX-42, HQ-129, HRO-50, AR-88 and many others.

Cooler 75A-4—"Although my Collins 75A-4 receiver works like a charm, I feel that its internal temperature sometimes gets a mite high, especially when the outside temperatures here in Arizona climb up to 110°F. or so. Any ideas for bringing down the internal temperature without a major overhaul job?"

Yes. Thanks to "Cap" (W2AOR/W4TAI) here is some information which will help you.

"I found that my 75A-4 seemed to be running a little warm," writes Cap, so I proceeded to make the following changes: I replaced V_{19} (6AL5) with top-hat type silican rectifiers; V_{10} (6AL5) with 1N34 crystal diodes; likewise V_{12} and V_{16}; and V_{17} (5Y3) with top-hat silicon rectifiers.

"In replacing the 5Y3, a plug-in unit was made using an octal plug and mounting the surge resistors and silicon diodes on the plug. I measured the total current in the B plus line and figured that the 33 ohm one watt series resistors would do as fuses for protection of the power transformer secondary in the event of diode breakdown, as well as surge resistors for the diodes. I inserted an 800 ohm 20 watt dropping resistor in the B plus line which reduced the current through the voltage regulator tube to 15 ma and thus allowed it to operate cooler. The reduced B plus voltage to the rest of the tubes in the set resulted in all tubes running cooler and had no effect on the performance of

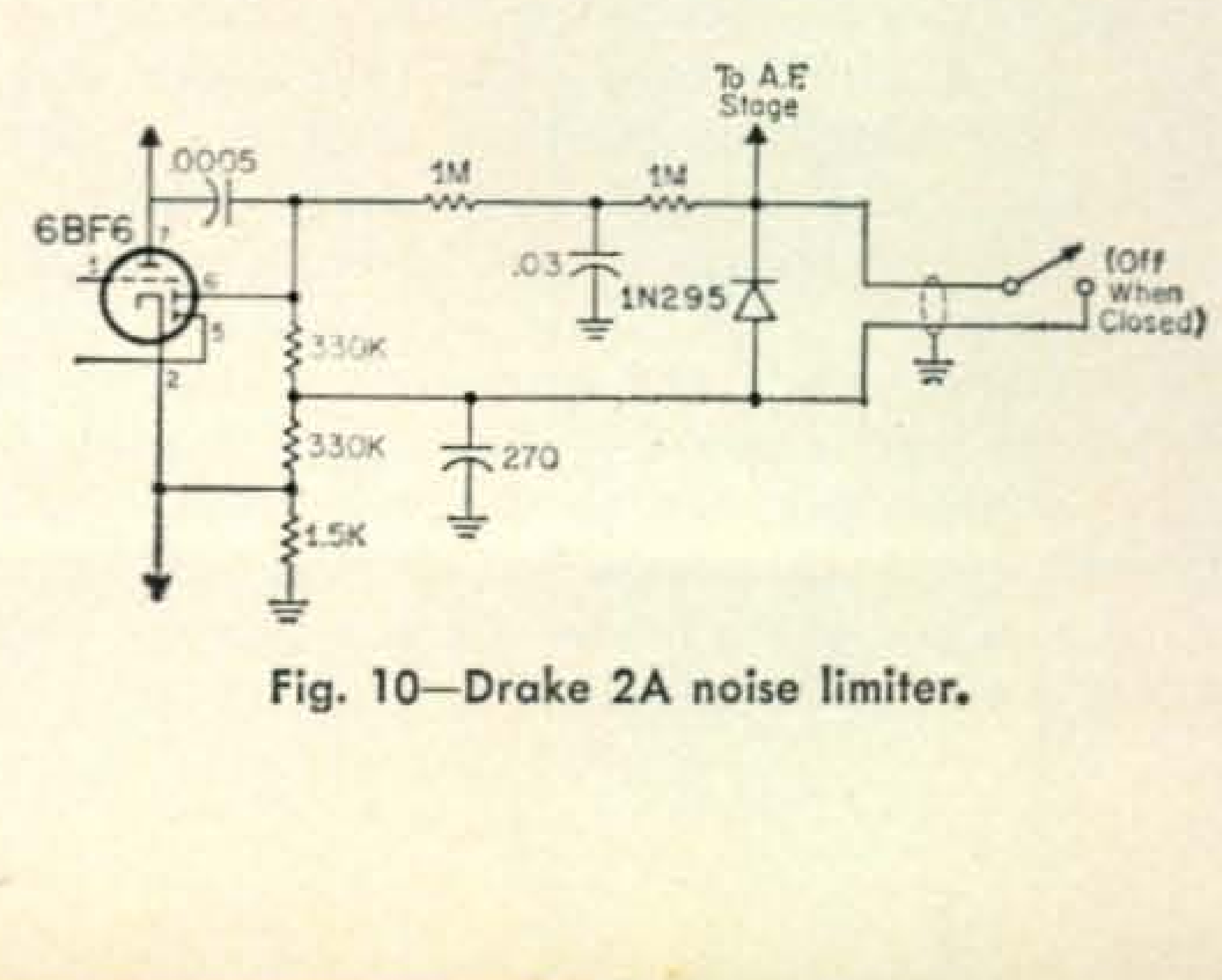


Fig. 10—Drake 2A noise limiter.

the set except a very slight reduction in audio output. The 75A-4 has more audio than can be used anyway, so the reduction was inconsequential. The receiver now runs better than 50% cooler and tube life has more than doubled.

"While I was at it I replaced V_2 (6DC6) r.f. amplifier with a 6BZ6 simply by directly replacing it. The receiver seems to have slightly less thermal noise and a noticeable increase in sensitivity."

Figure 9 shows how the 5Y3 was changed with silicon rectifiers.

Drake 2-A Noise Limiter—"How about a simple modification for adding a noise limiter to the Drake 2-A receiver?"

See fig. 10. This limiter is quite effective. Diodes that have low front-to-back resistance will not work as well as the one recommended—the better the diode, the better the n.l. action.

Instead of using an extra switch you can use the ACC switch on the receiver. This limiter has been used with great success by a number of W6 hams. Its original version is by K6YCX.

Q Multiplier for High i.f.'s—"My receiver uses an i.f. of 1650 kc. I'd like to add a Q multiplier. I find no Q multipliers on the market for such a high i.f. Can you help me? If so, please make it simple."

See fig. 11. This Q multiplier should meet your requirements. After installing check the i.f. alignment of your receiver. I suggest that you mount the parts in a Mini-box for good shielding. Any voltage from 75 to 150 volts will work fine. Although a 6C4 is used in the circuit you can use if you desire, a nuvistor such as the 6CW4 or 6DS4.

A.f. Signal Generator—"I would appreciate it very much if you would publish the circuit of a good single frequency a.f. generator that puts out a good sine wave. It can be one that uses either tubes or transistors. Any frequency from 500 to 3000 cycles will do fine. Help me, please?"

Sure. See fig. 2. This little a.f. generator using transistors works like a charm. Its output waveform is excellent.

The inductance L in the emitter of the first transistor can be a good iron core choke or the primary of nearly any ouput transformer (2000 to 6500 ohms or so). The capacitors across the inductance may be varied in value (along with the latter) to give you the frequency you want. I suggest that you keep the ratios of capacitance of the two condensers as is and vary the size of L.

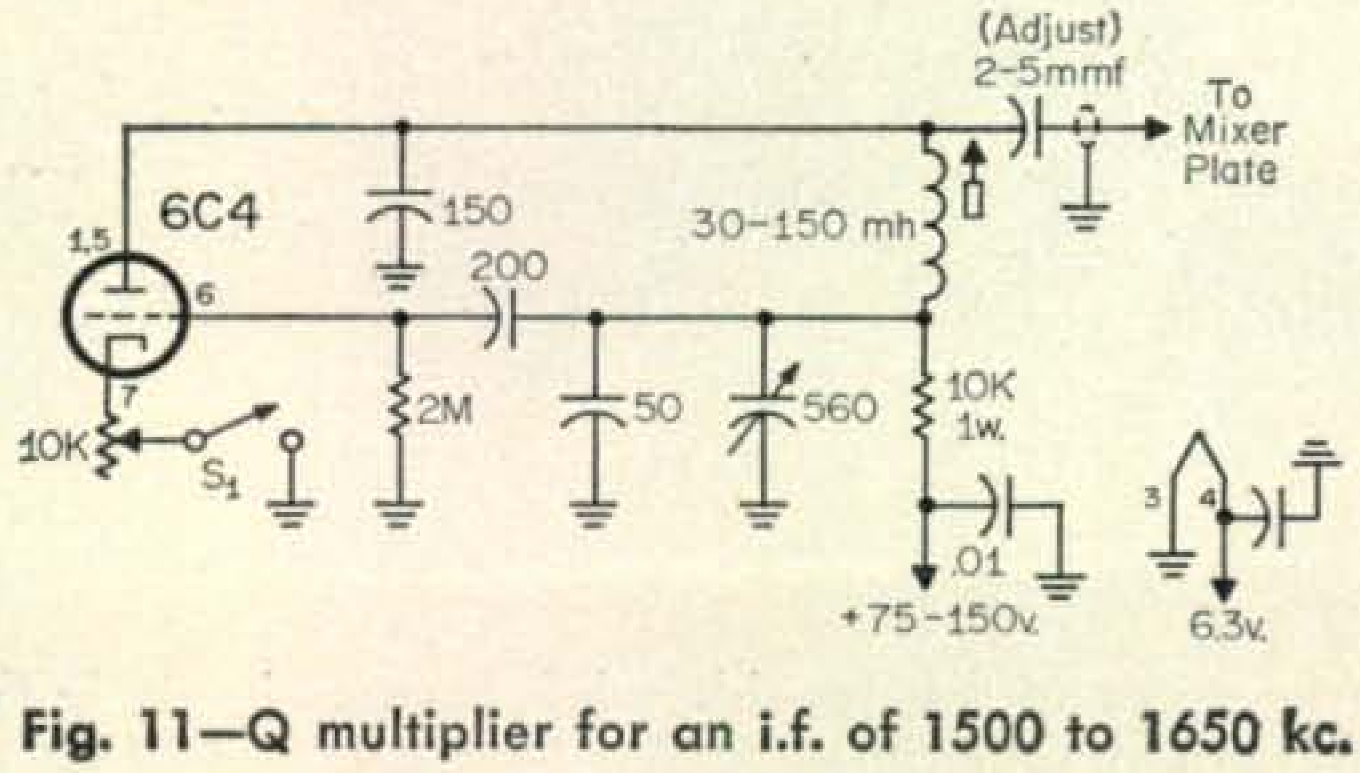


Fig. 11—Q multiplier for an i.f. of 1500 to 1650 kc.

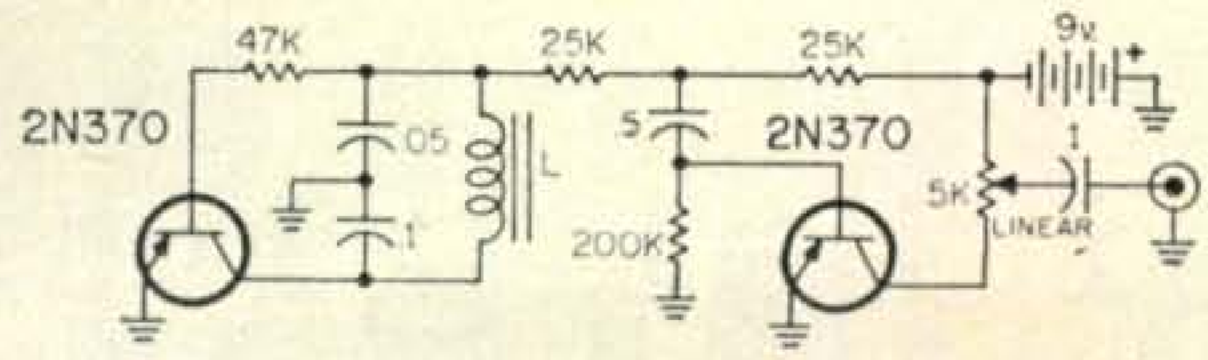


Fig. 12—An a.f. signal generator.

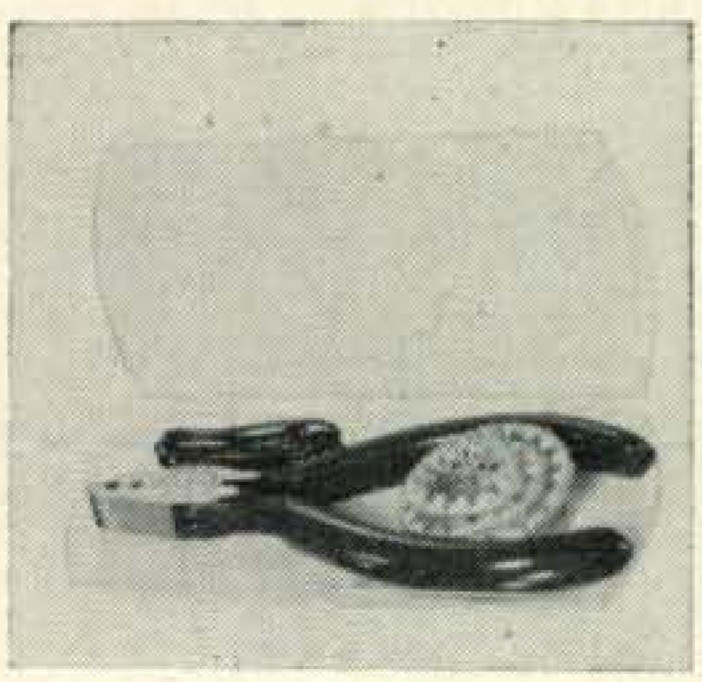
Transistors other than 2N370 (as shown) that can be used are: 2N105, 2N283, 2N371, 2N372, 2N373, 2N374 and CK-722.

Thirty

We hope that republication of the items in this month's HAM CLINIC will be of interest to those who have never seen them before, or will be brought to the attention of those who have seen them and have forgotten where they appeared.

Due to other commitments, this correspondent will cease writing the HAM CLINIC column on a regular basis but will maintain his contact with *CQ* as well as other amateur radio journals. 73 & 75 Chuck.

New Amateur Products



Shure

SHURE Brothers, Inc., is offering a specially designed tool for use when coiled cords on hand-held microphones need repair.

The new tool is a "crimping" pliers available as part of the Shure Solderless Terminal Kit No. TK-1, which includes 75 solderless clips and a length of copper lead wire. The TK-1 is available from authorized Shure dealers for $7.50. For additional information write: Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois, or circle 64 on page 110.

Amperex

AMPEREX announces the 5894B/8737, a twin tetrode improved version of the 5894. The 5894B/8737 employs an oxide coated, unipotential cathode and is designed for use as an r.f. power amplifier, oscillator and frequency multiplier up to 250 mcs. Further information may be obtained from: Amperex Electronic Corporation, Tube Division, Hicksville, L.I., N.Y., 11802, or circle 63 on page 110.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

ABOUT the most popular band in the electromagnetic spectrum these days is the 50 megacycles or so that lie above 100 mc. Amateurs have carved out the 2 meter band near the top end of the old military aircraft frequencies that covered 100 to 156 mc during and just after World War II. Broadcast frequency modulation stations occupy the bottom end, and civil aircraft navigation, towers, and traffic control use the 108-135 mc portion, with military air traffic control, towers, air line business channels, and a sprinkling of satellite frequencies, plus Civil Air Patrol and M.A.R.S. frequencies to round out the band.

All this traffic in the vhf band makes it highly attractive to the amateur, the s.w.l., the experimenter, and even volunteer police and firemen who have their own channels at the extreme upper end of the 100-156 mc spread. The band is high enough in frequency to escape the atmospheric noise of the lower frequencies, and is relatively little bothered by ignition noise and other man-made disturbances which plague six meters, for example. On the other hand, the size and shape of coils and capacitors, while small, are still of reasonably manageable proportions, and do not require the care in construction of 220 mc and higher-frequency gear.

