CQ

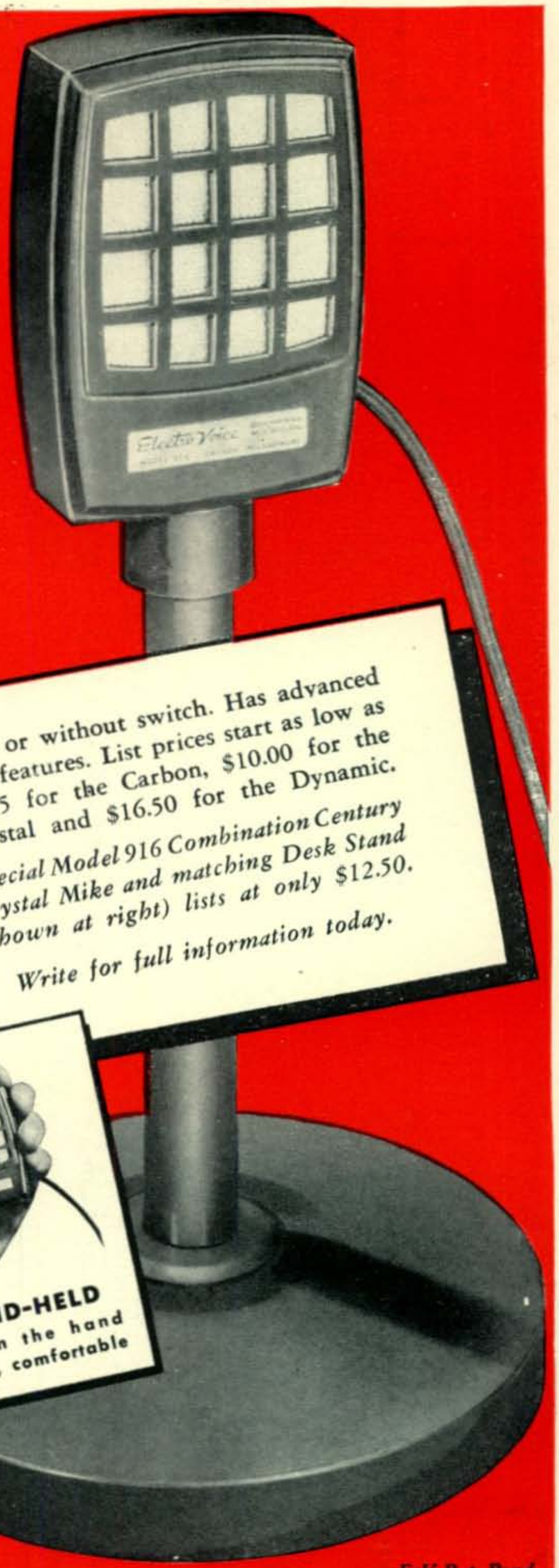
MARCH, 1949

The Radio Amateurs' Journal

35¢

Published by RADIO MAGAZINES, INC. Subscription $3.00 a year

You can't beat the CENTURY for clear QSO's at low cost!



● You listen to the CENTURY . . . and you're amazed! You never expect such voice quality, such performance, for so little cost. And when you go "on the air" with this *miracle mike*, you know you are clearly reproducing your exact voice . . . putting your own personality on the carrier. • Available in high level *crystal, carbon, dynamic* types, with or without switch. Has advanced E-V features. List prices start as low as $8.25 for the Carbon, $10.00 for the Crystal and $16.50 for the Dynamic.

Special Model 916 Combination Century Crystal Mike and matching Desk Stand (shown at right) lists at only $12.50.

Write for full information today.

Authorized Distributors Everywhere

ELECTRO-VOICE, INC., BUCHANAN, MICH.

Export: 13 East 40th St., New York 16, N. Y.
Cables: Arlab

HAND-HELD
Fits in the hand easily, comfortable

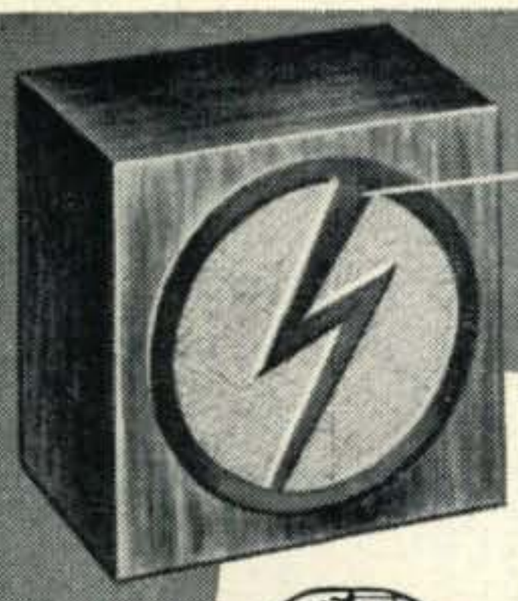
MOBIL-MIKE
Carbon or Dynamic, with relay control switch and hanger

DESK MOUNT
Mounts on Model 415 Reclining Desk Stand

E-V Pat. Pend.
Licensed under Brush Patents

NO FINER CHOICE THAN

Electro-Voice



"ONE, TWO, THREE, TEST..."

Why should the 6L6-G in your audio amplifier be a Ken-Rad tube?

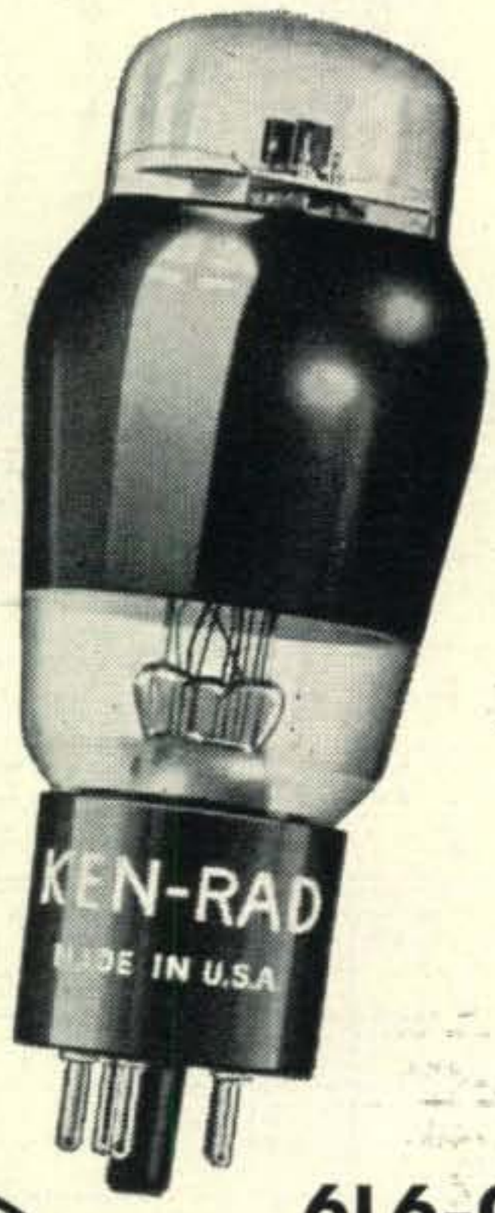
BECAUSE PRECISION MANUFACTURE GIVES GREATER BEAM POWER EFFICIENCY!

How Ken-Rad tubes are built, is the "why" of their fine performance. Beam power tubes like the 6L6-G go up in efficiency, in ratio to the care with which they're made. The electrons are focused, or beamed, to avoid the screen-grid structure while passing through it. Excellence of this focusing action depends on accurate alignment of the control and screen grids—i.e., painstaking assembly. Here Ken-Rad standards never slacken!

Good basic design, pre-tested materials, an exhaustive series of assembly inspections and performance checks—these further support Ken-Rad quality, to give you glass, metal, and miniature tubes that play a leading part in the enjoyment you get from your rig.

Type 6L6-G accents the usefulness of the individual Ken-Rad tube when full advantage is taken of its capabilities. Though one of the first beam power tubes designed, the 6L6-G still is alone in its power class for use in a-f circuits for ham and public-address work. One tube in Class A will put out 10.8 w. A pair in Class AB_2 will put out 47 w. This is enough power, on the one hand, to modulate a 100-w transmitter—audio-wise, to handle a number of speakers covering a large hall, should such volume be needed!

Visit your Ken-Rad distributor or dealer today. Listen to the three-way tube message he has for you: quality—performance—*value!*



6L6-G
BEAM POWER AMPLIFIER TETRODE

FOR KEN-RAD QUALITY,
LOOK BEYOND THE DATA SHEET!

182-HA26-8650

KEN-RAD *Radio Tubes*

PRODUCT OF GENERAL ELECTRIC COMPANY

Schenectady 5, New York

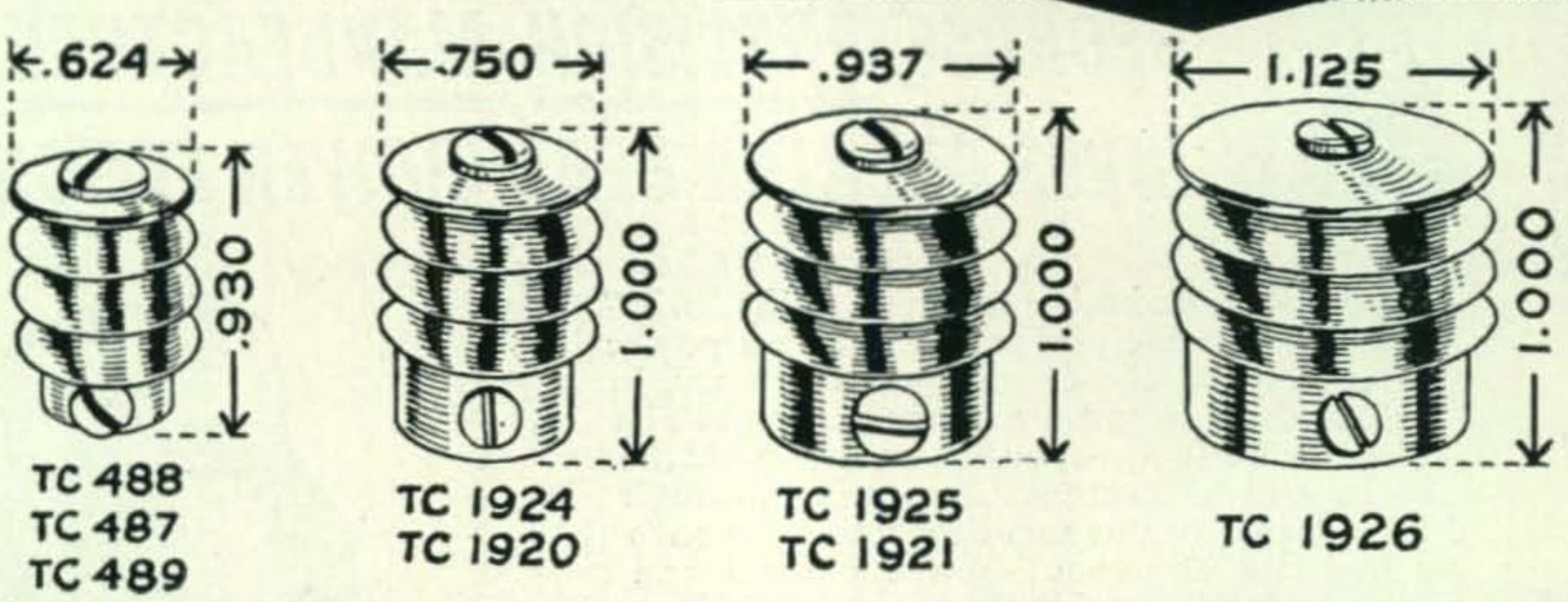
YOUR PREFERRED SOURCE FOR AMATEUR TUBES IS YOUR NEARBY KEN-RAD DISTRIBUTOR OR DEALER

ANOTHER BUD *First!*

A COMPLETE LINE OF

Heat Radiating Plate and Grid Tube

CONNECTORS



TC 488
TC 487
TC 489

TC 1924
TC 1920

TC 1925
TC 1921

TC 1926

BUD heat radiating connectors fit all sizes of industrial and transmitting vacuum tubes. These connectors serve a dual purpose, not only are they useful to make connections to plate or grid terminals, but they provide a large heat radiating surface that will dissipate heat from the glass seal and tube element.

Eight sizes fit all grid and plate leads and also provide sufficient heat radiation for any tube operating in the range of 50 to 2000 watts. All radiators are machined from special aluminum rod. Edges are rounded to minimize corona loss.

TABLE BELOW LISTS PROPER CONNECTORS TO FIT VARIOUS TUBES

CATALOG NO.	HOLE SIZE FOR LEAD	HEAT RADIATING CONNECTORS TO FIT THE FOLLOWING TUBES	DEALER COST
TC-488	.052	3C24 — 24 — 24G — 25T — 27	$ .36
TC-487	.062	UH50 — HK24 — 304B — 829B — 832A — 834	.36
TC-489	.072	35T — 35TG — 75TH — HK254 — HK257B — 484 — 8001	.36
TC-1924	.125	HK57 — 152TH	.50
TC-1920	.375	4-125A — 150TH — 2-150D — 250R — 250TH — 250TL — 420A — 802 — 803 — 804 — 807 — 808 Grid — 814 — 815 — 828	.50
TC-1925	.125	304TH — 304TL	.60
TC-1921	.570	ZB60 — HF60 — HF100 — 111H — 211H — 203H — HF175 — HF300 Grid — 100R — HK357C — 450TH — 454 — 750TH — 805 — 806 — 808 — 809 — 810 — 811 — 812 — 813 — 828 — 833 — 866 — 854 — 1500T — 2000T — 1054 — 5331 — 5332 — 8000 — 8003 — 8005	.60
TC-1926	.810	WL468 — WL463 — WL460 — HF200 — HF201 — HF300	.90

NOTE — TC-1923 Heat Radiating Connector with hole size of .110", is still in our line and can be furnished. Dealer Cost ..... $ .50

The mark BUD *of perfection*

BUD RADIO INC.

2120 EAST 55th ST. CLEVELAND 3, OHIO

CQ

The Radio Amateurs' Journal

Published monthly by RADIO MAGAZINES, INC., at 342 Madison Ave., New York 17, N.Y. Telephone MUrray Hill 2-1346. Entered as Second Class Matter Oct. 10, 1947 at the Post Office, New York, N.Y. under the Act of March 3, 1879.

Vol. 5 MARCH, 1949 No. 3

In This Issue

Here's one ham's dream that really came true. This array of antennas makes W2NMC/maritime mobile the target for scores of questions wherever his cruiser "Norte" puts in for gas or supplies. On extreme left is vertical rod for a Harvey-Wells ship-to-shore radiophone. On extreme right is a top-loaded 16-foot vetrical for 20 and 75 meters. Both of these can be pulled to the stern to permit the 3-element 10-meter rotary to be swung around. Beam is shown tied down in cruising position.

Photo by W2DJJ

★ ★ Letters ★ ★

CUL OM

Brentwood Heights, Calif.

Editor, *CQ*:

There has been a lot of criticism aimed at the "CUL 73" type of QSO in recent years, and with some justification.

In that whirling dervish of a world peopled by the "ratrace" boys, however, the extended QSO is distinctly persona non grata. When there are 40 eager beavers waiting in line to work some rare jewel of the 14-mc level, every unnecessary word (or dot) looms big as a house. Now, everybody knows this. And most abide by it. But all too often the DX gets tangled up with one of these puddingheads who gets through his QSO in jig time, but who takes ten minutes to say good-bye. These birds always remind me of the fellow who, when he parted with his girl friend, kept holding hands with her to keep her from hitting him.

Why in the world can't people converse by radio in an intelligent manner? Why can't they just say "good night" or "good-bye" and let it go at that? The other night I copied down the closing wails of one of these slow leave-takers, who had just exchanged a snappy signal report and agreement to QSL with one of our European friends. His parting follows:

"WL OM QRU HR WL SA CUL 73 GE/GM GUD HUNTING ES DX BEST OF LUCK CHEERIO MERRY XMAS HAPPY NEW YEAR TNX FOR FB QSO GN AR diddleedow-deedow. Dit diddy dit dit, did dit."

For my dough, that guy should have his head examined. Let's everybody make a resolution to let go of the rare DX with a little less of the "Parting is such sweet sorrow" stuff, huh, fellows? Please?

Bill Lippman, W6SN

Keying the ARC-5

129 Rochambeau Ave.
Providence, R. I.

Editor, *CQ*:

Among the letters on page 6 of the November, 1948, issue was one describing a method of keying the ARC-5 transmitter, which I should like to heartily endorse. Until reading this letter my note had been usually T8C. For about $.50 I tried this system and was amazed to see my reports jump to T9X in almost every case. Since the installation I have received no less than T9 on any QSO, furthermore the percentage of QSOs to calls has jumped better than 25%.

Only .006-μf condensers were available here and so they were used in place of the .005-μf specified. The filter as recommended was placed inside of transmitter against the sidewall and a piece of RG-59-U used to connect to the key. The slight remaining keyclick in local BC receivers was completely eliminated by another .006-μf condenser at the key points.

Donald Victorson, W1RIF

---

145 E. Main St., Gloucester, Mass.

Editor, *CQ*:

Up until the time of reading the article in May, 1948. *CQ*, by Mack Seybold, "Clickless Keying Using VR Tubes," three of us—W1RHI, W1RAL, and I—have had trouble with key clicks. We live

EVERY ORDER IS RUSH AT PR!

Jobbers and quantity buyers of crystals are enthusiastic about prompt PR delivery. By most standards our regular service will meet or beat so-called "Rush" orders. Actually EVERY order is "Rush" at PR. We know your problems. We know you want your crystal supplies as quickly as possible . . . and we are in business to meet your needs . . . not weeks from now . . . but NOW!

10 METERS, Type Z-5, $5.00 • 20 METERS, Type Z-3, $3.75 • 40 & 80 METERS, Type Z-2, $2.75

PR

SINCE CRYSTALS 1934

PRECISION CRYSTALS

USE "PR" and KNOW where You Are!

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

in a crowded neighborhood and the neighbors didn't care for the key clicks on their favorite programs. When he suggested using VR tubes, the three of us got busy and we tried out the circuit. We found that it wiped out the key clicks entirely. It did such a good job that a radio operating on the broadcast band in the same room with the transmitter was not able to pick up any clicks.

But there's just one drawback—plate current in the final isn't completely cut off when the key is up—even though the VR tube in the keying circuit is not conducting. The final plate current with the key up is an average of about 12 ma for the three transmitters.

W1RHI has a small "MicaMold" transmitter using a 6L6 in the final. W1RAL has a BC459A surplus transmitter and I have the same. I contend that it is not the fault of the keying circuit that causes a small amout of plate current to flow in the final of the transmitter while the key is up. But W1RHI seems to think that the VR tube keyer is at fault. He has exactly the same parts values in his keyer as given in the diagram of the 829B final. (Fig. 2 in *CQ*.) But he has an adjustable 10,000-ohm resistor for R1 instead of a fixed one.

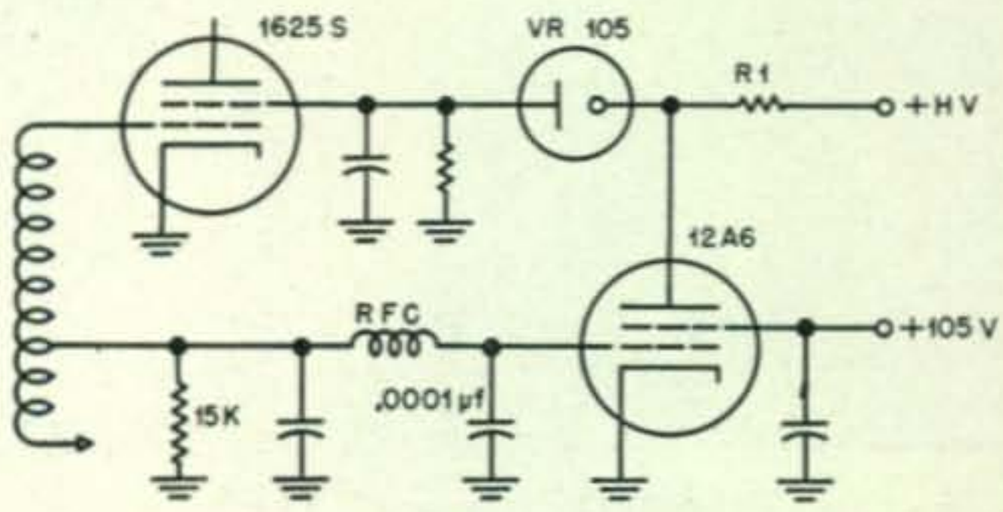
All three of the transmitters are essentially the same in that the finals are grid leak biased. I would like to know if plate current can be expected to go to complete cut-off by simply removing tthe screen grid voltage. If there is a way to obtain complete plate current cut-off with the screen grid voltage removed, would you please tell me about it.

The 25,000-ohm adjustable resistor is so adjusted that the VR tube goes out with the key up and lights up with the key down. The tube goes out completely with key up. There is absolutely no current passed by the VR tube in the key-up position. I have checked this. The main thing I want to know is if final plate current can be cut off completely by removing screen grid voltage while still leaving grid excitation on.

By the way, there is always about 12 ma plate current in the key-up position even with R1 (the 25,000-ohm adjustable) having maximum resistance. The keyer operates right with about 16,000 ohms resistance there.

Herbert Batten

Editor's Note: The author suggests running a high resistance line to the negative supply from the 1625s screen circuit to cut the tubes off completely in key-up position. Also suggested the circuit used successfully at his station for keying the 274N transmitter. The oscillator plate is keyed from a regulated supply and triggers the 1625s as follows:



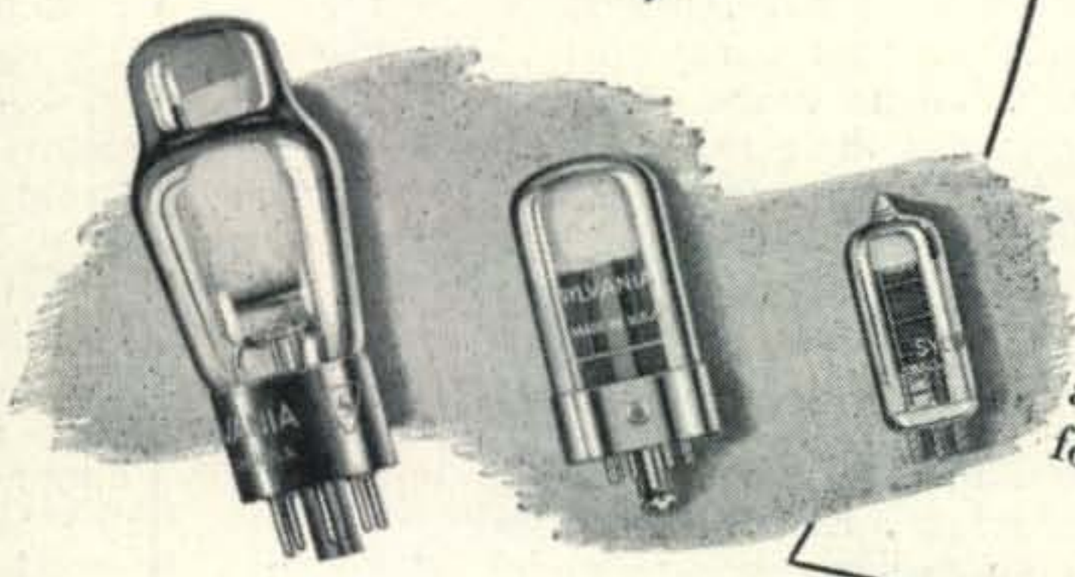
The 12A6 fits in the crystal socket, and the VR105 where the 1629 was.

CQ

Made for you...OM

SYLVANIA TRANSMITTING TUBES

● Now you can get famous Sylvania quality in a comprehensive line of transmitting tubes... triodes, beam power tubes, rectifiers (mercury vapor and vacuum). This line consists of 20 different types that will meet most of your requirements. All of them are made to Sylvania's exacting standards. See your Sylvania Distributor. Send coupon for free descriptive folder.



SYLVANIA RECEIVING TUBES

● Every type you need, from miniature tubes to the rugged Lock-In tubes, can be selected from the complete Sylvania line. Every step in the manufacture of these high quality tubes is controlled to assure you the finest money can buy. Ask for Sylvania *every* time.

SYLVANIA GERMANIUM DIODES

● Compact, heaterless rectifiers for your many diode requirements. See your Sylvania Distributor. Meanwhile send for free copy of "21 Circuits for Sylvania Germanium Crystal Diodes," written *by* and *for* hams.

SYLVANIA ELECTRIC

RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS; PHOTOLAMPS

Sylvania Electric Products Inc.
Radio Tube Division, Advertising Dept., Room R-2403
Emporium, Pa.

Gentlemen: Kindly forward information on items checked.

☐ *Transmitting Tubes* ☐ *Receiving Tubes*
☐ *Germanium Diodes*

Name_____

Address_____

City_____

State_____ Zone_____

Feenix, Ariz.

Deer Hon. Ed:

To you I are coming again to tell you of problems with my good boy friend Scratchi, who are sometimes, I think, just too much trouble what with all this ham stuff coming at wrong times. Like when I want to go to big dance in town or when big Arizona moon just too romantic for anybody to sit inside. But when I are yearning for much spooning, Scratchi always entangling self in matters of single side bands or condensirs or old rigs.

Well, I are reclining in great thought at home one day when that boy Scratchi arrive in big hurry saying he are off on Secret Mission and can not see me for some days. I say what kind secret mission and he just look much secrutive and wink one of those lushus eyes and say he are not telling. I ask if it are for the govermint and he say in a way sort of about govermint proppity. Then he are gone in his little hot rod, leaving me a little mad but most of all wondering.

I pass several days with no word from my Scratchi, and I not wanting to eat much for I are beginning to worry some bits. Finally, Hon. Mama she say why dont I forget all abouts this Scratchi that not worth worrying about. Those are not just the words Hon. Mama used, but I wouldn't want you to think she not always honorable lady. Several more days and I beginning to listen to her. She are saying if I want nice steady mans I should latchi on to Itchi, that good upstanding brother of Scratchi who work on farm and grow lettices and melons and oranges so big Arizona is much proud of him.

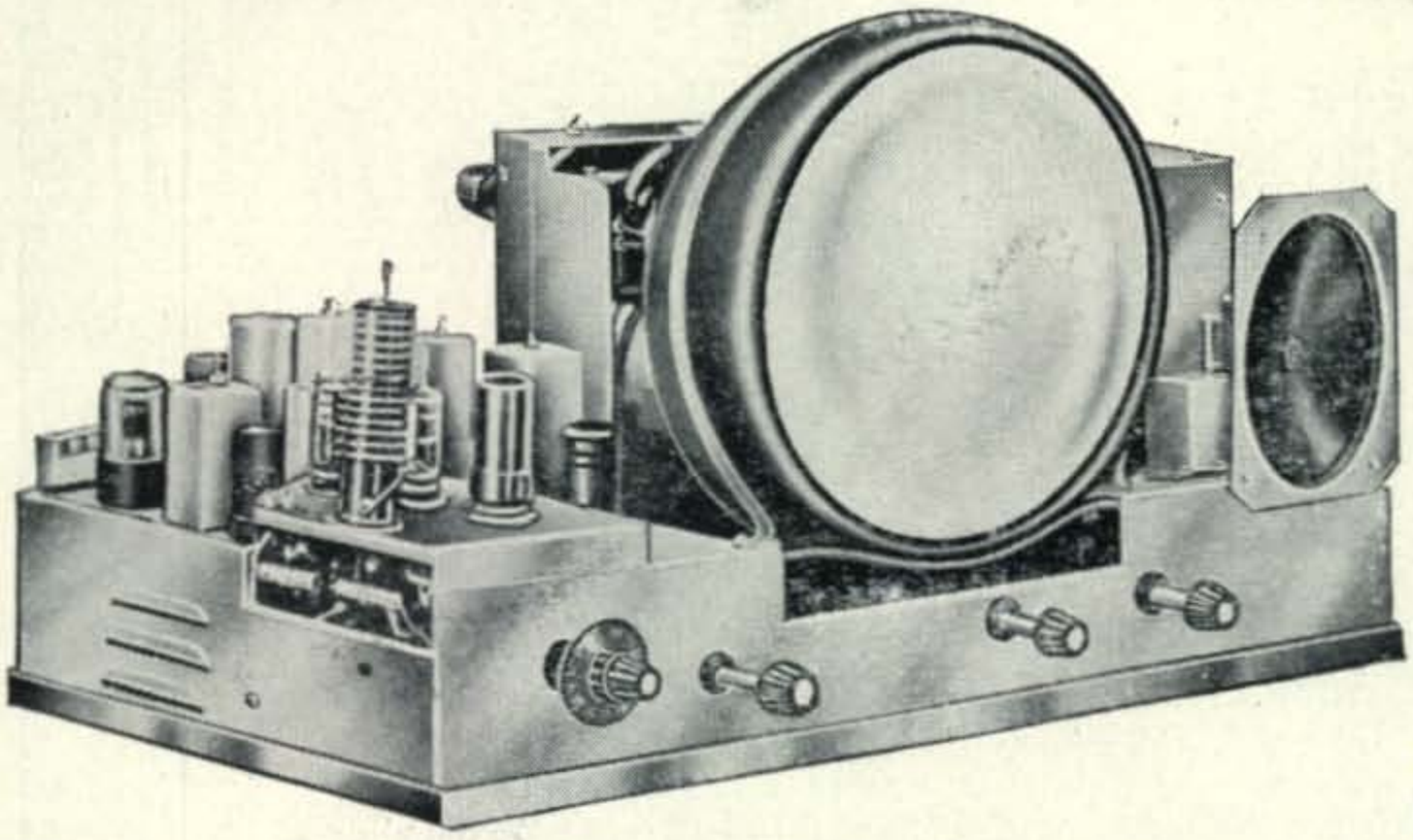
So I calls up Itchi and ask him to come for dinner. When he arrives he seems happy for he say he are lonely for his little brother, who keep things humming at ranch with blowing fuses and falling off poles and much noises from shack. Trubble is, Itchi only has in his eyes for me that look that is right for future brother-in-law and not of big wolf making hay while cat is away. But Lil O. Watanabe, that's I, are not one to sit idly by while eligable male are around. So I says maybe we can go to movie after dinner and mama is smiling happy like and Itchi, so happy and stuffed with mama's good old country cooking, are saying okays by him.

We are getting in the old station wagon Scratchi are having modernized with antennas and portable rigs. Itchi and I are having some argaments over movies to see. Itchi are saying Roy Rogers and I say Gregory Peck. But I snuggles a bit and say Gregory Peck again and so it's Gregory Peck, natch. It is in my thought that Itchi might melt if he are seeing real romantic movie and this are some humdinger of romantic movie with Gregory being most romantic of ever.

(*Continued on page 85*)

Men...You Can Make $150 a Week in Television!

To succeed, you need assemble and sell only 1 Transvision TV Kit a week*



TRANSVISION offers ambitious men an opportunity to get into Television now, and make big money.

Here's our 3-Point DEALER PLAN:

1. Sell high-quality television sets *constructed by you from our TV kits,* at competition-beating prices.
2. Feature our beautiful line of *exclusive custom-built cabinets,* designed and finished to your customers' specifications.
3. *Make profits from resale* of the nationally advertised Transvision line of TV Kits and Accessories.

Dealer Folder No. D-1 shows how you can make $150 a week. Write for it now.

New...Transvision 10" TV Kit (Model 10A)—a Sensational Value!

Gives Bright, Stable 52 Sq. In. Picture—Continuous Tuning

EASY TO ASSEMBLE — SAVES YOU ½ THE COST!

Want a television set for yourself? Want to assemble them for resale at a profit? The new Transvision Model 10A electromagnetic Television Kit (illustrated above) is ideal: Gives a bright, stable 52 sq. in. picture. Has 10" picture tube, and **CONTINUOUS TUNING** on all 12 channels. Its high sensitivity makes for improved long-distance reception; especially good on high channels. Comes **complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.**

Transvision **MODEL 10A TV KIT,** less cabinet.....**Net $199.00**
Transvision **MODEL 12A TV KIT,** same as above, but has a 12" picture tube .....**Net $263.00**

NEW STREAMLINED CABINETS for Transvision Model 10A or 12A TV Kit. Made of select grain walnut with beautiful rubbed finish. Fully drilled, ready for installation of assembled receiver.

Walnut Cabinet for 10A or 12A (Specify).....**Net $44.95**
Mahogany and Blonde slightly higher.

NO TECHNICAL KNOWLEDGE REQUIRED FOR ASSEMBLY!

Transvision's simple step-by-step Instruction Sheet makes assembling a Television Kit a pleasure. Each kit comes complete with all-channel double-folded dipole antenna and 60 ft. of lead-in wire.

Nothing else to buy!

FREE **162 p. Transvision TELEVISION COURSE** ***with purchase of any Transvision TV Kit.***

You don't need this course to assemble a Transvision TV Kit, because the job is easy enough and our instruction sheet is simple and clear. BUT, if you want a *good introduction to television fundamentals* as a basis for further study, the Transvision Television Home-Study Course is ideal. *Remember, you pay nothing extra for this course.* Ask your distributor.

BUILD YOUR OWN CABINETS...

Low Cost . . . Big Value . . . Big Profits!

Build and sell beautiful Television Sets with Transvision's "MODULAR" CABINETS . . . supplied in knockdown, unpainted form. *Easy to assemble.*

Transvision's "MODULAR" Cabinets come in *knockdown, unpainted units,* offering an unlimited range of combinations, including even a bar. Finish them off *to suit any living room, den, office,* etc. The units are simple and practical in design, and require as little as ½ hour per unit for assembly.

Corner piece, shown above, has room for *Television, Phono, Record Storage,* and *Open Book Case . . . COMPLETE Net $84.00.* For other units and prices, *write for "Modular" Catalog.*

All Transvision Prices are fair traded; subject to change without notice. Prices 5% higher west of the Mississippi.

TRANSVISION, INC., Dept. CQ, NEW ROCHELLE, N. Y.

For FREE 20 p. TV BOOKLET, Dealer Folder D-1, and Catalog, See Your Distributor-

NEW YORK, N. Y.
PALLADIUM TELEVISION CORP.
785 Third Avenue
PHILED TELEVISION CORP.
Room 1405
142 Liberty Street

BROOKLYN, N. Y.
TRANSVISION OF BROOKLYN
485 Coney Island Avenue

STATEN ISLAND, N. Y.
B. & D. DISTRIBUTING CO.
Staten Island 5

LONG ISLAND, N. Y.
ELECTRONIC SUPPLY CO.
40-14 Greenpoint Avenue
Long Island City, N. Y.
ISLAND RADIO DISTRIB. CO.
412 Fulton Avenue
Hempstead, Long Island, N. Y.

WESTCHESTER, N. Y.
RADIOMART
149 Riverdale Avenue
Yonkers, New York

SYRACUSE, N. Y.
NORTHERN DISTRIBUTORS
517 Butternut Street

NEW JERSEY
NIDISCO JERSEY CITY, Inc.
713 Newark Avenue
Jersey City, New Jersey; also—
Cliffside, Passaic, Trenton
TRANSVISION OF NEW JERSEY
601 Broad Street
Newark, New Jersey

BOSTON, MASS.
TRANSVISION OF NEW ENGLAND
1306 Boylston Street

PHILADELPHIA, PA.
TRANSVISION OF PHILADELPHIA
235 North Broad Street

WASHINGTON, D. C.
STAR RADIO
409 11th Street, N.W.

CHICAGO, ILL.
TRANSVISION OF CHICAGO
1002 South Michigan Avenue

LOS ANGELES, CAL.
TRANSVISION OF CALIFORNIA
8572 Santa Monica Boulevard
Los Angeles 46

SAN FRANCISCO, CAL.
TRANSVISION OF CALIFORNIA
3471 California Street
San Francisco 18

ZERO BIAS

EDITORIAL

DID YOU EVER have a bad cavity in one of your teeth—where the nerve was exposed and every time you took a cold drink the pain was stabbing? You may not want to visit the dentist—but you do! The only relief you can get from the pain is by effecting a cure. So you do something distasteful and go to the dentist, only because of necessity—but the result is you're a lot better off.

January's editorial might be compared to a dentist's probe, to a dash of cold water on an exposed nerve. It hit home and it hurt. Hams don't like to be called quitters, but when you get down to solid bedrock, that is just what lots of them are—being quitters by staying off the air because of TVI. And we intend to probe in the cavity until amateurs take the only way out—by effecting a cure.

A hundred times, a thousand times, it's been the same old story of going over and over again with amateurs the facts of television interference. There is no sure-fire cure. There are many individual steps, the cumulative results of which are substantial. There are some hopeless cases of TVI at the moment. There are some situations where little can be done with completely impossible neighbors. But looking at the field in its entirety there is a vast amount that can be done that hasn't.

Don't let TVI put you off the air.
Cooperate, but OPERATE!

How many amateurs have documented charges of unscrupulous practices by service installation men? Of course we know of their existence. How many radio clubs have inaugurated club programs to pool their combined knowledge? How many clubs have entered cooperative programs with television distributors in their neighborhoods? What actual percentage of amateurs have taken preventive measures with their transmitters? What we need to lick the problem of TVI is action—not only action on the part of the amateur, but everyone connected with the TV industry.

Improved models are being released all the time. Unfortunately, they are accompanied by release of cheaper sets where quality has been sacrificed in the face of economy. But if the ham is relatively free from causing interference he doesn't have to worry about TVI in the TV midgets—it will become a problem not unlike cigar store radios. The FCC will back the ham, the public can be made to realize that it *is* the fault of the set, and manufacturers will have their higher price line to push should they have no alternative. Some of the letters we're receiving indicate a fighting spirit. Here are a couple of typical ones——

722 Savannah Ave. Wilkinsburg, Pa.
Editor, CQ:

Your editorial on the retrenchment of the amateur brings forth this letter. After much thought about the matter of TVI, I believe that the amateur is the forgotten man, and I mean completely forgotten. . . .

The public will buy any sets, whether good or bad, and then blame the amateur for all the interference that may happen to their "squint boxes." To this, add the action of many service men who do not know what else to do but blame the amateur.

If we are to continue to exist we must continue to operate. Let us suppress our spurious and harmonic radiations to a minimum, but continue to operate and not go into hiding. We have a very bad situation to contend with. But first do not stop operating! We must make the set manufacturers do something about this setup . . . Your operating time must be kept up and protests placed where they do some good.

Chris E. Hobson, W3AER

---

37 Longfellow St., Baldwin, L.I., N.Y.
Editor, CQ:

I read with interest your editorial on TVI in the January issue of CQ. While I agree with you in general, I don't think all the blame is on the amateurs' side.

Here we are, legally licensed to operate our rigs, and the FCC says if the second harmonic is down 40 db, we may consider our transmitters to be operating properly. But in 90 per cent of the cases, this 40 db does not clear up the interference. Also, the letter the FCC has recently released to the TV set owners explains the cause of TVI and what they may expect in reception, but does nothing to cure the problem. So where are we? Still off the air.

In my own case I have no method of measuring the reduction in db, but have been using a wavemeter with a 0-200 microammeter. Originally, with it closely coupled to the feeders, the needle went off scale. Now I have it down to the point where I cannot get any indication of second harmonic at all. It seems to me this must be quite a large attenuation ratio, yet I still cause trouble in sets 75 to 100 feet away.

The television set manufacturers should be made to share some of the burden, such as putting in efficient traps in the i.f. and in the antenna circuits. All we hear of are more and more gadgets for the ham to try, but never any mention of improvements being made in the TV set.

I have spent many hours trying out different ideas to clear up the interference, and am getting pretty well disgusted with the whole thing. After all, when your fundamental is blasting open the

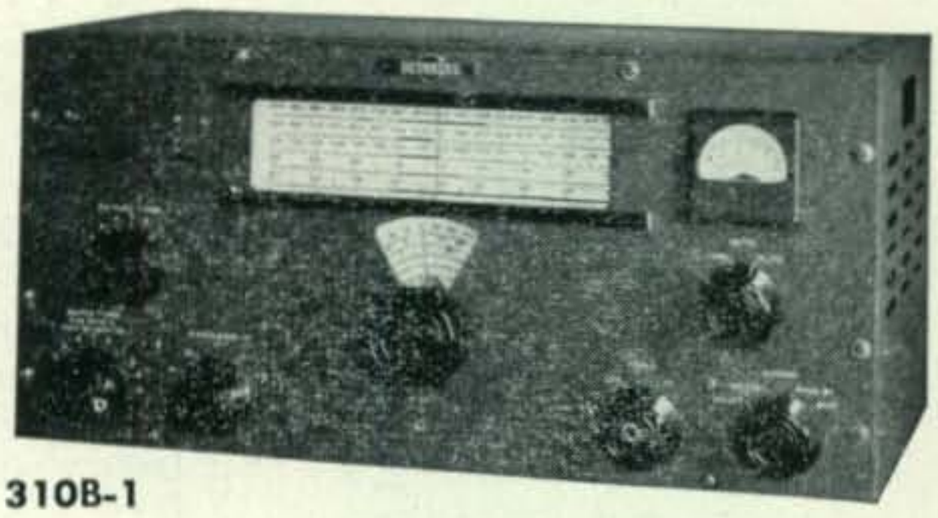
(Continued on page 89)

More contacts, more quickly, easily, with a . . .

COLLINS PTO Exciter Unit

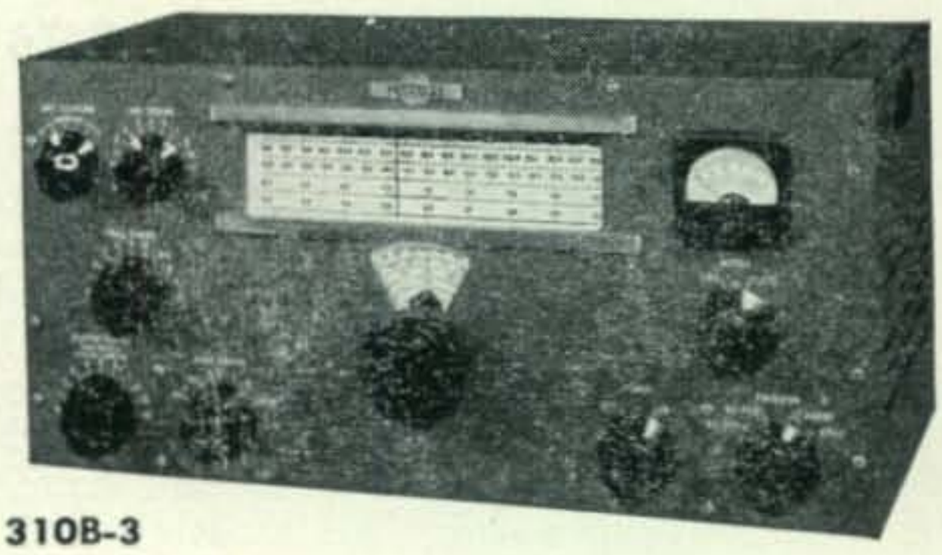
All these Collins exciters give you the flexibility of variable frequency, with the accuracy of calibration and remarkable stability inherent in the 70E-8A PTO around which they are engineered. The slide rule dials of both the 310B series and 310C series roughly indicate operating frequency, while their vernier dials read directly in kilocycles. See them at your Collins dealer's. If you don't know him write us for his name and address.

The 310B-1 is a versatile, self-powered unit with an input of 40 watts on all ham bands under 32 mc. It is bandswitching with the exception of the final amplifier, where plug-in coils are used. Output coupling is by means of a link in the plate tank coil. The tube complement consists of 1—6SJ7 PTO, 3—6AG7 multipliers, 1—2E26 r-f amplifier, 1—6SL7GT sidetone oscillator, 1—5R4GY H. V. rectifier, 1—5Z4 L. V. rectifier, 1—6H6 bias rectifier, 1—VR105 voltage regulator, 1—VR150 voltage regulator. Price, $190.00.

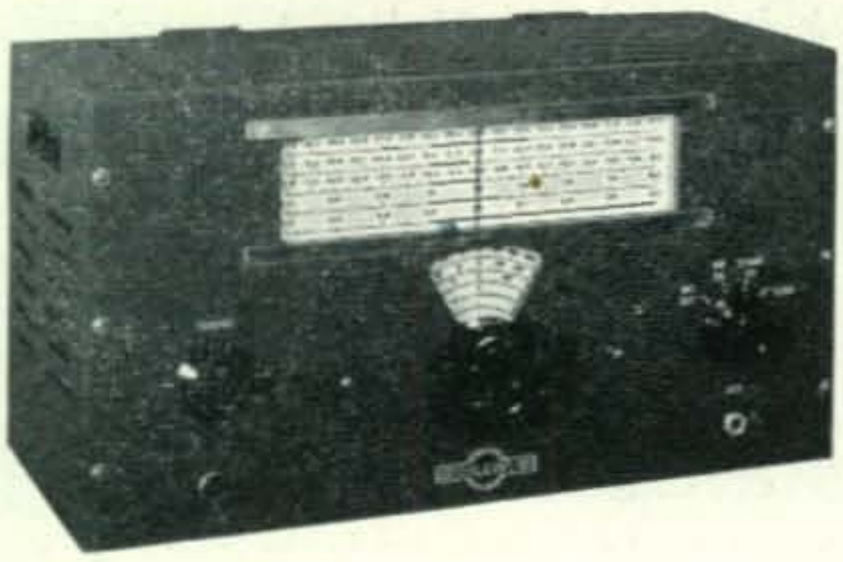


310B-1

The 310B-3 has a series-parallel tunable matching antenna network, of the universal type, which will match balanced or unbalanced antenna systems over a wide range of impedances. Otherwise it is identical with the 310B-1. It makes a fine standby transmitter, is excellent for spot frequency network and, because of its low power requirements, for emergency work. Also, it is unexcelled for the beginner. Later, when more power is called for, he has only to add the final amplifier stage. Price, $215.00.



310B-3



310C-1 and 310C-2

The 310C-1 exciter is a straightforward unit consisting of a 70E-8A and a multiplier, with an r-f output of approximately 80 volts rms across 40,000 ohms. Its output frequency range is from 3.2 mc to 4.0 mc. The output of the 310C-1 can be plugged into the crystal socket, or applied to the grid of an 807 buffer stage, providing crystal accuracy and stability with greater versatility than a large number of crystals would afford. Price, $85.00.

The 310C-2 is identical with the 310C-1, but with self-contained power supply. Price, $100.00.

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

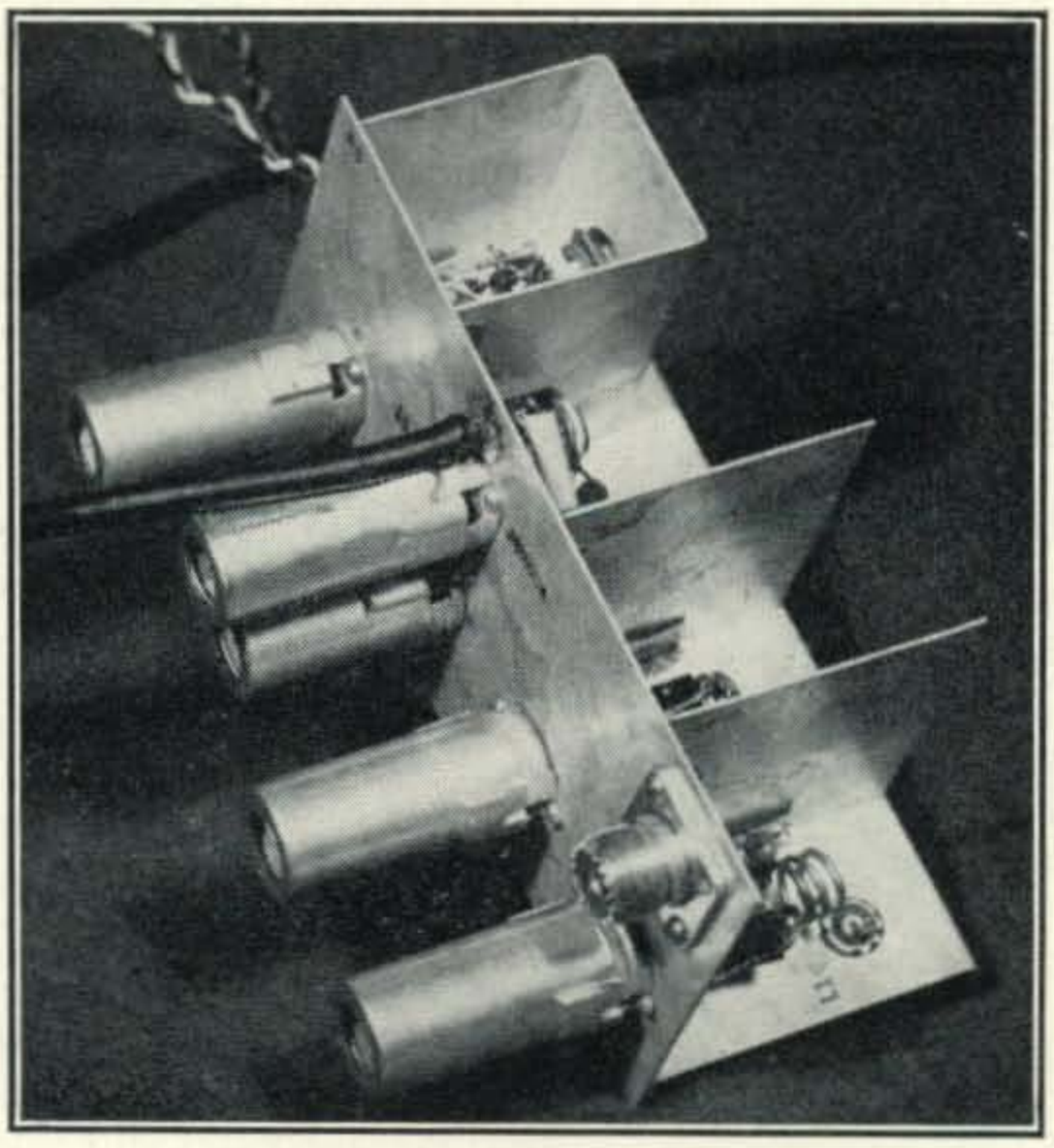
11 West 42nd Street, New York 18, New York **458 South Spring Street, Los Angeles 13, California**

A Low Noise V-H-F Converter

JOHN E. STACY, W1KIM*

Inherent tube and circuit noise can effectively mask all but strong v-h-f signals. How this problem can be licked is described in this article on an outstanding unit. Build it and you, too, can have a "hot" 2-meter location.

THE PROBLEM of noise at v.h.f. is assuming greater importance with present-day superheterodyne receivers. Even with the best of the conventional types of receivers, internal set noise is invariably the limiting factor with regard to usefulness. Apparently many are content in believing that little, if anything, can be done about noise above 30 mc and particularly at 144 mc. This thought in general comes about by extending methods and techniques used at frequencies below 30 mc. For example, the general input circuitry and tube types used at 144 mc are very similar to those seen at the very low frequencies. During the past two years the 6AK5 pentode has been worshipped by many operating 2-meter receivers, merely because it lived up to its high standards at 10 meters. One popular conception at 2 meters is that the terrific gain of a 6AK5 pentode will solve the noise problem. Obviously, this is erroneous since even the 6AK5 pentode cannot distinguish between noise and signal and the signal-to-noise ratio for a given signal is not changed.



Departure from conventional chassis permits unusually compact layout.

What can be done to decrease the noise in a v-h-f receiver? Actually much can be done in this respect, but just a little understanding of noise in receivers may help to solve the problem. All the potential sources of noise will not be mentioned, but rather those pertinent to improvement on a large scale of the over-all noise figure. In a broad classification noise may be listed as:

1. That external to the receiver, or antenna noise.
2. That generated within the receiver via several mechanisms.

As a rule, below 30 mc, antenna noise is several times the inherent receiver noise even with pentode inputs. However, at 144 mc the converse is true and usually all attention is devoted to the receiver since little can be done to the antenna noise. The Johnson noise voltage generated within the antenna radiation resistance therefore will be neglected entirely. Looking at the receiver input stages, the major contributions to building up noise voltages are thermal agitation or Johnson effects within the circuitry and the many inherent tube noises. Tube noises are composed mainly of shot-noise (Schottky effect), partition noise due to current division, usually of consequence in pentodes, and induced noise at extremely high frequencies.

In the v-h-f converter to be described, much attention has been devoted to the proper selection of input tubes. Since tube noise is inherent one might infer that some tube types display optimum quantities of noise. This is true and the proper selection of input tubes depends upon several parameters. In mentioning shot effect earlier it should have been stated that its relative magnitude and contribution can be resolved as a fictitious resistance R_{eq}.[1] This resistance can be shown approximately for triodes as:

$$R_{eq} = \frac{2.5}{gm} =$$

Equivalent noise resistance and for pentodes

$$R_{eq} = \frac{I_p}{I_p+I_{sg}} \left(\frac{2.5}{gm} + \frac{20I_{sg}}{g^2m}\right)$$

I_p = Plate Current; I_{sg} = Screen Current

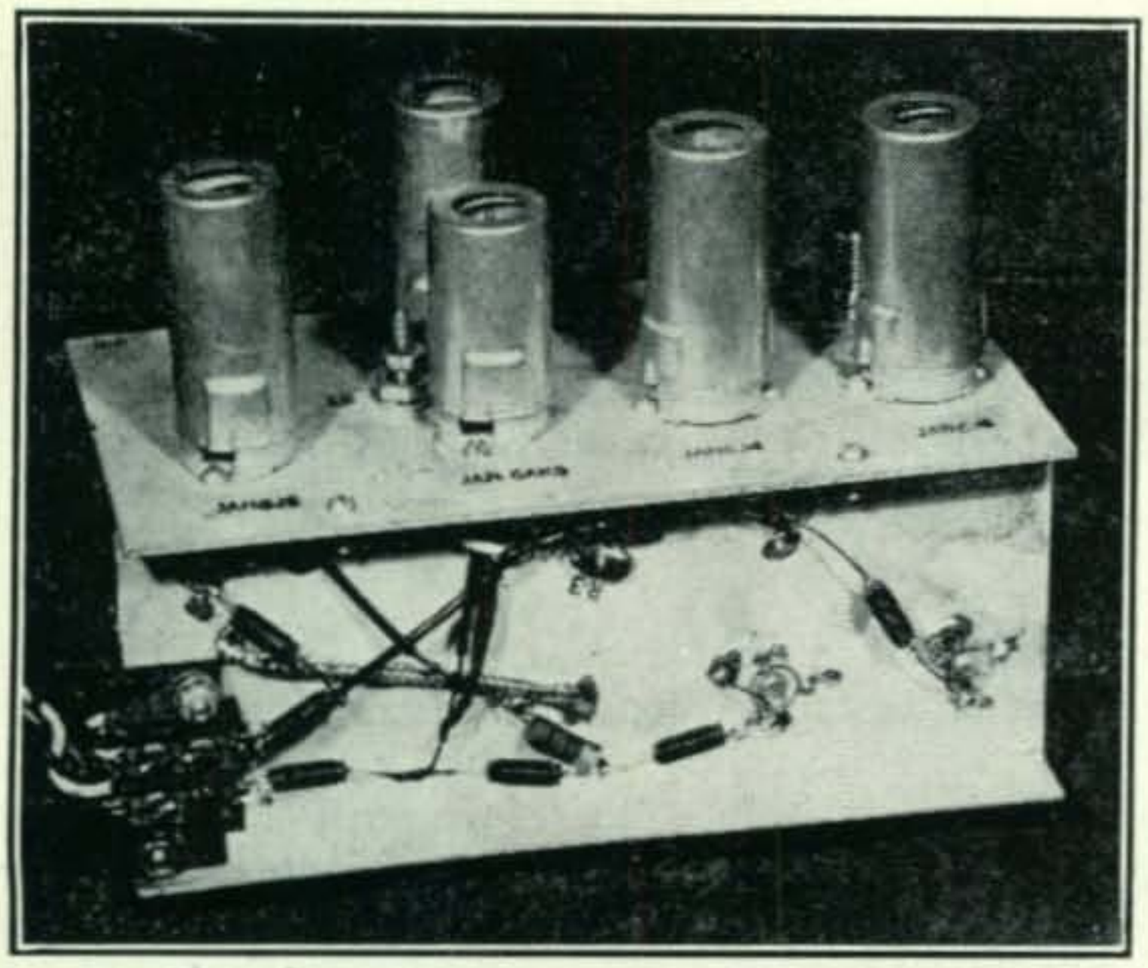
Since it is desired to have as low as possible a value of R_{eq} this suggests immediately that pentodes should be omitted. This thought is further substantiated since it was mentioned that partition noise contributes much to noise. Some values of R_{eq} are shown here for comparative purposes.[2]

Obviously our choice should be a triode—but which one? Other considerations for our choice

*Laboratory for Electronics, Inc.,
11 Leon St., Boston 15, Mass.

1 W. A. Harris, RCA Review, April, 1941.

2 Ed. Note: For a detailed discussion see "Some Notes on Noise Theory and its Applications to Input Circuit Design," by Wm. A. Harris, RCA Review, Vol. IX, No. 3, Sept., 1948.



Unusual chassis construction permits wiring on both sides of converter chassis plate.

of input tube should be power gain, input and output capacities, and input conductance. If the first tube has a large power gain then subsequent stages contribute little, if any, noise. This suggests that the tube have a large value of *gm*. The tube capacities are mentioned only with thought toward broad-band operation. Input conductance increases with frequency for any given tube type and so the induced noise voltages vary accordingly, although for triodes it is quite small. Generally speaking a tube should be recommended specifically for v-h-f operation in its data sheet to assure low input conductance. With all these parameters in mind, at 144 mc for instance, one might choose the 6J6, 6AK5, or 6J4 triodes as the ideal input stage.

The noise figure of a triode stage is essentially the same regardless of which element is grounded.[3] However, it is well known that a triode shows great instability when used as a grounded cathode stage and requires neutralization. When properly neutralized by ordinary methods, both noise figure and stability are good but as excursions are made from the original center frequency both properties suffer. If such a stage were properly neutralized, it would have the advantage of extremely high power gain so that any following stage would contribute only negligible noise. In the grounded-plate circuit it is even more difficult to realize stability and the available power gain is less than unity. The remaining circuit is the grounded-grid arrangement. This category assures high stability with proper triodes (having low plate-to-cathode capacities). Its only disadvantage is the rather low power gain and it is usually necessary to use two or more cascaded stages as a result to assure reduction of following stage noise. The cathode-driven stage, as it is sometimes referred to, offers a major feature not to be overlooked—that of simplicity. Indeed, except for the necessity of two stages, much of the usual complicity is absent.

Calculation of the minimal noise figure at band center for two grounded-grid stages is rather tedious and will not be included here. However, some remarks relative to the optimum noise figure may be in order. In the usual grounded cathode amplifier the best noise figure does not come about with perfect match of signal source and input grid. In fact, it can be shown that a proper match deteriorates the noise figure more than 3 db. On the other hand this same situation does not apply to cathode-driven stages. In this respect grounded-grid stages are ideal where a match and good noise figure are to be realized. Actual laboratory tests showed that an over-all noise figure of 5.5 db can be realized at 144 mc for two stages of 6J4 types (bandpass of 4 mc and source impedance of 50 ohms).

It will be noted that so far all reference to noise has been by way of noise figure rather than signal-to-noise ratio. Actually, when a receiver is said to have a signal-to-noise ratio of so much, the meaning is somewhat ambiguous. Supposing that for a certain signal the ratio is 10, for another signal it may be only 5! Obviously a receiver cannot be absolutely rated by way of signal-to-noise ratio. On the other hand, noise figure is an order of merit that compares the actual noise level of a receiver to that of a theoretical noise-free receiver. This comparison is made for a given fixed bandwidth, since noise is a random phenomena. The ideal receiver would contribute no noise, only the source noise (antenna) would be evident. If we assume that the antenna Johnson noise[4] is 1 and the ideal receiver noise figure is 1, then the over-all noise figure in the ideal case is 2. Expressed in db the best noise figure for a receiver is zero.

Description

The low-noise converter disclosed here is one of two designed after consideration of the aforementioned information on noise. The second and somewhat different converter will be described in a subsequent paper. The complete circuit is shown in *Fig. 1*. Two cascaded 6J4 types in grounded-grid are employed as r-f amplifiers broad-banded over 4 mc at 144 mc and 5 mc at 220 mc. The input impedance offers a good match for 50 to 100 ohms. No tuning of these stages is necessary after once

3 Ed. Note: "Notes on Noise Figures," by Harold Goldberg, **Proceedings I.R.E.**, Vol. 36, No. 10, Oct., 1948.

4 The noise voltage generated within a resistor is given by the familiar Johnson form: $E^2_n = 4KTRB$. This form also applies to the input resistance in an amplifier.

TABLE I

	R_{eq}
Triodes	
9002	1150
6C4	1140
2C40	520
6J6	475
7F8	440
6F4	430
6AK5	385
6J4	210
Pentodes	
9003	13,000
9001	6600
6AK5	1880
6AG5	1640

set. The mean gain per stage is 5, or 25 over-all. The mixer is a triode-connected 6AK5 whose output circuit is tuned to 14 mc. The i.f. is fed directly into a 6C4 cathode follower whose output impedance is approximately 250 ohms. Tuning is accomplished through the local oscillator operating on the low side of the input signal frequency. A half-section 6J6 is used in a converted Colpitts oscillator. The 3 db over-all bandpass of the converter is about 150 kc so that tuning may be trimmed via the low-frequency communication bandspread dial.

Sub-Chassis Construction

Following the techniques used in high-gain i-f systems during the past several years, a similar physical design was used for the sub-chassis. It was desired to use straight line layout of all stages and run all leads carrying voltages beneath the chassis. These precautions insure a minimum possibility of regeneration within the unit. With the stages aligned in a row a minimum of coupling is present in the ground currents. Since all voltages are kept below the sub-chassis and decoupled before brought through, the coupling by way of the power leads is minimized. Originally, it was planned to mount the tubes on the inverted chassis with the envelopes protruding below with the voltage leads. This offered some inconvenience, such as crowding of components and lack of suitable mounting methods. It was decided that a panel attached to the chassis (as shown in the photos) would best serve the purposes of mounting the tubes. The sockets are spaced close to the sub-chassis so that the terminals are readily available. The layout of all chassis members is shown in *Fig.* 2. Included are two inter-stage shields and oscillator housing. The shields are self-explanatory in make and purpose. They are slid into anti-rattle clips which have been previously soldered to both chassis and panel. Such removable shielding members permit access to all wiring. Silver plating[5] all members is definitely advisable not only for electrical reasons but also for purposes of corrosion prevention. Even copper or brass is prone to slow oxidation. If steel is used for economical reasons, it is suggested that it first be lightly copper plated. Maximum silver plating need only be of the order of three ten thousandths.

R-F Stages

The virtues of the 6J4 cannot be over emphasized for use in the first stages. Extremely high transconductance (gm = 12000 μmhos), low equivalent noise resistance (210 ohms), and excellent grid shielding (C_{pk} = .24 $\mu\mu$f) make this tube type a unanimous choice. The input circuit in the converter is simple since it is strictly non-critical. The input impedance is approximately $1/gm$ or 85 ohms.[6] With such loading the input bandwidth is roughly 100 mc. Obviously the value of L_1 is not critical and can be off by a factor of three. L_1, as used in the converter, was chosen equal to .1 μh for 144 mc. The coil is a coaxial bi-filar type.

5 Almost every town has a gift shop or jewelry repair shop that will silver plate small parts for very little cost.

6 Ed. Note: The input impedance of a grounded grid amplifier is also a function of the load impedance between plate and cathode.

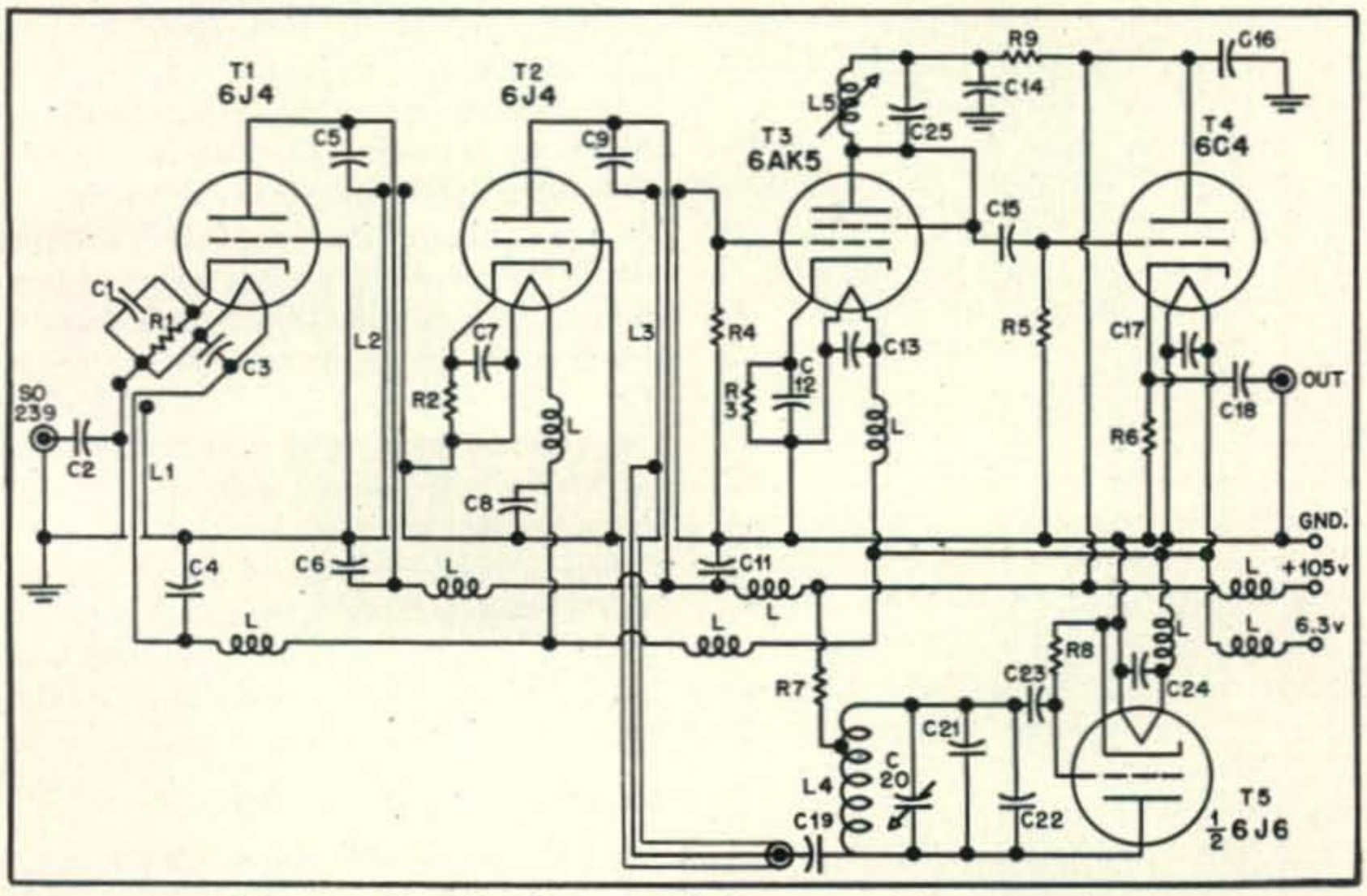


Fig. 1. Circuit diagram of the complete converter.

C1, C2, C3, C13, C17—220 $\mu\mu$f, ceramic (Erie).
C5, C7, C9, C11, C23—220 $\mu\mu$f, silver mica (El Menco CM-15).
C4, C6, C8, C12 C24—200 $\mu\mu$f, silver button (Erie).
C14, C15, C16, C18—1000 $\mu\mu$f, ceramic (Erie).
C19—2 $\mu\mu$f, ceramic (Erie).
C20—102 Johnson variable.
C21—3-25 $\mu\mu$f, ceramic trimmer (Erie).
C22—5 $\mu\mu$f, ceramic, (Erie N680).
C25—47 $\mu\mu$f, mica (El Menco CM19).
R1, R2—100 ohms, ½ w.
R3—2200 ohms, ½ w.
R4—4000 ohms, ½ w.
R5—47K, ½ w.
R6—1000 ohms, 1 w.
R7—1000 ohms, ½ w.
R8—18K, ½ w.
R9—750 ohms, ½ w.
(All resistors Allen Bradley, or equivalent)

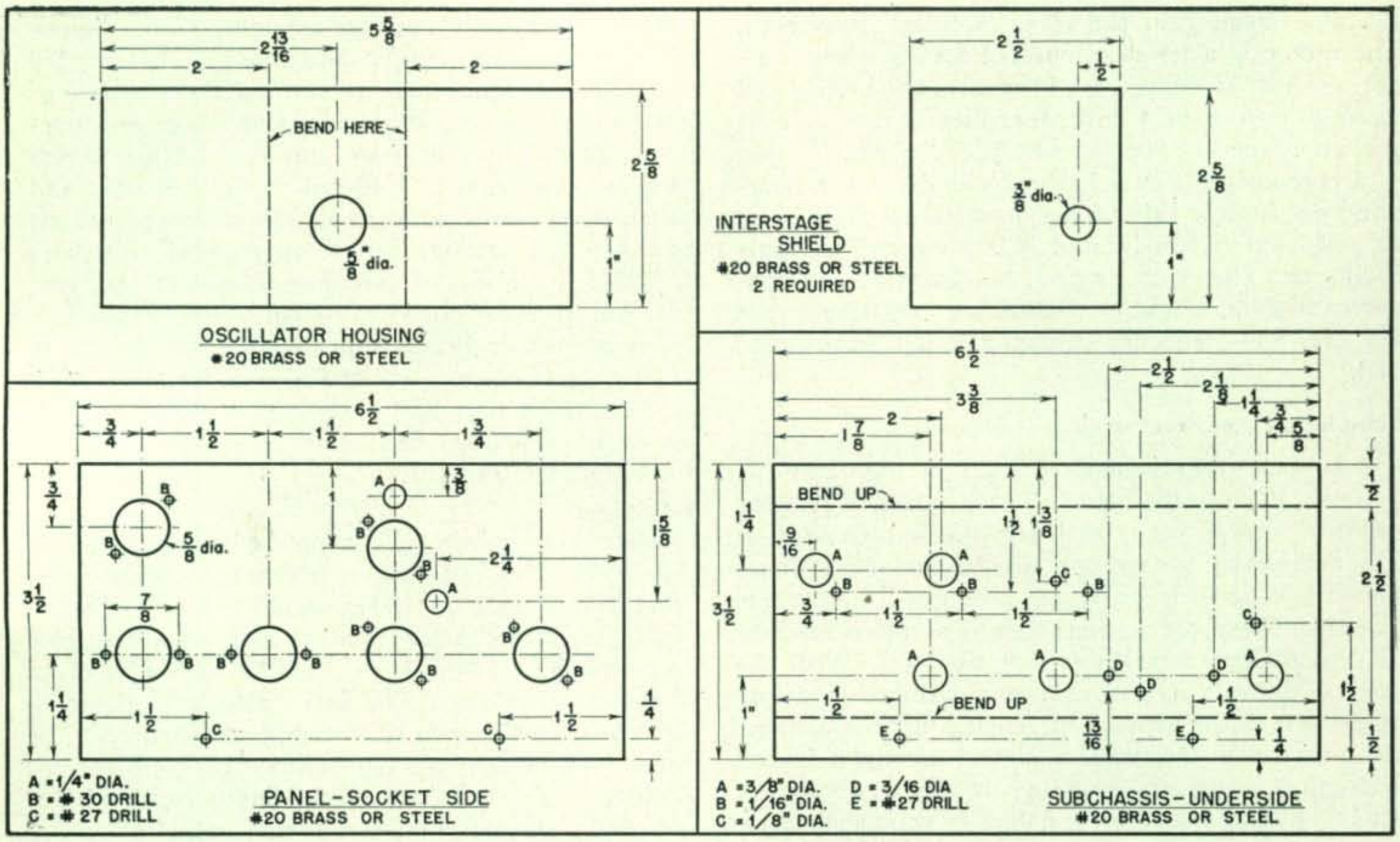


Fig. 2. Mechanical layout of metal work for converter.

Since the heater-to-cathode capacity must be eliminated from the tuned circuits it is best done by elevating the heaters to the r-f level of the cathode. The inner wire, #24 Formvar, carries one heater leg. Unity coupling assures equal r-f potential for both inner and outer coils. The other heater leg returns on the outside of the coil which also carries the signal current. The coil is made of 1/16" silver-plated copper tubing.

The Formvar insulation may be removed by passing the ends through a match flame. Capacitor C_1 should be a high-grade silver mica, although actually any good condenser with as little lead inductance as possible should work nicely. It is suggested that the E1 Menco CM-15 variety be used. Pins *1*, *5*, and *6* should be tied together at the center tube and grounded to the sub-chassis directly below. This *must* be a perfect ground and if a heavy soldering iron is not available, a turret lug will provide a good ground. The coil L_1 should also be meticulously grounded. A 1/16" hole, as shown in *Fig. 2*, should be used to feed the cold end of L_1 through the chassis before soldering. Actual positioning of the various components is best seen in the photographs. Antenna coupling capacitor C_2 may be tapped anywhere in the top half of L_1 without any appreciable difference in noise figure.

Coils L_2 and L_3 are the semi-critical components; that is, they require some attention relative to tuning. These inductances are similar to L_1 except for value. In the case of L_2 the inner lead carries plate voltage and part of the outside carries heater voltage for the second 6J4. The other heater leg is elevated by way of a self-resonant choke L. Generally both stages are quite the same in principle. The cathode of the second stage is tapped up on L_2 to give an interstage bandpass of about 6.5 mc. This point is 1½ turns from the cold end for 144 mc. The output of the second stage is loaded to give a bandwidth of 6.5 mc. with resistor R_4. The formula, bandwidth $= 1/2\pi RC$ gives 1800 ohms for R_4 where the total capacity is 12 $\mu\mu$f.

However, due to the input loading of the 6AK5 mixer and circuit losses the value of R_4 should be 4000 ohms. The over-all bandwidth will be smaller by a shrinkage factor of .65 or approximately 4 mc. This means that the gain will not vary more than 3 db over the two-meter band. The over-all power gain is 15 db which is ample to eliminate successive stage noise. The decoupling networks are found below the sub-chassis. Capacitors C_4, C_6, and C_8 are silver button mica types and were found to be the best for the purpose at these frequencies. The values of L are found in the coil table. Half-section 6J6 tubes were tried in place of the 6J4 types and the gain and noise figure suffered substantially. Instability was also noticed due to the higher C_{pk}.

The Mixer and Cathode Follower

No actual sound reason can be given for selecting a 6AK5 as a mixer tube. Since the mixer introduces no appreciable noise the only considerations were input conductance and conversion transconductance. Some tubes with good qualifications which may be substituted for the 6AK5 are 6J6, 6J4, 6AS6, 6AG5, etc. Proof that the mixer added no noise was shown when the 6AK5 was operated as a pentode. If it is used as a pentode, the bias-resistor value should be changed to 1000 ohms. The

i-f coil is wound on an LS3 form with the brass portion of the slug removed. Any suitable form should be adequate. It should be noted that if an LS3 form is used, the winding should be kept a 1/16" or more from each terminating lug. The precaution will assure highest *Q*. The i-f signal is fed directly into the 6C4 cathode follower grid.

Very little can be said about the follower. It was felt that its use was the best method of coupling into the low-frequency receiver. It is conventional in every detail. The load resistor is not critical. It merely fixes the quiescent current level. The approximate output inmpedance is 250 ohms which is a fair match for most communication receiver inputs. A 6J6 offers a lower output impedance as do other high *gm* tubes. The output cable is the low capacity RG62U variety and it offers very little discontinuity for short lengths at this frequency. A recommended length it three feet.

The Oscillator

A half-section 6J6 performs very well in the circuit shown. A 6C4 will work equally as well. The circuit is quite simple physically. Pins *1*, *4*, *6*, and *7* are bent over and soldered to the center tube which in turn is grounded to the sub-chassis. This leaves pin *2* as anode, pin *3* as heater, and pin *5* as the grid. The coil L_4 should be mounted directly on the tube socket via pin *2* and capacitor *C23*. The "750" negative coefficient condenser, C22, should be not more than 5 $\mu\mu$f. With a smaller coefficient it may be as large as 10 $\mu\mu$f. These values are given to prevent over-compensation. The condenser should be mounted resting upon the socket body so that it will assume the temperature of the socket. Since most of the drift is caused by socket heating, actual drift caused by the 6J6 is less than 25% of the total drift as shown by insertion of cold tubes. The total drift as checked on several converters averaged 25 kc and 90% of this occured within the first few minutes.

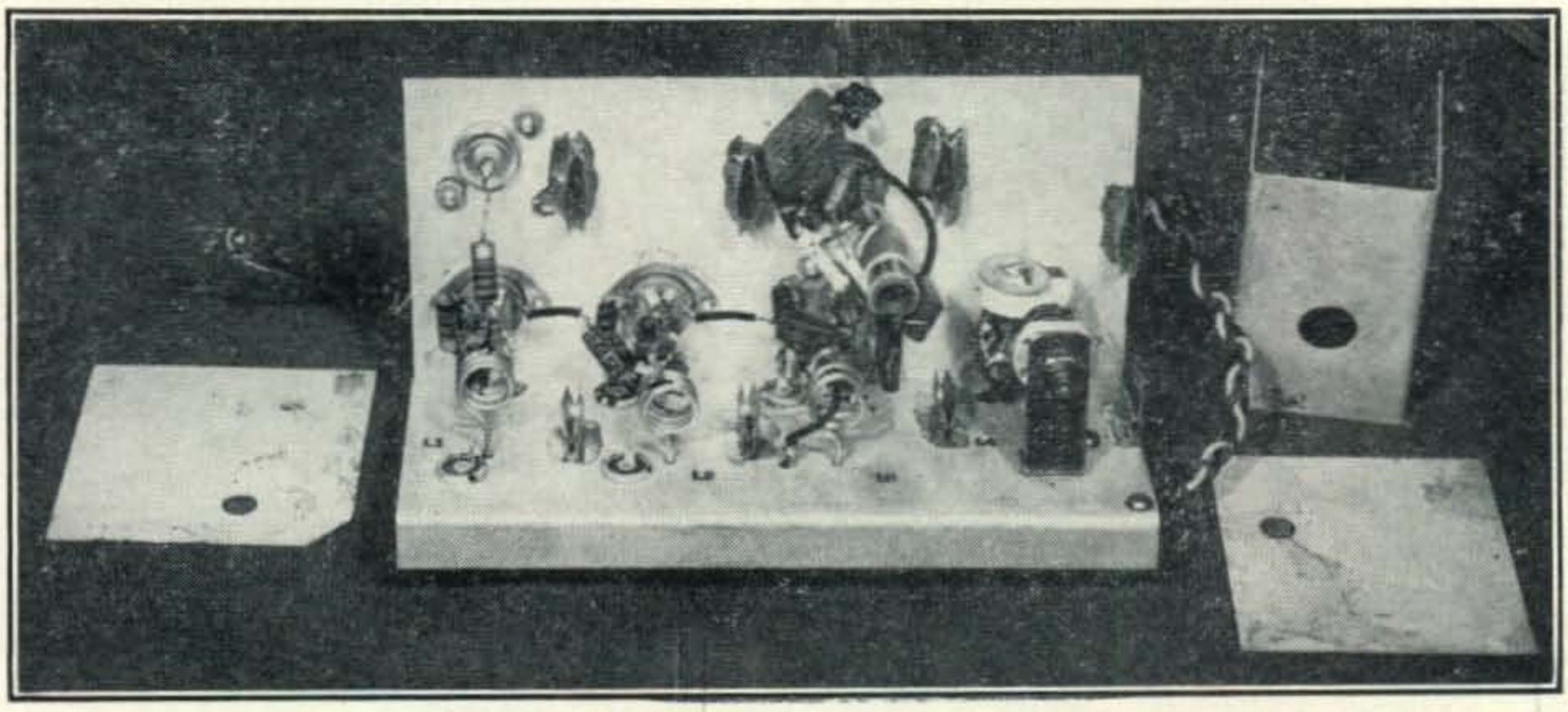
With the oscillator housing removed the same order of drift consumes somewhat more time. With the values given the ceramic trimmer (do not use a negative coefficient trimmer) will cover a spectrum large enough to set the oscillator below or above the signal frequency. Local oscillator injection voltage is taken from the plate through a 2-$\mu\mu$f condenser. The feed runs below the sub-chassis through a shielded lead and emerges close to the cold end of L_3. The shield must be well grounded at both ends. The position of the injection lead on L_3 may seem surprising but it seldom has been more than two-thirds turns from the cold end. Cut and try is probably the method to be used to determine best output. If a vacuum tube voltmeter is available, the measured value of *LO* injection should be about 1.5 to 2.0 volts at the mixer grid. Both high and low oscillator frequencies were tried with no appreciable difference. The low side was chosen since it seemed to exhibit no pulling and less drift. Of course, all tuning should be made with the shielding member in place. With the midget Johnson condenser half closed the ceramic trimmer should be set for 132 mc or 160 mc if a 14 mc i.f. is used.

Tuning of the converter by tuning the oscillator means that every signal can be peaked. This is indeed an important feature. In conventional gang-tuned circuits, it is impossible to obtain on-center tuning over a range greater than the bandpass of the system due to the inherent error in tracking. Since most low-frequency receivers have band-spread tuning, it is fitting to use this as a trimmer in conjunction with the oscillator tuning.

Assembly and Tuning

After the chassis has been completely assembled, including the spring clips to hold the shields, the order of development is routine. Sockets are mounted, ground circuits completed, heater circuits wired, coils mounted, silver buttons mounted, oscillator-tuning condenser mounted, etc. Undoubtedly, everyone has his own methods and procedures. V-H-F experience is helpful but not at all necessary.

Alignment is best and easiest done with proper equipment. However, since all coils are pre-tuned by their nature, alignment can be accomplished with no equipment. A good antenna system and a few helpful signals are all that is needed. The antenna tap may be fastened one-half turn from the cathode end to start. After the tuning is complete one may seek the optimum setting of this tap. L_2 should be tapped 1½ turns from cold end and L_3 one-half turn from the cold end. With the



Looking at the converter from the rear with the three removable shields unfastened from their spring clips.

converter output cable connected to the communications receiver and the r-f gain advanced to a point where noise is evident, search may be made for the i.f. A slight increase of noise will indicate the frequency of L_5. It may then be adjusted to 14 mc or to any frequency desired.

Then the oscillator ceramic trimmer may be rotated in search for a signal. When a signal is located then the coils L_3 and L_2 may be physically lengthened or contracted for maximum gain. With such procedure it can soon be peaked to optimum, and knowledge of actual frequency of the signal being used will greatly aid in peaking procedures. Obviously L_2 and L_3 should be peaked at the center of the band (146 mc). The coils, as made by the coil chart, should have the following tuning range: L_2 and L_3 — 7 per cent; L_5 — 5 per cent.

A quick check of the noise figure can be made by removing the plate voltage from the converter and adjusting the low-frequency receiver S-meter to read zero. When the converter is switched on, the S-meter should increase no more than S2. It will be very evident after using the receiver whether or not the converter definitely has a low-noise figure. The suggested method of operating this converter is as follows: The audio gain should be wide open or nearly so and the r-f gain should be adjusted to the point which just begins to introduce some noise. If an S9 signal is then picked up by tuning the converter the loudspeaker should literally jump!

The author has built over thirty of these converters to date and the average noise figures as measured in the laboratory are shown here.

Frequency	*Bandwidth*	*Noise Factor*
144 mc	4 mc	5.5 db
220 mc	5 mc	8 db

These figures were obtained with a simple diode noise generator.

The spread over several converters was remarkably narrow although one particular unit displayed a much higher noise figure for some unknown reason. No apparent difference is evident between this one and the others, but it is believed to be either faulty components or wiring since many tubes were tried.

It should be noted that the operating plate voltage shown on the diagram is 105 volts. This should be obtained from a low-impedance source and preferably through a VR105 regulator. A maximum of 150 volts is recommended. Actual power supply requirements are 105 volts at 35 ma and 6.3 volts at 1.6 amperes. Also note that the oscillator-tuning condenser shaft is d.c., hot to ground. A 3/16" to ¼" coupling will be needed of the insulating variety. Since most antenna feed systems at these frequencies are low-impedance coaxial types, the antenna coupling connector used is the SO239 (Amphenol 83-1R). Needless to say, if the feeder system is greater than 100 ohms, some sort of transformer will be needed.

The full-dress version of the converter is not shown in the photographs. The converter is mounted on an 11" x 7" x 2" chassis along with the power supply. The chassis in turn is fastened behind the panel of the Bud type 1747 black crackle finish cabinet. The dial is a National ACN or SCN and almost 180 degrees of bandspread is available for a Johnson 102 tuning condenser. The result is quite professional in appearance. Two bat-handle switches and a pilot light are mounted below the dial. One switch is for the a-c line and the other breaks the high voltage for standby purposes. A one inch circular hole is needed in the rear of the cabinet to bring in the antenna line. A hinged cover on the cabinet permits inspection of the converter in the customary fashion.

Conclusion

The author has had the interesting experience of using many 2-meter superheterodyne receivers in New England and particularly in Boston. Most of the receivers were converted SCR-522 equipments while others were various commercial and home-built equipments. It was generally concluded that it was something short of miraculous how

(*Continued on page 93*)

COIL CHART

Coil	144 mc	220 mc
L_1	4 TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar	2 TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar
L_2	4½ TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar	2 TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar
L_3	3½ TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar	1½ TT—1/16" copper tubing 3/8" ID threaded with #24 Formvar
L_4	2 TT—1/16" copper tubing 3/8" ID	1 TT—1/16" copper tubing ½" ID
L	28 TT—#28—on 1/8" x ½" form (Speer or equivalent)	22 TT—#28—on 3/32" x ½" form (Speer or equivalent)
L_5	14 mc: 15 TT #28 close wound on 3/8" form (LS3) 50 $\mu\mu$f = C	7 mc: 21 TT #28 close wound on 3/8" form (LS3) 100 $\mu\mu$f = C

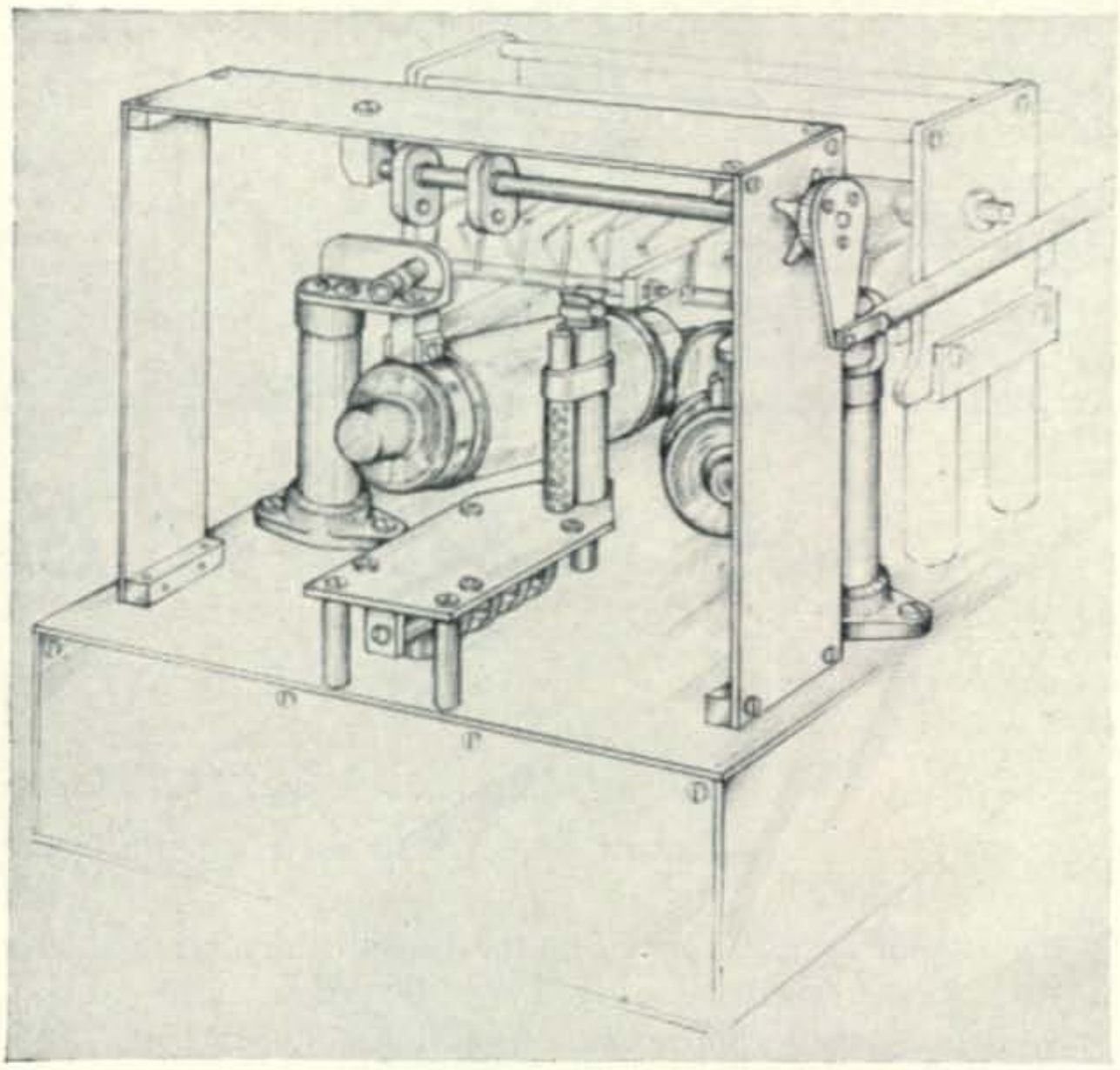
LS3 is Cambridge Thermionic Corp., Cambridge, Mass., slug-tuned form.

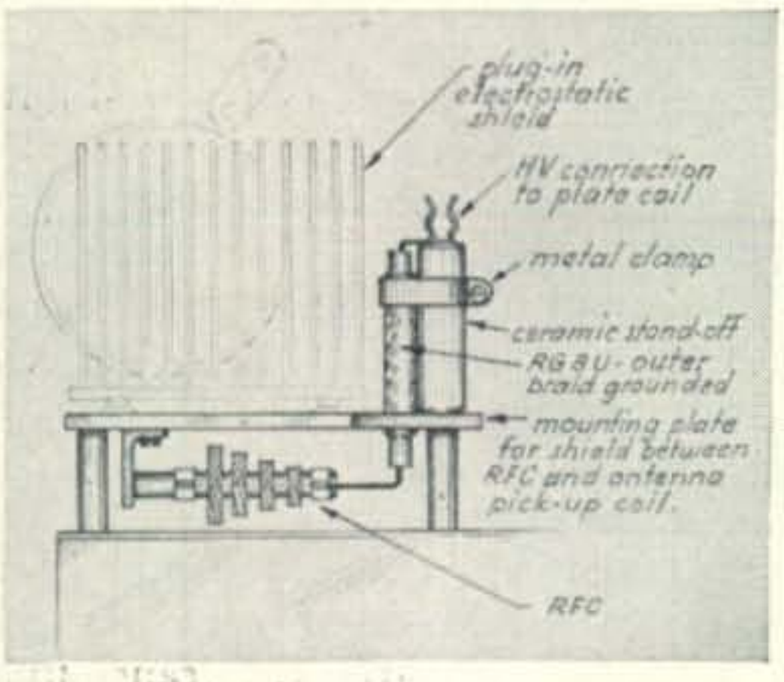
PAGE FROM A DESIGNER'S NOTEBOOK

Material and Sketches by Clayton F. Bane, W6WB*

Judging by the amount of mail received to date regarding the "Final-final" story, many are interested in r-f amplifier design or re-design. At the right is the original, with a few "plusses" added.

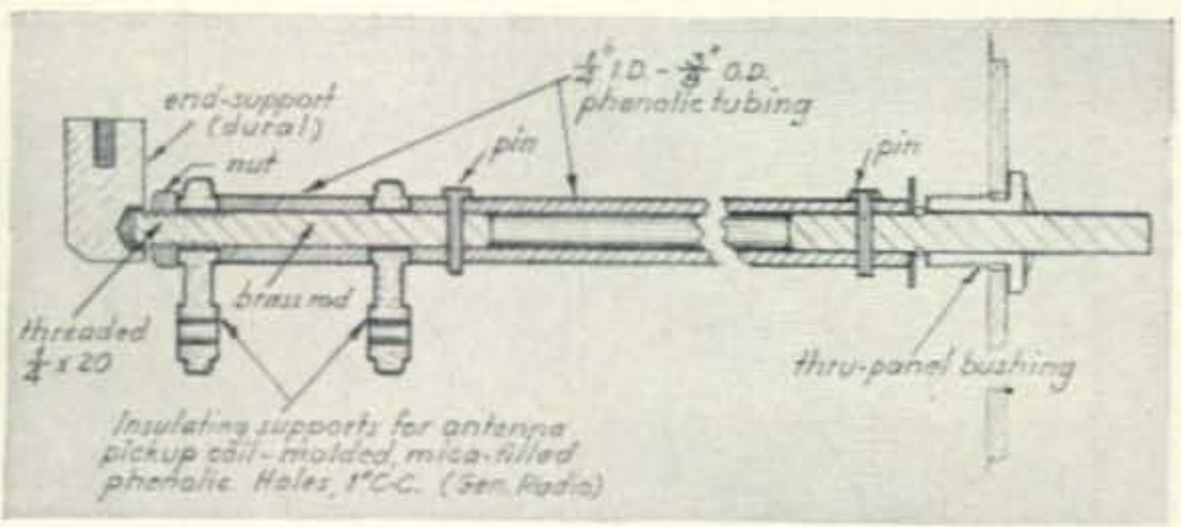
Split-stator by-passing is again achieved with fixed vacuums, tuning in this instance being accomplished with a conventional variable. The latter is a split-stator type but the rotor is left "floating" above ground. The geometry of such a capacitor permits a symmetrical, push-pull connection to both stators without the risk of high impedance harmonic paths—a distinct possibility with a grounded rotor. The two fixed vacuums are left permanently in the circuit and (to provide the shortest possible ground-return leads) are mounted directly beneath the variable, parallel to the face of the chassis. This method of mounting brings the return point of the vacuums near to the common ground of the screen and grid circuits.



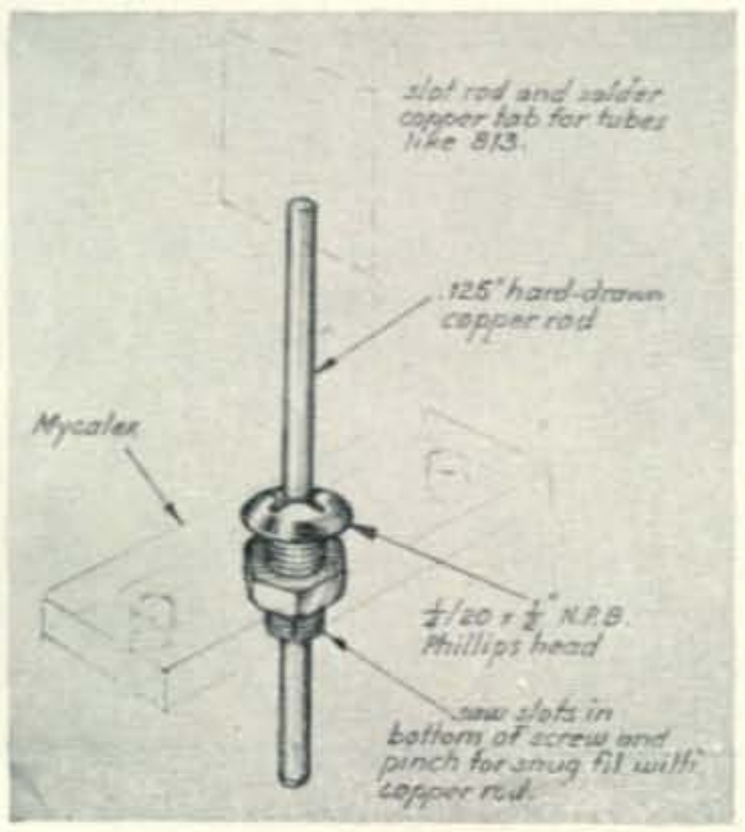


Sketched at the left is an idea that will provide complete shielding between the high voltage connection to the plate coil (and r.f.c.) and the antenna pick-up coil (to prevent coupling of harmonics flowing "in phase" through these elements).