V.h.f. signals normally are reliable—if they can be heard at all they are readable over a nearly line-of-sight path (ignoring for the moment the more sophisticated v.h.f. work, meteor scatter, and so forth). This band is also interesting because of its space possibilities, with satellite relays already tested, and weather satellite broadcast of high-altitude earth photographs routinely available to the amateur.

*5716 N. King's Highway, Alexandria, Virginia 22303.

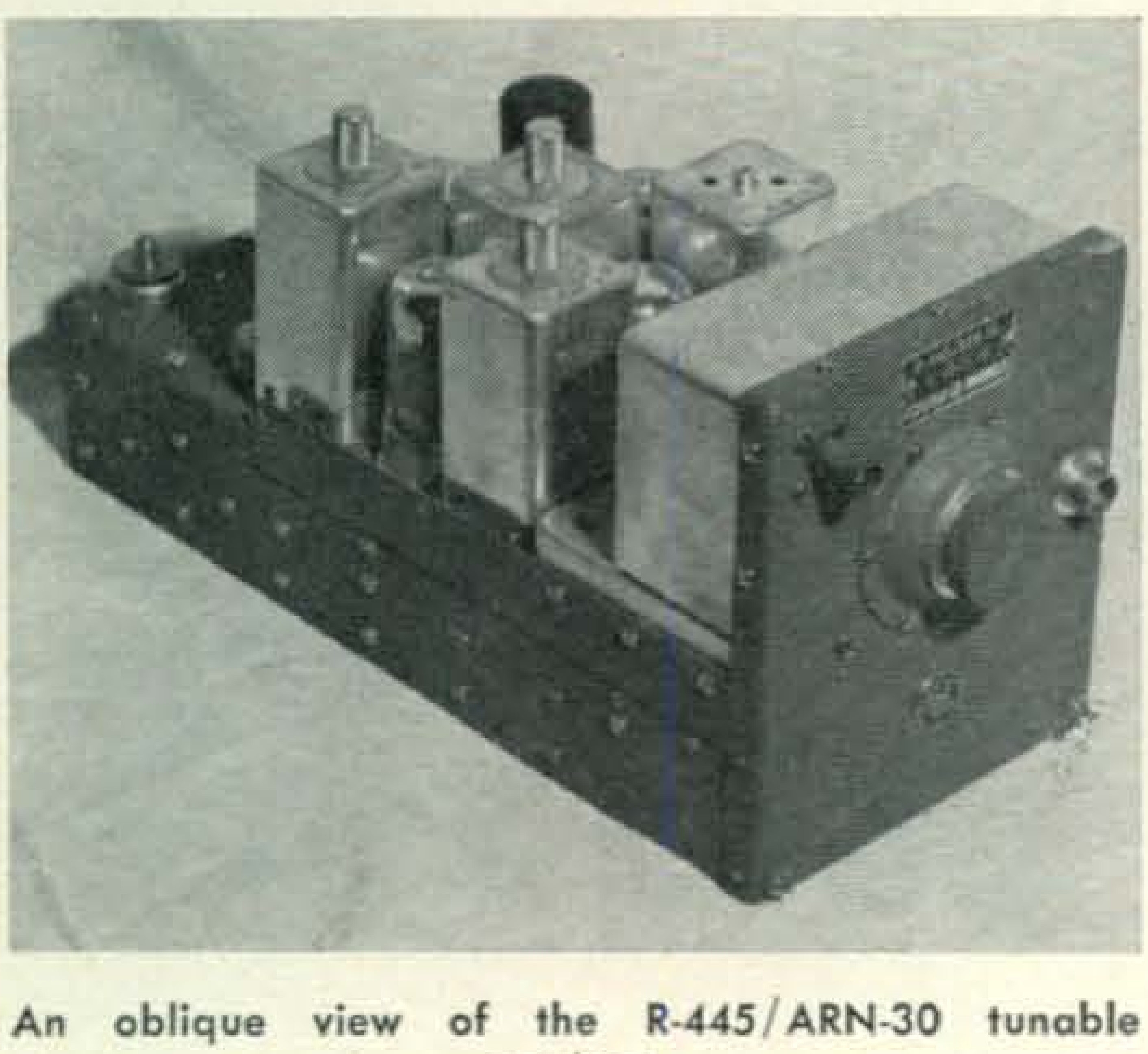
So it is a little surprising to me to see relatively little v.h.f. gear in the marketplace. Gonset has made high-quality amateur v.h.f. sets for years, and a few consumer-type monitor receivers have been marketed, plus Hallicrafters' general-coverage receivers which do not do true justice to v.h.f., though they may be quite adequate on the lower bands.

So we turn to surplus for v.h.f. equipment, largely receivers, for v.h.f. transmitters in the 2-meter band are more widely available, and many people find it practical to build their own v.h.f. loudenboomers.

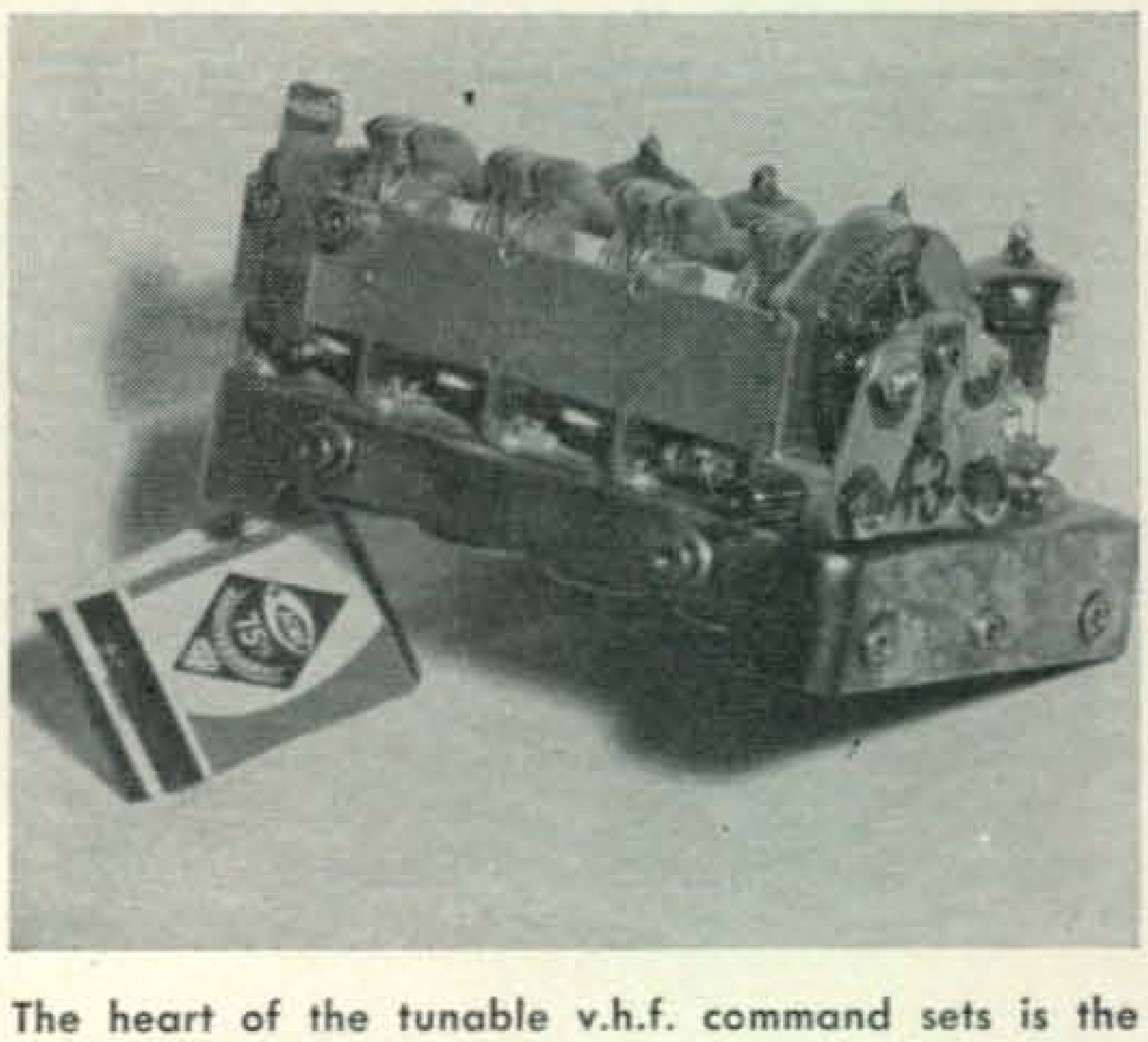
The granddaddy of surplus radio equipment for most amateurs is the SCR-522, a British design circa 1939, copied here by Bendix, built by Bendix, Zenith, and others, and produced by the thousand through 1945. New SCR-522 command sets are still turning up in the lowest layers of abandoned military depots. Their coverage: 100-156 mc.

This is an ancient set by v.h.f. standards, but a good many amateurs still swear by them, and the transmitters, particularly, are in common amateur use. Until licensing regulations (type acceptance) were tightened in the aircraft bands recently, scores of SCR-522's were used as Unicom sets in small airports—and a few still survive in bootleg Unicom service. The SCR-522 consists of two units, the BC-624 transmitter and the BC-625 receiver. Both are 4-channel, crystal-controlled. Schematics can be found in *CQ*'s *Surplus Schematics Handbook*, p. 92. (See also *CQ's Surplus Conversion Handbook*, p. 50, and 73, June 1966 for conversion information.)

There was a tuneable version of the SCR-522 receiver, nomenclature BC-639. Its design is virtually identical to the BC-625 with the exception of the local oscillator section. This receiver still commands a high price—often $75 or more with its 60 cycle a.c. power unit RA-42. For its price, the BC-639 is no bargain. It cannot be said to be sensitive or stable, and its chief selling point

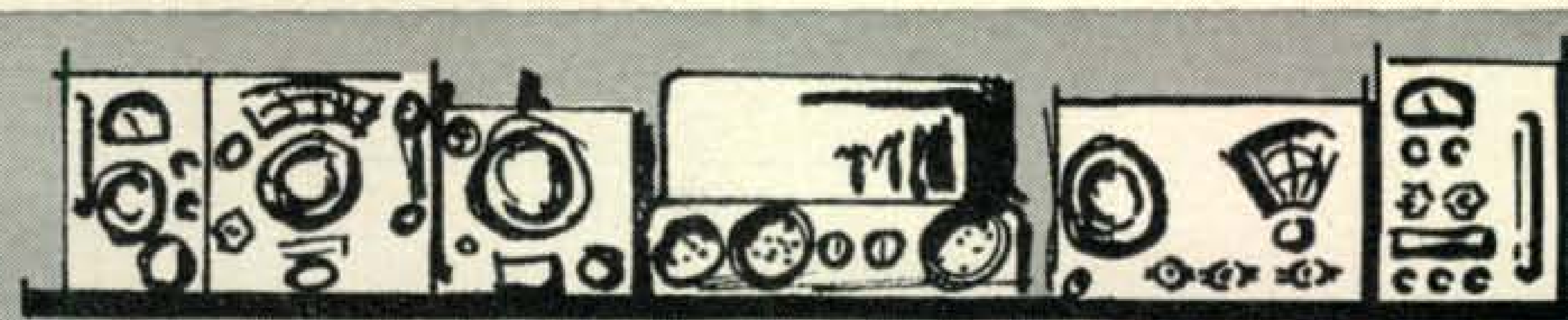


An oblique view of the R-445/ARN-30 tunable receiver.



The heart of the tunable v.h.f. command sets is the front end designed by Dr. Fred Drake in 1942.

SURPLUS CORNER



BIG CATALOG

World's "BEST BUYS" in GOV'T. SURPLUS Electronic Equipment

TRANSMITTERS—RECEIVERS:

BC-453 Receiver—190 to 550 KC.	Used:	**$16.95**
BC-455 Receiver—6 to 9 MC.—	Gov't. Reconditioned, w/Dyn:	**14.95**
BC-456 Modulator	Used:	**3.95**
BC-696 Trans.—3 to 4 MC.	Gov't. Reconditioned:	**12.95**
T-20 Trans.—4 to 5.3 MC.	New:	**9.95**
T-21 Trans.—5.3 to 7 MC.	New:	**9.95**
T-22 Trans.—7 to 9 MC.	New:	**18.95**
BC-348 Receiver—200 to 500 KC.—1.5 to 18 MC.	Used:	**69.50**

BIG NEW CATALOG—Just off press. Send 25¢ (coins or stamps) for your copy & receive 50¢ credit on your order. Address Dept. CQ.

FAIR RADIO SALES
P.O. Box 1105 • LIMA, OHIO • 45802

"SASCO ELECTRONICS"

Surplus Communications and Experimenters' gear
—Thousands of Bargains—test equipment—
March Specials: Facsimile Equipment

CV-172-A/UX fax converter—PP-86 TXC power supply. RD-92-A/UX recorder, also RTTY gear and many more goodies—

SEND FOR LIST

1009 King St., Alexandria, Virginia, 22314

WANTED!

ANY QUANTITY

TED U.H.F. XMTRS
URR-13 U.H.F. REC
R-484/APR-14 REC
APR-9, 13, 17, REC

ALSO

ID-18 and IP-68/CPN-2, R-15/APN-3 REC I.F. STRIPS, ID-17/APN-3, ALL TYPES OF RADAR, RADIO, TEST EQUIPMENT

TECHNICAL SYSTEMS CORPORATION
42 WEST 15th STREET, NEW YORK, N. Y. 10011

For further information, check number 14, on page 110

LIBERTY ELECTRONICS WANTS TO BUY FOR CASH

Electron tubes and semiconductors

Most any type or quantity
Receiving, transmitting, special purpose, magnetrons, klystrons
We will make you an immediate offer in cash.

Special sale

SP-600 Receiver	$295.00
4CX1000A—New	120.00

Surplus communication and test equipment

AN/GRC-3, 4, 5, 6, 7, 8, 10, 19, 26, 27, 46, VRC-12
AN/PRC-8, 9, 10, 25
Test equipment with ARM, SG, URM, UPM, USM, and TS prefixes
Communications: AN/TRC-1, 24, 35, 36
Receivers: AN/APR-9, 13, 14, R-388A, R-274, R-390A, R-391, R-392, etc.
Indicators: ID-250, 251, 387, 257A, etc.
Aircraft: AN/ARC-27, 34, 38, 44, 52, 55, 57, 73, 84
AN/ARN-14, 59, 67, 70
AN/APS-42, 81
AN/APN-3, AN/CPN-2A, AN/APN-84
Also: Tektronix, Hewlett Packard, Boonton, and General Radio equipment, etc.

Liberty Electronics, Inc.

548 Broadway, New York, New York 10012, Phone 212 - 925 - 6000

For further information, check number 15, on page 110

Transmitters	
T-11	116-132 mc
T-13	132-148 mc
Receivers	
R-10A	520-1500 kc
R-11A	190- 550 kc
R-13 (R-45/ARN-30)	108- 135 mc
R-15	108- 135 mc
R-19	118- 148 mc
R-20	75 mc fixed

Fig. 1—A table of components for the late model A.R.C. v.h.f. sets.