The lead from the r.f.c. to the coil center-tap connection is a short section of RG8-U concentric line. Leave about 1/2" clearance between the copper braid and the clip connection. This also applies to lower connection to r.f.c. The r.f.c. itself is well shielded from the antenna pick-up coil, being mounted beneath the mounting plate for the plug-in electrostatic shield.

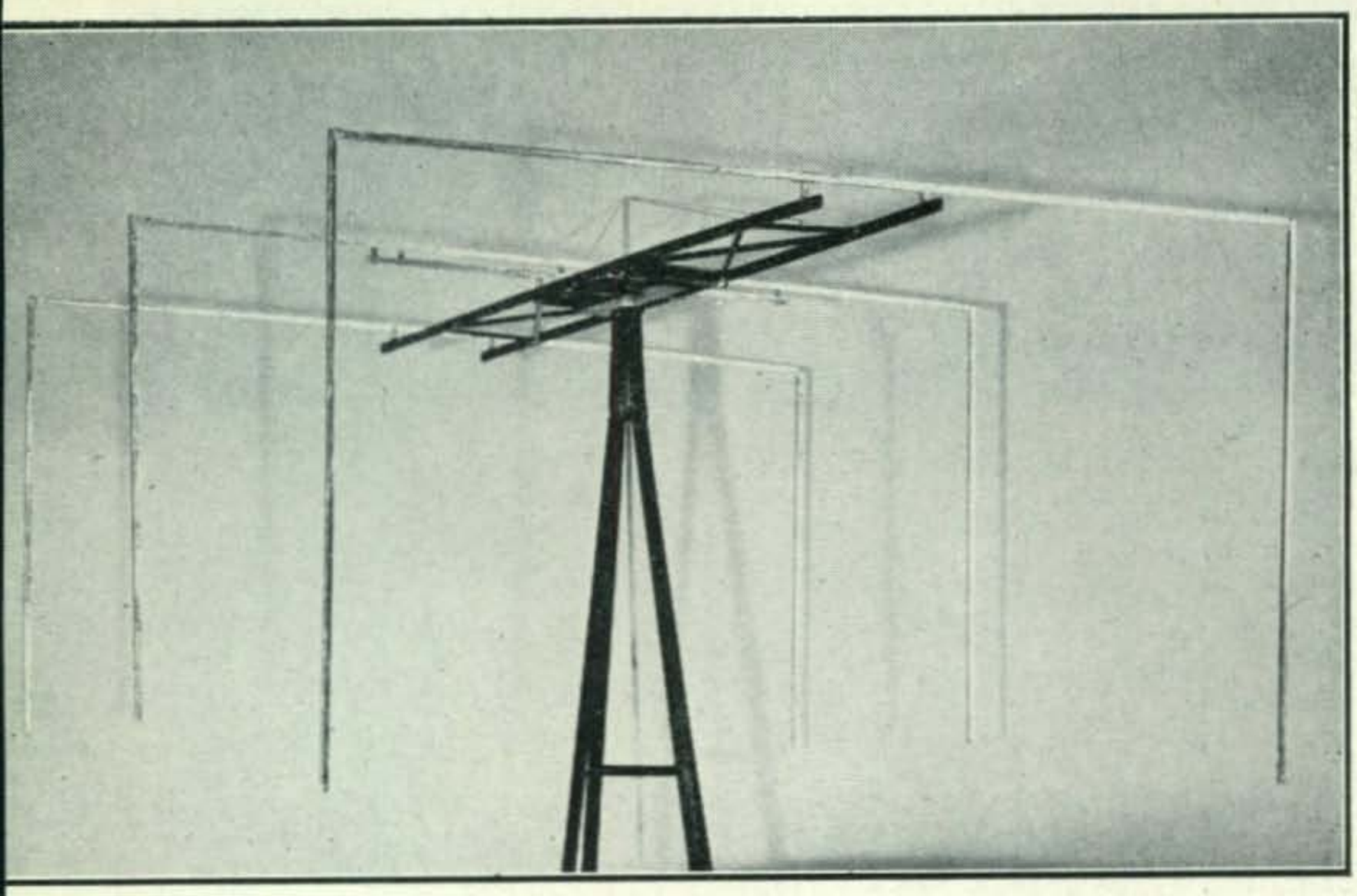


A satisfactory arrangement for varying the position of the antenna pick-up coil, particularly when the plate coil runs parallel to the front panel, is shown at the left. Note that a continuous metal shaft is avoided since this would introduce capacity unbalance to one side of the plate coil.



At the right is depicted one of the simplest methods for constructing neutralizing capacitors for tetrodes. The use of a Phillips-head screw solves the problem of locating an accurate center on the head of the screw. Try to get exact size copper rod—Revere stocks a .125" diameter copper rod. Drill undersize and ream to .125" for a snug fit. Two saw cuts on the bottom provide a chuck effect for tension. For 813 tubes use a small tab soldered to a slot in the top of the rod. A flat can be filed on one face of the rod and one of the bottom saw-cut sections can be bent inward to contact this flat. This will prevent rotation of the top tab. Use Mycalex; drill with a high-speed drill and use plenty of water for cooling and lubrication.

*155 St. Elmo Way, San Francisco, Calif.



Scale model replica of the complete indoor beam.

A Paste-Pot Beam for 10

EDWARD J. WHITE, WINPL*

An evening's work and $1.50 for materials can produce an indoor beam that is a bargain you can't afford to pass up.

THE MANY articles on 10-meter beams in publications devoted to amateur radio have been read with considerable interest and envy. Each article lauded the construction and particularly the proven performance. But for many months I have waited in vain for an article on a beam for the city dweller. I had been operating on an "inside" folded dipole. My particular problems had many aspects, most of which are familiar to amateurs not living in private homes. First: no outside antenna could be used. Second: I was hemmed in by a four-story apartment block to the south and a tin roof to the north. Third: BCI proved such a headache that NBFM had replaced AM modulation. These obstacles meant I had to install the beam in the unfinished attic or go without it.

It became apparent that I must overcome the problems myself. The cost of the beam had to be kept as low as possible, as I had visions that it would not work and I would find myself back to the folded dipole. The only materials on hand were a few pieces of plywood and several lengths of grounds (grounds being long wooden strips three-quarters of an inch square). These wooden strips would make swell elements if they were aluminum—so, the next step was to cover the grounds with aluminum foil. Remember this is an *indoor* beam.

Aluminum foil was purchased[1] in a roll from L. L. Bean Mfg. Co. of Freeport, Maine, for sixty cents. Three elements were constructed. The library paste that was used to stick the foil to the grounds was of the 5 & 10 variety. Total expenditure to date—90 cents.

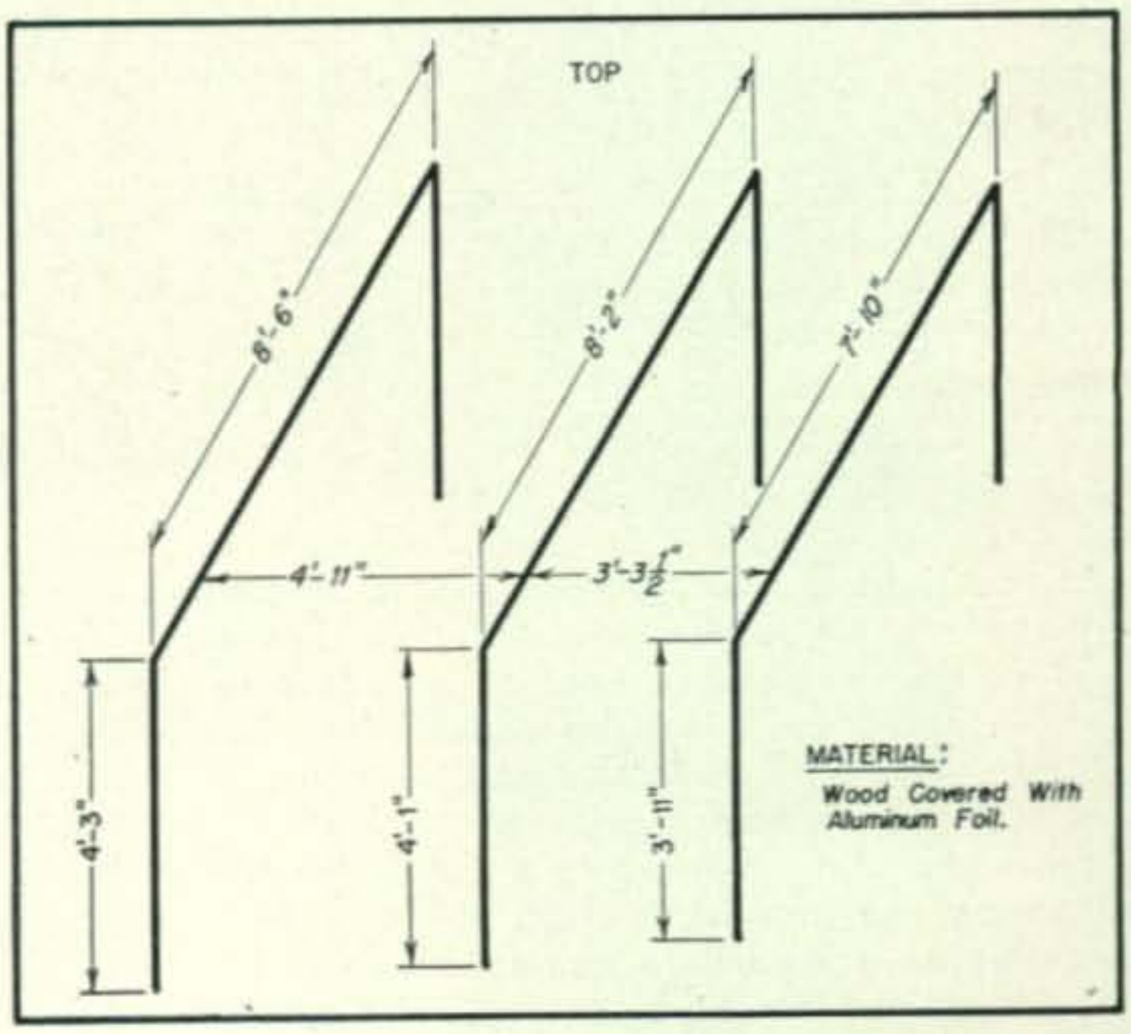
1 Or use "Reynolds-Wrap," available at grocery stores.

**136 Woodlawn St., Chicopee Falls, Mass.*

Constructing the Elements

To construct each element a strip of foil slightly longer than the ground is cut from the roll. The aluminum strip should be about four inches wide. The foil is laid on the floor and paste applied to one side of the ground. Next, place the pasted side on the foil, and paste the foil around the ground, full length, not spirally. A thin film of paste is all that is needed. Smooth out the wrinkles and the element is complete.

Incidentally, the same aluminum foil has been pasted on the inside of the Masonite panels of the sides and back of my wooden-framed transmitter



The beam is folded to permit rotation in confined attic area. Dimensions are for 28.7 mc.

cabinet and has proved very successful in shielding the rig.

Surveying available space, it was obvious that a wide-spaced beam was definitely out. The longest length in the attic was 18 feet, east to west, so the elements were hung temporarily from the rafters as a close-spaced "fixed" beam. The spacing used was .1 and .15 for the director and reflector respectively. 300-ohm Amphenol Twin-Lead was used for the transmission line, and a "T" was used to accomplish the matching. The first adjustment of the T was made with the aid of a "Twin-Lamp" indicator.

During several contacts additional adjustments were made with the aid of the "S" meters. The final match setting was 26½" each side of center.

Bending to Fit

The performance of the beam while fixed in one position seemed to warrant the installation of a rotating device. The elements were approximately 16 feet long and the space between the pitch of the roof and chimney, north to south, was only about ten feet. So, I bent the elements. One-quarter wavelength was used on the horizontal and one-eighth wavelength vertically (downward) at right angles on each end of all three elements. An 8-foot boom was constructed from plywood and cross-braced grounds. The boom support consisted of a wooden tripod. The boom was set on the tripod and a shaft was extended to the floor.

A circular wooden disc was attached to the bottom end of the shaft. A disc of similar size was suspended over the stair-well of the attic stairs and another shaft extended downward, so it could be reached by opening the attic door. A compass card was mounted and an arrow attached to the end of this shaft to act as a handle for turning and also as a direction indicator. A length of clothesline was used to connect the two discs of the rotating drive unit. This did not prove satisfactory as there was slippage. Rubber tape was tacked to the rim of the discs, but the slippage was not entirely eliminated. The clothesline was replaced with old rubber-covered mike cord and the drive became slip-free.

The elements were fastened to the boom with stand-off insulators. The adjustment of the T match remained the same and the loading was satisfactory. Everything seemed to be in order. Locals that had been contacted on the folded dipole were again contacted and subsequent checks proved the beam to have a 24 db front-to-back ratio. My carrier level signal reports have noticeably increased. On receiving, the improvement is equally satisfactory compared to the folded dipole. One gratifying result was that locals (on the ground wave) previously unheard, were now Q5. While forward gain was good, the radiation from the ends was high, as compared to the conventional straight element beams.

Adding up the cost, I had spent a "grand total" of $1.50, including the elements, paste and hardware.

I got a beam on ten—hurray!!!

$7,400 For an Old Call Book

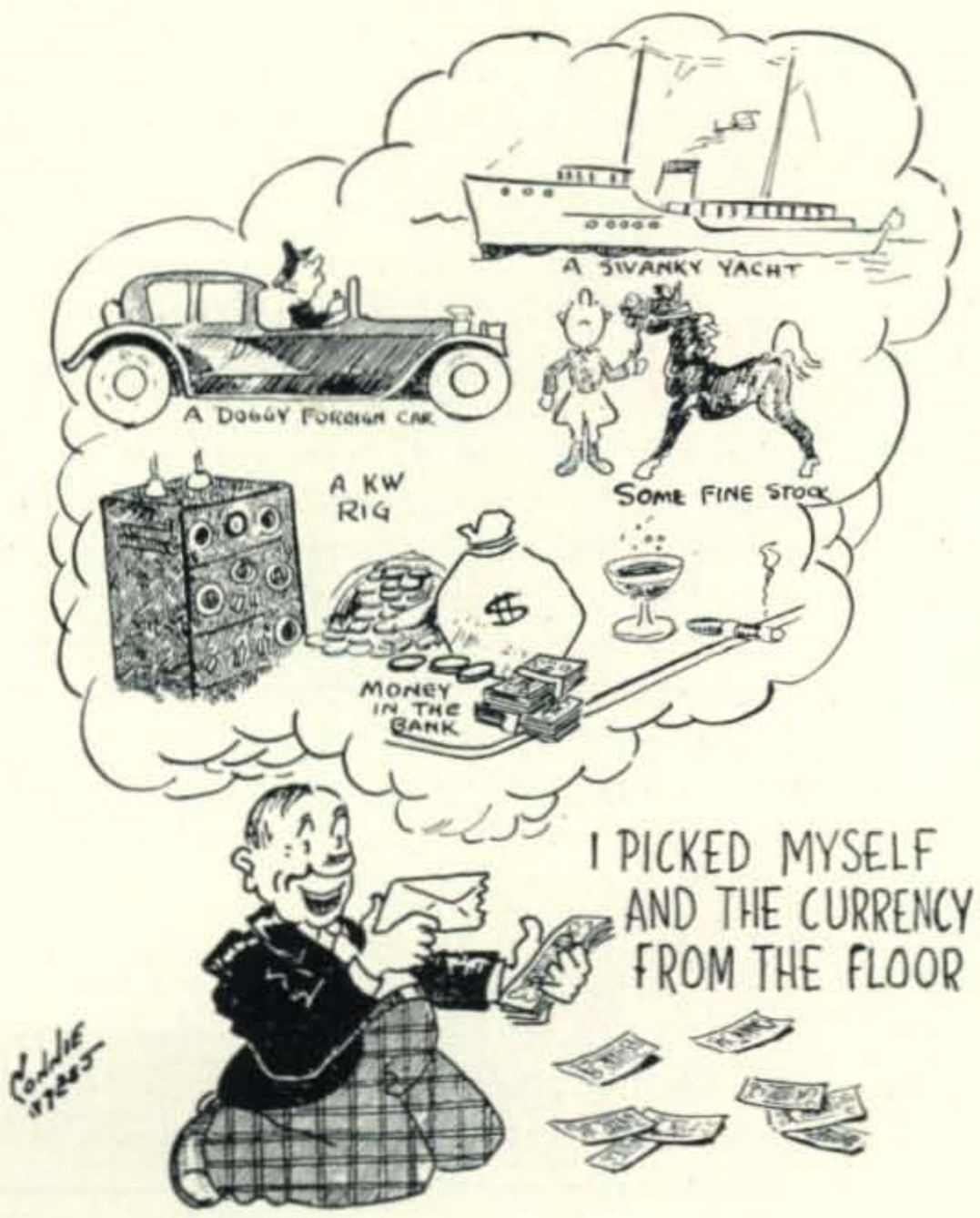
HENRY W. YAHNEL, W2SN*

BEING a great believer in the law of averages, I knew that sooner or later it had to happen. I have been expecting it ever since I took over the W2 QSL managership, sixteen years ago.

I'm not going to let it turn my head, however, and am going to try to continue living as a normal human being, although for the first few months it's going to be difficult. There are so many things I have been wanting to buy.

Well, gang, this is going to be hard for you to swallow but, so help me, it's true, and as far as I can see, it is also some kind of a record.

You see, it's like this. No doubt you have read articles in newspapers where sometime or other in his life, some fellow paused long enough in his busy daily routine to reach out and do some act of kindness for some other fellow, shook his head when offered money for his kind act, smiled, and went on with his daily routine, perhaps just a bit happier than usual.



Years later he was reminded of this act through some attorney, who advised that this unknown person had remembered him in his will when he passed out of this world of static to a better DX location. In some of these instances the amounts mentioned has run into a lot of cabbage.

About the same thing has happened to me, but, as I stated previously, I am not going to let it turn my head. Going to keep right on running the QSL Bureau for the gang, sorting cards, sending out envelopes and burning up cards that are uncalled for after a certain time when they begin to clutter up the files.

(*Continued on page 92*)

**Second District QSL Mgr., Lake Ave., Helmetta, N. J.*

Choosing your Receiver

S. G. REQUE, W2FZW*

The average amateur station uses a commercially made unit picked from a large variety of models. Here's how to make the wisest selection.

TODAY, BUYING a receiver is not an easy task, as those who have faced the problem will testify. Prices have increased greatly since the war and most of us feel that we must get the most for our money. A mistake in judgment becomes serious in an investment which may amount to several hundred dollars. The manufacturers have recognized conservative trends in buying and have in general tended to load their receivers with "extras" as well as to change their appearance with "new look" styling. One prewar sales stimulant was to extend the frequency range, and this is being done again today. Advertising loudly proclaims the benefits due to new circuit designs and the use of new tube types. Voltage regulators are now standard equipment in the smallest and least elaborate receivers whereas a few years ago they were practically non-existent. The pros and cons of single and double conversion occupy our attention. In other words, a receiver is a complicated sort of gadget today.

Before we give up in discouragement let us see if it is possible to go back to the fundamental principles of our receiver and arrive at some yardstick (divorced from the frills) by means of which we may judge its performance. Having narrowed the field to include only those receivers which will meet our own specific performance requirements we can then indulge our fancy with regard to the "extras"—dial arrangements, cabinet styling, price, etc., in choosing within this group.

The Basic Receiver

Since the superheterodyne receiver is now universally used except in a relatively few special applications, let us confine our attention to this type. *Figure 1* is a block diagram of a basic

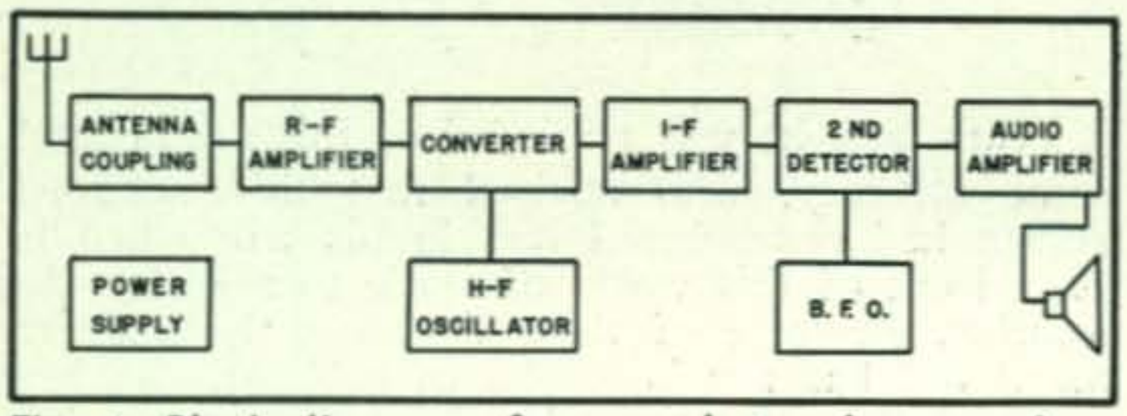


Fig. 1. Block diagram of a superheterodyne receiver.

superhet receiver. Each one of the indicated blocks is a functional unit of the receiver. Each one exerts some controlling effect on the performance of the receiver as a whole. If we want to compare receiver designs in an intelligent manner we should understand these controlling effects and also have some idea of how far we could go in the design of a "perfect" receiver. Of course, the perfect receiver has not yet been built but we can greatly profit by having it in our mind's eye as a standard for comparison unbiased by our prejudices regarding any manufacturer's name.

Suppose we try to list the most important characteristics of this receiver based purely on its ability to receive signals, ignoring matters of convenience, appearance, or personal taste. The following list should be typical:

1. Sensitivity
2. Noise response (signal/noise ratio, etc.)
3. Selectivity
4. Stability
5. Power output
6. Distortion

Now we can start to identify the relations which exist between the characteristics in our list and the functional units shown in our block diagram. Unfortunately, each one of the points to be covered is so technical as to merit many times more space than we can allow it here. However, we can cover the main points involved and ask the forbearance of the experts if we cover some questions rather lightly.

Sensitivity and Noise

First of all let's see what determines the sensitivity of our receiver. Sensitivity is defined as the signal which must be applied to the input terminals in order to produce a standard output. A dummy antenna is usually connected between the signal generator and the input terminals, and since both the dummy antenna and the standard output have been agreed upon by all manufacturers their figures will be alike, no matter which one measures any particular receiver. It should be apparent that we are really measuring the gain or amplification of the receiver in such a manner that we produce a useful output signal, but one low enough to avoid any accidental overload during test. In other words, the definition of sensitivity tells us that a receiver of good sensitivity is a high-gain receiver.

In order to get a clearer picture of how much gain we need for amateur receivers let us recall some of our QSOs. On the 75-meter phone band, for instance, it is not uncommon to receive reports of 10 db to 20 db above S9 on the meter. According to the instruction book for my receiver, S9 on the meter corresponds to 50 microvolts at the antenna terminals, so that a +20 db signal corresponds to 500 microvolts. With QRM as it

*1250 Garner Ave., Schenectady, N. Y.

is in the evenings even the bitter-enders give up when the signal gets down to S6 or approximately 15 microvolts. Under these circumstances 1 microvolt sensitivity is unnecessary and the trouble involved in building such a receiver is largely wasted. In addition, most of us live in or close to cities where the noise levels at these lower amateur frequencies due to power lines, motors, oil burners, etc., will completely mask 1-microvolt signals.

However, this picture changes as we move to higher and higher frequencies. Not only does our interest change to include the weakest DX signals, but also we find the man-made noise level lowering (with one notable exception—automobile ignition noise). Here the demand is for better and better sensitivity. Because of the lower noise level we can make good use of it. But here again we will find limitations, this time within the receiver itself. So before we become too excited by visions of a super-deluxe 21-tube ultra-heterodyne receiver, let's get some idea of how this internal noise behaves.

Perhaps one of the most profound discoveries in the field of electronics was the discovery of the nature of thermal noise. In 1928 J. B. Johnson of the Bell Telephone Laboratories predicted and proved that all electrical apparatus, even a simple wire, would produce a small random voltage due to the motion of electrons in its structure. Because the motion of these electrons is a function of temperature, this random voltage or noise voltage is frequently called thermal noise. Some people call it Johnson noise in honor of Mr. Johnson. Because it is tied up with the physical nature of our apparatus we can never hope to avoid it. Vacuum tubes also produce noise voltages due to fluctuations in electron flow between cathode and plate. It is convenient to treat all these tube noise voltages as if the tube itself were perfect and the source of the noise were in the grid circuit, either as a resistor or a small generator. *Table I* lists some typical values of noise voltages in various parts of a receiving system. If the bandwidth is reduced these noise voltages will be reduced by the square-root of the bandwidth factor—i.e., if we reduce the bandwidth from 10 kc to 2.5 kc, or by a factor of one-fourth, the noise voltages will be reduced one-half. The frequency to which we listen has no effect upon the noise.

The first and perhaps most important observation we can make is that the weakest signal we can ever hope to hear will be one strong enough to compete with the antenna noise. Any attempt to amplify the signal will amplify the antenna noise the same amount, even with a "perfect" noiseless amplifier. In other words, the antenna noise sets the sensitivity limit on a "perfect" receiver.

We do not have perfect receivers, however. Engineers therefore invented the term "noise factor" to show how closely a given receiver approaches perfection. Noise factor (for our purposes) is the ratio between the observed noise power and the noise power due to the antenna.

Designed for maximum performance, these four receivers are the finest units for amateur communications made by the foremost commercial manufacturers. Top to bottom: Hammarlund Super Pro, National HRO 7, Hallicrafters SX-42 and Collins 75A.

This noise factor is always used to rate receivers for critical services because it recognizes the limiting nature of the antenna noise as well as the effects of bandwidth upon noise.

Let's see how the figures in *Table I* help us in judging the front end of our receiver. As a first example consider a 6SA7 converter fed directly from the antenna coupling circuit. Now

TABLE I

TYPICAL NOISE VOLTAGES
(Room Temperature, 10-kc Bandwidth)

APPARATUS	RMS NOISE VOLTAGE	
300-OHM ANTENNA FEEDER	0.22 MICROVOLT	
100-OHM ANTENNA FEEDER	0.13 MICROVOLT	
6AK5 R-F AMPLIFIER	0.55 MICROVOLT	Measured at grid. See Text.
6SK7 R-F AMPLIFIER	1.35 MICROVOLT	
6SA7 CONVERTER	5.5 MICROVOLTS	
6BE6 CONVERTER	5.5 MICROVOLTS	

at 30 mc we can expect the antenna coupling circuit to give us a voltage gain of approximately 4 or 5 when a 300-ohm antenna feeder is used. So the 0.22-microvolt antenna noise is presented to the 6SA7 grid as approximately 1.0 microvolt of noise. However, the 6SA7 noise, referred to its grid, is 5.5 microvolts so that there is a noise power ratio of $(5.5/1.0)^2$ or approximately 30 to 1. This could also be called a 15-db noise factor, and indicates that the noise is approximately 3 S-units louder than a perfect receiver. Put in still another way, the received signal must be 3 S-units (30 to 1 in power) more powerful to be discernible.

A 6AK5 r-f amplifier added to the front end will immediately improve matters. *Table I* tells us that the 6AK5 internal noise voltage is only 1/10 that of the 6SA7 or 6BE6. If we assume the same antenna and coupling circuit as our previous example, the tube noise adds only 30% more power to the antenna circuit noise. Our noise factor will be approximately 1 db, or so small that the difference between this and a perfect receiver input will not be perceptible to the ear. Provided this tube is capable of giving a gain of 15 or so, the antenna circuit noise will be amplified to something in the order of 15 microvolts which will override the following converter's internal noise. Then our receiver will very nearly approximate our ideal.

However, a word of caution is in order. At 30 mc, or higher, it may be difficult to obtain our assumed antenna coupling circuit gain of 4 or 5 and our r-f amplifier gain of 15. Good circuit arrangement, short leads, highest quality components (especially the bandswitch, if one is used), and low stray capacities are essential to achieve these results. One r-f stage *does not guarantee* a good noise figure even though it is *possible* to achieve a good noise figure with only one r-f stage at frequencies up to 50 mc. Conversely, at low frequencies near the broadcast band it is *possible* to achieve a high enough antenna coupling circuit gain to obtain a good noise figure without an r-f stage. However, as we mentioned before, the external noise usually limits our usable sensitivity before we reach the limit set by antenna noise, at these frequencies.

In order to complete the picture on sensitivity and noise we must, of course, consider the rest of the receiver. Our only real remaining requirement is that the gain from the converter grid to the second detector must be sufficient to make the antenna noise audible. If we assume that the noise voltage is to be amplified up to something near 0.3-volt level or better, in order that the detector will be working moderately well, we won't be far wrong. The converter and two i-f stages can readily do this.

Selectivity

Our next consideration of any receiver usually concerns its selectivity. In using this term we usually mean the ability of the receiver to distinguish between adjacent signals. However, for reasons which will soon become apparent, design engineers prefer to use the term ACA (adjacent channel attenuation) when speaking of this type of selectivity. This type of selectivity is usually determined by the i-f amplifier system. The ideal form of i-f selectivity for high ACA is shown in *Fig. 2a*. In *Fig. 2b* we have shown a type of selectivity obtainable in the well equipped laboratory, while *Fig. 2c* shows the usual selectivity obtained in communication receivers. Especially in the latter case, increasing ACA usually means narrowing the bandwidth of the amplifier.

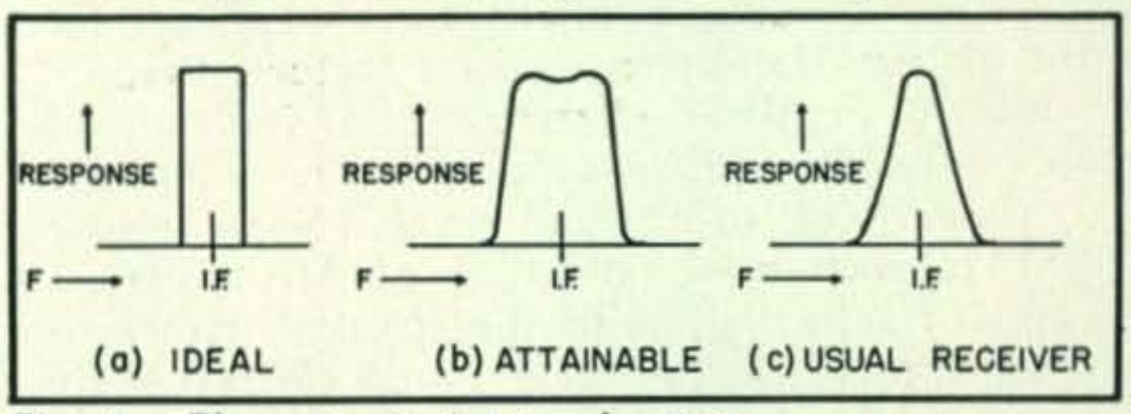


Fig. 2. Three typical i-f selectivity curves.

One way we may narrow the bandwidth is by using a large number of tuned circuits. For example, two i-f amplifier stages will use three i-f transformers which may be double tuned and give the selectivity curve of six tuned circuits in cascade. The "skirts" of the resultant curve will be steep. With double tuned transformers a flat-topped selectivity curve (*Fig. 2b*) with fairly steep "skirts" is also possible, though few manufacturers adjust the i-f transformers this way. The mechanical tolerances become rather tight when a flat-topped curve is desired, and an oscilloscope and FM sweep oscillator are practical necessities for alignment. The usual method of just peaking the trimmers won't do.

We can also get a narrow bandwidth by increasing the Q of the i-f transformer components. Iron core coils help a lot. Regeneration gives the same effect,[1] though it may be critical to adjust and control. A front panel control for regeneration is a "must" item since tube aging, line voltage changes, etc., must all be compensated for best results in a regenerative system. (Most of us cannot be bothered with this necessary "nuisance" control.) And lastly there is that very high Q

1 Although it furnishes an asymmetrical amplitude frequency curve.—Ed.

device—the quartz crystal. A good, adjustable bandwidth, crystal filter is a relatively simple device that is very hard to beat. It must be admitted that it won't give very steep "skirts" for phone operation, but in the hands of someone *familiar* with its operation it can perform near-miracles in a tight QRM situation. It is likely that the failure of most crystal filters to do a good job is largely due to improper handling by the operator.

Since circuits of the same *Q* will have bandwidths proportional to their resonant frequencies, we can also exert a great deal of control on the bandwidth of the i-f amplifier by suitably choosing its frequency. In general, the lower we choose the i-f frequency the narrower the i-f amplifier's bandwidth becomes. This is the engineering reason behind the majority of "Q5ers" and some single-sideband selectors now being marketed and used in many ham shacks. Most of us shun the use of "outboard" adapters and so we might logically ask why we do not use a low intermediate frequency, say 100 kc, in the first place.

In order to answer this question let us return to our block diagram, *Fig. 1*, and examine the action of the converter-h.f. oscillator combination. As we know, the h-f oscillator "beats" with the incoming signal to produce a difference frequency, the intermediate frequency (or i.f.). For reasons concerned with "tracking" or single-dial control we usually make the h-f oscillator higher in frequency than the received signal, though this is not essential. The situation is shown in the diagram, *Fig. 3a*. In the next diagram, *Fig. 3b*, a situation is shown which frequently exists in our crowded radio spectrum. The "image" signal will also beat with the h-f oscillator to produce a difference signal at the i-f frequency, and the i-f amplifier is unable to differentiate between the two signals. This situation is unavoidable if both signals reach the converter grid. This is a basic "flaw" or undesirable characteristic of the superheterodyne principle. Fortunately we can eliminate the image provided the r-f selectivity is good enough to prevent the image signal from reaching the converter grid. In other words we also require sufficient image selectivity. *Figure 3c* shows this schematically and it should be apparent from this diagram that the lower the i-f frequency is chosen the harder it is to obtain sufficient selectivity in the tuned circuits ahead of the converter grid.

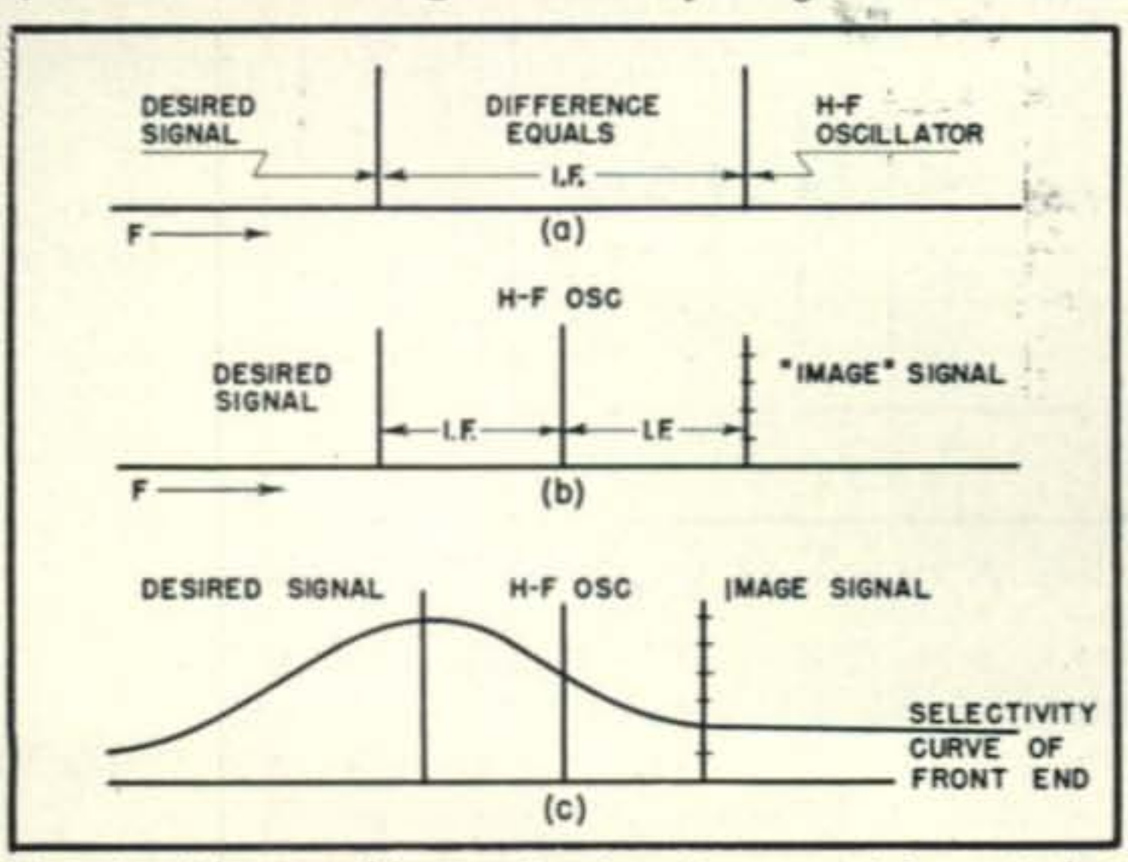


Fig. 3. The problem of choosing an i-f and h-f oscillator frequencies (see text).

Here again a numerical example may be in order, to illustrate the relative magnitudes we might expect. Assume that we are considering a 30-mc front end. If we use circuits of high quality parts and hold the circuit capacity (including stray and tube capacities) to a practical minimum we can expect a single tuned circuit to give results comparable to those shown in *Table II*.

TABLE II

R-F TUNED CIRCUIT PERFORMANCE

SIGNAL FREQ.	I.F.	IMAGE FREQ.–SIGNAL FREQ. DIFFERENCE	IMAGE ATTENUATION
30 MC	455 KC	910 KC	10 db
30 MC	1500 KC	3000 KC	20 db

With one r-f stage there will be two tuned circuits between the converter grid and the antenna, so we would expect 20-db image attenuation for a 455-kc i-f frequency. This would reduce an S9 image signal to approximately S5. However, if we used a 1500 kc i-f frequency the image attenuation would be 40 db, or an S9 image signal would be reduced to approximately S1, barely audible. The use of two r-f stages with the 455-kc i.f. would improve matters by one more tuned circuit giving an over-all figure of 30-db image attenuation. However, this would not compare too well with the single r-f stage front end used with a 1500-kc i-f frequency. Obviously the image situation would be hopeless with a 100-kc i-f frequency long before we approached 30 mc in our r-f stages.

The difficult problem of compromise between a suitable i-f frequency for ACA and one suitable for good image selectivity has probably driven many a good design engineer to seek solace in a case of Old Crow. To add to the confusion, good filter crystals are readily available only in the 455-kc range. The only way around this i-f problem is to use two i-f frequencies in series; i.e. double conversion. In this design one can first convert to a high i-f frequency, eliminating the image signal readily, and then convert again to a low i-f frequency in order to obtain a high ACA. One amateur receiver on the market at the time of writing this article is exploiting this principle, and there are grapevine rumors of more on the design boards. There are problems involved because we now have two oscillators in the receiver front end, and their various harmonics can beat together to produce a large assortment of spurious signals or "birdies." A careful choice of the two i-f frequencies will serve to eliminate them from the amateur bands. Shielding and circuit design are the only weapons against birdies when general coverage is desired. It is likely that double conversion receivers will be restricted to amateur bands only for some time to come, unless very elaborate (and hence expensive) design and construction are used.

(*Continued on page 86*)

THE CLAPP OSCILLATOR

An unusually stable v.f.o., the Clapp oscillator is finding widespread acceptance on the ham bands. Here is a simple table-top unit and a circuit analysis.

Its Application

W. L. WERDEN, W8DMK*

BEING A RABID experimenter on v-f-o exciters, the recent description of the so-called Clapp oscillator sent the writer to the junk box and a haywire version was soon delighting him with its extreme stability and clean-cut keying. A compact versatile unit was soon built up, using the basic oscillator plus a Class A isolation stage and an output amplifier with output on either 80 or 40 meters.

A type 6C4 miniature triode is used as the oscillator; this is followed by a 6AK5, Class A stage, which provides sufficient excitation to a 6AQ5 with output either as an amplifier or doubler.

This unit is built on one of the new Johnson chassis, which in spite of its lightness is extremely rigid; and, of course, is much easier to work. The little rig was constructed using only a hand drill and several sizes of files to enlarge the drilled holes wherever necessary, so don't let the metal construction scare you.

The tubes are all lined up on the back drop of the chassis to keep any heat generated by them away from the grid coil which is enclosed in the 4" x 5" x 6" shield box on top.

**Route 1, North Lima, Ohio.*

The grid coil, which is the important element of this circuit, is a Bud 80OEL removed from its base and mounted on two feed-through insulators. The link turns are not used, making the coil 30 turns of No. 18 wire 1¾" in diameter and 1½" long.

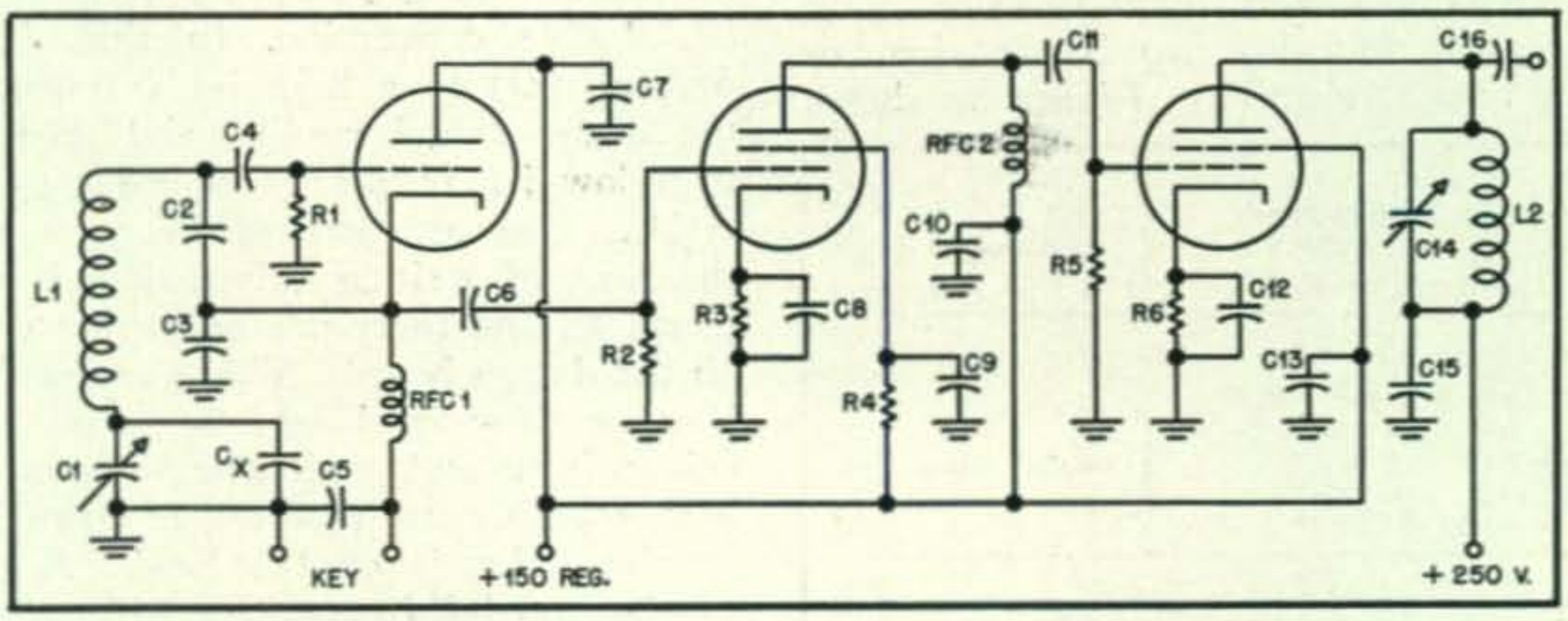
This coil is tuned by a 75-$\mu\mu$f fixed silver mica condenser shunted by a 25-$\mu\mu$f two-bearing midget, solidly mounted directly to the chassis. This combination gives a spread on 80 meters from 3500 kc to approximately 3750 kc.[1] This was deemed sufficient here, as operation is mainly on the higher frequencies.

If a different tuning range is desired the proportions must be changed to meet your requirements. More tuning capacity and less fixed capacity will give less bandspread but greater tuning range and vice-versa. The important thing is to keep a total maximum capacity of approximately 100 $\mu\mu$f. Possibly a 25-$\mu\mu$f silver ceramic variable would be a welcome addition in helping to put the band where you want it, but was not found necessary here. However, slight differences in shield placement and coil dimensions will affect the frequency enough to make this addition seem desirable.

A study of the accompanying photographs will depict the layout and construction much better than words. The only precaution required is to make the wiring as solid as possible, using tie points wherever necessary.

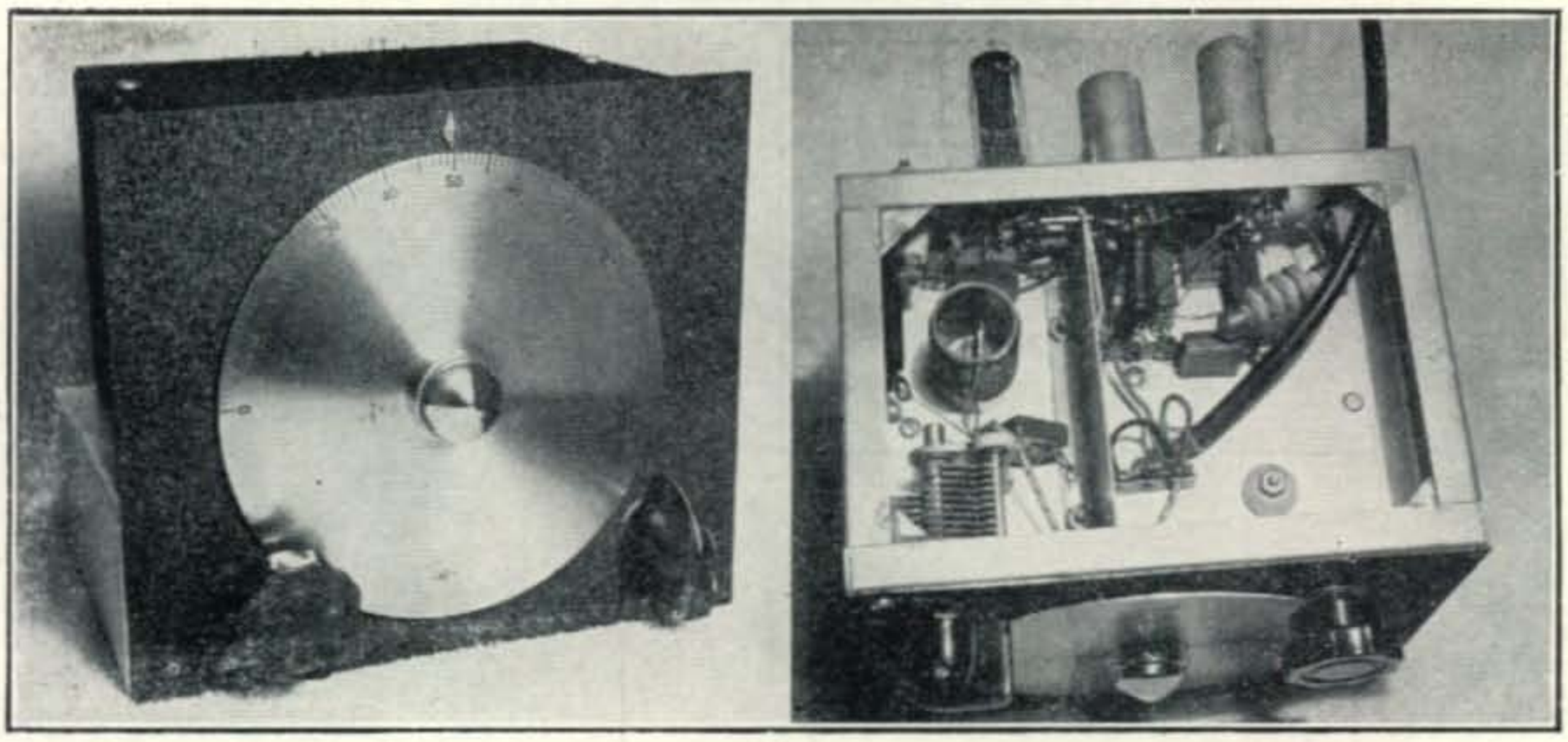
---

1 The tank circuits includes also the series combination of *C* 2 and *C* 3 —*Ed.*



Circuit diagram of the 6C4 oscillator, 6AK5 Class A stage, and 6AQ5 amplifier/doubler.