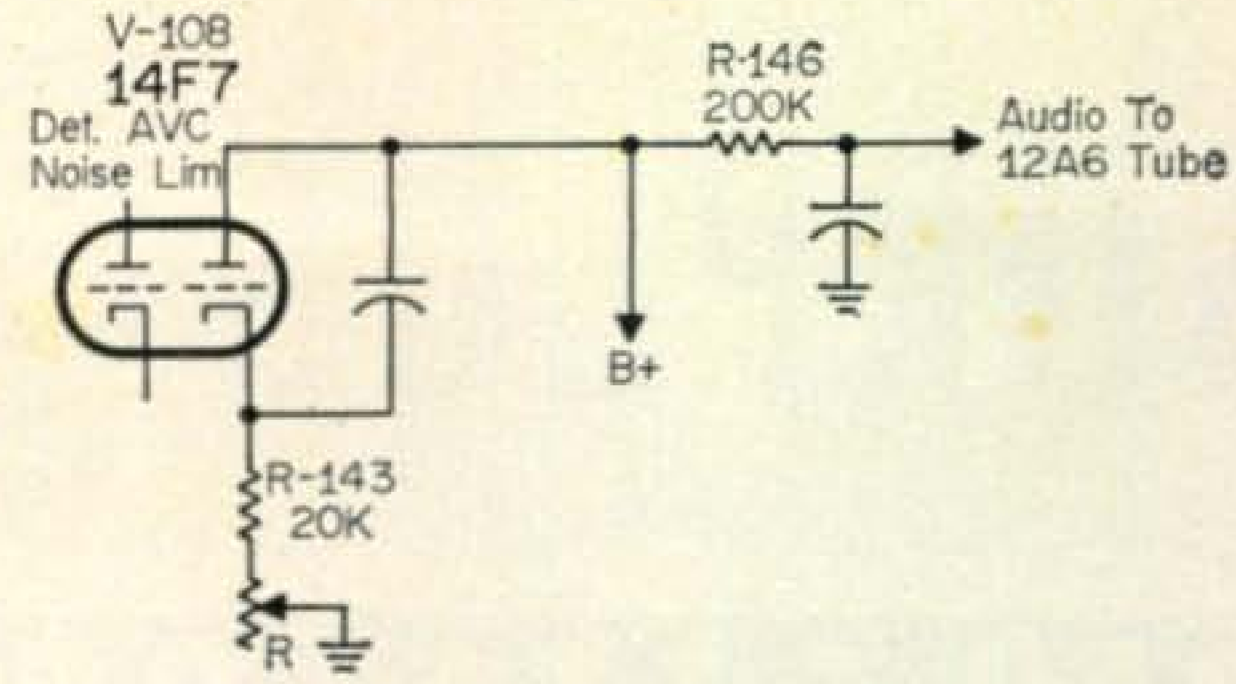


Fig. 3—Adding a squelch to v.h.f. command sets. R_{143} (or R_{43} as it is marked in some diagrams) is normally grounded. Lift the grounded end and insert *R*, a 25K pot, to control the attack level of the squelch.

is its full 56 mc coverage.

There have been other v.h.f. sets in surplus—the BC-733 aircraft localizer receiver, crystal-controlled and not readily converted to tuneable operation; numerous Collins and other commercial aircraft gear which is not adapted to ready conversion, and does not perform well if converted.

As most readers of *CQ* know by now, I have a bias in favor of the old "command set" design which was originated as the "Type K" by Aircraft Radio Corporation in the 1930's. To my mind, the best surplus bargain in v.h.f. today is the last of the "Type K" breed, a final development in the RAV, ARA, SCR-274-N, AN/ARC-5 line. This gem is the AN/ARN-30 aircraft "Omni" navigation/communication set, known also as A.R.C. Type 15, plus a sister set, A.R.C. type 12—AN/ARC-60 in military parlance.

The ARN-30 receiver (R-445) is a fine package of v.h.f. equipment, slipped into the old BC-453 receiver case. In many respects the ARN-30 resembles its fine forebears. Layout is much the same, though all components are of a vintage only about ten years back. Rated sensitivity was not poorer than 2 microvolts to give an output of 10 miliwatts into a 300 ohm load, but these were conservative figures: I have seen test results indicating better than one microvolt sensitivity for a properly aligned set, and that kind of figure can be rather easily obtained in a portion of the coverage, say the 2-meter band, by a routine touching up of the alignment at that point.

Selectivity in the much similar R-15 receiver (part of the A.R.C. type 12 set) was rated at 100 kc wide at 6 db down—not narrow, but quite adequate for most v.h.f. work. The other models are virtually identical.

To keep straight the various models of the late A.R.C. v.h.f. sets, see fig. 1, a table of components.

The heart of the tuneable v.h.f. command sets is a jewel of a front end designed by Dr. Fred Drake in 1942. I have told previously how the military missed the boat on this design, buying instead the hugely more expensive, less sensitive, Western Electric R-28/ARC-5. This "preselec-

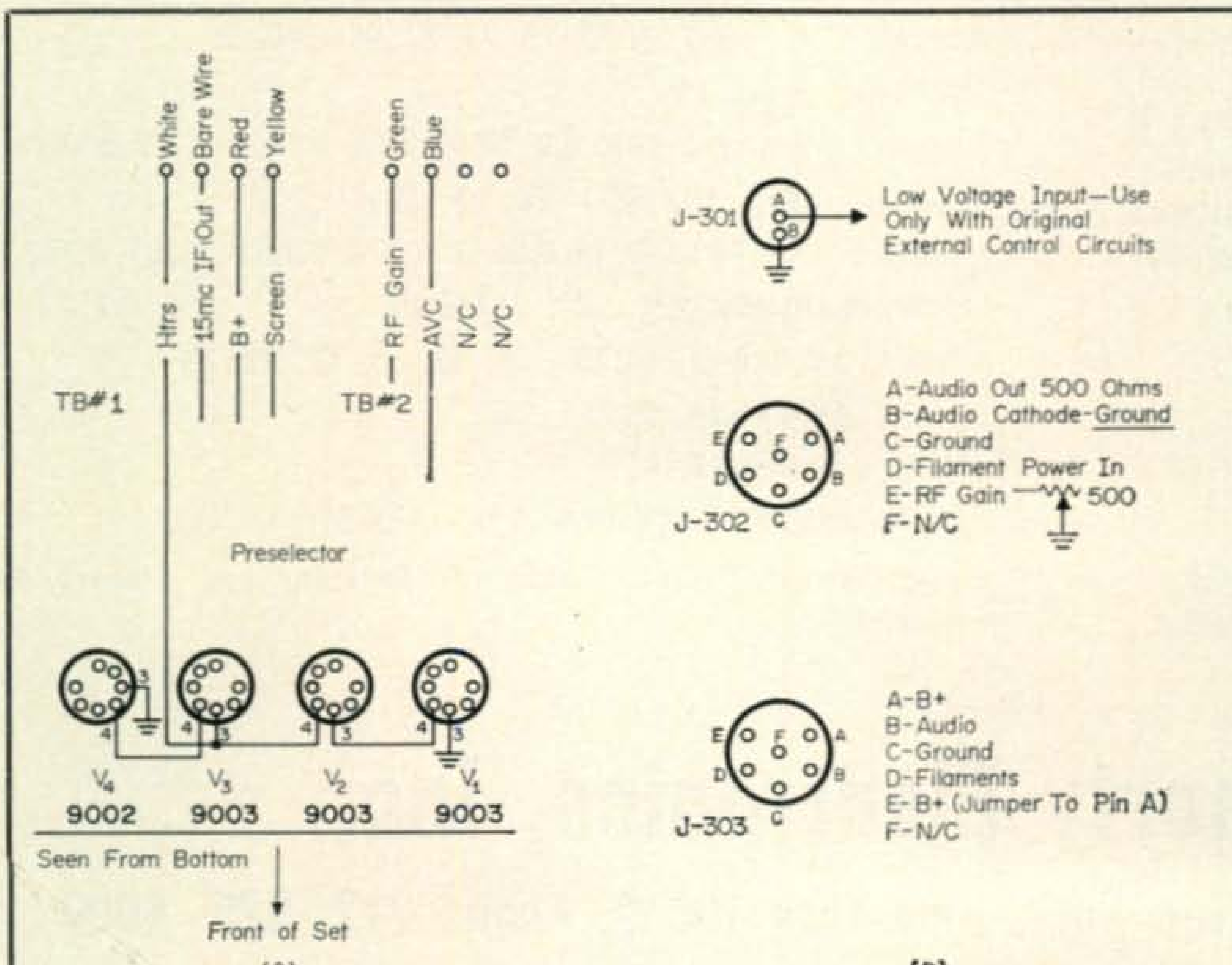


Fig. 2—(A) The conversion of the 28 volt filaments in the ARN-30, R-15, R-19, etc., to operate on 14 volts. (B) The power plug wiring for the R-15, R-191 and R-445 receivers. (C) Rear plug connections for the R-13 and R-445 receivers only.

tor" as Aircraft Radio Corp. called it, uses four seven-pin miniature tubes (9002 and 9003) in a very low-noise design for its day.

The rare R-112 and R-113/ARC-5 receivers covered 100-125 and 125-156 mc, but only a few hundred were built, and I know no other person who has them beside myself and some A.R.C. engineers. Jewels they are, a handcrafted prototype production run. The chief differences between them and the later versions are loctal tubes in the postwar sets, and the use of brass wire in the wartime units to broaden the 15 mc i.f. response as required by military specs.

The coils for the four different frequency bands in these sets (100-125, 108-135 mc, 125-156 mc, and 118-148 mc) were wound according to different design parameters, but to a great degree it is possible to adjust frequencies by squeezing or expanding the turns, or by simply trimming up the brass slugs in the bottom of the four coil cans under the preselector. (You have to remove the preselector to get at the slugs, so it is best to drill access holes in the chassis for the slugs.

There is one feature of the older Command Sets that is missing from the postwar vhf and i.f.-mf models, the plug-in i.f. cans. The i.f.'s are soldered in place, and it is necessary to move them at least a small amount to get at the screws that hold the preselector. You can loosen the holddown screws on the i.f. and shift them far enough to get at the front end section if you are careful about it.

Only the earliest postwar sets had dials—they were designed to be operated strictly from a remote control box in the aircraft cockpit, with the radio gear located in a distant rack. It is possible to scrounge a dial and its gears from a junker AN/ARC-5, SCR-274-N, etc. and by careful drilling, locate it on the front end chassis, where the tuning spline will match the larger gear. This is admittedly a ticklish proposition, but I have done it several times with good results. The gears require ¼ inch mounting holes in the preselector frame, but locating them involves careful measuring first.

The gray postwar sets came in three types of hookups, with differing front panel jacks. Fig. 2 shows the alternative connections for audio, B+, filaments, etc. Note that on the R-15, R-19, R-445/ARN-30 sets there must be a B+ jumper from pin A to pin E of the jack marked "C" when the power supply or dynamotor is mounted on the rear deck of the receiver.

A suitable rf gain control would be a O-50K pot. connected from pin E of jack "B" to ground. Audio gain should likewise be a potentiometer connected from pin B of the same jack to ground, or alternatively the pin could be hooked to ground and forgotten.

Audio output is 500 ohms, and as mentioned above, will drive a small speaker when properly matched to it.

Power required is 250-280 volts dc and 28 volts ac or dc for the tube heaters. If the original

For further information, check number 29, on page 110

For further information, check number 27, on page 110

dynamotor will not serve, any of the common power supplies described in many surplus handbooks will serve. I can supply a three-point connector for the rear deck jack at 25¢ plus a self addressed stamped envelope.

There was a noise limiter incorporated in all the postwar sets, but only a few had the squelch, which can be added easily with a miniature 25K pot wired as shown in fig. 3.

Most of these v.h.f. sets had 28 volt filament wiring; 14 volt changes are shown in fig. 2, for the preselector section.

Weather Pictures [*from page 30*]

the 2400 c.p.s. down to 20 c.p.s.[2] to synchronize the 4 c.p.s. saw-tooth oscillator which provides the horizontal sweep for the picture c.r.t. and a video monitorscope. A push-pull amplifier provides a balanced horizontal signal.

The 200-second vertical sweep is obtained from a Miller Integrator saw-tooth generator the output of which is applied to the vertical plates of the c.r.t. through a push-pull d.c. coupled amplifier.

The video information from V_2 modulates the Z-axis of a 5" c.r.t. Rectification of the signal is not employed here, in order to avoid the need for low-frequency coupling. While no signal is present, the beam intensity is adjusted to near cut-off. When the signal is applied, the positive half-cycles increase the beam intensity in proportion to the signal level.

The video level is monitored by a meter, while a second oscilloscope monitors the video modulation on the 2400 c.p.s. sub-carrier to make it easier to determine the position of the phasing line as needed at the start of a picture frame.

A camera, placed in front of the c.r.t., photographs the picture as it is scanned. A 200-second time exposure is used.

In operation, the tape playback is started just before the cycling information for the picture which consists of 3 seconds of 300 c.p.s. tone and 5 seconds of phasing pulses.

The phasing-control switch is closed to cut off the divider chain and thus permit the 4 c.p.s. horizontal-sweep oscillator to run freely. When the phasing line is properly positioned (at the start or end of the line signal as observed on the c.r.t. or the monitorscope), the phasing switch is opened and thus allows the 4 c.p.s. oscillator to be synchronized by the 20 c.p.s. divider in the proper phase relationship.

At the same time, the reset switch at the Miller Integrator is operated to start the 200-second vertical sweep at the beginning of a cycle. The camera shutter is then opened until 200 seconds elapse as indicated by the next 300 c.p.s. cycling tone for the following picture frame.

The c.r.t. from which the pictures are photographed has a curved face which accounts for the curvature and poorer focus along the sides of some of the photos.

An early difficulty was the appearance of a diffused white area near the center of the photographs as seen between Sicily and The Italian Boot at fig. 4. This was due to a red glow from the c.r.t. cathode which, although normally not observed and in spite of the fact that a dark-green filter was used during the photography to minimize it, was of sufficient intensity to be impressed on the film during the long exposure.

A technique used to correct this situation is that of covering the c.r.t. screen with dark paper, except over the general area in which the slow-scan trace is travelling. This requires moving the paper by hand as the scanning is followed which, to quote I1PDN, "Is sort of a strip-tease applied to the cathode-ray tube!"

The equipment is being modified with another horizontal oscillator that will allow reproduction of DRIR (Direct Readout InfraRed) pictures. Nimbus II has ceased such transmissions; however, Ettore and Ugo have tapes, recorded from earlier passes, which can be used for tests in perfecting their DRIR readout system.

I1PDN and I1DV are to be congratulated on their fine work. We hope to see more of it, as well as that from other amateurs. —*W2AEF*

[2]A 4 c.p.s. divider is not used, inasmuch as it was found that the 20 c.p.s. signal locks the 4 c.p.s. saw-tooth oscillator satisfactorily.

For further information, check number 31, on page 110

Hurricane Review *[from page 58]*

Operation may be from 115 or 230 v.a.c. 60 c.p.s. The unit is supplied wired with a power cable and plug for 115-volt service, but it also is furnished with a separate 230-volt plug that can be installed on the cable. The connections at the other end of the cable are then changed for 230-volt use at a screw-type terminal strip on the rear of the unit.

The lower-voltage circuits are connected between the power supply and the transceiver through a cable equipped with a Jones plug. The p.a. screen and plate voltages are routed through a separate high-voltage cable and plug.

A time-delay relay prevents application of power before the tubes have sufficiently heated up. A precautionary measure that ensures protecting the tubes against accidental damage is that the transmitter *must* be tuned up in the low-power position and the plate voltage *cannot* be applied, *unless* the switch is set for low power. Even if you have been operating with high power and in the meanwhile have turned off the plate-voltage switch, the high-power position is locked out and you cannot reapply the voltage until the power-level switch is first set to low power. A plate-overload relay also is included for added protection.

A 3″ × 5″ loudspeaker for the receiver is contained in the power-supply case.

Construction

The Hurricane is built on a very rugged chassis with sides extending both above and below the chassis deck. The p.a. is enclosed in a perforated cage at one corner of the chassis, with forced-air cooling for the tubes provided through air-system sockets by a built-in blower. During receive, a voltage-dropping resistor in the supply line for the blower motor allows the blower to run at a slow speed for very quiet operation. Whenever the transmitter is activated, the antenna relay shorts out the dropping resistor and permits the blower to run at full speed to provide adequate cooling while the p.a. tubes are in operation.

When the cover of the p.a. enclosure is removed, a safety interlock ensures removal of plate voltage by opening the primary circuit of the high-voltage power transformer.

The panel for the transceiver is supported both at the front apron of the chassis and by wide flanges at the top. The two units for the setup are matched with the traditional styling of the Hallicrafters series of high-quality gear.

The transceiver weighs 26 pounds and is 7¾″ × 16½″ × 15″ (H.W.D.). The power supply weighs 61 pounds and is 7¾″ × 10⅝″ × 15″.

The v.f.o. is gear driven by a tuning knob that revolves once for every 25 kc and which rotates the incrementally-calibrated dial once for every 100 kc. This dial is linearly calibrated in 1 kc steps. A second dial indicates each 50 kc point over a 500 kc range and is referred to for determining the number of kc that must be added to the incremental-dial reading for the frequency readout. Black numerals between 0 and 500 are used for the ham bands that start at a megacycle point, red numerals between 500 and 1000 are used for the bands starting at an odd .5 megacycle point. The dials are visible through windows recessed behind an escutcheon.

The meter also is behind a window in the escutcheon and a 3-position selector allows it to be switched to read p.a. screen current, a.a.l.c. voltage or receiver S-units/r.f. power output. The two functions at the latter position switch automatically when the changeover is made between receive and transmit.

A handy arrangement is that the bias can be adjusted with a screw driver from the front of the panel, eliminating the inconvenience of reaching around to the rear of the unit while still viewing the panel meter when you're setting the bias, as is usually the case.

The phone jack and mic connector (screw-on type with p.t.t. circuit) are on the panel, while the key jack is on the rear of the unit. Also at the rear is an accessory connector for use with the HA-20 DX Adapter. This unit contains a v.f.o. that provides separate transmitter-frequency control to allow reception outside the American ham bands, while transmissions can be made within the band. A bridge for continuously monitoring the s.w.r. also is included in the accessory.

Performance

The Hurricane must actually be operated to be appreciated. The overall a.f. response is such that the audio quality is extremely pleasant sounding and although the a.g.c. release time appears to be a little faster than usual for s.s.b., operation is quite smooth and you don't get the feeling of signal pumping. The unwanted-sideband suppression is considerably higher than usually found as may be noted from the measurements shown later. The calibration and stability are all that could be desired.

Anyone who has observed the operation of a noise blanker can tell you how effective it can be in suppressing impulse-type noise without distorting the signal. The job in the SR-2000 is equal to the task, although it appears to be more effective on high-level pulses than on low-level ones; however, in the case of the latter, high suppression usually is not needed in the presence of otherwise useable signals. The blanker threshold setting is somewhat critical while being adjusted for optimum noise suppression in that if it is advanced too far, the blanker stage can be gated by off-frequency signals or overall background noise which then may be heard weakly as a spurious signal or cause a loss of desired-signal level. This occurs because the blanker system is installed ahead of the selective i.f. circuits and the associated pulse amplifiers are therefore susceptable to pickup of unwanted signals. The blanker in the Hurricane is not alone in this respect, however, inasmuch as we've run into similar situations with a number of other blankers.

Besides putting out a hefty signal, the trans-

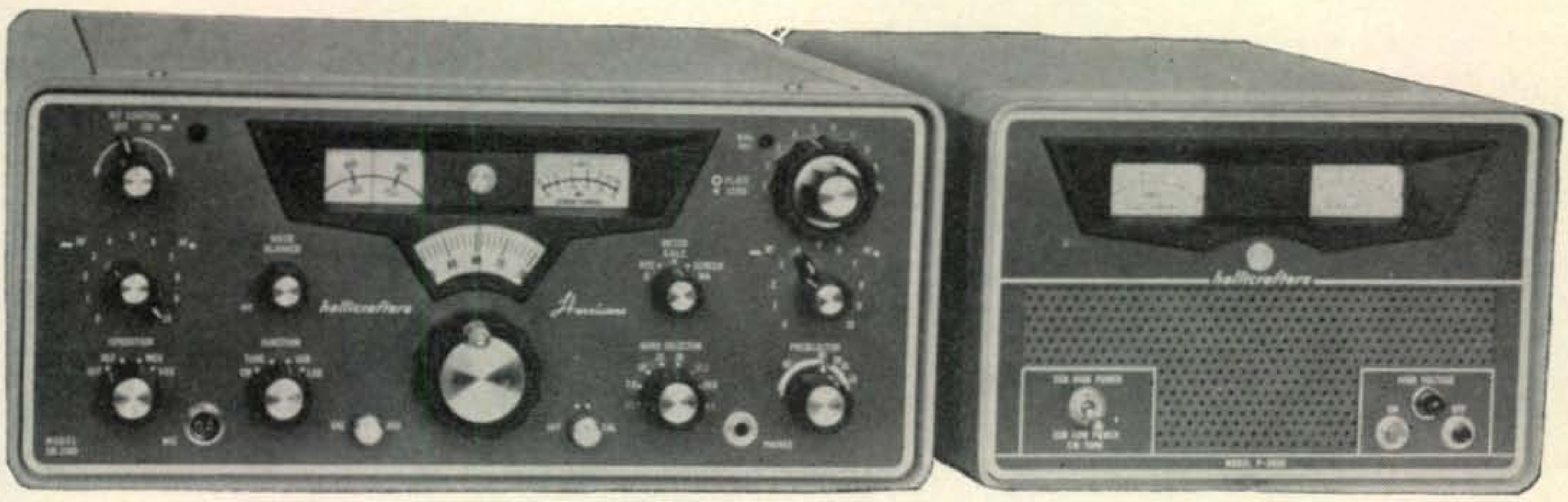
HAMBUERGER *presents:*

This month's best buy...

hallicrafters

SR-2000 HURRICANE $995.00

P-2000 POWER SUPPLY $395.00



SPECIAL FEATURES:

Patented Receiver Offset Control (RIT) permits ±2 ks adjustment of receiver frequency, independent of transmitter, for round-table, net or CW operation. Hallicrafters exclusive Amplified Automatic Level Control.

FREQUENCY COVERAGE:

Full coverage provided for 80, 40, 20, 15 and 10 meters. All crystals provided for 28.0 to 30.0 mcs.

GENERAL:

Dial cal., 1 kc. Linear gear drive with less than 1 kc readout. Adjustable IF noise blanker. Provision for plug-in external VFO/DX adapter. Built-in VOX plus break-in CW and PTT. Built-in CW sidetone. Hi-Low power switch useable in CW or SSB.* 2.1 kc crystal lattice filter. S-meter-RFO-AALC and final screen metering.* Two-speed blower, 100 kc crystal cal. VFO covers 500 kc.

TRANSMITTER SECTION:

Two 8122 output tubes. Variable Pi network. Power input, 2000 watts P.E.P. SSB; 1000 watts CW. Carrier and unwanted SB suppression, 50db; distortion products, 30db. Audio: 500-2600 cps @ 6 db.

RECEIVER SECTION:

Sensitivity less than 1 μv for 20 db S/N. Audio output, 2W.; overall gain, 1 μv for ½ W. output.

*Meters for final plate current and voltage built into P2000AC power supply. Also Hi-Lo power switch.

Liberal Trades — Call or Write for Quote.

HAMBUERGER

424 York Road • Jenkintown, Pa. 19046 • Phone: 215-887-7350

mitter produces an exceptionally clean s.s.b. signal thanks to good linearity and the high sideband suppression.

The a.a.l.c. works beautifully with no sign of flattopping on the r.f. envelope, no matter how high you crank up the mic again. The c.w. keying is clean, crisp and without clicks or chirp; however, when keyed using v.o.x., the first dot or part of a dash after a pause in the transmission often is missed or shortened, until the antenna relay pulls in. Although the v.o.x. delay can be made quite short, the chance of your being broken by another station usually will be limited to pauses (.1-.25 sec.) in the transmission when the relays trip back to receive after the v.o.x. delay, as generally is the case with v.o.x. type break-in. The sidetone monitor has a pleasant sound at about 1000 c.p.s. and the ability to alter its level provides comfortable listening. Should you desire a lower-pitched tone, it can be obtained by installing a .001 mf capacitor across the neon-bulb oscillator. The rig, by the way, is strictly an s.s.b./c.w. job, there are no provisions for a.m.

Tuning up the p.a. at first is a bit tricky when initially done on a given band, until you've gotten the hang of it. The precautionary measures against tube damage are an excellent feature that should pay off well. After a month of rigorous testing and on-the-air operation, no deteriorating effects were experienced.

Measurements

For those interested in statistics, the results of our lab measurements are as follows: Receiver sensitivity (rated at 1 μv for 20 db S/N): .4-.75 μv (depending on band) for 20 db S/N, .15-.25 μv for 10 db S/N. Variation in gain between bands (not rated): with 14 mc as the reference, -4.5 db at 3.7 mc, -0.5 db at 7.2 mc, $+5$ db at 21.2 mc and -5 db on 28.7 mc. Unwanted-sideband suppression (rated at 50 db for 500-2500 c.p.s.): 50 db at 500 c.p.s., over 60 db at 1-2.5 kc. Overall response (r.f. input to a.f. output): 300-2300 c.p.s. at 6 db points. A.g.c. figure of merit (rated at 10 db a.f. output change with 60 db r.f. input change): 16 db a.f. change with 20 db r.f. change (1-10 μv) and 5 db a.f. change with 60 db r.f. change (10-10,000 μv). In-band tweets (rated at less than 1 μv equivalent): 1μv at 14,135 kc, .5 μv or less at 3760, 28,125 and 28,560 kc. 6-6.5 mc 1st i.f. rejection (rated at better than 46 db at 4 and 7 mc, and 60 db at other frequencies): 56 db at 3.5 mc, 40 db at 4 mc, 46 db on 7 mc band, 66 db on 14 mc band, 60 db on 21 and 28 mc bands. 1650 kc i.f. rejection (not rated) over 90 db on all bands. Image and spurious rejection: at least 50 db as rated. S-meter: 50 μv for S-9 reading on 14 mc.

Frequency stability (rated at 250 c.p.s. drift in first hour after 15-minute warmup, less than 100 c.p.s. per hour thereafter): 300 c.p.s. after first 15 minutes from cold start at average room ambient, 250 c.p.s. next hour, 100 c.p.s. following hour and less than 50 c.p.s. per hour thereafter. With $\pm 10\%$ line-voltage variation (not rated): ± 18 c.p.s. Calibration accuracy (rated at less than ± 2 kc error across the dial after indexing at high-frequency end of dial): 500 c.p.s. at each 10 kc point, except top 50 kc: 1 kc. Indexed at nearest 100 kc point, within 250 c.p.s. except top 50 kc as above. The 1 kc dial increments are spaced about 1/8" apart.

The transmitter input on tuneup (d.c.) and on c.w. was 900 watts with 500 watts output as rated. S.s.b. p.e.p. (rated at 2000 watts input with 1000 watts out in high-power position, 1000 watts input with 500 watts out at low power): output 15% higher than rated on both high and low power with voice modulation. The signal-to-distortion ratio was at least equal to the rating of 30 db on both high and low power. Unwanted-sideband suppression was the same as on receive and in this respect the Hurricane is one of the very few s.s.b. rigs we've seen to produce an r.f. envelope pattern with no discernable ripple. Carrier suppression was at least equivalent to the rating of 60 db.

The Hallicrafters SR-2000 Hurricane Transceiver is quite a package which, with the addition of a mic, key and antenna, provides a complete station for operation with the maximum power limit. It is priced at $995, less power supply. The latter, Model P-2000, is $395. The manufacturer is Hallicrafters, Inc., 5th and Kostner Aves., Chicago, Ill. 60624. —*W2AEF*

DX [*from page 73*]

5U7 Niger Republic: 5U7AL has been reported on 14223 kc at 1830 GMT. *(Tnx West Gulf Bulletin).*

9M2 West Malaysia: 9M2DQ has been putting good s.s.b. signals into the states via the longpath in the morning hours. He is partial to 14195-14198 kc and tuning around 14205.

9M8 East Malaysia: 9M8RS is reported active on c.w. during the morning hours via the longpath. *(Tnx West Gulf Bulletin).*

QTH's and QSL Managers

WB2VJD/CE0A	via K5GOT.
FO8BL	to P.O. Box 45, Papeete.
KH6EDY	to U.S. Naval Station, Box 36, FPO San Francisco, Calif., 96640.
MP4BEU	P.O. Box 138, Bahrein Island, Persian Gulf.
SV0WL	to Lt. W. L. Corbin, 693rd. Security Group, APO, New York, N.Y., 09291.
TF2WKE	via WA2FJW.
VK2BRJ/VK9	c/o Ack, W4ECI.
VK0CR	to Gregg Johnson, 31 Inglis St., Hobart, Tasmania, Australia.
VP1VR	via W4VPD.
VP2MK	via W8EWS.
VP2VD	cards for Oct. 20-24, 1965 to K4IIF, later cards to G3SBP.
VR2GSM	via W9YSM.
YK1AM	P.O. Box 35, Damascus, Syria.
ZA1RB	via I1RB.
4U1SU	via HB9SI.
5U7AL	c/o American Embassy, Naimey, Niger Republic.

OM's and YL's applying for WAZ and the higher endorsements of WPX are invited to submit photographs of selves and gear for use in the DX column. Let's see some smiling faces and shining receivers.

73, John, K4IIF

Signals From Space [*from page 62*]

by sending the receiver output down a coaxial cable (as a d.c. voltage), bucking out about three-quarters of this by a battery, and displaying the remaining voltage on a microameter. But this still necessitated **continuous** aural monitoring so as to delete any man-made noise, and the writing of meter readings *every minute* onto his charts.

Although good charts resulted from this night observation, still no real findings occurred after two months of minute-writing, if we may coin a word. Just as things began to look hopeless, the Milky Way began crossing the meridian of the antenna in the early morning in March, 1939, and positive results were obtained at last. Even these readings were not absolute, due to the normal heating of the equipment as the sun would rise each morning. But by April the plane of the Milky Way was crossing the plane of the antenna during hours of darkness and conclusive evidence of "noise" was obtained every night. It was now quite evident that the Milky Way emitted *something*, and that something was of substantial intensity.

Later that summer other celestial objects were examined by the parabolic reflector at 162 mc, but none produced conclusive results as had the Milky Way earlier in the spring.

Attempts were then made by Reber to find the sun with his dish, but, due to thermal heating of the equipment, discernable findings were impossible.

Space Signals "Pinned The Needle"

In early 1940 W9GFZ embarked on an awesome course—to plot a radio survey of the sky. To aid him in this task he purchased a General

supplies with automatic voltage regulation were constructed to replace the old d.c. system. Throughout this venture he feverishly worked to improve the system.

He increased the receiver bandwidth and improved the overall gain stability. By 1943 he was able to take reliable measurements during the day.

The antenna was aimed at the sun and immediately it held the pen recorder against the pin. It stayed there for a solid half hour.

The Return To UHF

Now that the 160 mc system had performed satisfactorily, Reber resolved to once again attempt u.h.f. listening. It was evident to him now that cosmic noise strength decreased with frequency, so his new findings should be at least as good as the 160 mc tests. He decided on 480 mc.

A four-stage amplifier utilizing RCA A5588A tubes was constructed and a new antenna feed fashioned for this frequency range. Results: Neither the Milky Way nor the sun could be detected. Worse yet, the A5588A's had a life span of only 50 hours, and had to be replaced at a cost of $30 each.

Through a friend, Grote Reber secured some GE 446B lighthouse tubes, and with these designed a new six-stage amplifier. The results with this setup were immediate and successful.

The Fame That Never Came

Although he truly fathered the science of radio astronomy, Grote Reber has succeeded in evading all significant publicity the mass media affords. With the exception of scientific records and a few published works which record his findings for others interested in little-known amateur history, the achievements of this great ham go rgely unheralded. He continued his experi-ents as a loner until 1947, when others joined m in the science he created. The sky noise

WHAT'S FREE IN NEW YORK?

The Annual Single Side-Band Show, all day Tuesday of IEEE convention week . .

THAT'S WHAT!

IT'S THE SHOW YOU WON'T WANT TO MISS!

Here's your big opportunity to see the newest Ham gear from the leading manufacturers, and to talk directly with the factory people. All at the 1967 Single Side-Band Show, Tuesday, March 21st, from 11 AM to 9 PM.

Everyone is invited! All Hams, would-be Hams, CB-Hams, and their friends! Come to the Penn Top Room of the Statler-Hilton Hotel, 7th Avenue and 33rd Street, New York City (opposite Pennsylvania Station).