C1—25 $\mu\mu$f, midget.
C2, C3—.001 μf, silver mica.
C4, C6—100 $\mu\mu$f, silver mica.
C5—.02 μf, paper.
C7, C8, C9, C10, C12—.01 μf, mica.
C11, C16—100 $\mu\mu$f, mica.
C13—.006 μf, mica.
C14—150 $\mu\mu$f, midget.
C15—.005 μf, mica.
Cx—75 $\mu\mu$f, silver mica.
R1, R2, R5—.1 meg., ½ watt.
R3—300 ohms, 1 watt.
R4—10,000 ohms, 1 watt.
R6—250 ohms, 10 watts.
RFC1, RFC2—2.5 mh.
L1—30 turns, No. 18, 1¾" by 1½" long.
L2—30 turns, No. 20 enameled on 1" diameter form.



Left: Simplicity of the v.f.o. permits only two controls, one for frequency adjustment and the other for amplifier peaking. Right: Under chassis view of the v.f.o. Only parts above the chassis are oscillator grid circuit components located for maximum isolation.

The output stage is shielded from the others with a 1⅞" high aluminum shield, 4" long as shown in the photograph.

With the output coil and condenser shown, the 80-meter band is covered at maximum capacity and the 40-meter band at minimum. A 200-$\mu\mu$f midget capacity would make this circuit easier to set up but none was available; and the 140-$\mu\mu$f unit was. We were lucky—it hit both bands on the first try.

Keying is done in the oscillator cathode only and cathode bias on the following stages holds their plate currents within ratings, with the key up, when 150 volts regulated by a VR150 is used on the oscillator, isolation stage and on the screen of the 6AQ5. 250 volts is applied to the 6AQ5 plate.

The v.f.o. in our station is never used as a frequency meter so a precision dial was considered unnecessary. The National type M shown works beautifully and can't lose calibration as the pin was removed from the tuning condenser shaft and the dial coupled directly—no flexible coupling being used—making it impossible for the large dial plate to change in relation to the position of the condenser even though the knob should slip.

The panel is 6⅛" by 7" and a 5" x 7" bottom plate is used, completely shielding the unit.

In our application the exciter provides more than enough excitation for an 807 buffer/multiplier which in turn drives on 813 final. In fact, on 80 meters the v-f-o output was coupled direct to the 813 and was found to supply rated drive on that band.

Power supply requirments are very modest as the total maximum current drain is less than 50 milliamperes, divided as follows:

6C4	key up - 0,	key down	10		
6AK5	" "	11	"	"	7.5
6AQ5	" "	28	"	"	18 to 24

If more than 250 volts is applied to the 6AQ5, it would probably be a good idea to increase *R6* to 350 ohms in order to keep within the dissipation rating of the tube.

This little exciter is the latest in a long line that has graced our operating table and from its performance it's a cinch to stay there for some time.

Its Theory

D. YPEY, PAØYP*

THE HIGH STABILITY LC oscillator described in this article is in fact a perfected Clapp oscillator, about which some readers may have read in *Proceedings of I.R.E.* (March 1948).

An electrical-oscillator circuit consists principally of two elements:

a. The frequency-determining network.

b. The amplifier to compensate for its losses.

The frequency stability thus depends on the stability of the frequency-determining element, and on the changes of the influence of the amplifier upon the frequency-determining element.

The stability of the frequency-determining element depends on its construction, constantness of temperature, etc. These, however, are of no importance to the description of the circuit itself. The influence of the amplifier upon the frequency-determining element may be best indicated in *Fig. 1*, which shows a three-point-oscillator— such as a Hartley, Colpitts, t.p.t.g., e.c.o.—Z_1, Z_2 and Z_3 forming the frequency-determining element. The tube-impedances Z_{pg}, Z_{gk} and Z_{pk} are directly par-

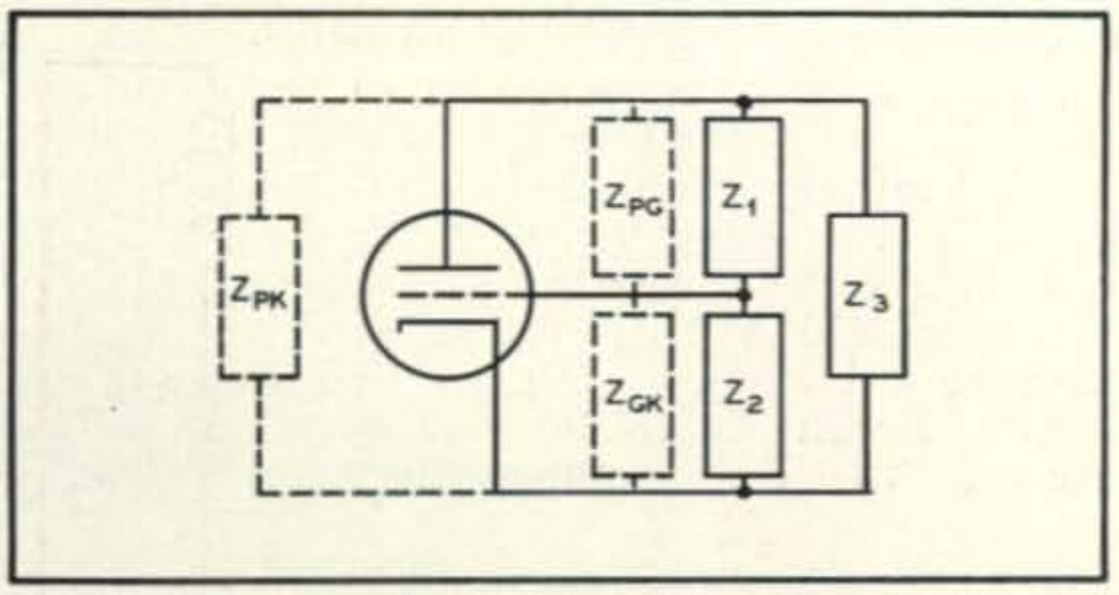


Fig. 1. Frequency determining elements of three-point oscillator.

*4 Gerard Doulaan, Hilversum, Netherlands

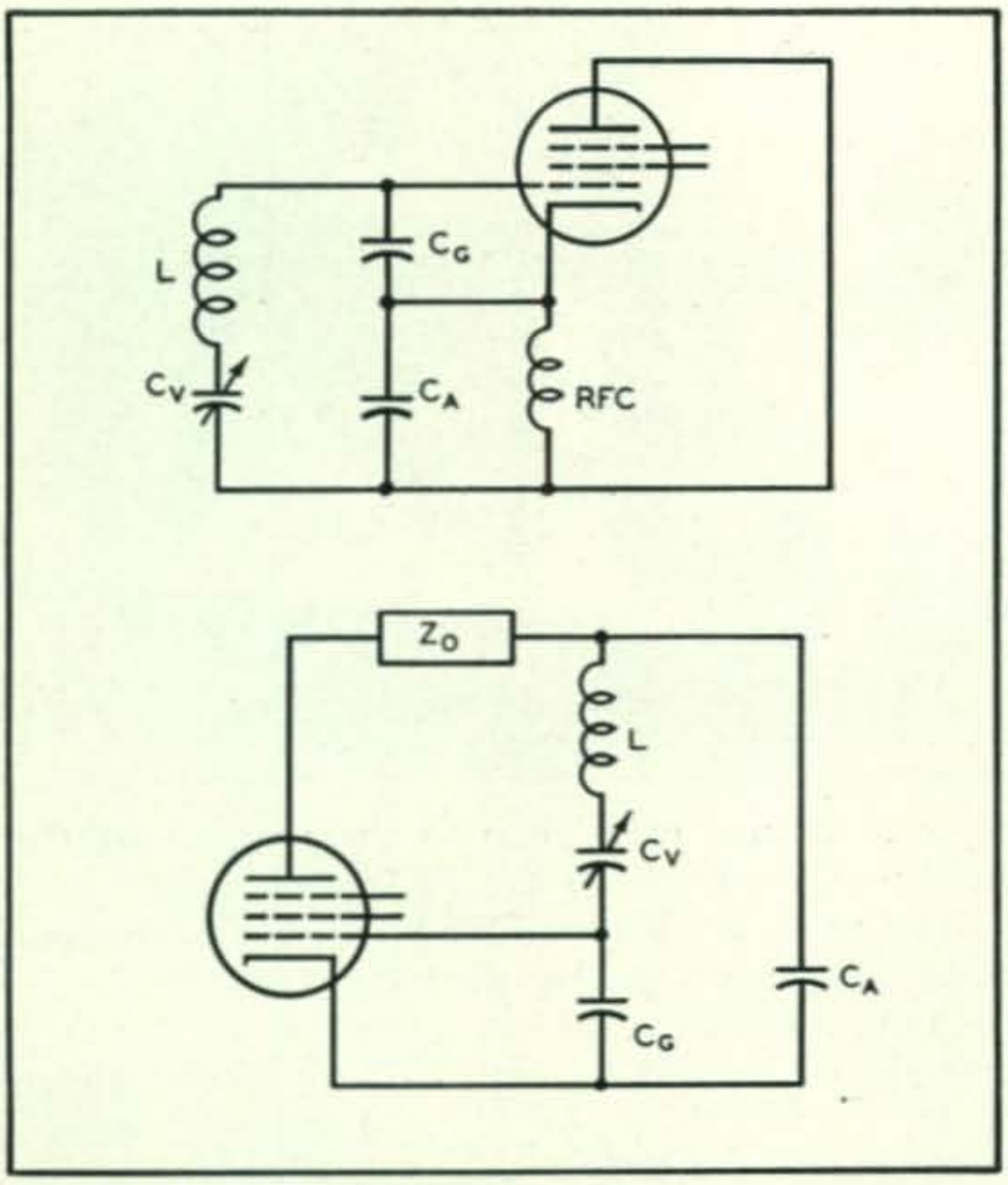


Fig. 2. (top). Basic Clapp oscillator circuit.
Fig. 4. (bottom). Method of coupling load to oscillator.

allel with these. These tube impedances are generally not constant and cause the frequency instability.

Their influence decreases proportional to the ratio of the tube impedances and the circuit impedances. Thus for *high* frequency stability it is important to choose the *tube impedances* as *high* as possible (pentodes) and to make the *circuit impedances* as *low* as possible. These circuit impedances depend upon the transconductance of the amplifier and the Q of the LC circuit. We conclude therefore, that in high-stability oscillators steep pentodes and low circuit impedances are essential.

Comparing several oscillator circuits, such as Hartley, Colpitts, etc., and the Clapp-oscillator (*Fig. 2*) we find that the former all work with parallel-tuned circuits, which have very high impedances, while the latter uses a series-tuned circuit, which has a low impedance. As we will see, C_a and C_g can be made rather large, so they will also have low impedance.

The circuit Q can be made high and the stability will be good. So I have chosen it as a fundamental circuit for my high stability oscillator.

Figure 3 shows the series-resonance circuit L, R, C_v with a little parallel capacity C_p which is introduced by the self capacity of the coil L. As the frequency of the oscillator will be slightly higher than the series-resonance frequency of the circuit shown in *Fig. 3*, because of the detuning-effect

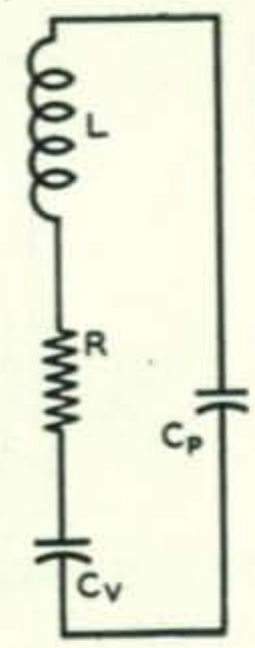


Fig. 3. Deriving impedance of frequency-determining circuit.

caused by C_a and C_g we can write the impedance of this circuit as

$$Z = \frac{R}{\left(1 - v\frac{C_p}{C_v}\right)^2} + j\frac{vQR}{\left(1 - v\frac{C_p}{C_v}\right)}$$

in which

$$v = \frac{2\Delta f}{f_s} = \frac{2\Delta\omega}{\omega_s}$$

The condition for oscillation is

$$\frac{G_m}{\omega^2 C_a C_g} = \frac{1}{j\omega C_s} + \frac{jvQR}{\left(1 - v\frac{C_p}{C_s}\right)} + \frac{R}{\left(1 - v\frac{C_p}{C_s}\right)^2}$$

in which $\omega = 2\pi f$ and $C_s = \frac{C_a C_g}{C_a + C_g}$ and G_m is the transconductance of the tube. Imaginary and real components delivers:

$$G_m = \frac{\omega C_a C_g}{Q C_v}\left(1 + \frac{C_p}{C_s}\right)^2 \text{ and } v = \frac{C_v}{C_p + C_s}.$$

In good coils C_p will be very small, and it can be omitted, so we find:

$$G_m = \frac{\omega C_a C_g}{Q C_v} \text{ and } v = \frac{C_v}{C_s} = \frac{C_v(C_a + C_g)}{C_a C_g}$$

v will be minimum if $C_a = C_g$.

The term $C_a C_g$ is determined by G_m and Q and is proportional to these. If we take for instance a circuit with

$L = 25/\text{uH}$
$C_v = 80\ pF = 80.10^{-12}\ F$;
$\omega = 2\pi \times 3.5 \times 10^6$; ($f = 3.5$ mc)
$G_m = 4\ \text{ma/V} = 4.10^{-3}\ \text{A/V}$
$= 4000$ microhmos (6V6)
$Q = 100$;

we see as

$$G_m = \frac{\omega C_a C_g}{Q C_v} : 4.10^{-3} = \frac{2\pi \times 3.5 \times 10^6 C_a C_g}{100 \times 80 \times 10^{-12}}$$

or

$C_a C_g = 1.5 \times 10^{-18}\ F^2$ so $C_a = C_g = 1.25 \times 10^{-9} F$
$= 1250\ pF$.

This means, that C_a and C_g have impedances of about 50 ohms, which is very low as compared with the plate resistance of the tube.

Loading the Oscillator

Coupling the load to the oscillator can be done best by placing the load in series with the frequency determining circuit as shown in *Fig. 4*. This has no influence on the frequency if Z_o is small compared with the plate resistance of the tube, and so changes of load have no influence too. However, Z_o may not cause the tube to be over-excited in the anode circuit, as this causes the plate resistance to decrease, which causes frequency variation.

This can be prevented with a.v.c. on the oscillator, but this will not be necessary if sufficient care is taken. Z_o may never be a tuned circuit.

So far we have only looked at the impedances of the component values of the fundamental circuit. Now I will describe how my own circuit has grown out of the fundaments. Therefore, we have to look at the tube impedances, which are for the greater part determined by the tube capacities. In *Fig. 5* all the tube capacities are drawn. C_{pg} is parallel

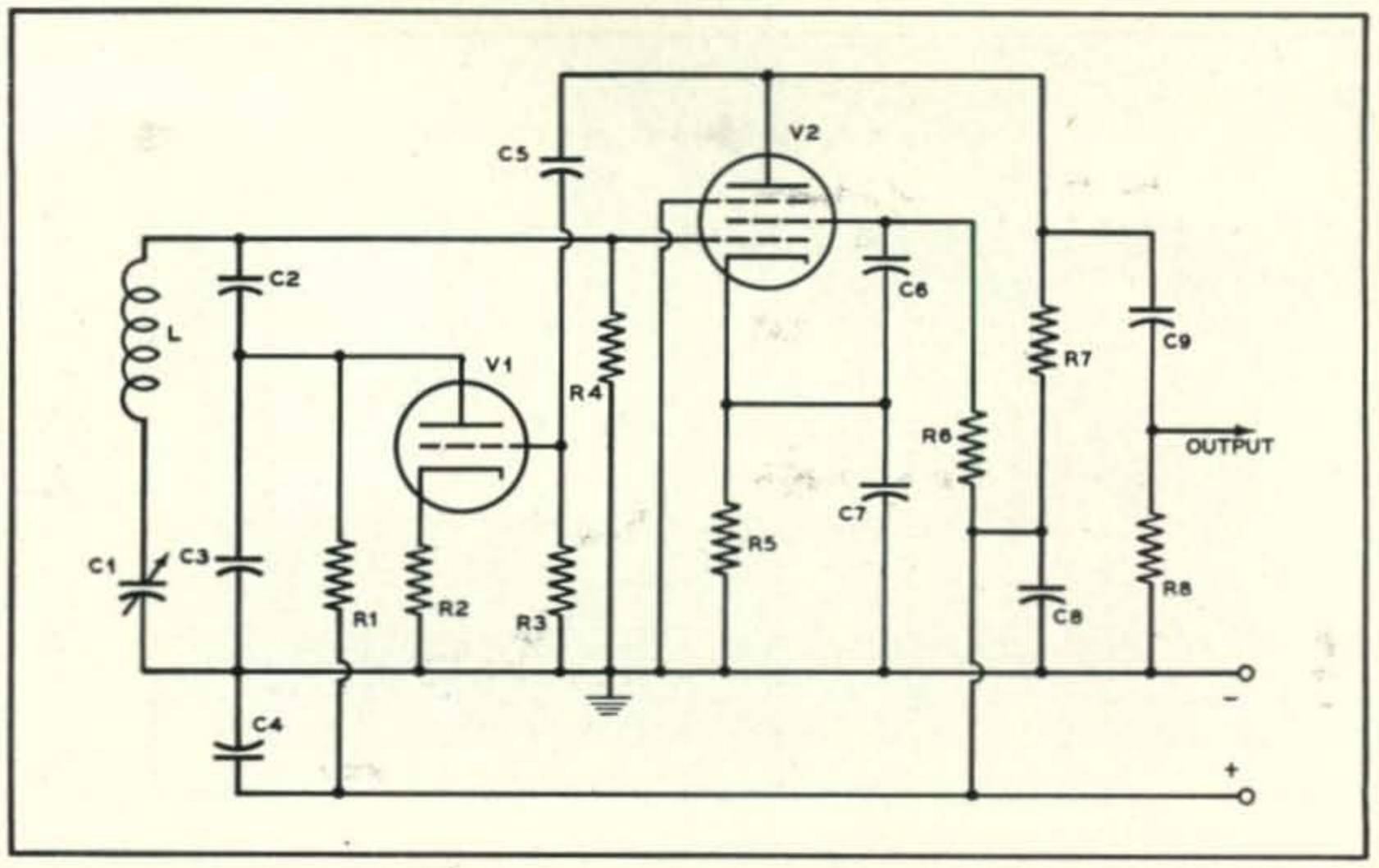


Fig. 6. Final development of Clapp oscillator circuit is this v.f.o.

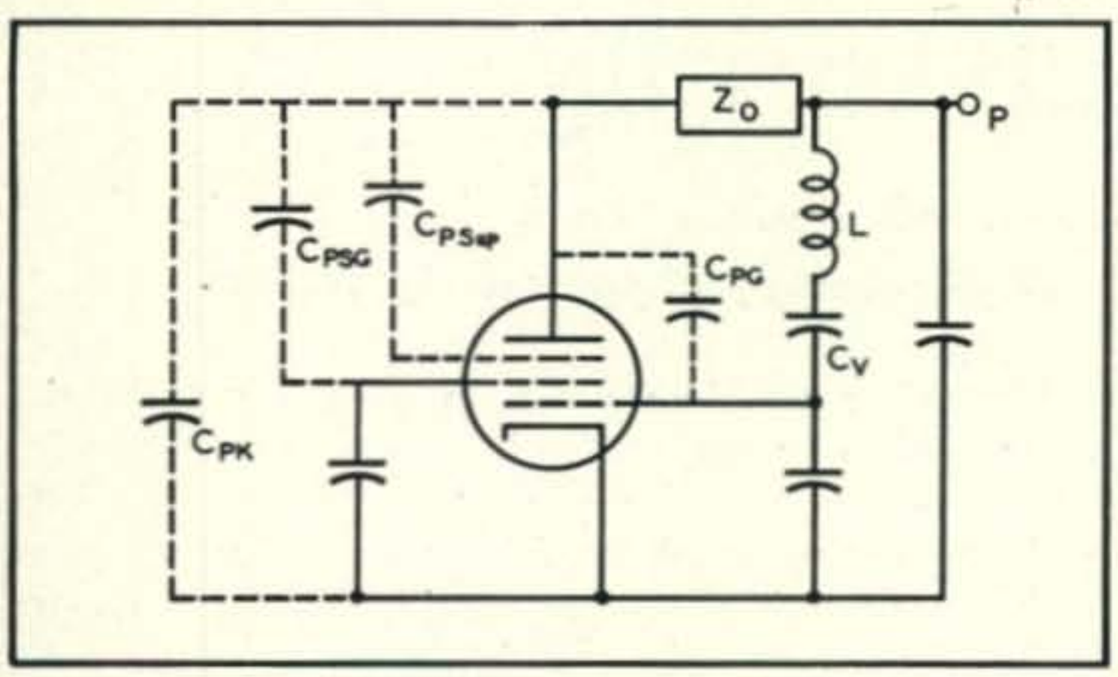


Fig. 5. Basic oscillator circuit with all tube capacities drawn in.

with Z_o + the tuned circuit, and may cause trouble. Therefore grid-and-plate leads should be sturdy and short. That's all we can do about this, but in pentodes C_{pg} these are very small, and not much trouble is expected. C_{psg} comes parallel to C_{pk} as the screen grid is connected via a large C to the cathode, G_3 is mostly connected to the cathode too, thus also adding to C_{pk}. This can be prevented by connecting G_3 to P, which makes it come parallel with Z_o, so it will be without influence on the frequency. At the same time all internal and external shielding of the tube should be connected to P as they form the greater part of C_{pk}. Also, connecting G_3 to P has a screening effect between the anode and the cathode, thus further diminishing C_{pk}. We see now, that it would be preferable to connect P to earth, so the effects of the tube impedances are reduced to those introduced by C_{pk}.

Eliminating Tube Effect

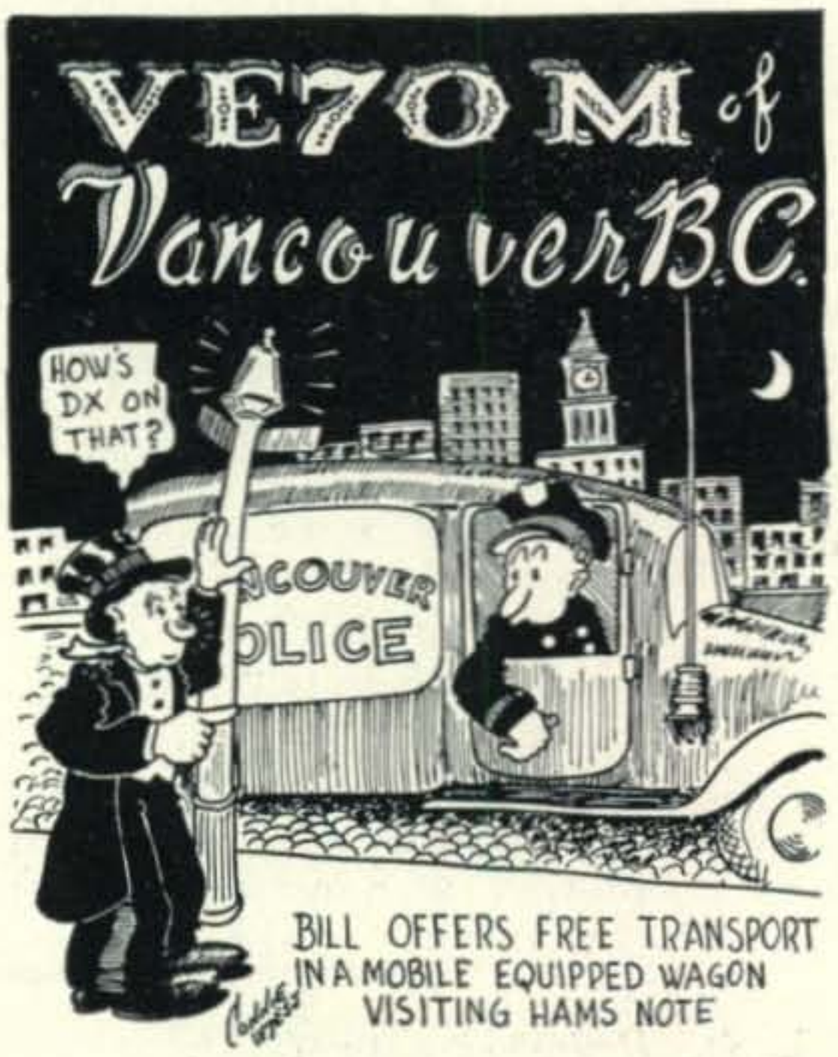
Now these effects are eliminated by also connecting the cathode to P, as then C_{pk} becomes parallel with Z_o, and can do no harm. This is done in the final arrangement, but this makes it necessary to find another way of feedback, which is performed by connecting a triode between the oscillator anode and the connecting point of C_a and C_g. We see that all tube effects are carefully eliminated, so any frequency instability will have a mechanical cause. Thus the final arrangement is drawn in *Fig. 6*.

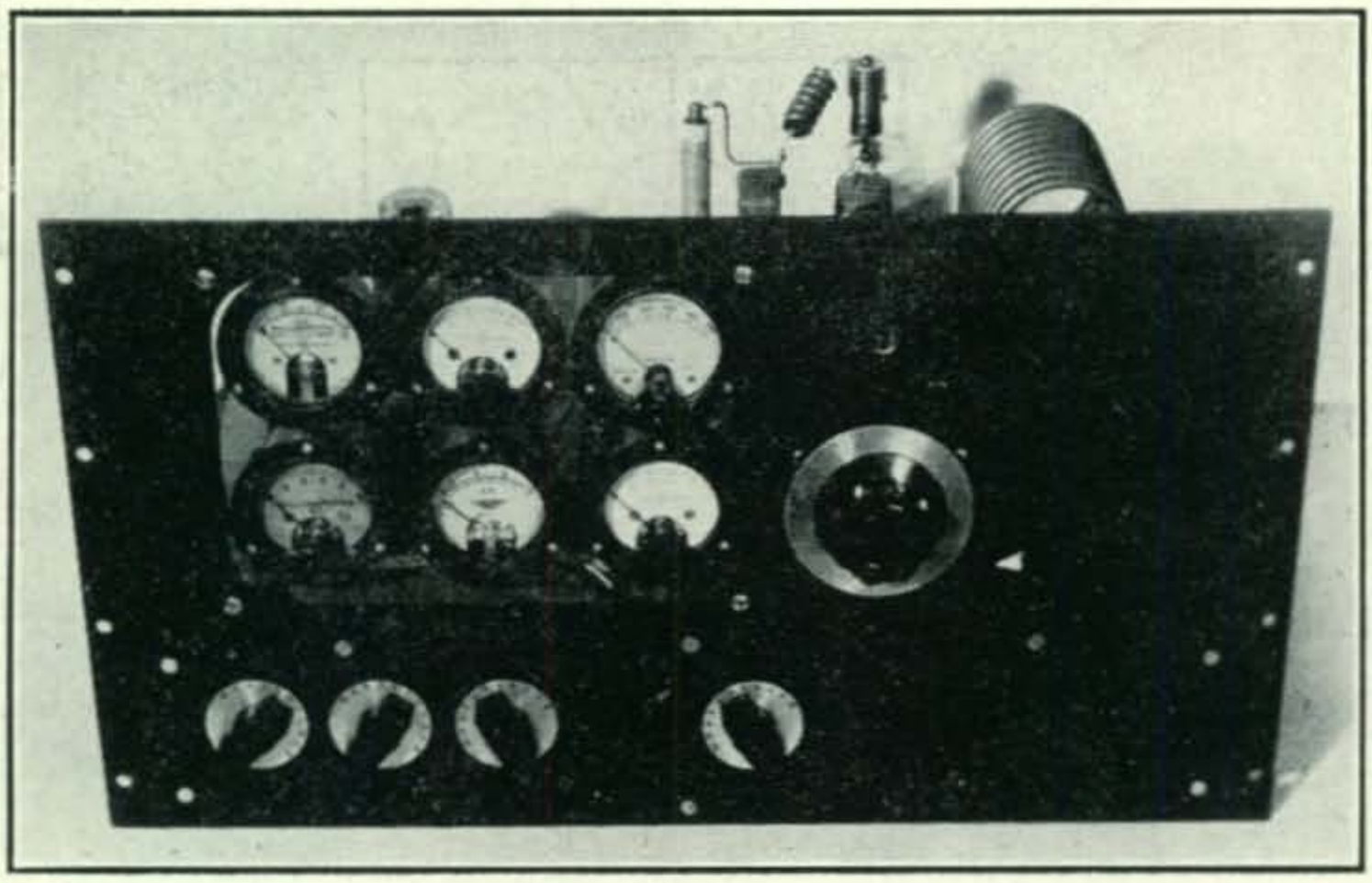
As a matter of fact, the transconductance of value V_2 adds to the transconductance of the whole circuit. Both tubes work in Class A with cathode resistor to form grid bias, as grid-current causes the grid-cathode impedance to decrease.

Inverse feedback can be applied by omitting C_2. This further stabilizes the tube constants, but of course this decreases the transconductance of the tube slightly.

It is possible to replace the LC circuit by a crystal, without changing the circuit entirely as only the Q of the crystal is large. C_a and C_g will have to be changed, to prevent over excitation and possible fracture of the crystal. For V_1, types such as 1852, 6AG7, etc., are best suited. Experiments have shown that this LC oscillator is highly stable, even far better than crystals in the most commonly used circuits.

Dollars for Watts





Layout for efficiency instead of symmetry still gives a pleasing appearance to the finished rig.

A. M. CLARK, W6MUC*

A Simple Approach to High Power

By using new design components, a kilowatt will easily fit on a single chassis. External v.f.o. and power supplies emphasize an increasingly popular design feature.

THE AMATEUR who either through choice or necessity operates his station from the living quarters of his home has two choices: he can remote control a transmitter placed in the garage, basement, or other location not exposed to the public gaze, or he can build a compact transmitter which will be acceptable among the furnishings of the room it occupies. To cope with modern operating techniques, remote control presents many problems connected with band changing and frequency variation. While these problems can be solved, as demonstrated by numerous installations, it seems simpler to make the transmitter suit the operating location, provided the essential features desired in the transmitter can be incorporated in the space alloted.

The author wanted a four-band bandswitching kilowatt c-w transmitter to fit in a receiver-size cabinet which could be located on the operating desk. The transmitter to be described meets the original objective except for the elimination of the bandswitching feature in the final amplifier plate circuit. Power supplies are located in the garage, but the rest of the transmitter is contained in a Super-Pro size (21" wide, 13½" deep, 12" high) steel cabinet.

Originally there were some misgivings about cramming this amount of transmitter into such a small space. A tentative shuffling of parts made it clear that a final amplifier tube with high-power gain was essential if the entire r-f section was to be included on one chassis. The Eimac 4-250A answered this requirement, as it is capable of handling the kilowatt at a reasonable plate voltage and with low driving power.

The other problem which usually faces the designer of a compact high-power transmitter is finding space for the plate tank capacitor. This problem was neatly dodged by using the new Eimac VVC-60 variable vacuum capacitor. The space problem was solved. The kilowatt final now occupied less than half the chassis space, leaving plenty of room for a reasonable layout of doublers, driver, and other necessary components.

Transmitter Circuitry

The circuit chosen is conventional. The transmitter is bandswitching with the exception of the final amplifier plate coil, which is plug-in for economy of space and circuit efficiency. Excitation for the transmitter is supplied by an external v.f.o. which delivers 80-meter output. The first stage in the transmitter is a 6N7. An 807 is used to drive the 4-250A final amplifier. For 10-meter operation, the two sections of the 6N7 double to 40 and 20, with the 807 doubling to 10. On 20 meters, the 807 is excited from the first section of the 6N7, with the 807 thus doubling from 40 to 20 meters. For 40-meter operation, the 807 is driven directly from the v.f.o. and doubles from 80 to 40 meters. On 80 meters the 807 operates as an amplifier, excited directly from the v.f.o. By using this arrangement all the exciter stages operate as doublers on the three high-frequency bands, thus helping to avoid feedback due to t.p.t.g. effects.

All stages are shunt-fed, keeping d.c. off condenser shafts and coils. Capacity coupling is used between stages to keep the number of tuned circuits to a minimum. All tubes are operated within ratings; the 807 easily furnishing rated drive to the 4-250A on all bands.

The 807 is keyed in the cathode circuit, with the 4-250A screen voltage and plate current being

*335 A. St., Redwood City, Calif.

reduced to a low key-up value by a 6Y6G control tube, as described in previous articles.[1]

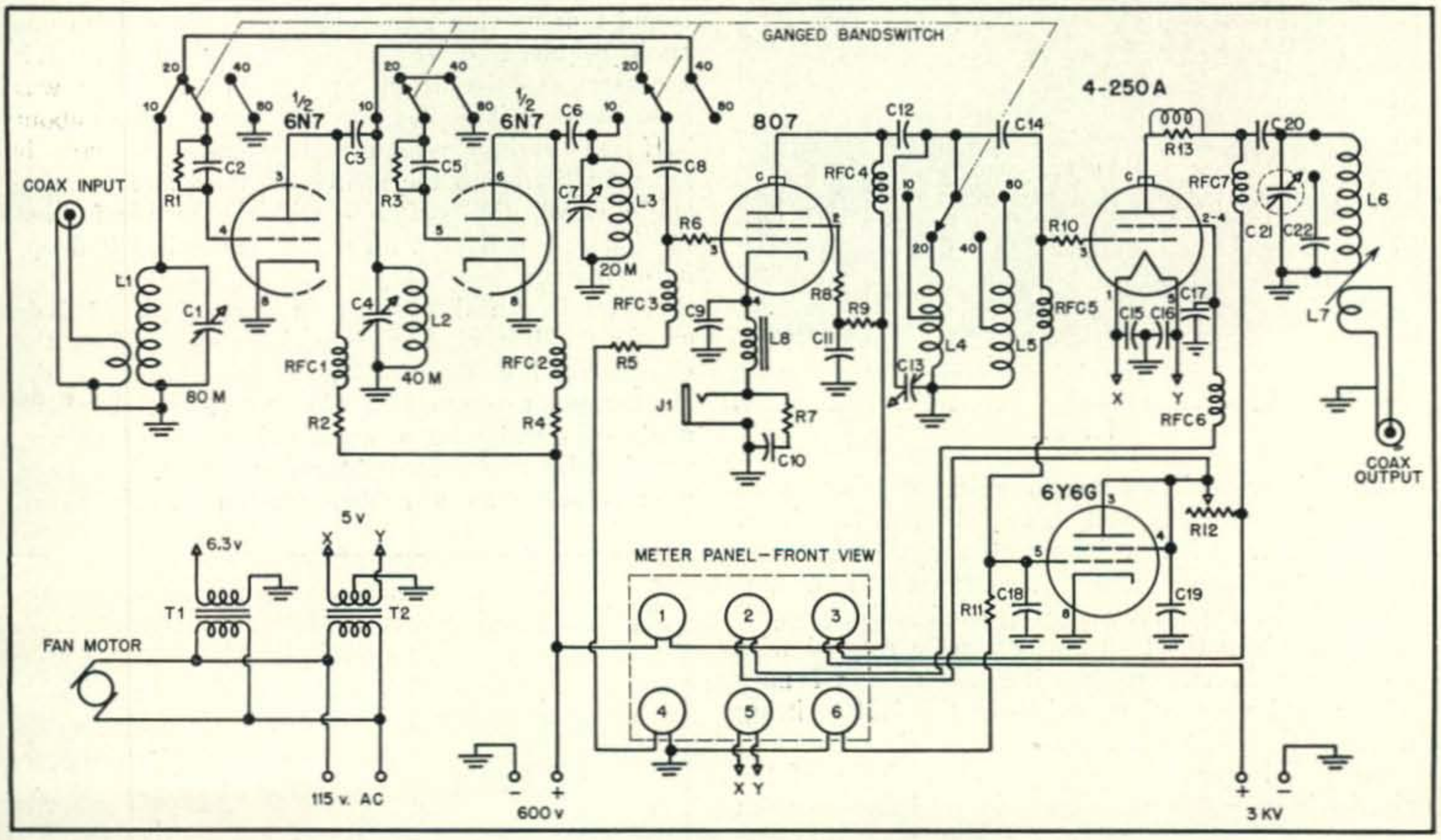
Two coils cover four bands in the 807 plate circuit, each being tapped at an appropriate point so that one coil tunes 80 or 40, the other 20 or 10 meters.

To add capacity to the final tank circuit on 80 and 40 meters, a 50-$\mu\mu$f fixed vacuum capacitor is connected to the tank circuit by means of additional plugs and jumpers on the coil plug strips. Power output is obtained through a variable end-link controlled from the front panel, and fed to the antenna coupler through a length of RG8U coaxial cable.

In spite of careful circuit isolation, some trouble was encountered from a v-h-f parasitic, and from a t.p.t.g. effect caused by coupling from the final tank to the 807 plate circuit. 50-ohm 1-watt carbon resistors in the control and screen grid leads at the 807 socket removed the v-h-f parasitic effectively.

A 50-ohm 5-watt carbon resistor was placed at the control grid socket terminal of the 4-250A. This reduced the feedback and brought the grid drive to the final down to exactly the right amount! Next, a plate suppressor for the 4-250A was made from an 80-ohm 10-watt Sprague Kool-

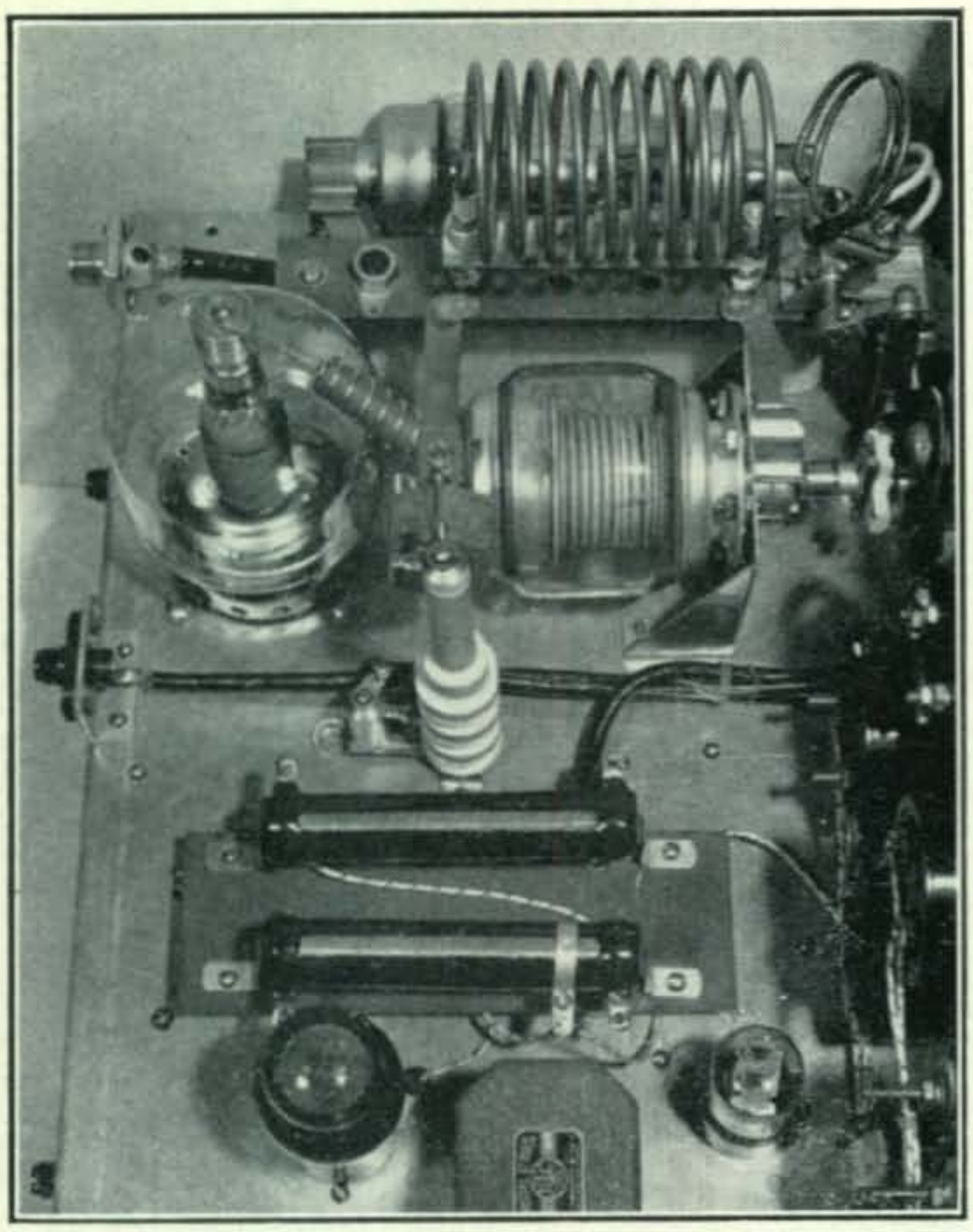
1 LeKashman, "The Lazy Kilowatt," *CQ*, July, 1946. Smith, "Safety Screen Ballast for Large Beam Tetrodes," *CQ*, Nov., 1947. Higgins, "A Chicago Kilowatt," *CQ*, Dec., 1947.



Circuit diagram of the transmitter without power supplies or v.f.o.

C1—100 $\mu\mu$f, midget variable.
C2, C5—100 $\mu\mu$f, mica.
C3, C6—.002 μf, mica.
C4, C7—50 $\mu\mu$f, midget variable.
C8—.0005 μf, mica.
C9, C18—.01 μf, mica.
C10—.25 μf.
C11, C19—.01 μf, 1000 v., mica.
C12—.001 μf, 1000 v., mica.
C13—100 $\mu\mu$f, variable.
C14—150 $\mu\mu$f, 1000 v., mica.
C15, C16, C17—.002 μf, 2500 v. mica.
C20—.001 μf, 7500 v., mica.
C21—10-60 $\mu\mu$f, variable, Eimac VVC 60-20
C22—50 $\mu\mu$f, fixed vac., Eimac VC 50-20
R1, R3—22,000 ohms, ½ w.
R2—7500 ohms, 10 w.
R4—5000 ohms, 10 w.
R5—50,000 ohms, 2 w.
R6, R8—50 ohms, 1 w., carbon.
R7—300 ohms, 5 w.
R9—30,000 ohms, 25 w, adjustable.
R10—50 ohms, 5 w, carbon.
R11—20,000 ohms, 10 w.
R12—100,000 ohms, adjustable. (2-50,000 ohms, 50 w, in series).
R13—4-250A plate suppressor (see text.)
RFC—1, 2, 3, 4, 5, 6, - 2.5 mh, 150 ma.
RFC7—800 ma, National R-175.
T1—6.3 vac, 3 a fil. trans.
T2—5 vac, 22 a fil. trans.
J1—key jack.
L1—30 turns #24E close wound on 1" form. Link 5 turns close wound at bottom.
L2—30 turns B&W #3011 airwound Miniductor, ¾" dia., 16 turns per inch.
L3—13 turns B&W #3011.
L4—10 turns B&W 1" dia., 8 turns per inch, tapped 4¼ turns from ground end.
L5—35 turns #20E, 19 turns close wound from plate end to tap, 16 turns spaced ⅞" from tap to ground end. Wound on 1¼" dia. ceramic form.
L6—80M: 26 turns airwound #12E, 2½" dia., 4½" long.
40M: 16 turns airwound #12E, 2½" dia, 3¼" long.
20M: 10 turns #8 bare, self supporting, 2½" dia, 3¾" long.
10M: 4 turns #8 bare, self supporting, 2½" dia, 3¾" long.
L7—2 turns #10 bare, 2" dia. variable end link.
L8—12-hy 80-ma choke in key filter.

Meters
1—0-150 ma, 807 plate.
2—0-100 ma, 4-250A screen.
3—0-500 ma, 4-250A plate.
4—0-10 ma, 807 grid.
5—0-8 vac, 4-250A fil.
6—0-50 ma, 4-250A grid.



Power amplifier and associated screen voltage control circuits. The vacuum padder across the tank coil is for 80.

ohm resistor with a 6-turn coil of #16 bare wire wrapped around it, and spaced to the length of the resistor. When this suppressor was installed at the tube plate terminal, it completed the debugging job. With full voltages applied and key open. any control on the transmitter can be rotated with no change in current, no indication of r-f anywhere, and no spurious noises in the HRO sitting next to the rig on the operating desk.

As added precautions, despite the stability of the rig, both socket connections of the 4-250A screen were by-passed, an r-f choke was placed in the screen supply lead directly at the socket, and the ends of all "suspicious" looking leads in the set were by-passed.

In spite of its compactness, the final amplifier is not crowded. To insure isolation of input and output circuits, all driver stage components are under the chassis, while all parts associated with the plate circuit are above deck. The base shell of the 4-250A is grounded to the chassis by spring clips fastened to the chassis, thus insuring effectiveness of the tube's internal shielding.

Mechanical Details

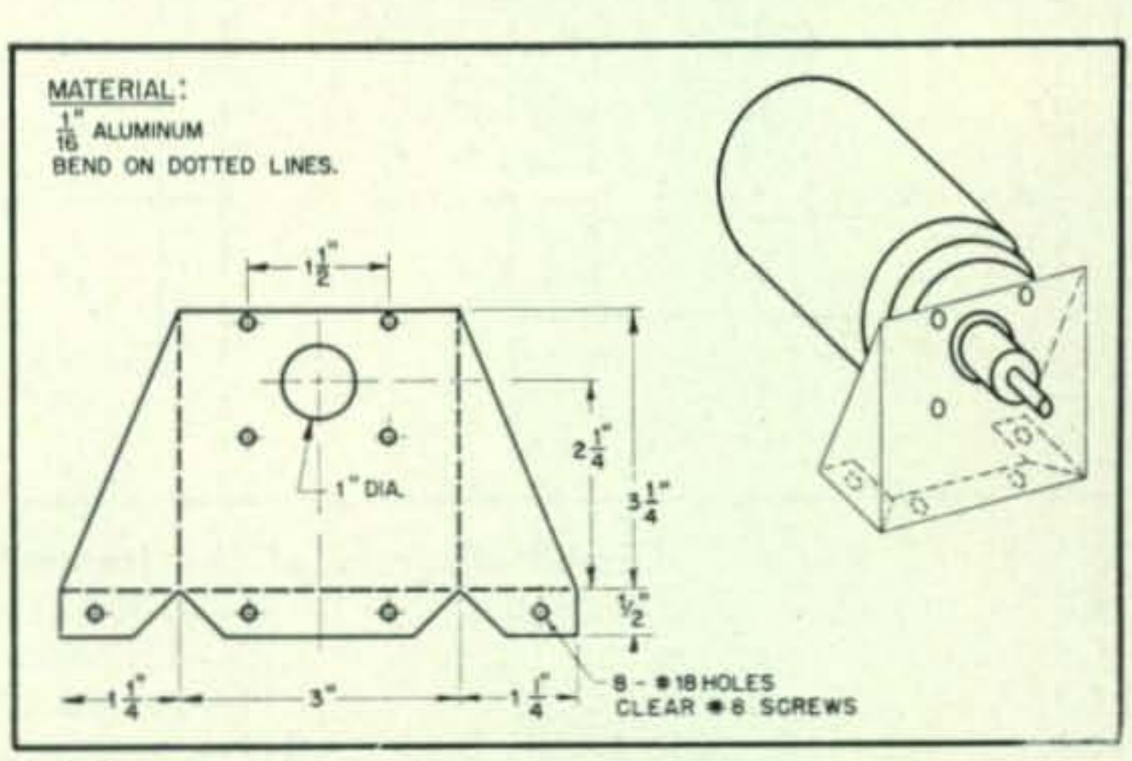
The transmitter is built on a homemade dural chassis 17" x 12" x 4", with a 19" x 10½" x ⅛" front panel, also made of dural. One inside corner of the chassis is partitioned off with another piece of dural the same height as the chassis, and bent into an angle which, with the chassis and the bottom of the cabinet, forms a closed box 8½" long, 5" wide, and 4" high. This box contains the input circuit from the v.f.o., all parts for the 6N7 circuits, and their bandswitch. The 807 socket is mounted on this partition so that the 807 extends horizontally to the rear of the chassis.