FREE!

VALUABLE PRIZES

Prizes to be awarded every hour on the hour. (Be sure to bring your Ham License or QSL).

FREE!

TECHNICAL SESSIONS

Informative discussions by the experts from leading equipment manufacturers.

FREE!

TWICE THE PRIZES
TWICE THE ROOM
TWICE THE EXHIBITS

GRAND PRIZES!

hallicrafters **SR-2000** "Hurricane" $1,390.00 TRANSCEIVER

—

NEW **SWAN** "500" TRANSCEIVER

—

PLUS MANY MANY MORE **ALL FREE!**

Coordinated, in the interest of Amateur Radio, by "HAM HEADQUARTERS, USA"®

HARRISON

225 Greenwich Street, New York, N.Y. 10007
(212) BARCLAY 7-7922
[139-20 Hillside Avenue, Jamaica, New York]

OPENING SOON! Our new, larger store, at 8 BARCLAY STREET (opposite Woolworth Building)

maps resulting from his years of painstaking chart-compiling served as the bible for other scientists embarking on space exploration by radio. But you're not likely to find Reber taking credit for it.

What is he doing today? Right now W9GFZ is quietly observing signals from space at the other end of the spectrum—only a few megacycles—from his Tasmania, Australia listening post. And from what we've been able to determine, several community residents swear those huge antennas have something to do with the dry spell! ■

Product Detector *[from page 68]*

grommet fitted in the top. This shield connects in the same manner as did the original tube shield. Figure 2 shows the correct cabling arrangement.

After the cable is made, the first i.f. tube, V_{107} in the R-388 (or V_9 in the SP-600) is removed and the adapter plugged in its plate. It is a good idea to recheck and peak the receiver i.f. and b.f.o.

Crystal B.F.O.

Another worthwhile modification of these receivers would be addition of a crystal controlled b.f.o. However, in the SP-600 the b.f.o. frequency adjust control is calibrated and after a check on its accuracy is made, the b.f.o. is simply set either side of zero to change sidebands. On the R-388 where the dial is calibrated in kilocycles, the b.f.o. control may be set either side of zero by using the crystal calibrator. In the case of my 3.1 kc filter, I adjusted the b.f.o. to 1.5 kc either side of zero and made a mark on the front panel at these points so instead of throwing a switch to change sidebands, I merely swing the b.f.o. frequency control to the proper mark.

A final word about these modification; any one of them will improve a receiver's performance and all of them will put your SP-600, R-388, or what have you in the same class with today's s.s.b. gear. RTTY performance is also very greatly improved. ■

Scratchi *[from page 11]*

Hon. Ed., I thinking maybe I just launching into orbit 120 feets of steel pipe with solar-powered 5-watt rig and beem antenna on top of it. Are you heering about any new saddlelites in orbit? Are it being against the law to putting saddlelites in orbit? Or, is maybe somebuddy giving prize for biggest saddlelite in orbit?

Should I try to keying rig to seeing if still working? Hon. Ed., as you can see, I reeling needing help, so riting me reel quick-like and telling me what to do.

Oh, one other thing. What can I do with all the oil that keeps pouring out of ground neer tower. Are having about 2 acre lake of it rite now.

Respectively yours,
Hashafisti Scratchi

IMRA News *[from page 27]*

21.400-21.450 mc. He is on the air almost daily from 1930 until 2030 GMT.

Paul looks to IMRA to help set up a local radio network between mission schools as well as to tie in with International communications. Again the situation of a weekly mail service, and the absence of any telephone service, makes Amateur Radio a must. Paul hopes soon to equip some 10 stations with very simple and inexpensive battery powered, and fixed frequency transceivers. He looks to IMRA for advice in this project.

IMRA intends to help outstanding Amateurs all over the world. IMRA hopes to provide them with an International Communications service and equipment. Through these two projects and through our own person to person contacts on the air, we hope to exploit the real potential of amateur radio and to foster, as best we can, international good will.

If you want to hear any more of IMRA, we have to hear from you. Please write the Editors of CQ or contact:

Grail Radio Club, Grailville, Loveland, Ohio 45140

Radio Club, St. Anthony Friray, Hudson, New Hampshire 03051

Radio Club, St. Anthony Friary, Hudson, New New York 10524

Mr. Murrill Burton, 1008 Mendenhall St., Thomasville, N.C. 27360

Rev. Daniel Linehan, S.J., Weston Observatory, Weston, Mass. 02193

Rev. Leonard Bose, 106 North Rangstorff Ave., Mountain View, Calif. 94041

Rev. Peter Bechman, O.S.B., St. Benedict Abbey, Atchison, Kan. 660002

Mt. St. Paul Amateur Radio Club, 500 Prospect Ave., Waukesha, Wisc. 53186

Rev. David Reddy, O.F.M., 601 McKinley Parkway, Buffalo, New York 14220

Maryknoll College Radio Club, Glen Ellyn, Illinois 60137

V. Mayree Tallman, 428 South West 28th Road, Miami, Florida 33129

Mr. Roy Alciatore, 5700 Canal Blvd., New Orleans, La. ■

Future of Coax *[from page 35]*

types are under development, including one with a Teflon® dielectric for improved high-temperature operation.

Conclusions

The point of this article is not to send every v.h.f. oriented amateur speeding to his nearest distributor for a miracle wire; the development of the plated cable hasn't reached this point. However, we wish to point out that the old standbys do not represent the ultimate technology in coaxial cables. We labor under the same state-of-the-art conditions as commercial interests and their demands for a better product will undoubtedly result in improvements of this type for amateurs, too. ■

For further information, check number 18, on page 110

For further information, check number 19, on page 110

Ham Shop

ADVERTISING RATES: Commercial and organization ads, **35¢** per word. Non-commercial ads for other than subscribers **10¢** per word, including abbreviations and addresses. **Minimum Charge $1.00.** No ad will be printed unless accompanied by full remittance. Current CQ subscribers must send mailing label from CQ wrapper in lieu of cash payment.

Closing Date: The **5th** 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. We reserve the right to reject advertising which we feel is objectionable.

Direct all correspondence and copy to: **CQ HAM SHOP, 14 Vanderventer Avenue, Port Washington, L.I.N.Y. 11050.**

FOR SALE CHEAP: Eico 753 transceiver with 751 AC supply. Complete and ready to go, excellent condition not a scratch. Jim Coulter K8HKQ, 191 Union, Hillsdale, Michigan 49242.

900 GENERAL ELECTRIC Communications two-way radio service manuals—progress & preprogress line—single or lot bids. Low & high band. Curley's Electronics, 408 Forest Ave., WB, Staten Island, N.Y. 10301.

QSL's by RUTGERS VARI-TYPING SERVICE, Thomas Street, Milford, N.J. 08848. Free Samples.

YOU NEED IT, we got it! Unheard of bargains in Coaxial Cable, Switching Equipment, Meters, Relays, Connectors, Capacitors, Transformers, etc. Phone or visit! Open Monday-Saturday till 5 P.M. Windsor Distributors, 46 Fulton Street, Brooklyn, New York 11201, Phone 212 MA4-7038.

"HOSS-Trader," Ed Moory: Offers on a 'Cash no trade Deal'. Demonstrator floor models, factory warranty. NCX-5, $459.95; NCL-2000, $549.00; NC-200, $298.00; Swan-350, $349.95; Swan Mark-1 Linear, $389.00; Galaxy 5, $345.00; SB-34, $339.00; Drake R-4A, $329.95; T4-X, $339.00; 2-Receiver, $179.95; New Ham-M Rotor and Demo TA-33, $184.95; Demo Classic 33, $104.95; Demo Ham-M Rotor, $89.95; "Special" ROHN 50 ft. fold over steel tower $188.00 Prepaid: Reconditioned Gear; 2-B, $179.95; SX-101-A, $149.00; KWM-2, $599.00; 32S-3, $499.00; 62S-1, $489.00; TR-4, $399.50; TR-3, $349.00; SB-33, $179.00; DX-100, $54.00; Heath Mohawk RX-1, $139.95; Swan 240, $169.00. "Ed Moory Wholesale Radio", Box 506, DeWitt, Arkansas. Phone 946-2820.

FREE CATALOG: Electronic parts, tubes, wholesale. Thousands of items. Unbeatable prices. Arcturus Electronics Corp., 502 22nd Street, Union City, New Jersey 07087.

GREAT BUYS: Catalog 10¢. Electronic, Electro-Mechanical Bargains, VHF-TX assembly $13.95. Fertik's 5249 "D," Philadelphia, Pa. 19120.

TECHNICAL Manuals Electronics Signal Corp. etc. 16 page catalog 25¢. Quaker Electronics, Hunlock Creek, Pa. 18621.

LOW-COST loans by mail. $6.00 monthly repays $104.50; $56.00 monthly repays $1,321.39. Borrow any amount. Guaranteed fast, confidential. Write today! Bankers Investment 72-A, Box 1648, Hutchinson, Kansas 67501.

1,000 Embossed business cards $3.99. Free samples. Wagner Company, 6200F Whitewood, Library, Penna. 15129.

SUPER Snooper, printed circuit kit, uses Audio Telescope, Microphone Modulator, $5.95. Dealers wanted. Lectronix, Box 42, Madison Heights, Mich. 48071.

POLICE-fire-aircraft-marine-amateur calls on your broadcast radio with TUNAVERTER! Tune the band! Economical! Guaranteed! Free catalog! Salch Company, Woodsboro, 3C, Texas 78393.

RADARS Wanted: Radar equipment of all kinds bought. Write: M. Cemprola, 550 Fifth Avenue, New York, New York 10036.

STAINLESS STEEL Hardware. Small quantities. Send S.A.S.E for list. Arlington Stainless, Section A, Box 2641, Baltimore, Maryland 21215.

FOR SALE: Volumes one, two, three, four Frederick Research Corp. Test Equipment (Military) Data Handbooks . . . 1961 Publication . . . Four New Bound Books . . . $5.50 postpaid, payment with order. RITCO, Box 156, Annadale, Virginia.

WANTED: Military, Commercial, SURPLUS, Airborne, Ground, Transmitters, Receivers, testsets, accessories. Especially Collins. We pay cash and freight. RITCO, Box 156, Annadale, Virginia, (703-560-5480 COLLECT).

RECEIVING & Industrial tubes, transistors, all brands—Biggest discounts, technicians, hobbyists, experimenters—Request Free giant catalog and save! ZALYTRON, 469-Q, Jericho Turnpike, Mineola, N.Y. 11501.

E-Z WAY Antenna Towers, brand new, all sizes. Write for free brochure and prices. SLEP Electronics Company, Drawer 178CP, Ellenton, Florida 33532.

RTTY gear for sale. Write for list issued monthly. 88 or 44 Mhy toroids, five for $1.75, postpaid. Elliott Buchanan and Associates, Inc., Oakland, Calif. 94610.

NEW SCIENTIFIC INSTRUMENT detects buried gold, silver, coins, treasures, war relics. $19.95 up. Free catalog. Relco-B22, Box 10563, Houston, Texas 77018.

AC-POWER Supply-Elmac PS-2V—$15.00, Shure 55C mike & Fl. stand, $20.00, Prop. pitch rotator, $25.00, All band Ham & BC radio $20.00. F. A. Lento W1BIW, 62 Far Horizons Drive, Easton, Conn. 06612.

SAVE on all new or used Ham gear. Call or write BOB GRIMES, 89 Aspen Road, Swampscott, Mass. 617-598-9700.

GOVERNMENI surplus picture catalog 25¢. Meshna, Nahant, Mass. 01908.

4-used 200 foot F.M. TV towers. Dismantled and ready for shipment. Blaw-Know model N16. Plans available. FAA hazard painted. Will sell one or more. For additional information contact Owen J. McGarrahan Co., 16 Pelham St., Cambridge, Mass. 02142. Phone area code 617-547-3250.

ZIP CODE directory. Over 35,000 codes for P.O. in 50 states. $1.00 postpaid. Five for $4.00. ZIPCO, 7603 Kipling Pky. S.E., Washington, D.C. 20028

EXPERIMENTORS. Send $1.00 for complete set of 14 plans BC, SW, VHF radios. Maximum 2 tubes. REKTRONICS, Box 506, St. Johns, Newfoundland, Canada.

NOVICE Crystals, all band, $1.30 each. Free list. Nat Stinnette, Umatilla, Fla. 32784.

QSL's BROWNIE WCCJI . . . 3111 Lehigh, Allentown, Pa. Samples 10¢, with catalogue 25¢.

HUNDRED QSL's $1.00. Samples, dime. Holland, R3, Box 649, Duluth, Minnesota 55803.

PLASTIC Holders each display 20 QSL cards. 3 for $1.00 or 10 for $3.00 prepaid and guaranteed. Free brochure of other Ham Goodies included. TEPABCO, Box 198Q, Gallatin, Tennessee 37066.

SELLING out large collection of AM, and FM gear. Going SSB. Send stamped envelope for list. Warren Waterman, W2JRX, Middletown, New York 10940.

AUCTIONFEST—Broward ARC—New location this year. Caminade High School, 500 North 51st Avenue, Hollywood, Florida. Wainwright, W4IEH, Chairman.

WANTED: Johnson Viking Desk Kilowatt Amplifier. Joseph Johnson, K9YNG, 300 North Walnut, Clinton, Illinois 61787, phone area code 217-935-5507.

COLLECTORS—CQ Magazine 12 years 1949-1960. Operators—Two handi-talkies AN/CRC-7 cover 144-147 mc. Robert E. Foltz, W9GBT, 1407 Mineral Springs Rd., Sterling, Illinois 61081.

BARGAIN! HIGH RELIABILITY, Oil filled capacitors; $3.00 each. Value; 1 mf/400 v.d.c.; 2 X .5 mf/400 v.d.c.; 10 for $3.90, 20 for $7.00; Shipping Wts 3 lbs & 6 lbs.; Midwest Electronics, 7104a Plateau St., St. Louis, Missouri 63117.

THREE Line Rubber Stamp $1.00, four lines $1.25, knob handle, postpaid. Chief's Stamp Shop, Maynard, Arkansas 72444.

FOR SALE: BC221AA metal case built in pwr. spuply original Cal. Book and xtal mint cond. $65.00. H. Fulmer, W9CHF, 8252 South 100 Street, Franklin, Wisc. 53132.

VHF-2 Meter M.S. and c.w. DX skeds wanted by WB2FXB. For June VHF contest skeds with W2UFT E.N.Y. on 6-432 contact Rob Escallon, WB2FXB, 5 Dunlap Way, North White Plains, N.Y. 10603.

ANTIQUE Radiola Superhet (2nd. HAR); Thorola Model 55 (Isodyne with donut coils) $20.00 each or trade either for A-K model 10 or 12. F. W. Chapman, W8TKR, 1367 Villa Rd., Birmingham, Michigan 48008.

PERFECT professionally wired SB-300, $225.00. J. Beistle, K5VYY, 3728 Wilkie Way, Fort Worth, Texas 76133.

FOR SALE: Going out of Hamdom. Lots of goodies. Please send SASE for list. Over 20 years accumulation of parts and supplies. F. W. Bearinger, W3CEV, 436 Pine St., Denver, Pa. 17517.

WANTED—Slow Scan TV Equipment for Satellite Reception to use with National HRO-500. Richard J. Konkel, 919 Raton Ct., Manitowoc, Wisc. 54220.

SELL or TRADE: Mobile supplies, scope, TV gear, many tubes, some antiques, many parts. Want Ham Mags., gas generator, trade lists. E. Lindberg, W2CIL, 113 Maple Dr., Bowmansville, N.Y. 14026.

AUDIO Analyzer Heathkit IM22 assembled Mint Cond. $50.00. Scope EICO 5" good cond. $40.00. D. W. Drury, W8FGS, 16621 Mark Twain, Detroit, Mich. 48235.

INTERESTED in some FAX Gear. Drop card with info and price. Harold S. Roth, WØLFH, Box 98, Vail, Iowa 51465.