The 807 plate circuit is located at the rear center of the chassis, and includes the plate coils, tuning condenser, r-f choke and plate blocking condenser, and the plate coil bandswitch.

The shaft of this bandswitch runs through one end of the box housing the 6N7 circuits on its way to the front panel, and is coupled to the 6N7 bandswitch by means of a Millen right-angle drive fixed to the two shafts and mounted on a small dural bracket. Thus, only one knob is needed to accomplish bandswitching of all the low-power stages.

The bandswitches are the ceramic wafer type with 90 degree spacing between contacts. It was found that moving two index mechanisms with one knob required more horsepower than was felt necessary, so the detent spring on one index was bent away until the loading on that index was about half its original pressure. If reasonable care is taken in lining up the switch shafts and the right-angle drive, the switches will rotate nicely and the index will have a nice solid feel when it drops into position.

A small fan draws air in through a 3" hole cut in the left chassis drop. This pressurizes the chassis, and cools the 4-250A base seals as the air escapes through holes in the socket. A cradle made of dural with a small pair of Lord mounts attached holds the fan motor in position. The Lord mounts serve as a rubber torsion suspension to



Details of variable vacuum condenser mounting plate.

prevent motor vibration from being transmitted to the chassis. A short piece of 3" diameter dural tubing is fastened to the inside of the chassis over the hole so that it encloses the fan blades, increasing the efficiency of the fan and muffling the whir from the blades.

The main advantage in using the fan to suck air into the chassis instead of blowing through the socket is that an unused chassis corner can be utilized.

On the right side of the chassis interior is the socket for the 4-250A, a 5-volt 22-ampere filament transformer, and a bakelite terminal board on which are mounted the 6N7 plate dropping resistors and the 807 screen voltage divider.

Normal precautions were taken to insure short

low-impedance return paths by mounting by-pass condensers as close as possible to their connecting points, and by the use of short, heavy leads.

Topside, on the left end of the chassis looking from the front, are grouped the 6N7 doubler next to the panel, a 6.3-volt filament transformer, and the 6Y6G control tube at the rear. To their right, near the center of the chassis, are the screen dropping resistors for the 4-250A, mounted on a strip of bakelite which is insulated from the chassis with small Isolantite stand-off insulators.

The remaining half of the top deck is taken up by the final tube and its tank circuit. The VVC is supported on a homemade bracket bent from 1/16" aluminum and screwed to the chassis. The condenser is connected to a knob on the front panel by a flexible coupling and a short length of ¼" shaft.

As the VVC makes 16 turns of the shaft to cover its range of 10 to 60 $\mu\mu$f, a counter dial salvaged from a surplus junk pile is geared to the condenser drive shaft. A small window cut in the panel above the tuning dial shows the number of turns the condenser shaft has made.

Coils for the final plate tank circuit were revamped from a surplus set purchased for a dollar each. Fixed center links and protective bakelite skeletons were removed, the coils were pruned to the required inductance values and reassembled.

A strip of Mycalex ¼" x 1¼" x 9" was bored for jacks to match the coil plugs. The end of this strip which extends past the coil plug bar serves as a mounting for the end link base.

The Mycalex jack bar is supported from the chassis on a pair of 2" Steatite standoff insulators. Connection is made to the vacuum capacitors by heavy copper straps ending in 100 ampere cartridge fuse clips which fit snugly over the condenser end bosses.

The output coupling coil can be varied from the front panel by means of a right-angle drive and crank arrangement. A short piece of RG8U coax connects to this coil through heavy flexible leads, and ends in a male coax fitting mounted on the rear of the chassis.

A view of the front panel shows that the principal concern was for effective placement of parts and not symmetry. Six 2" bakelite cased meters are mounted on a 6" x 9" x 3/16" Lucite sheet set behind a 5½" x 8" window cut in the panel. This window is covered by another 6" x 9" Lucite sheet to prevent unwary fingers from coming in contact with the meters. From left to right on the top row the meters read: 807 plate current, 4-250A screen current, and 4-250A plate current. Bottom row left to right are: 807 grid current, 4-250A filament voltage, and 4-250A grid current.

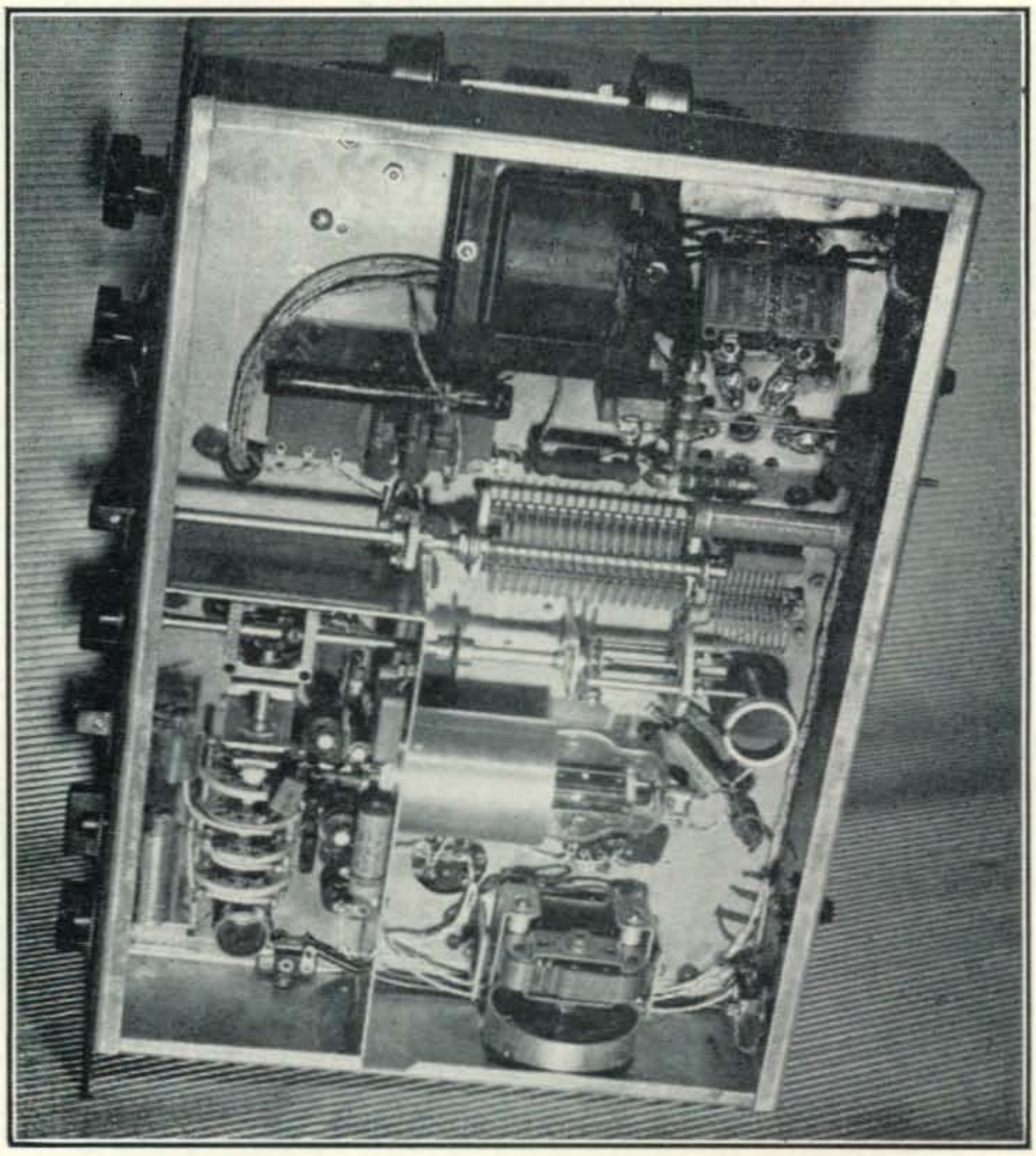
Tuning Controls

Beneath the meter window from the left are the 80-meter input tuning condenser, 20-meter doubler tuning condenser, 10-meter doubler tuning condenser, ganged bandswitch knob, and 807 plate tuning condenser. To the right of the meter window is the 4-250-A plate tuning knob, with a small circular window for the counter dial directly above. The last control on the right side of the panel is the variable output coupling knob.

Two power supplies are used, a 600-volt 200-ma supply for the low power stages, and a 3KV supply for the final. They are located in the garage encased in wood packing cases for safety. Contactors controlled from the operating position close the primaries of the filament and plate transformers. An overload relay set at 400 ma protects the final amplifier tube and the rectifiers.

Primary voltage of the high voltage supply is controlled by a 2-kilowatt Variac at the operating

(*Continued on page 91*)



Driver stage, power amplifier grid circuit, and cooling fan are mounted under the chassis.

Versatile Single-Sideband Exciter

DONALD E. NORGAARD, W2KUJ*

PART I -- If you're still hesitant about jumping on the SS band wagon, here is an exciter that also gives you AM and PM. Part I covers the construction; Part II will deal with the adjustment.

EXPERIENCE for almost a full year in operating a single-sideband amateur transmitter and receiver in the 14-mc phone band has revealed the following points worthy of note:

1. Even at the close of an 11-month period of operation less than 10% of the operators acknowledging a call made on single-sideband recognize the signal as being single-sideband. This includes only calls which were acknowledged, since there is no way to determine how many *heard* but ignored the signal.
2. About 80% of the contacts initiated by a call with AM transmission end up as successful single-sideband contacts when the operator at the receiving end is coached into usable operation of a receiver on a single-sideband signal. Sometimes considerable patience is required at both ends of the circuit before each party is reasonably happy about the results. Heavy QRM is frequently the cause of difficulty at this transition point. Also, many receivers are far from ideally suited for reception of single-sideband signals.
3. Almost 100% of the operators who are successful in reading the single-sideband signal report a decided improvement in signal-to-QRM ratio. According to these reports, the improvement apparently is *at least as great* as theory has predicted and laboratory tests have indicated.[1]
4. Over 30% of the operators who report adequate reception of single-sideband transmissions have indicated that they plan to build (or convert to) single-sideband.

These points appear to teach the following things:

1. Only a few single-sideband stations are operating as yet in the amateur phone bands, and the number of contacts involving a single-sideband station have been an extremely small percentage of the total.
2. Single-sideband works pretty well, if one believes what he hears.

Until operators are generally aware that single-sideband signals *are* on the air, it is wise to provide a single-sideband transmitter with means of generating a signal that can be read with conventional receiver adjustment just to help out in the initial stages of a QSO. The exciter-transmitter unit described in this article is one which generates single-sideband signals by the "phasing" method[2] as well as splatter-proof amplitude-modulation or phase modulation signals. In addition to this versatility, any desired amount of sideband-to-carrier ratio may be employed with single-sideband or AM transmission. An additional feature is that transmission may be on one sideband or the other as desired.

The Versatile Exciter

The photograph (*Fig. 1*) shows the complete exciter and power supply mounted on a 19" x 10½" relay rack panel with all necessary controls conveniently accessible. The self-contained power supply is sufficient for operation of the output stage at a peak output level of 15 watts. Higher power may be obtained by supplying the output stage from an external power supply of higher voltage. As a driver for a following high power stage the self-contained power supply will usually be adequate, depending on the design of the coupling circuits and driving power requirements of the high-level stage.

*Research Laboratory, General Electric Co., Schenectady, N. Y.

1 Norgaard, D.E. "What About Single-Sideband?," *QST*, May, 1948.

2 Norgaard, D.E. "A New Approach to Single-Sideband," *QST*, June, 1948.

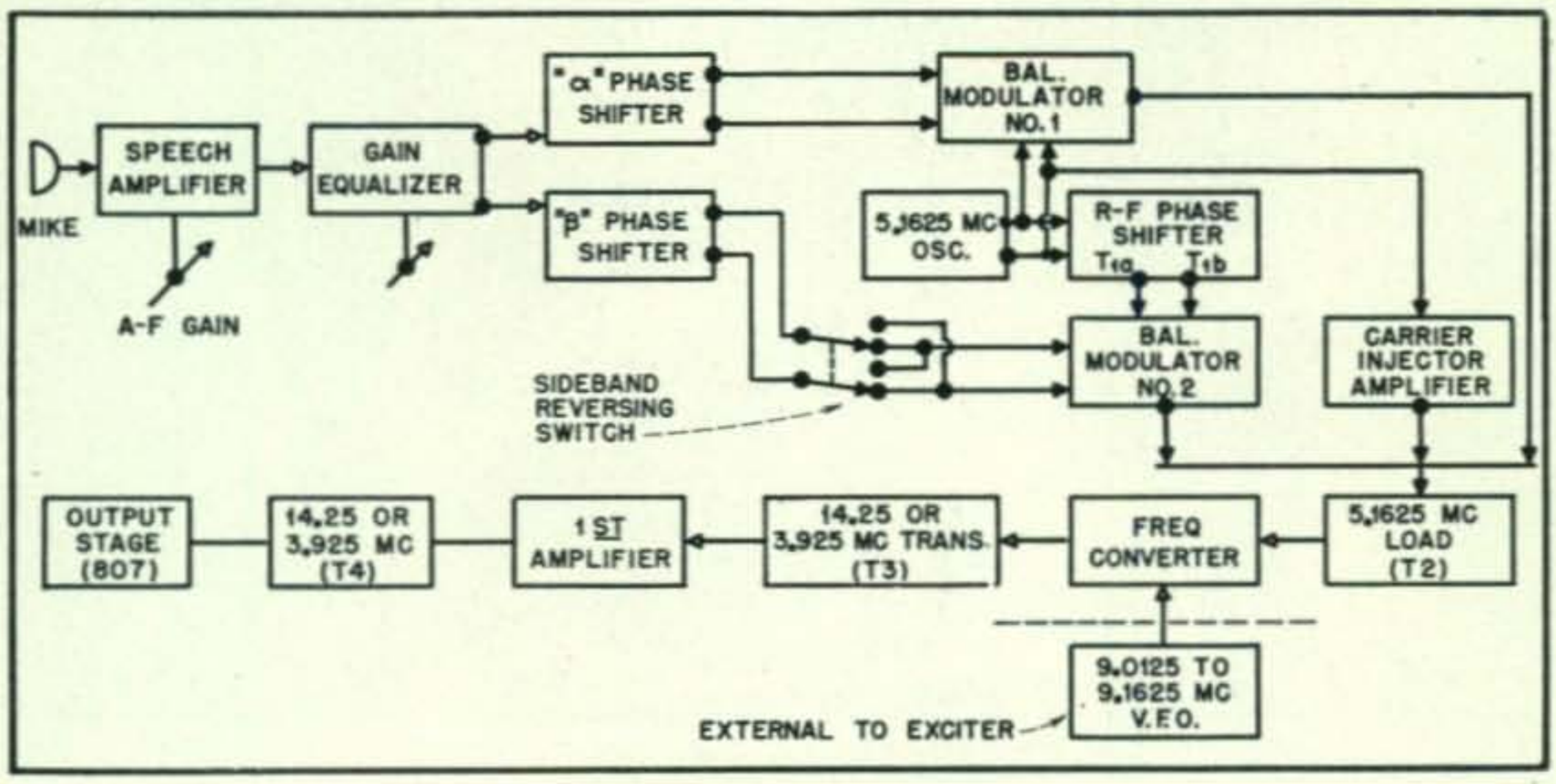


Fig. 2. Block diagram of the exciter.

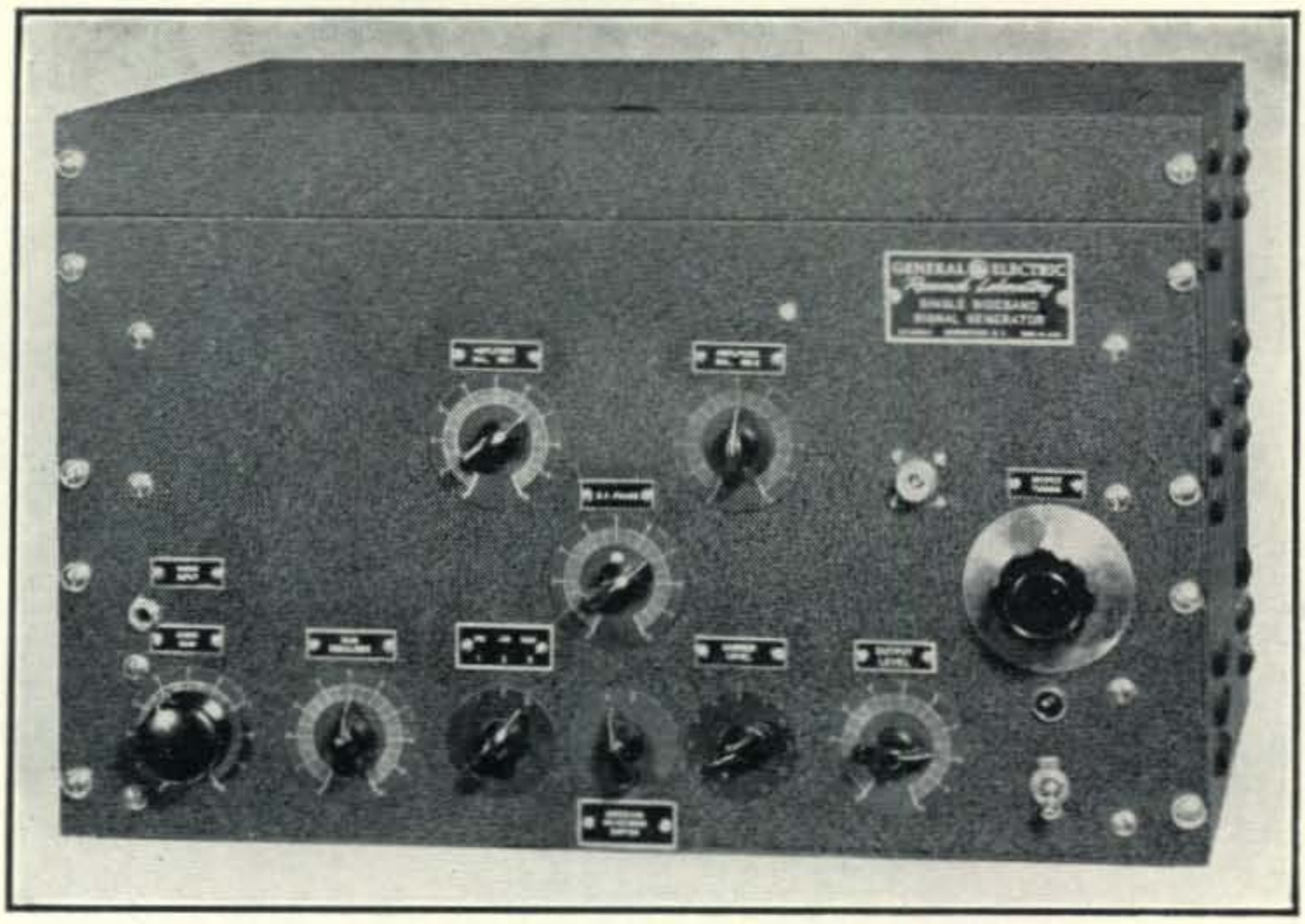


Fig. 1. Front panel view of single-sideband exciter. Controls are: Top row—modulator No. 1 amplitude balance, modulator No. 2 amplitude balance. Second row—r-f phase adjustment (center), output tuning (right). Bottom row—audio gain control, gain equalizer, PM-AM-SSB switch, sideband reversing switch, carrier level control, r-f gain control (output level), off-on switch. Output jack is located to left and above output tuning control.

It is well to point out at this time that the circuit design is such that single-sideband signals of extremely good quality can be generated. The unwanted sideband is more than 40 decibels below the desired sideband over a signal-frequency range from 70 to 5500 cps *when adjusted properly.* The adjustment procedure to be covered in Part II will be found somewhat easier to follow than to read about, and, when followed *exactly,* will assure the type of performance indicated.

Since the modulation—or, more properly—the generation of sidebands is accomplished at very low power levels, the cost of tubes and other components used in this portion of the exciter is small. No effort has been made in the design to strive for high efficiency at this point with the inevitable sacrifice of nearly idealized performance. The total cost per watt—useful sideband watts—is lower than that for any other type of voice-modulated transmitter. This feature alone is one of the dominant characteristics of this method of single-sideband operation.

The method of generating the sidebands is illustrated in the block diagram, *Fig. 2.* Each balanced modulator generates both upper and lower sidebands. When the modulator outputs are added, one sideband is reinforced while the other is cancelled. When carrier is added, disabling one modulator will permit generation of AM signals, while disabling the other permits generation of PM signals. By making a simple check with an oscilloscope on AM and then switching to PM, the deviation is known positively. Of course, the primary purpose of the exciter is for single-sideband operation, but its use as an all-purpose exciter or transmitter is simple and effective. Direct comparison may be made between AM, PM, and single-sideband transmission, and this versatility is really helpful in "breaking the ice" in establishing contact with operators unfamiliar with single-sideband reception.

The complete circuit diagram of the exciter is shown in *Fig. 3.* It will be noted that all tubes except for the output stage are receiving types, as are all other circuit components.

The list accompanying *Fig. 3* gives data on all parts. The majority of the parts need not be exactly as specified—suitable substitutes may be used. Those parts where substitution is inadvisable are marked with an asterisk (*) in the parts list.

The speech amplifier illustrated does not include a sharp cutoff low-pass filter to restrict the audio range to 3000 cycles. Such a filter is advisable, however, and may be inserted externally (between the microphone and the exciter) or built-in *ahead* of the gain equalizer. Numerous articles on low-level speech frequency filters have been published. The audio amplifier does have intentionally restricted bandwidth of a sort, giving 12 db per octave attenuation above 4000 cycles. Since the modulation system is virtually splatter-proof, speech clipping is not necessary—nor is it recommended. As it stands, the gain of the speech amplifier is sufficient to work directly from a crystal or high-impedance dynamic microphone.

The ten controls on the front panel may seem like a large number for such a little exciter. It should be remembered, however, that the majority of them are set once and then left alone. This is true of the gain equalizing control, modulator balance controls, r-f phase adjustment, r-f gain control, and, to a lesser extent, the audio gain control and the sideband reversing switch. If one chooses to operate consistently on AM, PM, or single-sideband, obviously this control would be left in the desired position, as would the carrier level control. The r-f gain, once set for proper excitation to the antenna or to the remainder of a transmitter should require very little attention. The reason for having these controls instantly available is that one may check operation quickly and take full advantage of the versatility of this type of exciter.

Circuit Description

A few words devoted to description of the circuit diagram may help in understanding the operation of the unit. The oscillator circuit (V_1) is a high-stability crystal oscillator patterned after the Clapp oscillator. No adjustments are neces-

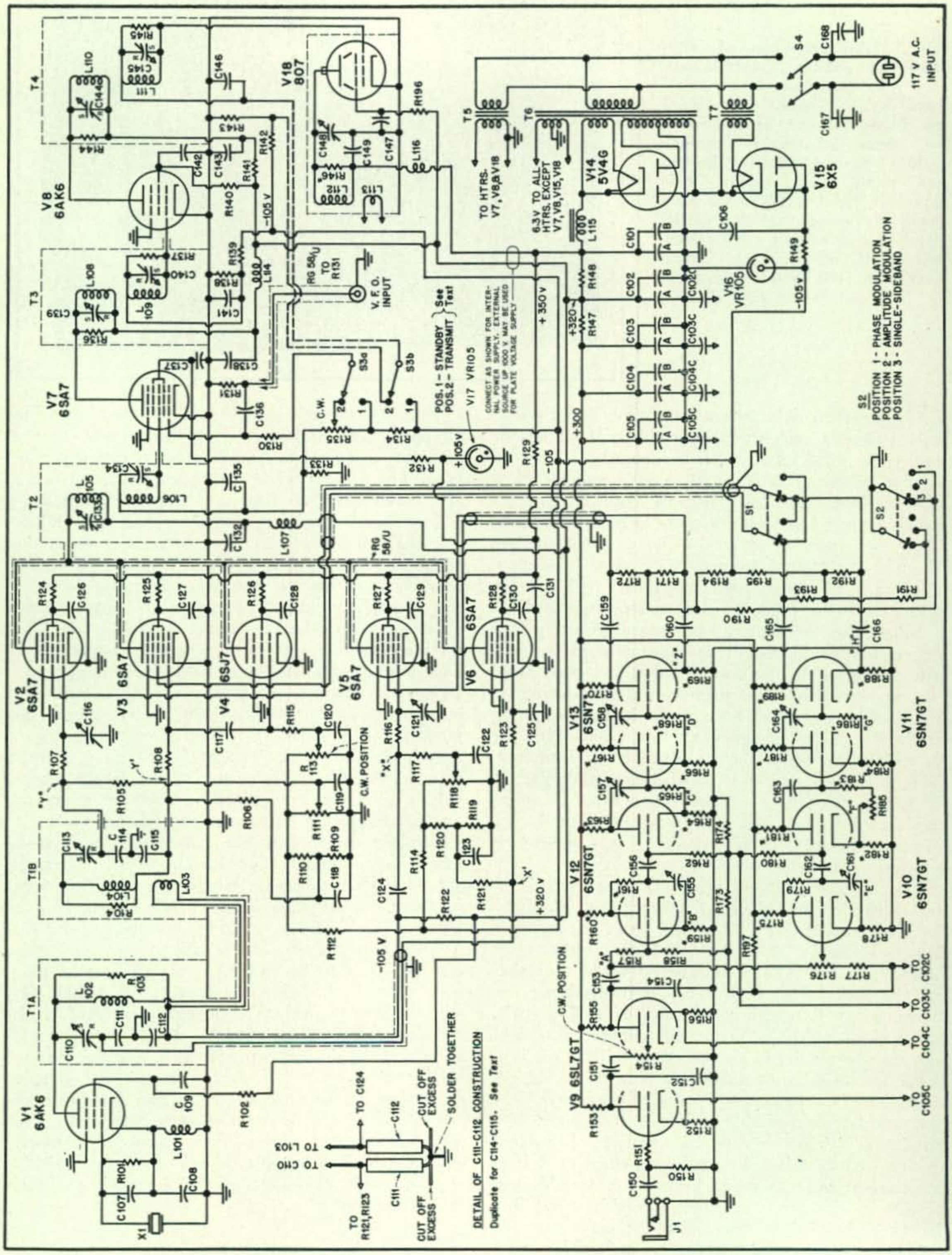


Fig. 3. Schematic diagram of the single-sideband signal generator.

C101, 102, 103, 104, 105—40-40-20 μf, 450-450-25 volt electrolytic condenser (Mallory FP 346, or equivalent).

C106—1 μf, 600 volts, paper or oil filled filter condenser.

C107—50 μμf, mica or ceramic, 300 v.

C108—100 μμf, mica or ceramic, 300 v.

C109—0.05 μf, paper, 300 v.

C110, 113—10-100 μμf, air trimmer (Hammarlund APC-100).

C111, 112, 114, 115—0.01 μf, 5%, mica, 300 v. (see text).

sary—it just oscillates. The load circuit for the oscillator tube is the double-section transformer, T_{1a} -T_{1b}, built in two parts to simplify layout of the modulator section of the exciter. Balanced modulator No. 1 comprises V_5 and V_6, with C_{121} as phase balance control (Marked Ø Bal #1 in *Fig. 4*) and R_{118} as amplitude balance control on the front panel. Balanced modulator No. 2 comprises V_2 and V_3, with C_{116} as phase balance control and R_{111} as amplitude balance control. The carrier amplifier tube (V_4) is supplied with unmodulated carrier, the bias control (R_{113}, carrier level) governing the amount of carrier component sent along with the sidebands. The PM-AM-SSB switch (S_2) selectivity disables modulator No. 2 or modulator No. 1 by applying cut-

C116, 121—5-25 μμf, air trimmer (Hammarlund APC-25).
C117—500 μμf, mica or ceramic, 300 v.
C118, 119, 120, 122, 123—0.05 or 0.1 μf, paper, 100 v.
C124—1000 μμf, mica or ceramic, 300 v.
C125—10 μμf, mica or ceramic, 300 v.
C126, 127, 128, 129, 130—1000 μμf, mica or ceramic, 300 v.
C131—1.0 μf, paper, 300 v.
C132—0.01 μf, mica or ceramic, 300 v.
C133—5-50 μμf, air trimmer (Hammarlund APC-50).
C134—10-100 μμf, air trimmer (Hammarlund APC-100).
C135—0.05 to 0.1 μf, paper, 100 v.
C136—100 μμf, mica or ceramic, 300 v.
C137, 138—0.01 μf, mica or ceramic, 300 v.
C139, 140, 144, 145, 148,—See Table I.
C141—0.05 to 0.1 μf, paper, 100 v.
C142, 143—0.01 μf, mica or ceramic, 300 v.
C146—0.05 to 0.1 μf, paper, 100 v.
C147—3000 μμf, mica or ceramic, 500 v.
C149—0.01 μf, mica only, 1200 v.
C150—0.001 μf, mica or ceramic, 300 v.
C151—0.002 μf, mica or ceramic, 300 v.
C152—330 μμf, mica or ceramic, 300 v.
C153—0.01 μf, mica or ceramic, 300 v.
C154—0.001 μf, mica or ceramic, 300 v.
C155—170-780 μμf, compression condenser set at 290 μμf (see text), (Solar type TP 750, or equivalent).
C156, 162—0.05 μf, paper tubular condenser.
C157—0.002 μf, mica condenser (5%) in parallel with compression condenser (Solar type TP-490, 85 to 490 μμf).
C158—0.001 μf, mica condenser (5%) in parallel with compression condenser (Solar type TP 750, or equivalent).
C159, 160, 165, 166—0.50 μf, paper tubular condenser, 400 v.
C161—170-780 μμf, compression condenser set at 590 μμf (see text) (Solar TP 750, or equivalent).
C163—0.009 μf, composite mica condenser, made up of two or more condensers in parallel to give specified value within 5%.
C164—500 μμf, mica condenser shunted by compression condenser to provide 800 μμf (see text).
C167,168—0.01 μf, mica or ceramic, 300 v.
J1—Microphone input jack.
L101, 107, 114, 116—One pie of National R-100 choke or equivalent inductance (approximately 0.5 millihenry).
L102, 103, 104, 105, 106, 108, 109, 110, 111, 112, 113—See transformer table (Table I).
L115—12 henry, 250 ma choke (Thordarson T75C51 or equivalent).
R101, 105, 106, 112, 114, 117, 121, 130, 142, 171, 172, 192, 193, 194, 195—100,000 ohms, ½ w. (All resistors Allen-Bradley or equivalent, except where otherwise noted.)
R102—50,000 ohms, 1 w.
R103, 104—22,000 ohms, 2 w.
R107, 108, 116, 123—470 ohms, ½ w.
R109, 110, 119, 120—5100 ohms, ½ w.
R111, 113, 118, 135, 176—50,000 ohms, linear taper potentiometer (IRC type CS, or equivalent).
R115—240,000 ohms, ½ w.
R122—1000 ohms, 1 w.
R124, 125, 126, 127, 128, 132—22 ohms, ½ w.
R129—10,000 ohms, wire wound, 25 w.
R131—51 ohms, 1 w.
R133—4700 ohms, ½ w.
R136, 137, 144, 145, 146—See Table I.
R138—15,000 ohms, ½ w.
R139—120,000 ohms, ½ w.
R140—47,000 ohms, ½ w.
R141—100 ohms, ½ w.
R143—33,000 ohms, ½ w.
R147, 148—500 ohms, 10 w., wire wound.
R149—25,000 ohms, 10 w., wire wound.
R150—470,000 ohms, ½ w.
R151, 173—10,000 ohms, ½ w.
R152, 156—1500 ohms, ½ w.
R153, 155—100,000 ohms, 1 w.
R154—250,000-ohm volume control potentiometer, log taper (Centralab A-127 or equivalent).
R157, 174—22,000 ohms ½ w.
R158—82,000 ohms, ½ w.
*R159, 160, 166, 167, 175, 178, 184, 187—4000 ohms, 1% resistors, ½ w. (Continental "Nobleloy").
*R161—50,000 ohms, 5%, ½ w., ("Nobleloy" type X-½).
R162, 180—2.2 meg., ½ w.
*R163, 164, 181, 182—3000 ohms, 1% resistor, ½ w. (Continental "Nobleloy").
*R165, 183, 186—500,000 ohms, 1%, ½ w. ("Nobleloy" type X-½).
*R168, 179—100,000 ohms, 5%, ½ w. ("Nobleloy" type X-½).
*R169, 170, 188, 189—5000 ohms, precision resistor, 1 w., 1% (Continental "Nobleloy", type X-1).
R177—50,000 ohms, ½ w.
R185—50,000-ohm potentiometer, linear taper, (IRC type CS or equivalent).
R190, 191—5100 ohms, ½ w.
R196—22 ohms, ½ w.
R197—330,000 ohms, ½ w.
S1—DPDT rotary switch, shorting type (Mallory 3122-J).
S2—Two-pole 3-position rotary switch (Mallory 3123-J).
S3—SPDT switch (Mallory 3222-J non-shorting), or relay for remote control.
S4—DPST toggle switch, 5 a., 115 v.
T1a, 1b, 2, 3, 4—See transformer table (Table I).
T5—115 v. to 6.3 v., 2 a. (Thordarson T19F81).
T6—115 v. to 5 v., 3 a; 400-0-400 v., 200 ma. 6.3 v. ct, 5 a. (Thordarson T92R21).
T7—115 v. to 6.3 v., 1 a.
V1, 8—6AK6 pentode.
V2, 3, 5, 6, 7—6SA7 pentagrid converter.
V4—6SJ7 pentode.
V9—6SL7GT double triode.
V10, 11, 12, 13—6SN7GT double triode.
V14—5V4G rectifier.
V15—6X5 or 6ZY5GT rectifier.
V16, 17—VR 105-30 voltage regulator tube.
V18—GL 807 beam tetrode.
X1—5.1625-mc crystal (see text).
VFO—9.0125 to 9.1625 mc, ½ w., output into 50 ohms.

TABLE I

Radio Frequency Transformer Data

T_{1a}	L_{102}	9 μh	30 turns #20 enamel wire, close-wound on ¾" form.
T_{1b}	L_{103}	0.75 μh	5 turns #20 enamel wire, close-wound on ¾" form. Arrange so that this coil may be moved along rod supporting L_{104} to adjust coupling.
	L_{104}	10 μh	35 turns #20 enamel wire, close-wound on ¾" form.
T_2	L_{105}	9 μh	30 turns #20 enamel wire, close-wound on ¾" form.
	L_{106}	10 μh	35 turns #20 enamel wire, close-wound on ¾" form. Arrange for variable coupling as for L_{103}.
		For 3.850 to 4.00 mc Operation	
T_3, T_4	L_{108}, L_{109}, L_{110}, L_{111}	32 μh	54 turns #26 enamel wire, close-wound on ¾" form. Arrange for adjustable coupling as for L_{103}.
	C_{139}, C_{140}, C_{144}, C_{145}		5 to 50 $\mu\mu$f, air trimmer (Hammarlund APC-50).
	R_{136}, R_{137}, R_{144}, R_{145}		33,000 ohms, ½ w. (Allen Bradley, or equivalent).
		For 14.2 to 14.3 mc Operation	
	L_{108}, L_{109}, L_{110}, L_{111}	2.5 μh	12 turns #18 enamel wire, close-wound on ¾" form. Arrange for adjustable coupling.
	C_{139}, C_{140}, C_{144}, C_{145}		5 to 50 $\mu\mu$f. air trimmer (Hammarlund APC-50).
	R_{136}, R_{137}, R_{144}, R_{145}		100,000 ohms, ½ w. (Allen Bradley or equivalent).
		Output Tank — For 3.850 to 4.00-mc Operation	
	L_{112}	6 μh	25 turns #18 enamel wire, wound on 1" diameter form, spaced to occupy 2" winding length.
	L_{113}		Choice depends on load impedance. About 9 turns on 1" diameter will match 72 ohms. Arrange for adjustable coupling.
	C_{148}	350 $\mu\mu$f	(Parallel Cornell-Dubilier 0.00025 μf, 5% tolerance, low-loss fixed mica condenser type 4-53025, 2500-volt working, with Hammarlund MC 100 SX, 100 $\mu\mu$f air condenser, or equivalent brands.)
	*R_{146}		"Swamping" resistor. Sprague non-inductive 10 watt type 10 NIT. See *Fig. 7* for value of this resistance. May be omitted when other loading is provided. See text.
		For 14.2 mc to 14.3 mc Operation	
	L_{112}	1.6 μh	13 turns #14 enamel wire on 1" form, spaced to occupy 2" winding space.
	L_{113}		Choice depends on load impedance. About 5 turns on 1" diameter form will match 72 ohms.
	C_{148}	100 $\mu\mu$f,	Hammarlund MC 100 SX condenser or equivalent.
	*R_{146}		"Swamping" resistor. Same as for 3.850 to 4.00-mc band.

off bias to the appropriate modulator. The plates of the five tubes comprising modulators one and two and the carrier amplifier are connected together with shielded cable and work into the modulator load transformer, T_2. The frequency converter tube, V_7, serves to convert the modulated signal to the desired output frequency selected by the first band-pass transformer, T_3. The intermediate amplifier (V_8) drives the output stage through the second band-pass transformer T_4. These two band-pass transformers are designed so that absolutely no retuning is necessary over either the 75-meter phone band or the 20-meter phone band independent of the frequency of operation within these bands.

In this regard, the output frequency is either the sum of an externally supplied v-f-o frequency and the crystal frequency (for 20 meters) or the difference frequency (for 75 meters). Design data is given for T_3 and T_4 for each band in the r-f transformer table (*Table I*). For convenience in calibration of the v.f.o., the crystal frequency should be 5.1625 mc, and the v.f.o. should cover the range from 9.0125 mc to 9.1625 mc. This puts the center of the 75-meter phone band at the same point on the v.f.o. as the center of the 20-meter phone band. Of course, this is not fundamentally necessary, but is convenient if operation is contemplated on both bands. The mechanical design of the exciter can be changed slightly so that

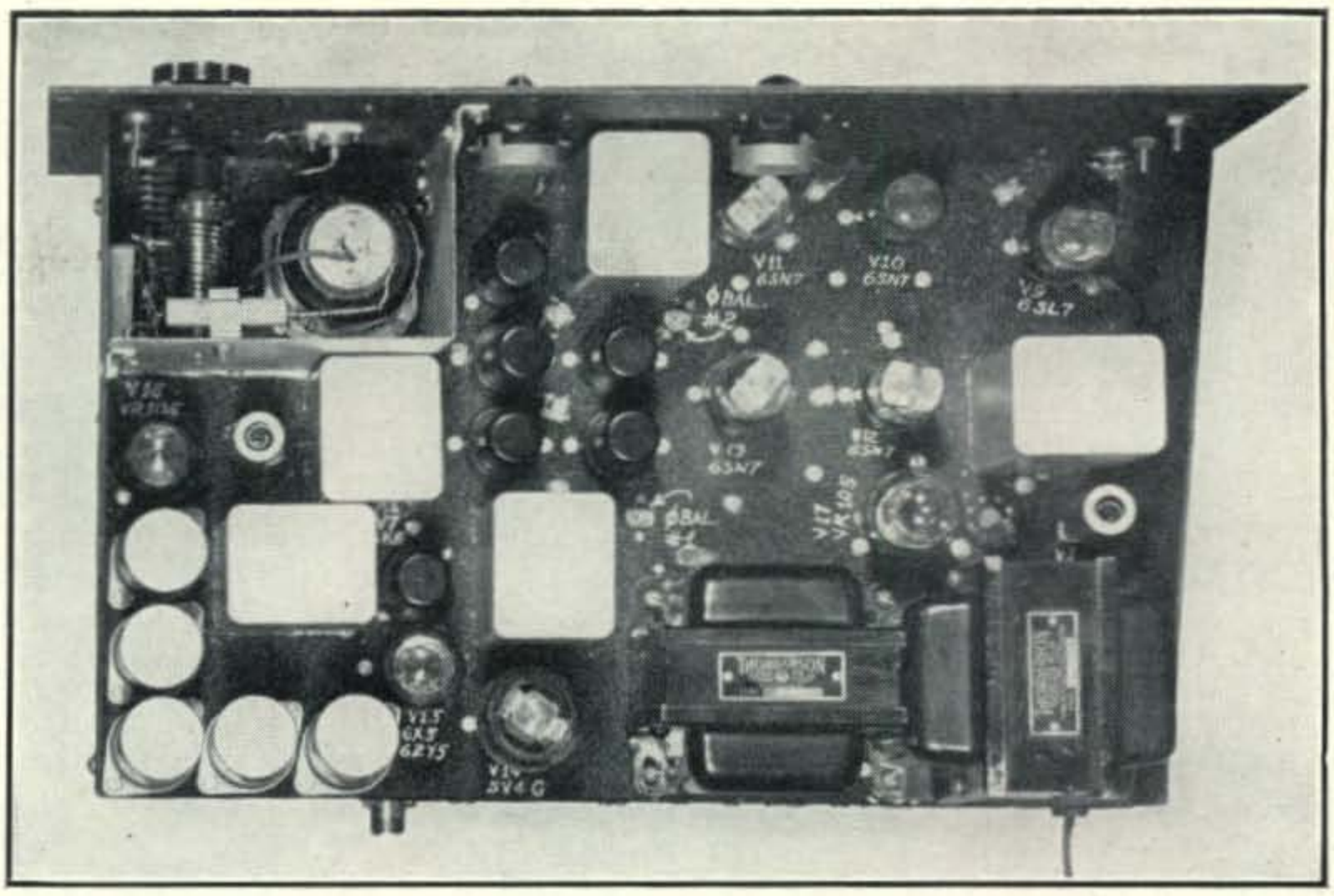


Fig. 4. Top view of exciter chassis. Note v-f-o input jack on rear apron of chassis.

plug-in transformers may be used to allow quick QSY from one band to the other. The transformers may be pre-tuned, so that plugging T_3 and T_4 and changing the output tank circuit is all that is necessary. If only one band is to be used (as is the case with the exciter pictured in *Figs. 1, 4,* and *5*) any pair of frequencies having the correct sum or difference will do. It is recommended, however, that frequencies near 5 mc and 9 mc be employed. A crystal of appropriate frequency may be used in place of a v.f.o. if desired.

The SEND-RECEIVE switch (S_3) merely cuts off the converter tube (V_7) in the receive or standby position so that oscillators (V_1 and the v.f.o.) may operate continuously. This contributes to frequency stability, a prime necessity in single-sideband operation. A relay may be substituted for S_3 if remote control is desired. If an external plate supply of higher voltage is used for the output stage, a two-pole switch or relay should be substituted for S_3, the extra section being used to apply protective bias to the output stage in the standby position. This is indicated in *Fig. 3* by dashed lines.

Of course, the v.f.o. used with this exciter should be made as stable as possible. Use of the Clapp circuit is recommended.

The output stage (V_{18}) operates as a Class AB_1 linear amplifier. The schematic diagram shows a plate voltage supply of 350 volts, but as much as 1000 volts can be used if more output is desired. Plate voltage should be applied at all times when the screen voltage is applied to the tube, since the screen grid will be damaged (due to excessive screen dissipation) without plate voltage.

The audio system comprises V_9 as a two-stage high-gain amplifier, V_{12} and V_{13} as coupling tubes for one of the phase-shift networks of *Figs. 2* and *3*, while V_{10} and V_{11} serve as coupling tubes

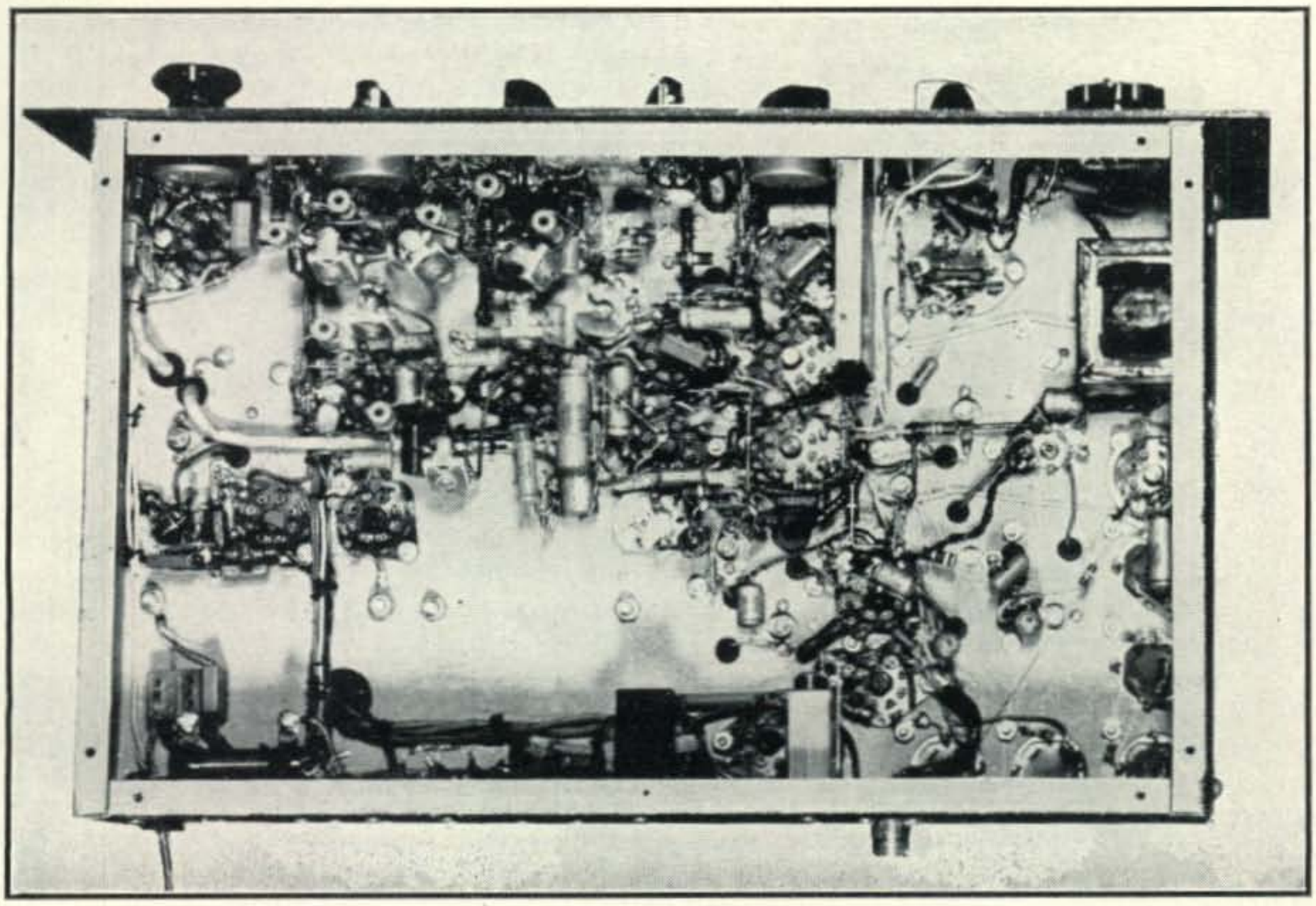


Fig. 5. View of underside of exciter chassis. Note barrier shield between modulators and input circuit of 807 stage (bottom plate removed).

for the other phase-shift network. The gain equalizing control, R_{176}, serves to permit adjustment of sideband cancellation. The sideband reversing switch allows single-sideband transmission on either the lower or the upper sideband as desired.

Well-filtered plate voltage is supplied to all tubes in the exciter by the rectifier, V_{14}, and its associated filter circuits. A separate bias rectifier, V_{15}, and bias regulator, V_{16}, provide stabilized fixed bias to the modulators, converter, and amplifier stages.