RIDERS MANUALS for sale or trade, Vol. 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15. Virgil G. Faught, W5OEO, Swain Star Route, Clarksville, Arkansas 72830.

FILAMENT TRANSFORMERS: two 6.3 volt @ 10 amp $2. each, two 2.5 volt @ 5 amp $2. each, one 5 volt @ 5 amp $2., one 2.5 volt @ 10 amp $2., one plate transformer 1000 volt—375 ma. $10. FOB Wheaton. R. E. Edson, W9EHK, 827 James Ct., Wheaton, Illinois 60187.

WANTED: Prop pitch motor, reasonable. State cond. and price. Austin C. Lewis, K4GGC, Box 100, Humboldt, Tenn. 38343.

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 sheet of plain paper, attach your mailing label from your latest issue of CQ, and mail in an envelope to:

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.

May CQ is the next issue you can make. Deadline is March 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.

Because you've got to SEE it to BELIEVE it... we will send you a FREE sample!

instant lettering®

DATAMARK

— the easy new way to label your projects!

Just rub over the pre-printed words or symbols with a ballpoint pen and they transfer to any surface — looks like finest printing! Label control panels, meter dials, letter on anything!

LOOK FOR *instant lettering*® **DATAMARK** SETS . . . only $1.25 each

— at leading electronic distributors

DATAMARK SETS AVAILABLE FOR:

- Amateur Radio. CB
- Audio, Hi-Fi, TV
- Experimenter Home Intercom
- Industrial Test Equipment
- Switch & Dial Markings
- Alphabets & Numerals in 1/8", 1/4" and 1/2" — each set has black, white, and gold

SEND FOR FREE SAMPLE

THE DATAK CORPORATION

85 HIGHLAND AVENUE • PASSAIC, N. J. 07055

For further information, check number 20, on page 110

→ SUB CARRIER DETECTOR ←

Add programs of commercial-free music thru your FM tuner. Detector, self-powered, plugs into multiplex output of tuner or easily wired into discriminator and permits reception of famous background music programs now transmitted as hidden programs on the FM broadcast band from coast to coast. Use with ANY FM tuner.

WIRED UNIT $75.00

KIT, with pretuned coils, no alignment necessary $49.50

Covers extra $4.95 each. Current list of FM Broadcast Stations with SCA authorization $1.00

MUSIC ASSOCIATED

65 Glenwood Road • Upper Montclair, New Jersey
phone 744-3387 area code 201

For further information, check number 21, on page 110

EASY TO LEARN CODE

It is easy and pleasant to learn or increase speed the modern way—with an **Instructograph Code Teacher.** Excellent for the beginner or advanced student. A quick, practical and dependable method. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready, no QRM, beats having someone send to you.

ENDORSED BY THOUSANDS!

The Instructograph Code Teacher literally takes the place of an operator-instructor and enables anyone to learn and master code without further assistance. Thousands of successful operators have "acquired the code" with the **Instructograph System.** Write today for full particulars and convenient rental plans.

INSTRUCTOGRAPH COMPANY

5071-C NO. BROADWAY, CHICAGO, ILL. 60640
4700-C Crenshaw Blvd., Los Angeles, Calif. 90043

For further information, check number 22, on page 110

WANTED: Collins 312B4 32S3—etc. also want HA 1-TO Keyer. F. E. Coble WA4LXX, 251 Collier Avenue, Nashville, Tenn. 37211.

FOR SALE: KWM2 $725.00, 516F2 with spkr $80.00, Mobile Mount $30.00, 30L1 $350.00. C. F. Johnson W5IE, 501 W. Sears Street, Denison, Texas 75020.

QSL's . . . 30 samples 10¢ . . . Filmcrafters-x . . . Martins Ferry, Ohio.

ZIP CODE directory $1.25. Lutchkus, P.O.B. 213, Carlisle, Pa. 17013.

QUADS: Proven sensational! All metal (except spacing insulator dowels); full size; two element; absolutely complete with boom, all hardware, wire and fittings; terrific gain and directivity; no bamboo or fibreglass; uses single 52 ohm coaxial feedline. 10-15-20 quad, $35; 15-20 quad, $32; 10-15 quad, $30; 20 meter quad, $25; 15 meter quad, $24; 10 meter quad, $23. Remit with order, shipped charges collect same day. Gotham, 1807 Purdy Ave., Miami Beach, Fla. 33139.

VACUUM Variable capacitors, Jennings UCS, 10-300MMFD, 7.5KV, complete with gear drive train, mounting bracket, brand new, $27.50 postpaid-insured. Supply limited, satisfaction guaranteed. Bill Slep Company, Drawer 178CQ, Ellenton, Florida 33532, Phone (813) 722-1843.

HOBBYISTS, EXPERIMENTERS, AMATEUR SCIENTISTS, STUDENTS. . . . Construction plans-all complete including drawings, schematics, parts lists, prices, parts sources . . . LASER-build your own coherent light optical laser. Operates in the pulsed mode, in the visible light range—$6.00 . . . DIODE LASER-Invisible light (infrared) can be continuously modulated—$3.00 . . . REVERBERATOR (Echo) Unit-build your own. Use with your automobile radio, home radio or hi-fi, electric guitar, etc. $3.00 . . . RADAR-build your own ultrasonic doppler radar. Detect motion of people, automobiles, even falling rain drops. Transistorized, uses standard small 9-volt battery—$4.00 . . . LONG RANGE "Sound Telescope"—this amazing device can enable you to hear conversations, birds and animals, other sounds hundreds of feet away. Very directional. Transistorized. Uses 9 V. battery—$3.00, or send 25¢ coin or stamps for complete catalog . . . TECHNICAL WRITERS GROUP, Box 5501, State College Station,, Raleigh, N.C. 27607.

CB'ers—AMATEURS! Your name & call on door-floor mat for home—shack, 17"x30" durable rubber, black, brown, green, or red. 2 1/4" white letters (limit 13) $7.95 ppd. Auto Mat (limit 8 letters each side) $12.95 ppd. Protect your license—pictures with plastic laminating kit—9x12" + small sheets $1.00 ppd. Emergency—Safety 4 Way Flasher for cars-pickups, flashes lights when parked! Easy installation, no wires to cut! Chrome finish! $6.50 ppd. Salch Co., Woodsboro CMPF3, Texas 78393.

FOR SALE—HT-32 clean, SB-200, 2 months old, Drake 2B & **1,000** gummed address labels, 50¢, 3 sets, same or different name $1.25. Mart's, Box 454, Mackinaw, Illinois 61755.

FOR SALE—HT-32 clean, SB-200, 2 months old, Drake 2B & 2BQ, $600.00. Will not ship. W3CAA, 227 Penn Pines, Clifton Heights, Pa. 19018. Phone CL 9-0105.

MIMEOGRAPH and give Tracts. Free samples. Christian Tract Center, 3905 Victoria, Hampton, Va.

FREE Catalog. Large selection of breadboarding kits, punched board, copper clad board, solderless connectors, and accessories for circuitry experimenting. Products widely used by industry and educational field. Aladin Kits Company, 21011 Dequindre, Hazel Park, Michigan 48030.

WRL's used gear saves money! Reconditioned-guaranteed-trial. Free list. Special! My personal antenna "farm." One package, $1,000. 2 Aeromotor 70' towers, 1 each Telrex 10, 15, 20 beam 6 element and 1 HyGain 3 element 40, 2 rotors. Write for details. Leo, WØGFQ, Box 919, Council Bluffs, Iowa 51501.

VOTE! VOTE! Vote! Hams—National Incentive Licensing Poll! Vote for or against, signing your call and handle on a QSL or postcard Now! Results of this poll will be petitioned to FCC and announced soon as possible. Spread the word—fast to Vote! Rush your vote to: SCCARC—WB2NOD—Department CQ, Box 685, Moravia, New York 13118.

DAYTON Hamvention April 15, 1967—Dayton Amateur Radio Association's 16th annual Hamvention, Wampler Arena Center, Dayton, Ohio. Participate in the technical sessions, forums, banquet and hidden transmitter hunt. Bring XYL for best in women's activities. For information write Dayton Hamvention, Department A, Box 44, Dayton, Ohio 45401.

MAKE up to $25,000.00 a year raising Chinchillas for us. Information 25¢. Keeney Brothers, New Freedom, Penna. 17349.

QSL'S Samples 10¢. N & S Print, Box 11184, Phoenix, Arizona 85017.

40 years accumulation Ham Magazines, parts, tubes, surplus. Best offer. Send S.A.S.E. for list. Heath twoer w/ps, ARC 4. George B. Martin, W2JHL, Erie St., Box 111, Campbell Hall, N.Y. 10916.

ROBERTS 1055 professional 4 track play and record stereo tape recorder. Hav VU meter, counter. Use in Vert. or Horiz. position. Includes tapes. New condition. Lists @ $375. Sell for $200. Joe Heffler, WB2QFR, 2200 Morris Ave., Bronx, N.Y. 10453. 212-295-1694.

NATIONAL NC-190 & Xtal Cal., cost over $225. Sacrifice at $150. or best offer. Kilowatt linear parts, new, SASE for list. K2ENN, 18 Wendy, E. Northport, New York 11731.

FOR SALE: One owner SX 101 M KIII excellent condition $110. Free delivery Southern Cal. N. E. Collett, W6YFR, 527 W. Walnut, Arcadia, Calif. 91007. Telephone 446 0571.

TRADE/SELL 144/220 mc transceiver URC-4 $15., Two 4-400 tubes $30. Hy-Gain 40 Meter beam $50. FT-243 xtals 50¢ ea. ARC-5 xmtr $2. Trade all for Heath SB-610 Scope. W. J. Davis, K6KZT, 4434 Josie Ave., Lakewood, Calif. 90713.

WANTED: 2.1 KC filter for 75A-4. Also want 75-100 ft. tower and 3-4 el. quad. (wide spaced). Gary Ashkenazy, WB2PBI, 36 Woodfield Rd., Stony Brook, New York 11790.

PERFECT Heath HP-10 DC transistorized power supply. I ship for $30. Wayne Fulton, WA5CXT, 6323 Newquay, Houston, Texas 77045.

WANTED: Globe C-100 CB, Heath HW-12 any condition. Write to: R. R. LaBrenz, K8HES, 940-W Hampton Rd., Essexville, Michigan 48732.

SELL T150A Xmtr. $65.00 F.O.B. or trade for 2 mtr. gear. B. Bulbulian, WB6OSH, 2735 S. McCall Avenue, Sanger, Cal. 93657.

CASH for Pierson or Pierson-Holt receiver, any condition. Glenn Lay, W7ADS, 109 No. Grandview Avenue, Yakima, Washington 98902.

FOR SALE: Knight T150A gud condx. 1st certified check $40. Bob Massey, WA9NBU/8, 556 W. Wadsworth, Houghton, Mich.

WANTED: Back Popular Electronics. 1954 to 1962 issues. Curtis Cook, Rte. 1, Box 20, Greenfield, Iowa 50849.

SELL—CQ back issues 1946 to 1959 complete. Most excellent. $30 for all. F. N. Saltus, K6AVF, 10074 Cristobal Dr., Spring Valley, Calif. 92077.

DOW KEY coaxial relay 52 ohm DK60-2C with auxilliary DPDT-115VAC. FB condition $10.00. R. Lautzenheiser, W5LYN, 1032 Shipley St., Springdale, Ark. 72764.

FOR SALE: RME-VHF152A converter $30. Want test equipment such as scope, audio gen., AC VTVM, Sweep gen. etc. D. W. Wismer, VE3EHC, 260 Frederick St., Kitchener, Ont., Can.

GOING TABLETOP. Trade perfect Collins Nov. 66 aligned KWS-1 #1491 for KWM-2 & PS or 32S3 & 75S3. Col. O. A. Heinlein, W7BIF, 107 Wyoming St., Boulder City, Nev. 89005.

NOVICES—Low power 3 band transx from '65 ARRL Handbook. QSO's W1 Zones 1,2,3,8,9,Ø. Best offer over $15. + shipping. N. Bedworth, WN1GTI, Taft School, Watertown, Conn. 06795.

GONSET Super twelve converter $35. N. Iverson, W7PVF, 2640 So. 133rd., Seattle, Washington 98168.

FOR SALE: Like new NC-140 receiver. $100.00 including shipping in USA. A. Hale, WA7ERA, Rte. 2, Boise, Idaho 83702.

FOR SALE: Seneca, Mohawk, BC 603 plate modulator, RBA. Cheap. F. Hillibush, K3KVK, Rd. #1, Box 241, Ringtown, Pa. 17967.

CANADIANS. Collins mechanical filter F455J15 $35. Argonne AR57 double xtal mic with stand $10. Heath QF1 with p/s $8. Heath IT10 transistor tester $8. M. C. Hart, VE3TA, Box 29, King City, Ontario, Canada.

WANTED to buy; Old radio and wireless gear, call books, magazines, catalogs and books before 1925. Erv Rasmussen, W6YPM, 164 Lowell St., Redwood City, California 94062.

WANTED: Information as to where I may obtain paper rolls and tape for model 19 RTTY. Joe V. Wright, W5AQN, P.O. Box 1316, Rockport, Texas 78382.

WANTED: Mechanical filters, 1.5 and 2.1 for Collins 75A4. S. Burnett, VE3GK, 85 Fifeshire Road, Willowdale, Ontario.

EICO 720 xmtr., 90 watts C.W. $49.95. Works perfect. Write: V. A. Bowen, W8DJA, 1257 W. Washington Ave., Alpena, Michigan 49707.

RTTY GEAR Model 14TD, Inc. base, sync. motor, cover in very good condition just $40.00. Will send prepaid. I. D. Smith, Jr., K8VEX, 124 E. Sycamore St., Wayland, Michigan 49348.

WANTED: Heathkit XC-2 and XC-6, 2 and 6 meter converters for Mohawk Receiver. H. S. Waites, VE7FL, Box 39, Marysville, B.C., Canada.

SELL: Clean RME DB22A with instruction book $19. Sell Heath grid-dip meter & instruction book. $12. Plus shipping. M. F. Tehan, K6HFY, 4329 Canyon Crest Rd., Altadena, Calif. 91001.

FOR SALE or trade for keyer, Minn-Honeywell Electronic Flash Aud. Sekonic light meter. William Sinkankas, WØHAO, 1511 North Division st., Davenport, Iowa 52804.

FOR SALE: Terado power converter model 50-175 excellent—12VDC to 110 VAC—60 cycle 150 watts continuous—175 watts Int. $50. L. K. Moyer, W3DYE, 38 Main Street, Bedminster, Pa. 18910.

WANTED: Hallicrafters HA-1 T.O. Keyer. Please state price and condition. Andy McGowan, Jr., WA5EBE, 1418 Grein Avenue, Lake Charles, Louisiana 70601.

NEW 8168/4CX1000A ruggedized 1000 hr. tubes $120. SK-806 sockets and chimneys $75.00. New, or swap for all band transceiver. Joe D. Reed, W5YFJ, 6025 Parkoaks Drive, Citrus Hights, Calif. 95610.

HEATH HO-10 Monitor scope plus HO-13 Panoramic adaptor, perfect. Not useable with new Drake Rcvr. Manuals included. $60 each or $100 for both. R. Martin, W4VOY, Rt. 1, Tavares, Fla. 32778.

WANTED: Hy-Gain Rotator and/or brake. Have 4CX250B, 7580W plus sockets and PL172S. Rod Linkous, W7YBX, 5632 47th Avenue S.W., Seattle, Washington 98116.

FOR SALE: Eight 100TH tubes. Guaranteed. $5.00 each. John Vugteveen, K8HNB, 415 Cochlin Street, Traverse City, Michigan 49684.

FOR SALE: Dow Key relay DK 60-G2C, $8.00; Vangard 2 meter converter 300D $8.00; Ameco CPS $8.00; 50 feet RG/58/U $4.00; Polaroid 80B, $20.00. Stix Borok, WB2PFY, 209-25 18th Avenue, Bayside, New York 11360. 212-357-4488.

20A C E SSB Xmtr plus 458-10 M VFO factory wired. New, never used. Highest offer. Stanley Stoller, W9TMH, 4535 Pratt Avenue, Lincolnwood, Illinois 60646.