Construction

The exciter unit is built on a standard 17" x 11" x 3" steel chassis with a 19" x 10½" panel. Use of a bottom plate for the chassis is recommended. This requires that about ⅛" clearance be allowed between the bottom of the panel and the chassis. The photographs (*Figs. 1, 4,* and *5*) illustrate only one of the many possible parts layouts. The audio amplifier and phase-shift networks are near the front panel where the gain control (R_{154}) and the gain equalizer control (R_{176}) can have conveniently short leads. The adjustable compression type condensers used in the phase-shift networks are mounted on small ceramic stand-off insulators and oriented so that they may be set conveniently with a screw driver. The total capacity required in some of the circuits (see the parts list) is such that the compression condensers constitute only a portion of each, the remainder being made up by fixed mica condensers shunting the adjustable section.

It is unnecessary to describe each step in construction, but a few general principles, if followed, may help prevent unstable or "cranky" operation. For instance, any grid leak resistor which has r-f voltage applied across it should be located directly at the grid (or the line carrying the signal), and the by-pass condenser at the "cold" end should be near the resistor. The bias voltage supply lines can then be any convenient length without putting stray r.f. where it isn't wanted. Features such as this are not always apparent from inspection of a schematic diagram, but should be considered carefully in any piece of equipment. All ground connections should be made direct to the chassis. The cathode connections of all r-f tubes (except the oscillator V_1) should be as short as possible, direct to chassis.

The r-f transformers T_{1a}, T_{1b}, T_2, T_3, and T_4, are contained in drawn-aluminum shield cans (National, type RO). The primary and secondary coils are listed in *Table I*, both as to inductance and winding data for typical coils. The coils used in the original exciter were calculated according to the formula, $L = \frac{0.2\ A^2\ N^2}{3A+9B}$ microhenries, where N is the number of turns, A is the diameter in inches, and B is the length of the winding in inches.[3] If it should be desirable or necessary to use different coil dimensions, this formula may be used to determine the winding data for a new coil with the assurance that it will resonate with the tuning condensers used in

(*Continued on page 90*)

3 ARRL Handbook, 25 Edition, 1948, p. 30.

MARS Activities

U-H-F men can now do a great service for the Air Force by sending their findings in the 200-400 mc bands to the Chief, MARS, USAF, 4 C 1067 Pentagon Building, Washington 25, D.C. The Chief will collate the information and forward it to the Air Force research laboratories. The participation of a large number of civilian amateurs will be of great assistance in expanding the present Military Amateur Radio System.

This information was requested by Brigadier General Tom C. Rives, Chief of the Electronics Subdivision of the Engineering Division, Air Material Command, Wright-Patterson Air Force Base, Dayton, Ohio, when he was queried, "How can amateur radio contribute to the electronics research program of the Air Force?"

General Rives is interested in every phase of amateur activity on the 225 and 420-mc bands.

What sort of frequency stability have you experienced? How do you modulate the rig? What do you use for feeders or waveguides? What kind of a radiating system do you use? He would like a schematic of your transmitter with values of the components listed, unusual circuitry, and if available, a picture would be appreciated.

Similar reports covering receiving equipment and u-h-f signal reception is desired. How did the weather affect the signals? How did humidity, fog, rain, snow, ice, temperature extremes or temperature inversions affect the signal strength? If you happened to have noted the results on instruments, fine. However, your personal evaluation of aural reception is just as valuable.

Even if you are not a licensed amateur you can make a valuable contribution as a u-h-f listener by cooperating with the amateurs in your community, noting such things as Doppler effects of planes, trains or meteors, ducting, atmospheric levels, especially as related to electrical storms, and any other peculiarities of reception in the u-h-f bands.

Overseas amateurs and experimenters are especially invited to send in their u-h-f experiences.

The information the Air Force needs can be supplied only by the interested amateur since his distribution is universal, whereas the radiation laboratories of the Air Force are located at only a few spots. How u-h-f works in the desert, in the arctic, in the mountains, on the seaboard, in the Delta country, must be known before an accurate evaluation of the 200-400 mc band can be made.

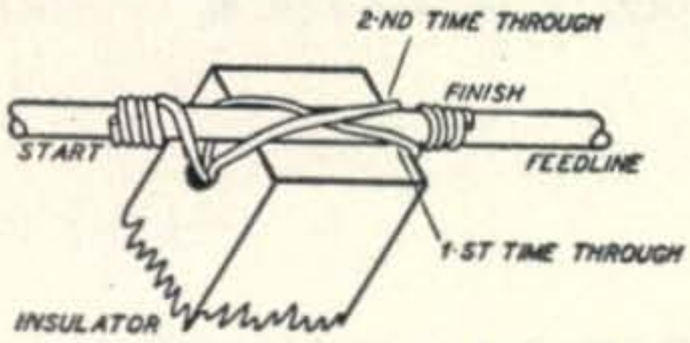
Air Force research runs through the entire radio spectrum considering all of the electronic applications of the various frequencies. Among these is the possibilities u-h-f offers as additional voice communications channels. The Air Force is not unique in this position. The whole communications world wants to know.

(*Continued on page 83*)

Inside the SHACK AND WORKSHOP

Attaching Spreaders to Open-wire Feedlines

Rather than trying to keep our spreaders in place with a single wire tie we have more-or-less permanently secured them by making the following wire "knot." It is very easily done and is well worth the slight additional effort and time involved.

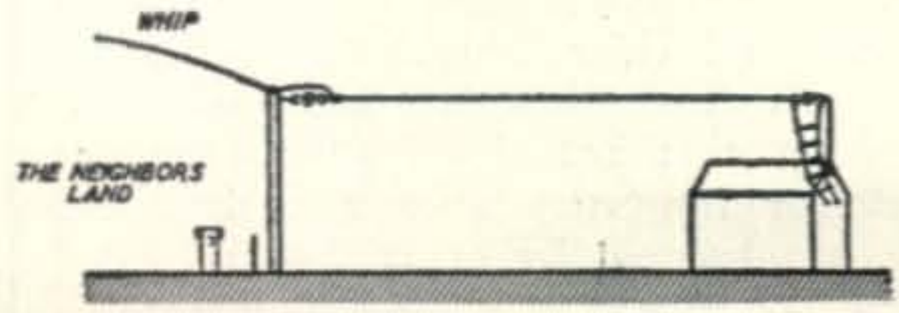


Start by wrapping a piece of No. 18 copper wire several times around the single feeder wire close to the end of the insulator. Then pass the free end through the spreader eye and bring it over and across the end of the spreader and feeder wire to the same side as the wrapping. Pass it again through the spreader eye and bring it back over and across, so that there is an "X" formed at the end of the spreader. Pass the end a third time through the eye and then wrap it around the feeder wire on the opposite side of the insulator from the beginning wrap.

William E. Duggan, W2WFZ

Zepp Antenna Stretcher

This is a simple way to stretch that sometimes all-too-short piece of real estate and enable it to better accommodate a low frequency antenna. A surplus 12-foot whip antenna is bolted to the top of the pole at the far end of the antenna system.



This whip is then connected to the end of the antenna. If your neighbor is tolerant you will be able to mount the whip almost horizontally, thereby encroaching on about 12 feet of his sky. If a center-fed Zepp is used, a whip can be added at each end of the flat-top increasing it by 24 feet.

Jack Najork, W2HNH

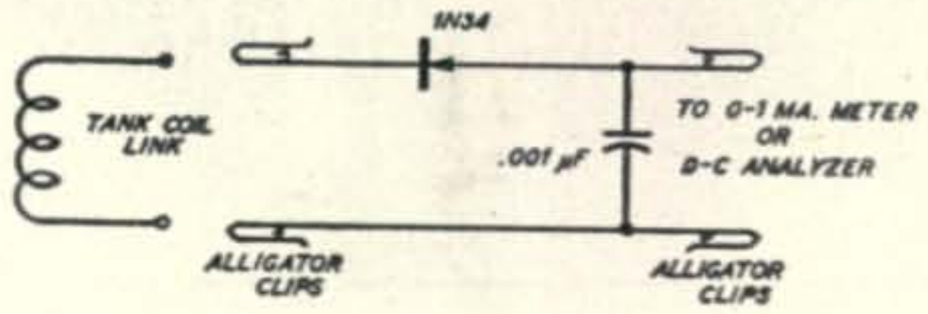
New Combination Tube Possibility

Many amateurs who build their own receivers or are modifying some surplus equipment should substitute the 6SQ7 or other duo-diode-triode with a 6S8-GT. The latter has an extra diode-cathode in the same glass envelope, thus this one tube can be operated as second detector, a. v. c., first audio, as well as noise limiter. This works better than the crystal diode and takes no more filament power than the original tube.

Wayne W. Cooper, W8EWC/2

Neutralization Indicator

For exact neutralization of an r-f amplifier, the indicating device should unbalance the circuit as little as possible. At 10 meters the time-honored neon bulb is ruled out, especially on these low grid-plate capacity tubes. The bulb upsets the circuit and prevents accurate null indication. If an output link is available on the final tank coil this little adaptor may be clipped to the link terminals and



a milliammeter or d-c circuit analyzer used to read current flow. Simply adjust the neutralization for minimum meter readings. This is the only way we have found to neutralize 813s, 4-250s, etc.

Bill Orr, W6SAI

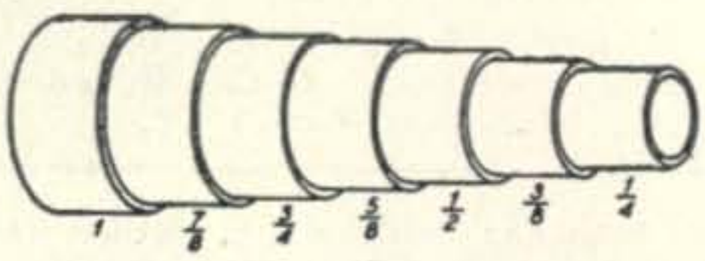
Protecting Porcelain Parts

Stand-off insulators of Steatite and similar material tend to break or chip when they are bolted tightly against a metal chassis or another Steatite part. Generally manufacturers supply cork washers to be used between the parts to absorb this strain. But just as frequently these are torn or lost and a substitute must be found. In their absence, gummed re-enforcements used with loose leak ring binders will do the job neatly. These are found in any stationery store. If the re-enforcements appear to be too thin, several may be stuck together to provide additional shock absorbing area.

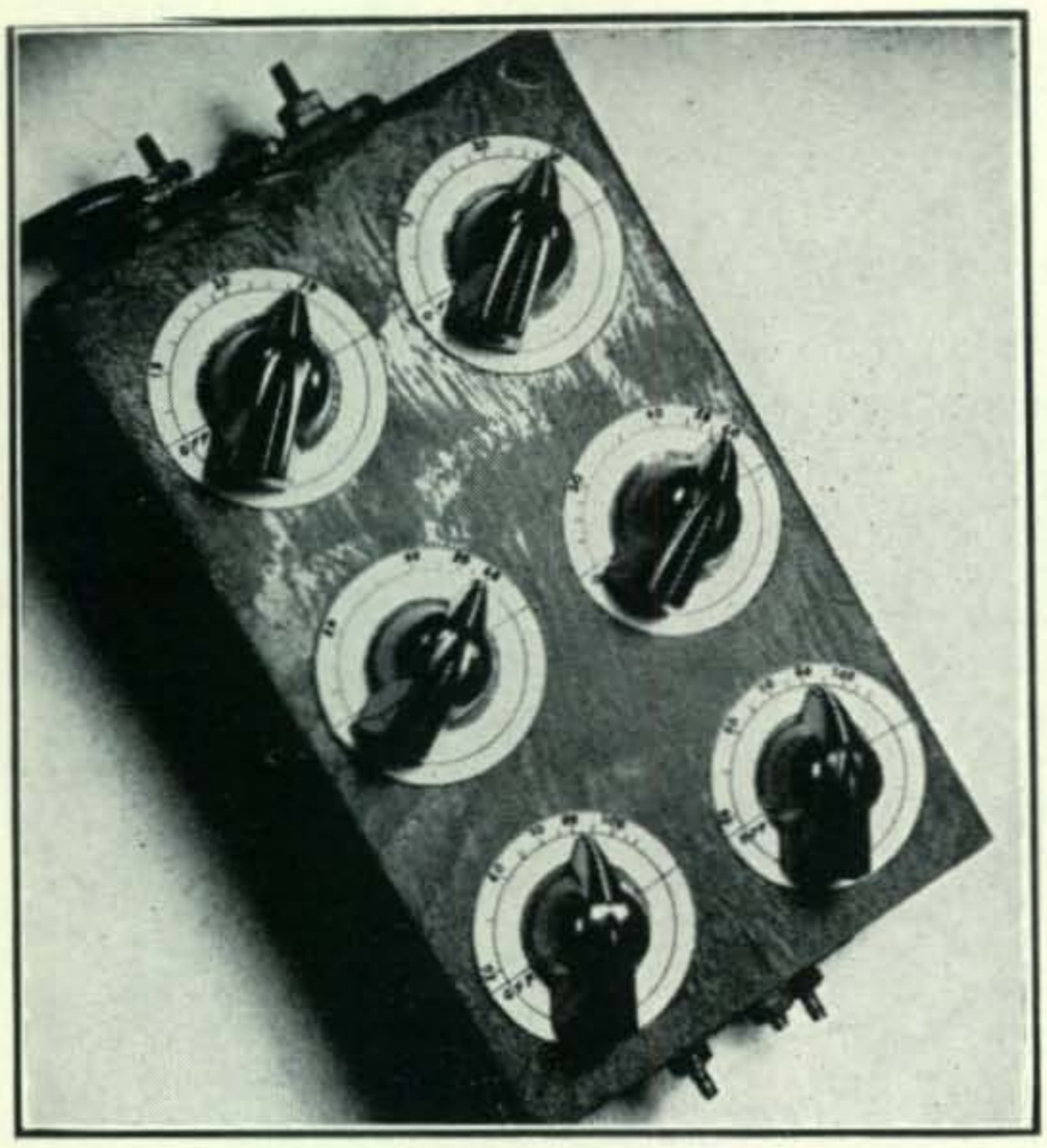
Frank H. Tooker, W2VQL

Universal Coil Winding Dowel

This is a device especially for chronic v-h-f experimeters. Needing a certain-diameter dowel upon which to wind self-supporting coils, the experimenter almost invariably searches the house—measuring the diameter of everything in sight. This is time consuming as well as disconcerting each time a circuit is to be tried out. To eliminate this need I have devised this dowel. It contains all the most commonly used diameters encountered in v-h-f work. It can be easily turned out on a lathe. It can be made of any material and each segment as long as the constructor thinks necessary. In building mine, I merely turned down the handle of a screwdriver (plastic) to the various diameters.



Peter N. Saveskie, W2JFE



Calibrated dials provide a direct reading indication of frequency that trap is tuned to for interference reduction.

THE TRAP BOX

WILFRED M. SCHERER, W2AEF*

ALTHOUGH EXCELLENT information has been published[1] regarding the identification of television interference, more exact methods are required, especially for the amateur inexperienced with the procedures heretofore described. Identification as to whether or not the amateur transmitter is the cause of TVI in specific instances is a relatively easy and obvious matter. Identification of the actual interfering frequency is usually not so simple a process. Frequently it is concluded that a harmonic coinciding with the TV channel is causing the trouble. This is most often true; however, in some cases, actual attenuation of this harmonic provides no improvement and the amateur involved becomes discouraged.

Shock excitation from the fundamental transmitter frequency often is to blame for TVI. Even if the receiver is not shock excited or overloaded to produce spurious beats, a fundamental frequency in the 28-mc region can combine with other signals present at the TV channel frequencies to cause beats at the receiver i-f frequency. This is especially true in some of the older type sets and in those having poor front-end selectivity. The same effect can occur with strong second or third harmonics of a 14-mc transmitter even though they do not fall directly in the TV channels. Amateur 50-mc fundamental signals can also either shock excite or combine with other TV signals to produce interfering beats.

A strong harmonic from the lower frequency amateur bands may not only fall directly in a TV channel, but may also fall into the video i.f. The second harmonic of a 27-30 mc signal will occur directly in channel 2 (54-60 mc). The third harmonic, which is often overlooked, not only is directly on channels 5 and 6 (76-82 and 82-88 mc), but also can produce images appearing on channels 2, 3 or 4 in older receivers employing i.f.s in the 8 to 13-mc region. The fourth harmonic can similarly cause images on sets using an i-f frequency in the 21 to 26-mc region. These are only a few of the possibilities. Many other combinations, too numerous to mention, do cause TVI. It is no wonder then that actual effective attenuation of a particular frequency, such as a definite harmonic, may be obscured by other factors.

The "trap box" was devised in order to better identify the frequency of the offending signal. The circuit is shown in *Fig. 1*. The halves of three pairs of calibrated parallel resonant traps, covering three different frequency ranges, are connected in series with each other. These in turn are hooked in series between the TV receiver and the TV antenna feed line. When interference is observed on the TV screen, the traps are adjusted until the interference is either eliminated or has decreased. The frequency of the undesired signal is then read directly from the calibrated scales of the traps effecting the deletion of the interference.

The effective use of the trap box, however, is limited under some conditions. If the offending signal is entering the TV receiver through any path other than the antenna feed line, the trap box is practically useless in the antenna circuit. Such a condition may be due to direct radiation to

**100 E. Palisade Ave., Englewood, N. J.*

1 "Television Interference, Its Causes and Cures," Radio Magazines, Inc., New York, N.Y.

The "trap box" will help to determine the frequency of a signal causing TVI. It will also indicate whether or not certain effective cures can be installed at the TV receiver input. It is recommended that the serviceman guaranteeing the TV installation handle the receiver connections. Should the trap box alone remove the TVI, duplicate traps can be installed in the antenna line permanently. In all cases positively identifying the frequency of the TVI will simplify the task of applying known remedies.

the components of a poorly shielded set, or may be due to r-f pickup through an unfiltered 117-volt a-c line cord. This may be checked by removing the antenna from the receiver and observing whether or not the interference still exists. Naturally, the TV picture will disappear, but an interference pattern of some sort may still be seen if this situation prevails. This may be further traced by inserting the trap box in the a-c line cord. This should be done directly at the receiver chassis. The traps described are wound with rather small wire, so care must be exercised to prevent overheating of the trap inductors. For tests with receivers drawing a small amount of power its use is permissible, but, in any event, tests with the trap box in the a-c line should be for a very short duration (especially when using the lowest frequency traps which are wound with No. 26 wire). If any extensive work along this line is expected, it is suggested that the inductors be wound with heavier wire.

Putting the Trap Box to Work

The trap box may be employed for purposes other than the indentification of amateur interference. Good will may be created between the amateur and the TV set owner by using the box to check other types of interference, such as that caused by FM broadcast stations, police services, etc. In addition, an indication will be obtained as to whether or not a trap at the TV receiver will be a solution under certain conditions. If this is so indicated, a change to shielded series tuned traps across the antenna or a-c line to ground will usually prove even more effective.

An example of a case where the trap box was employed is of interest. A TV receiver was placed in the same room with a 50-kw transmitter (non-amateur) operating on 11.9 mc. Reception of pictures was impossible. This was blamed on known harmonics in the TV channel region. The trap box was inserted in the antenna leads and the traps were adjusted until clear undisturbed pictures were obtainable. Reference to the calibrated scales indicated that the main source of interference was caused by the second harmonic at 23.8 mc which fell near the center of the video i-f range. The transmitter was then placed on 21.5 mc. Pictures again were unobtainable and adjustment of the trap box gave no improvement. The antenna was disconnected from the receiver and the interference patterns still persisted, indicating either direct pickup in the receiver or the a-c line cord. The box was then inserted in the a-c line directly at the chassis, and when it was adjusted to 21.5 mc, virtually all the interference pattern disappeared, showing that the r-f pickup was through this line. While the second harmonic of the 11.9-mc signal was not sufficiently strong to cause interference through the a-c line, the 21.5-mc fundamental, being of considerably higher power, crashed in through the line under normal conditions.

Construction

The shielded box is made of copper (aluminum may be substituted, but do not use steel) and is

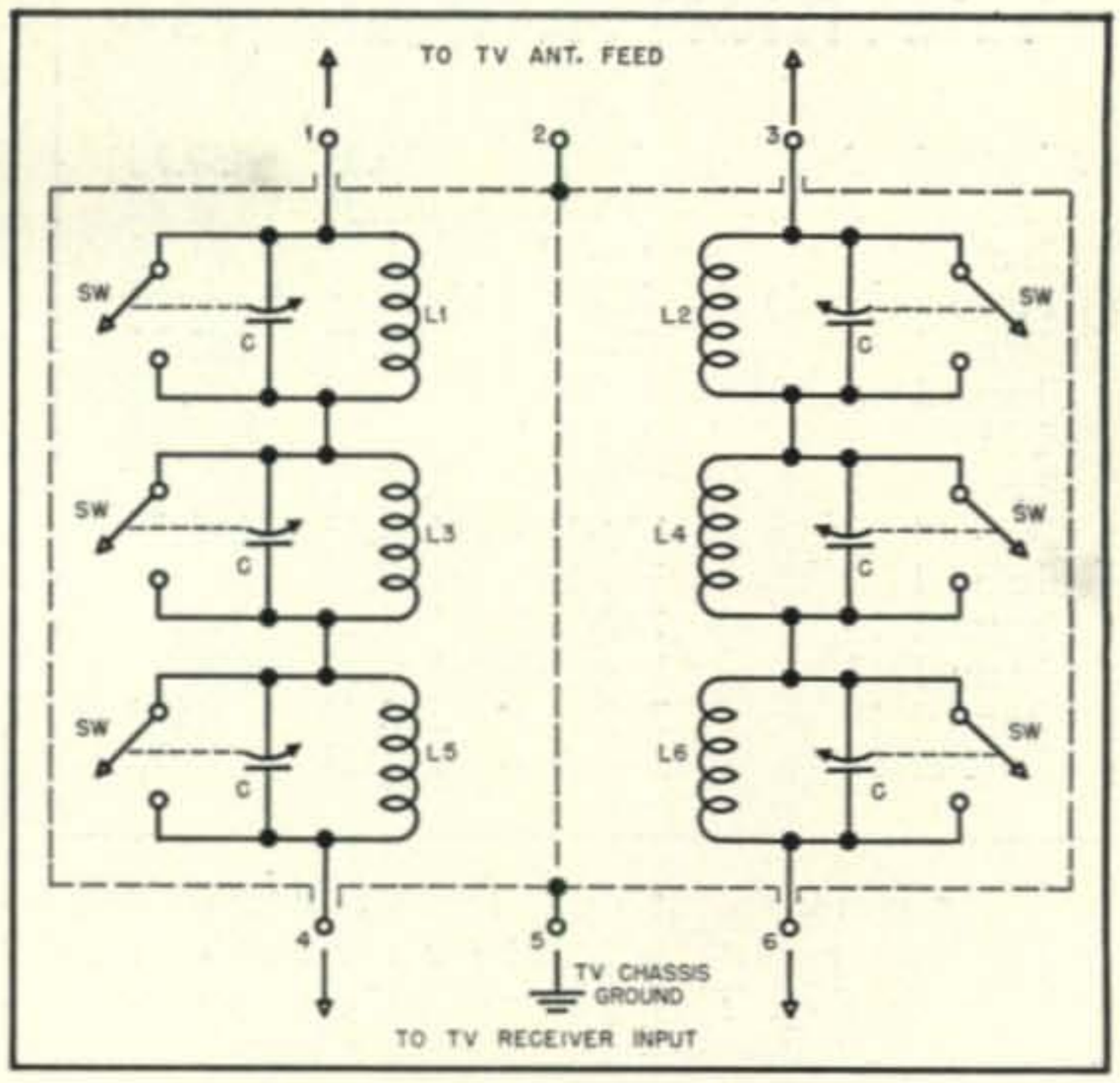
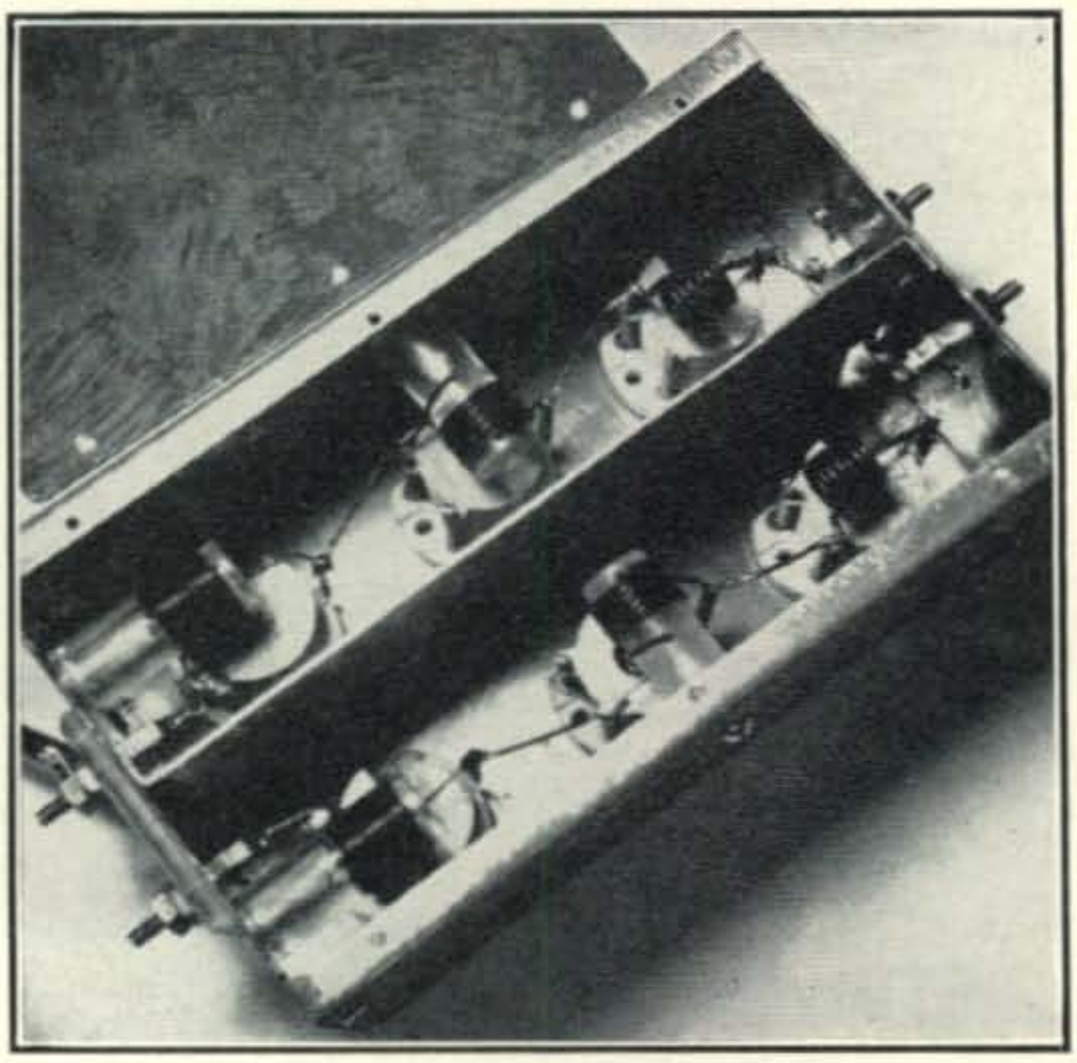


Fig. 1. Circuit diagram of the trap box.

C—50 $\mu\mu$f—ACP type with extension shaft.
SW—Rear rotor plate bent at one corner to make contact with rear stator plate when capacitor set at maximum.
L1, L2—14-30 mc—18 turns No. 26 enamel close wound on 1/2" diameter polystyrene rod.
L3, L4—27-60 mc—8 turns No. 22 wound as above.
L5, L6—50-120 mc—5 1/2 turns No. 14 enamel close wound self supporting, 5/16" inside diameter.

6" long, 2¾" high, and 3½" wide. A partition shield is installed through the center to separate the halves of each pair of traps. The APC type variable capacitors, of 50 $\mu\mu$f each and having extension shafts for a knob, are mounted directly on the face of the box. Be sure to use capacitors in which the rotor is not grounded to the mounting studs. The clearance hole in the box for the rotor shaft should be at least ⅜" in diameter to minimize capacitance to the box. A corner of each



The three sets of traps are separated by a shield partition running the full length of the box.

TELEVISION FREQUENCIES

		Visual	*Aural*
Channel 2	54-60	55.25	59.75
Channel 3	60-66	61.25	65.75
Channel 4	66-72	67.25	71.75
(Aeronautical)	72-76	(Marker	Beacon)
Channel 5	76-82	77.25	81.75
Channel 6	82-88	83.25	87.75
(FM)	88-108		
Channel 7	174-180	175.25	179.75
Channel 8	180-186	181.25	185.75
Channel 9	186-192	187.25	191.75
Channel 10	192-198	193.25	197.75
Channel 11	198-204	199.25	203.75
Channel 12	204-210	205.25	209.75
Channel 13	210-216	211.25	215.75

rear rotor plate is bent so as to make contact with the rear stator plate when the capacitor is at its maximum setting. This is done so the trap may be shorted out of the circuit.

The capacitor stators should be connected toward terminals *4* and *6* at the receiver end of the box, and the rotors toward terminals *1* and *3* at the antenna end. This is done to minimize direct r-f pickup at the receiver end. Terminals *1*, *3*, *4* and *6* should, of course, be insulated from the box, and the ground terminals *2* and *5* should be located next to *1* and *3* or *4* and *6* respectively.

In order to minimize the possibility of mutual coupling between the traps, the two end inductors are wound in opposite directions while the center ones are placed at right angles to the others.

The frequency ranges of the trap box illustrated are 14-30 mc, 27-60 mc, and 50-120 mc. Other ranges may be added or substituted as desired. *L* for 90-200 mc should be 2 turns No. 14 enamel self-supporting 5/16" i.d. *L* for 7-16 mc should be 30 turns No. 22 enamel close-wound on ¼" diameter rod.

To calibrate the trap box, couple a signal generator to the antenna side of the box. A Dipper[2] may be used as the signal generator by coupling it through a short one-turn link to the probe coil. Connections should be made to terminal *1* and ground terminal *2* of the trap box. At the receiver end of the box connect a vacuum tube voltmeter capable of reading r.f. A 1-ma meter connected in series with a crystal diode may be used instead of the v.t.v.m. Connections should be made to terminal *4* and ground terminal *5*. Make all leads as short as possible. The three traps along the corresponding side of the box will now be ready for calibration.

Short out all the traps except the one to be calibrated. Set the generator at the desired frequency and tune the trap for a null as indicated by the meter. Mark the scale and repeat for succeeding points. After all the traps on this side of the box have been calibrated, switch the outside connections from terminals *1* and *4* to terminals *3* and *6* so the traps on the other side may be calibrated in the same manner.

Calibration also may be made by connecting the trap box in series with an antenna connected to a communications receiver. Tune the receiver to an incoming signal at the point desired for calibration and then adjust the trap concerned for maximum attenuation of the signal. Mark this point on the trap scale and then proceed for succeeding points in the same way. Since most communications receivers do not cover the higher frequencies, the sound carrier of the various TV channels may be used in conjunction with a TV receiver for calibration.

Installation and Operation

Where the antenna feed line to the TV set is Twin Lead, connections should be made to terminals *1* and *3* for the line, and to terminals *4* and *6* for the receiver input. This will place one set of traps in each leg of the feed line. Terminal *5* should be connected to the receiver chassis ground. If the feed line is coax, connect the inner conductor to terminal *1* and the outer shield to terminal *2*. Connect terminal *4* to the receiver input and terminal *5* to the chassis ground. This will place one set of traps in series with the inner conductor only.

To avoid direct r-f pickup, all connections to terminals *4*, *5*, and *6* should be made as short as physically possible. On many of the smaller TV sets the chassis is connected to one side of the a-c line, so before making any connections to the chassis, correct polarization of the a-c plug should be checked in order to be certain the chassis is at ground potential for the elimination of the danger of shock.

After installation of the trap box short out all the traps and turn on the receiver for observation of the interference. Next tune the lowest frequency set of traps until the interference disappears or definitely decreases. If nothing happens to the TVI, short out this set of traps and proceed using the next higher frequency pair. If necessary, repeat in the same manner with the last set of traps. Where the antenna feed is Twin Lead, both traps for each frequency range should be tuned simultaneously. If the feed is coax, only the trap connected through to the inner conductor need be tuned. Under some conditions slight hand capacitance effects may be noticed when adjusting the traps and must be taken into consideration.

If the interfering signal falls directly in any one TV channel, it is apparent that the picture, as well as the interference, will disappear when the trap box is tuned for this channel. It will often be found helpful to advance the brilliance and contrast controls to maximum where some vestige of the picture still may be seen with a decrease in interference. On some receivers, depending upon the method of obtaining sound, it is possible to tune out the sound by means of the traps without seriously disturbing the picture.

By referring to the calibrated scales on the dial plates, the frequency of the interfering signal may be easily identified.

---

2 Scherer, "The Improved Dipper," Feb., 1949. "Television Interference, Its Causes and Cures," Radio Magazines, Inc., New York, N.Y.

Monthly DX Predictions - March

OLIVER PERRY FERRELL*

THE methods described in National Bureau of Standards Circular 462 ("Ionospheric Radio Propagation")[1] making use of the CRPL-D series ("Basic Radio Propagation Predictions")[1] permits a fairly accurate estimate of radio transmitting conditions to be predicted in advance. Also of special interest to the radio amateur are the modifications outlined in an article in the November, 1948, issue of *CQ*.[2] Using the methods described in this latter text the following prediction was prepared based on these parameters:

A. 1000 watts effective radiated power.
B. Antenna gain factor is 1.
C. Noise discrimination factor is 1.
D. Service gain factor c.w.-to-phone is 14 db.
E. Receiving location free of man-made noise and interference.

East Coast to Eastern Asia

40 meters: Likely to undergo considerable auroral zone absorption, but on ionospherically quiet mornings band may open with weak signals from 0345 to 0630 EST. Peak time around 0500 EST. *20 meters*: Some phones readable around midnight over the direct route. Second opening starts suddenly just before 0800 EST and lasts until possibly 1015 EST. Conditions variable at all times. *10 meters*: Erratic opening between 1645 and 1800 EST. Near the MUF with signals expected on less than 50% of the entire month.

East Coast to East Indies

40 meters: Conditions are rapidly deteriorating on this band. Band might open between 0545 and 0645 EST, but atmospheric noise level should prohibit any work at this frequency into this area. *20 meters*: Band opens suddenly with fair signals around 0630 EST. Phones during first hour, then c-w until possibly 1030 EST on ionospherically quiet days. Scattered signals during most of early afternoon. Direct path peak also noted at 1700 EST, but expect this to be badly QRM-ed. C-W only. *10 meters*: Low percentage opening from 1400 to 1545 EST. Very undependable, but signals good when band opens.

East Coast to Australasia

40 meters: Signals come out of the atmospheric noise after 0130 EST. Band peaks between 0330 and 0530 EST dropping back into noise around 0800 EST. Should be a good DX path during peak hours. *20 meters*: Extensive opening from 0030 until 0915 EST. Peak from 0330 to 0530 EST. Erratic conditions from 0530 until 0700 EST, but otherwise signals should be fair to good. *10 meters*: Generally improved opening over past two or three months. Band should open around 1630 EST and build up gradually until closing at about 2015 EST.

East Coast to Middle East

40 meters: *Their* signals come out of noise around 1600 EST, but most likely will not hear Americans until after 1745 EST. Peak 1830 to 2130 EST on ionospherically quiet days. *20 meters*: Signals build up after 1200 EST. Peak 1600 to closing at 2115 EST. *10 meters*: Short opening 0945 to 1215 EST. Signals good on quiet days.

East Coast to South Africa

40 meters: Band opens shortly after 1700 EST, but atmospheric noise at far end is very bad until 1900 or 2000 EST. Probable peak 2130 to 2330 EST. *20 meters*: Very extensive opening during this month. Signals build up from 1430 to 1730 EST. Good conditions from 1830 to 2300 EST. Band closes around 0130 EST. Phones during last five hours of the opening. *10 meters*: Band opens around 0645 EST with weak signals. Conditions poor to fair until 1030 EST when conditions begin to improve slowly. Probably peak in late afternoon—1500 to 1630 EST. Unusual equinox conditions.

East Coast to Deep South America

40 meters: Band is open from 1745 EST to 0530 EST the following day. Atmospheric noise declines after midnight—probable peak conditions 0200 to 0500 EST. *20 meters*: Signals come out of the noise around 1630 EST. Conditions fair to good until shortly after 0600 EST the following morning. *10 meters*: Band opens suddenly with strong signals around 0645 EST. Conditions drop down slightly during midday, but build to a good peak from 1500 to closing at 1830 EST.

Midwest to Equatorial Africa

40 meters: Probably hear *their* signals from 1530 CST, but noise is very high at far end of path until after 1800 CST. Band closes around 0030 CST. *20 meters*: Extensive opening from 1230 until after 2200 CST. Conditions build up with peak from 1830 to 2200 CST. Band may erratically stay open until 0100 the following morning. *10 meters*: Band opens around 0700 CST. Conditions improve about 10 db with peak from 1400 to 1630 CST.

Midwest to Western Australia

40 meters: Good opening starting around 0300 CST. Signals peak between 0430 and 0630 CST, finally fading into the noise level shortly after 0730 CST. *20 meters*: Signals start breaking through around 0100 CST. Conditions erratic and variable from day to day between 0430 and 0700 CST. Band generally should pick up rapidly after 0730 with strong signals until closing at about 1015 CST. *10 meters*: Fairly extensive opening starting around 1600 CST. Band closes around 2045 CST. No specific peak time predictable.

Midwest to Eastern Asia

40 meters: Considerable auroral absorption over the direct route. Possible weak opening from 0445 to 0630 CST. Atmospheric noise also bad—not a good frequency for this path. *20 meters*: Band should open suddenly around 0745 CST with good signals. Conditions subject to even

(*Continued on page 85*)

*Assistant Editor, CQ.

1 Available from the Superintendent of Documents, Government Printing Office, Washington 25, D.C.

2 "A New Method of Predicting Band Conditions" O. P. Ferrell, *CQ*, November, 1948, page 26.

Conducted by HERB BECKER, W6QD*

W. A. Z.

Our sincerest congratulations to the following DXers for having achieved W.A.Z.

99	W3BES	Jerry Mathis	40	206
100	W6MUC	Al Clark	40	145
101	W6AVM	Byron W. Gutheil	40	156

Jerry Mathis, W3BES, needs no introduction, I am sure, as he has been beating up the DX bands for years. W6MUC is the third one in his little town of Redwood City to work the 40 zones, the other two being W6ZCY and W6MX. W6AVM went about making W.A.Z. in a very quiet way, and when we received his cards, all of them were for 1948 QSOs. Nice going, fellows.

All-time W.A.Z. certificates were awarded this month to W2YW (ex-W2GTZ) and OK1CX. Both of these fellows need only one or two postwar cofirmations to get them the postwar W.A.Z. certificate.

W. A. Z. Honor Roll Rules

To enter the Honor Roll, it is necessary to submit a list of zones and countries worked. This list should include the call letters of the station, date, and time of QSO. The Honor Roll standings are on a postwar basis, covering contacts made since November 15, 1945. To facilitate the making of your original list of zones and countries, we have printed forms which are available.

There are two sections to the Honor Roll: the c.w.-phone portion, and the phone-only section. The c.w.-phone totals indicate the absolute total of DX worked by any station on either c.w. or phone; whereas the phone-only section represents contacts made only on *two-way* phone.

To apply for the W.A.Z. award, a station must first be entered in the Honor Roll. It is necessary to submit a confirmation from each of the 40 zones worked. This is the only time when confirmations are required. They may be sent to either *CQ* Magazine, 342 Madison Ave., New York 17, or to me at 1406 South Grand Ave., Los Angeles 15.

For those who have not previously been listed in the Honor Roll, and who submit their 40 confirmations for the W.A.Z. award, it is necessary that you send your initial zone and country list at the same time.

CQ also has an all-time W.A.Z. award. For this, it is necessary only to submit your 40 confirmations which may cover contacts made prewar and/or postwar. No country list is necessary when applying for an all-time W.A.Z. award.

A few surprises took place this past month. For example, Al Hill, W1QMI, formerly of ARRL, is back out here to live, and popped in the other day. Since Al handled the DXCC back there, he is a firm believer in everyone working at least 100 countries . . . or, maybe I should say, getting confirmations from them. . . . and, oh yes, working them with 100 watts. . . . A few days later, W1HKK barged in, and he wanted to work the rig. So, with the 20-meter band as flat as last week's bottle of ginger ale, Dana proceeded to punch out a CQ on my poor old key. Luckily for you guys, the band was dead. Really, though, he is a darn good *phone* DX man. A few days after that, who should walk in but W9UIG, Bill Shaw, of Chicago. He was out here on business, but said he wasn't trying to sell a thing . . . or shouldn't I have said that, Bill?

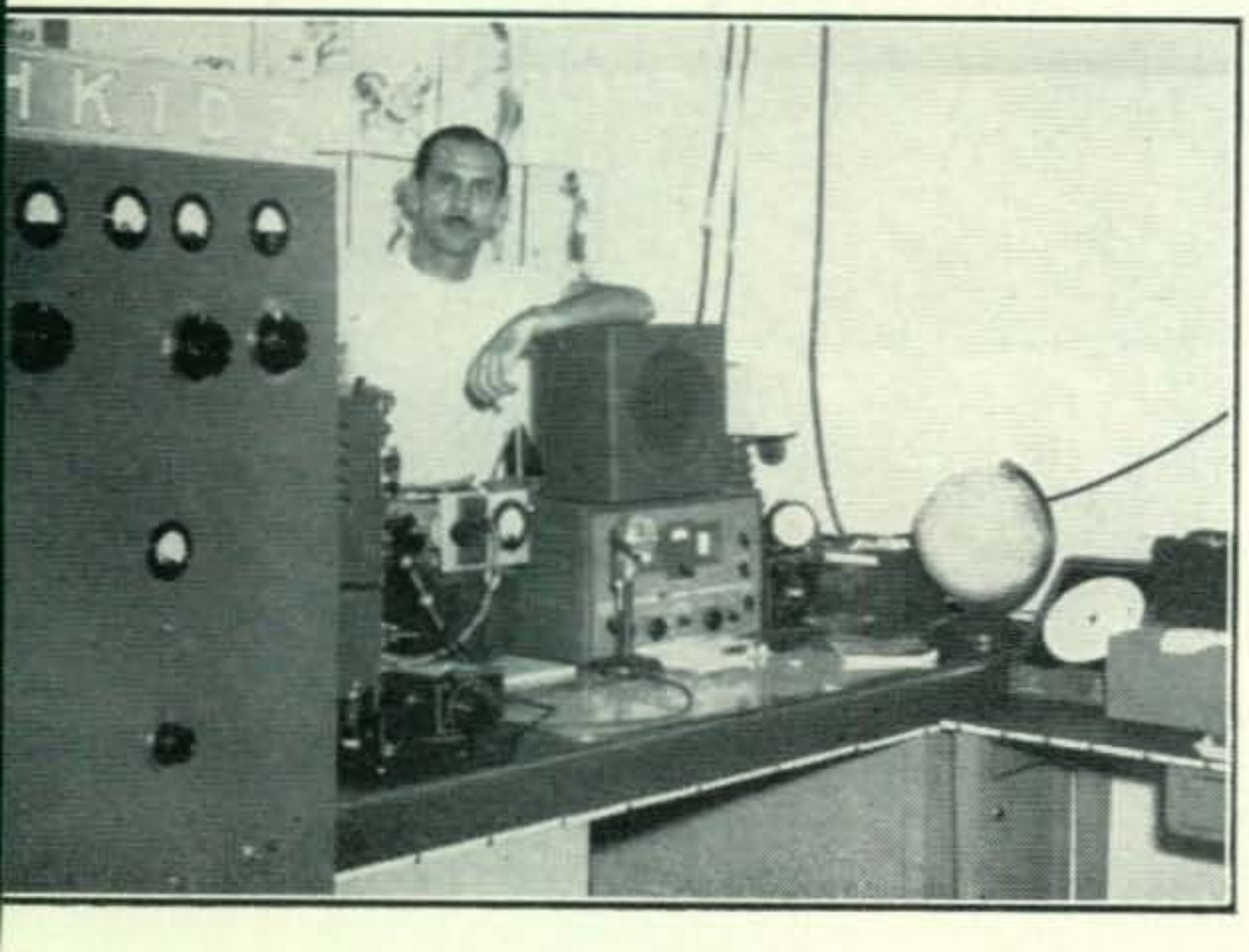
It looks like the Northern California DX Club has some new officers with the Prexy being W6WB, the V. P. is W6UZX, and secretary-treasurer is W6TI. The board of directors include W6RM and W6RBQ. W6PB still edits their DXer, and from it, we swipe the item that *UF6AE*, 14,056, is a new one on the air for those who need a UF6. Also, *AR1OD* is now signing *YK1AF* at 14,050 and 7025.

VK4RC is somewhat irked because he can't get cards from *VR4AA* and *TF8A*, yet his pal *VK4KS* did get his. Bob says, around the first of December, *AC4YN* showed up signing *AC4RF*, and, "The usual 8,106 stations ganged up on his frequency." After waiting three years to work a CR7, he did it up right by working two within an hour. Bob also wished the gang would use QLM and QHM more often. It would really do a lot of good.

Something stirred on Long Island, and up pops none other than W2IOP with some new countries including *ZD1PW*, *AR4A*, *KH6VP/VR4*, and *VU7AF* on 20 phone. Rumors have it that Larry was coached on the side by W2SAI and all the other phone men who gave him a break out of respect for his broken down phone signal. Oh yes, VU7AF is in Nepal and on 14,304. Aim your rhombics southwest.

W1NWO says he has been taking quite a

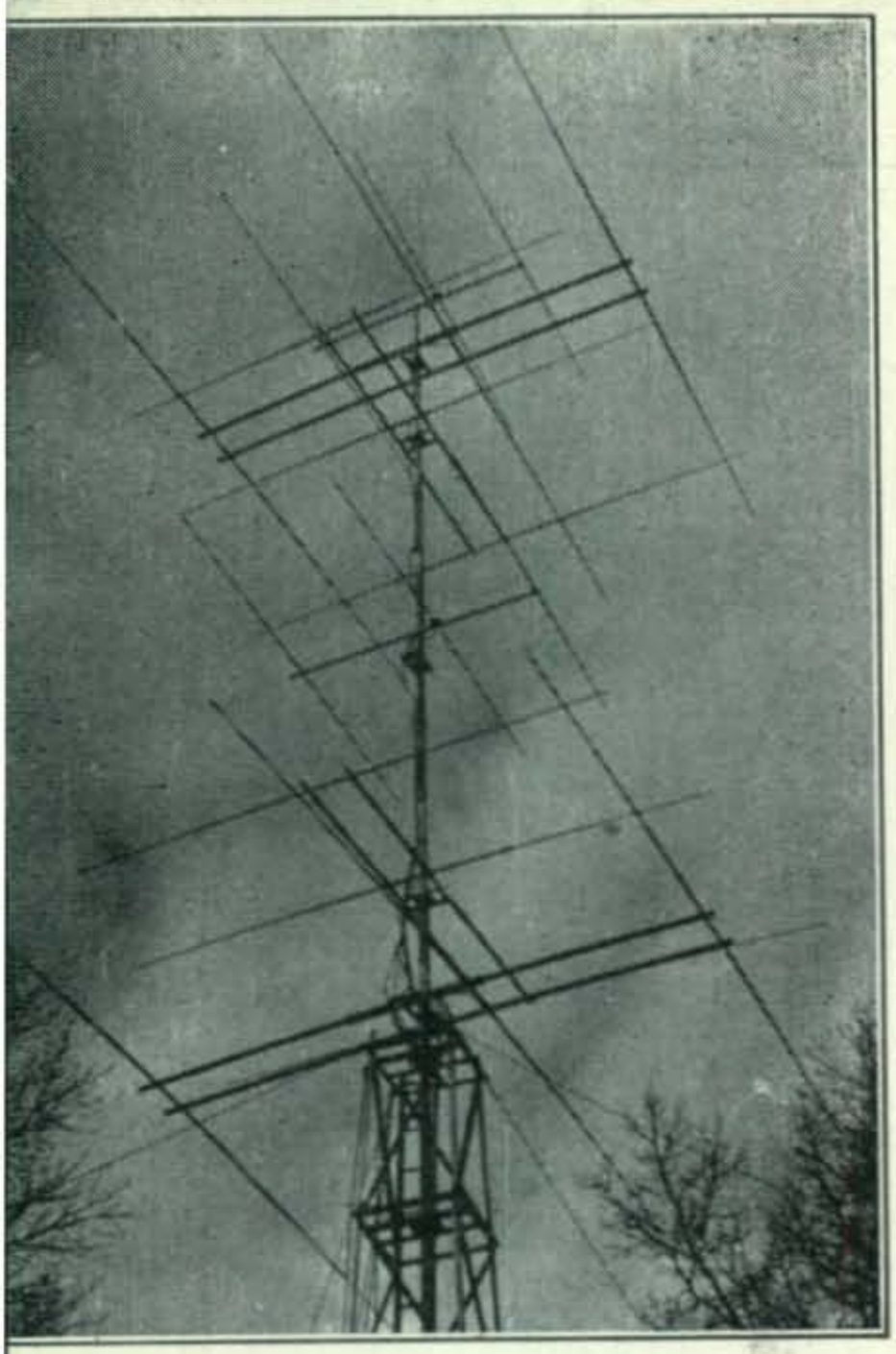
Send all contributions to Herb Becker, 1406 South Grand Ave., Los Angeles 15, Calif.