COLLINS 70E8A unused with dial, prepaid, $48.00. Paul Rockwell, W3AFM, 5800 Hillburne Way, Chevy Chase, Maryland 20015.

WANTED: Support the Western Cousin Projects on 3970 kcs at 0500 Z any night. R. J. Lawrence, W7VFR, 1030 Cedar, Richland, Washington 99352.

SELL: Mosley 40K kit (adds 40 meters to tribander) $20.00. Unused 75S1 noise blanker (useable with 75S3) $40.00. Ampex 960, $250.00. Foy Guin, Jr., W4RLS, P.O. Box 940, Russellville, Alabama 35653.

UNUSED Joystick Antenna System, $17.50 postpaid. Don Stoner Audio RAM Speech/comp/cilpp., $9.50. John Schroeder, W6UFJ, 5625 Quinn St., Apt. N, Bell Gardens, Calif. 90201.

THREE in. Dumont Scope in good operating condition. Will trade for Keyer or other. Make offer to S. Hirsh, WB2FGQ, 189 Island Parkway, Island Park, L.I., N.Y. 11558.

LIKE NEW 80-10 SSB-CW-AM 130W Sommerkamp FL-200B transmitter $285.00 or trade for SB-401. R. O. Goodwin, W5OJX, RFD 2, Box 70, Carriere, Miss. 39426.

SELL: Viking Adventurer Xmtr $30.00; SX-99 Rcvr $80.00; Knight T-60 Xmtr $35.00. Steve Marshall, K4WUN, Box 544, Earlham College, Richmond, Indiana 47374.

SPRING cleaning. Selling SW Rcvr, 18 AVQ, 6n. 3 el. xtals, other goodies. Write to: The Rev. G. F. Gargiulo, WA1GFJ, 160 Elm St., College, Richmond, Indiana 47374. Area code 703-389-3749.

WANTED: Eimac 3-1000Z tube also Collins KWS-1 in perfect shape. Lloyd Rondeau, 2436 Carney Ave., Marinette, Wisc. 54143.

6KC Mechanical filter wanted for Collins 75A-4 receiver. Dick Shongut, W2QFR, 25 Cameron Place, New Rochelle, N.Y. 10804.

HT-37-SX111 Mike-keyer-speaker. Mint condition. $450.00 or best offer. All you need is antenna. Station of son, K8AYP, now stationed in Viet Nam. Available at R. A. Gadowski, K8AJJ, 25800 Franklin Park Drive, Franklin, Mich.

FOR SALE: One HW-22 almost new. Used about 2 hours. $85.00. W. E. Brownfield, W7AQX, 2424 S.W. Sheffield St., Portland, Oregon 97201.

GOING Mobile: Expertly wired Heath HW32, 20M transceiver, Mike and DC Heath HP-13 supply, $130.00. G. S. Bean, W8KBJ, 613 Asbury Road, Cincinnati, Ohio 45230.

NEW Hallicrafter R-47 speaker $8.00, excellent Heath AM-2 SWR bridge $6.00, excellent ICA code practice set $3.50. T. A. Chartrand, W8PRL, 1626 South Genesee Drive, Lansing, Michigan 48915.

EXCITER, all band, $28.50. Transistor power supply $16.00. Will sell or trade tubes, components, camera or typewriter for ham gear or test equipment, even if defective. J. Boer, K2OYN, 449 Hill St., Boonton, N.J. 07005.

WANTED: Beam or Quad, Mast TR-44 rotor. All must be good cond., cheap. Sell or trade and unused AR-22 rotor. Arthur Bernstein, WA2YJN, 2411 East 3rd Street, Brooklyn, New York 11223.

WANTED: Central Electronic's V200. State age, and condition. Also latest type A.F.S. converter for RTTY. Len Humphries, VE3XF, 41 Kildonan Drive, Scarborough, Ont., Canada.

WANTED—QST's—Last four issues needed to complete private collection. 1916—FEB., MAY, JUNE, JULY. Any reasonable price paid. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., New York 11050.

WANTED: Silver Dollars any date. Must see actual coin before I can make a firm offer. If interested in making a profit on your dollars send your silver dollars to me by insured mail. I will return any and all postage even if we can not come to terms. Coins not accepted will be returned immediately by insured mail. Send to HAM SHOP, c/o CQ MAGAZINE, Box CESR, 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050.

HOT-SHOT CARD. Designed for clubs and individuals engaged in emergency communication, this 4" by 5" red card with black printing may be placed in your mobile unit's window to identify you as an "Emergency Radio Unit." Card is on a heavy Bristol board stock and is almost identical to those issued to regular emergency vehicles by many agencies. 50¢ each, ppd, or available in bulk amounts of 25 cards for $6.25. Order now from HOT SHOT CARD, c/o CQ's Ham Shop, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050.

GRAND RAPIDS AMATEUR RADIO ASSOCIATION presents their 19th annual Amateur Radio Convention, Friday and Saturday, April 21-22, in the Civic Auditorium, Pantlind Hotel, Grand Rapids, Michigan. Write: G.R.A.R.A., Box 1333 Grand Rapids, Michigan 49501.

FOR SALE: Gonset G S B 100, $105. P/S 1800 volts, $25. Gonset super 12 converter $25. Tecraft 6 meter transmitter $25. R. Velazquez, WA2YDH, 34-36 64th St., Woodside, N.Y. 11377.

SELL: Collins 310B cw exciter with PTO, homebrew 100 watt amp-modulator. Sell separately or together. P. Rubinfeld, WB2JNS, 97 Mountainview Rd., Millburn, N.J. 07041.

HAVE lots of Ham Radio parts and components would like to swap them for Lincoln Head pennies or what have you. Pennies prior to 1935. R. G. Wilson, W3GHD, 139 Campbell Ave., Havertown, Pa. 19083.

$5.00 for manual and schematic for Rex Bassett GC-75. Will return after photographing if requested. Ed McCormick, W5MRZ, P.O. Box 36, Wynne, Arkansas 72396.

FOR SALE: 61 Ft. Vesto Tower. $150. Can't ship. Ted Harvey, W2CTE, 21 Ramapo Ave., Suffern, N.Y. 10901.

HEATH MARAUDER & 75A3 for sale. David Sachs, WB2VZM, 2279 East 22nd St., Brooklyn, N.Y. 11229.

COMPLETE STATION: Collins 32V3, Filter, Relay, P.T.T. D104 Mike, Phone Patch, HQ129X Recvr, Xtal Calib., Spkr. Like new, hardly used. F.O.B. firm $295. Ant. only needed! Monroe M. Freedman, W2ASI, 15 Kensington Oval, Isle of Sans Souci, Davenport Neck, New Rochelle, N.Y. 10805.

MODEL 19 Teletype cover with doghouse and tape reel. $10.00 or swap. Will answer letters if you send stamp. No postcards. J. Thomsen, W9YVP, 11001 South Pulaski, Chicago, Illinois 60655.

TWO METER Station: SCR 522, matching power supply & extra tubes, Tecraft CC-144 converter (14 mcs IF), 8 element beam. $60. package. D. E. Logan Jr., WB2FBF, 21 Judith St. Nanuet, N.Y. 10954.

TWO'ER with 12 VDC supply, halo, 5-element beam. Will deliver within 50 miles. $55. cash. KØFPC, R. V. Davis, 1005 So. Lexington, Harrisonville. Missouri 64701.

NEEDED one Collins Mechanical filter F-455J-21 (2.1kc) for Collins 75A4. Harry M. Riddle, W8EDL, 2661 Northwood Ave., Toledo, Ohio 43606.

SELL RDO rec. with manuals $100. covers 40 to 100 mcs. described in Oct. and Nov. CQ, good condition. Frank Kedl, W7CRP, 55 E. 8th St., Sheridan, Wyoming, 82801.

WANTED: New or like new A4-22 Control unit part #ACU-83. Give full particulars. J. L. Rigau, W4QGW, Box 685, Gloucester, Va. 23061.

RCA-5820 image orthicon, used only 40 hours; make offer. Want ATV gear, Vidicons, 432 MC gear. R. E. Beatie, 1904 E. 114 Ave., Tampa, Fla. 33612.

BEGINNER wants SWL, REC, VTVM, RF sig. gen., scope, Heath Edu-kits, EF1, EF2, EF3, orig. owner late models. Cash or photo equip. Allan A. Sonsky 191 East 17th St., Brooklyn, N.Y. 11226.

FOR SALE: Heath HG-10 VFO excellent condition, and Knight R-55. Best offer. G. J. Cotellis, Jr., WA4RGD, 1903 32nd Street, West, Bradenton, Fla. 33505.

WANTED: Early vacuum tubes for my private antique wireless museum. Need DeForest spherical "Audion" with candelabra screw base, UV203, etc. R. W. Schnedorf, W9LJH, 610 Monroe Ave., River Forest, Ill. 60305.

FOR SALE: Collins KW-1 transmitter. 1,000 watts phone or C.W. In fine condition. $1,000.00 F.O.B. Athens, Georgia. George F. Norton, W4EEE, Georgia University Station, Athens, Georgia 30601.

SENECA 6 & 2 meter, very clean, unmodified 2 years old, $135. or swap for other gear. Joe H. Owings, KØAHD, 10217 St. Daniel Ln. St. Ann, Mo. 63074.

HA-1 TO KEYER. Excellent condition. $45.00 postpaid. J. R. Belt, WAØJIH, 1206 Main St., Parkville, Mo. 64152.

NEW Triplett 221T meters 100 mils and 1000 mils $6. each B&W 426 72 ohm LP filter $10. B&W CC50 dipole connector with RG59U attached $2. G. L. Countryman, W4JA, 75 E. Bay St., Charleston, South Carolina 29401.

FOR SALE: Radio News, CQ, QST, RSGB and callbooks. Write for list. 15 cents per copy plus postage. John M. Sulak, W8UMR, R.D. 2, Box 109, Wellsburg, W. Va. 26070.

WANTED BC221 or LM Freq. meter with original cal. book, R11A, R23 or BC453. State price, Weight, and condition. L. Wuertz, 517 Camp St., Sandusky, Ohio 44870.

METERS 3½ Weston round 0-50; 0-75; 0-80, $3.50 each P.P. QST, CQ, Western Radio Amateur, Electronics 1935-1938: Bill Hayward, WØPEM, 3408 Monterey Street, St. Joseph, Mo. 64507.

SELL or TRADE plus cash 250-23-3 Matchbox/coupler, Duomatic keyer, D-104 and stand. Need 30L-1, 312B-4, SM-1 or SM-2, 200 and 500 cycle 32S3 filters, Superex Fones. Henry Taylor, K7NHG, Star Route, Olga, Wash. 98279.

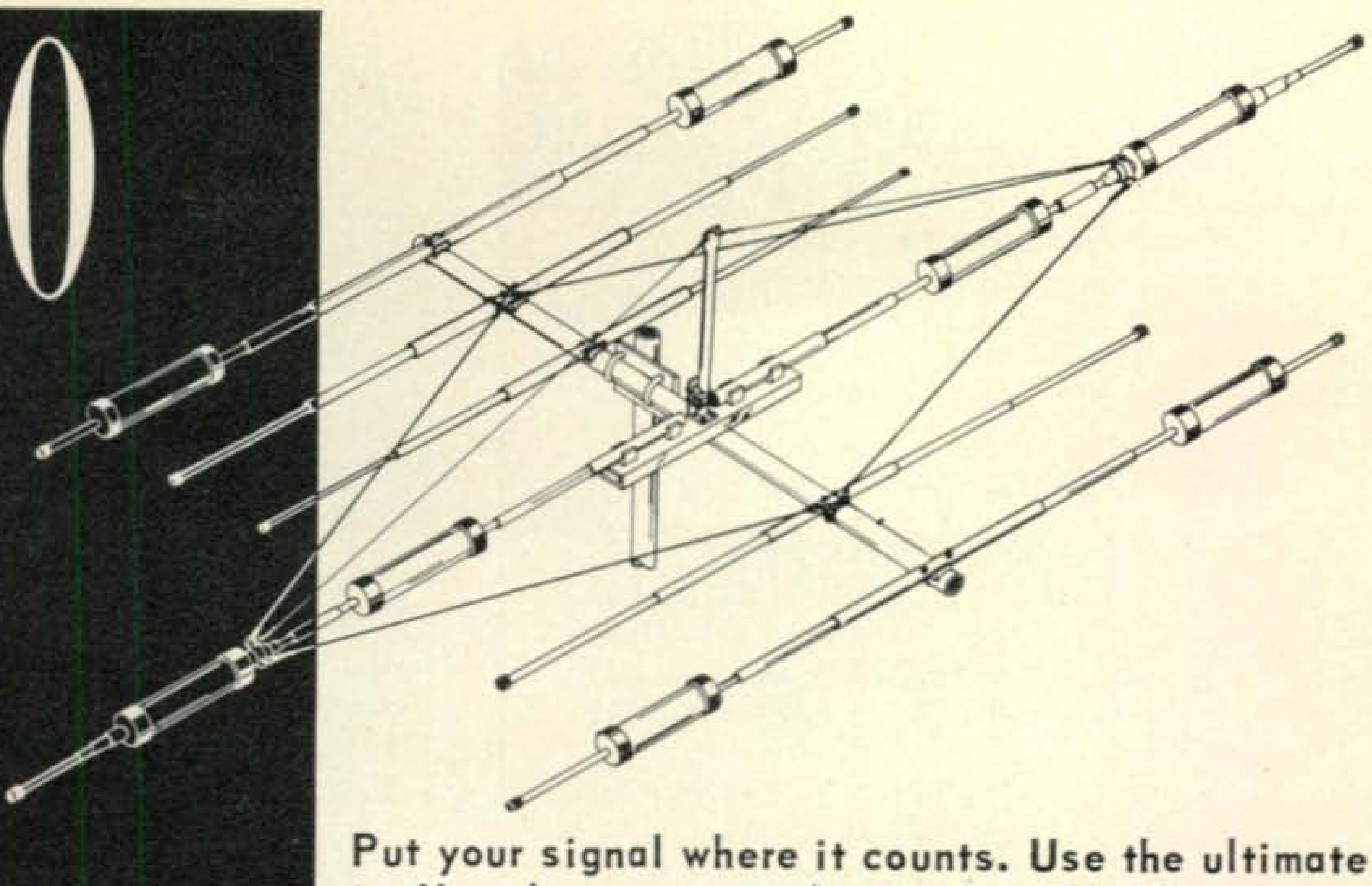
B&W 5100 and 51SB for sale. WA5CMC, C. Ludlam, 2309 Bullington St., Wichita Falls, Texas 76301.

WANTED: B&W 1 kw grounded grid linear L-1000-A, L-1001-A or LPA-1. George F. Marts, WØTDH, 4201 Colvin Drive, St. Louis, Mo. 63123.

HEATH Two'er w/mike, xtal—$30.00, Hi pwr fixed vacuum cap., Viking II, HQ-140XA, Johnson VFO—all offers answered—213-767-2540. D. R. Etheredge, W6DMP, 12040 Redbank St., Sun Valley, Calif. 91352.

TA-3640

for 10 15 20 and 40 meters



Put your signal where it counts. Use the ultimate in Ham beams - - - the Mosley TA-36 with Kit TA-40KR added to radiating element. Employs 4 operating elements on 10 meters, 3 operating elements on 15 meters, 3 operating elements on 20 meters. SWR is 1.5/1 or better at resonant frequencies over all 4 bands. Constructed of heavy-wall aluminum for maximum strength. Rated for full power.

Write for detailed specifications and performance data on the Mosley TA-3640.