HK1DZ shows what puts out that terrific signal of his on 20-meter phone.

W. A. Z. HONOR ROLL

C. W.-PHONE			C. W.-PHONE			C. W.-PHONE			C. W.-PHONE			PHONE ONLY		
W6VFR	40	215	W7DXZ	40	146	OK1CX	39	133	VE1EA	37	116	W6VFR	39	146
W2BXA	40	208	W9NRB	40	146	G5RV	39	132	WØAZT	37	112			
G2PL	40	207	W6MUC	40	145	G2VD	39	132	W2BJ	37	111	W6DI	38	164
W3BES	40	206	W6QD	40	145	W2GUR	39	132	W6CTL	37	111	W4CYU	38	163
W8HGW	40	206	W6LER	40	145	G2FSR	39	130	G4AR	37	108	W8BKP	38	145
W6ENV	40	206	JA2KG	40	145	W6DLY	39	129	W8HSW	37	104	W7HTB	38	132
W6PFD	40	204	OK1LM	40	141	OK1AW	39	128	W2BLS	37	100	W1JCX	37	158
W6EBG	40	202	W6CEM	40	137	W8VLK	39	125	G5MR	37	100	W2BXA	37	148
W6ITA	40	202	ON4JW	40	136	VR5PL	39	124	G3AAE	37	99	W8BF	37	146
W6SAI	40	201	W6RDR	40	134	G5VU	39	124	W2SGK	37	95	G3DO	37	136
W6SN	40	200	G3AZ	40	134	G3AAK	39	122	W7BTH	37	95	W1HKK	37	136
G6ZO	40	199	W6YZU	40	129	G5WM	39	120				G6LX	37	124
W6ADP	40	198	W7GBW	40	129	G8RL	39	120	WØDU	36	138	G2AJ	37	121
W3GHD	40	197	W6MLY	40	129	WØOUH	39	119	W2RGV	36	137	C1CH	37	83
W4CYU	40	195	G5BJ	40	126	G6BS	39	117	W3LVJ	36	131			
W3LOE	40	194	PK6HA	40	124	W6NRZ	39	117	W3WU	36	127	W1NWO	36	145
W4BPD	40	193	W6NRQ	40	123	W7ETK	39	116	OA4AK	36	128	W8REU	36	144
WØYXO	40	192	W6LN	40	118	G3QD	39	116	W3AYS	36	124	W1MCW	36	141
ZL1HY	40	188	W6BIL	40	93	W6LGD	39	114	W4DIA	36	120	W9RBI	36	136
W6SA	40	186				W6ID	39	114	SV1RX	36	119	W2DYR	36	135
W6MJB	40	186	W2PEO	39	200	G3TK	39	114	MD5AK	36	118	W6PXH	36	131
W6FSJ	40	185	W2GWE	39	200	W6RLQ	39	113	VK4RC	36	115	W1FJN	36	128
W2CZO	40	185	W2HHF	39	199	W6MUF	39	108	G2CNN	36	114	G2PL	36	128
W3EVW	40	185	W3KT	39	195	W7GXA	39	106	G2AKQ	36	112	GM2UU	36	127
W6MEK	40	185	W9IU	39	194	W6MI	39	106	W2BF	36	108	G6BW	36	127
W2IOP	40	184	W3JNN	39	191	KH6PY	39	106	W4BK	36	101	W3JNN	36	126
W6NNV	40	182	W2HZY	39	191	KG6AL	39	104	G2AO	36	100	W9HB	36	126
W6KRI	40	182	W3DPA	39	191	W6LEV	39	103	GM3CSM	36	98	W6WNH	36	123
W6MX	40	182	W8BKP	39	190	W7ENW	39	101	W5CD	36	97	W4INL	36	122
W6DI	40	182	W2NSZ	39	189	W6WJX	39	101	G6WX	36	95	W4ESP	36	119
VK2DI	40	181	WØNUC	39	189	W6AX	39	93	W3FYS	36	93	F8VC	36	114
VE7ZM	40	181	W8RDZ	39	188	G6PJ	39	76	W7PK	36	91	VE7ZM	36	110
W6ZCY	40	180	F8BS	39	186				WØRBA	36	91	G5YV	36	106
W9KOK	40	180	W9ANT	39	185	W1JYH	38	178	W7EYS	36	90	G6WX	36	105
W7AMX	40	179	W8NBK	39	183	VE3QD	38	172	GM2AAT	36	75	W3DHM	36	96
W6AM	40	178	W5ASG	39	180	W3EPV	38	172				W6SA	36	92
W7DL	40	178	W3JTC	39	180	W3IYE	38	161	W4DHZ	35	133	F8DC	36	87
W9VW	40	178	W3DRD	39	177	KP4KD	38	159	W4HA	35	131			
ZS2X	40	177	PY1DH	39	177	W1ZL	38	154	W4LVV	35	125	XE1AC	35	143
W7GUI	40	176	W9RBI	39	176	W8FJN	38	153	W8ZMC	35	123	W6PCK	35	115
W6PCS	40	175	W1ENE	39	173	VO6EP	38	151	VE3AAZ	35	120	G3FU	35	115
W6TT	40	174	W2CWE	39	173	W3DKT	38	151	W2GVZ	35	120	W6CHV	35	113
W6OMC	40	173	W1NMP	39	172	W4OM	38	149	W9WCE	35	119	W4OM	35	106
W6RM	40	172	W4INL	39	170	W2PUD	38	149	VE3ACS	35	118	W9CKP	35	106
VE7HC	40	172	W2CYS	39	170	W8CVU	38	142	W9CKP	35	116	G8QX	35	100
W6PKO	40	171	W8LEC	39	169	W3KDP	38	141	W8AVB	35	113	VE3BNQ	35	92
W6WKU	40	170	W1BIH	39	168	SM5WI	38	137	VE1PQ	35	112			
W5AFX	40	169	W6RBQ	39	166	TF3EA	38	134	W2WC	35	110	W4HA	34	120
W7FZA	40	166	W4DKA	39	164	W1KFV	38	134	W6ZZ	35	104	W2RGV	34	111
W6DUC	40	166	W6GDJ	39	164	W4VE	38	133	G8VR	35	100	W8BIQ	34	109
W6AOA	40	165	W6MVQ	39	164	W4FPK	38	132	W2HAZ	35	93	W8ZMC	34	108
W6AMA	40	165	VK2ACX	39	164	G8IL	38	131	G2AVP	35	89	W3PA	34	95
W6PB	40	165	CE3AG	39	164	W3ZN	38	130	W8JM	35	86	W8QBF	34	90
VE4RO	40	164	W4GG	39	162	G5CI	38	130	D4ANM	35	80	W2NXZ	34	65
W6SRU	40	162	W4BRB	39	162	W2PQJ	38	130	G8RC	35	78			
KH61J	40	161	W9LM	39	161	WØEYR	38	129	G3BDQ	35	74	W5ASG	33	118
W6BAM	40	161	I1KN	39	160	W9FKH	38	127	W7FNK	35	72	W2ZW	33	115
W6DZZ	40	161	G5DQ	39	160	G6LX	38	126	W9FNR	34	109	W9BZB	33	114
WØNTA	40	161	WØGKS	39	159	W9MZP	38	126	G8QX	34	99	W5LWV	33	100
W6IBD	40	161	WØAIW	39	157	W9FKC	38	124	G8KU	34	96	W2PQJ	33	100
W7BD	40	160	W9LNM	39	157	W9TB	38	124	W9LI	34	90	WØHX	33	95
LA7Y	40	159	G8KP	39	156	GW3AX	38	123	W8JM	34	89	W2GHV	33	93
W6RW	40	158	W2RDK	39	154	WØSQO	38	123	G6XX	34	89	W6AM	33	89
G3DO	40	157	W8SDR	39	153	W6IFW	38	122	WØFWW	34	89	VE3ZM	33	81
W6AVM	40	156	G6QB	39	152	W8WWU	38	121	W2JA	34	84	W2DRH	33	60
G3AAM	40	156	G5YV	39	151	GW4CX	38	120	W8PCS	34	80			
W7BE	40	156	G2AJ	39	151	W8KPL	38	117	W6WUD	34	68	W9RNX	32	113
W6PQT	40	155	W2COK	39	150	W9YNB	38	117	J4AAK	34	66	W9MIR	32	99
W6KUT	40	155	W6EPZ	39	149	W5CPI	38	113				W9WCE	32	97
W6BPD	40	154	G2WW	39	147	G3ZI	38	107	W4QN	33	104	WØAIW	32	93
W6FHE	40	152	D2KW	39	147	G8IP	38	105	WØGBJ	33	79	W2HY	32	85
W1AB	40	151	W6SYG	39	147	C1CH	38	84	G2LC	33	85	W2SVK	32	84
W6UCX	40	150	W2MEL	39	145	G3BI	38	75	W8QUS	33	85	W9GZK	32	72
W6SC	40	150	W6EAK	39	143				WØFET	33	81	W6UZX	31	85
OK1FF	40	150	W6OEG	39	143	CM2SW	37	161	G8VG	33	78	W4LZM	31	85
W6LEE	40	150	W6JZP	39	142	W3JKO	37	154	G3BFC	33	77			
W6UZX	40	149	W9DUY	39	141	W3OCU	37	151				OA4AK	30	86
W6PZ	40	149	G6BQ	39	140	W2TJF	37	144	VE3AGC	32	108	W2SVK	30	74
ON4TA	40	148	G3FJ	39	139	W2EMW	37	141	W2OEC	32	105	W7JUO	30	70
W6TI	40	148	W9VND	39	136	W3LVJ	37	138	W1BFB	32	94	WØJED	30	61
W6ANN	40	148	W6RLN	39	135	W4ML	37	134	VE1NE	32	91			
W6AYZ	40	147	W6LRU	39	134	GM2UU	37	133	VE5JV	31	89	W6ZZ	28	60
						W2CNT	37	126				W8SXU	28	59
						G4CP	37	117	W7BE/KH6	30	55	W2BF	27	52



W1NWO's stacked 10 and 20-meter beams with two 15-meter beams thrown in for balance.

beating lately from W1JCX, W1ENE, and GM-8MN on his multiple antennas which he calls his "Christmas tree special." Get this . . . The overall height is 82′ and on this 82′ of pipe, which rotates within a 43′ steel tower, here's what Willard has in the way of antennas: a pair of 3-element 20-meter, a pair of 3-element 15's, and a pair of 3-element 10's. Imagine that—six 3-element beams on one mast. The 20-meter beams use fibre glass spreaders, while the 15's are on wooden spreaders. It seems that the XYL of GM-8MN told Willard's better half that she was sorry for her for having to look at such a monstrosity in her back yard. W1NWO's comment? Simply this: "I think it is beautiful . . . it improves the landscape no end."

Some of the boys have been getting fooled with the new DU prefix. As you probably have learned by this time, that's the new intermediate for KA.

W6SN has just worked his 200th country by getting *FK8AB*. It might be of interest to some of you that all his contacts were made on c.w. both ways, and on 20 meters only. Bill uses a single 250TH in the final, while his receiver is a 1938 NC-101X with no refinements in front or in back of it . . . WØYXO is again active after a bit of antenna trouble, with his countries now standing at 192 . . . W6AM worked a couple which might be of interest: *FU8AA* and *ZS3F* in South West Africa; the latter was on 20 phone, while the FU8 was on 20 c.w.

Another new one giving the boys a thrill was *VQ1CUR*. Of course, he was none other than VQ4CUR operating for a short time in Zanzibar . . . Speaking of VQ1CUR, I got a snicker from a crack made by ZL1HY when he said he had also *heard* VQ1CUR on 14,000, but he didn't seem to work anyone down his way, though he called him enough. Then he says, "Wish I had signed ZL1CAT, and then VQ1CUR might have chased me!" . . . Here's some more news from ZL1HY. He tells us that ZL1FT, who used 201As for years, is now married and has forgotten about ham radio. ZL1GX is also married, but he has managed to get back on the air again, in fact, Dave says he has 37 zones and about 90 countries. (Hey, Fred, where's your list?) ZL1MR is still DXing, but not as active as prewar. Then, of course, those who have worked ZL1BY will remember that potent signal of his, prewar, as ZL2CI. Dave goes on to say that ZL1MB probably is their champion DX operator at this time, while ZL1AX lives on 10-meter c.w. and cleans up that band very well. He was with the Byrd expedition some years back at the Pole. ZL2MM lives on 40 meters and does most of his work there. Probably the most active in the ZL2s are FA, CU, GX, GH, and QM. ZL-3AB, 3BJ, and 3CC are doing a good job in this area. Most of you old-timers will remember these three from way back. ZL1HY relates that ZL3MD might be on shortly with a VR4 call, using both c.w. and phone. Now, to refresh your memory, I think I should mention that ZL1AY is W.A.Z. and is now approaching 190 countries, which is a slug of DX in itself.

W1BIH made some sort of a New Year's resolution wherein he has resolved to fix up a nice neat country list on one of our forms . . . Not a bad resolution.

Zone and Country Lists

Speaking of forms for compiling zone and country lists, remember that they can be had simply by sending a stamped, self-addressed envelope. Foreign stations who find it difficult to send stamps or coupons, simply send us a request for the number of forms desired.

While on the subject of submitting your list of zones or countries on one of these standard forms, I would like to emphasize again that when you send in *additional* zones and countries, please do not feel that you must use another form. In fact, we would prefer you didn't, because, in the first place, it wastes paper, and in the second place, it makes it harder for the DX committee to give you credit on your Master List. Once you have sent in your initial list of zones and countries on our standard forms, they are checked, and you are entered in the Honor Roll. From that time on, we would prefer that you send in your additions in a letter or on a card. As I mentioned before, it would also help on this end of the deal if you would keep your Honor Roll additions separate from the general DX news which you might send in to me.

I am sorry to say that the printer botched up the name of W6IBD in the W.A.Z. announcement in the February column. For the record, the correct name of W6IBD is Warren Davis. I don't think he would answer to the one we printed.

If you need Guantanamo Bay there are a few new ones on down there now and Don Dahl, NY4-DD, gives with the dope. *NY4AW* 20 phone, *NY4BA* 20 phone, *NY4GB* 20 phone and c.w.,

(*Continued on page 72*)

1948 DX MARATHON SCORES

You fellows who entered the 1948 DX Marathon will not find any scores in this issue. We are now receiving the last additions for your Marathon, and W6DI is a busy little bee, tabulating the final standings. We will try to have the final scores announced in the next issue, but, at this point, I am not promising. At least you may look for the finals in the April or May issue at the latest.

VHF UHF

Conducted by VINCE DAWSON, JR., WØZJB*

6 Meters Opens Jan. 25, 1949

During one of the worst ionospheric storms observed within the past year, a strong steady signal from HC2OT was heard and worked from coast to coast by a large number of 6-meter stations.

W8NQD heard HC2OT at 1800 EST while working W5NXM. At 1815 EST HC2OT was heard by W5WX who missed contact because of his low power. W7QAP heard him work W7FGG, W5KSW, W5JLY, W5VY, W5FFM and W5ZZF from 1828 to 1910 EST.

The signal from HC2OT was very steady until just before fadeout. No flutter and always Q5. No **other** signals from 80 to 6 meters were audible from this direction at this time. More details next month.

WITHOUT A DOUBT, January 24, 1949, will go down in the books as one of the most widespread auroral induced sporadic-E sessions on 6 meters. Intense patches of ionization akin to auroral curtains appeared to have been scattered all over the North American continent. The lower frequencies were completely blacked out while 6-meter signals rolled into Kansas City from all directions of the compass. Unfortunately, your conductor was a lowly SWL, but did manage to pull in the following stations: W4LNG, W4FWH, W5CUH, W5HLD, W5HTZ, W5LF, W5NS, W7JRG, W8QYD, W8WSE, W9ALU, W9AQQ, W9QKM, W9QUV, W9UIA, W9ZHL, W9ZHB, WØCJS, WØKRZ and WØHVW. The first signal was heard at 1800 CST, the last around 2200 CST. The following night, January 25, the band reopened with weak sporadic-E to the east coast from the midwest. W7JRG worked WØNFM WØHAQ, and W9QUV on c-w. More details next month. Imagine hearing three stations from Oklahoma—and I had to work so hard for that 47th State.

Contests

The weekend of January 15-16 was undeniably a high point in v-h-f activity. Contrary to predictions (published elsewhere) that it would be the "worst" weekend for 6-meter skip DX, the band opened up with terrific sock on the 15th in the southwest and with scattered signals on he 16th. Many contestants added these "gift" sections and came up with really high scores.

Speaking of contests, the Amateur VHF Institute of New York has one scheduled on 144 mc starting Saturday, April 23, 1949, at 1800 local time and ending midnight Sunday, April 24, 1949. The idea is novel and is called the "Two-Meter Mileage Contest." Scoring will be determined by the point-to-point distance between stations contacted provided you are using a reliable scaling method. The contest is world-wide and foreign participation is welcome. A handsomely engraved Certificate of Merit will be awarded the highest scoring station in each ARRL section and each district of a foreign country submitting a score. In addition, the two stations making the greatest mileage during the contest weekend will receive a special dual award. In submitting an entry show the time of contact, station worked, and the exact mileage. All entries before May 1, 1949, to The Amateur VHF Institute, 47-01 Maspeth Ave., Maspeth, N. Y.

During the weekend January 7-9, 1949, the Two Meter and Down Club of southern California sponsored a contest on 144 mc and up. More than 150 stations participated for the first prize, either a 16-element beam (built by W6IDF) or a 2-meter coaxial pipe tuner (assembled by W6NMW). Rules of the contest were one point for each 2-meter contact and two points for each contact on a higher frequency band. Either mobile or fixed operation, one operator, no cross-band work permitted. Probable high score was entered by Gridleak, W6YYG, with 179 points. Gridleak will not officially submit a log since he feels he has a much better than average location and wants to see everyone have a chance. Mel, W6WSQ, working one frequency on 2 meters ran up 140 points (and a folded diaper, too). W6ZRU had 137 stations worked, W6FOW had 114, W6CRV had 104, W6EKK had 101, and W6WKO had 100 even. Who says all the 2-meter activity is on the east coast?

Hourly 6-meter Cycles

Last month (page 40) we ran an item from the sporadic-E project folder about yearly cycles and possible 6-meter openings. This attracted considerable interest, as it had been the first published data specifically showing and proving some of our best hunches. Going further into Propagation

What the well-dressed XYL will wear in hats is modeled by W1OIR, accompanied by the OM, v-h-f'er W1DJ.

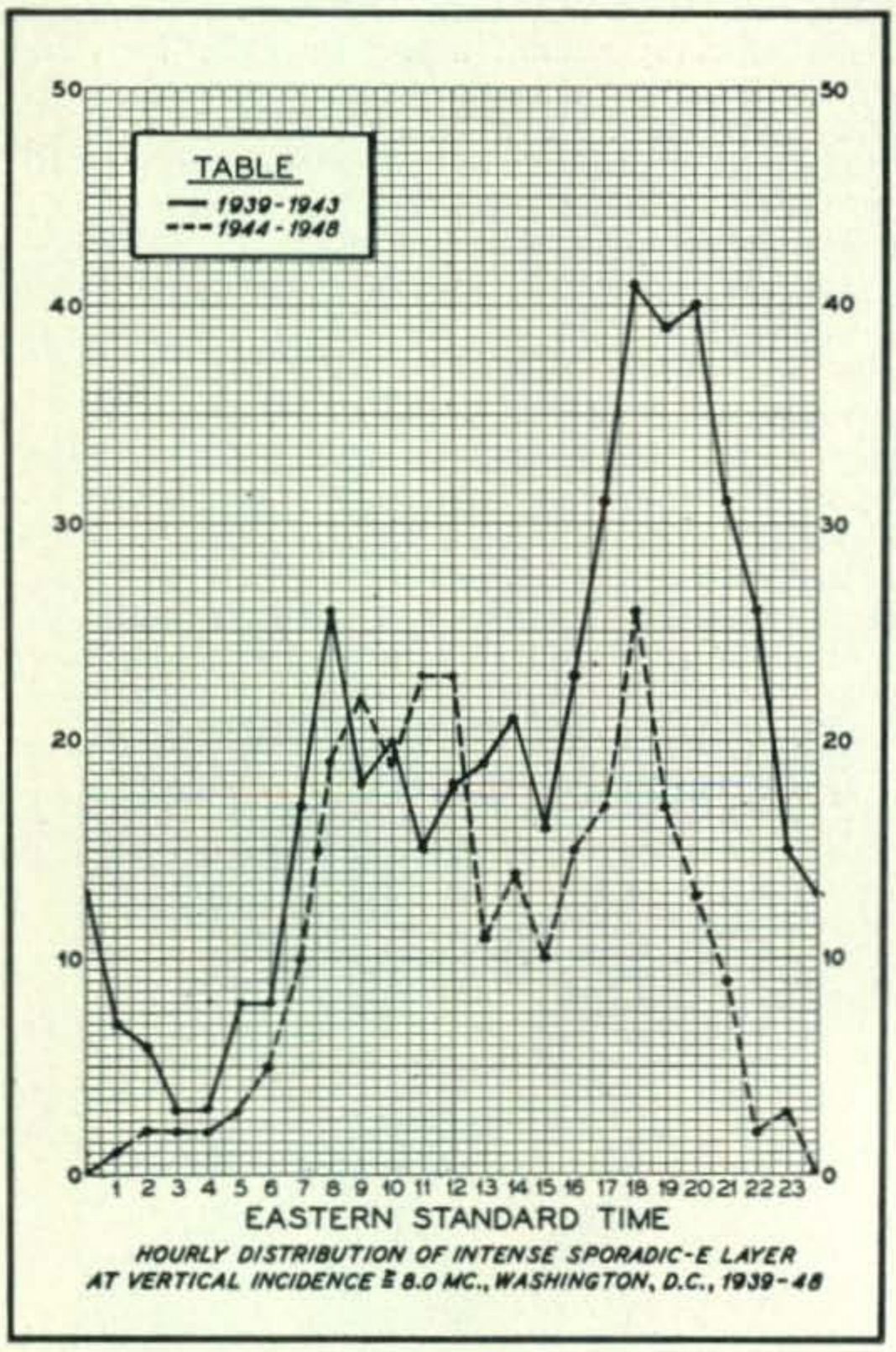
**Send all contributions to Vince Dawson, Box 837, Gashland, Mo.*

50 MC HONOR ROLL

CALL	S.	C.	CALL	S.	C.	CALL	S.	C.	CALL	S.	C.	CALL	S.	C.
W9ZHB	48	6	W9ALU	42	5	W5FSC	37	8	W6AMD	34	3	W9MBL	28	2
WØZJB	48	4	W3CIR/1	42	5	W2RLV	37	6	W7JRG	27	2	W1AF	27	5
WØNFM	47	5	WØINI	42	3	W5JTI	37	5	W1HDQ	33	6	W7ACD	27	2
W9QUV	47	4	WØKPQ	42	2	W4EQR	37	4	W6PUZ	33	4	W7JRG	27	2
W6UXN	47	3	W5ML	41	3	W5VV	37	4	W4WMI/4	33	3	W5LBG	26	3
WØUSI	47	3	W7DYD	41	2	W6IWS	37	3	W4DRZ	33	3	WØDNW	26	2
W6WNN	47	3	W8ZVY	40	7	W6OVK	37	3	W7KAD	33	3	WØYKX	26	2
W4GJO	46	4	W4QN	40	4	W9NJT	37	3	W3MKL	33	2	W7BOC	26	2
W9DWU	46	3	W1LLL	40	4	W9UNS	37	2	W1CLH	32	3	WØUEL	26	2
WØDZM	46	3	W4FBH	40	3	W9UIA	36	3	W5WX	32	3	W6NAW	26	2
WØBJV	46	3	WØSV	40	2	W7FDJ	36	3	W6FPV	31	3	VE1QZ	24	6
W9ZHL	45	6	W4GIY	40	2	W3OR	35	6	W4HVV	30	2	W5LIU	24	3
W1CLS	45	5	W5JLY	39	10	W1GJZ	35	5	WØDER	30	2	G5BY	24	19
W7BQX	45	4	W1CGY	39	6	W6BPT	35	4	W7QLZ	29	4	XE1KE	23	6
W9PK	45	3	W2IDZ	39	5	W1JLK	35	4	W4FNR	29	3	W9AB	23	4
W8NSS	45	3	W6ANN	39	3	W9VZP	35	4	W8MVG	29	6	W8YLS	22	3
W7ERA	44	4	WØDKS	39	3	W5HF	35	3	W5ELL	29	2	W7CTY	22	2
W7FFE	44	4	WØYSJ	39	2	W5HTZ	35	3	VE1QY	28	4	W8LBH	21	2
WØQIN	44	4	W4GMP	39	2	W5HLD	35	3	W9FKI	28	4	W5HVP	20	3
W8QYD	44	4	W2AMJ	38	6	W7JPA	35	2	W4LNG	28	4	VE7NM	17	2
W5VY	43	11	W5FRD	38	6	W2BYM	34	4	W4FQL	28	3	VE7CN	15	2
W5AJG	43	3	W3OJU	38	5	W3RUE	34	3	W1ATP	28	3	W8EP	14	2
W4EQM	43	3	W4FID	38	4	WØJHS	34	3	W5ESZ	28	2	KH6PP	5	7
W7HEA	43	3	W9RQM	38	2									

Report No. 4, we came up with another gem. This one concerns the time of day that 6 meters is likely to open. For the purposes of the study the 10 years of data were divided at the sunspot minimum, thus, we get a period 1939-1943 when the sunspot cycle was declining and another period 1944-1948 when it was either ascending or near maximum.

The accompanying graph shows two very distinct factors. One, very few openings are likely to occur during the late evening and early morning and two, a very significant change in the number of openings occured before and after sunspot minimum. Note, for example, that between the two periods in question, there were *three times* as many 2100 hour openings possible during the sunspot decline than during the ascending period. The number of morning openings was about equal. The large number of midnight openings (1939-1943) were due to, or associated with, ionosphere storms. As we mentioned before, the data prior to 1939 is too scanty to add to this analysis. However, adding last month's graph and this one together, it appears that we will get more 6-meter openings in the next two or three years as compared to the last four or five years, and a much greater percentage of these additional openings will occur in the early evening.



The frequency distribution of Washington fEs measurements closely follow the possible number of 6-meter openings.

Activity Hither, Thither and Yon

It is certainly difficult to fully judge activity from one week to another on the 6-meter band. If the weekend of January 15-16 did nothing else, it did show what one could expect, if everyone got on who was able and willing. In the Philadelphia area activity tripled during the week, and then during the weekend when a majority of the Frankford Radio Club moved down to the low end, a total of 54 stations were heard. Of all the comments, I like the one by a very well-known contest man (an F.R.C. member) who early Monday morning said, "Well, I learned a lot about v-h-f operation this weekend, and it was certainly a tougher contest than any other I've been in."

The Potlickers 6-meter Net in the Akron, Ohio, area is still going strong with meetings at 1900 EST, Mondays and Fridays. W8CEQ is net control . . . W1CLS says that the Horsetraders, a legendary New England outfit, is keeping activity on the upswing and several new stations are consistently active in between their 6-meter meetings . . . The Atlantic 6-meter Net is also supposed to be going strong, although probably W3MFY was a little miffed when several of the new stations on during the contest said that they always listen in, but never try to call in or join. What's matter? They think 6 meters is an exclusive outfit?

(Continued on page 58)

Complete with AMPLIFIER

$99.95

(Slightly higher west of Rockies)

AIR KING WIRE RECORDER "Know-How"

opens the door to new and thrilling experiences.

What Ham can resist the thrill of replaying for his friends *absolute proof* of an exciting DX contact? Where is the amateur who can keep his seat when you repeat his signal *exactly* as it came in? With an AIR KING wire recorder only the limits of your imagination can limit the interesting possibilities. Be one of the first to work this *new, exciting field.* Do it today . . . just fill in and mail the attached coupon. No cost, no obligation, of course.

THE AIR KING WIRE RECORDER
"Engineered" for use in the Ham Shack

★ Complete with amplifier ★ Records directly from your rig ★ Automatic shut-off at end of play or rewind of wire ★ Rewind speed: 6 times forward speed ★ Plug for cable to record from radio or phonograph ★ Erases automatically when recording over used wire ★ Safety lock prevents accidental erasure ★ Covered in leatherette ★ One-piece chassis ★ Luggage-type carrying case ★ 5" Alnico V P.M. Speaker ★ TUBES: 2—50L6, 1—1280, 1—6AQ6 *plus* selenium rectifier ★ WEIGHS: 21½ pounds ★ MEASURES: 13¾" long by 12" wide by 9" high

Only "know-how" can build fine wire recorders. AIR KING, a pioneer in the magnetic recorder industry, has it!

FREE INFORMATION

AIR KING PRODUCTS CO., INC.
170 53rd Street, Brooklyn 32, N. Y.

At no cost or obligation to me, please send additional information about the AIR KING Wire Recorder.

NAME.....

ADDRESS.....

CITY.....ZONE....STATE.....

FOR QUICK ACTION—MAIL TODAY!

AIR KING

Conducted by LOUISA DRESSER, W2OOH*

WHILE the season of DX is still with us, let's take a look at some of the DX stations operated by YLs. One of the choice ones that keeps 'em lined up waiting their turn is CZ2AC, Rosetta Monsini. Aged 27, and an Italian YL, during the war Rosetta attended radio school where she learned code and theory. Then she joined the underground, working for the partisans. Previous to the war, Rosetta spent much time in Germany and Switzerland (she speaks Italian, German and French), and at the end of the war she returned to Switzerland to work for a Swiss family. Two or three times a year this family goes to Monaco—which explains CZ2AC. Working strictly under cover, she operates only at night. For equipment Rosetta has a Hallicrafters S40A receiver. The transmitter is a v.f.o. and p.a., 6J5-6F6-6L6, with 10 watts input furnished by two power supplies built in a separate box which also contains the S-meter for the S40. Her antenna is an 8JK for 20 meters, fed with 75-ohm Amphenol line.

Although Rosetta had learned radio code and theory during the war in Italy, it was a Swiss friend who taught her amateur radio, and it was he who built her transmitter. A good match all around, for about the time you read this, Rosetta and her HB friend will become Mr. and Mrs. (or should we say Signor e Signora?). May we wish them every good luck and continued DX!

Special Calls For Norway's YLs

Via LA5YA we learn that all the licensed Norwegian YLs have received a YL-suffix call. For instance: LA2YL, Borghild Pallvik; LA3YL, Vera Almar-Naess; LA4YL, Randi Sindre; LA5-YL, Anne-Marie Stuenaes; LA6YL, Ashild Hansen. Bet you're wondering the same thing we are—what will the licensing agency do when more than one YL in a district become licensed?

Assistant Editor, CQ. Send all contributions c/o CQ, 342 Madison Ave., New York 17, N. Y.

CZ2AC, Rosetta Monsini. Writes Rosetta: "The photo is two years old—now I have the New Look, but not a new photo—hi!"

ZS - YLs Active

In *Radio-ZS*, official organ of the South African Radio League, "Bee," ZS5DZ, is conducting a column called the "The YL's Corner." We had the pleasure of looking over three recent issues, and from all indications the ZS YLs are an active and enthusiastic group. They have their own branch of YLRL of which Diana, ZS6GH, is president, and Edith, ZS6BD, vice president. Besides publishing their own edition of YLRL *Harmonics*, the YLs are sponsoring contests and have a weekly net on 40. A continuing feature of "The YL's Corner" is an account by Diana of her globe trotting, and contacts with VE, W, G, etc., hams. In a recent letter Diana tells us the Johannesburg YL Club continues to grow, their latest op being ZS6YL, Toni. Diana adds: "Please ask the girls on 10 to look out for ZS6KK, Marie; ZS6LK, Mae; ZS5DZ, Bee; ZS2AA, Iris; ZS2EC, Lass; and ZS5DF, Meg. They also operate 20, mostly c.w."

A newcomer to 10-meter DX, Jira, OK1M1, writes: "On December 13th I started on 28 mc c.w. and worked my first DX, a W3 station. I'm looking forward to QSOs with YLs all over the world and will be on most every day between 2 and 4 p.m. (OK), with 40 watts v.f.o.-p.a. and a BC-312 with a German 9-tube war surplus super as a converter for ten."

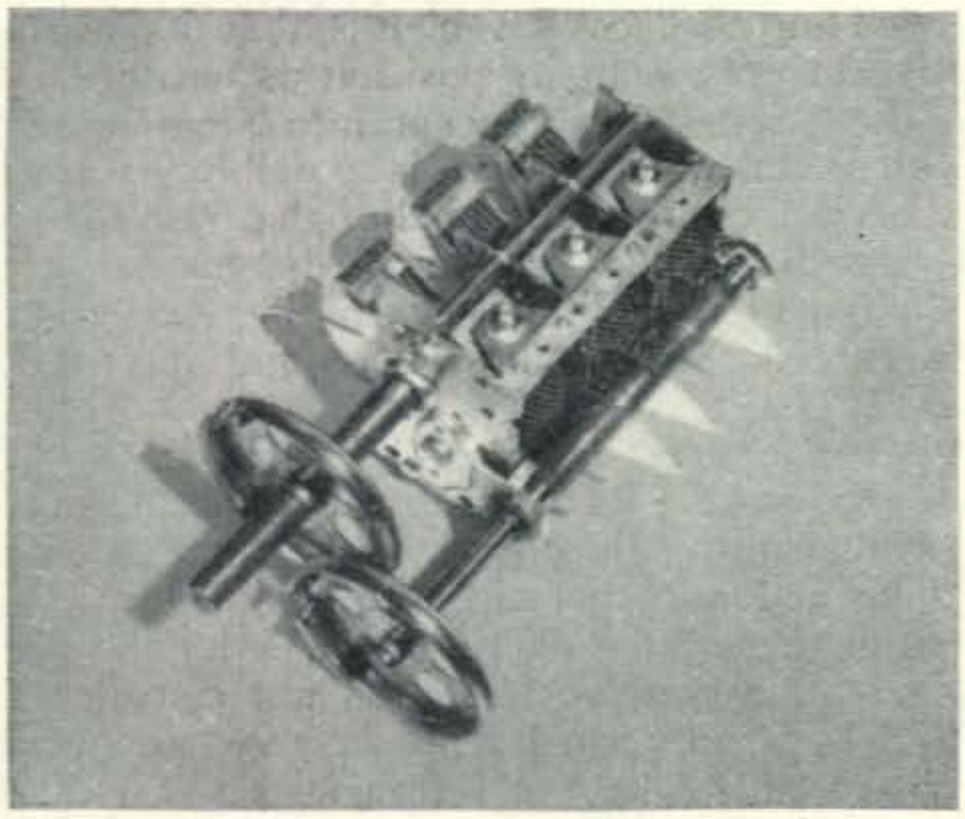
Ada, I1MQ, complains that conditions on 20 meters were wretched the first part of the winter and she and her father have been working almost exclusively on 40. "Our DX for Oct.-Dec. included AP5A, YA3B, PY7WS, AR1OD, and many ZLs, VKs and Ws—our transmitter always the old 'barracchino' with 15 watts input!"

By the way do any of you recall hearing about the Italian "C.Z." boat which was holder of the world record for depth (440 meters)? If so, you will be interested to learn that Ada's family are friends of the inventor, Vassena, and that Ada assisted the Vassenas in their work. "I helped them at Lecco," explains Ada, "and moved about with them on the Ligurian coast to assist in the trials of the boat. As misfortune willed it, the 'C.Z.', which had sunk in October because of a stupid accident and was later recovered, foundered and sank anew in Capri waters in November. This time she plunged to a depth of 1000 meters, from which it was concluded that it would be impossible to recover her the second time." That 1000-meter depth is the wrong kind of DX, Ada!

Speaking of DX, now we've learned one of the secrets of how W2PBI (Jerry and Max) have attained a score of 96 countries on 10 phone, run-

(*Continued on page 80*)

Two Reasons for Continued Popularity of the S-40A



SENSITIVITY . . . through high Q circuits. It's an engineering feat to get such sensitivity from one RF and two IF stages. Hallicrafters does it by going all out for proper $\frac{L}{C}$ ratio.

Evidence of this is the main tuning gang with built-in band spread shown above. Minimum circuit capacity is reduced by having main and band-spread rotors use the same stator. In addition, iron cores in the RF coils are micro-set with fine screw threads for exact inductance—a Hallicrafters developed feature.

DEPENDABILITY...achieved through controlled production, with parts pre-tested to insure uniform high quality. In addition to tests you'd normally expect, power transformers are tested for temperature rise, variable capacitors for tracking, resistors for noise, condensers for insulation resistance, and IF transformers for band width and stability. Coils are held to within 0.25% of prescribed inductance.

BEFORE YOU BUY, see and try the S-40A. Compare its features . . . learn the thrill of its superior, dependable performance. It's an amazing value—at only $99.50.

OTHER FEATURES include temperature compensated oscillator, calibrated band-spread dial, series-type noise limiter, built-in speaker, 3-position tone control, range 540 kc to 43 Mc, 8 tubes plus rectifier.

S-40A $99.50

the hallicrafters co.

4401 West Fifth Avenue, Chicago 24, Illinois

MANUFACTURERS OF *PRECISION* RADIO AND TELEVISION EQUIPMENT

Postscripts

Old-Timers' Nite

The Delaware Valley Radio Assn. of Trenton, N.J., will sponsor its 5th annual Old-Timers' Nite on Saturday, April 9th. It will be held in the Grand Ball Room of the Hotel Stacy-Trent, West State and Willow Streets in downtown Trenton. A turkey dinner will be served at 6:30 p.m., and other features of the affair, which will be stag. will include guest speakers who are old-timers in the radio field, W2ZI's collection of old-time wireless gear, and door prizes. Make reservations before April 1st with Ed. G. Raser, W2ZI, General Chairman, 315 Beechwood Ave., Trenton 8, N.J. Tickets are $5 before April 1st, or $6 at the door.

Regulation Proposals to FCC

The proposals ARRL has submitted to the FCC regarding amateur regulatory matters are well known through publication in *QST*. However, without a widely circulated publication at their disposal, it is not surprising that a vast amount of mis-information about the proposals presented to FCC by NARC and SARA is circulating. The news report presented here regarding NARC and SARA is not an editorial endorsement of their programs. The attitude of *CQ* on the controversial questions concerned has been discussed in "Zero Bias" month after month. But since the proposals of NARC and SARA (as well as those of ARRL) have become part of the testimony upon which FCC will base future decisions, all amateurs should have knowledge of, and must be concerned with, their ramifications.

NARC Proposals

The National Amateur Radio Council, Inc., founded in 1948, is administered by five elected directors and three officers picked by the directors. The officers and directors are bound to abide by majority rules, based upon results of polls taken among membership. Through legal counsel hired in Washington, D.C., they have proposed before the FCC a series of modifications of existing regulations governing amateur operation and opposition to several of the suggested changes urged by ARRL and SARA. Their petition to FCC is as follows: NARC proposes that additional frequencies for type A3 emission be provided on the 20 and 75-meter bands; namely, that the radiophone frequencies be changed from 3850-4000 kc to 3750-4000 kc, an increase of 100 kc. That the frequencies on the 20-meter band for radiotelephone be changed from 14,200-14,400 kc until the effective date of the Atlantic City Conference agreements, and thereafter to be 14,200-14,350 kc, a temporary increase of 100 kc on 20 meters and a permanent increase of 50 kc after the effective date of the Atlantic City Conference agreements.

NARC, after ascertaining the opinion of its members regarding the 16 wpm code requirement suggested by ARRL for Class A examination, has instructed its attorneys to oppose this recommendation. NARC is also opposed to the requirement that all newly licensed operators operate c.w. for a year before operating radiophone below 30 mc.

The membership also committed itself as being in favor of some radiophone frequencies on 40 meters and the return of the 160-meter band. On the advice of their legal counsel no move was made regarding 7 mc. Likewise the 160-meter petition was delayed in view of a pending general allocation hearing by the Commission in the near future.

SARA Proposals

The Society of American Radio Amateurs was organized in 1948. SARA claims that its primary objective in proposing its position as outlined is to inject the engineering concept into amateur radio regulations insofar as that is possible or practicable. SARA expresses the belief that only by such an approach to the problems of amateur radio can the position of this service be strengthened and advanced, both domestically and internationally.

SARA supports in general the proposals and philosophy of ARRL, except that pertaining to the expansion of the 3.85-4.0 mc phone sub-band by 50 kc and as otherwise outlined below. With respect to the expansion of the 3.85-4.0 mc phone sub-band allocation, SARA does not consider this proposal to be in accord with the most economical use of available amateur frequencies nor with the objective of presenting a strong and united front for the preservation of amateur radio against the demands of other services which press every advantage to gain additional allocations, frequently at the expense of the amateur. SARA recognizes that for many amateurs the social advantages of phone communication are of personal benefit, but believes that in most cases there is self-imposed technical training and some pursuit of other aspects of amateur radio which render this attraction of the amateur service to be in the national interest.

SARA recommends: (a) That no increase be made in phone sub-bands 3850-4000 kc, 14200-14300 kc, and 28500-29700.

(b) That the prewar amateur band 1750-2050 kc, or such part of it as can be soon made available, be returned to the amateur service, with at least 25 kc being devoted exclusively to A-1 emission in the event the entire prewar band cannot be made available.

In order to provide for the orderly and progressive advancement of the technical development of amateur radio, SARA recommends as a first step: That the following frequencies be reserved exclusively for single-sideband suppressed carrier radiotelephone in addition to A-1 emission: (a) 3850-3875 kc, (b) 14285-14300 kc, (c) 28500-28525 kc. (Note: SSSC should continue to be permissible within all bands assigned A-3 emissions.)

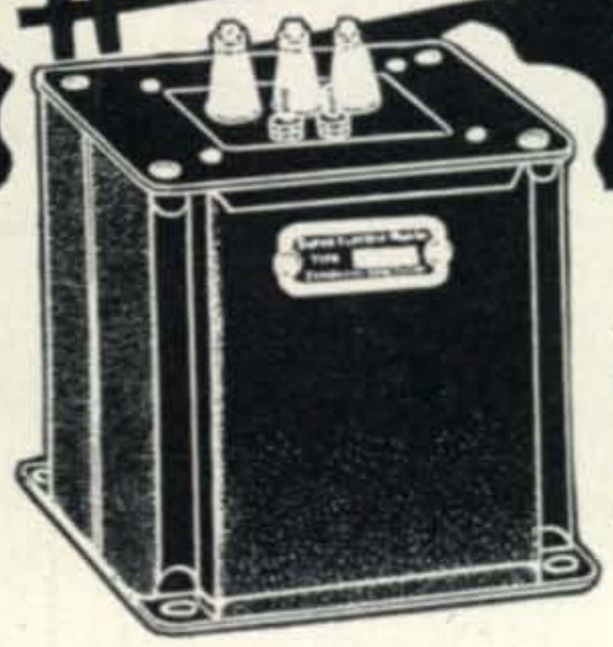
SARA concurs strongly with the ARRL that no phone allocation should be made in the 7.0-7.3 mc band.

In addition, SARA feels that while the ARRL proposals to restrict operation by newly licensed amateurs to c.w. (below 50 mc only) during the first year of their initial license period and to require a demonstrated code ability of 16 wpm for Class A license, are commendable, these proposals

(*Continued on page 89*)

HARRISON HAS IT!

WORLDS BIGGEST TRANSFORMER BARGAIN!



$19.95 ITEM TP-17

(ADD 85¢ FOR CRATING IF SHIPPED)

1500 VOLTS DC OUTPUT AT 550 MA!

- BRAND NEW! (NO OVERRATED SURPLUS)
- RATING CLEARLY MARKED!
- HUSKY!—1750—0—1750 VOLTS DC CONTINUOUS COMMERCIAL SERVICE (CCS) RATING 400 MA
- HEAVY!—37 POUNDS
- COMPACT!—6¾" X 8" X 7¼" HIGH

Completely shielded and potted, porcelain high voltage terminals—mounts upright or inverted.
Because of the sensational low price, we cannot advertise the manufacturer's name!

DON'T MISS THIS TREMENDOUS BUY! ONLY HARRISON HAS IT!

NEED THESE? (No Surplus)

RCA or TAYLOR 866A Rectifiers..... **$1.95**
UNITED Z-225—Same as 866A's except for smaller bulb—Efficient! Rugged!..... **$2.25**
SOCKETS FOR 866A/Z-225 RECTIFIER TUBES
Millen 33004..... **.30** Johnson 123-209..... **.88**
Millen Ceramic Safety Cap for 866A/Z-225..... **.21**
866A Filament Transformer—2½ Volts CT at 10 amperes. 7500 Volt Insulation.
Extra Special!..... **$2.39**

SMOOTHING AND SWINGING CHOKES

20 Henry Smoothing	5/25 Henry Swinging	DC MA	DC Res.	Price Each
S-33	S-34	300	90	$ 6.86
S-35	S-36	400	85	10.29
S-37	S-38	550	60	13.72

OHMITE Bleeder Resistor for 1500 V Supply **$2.18**

STEEL CHASSIS BASES

Heavy! Strong! One piece construction with corners reinforced and spot welded. Furnished in Black Wrinkle or Electro-Zinc plated.

5x7x2	.70	4x17x3	1.09	11x17x2	1.62
5x10x3	.88	8x10x2½	1.15	11x17x3	1.81
7x7x2	.73	8x17x2	1.30	12x17x2	1.67
7x9x2	.88	8x17x3	1.44	12x17x3	1.86
7x11x2	.94	10x12x3	1.41	13x17x2	2.01
7x12x3	1.03	10x14x3	1.35	13x17x3	2.25
7x13x2	1.06	10x17x2	1.35	10x17x4	1.96
7x15x3	1.29	10x17x3	1.35	13x17x4	2.60

MOBILE TIME IS HERE!

SUBRACO MT — 15X

The finest ham mobile rig on today's market—30 watts, 100% modulation, push-to-talk, built-in antenna relay! Engineered for efficient 10-11 meter mobile work. Compact—4½" x 5½" x 6½" deep. 6V6 tritet osc., 2E26 RF amp., 6V6 speech amp., 1635 Class B Modulator. Ready to install with tubes, antenna connectors, brackets, push-to-talk mike, and Bliley xtal. **$89.95**

Fully Filtered Vibrator Packs—6V DC Input
300 Volts, 100 MA for low power input to final (15 watts)..... **$14.95**
400 Volts, 150 MA for full power!..... **$31.20**

CARTER MAGMOTOR MAS420—6V DC input—400 volts at 200 MA output. Very Compact **$38.42**
CARTER GENEMOTOR 420A—6V DC input—400 Volts 200 MA output CCS Rating.... **$39.34**
GONSET 3-30—This NEW converter offers continuous coverage 3 to 30 MC. Same size as the famous "10-11" **$39.95**
The Latest "10-11"..... **$39.95**
Gonset Noise Clipper..... **$8.95**
96" Stainless steel whip antenna (AS-196) with insulated bumper mount (NA)..... **$7.05**

WORKING ON YOUR ANTENNA?

Lots of the WINTER SPECIALS offered in last month's CQ ad are still available. Your last chance to buy antenna gear at these crazy prices.