Mosley Electronics, Inc.
4610 NORTH LINDBERGH BLVD.
BRIDGETON, MISSOURI 63044

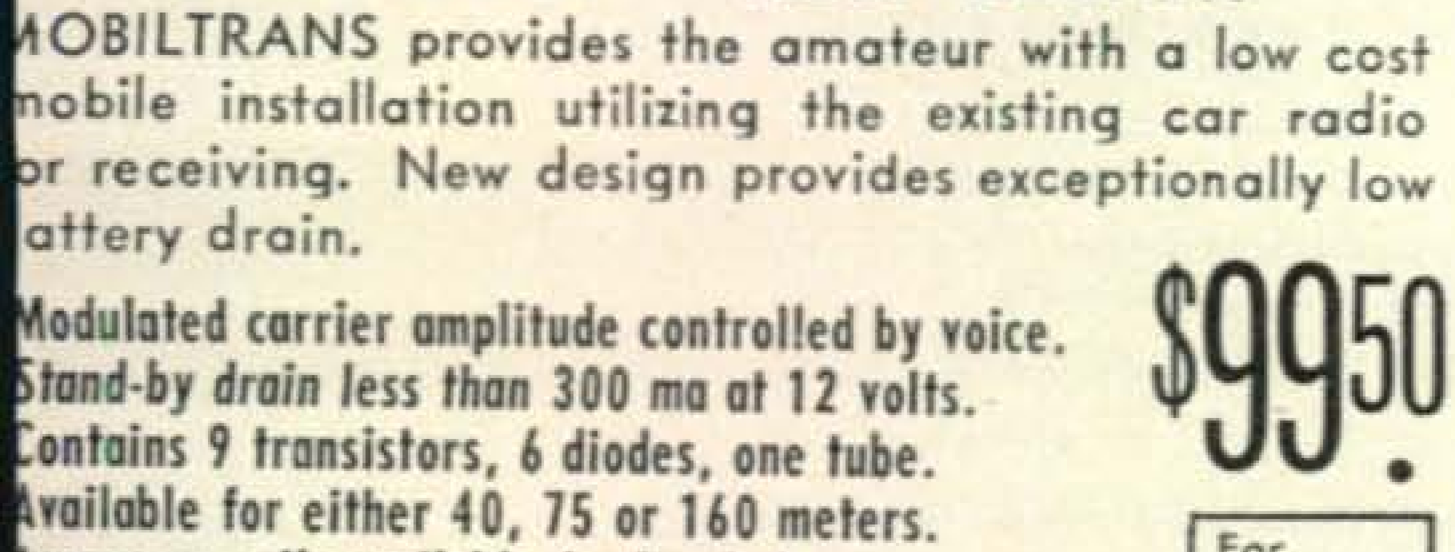
For further information, check number 33, on page 110

A NEW MOBILE CONCEPT

MOBILTRANS 40

Complete 40W Transmitter and Receiving Converter in a Single Unit Including Power Supply!

/75/160



LOW COST • NEW DESIGN

MOBILTRANS provides the amateur with a low cost mobile installation utilizing the existing car radio for receiving. New design provides exceptionally low battery drain.

Modulated carrier amplitude controlled by voice.
Stand-by drain less than 300 ma at 12 volts.
Contains 9 transistors, 6 diodes, one tube.
Available for either 40, 75 or 160 meters.
Accessory coils available for band change.
Three position crystal selector (FT-243 type).
Operating wt. 5 lbs. Size: 2⅞" H, 8" W, 8¼" L.
For 12 volts negative ground ONLY.

$99.50

For Detailed Brochure, Write or Wire:

justin, inc.
BOX 135, SAN GABRIEL, CALIFORNIA

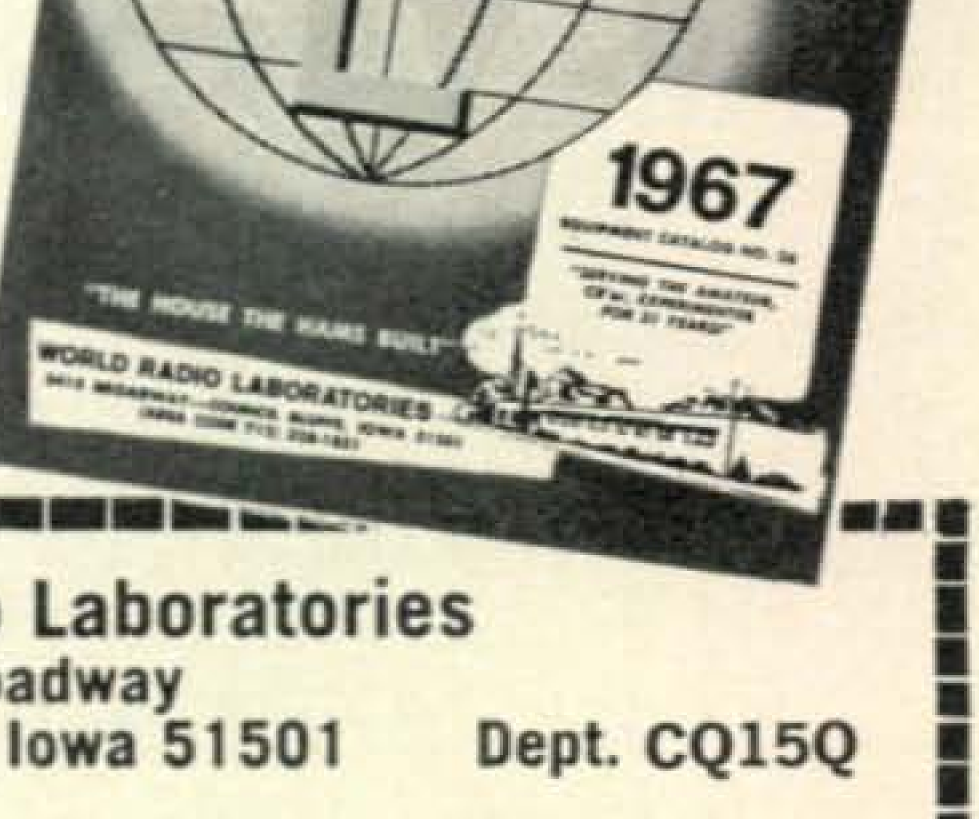
For further information, check number 23, on page 110

NEW! 1967 CATALOG OF BARGAINS

FREE

Everything in equipment and accessories for HAMS and CBers at World Radio Lab's Amazing Low Prices!

Anything in the book on easy credit terms, TOO!



World Radio Laboratories
3415 West Broadway
Council Bluffs, Iowa 51501 **Dept. CQ15Q**

Gentlemen:
Please rush me your Free 1967 Catalog.

Name ____________________
Address ____________________
City ____________ State ______ Zip ______

For further information, check number 24, on page 110

For further information, check number 25, on page 110

READER SERVICE

NAME ______________________ CALL __________
(Please Print)
ADDRESS ______________________________
CITY ______________________________
STATE ______________ ZIP CODE __________

Please send me more information on your ads in the Mar. 1967 *CQ* keyed as follows:

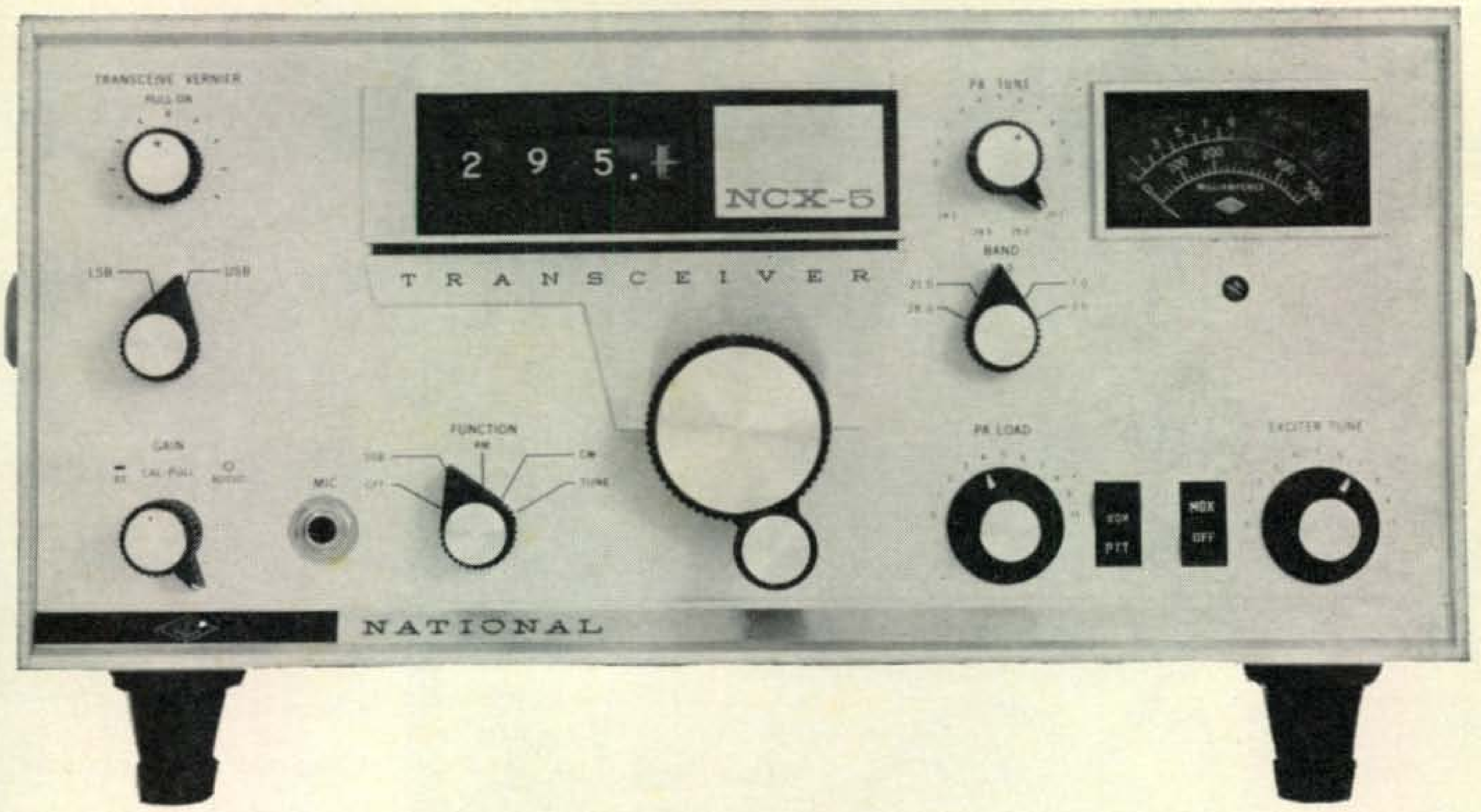
1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72
73	74	75	76	77	78	79	Total Inquiries				

Void after March 1967

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

advertisers index

Creditability Gap —
a Cadillac for the Price of a Chevvy?



I am referring now to the new Mark II version of National's NCX-5. Formerly priced at $685, this superbly engineered transceiver is considered the most complete of all existing sideband rigs.

Amongst its features is the ability to operate break-in. This is a boon for the CW man. It eliminates unnecessary mechanical handling. Then, too, there is built into the set VOX and your choice of selectable sideband.

For those whose interest lies in net operations, the NCX-5 provides delta tuning on the other fellow's signal up to 5 KC either side. Still another point is worthy of comment. I refer to the mechanical clutch assembly which enables you to pull outwardly on the main tuning knob and adjust the digital readout dial to the accuracy needed (as indicated by means of a separately available calibrator).

There is a finer tuning resolution with the NCX-5. This is important because you have frequency readout to as small an increment as 200 cycles. This imposing dial with direct readout is quite unique in the trade. It reverses itself as you change bands. The oscillator, of course, is constant and remains the same for all band operation there being no switch or separate set of inductors to bother with. The NCX-5 is a 5-band set. You need not take a back seat for 10 and 15 meter operation and with the increasing sunspot activity, its performance on these bands is truly magnificient.

The NCX-5 has two stages of radio frequency preselection—not one as is customarily found—and this gives the set a great deal more hop—so much so that on 80 meters, they have to dampen it down.

The NCX-5 positively requires a properly matched antenna, not only one with a reasonably low VSWR but also one which reflects the proper impedance. For example, if you try hooking up the set to a long wire, you will immediately observe what appears to be an oscillation in the receiver. This will not exist if you use a 50-75 ohm coaxial feed.

The NCX-5 Mark II model uses a diode type of balanced modulator with reasonable "stay put" stability. This means that the unwanted products from the opposite side band and/or the carrier are rejected by more than 50 db. An unusually good crystal filter with a passband of 2.5 KC makes sideband sound crisp and clean. This model features a separate envelope detector for AM reproduction.

We offer the NCX-5 in several packages to fit your pocketbook. The basic set is $549. The National power supply is $110. The Herbert W. Gordon Company power supply—not quite so handsome but electrically rugged and meeting the requirements of the NCX-5—is but $75. We offer a kit of components with which to make a power supply and this is but $50. We are open to trades and will do our best to give you a good deal. Remember, we carry the NCX-5's in stock and all of the power supply components in stock as well. The calibrator is likewise here at $27.50 and a separate VFO is sold for $250.00.

Worthy of your consideration at its former original price, the NCX-5 is truly today's Cadillac at Chevrolet's price.

Our latest catalog is available, free upon request.

Helping Hams to Help Themselves

HERBERT W. GORDON COMPANY

Woodchuck Hill • Harvard, Massachusetts 01451 • 617-456-3548

For further information, check number 34, on page 110

WRL gives you a FREE 2-week trial

ON THE
Great NEW

GALAXY V MARK 2

5 BAND TRANSCEIVER

NOW—even Better than Ever!

6 NEW Features:

- New 400 Watt Power
- New Precise Vernier Logging Scale
- New Solid State VFO
- New CW Sidetone Audio
- New CW Break-In Option
- New CW Filter Option

6 WAYS BETTER—

Yet Still Only $420.00

Satisfaction Guaranteed! (Serving Amateurs over 31 years!)

■ We have the great new Galaxy V Mark 2 in stock, and we're so confident you'll like it that we're going to make it easy for you to step up to this powerful 80 through 10 meter transceiver on a "no risk" two-week FREE trial! Just mail the coupon in for details. Remember, we give the highest trade-in on your present equipment...offer an easy monthly payment plan *(no finance company—you deal directly with us).*

Send in the coupon today, just check off your interests and mail.

"The House the HAMS Built!"

Leo I. Meyerson
WØGFQ
President

WORLD RADIO LABORATORIES CQ-15S
3415 West Broadway, Council Bluffs, Iowa Zip 51501

Please send me the following: (F.O.B. Council Bluffs, Iowa)

☐ Information on 2-week trial
☐ Galaxy V Mark 2 Brochure ☐ A.C. SUPPLY—$79.95
☐ GALAXY V Mark 2—$420.00 ☐ Quote me a trade
☐ Fixed Station Package—$597.55
☐ Mobile Package—$606.50 ☐ FREE WRL 1967 Catalog
☐ Enclosed is my Money Order ☐ Check ☐ Charge it

Name__________ Call__________
Address__________
City__________ State__________ Zip__________

For further information, check number 12, on page 110

The world's finest 5-band transceiver

NATIONAL'S NEW 1967 NCX-5...$549

The only change is the price!

You can pay much more, but you'll never find another 5-band transceiver to match National's top-quality NCX-5. Here are the features and performance figures that have made the NCX-5 the most wanted transceiver on the market: ■ Amazing frequency stability . . . virtually no warm-up drift ■ Incomparable selectivity . . . 8-pole high-frequency lattice filter exhibits a 1.7:1 shape factor ■ Two RF stages in receiver section for matchless sensitivity ■ Transceive Vernier control for 5 kHz of receiver offset ■ Digital counter read-out accurate to 1 kHz on each band with additional counter calibration to 100 cycles ■ Conservative 200 Watts PEP rating ■ Fast attack-slow decay AGC ■ S-meter ■ Full VOX or PTT operation ■ Break-in CW keying with adjustable release time ■ ALC and external ALC input for use with the NCL-2000 linear amplifier ■ Mobile mount included. See the NCX-5 at your National dealer's today. Enjoy National quality . . . National features . . . National's full One Year Warranty . . . at National's 1967 price . . . only $549.

National Radio Company

37 Washington Street, Melrose, Massachusetts 02176

For further information check number 39 on page 110