MILLEN 500 WATT RF AMPLIFIER

Well designed, factory wired, 500 watt RF amplifier. A natural to use with the bargain transformer TP-17! Wired for use with 812A's, 812H's or similar triodes. 10½" relay rack panel, complete with meters, instructions, and one set of coils—less only tubes **$89.50**
Extra Coils per Band..... **$4.10**
RCA 812A (two required)..... Each **$4.05**
UNITED 812H (two required)..... Each **$7.50**
Filament transformer for 812A's or 812H's—6.3 Volts at 8 amps. No. T21F12..... **$3.56**

MILLEN EXCITER-TRANSMITTER

Use this FB 50 watt rig to drive the 500 Watt RF Amplifier or as a standby xmitter. 6L6 Xtal Osc.—807 RF Amp. Requires up to 750 volts at 200 MA. Complete with coils for ten meters—Less tubes..... **$42.50**
Kit of HSS Tubes for Exciter..... **$1.95**
Cathode Coils..... **90c.** ea.
Osc. or Plate Coils..... **$1.25** ea.

GOT TVI, BCI?

The new issue of the HARRISON HAM-A-LOG has:

- An interesting article on interference reduction.
- Material to do the job.
- An FB ANTENNA COUPLER for only **$24.75**, complete! (Just the thing to attenuate those harmonics.)
- Many other bargains!
- News of Ham Activities!

DID YOU GET YOUR COPY?

A postcard with your name, address and call will bring it without obligation.

SOMETHING NEW IN PRESELECTORS

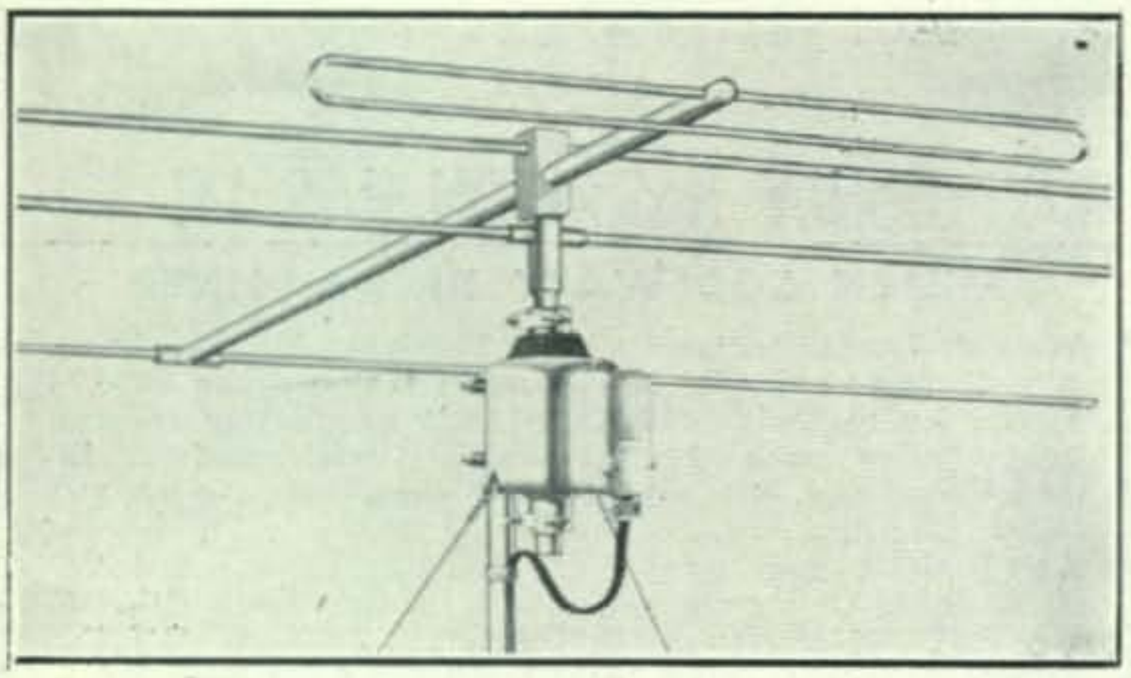
Add a hot stage of RF to your receiver for only **$11.97**, complete with tube! This Regency Booster uses a 6J6 push-pull neutralized triode, broad band circuit to give maximum gain and highest signal to noise ratio. Order yours today—specify 10, 6, or 2 meter band. (Also available for Hi TV, Low TV, and FM)
Tuning rods for booster..... Per pair **30c.**
CO-AX CONNECTOR BARGAIN! PL-259 with ferrule for ½" cables. Special **4** for **98c.**

HARRISON RADIO CORPORATION
11 WEST BROADWAY, NEW YORK 7
Phone the Lucky 7's — BArclay 7-7777

PARTS AND PRODUCTS REVIEW

V-H-F Antenna Rotator

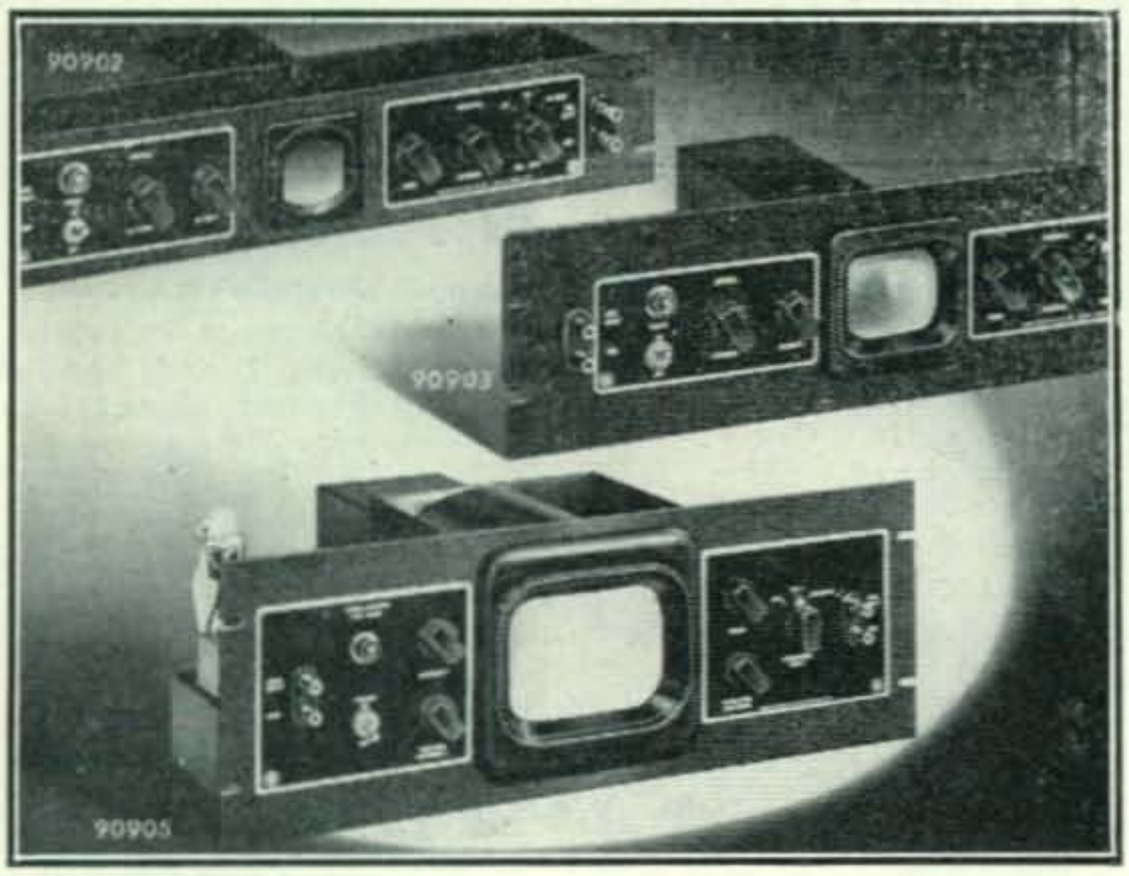
The Alliance Tenna-Rotor manufactured by Alliance Manufacturing Co., Alliance, Ohio, is an antenna rotator designed to rotate small beams. It consists of the rotator which is mounted on the antenna mast and a control box placed adjacent to the receiver.



The rotator unit, fully enclosed in a split zinc die-cast housing, is actually a rotating hollow shaft, into which the antenna center post is clamped. A four-conductor cable connects the rotator with a plastic control box. A three-position selector switch controls the clockwise or counter-clockwise rotation through 365 degrees. An automatic signal light illuminates a screen on the panel and tells when the limit of travel in either direction is reached. Tenna-Rotor is factory lubricated for life.

Basic Oscilloscopes

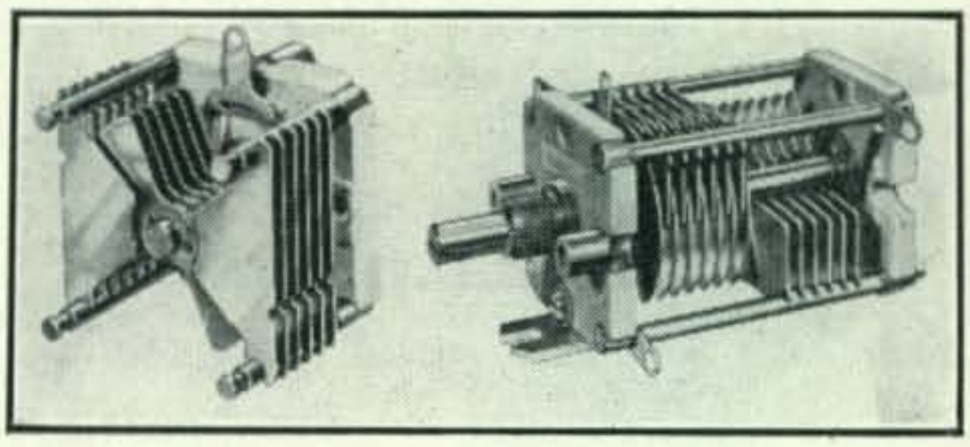
The Millen No. 90902, No. 90903 and No. 90905 Rack Panel Oscilloscopes for two, three and five inch tubes, respectively, are inexpensive basic units comprising power supply, brilliancy and



centering controls, safety features, magnetic shielding, switches, etc. As a transmitter monitor, no additional equipment or accessories are required. The well-known trapezoidal monitoring patterns are secured by feeding modulated carrier voltage from a pick up loop directly to vertical plates of the cathode ray tube and audio modulating voltage to horizontal plates. By the addition of such units as sweeps, pulse generators, amplifiers, servo sweeps, etc., all of which can be conveniently and neatly constructed on companion rack panels, the original basic 'scope unit may be expanded to serve any conceivable industrial or laboratory application. Manufactured by James Millen Manufacturing Co., Inc., Malden, Mass.

New Variable Condensers

Incorporating many important design advantages, E. F. Johnson's new line of 167 variables features new and perfected ceramic soldering. This ceramic band is stronger than the rugged Steatite end plates themselves. There are no eyelets, nuts or screws to work loose, causing stator wobble and capacity fluctuations. Stator terminals, mounting posts and rotor bearings are all ceramic soldered.



Silent operation on the highest frequencies is assured with a split sleeve tension bearing that also prevents the minutest fluctuation in capacity. Two sets of stator contacts are provided for connecting components to either side of the variable without appreciably increasing lead inductance of the circuit.

The new Johnson 167 variables are already available in fifteen different sizes and capacities with spacing of either .030" or .080". Additional sizes and capacities available on special order. Johnson invites those interested to write for their new 167 Variable catalog.

New Germanium Diodes

Five new types of Germanium Diodes, featuring a welded whisker which eliminates contact variation, have been announced by the Specialty Division of General Electric's Electronics Department at Syracuse, N.Y.

The five types provide a wide range of specifications which cover most general requirements for diode rectifiers in the electronics field. Designed to increase the operating efficiency of electronic circuits requiring diode rectifiers, the diodes replace such elements as 6H6 and 6AL5 tubes, copper oxide, selenium and silicon rectifiers.

The new diodes have a safe forward current of .05 amps and a safe back voltage of 60 volts. They feature a low shunt capacity of 0.8-$\mu\mu$f maximum, a quick recovery time and a life expectancy of 10,000 hours minimum.

MORE FOR YOUR MONEY **EVERYTHING FOR THE HAM**

yes sir.. it is easy to buy by mail and prices are right

TUBES
JAN TYPE BOXED

24 G	$1.00
28 D7	.29
807	1.49
874	.98
HY-615	.39
803	7.95
12SL7gt	.29
211	.39
VR150	.75
814	4.95
12SK7gt	.75
872A	1.75
845W	3.45
2051	.69
927	1.95

SPECIAL

150 ohms twin lead in 50 ft. coils with eyelets on one end.....49c. ea.

3 Coils $1.00

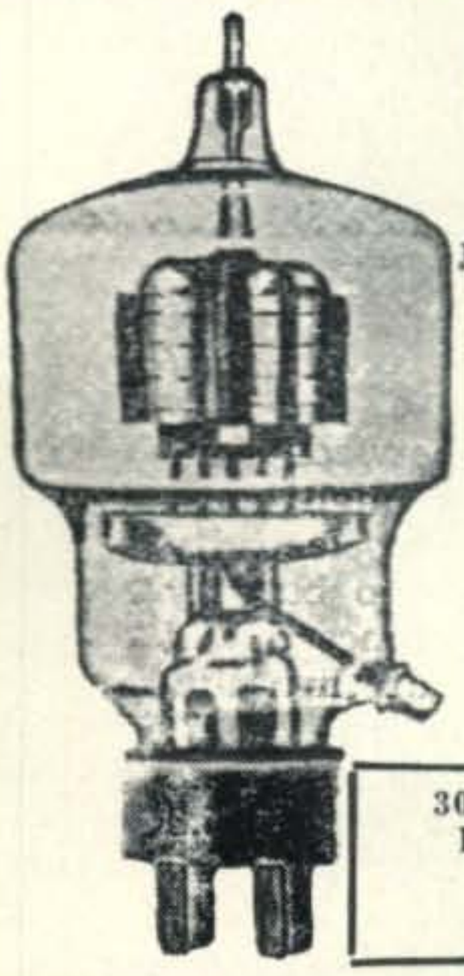
SURPLUS UNUSED

24V relays all types.....90c. ea.

2 FOR $1.49

Please Specify Your Requirements

POWER!! POWER!!



EIMAC 304TL

BRAND NEW
JAN. INSPECTED
SUPER
VALUE
BETTER ORDER
4 OR MORE

79c EA.

4 for $3.00

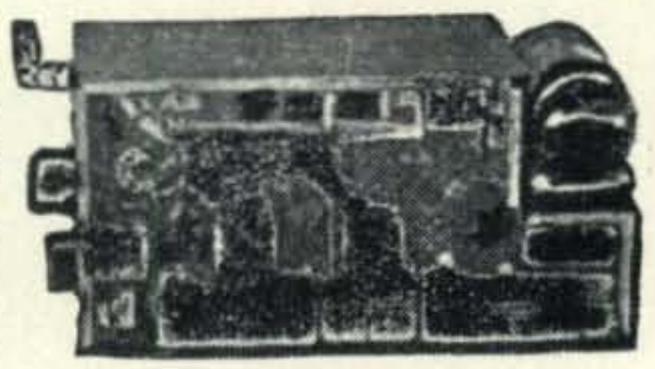
While They Last
Any Quantity

304TL SOCKETS
BRAND NEW
JOHNSON
$1.20 ea.

SCOOP! 110 (MC) Rec. Bargain

BC-733 D Localizer Receiver

Freq. 108-110 Mc. Tube complement 10 tubes—1—12SQ7, 2—12SR7, 1—12A6, 1—12AH7GT, 2—12SG7, 3—717A. USED CONDITION. Companion to the glide path receiver. Also contains 90 and 150 cycles band-pass filters. Has the best AVC system yet developed. Can use parts or use as a model for construction. 10 tubes, crystals, relays, etc. Schematic included, with dynamotor. Don't pass this up.



Individually Boxed $3.95

BARGAIN 2 FOR $6.95

SPECIAL FOR YOU

Cathode Ray 5FP7, 5BP1, 5GP1. 5BP4

$1.95

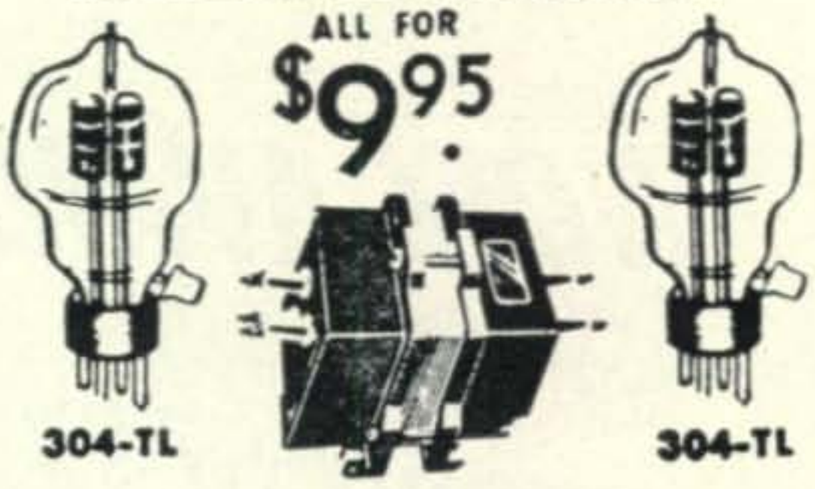
2 for $3.00

Gibson Girl Transmitter SCR 578B (New)

$19.95

MIRACLE KIT VALUE

Good for 2 KW.
SPECIAL COMBINATION
ALL FOR
$9.95



304-TL 304-TL

Kenyon Filament Transformer

Primary 117 V. AC.—50-60 cycle Secondary. Will operate two 304 TL's. etc. Sec.: 5 Volts, at 115 amps. Shpg. wt. 34 lbs. Two 304-TL's: 1 filament trans. .....BARGAIN **$9.95**

SAVE ON THESE VALUES

300 ohm Amphenol. Per C	$2.34
150 ohm Amphenol. Per C	2.16
75 ohm Amphenol (small). Per C	1.98
Kilowatt 75 ohm Amphenol. Twin lead, Per C. ft.	7.20
3 Gang 410 mmfd. per Sect. Cond. Excellent Quality	2.95
4 Gang 150 mmfd. Variable	.95
Condensers—New:	
2 mfd. at 2500 W.V. Each	2.95
4 mfd. at 600 V. Oil—round can. Each	1.19
Relay, Leach, 115V-AC DPST. New	1.50
Toggle Switch—SPST—plus spring return	.19
Toggle Switch—H.D.-DPST—12 amp. 125 V	.39
Phosphor Bronze dial cable 16 str.—250 spool	.69
Cable—6 wire No. 16, glass insul. shielded, plastic covered—perfect for beam control. 15c per ft. 100 ft.	12.00
Cable—6 wire No. 18, unshielded. Per ft.	.08
Cable—4 wire No. 18, plastic—Shielded. Per ft.	.10
100 ft.	5.50
Cable—Single shielded grid wire No. 20-AN Specs. Special—Per hundred	1.50

TERMS: F.O.B. Pasadena unless postpaid. No C.O.D.'s under $2.00 25% deposit on ALL Orders. All C.O.D.'s shipped by Rail Express. Save freight and C.O.D. fees by sending full price with order and we will ship by fast truck, transportation collect. Californians include 2½% sales tax.

WRITE FOR OUR BIG SPECIAL BULLETIN

DOW RADIO

1759 EAST COLORADO ST.
PASADENA 4, CALIFORNIA
Tel. Sycamore 3-1196—L. A. Ryan 16683

V.H.F. — U.H.F.

(*from page 50*)

While the news has been mostly good Stateside, XE1KE has sold out his equipment to XE1PA and by the time this is in print will be on his way up to Santa Barbara, Calif. Although we hate to lose you for a DX contact, welcome back to the States again. All we can say is, many thanks from the gang for a job well done in promoting 50-mc activity in Mexico, mucho bueno, amigo.

And how's this for taking the cake? W2IOP (old gold-plate himself) has forwarded to us a letter from Honey Bucket Hollow (hush you veterans from the Far East—we also know what a honey bucket is), Honshu, Japan. At any rate, it seems this certain party has put his BC-610 on 6 meters and has a rhombic of some astronomical size aimed this way. He also has a crystal controlled converter and is hunting 50-mc DX and wants us all to be on the lookout for him. All well and good, but the letter is just signed, "Tom." Come now, 2IOP, he must have a call. (Yer right, it's J2AAL—*W2IOP*).

Many moons have passed since we last heard from Larry, KZ5AY. Reports are that activity is improving in the Canal Zone with KZ5NB, KZ5GT and KZ5AY active. These boys are using SCR-522 units, while KZ5CJ is planning to put his TBS-50 on this band. During the evening of December 23, 1948, from 2029 to 2125 EST, KZ5AY was running cross-band checks with KZ5CJ and was overheard by HC2OT, who also seems to get around quite a bit. KZ5AY is on c.w. around 50.6 mc and KZ5NB is on 50.23 mc phone.

The 6-meter band appears to be a little better this past year, according to Tom Stence, W8NQD. At least Tom believes that the band opens more often than we imagine, but there just are not enough stations active at the right places at the right time. However, if the 50-mc band were to fill up like those on the lower frequencies we might realize just how good a band we have, for either skip DX or extended ground wave coverage. For example, during the opening on December 22nd, Tom heard Leroy, W5AJG, for several hours with a terrific signal indicating a really first-class opening, but no one was on to take advantage of it . . . In much the same vein, Bert, W5WX, says on the same evening he worked W9VZP and then after listening for another two hours heard nothing but carriers and diathermy.

(*Continued on page 65*)

HENRY HAS

Henry Radio stores in Butler, Missouri and 11240 West Olympic Blvd., Los Angeles, California have complete stocks of all Collins amateur equipment for immediate delivery. Also complete stocks of all other amateur receivers, transmitters, and parts. I promise you that you can find nowhere else lower prices, more complete stocks, quicker delivery, easier terms or more generous trade-ins. I give you 10-day free trial and 90-day free service. I promise that you will be satisfied on every detail. Write, wire, phone or visit either store today.

Bob Henry
WØARA

A FEW ITEMS IN STOCK ARE:

National NC-33	$ 57.50
National NC-57	89.50
National NC-173	189.50
National NC-183	268.00
National HRO-7	292.50
National HRO-7C	372.45
National HFS	142.00
Hallicrafters S38	49.95
Hallicrafters S53	89.50
Hallicrafters S40A	99.50
Hallicrafters SX43	189.50
Hallicrafters SX42	275.00
Hallicrafters SX62	269.50
Hallicrafters HT18	110.00
Hallicrafters HT19	359.50
RME HF-10-20	77.00
RME VHF-152A	86.60
RME DB22A	71.00
Hammarlund HQ-129X	177.30
Signal Shifter EX kit	49.75
Telvar T60-2	150.00
Harvey-Wells TBS-50	99.50
Harvey-Wells TBS-50A	121.25
Hunter 20A Cyclemaster	169.50
Subraco MT-15X	79.95

Hallicrafters & National TV sets

Gonset, Silver, Meissner, Millen, Sonar, Stancor, Bud, Mon-Key, Vibroplex, B & W, Johnson, RCA, Gordon, Amphenol, Hy-Lite, Elincor, Workshop, Premax; I have everything for the amateur.

Some prices higher on west coast.

FOR EXAMPLE:

Collins 75A-1 receiver	**$ 375.00**
Collins 32V-1	**475.00**
Collins 30K-1	**1450.00**
Collins 70E-8	**40.00**
Collins 310C-1	**85.00**
Collins 310C-2	**100.00**
Collins 310B-1	**190.00**
Collins 310B-3	**215.00**

COMPLETE STOCKS

Henry has *everything* in the ham field.

QUICK DELIVERY

Shipments *4 hours* after receipt of order. Send $5.00 with order and shipment will be made at once C.O.D.

TRADE-INS

You can't beat Bob Henry for trade-ins. Write, wire or phone today about your equipment and Bob Henry will make you a better offer than you can get anywhere else.

TIME PAYMENT

Because Bob Henry finances the terms himself you get a better break. Save time and money, deal with Bob Henry on his personal, profitable time payment plan.

Butler, 3, Missouri

HENRY RADIO STORES

11240 Olympic Blvd.
LOS ANGELES 25
CALIF.

"WORLD'S LARGEST DISTRIBUTORS OF SHORT WAVE RECEIVERS"

ESSE RADIO CO.

RECTIFIER POWER UNIT

INDIANAPOLIS, INDIANA

Navy Type CLG-20341

110/220 Volts, 50/60 cycle, single phase AC operated. Net weight 263 lbs. Gross weight 335 lbs. 28" high, 19⅜" wide, 23¼" deep (4.25 cubic ft.).

Will continuously deliver rated load of 25 amperes at 7 volts, 14 Volts, or 28 Volts DC.

It will furnish an instantaneous dynamotor starting current of 25 amperes at 28 Volts output.

This unit is portable and is sturdily constructed in welded steel frame. It is housed in steel case provided with louvres. 4 handles for carrying are welded to case. Controls, fuses and cables readily accessible. Input and output cables are permanently attached and stored in compartments in front of case. Spare fuses and pilot lamps are easily accessible from the front. On/off switch is mounted in recessed panel on front of case.

4 connector lengths and terminals are provided for proper connections to input and output voltages. Terminal cut-out provides protection. A sturdy blower motor fan is provided for cooling of the 15 amp. Selenium rectifiers running 1550 RPM and has 10" blades.

A sensitive regulating curcuit keeps output voltage constant under varying load conditions or input voltage fluctuations. Adequate inductance and capacity are included for good filtering of the output voltages.

A complete operating manual accompanies the unit.

This equipment was made by Electronic Laboratories, Inc. of Indianapolis, Indiana and is really a very dependable fine rectifier power unit and can be compared with only the finest. It cost our Government approximately $500.00.

Our price, complete, BRAND NEW . . . $179.50

Spare Parts Kit for the Above Described Rectifier Power Unit Navy Type CLG-20341

Contains:

1 Resistor, WW, 9 watts, 15 ohms

1. Resistor, WW, 100 watts, 25 ohms

6 Condensers, 2000 Mfd. 50 V. Electrolytic

1 Socket and red lens

1 12 ft. 2 conductor No. 10 wire output cable, with lugs

1 25 ft. Input cable No. 10 wire, plug on cable

1 Relay, normally open, DPST, 115 V. 60 cycle AC

2 Pilot lamps 6 V., .25 amp. bayonet base

1 Switch DPDT toggle type 10 amp. at 125 V. rating

1 Thermal cutout, contacts 10 amps at 110 V. AC normally closed, switch opens at 70 degrees C°

20 Fuses, cartridge type, 15 amp. 25 Volts

10 Fuses, cartridge type, 30 amp. 250 Volts

1 Rectifier, selenium, 13 volts 60 cycle input, 9 volts 2 amps. output

2 Rectifiers, Selenium, Input 46 Volts AC, Output 35 volts 15 amps.

1 Blower Motor Assembly fan, Input 115 V. 60 cycles AC, 1550 RPM, 10" blades

2 Fuse clips, phosphor bronze

2 Cap screw, hex heads

2 Lock washer, split ring type

All these parts are housed in a heavy gray metal hinged box with a latch on it and cost the Government approximately $250.00.

Our price on Spare Parts Kit is ....$79.50. These are Brand New

ESSE RADIO CO.

CONCERT MASTER RADIO TUBES

INDIANAPOLIS, INDIANA

Newly Manufactured, Brand New Radio Tubes (Not Surplus)

Each tube is individually beautifully boxed. Standard radio tube guarantee, backed by the manufacturer and also by Esse Radio Company.

.55c each

OZ4, 1A3, 1A4P, 1A5GT, 1A6, 1A7GT, 1B3GT/8016, 1B4P, 1B5/25S, 1C5GT, 1C6, 1C7G, 1D5GT, 1D7G, 1D8GT, 1E5GT, 1E7GT, 1F4, 1F5G, 1F6, 1F7G, 1G4GT, 1G5GT, 1G6GT, 1H4G, 1H5GT, 1H6G, 1J5G, 1J6GT, 1LA4, 1L4, 1LA6, 1LD5, 1LE3, 1LH4, 1LN5, 1N5GT, 1P5GT, 1O5GT, 1R5, 1S5, 1S4, 1T4, 1T5, 1U4, 1U5, 1V, 5T4G, 5U4G, 5V4G, 5W4, 5X4G, 5Y3GT, 5Y4, 7A4, 7A5, 7A6, 7A7, 7A8, 7AF7, 7AG7, 7B4, 7B5, 7B6, 7B7, 7B8, 7C4, 7C6, 7C7, 7E5, 7E6, 7E7, 7F7, 7G7/1232, 7J7, 7L7, 7N7, 7R7, 7S7, 7V7, 7W7, 7X7

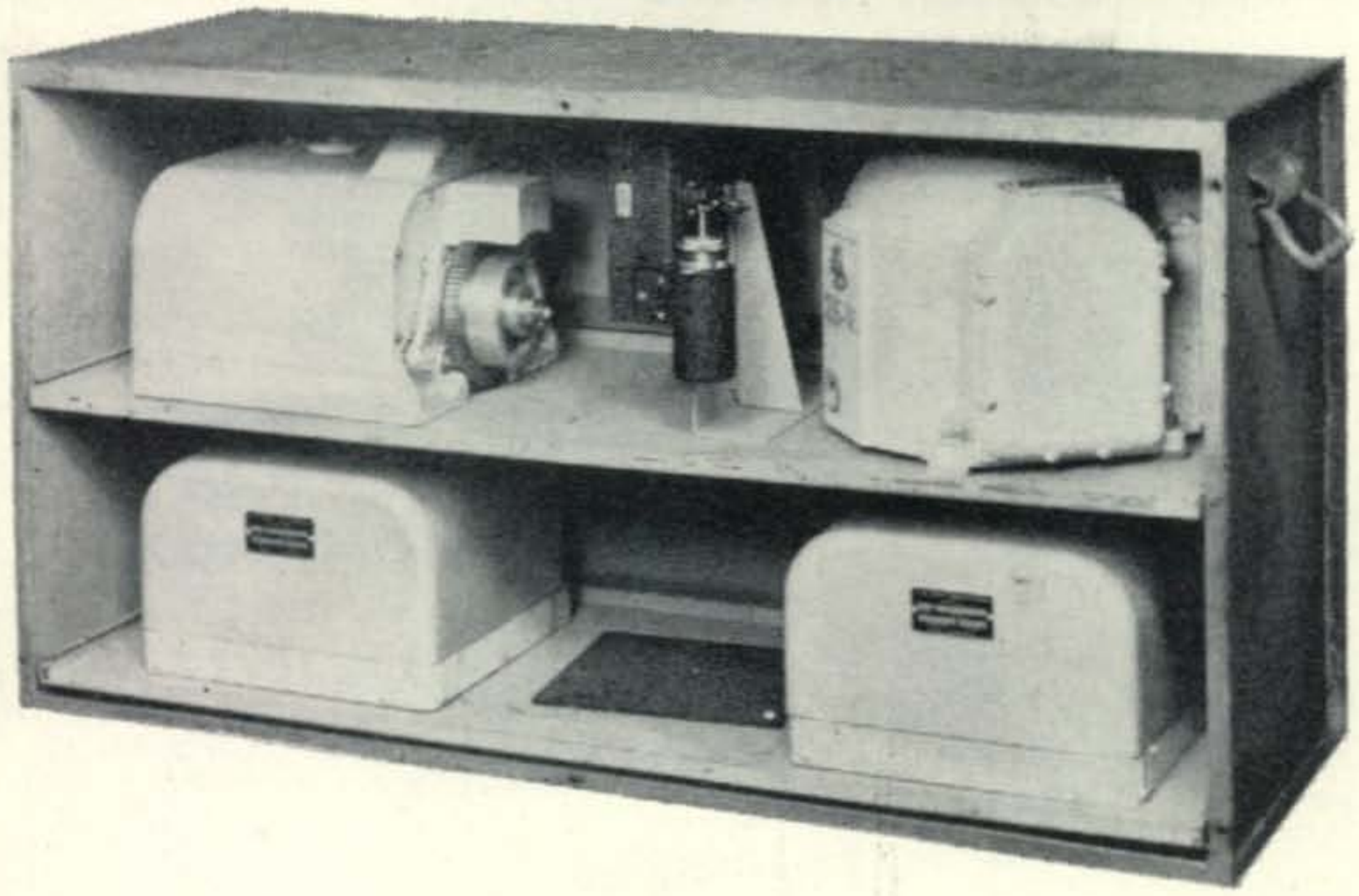
.65c each

2A3, 2A5, 2A6, 2A7, 2B7, 2E5, 3A4, 3A8GT, 3LF4, 3Q4, 3Q5GT, 3S4, 3V4, 5Z3, 5Z4, 6A3, 6A4/LA, 6A6, 6A7, 6A8G, 6AB5/6N5, 6AB7/1853, 6AC5GT, 6AC7, 6AD7, 6AF6G, 6AG5, 6AG7, 6AK6, 6AL5, 6AL7, 6AQ5, 6AQ6, 6AR5, 6AS5, 6AT6, 6AU6, 6AV6, 6B4G, 6B5, 6B6G, 6B7, 6B8G, 6BA6, 6BE6, 6BA7, 6BF6, 6BG6G, 6BH6, 6BJ6, 6C4, 6C5GT, 6C6, 6D6, 6D8, 6E5, 6F5GT, 6F6GT, 6F7, 6F8G, 6G6G, 6H6GT, 6J5, 6J6, 6J7, 6J8G, 6K5GT, 6K6GT, 6K7, 6K8G, 6L6G, 6L7, 6N7, 6P5GT, 6Q6, 6Q7, 6R7, 6S7, 6S8GT, 6SA7GT, 6C8G, 6SB7-Y, 6SC7, 6SF5, 6SF7, 6SG7, 6SH7, 6SJ7GT, 6SK7GT, 6SL7GT, 6SN7GT, 6SQ7GT, 6SR7, 6SS7, 6ST7, 6T7, 6U6G, 6U7, 6SZ7, 6V6, 6W7, 6X4, 6X5GT, 6Y6GT, 6ZY5, 12A7, 12A8GT, 12AH7GT, 12AL5, 12AT6, 12AU6, 12AU7, 12AV6, 12AW6, 12AX7, 12BA6, 12BA7, 12BE6, 12C8, 12F8GT, 12H6, 12J5GT, 12J7GT, 12K7GT, 12K8, 12Q7GT, 12SA7GT, 12SC7, 12SF5GT, 12SF7, 12SG7, 12SH7, 12SJ7GT, 12SK7GT, 12SL7GT, 12SN7GT, 12SQ7GT, 12SR7, 12Z3, 14A4, 14A5, 14A7/12B7, 14AF7, 14B6, 14B8, 14C7, 14E6, 14F7, 14H7, 14J7, 14N7, 14R7, 14X7GT, 19T8, 24A, 25A6GT, 25A7GT, 25AC5GT, 25L6, 25Z5, 25Z6GT, 10, 26, 27, 30, 31, 32, 32L7GT, 33, 34, 35, 35B5, 35A5, 35C5, 35L6GT, 35L7GT, 35W4, 35Y4, 35Z3, 35Z4GT, 35Z5GT, 36, 37, 38, 39/44, 40, 41, 42, 43, 45, 46, 45Z3, 45Z5GT, 47, 49, 50, 50A5, 50B5, 50C5, 50L6GT, 50X6, 50Y6GT, 51, 53, 55, 56, 57, 58, 59, 70L7, 71A, 75, 76, 77, 78, 79, 80, 81, 83, 83V, 82, 84/6Z4, 85, 89, 117L7GT, 117P7, 117Z3, 117Z6GT, 182B, 183, 482B, 483, 2050, 2051, XXD (14AF7), XX5FM (7X7), XXL (7A4)

ESSE RADIO CO.

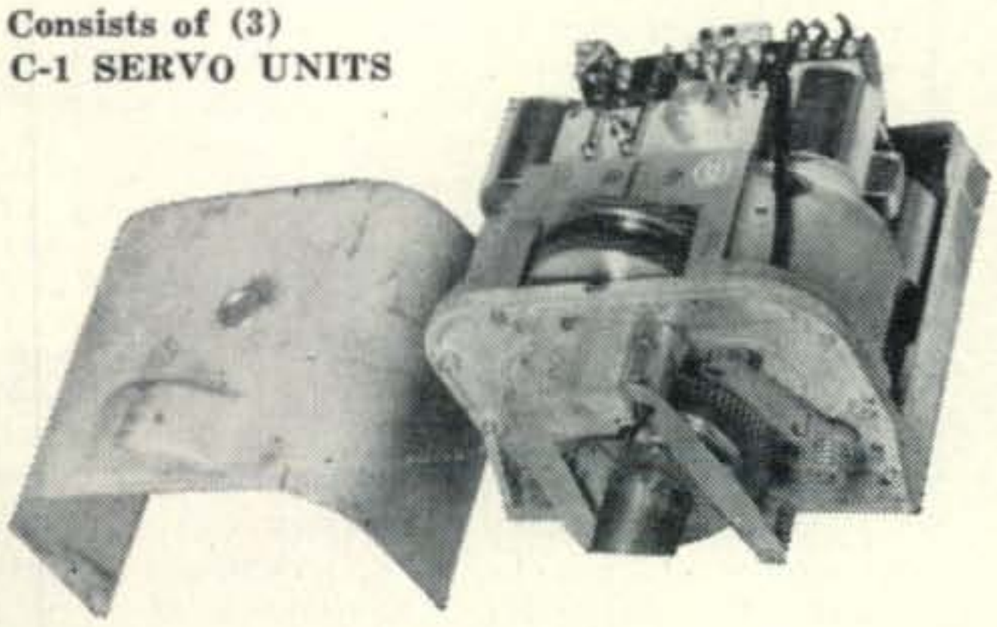
C-1 AUTO PILOT ASSEMBLY
Made by NORDEN

INDIANAPOLIS, INDIANA



Stabilized bombing approach equipment type M-7. All the following units come housed in a steel case, size 36" long x 17" high x 12" deep. Weighs approximately 160 lbs. net.

Consists of (3)
C-1 SERVO UNITS



and (1) C-1 GYRO

C-1 SERVO UNIT

Use to rotate beam antenna, actuate boat rudder control, etc. Contains 24 V. motor, clutch, relays, etc. Reversible. Size overall approx. 10½" x 8½" x 6½".

C-1 GYRO

Part of the C-1 Auto Pilot which is sold separate and may be used to conduct many interesting and amusing experiments. Operates from 24 V. DC or may be operated for short periods on 110 V. AC. Gyro will run for approx. 15 minutes after actuating. Size—approx. 8" x 8½" x 8½".

And 1 **DIRECTIONAL PANEL** with dashpot action (not pictured).

All five of these units as described individually and as pictured at top, priced, brand new, at..... **$49.50**

PART of AUTO PILOT — BUT NOT INCLUDED IN ASSEMBLY AS SHOWN ABOVE

C-1 AUTO PILOT AMPLIFIER

$16.95

Used to control operation of servo unit in response to signals received from gyro unit and control unit. The complete amplifier includes one rect. 7Y4, 3—7F7's for amplification and control, 3—7N7's for signal discrimination, 1 power transformer, 6 relays, 4 control pots, chokes, condensers, etc. Convert for use on radio controlled models, doors, etc. Operates from 24 V. DC. Size, 9¼" x 6¼" x 7⅝".

C-1 AUTO PILOT CONTROL BOX

Used for aligning control of C-1 Auto Pilot or use for parts, etc. Contains many useful pots., toggle switches, plugs, etc. Size, 11" x 6" x 4½".

PRICE

$6.75

ESSE RADIO CO.

CRYSTALS IN STANDARD 5-PRONG SOCKET HOLDERS

INDIANAPOLIS, INDIANA

6 Meter Ham Band		10 Meter Ham Band	40 Meter Ham Band	Other Frequencies	
8351	8476	7210	7210	5560	7970
8356	8477	7240	7240	7660	7990
8357	8480	7250	7250	7670	8124
8360	8486	7260	7260	7680	8130
8361	8488	7270	7270	7690	8245
8362	8520	7280	7280	7700	8250
8367	8530	7290	7290	7710	8251
8400	8540	7300	7300	7940	8252
8450	8541	7320		7950	8261
8451	8547	7330			
8452		7340			

Your choice of the above.....50c each

A TREMENDOUS BARGAIN
Quartz Crystals without Holders

Get an assortment of these and grind to your own frequencies or use them as they are. .5X.6" B-cut lapped on faces and squared on edges (Ready to use). We will give you an assortment of these from approximately 13 thousandths of an inch to 24 thousandths of an inch whereby you can grind to frequencies desired.

These crystals are now ground to the approximate following frequencies:

3880	4640	6225	7300
3900	4900	6275	7400
4140	5300	6700	7500
4600	5580	6850	7800
4650	5800	6900	7909

Formula for converting thicknesses of B-cut crystals to frequency is as follows: F=98.4/T where F is frequency in kilocycles and T is thickness in inches.

AN ASSORTMENT OF 20 DIFFERENT THICKNESSES **$1.50**

SURPLUS RADIO CONVERSION MANUAL

Edited and printed by Techno-Graphic Publications. It contains 115 pages, size is 7" x 10½", printed on good paper stock, covers well bound. A partial list of contents includes complete information on the conversion of the following popular war surplus items: BC-221 Frequency meter, BC342, BC312, BC348, BC946B, SCR274N, SCR522, BC1068A receivers, BC412 cathode ray oscilloscope, BC645 transceiver for citizen's band, SCR274N transmitters, SCR522 transmitter, TBY transceiver, various dynamotors, and a cross-index on tube numbers, frequency allocation chart, electronic surplus index with listing of over 135 items and description or functions or frequencies or tube line-ups etc. of same. Circuit diagrams of original items, and of converted jobs, together in the manual. The text is clear, concise and with values of various component parts abound easy to read and follow.

The price per copy is..... **$1.25**

Resistor—Fixed—Carbon Type, ¼ watt, 1200 ohms ± 10% .....$ 2.00 per hundred
Resistor—Fixed—Carbon Type, 1 watt, 220,000 ohms ± 10% ..... 2.00 per hundred
Resistor—Fixed Composition—Insulated, 2 watt, 3300 ohms ± 10%..... 2.00 per hundred
Resistor—Fixed Carbon Type—½ watt, 820 ohms ± 5% ..... 2.00 per hundred
Resistor—Fixed Carbon Type—½ watt, 910 ohms ± 5% ..... 2.00 per hundred
Trimmer Assembly—120 MMF to 2 MMF, 2" body length .....25c each
Condenser, Electrolytic, 100-100-100 Mfd. at 35 volts D.C., Aluminum can 1¼" dia., 2¼" high, with mounting flange. Brand new, Price.....$ .50
Capacitor—Tubular, .0018 MFD ± 20%, 800 volts, ⅜" dia. x 1¼" long.....$10.00 per hundred
Capacitor—Tubular, .005 MFD ± 25%, 600 volts, ⅜" dia. x 1¼" long..... 10.00 per hundred
Capacitor—Tubular, .1 MFD ± 20%, 400 volts, .5625 dia. x 1¾" long..... 10.00 per hundred
Capacitor—Tubular, .5 MFD ± 20%, 100 volts, 21/32" dia. x 21/32" long..... 15.00 per hundred
Capacitor—Tubular, .25 MFD ± 20%, 400 volts, 23/32" dia. x 21/32" long..... 10.00 per hundred
Mica Capacitor—56 ± 10%, 500 volts DC., Body—51/65" x 15/32" x 7/32"..... 5.00 per hundred
Mica Capacitor—56 ± 10%, 500 volts DC., Body——51/64" x 15/32" x 7/32" ..... 3.00 per hundred
Ceramic Capacitor—Non-Insulated, 120 MMF ± 10%, 500 volts DC., .250 dia. x .460 body— ..... 8.00 per hundred

Ceramic Capacitor—6 MMF ± 1 MMF, 500 volts DC., .250 dia. x .460 body..... 15.00 per hundred
Dry Electrolytic Capacitor—Capacitance 20 MMF,—10 ± 90%, 250 volts, 15/16" dia. x 1⅞" body length .....50c each
Dry Electrolytic Capacitor—Capacitance 30 MFD,—10 ± 90%, 250 volts, ⅞" dia. x 2⅛" body length .....60c each
Dry Electrolytic Capacitor—Capacitance 5 MFD,—10 ± 150%, 50 volts, 11/16" dia. x 1¼" body length .....25c each
Dry Electrolytic Capacitor—Capacitance 10 MFD,—10 ± 90%, 60 volts, ½" dia. x 1¾" body length .....35c each
Volume Control with Switch—Overall resistance 500,000 ± 30%—Top 100,000 at 37%, .250 dia. shaft—2-5/16" long. SPST switch rating 2 amps at 125 volts. .....35c each
Rotary Switch—Wafer Type—12 terminals—3 position—Shaft torque 25-35 oz. in .250 dia. shaft x 2⅜" long. .....35c each
Loud Speakers—2" x 3" P.M., 250-340 Resonance cycles per second. Voice Coil impedance 11¾" ohms. Power tube 154-150 milliwatts, 1.2 volts on voice coil. .....$1.10 each
Wave Trap Coil—455 K.C. Inductance range 1.644 mh to 3.394 mh. Distributed capacity 12.3 mmfd at nominal inductance 20 mh.....25c each
Coil—Oscillator A Band—990-2075 KC., 126 mmfd, Inductance at 1000 ohms—163.1 m.h.-30.42 m.h. .....35c each

ESSE Radio Co
130 W. New York St.
Indianapolis 4, Ind.

Unless Otherwise Stated, All of This Equipment Is Sold As Used
CASH REQUIRED WITH ALL ORDERS
Orders Shipped F.O.B. Collect

Tuning up to 10-11 meters, Bert found the old gang in W9-WØ just idly chewing the fat, whereupon he gnashed his teeth so hard that the upper plate broke into three parts . . . However, this situation is pretty far from funny and we would like to see some constructive efforts made in maintaining a higher order of activity.

As a matter of fact, Tuck, W8QYD, Dayton, Ohio, wishes the 6-meter gang in Chicago, South Bend, Elkhart and viciniy would wake up. Tuck holds nightly QSO's with W9ZHL in Terre Haute, Ind. (some 173 miles) with averaging S5 signals. The rig is just an 829B, running 100 watts. The antenna is a 4-element beam about forty-seven feet in the air. Actually this is better than the 10-meter boys are doing at night and probably represents better than a median value of the distances worked on 75-meter phone. If the fellows had a little more *stick-to-it-ivity* they would probably like 6 better than 160 (say, a good slogan!)

W9NJT and W9VZP say that they are the most exclusive gang on the air in Wisconsin, for where else can two amateurs in these frequency poor days find 4000 kilocycles to wallow around in? They were listening during the aurora of December 30, but heard no one . . . From the great northwest, W7DYD says that activity is represented by W7LYA. W7MIG, W7BYK. W7KGQ and W7DYD. The boys have jumped up to 51 mc and may try to get on 144 mc this coming spring . . . Over in Big Piney, Wyoming, W7ILL says he was unable to hear any F2 signals. but on the seventh of January had a good opening to his west. Monte also passes along the information that Louie, W7ACD, has run down to Arizona for a vacation. No doubt Louie, Chief Desert Rat 7QLZ and Scratchi will get together and compare notes in Feenix!

From the Garden State, we find that Ed, W2IDZ, has been partially inactive the past year while trying to whip up a foolproof converter. Ed has had quite a bit of experience in these lines and has a new humdinger that covers 2-6-10-11-15, all in one package. Band-switching down to

144-mc nearly threw Ed a curve, but this model has been duplicated five times with equal success. From his hill-top location, Ed can practically look over two-thirds of Jersey, which does give him an advantage in straight coverage work. He is up to 39 states and 5 countries.

John Chambers, W6NLZ, tells us that he is going overboard about this v-h-f and u-h-f stuff. John has receivers going covering from 80 to 6200 mc, and transmitters on 144, 235, 420, 1215, 2350, and 3300 mc. Gear is also planned for above 5000 mc. His new location is on a hilltop and 75-foot poles are ready to go up supporting some fancy arrays. The rig on 144 and 235 will run a full gallon using VT-127As.

Basil, VE5NC, still reports distortion on the FM stations in the 40-50 mc band he hears from the eastern and southeastern section of the U.S.A. On December 23, Basil heard around midnight auroral scattering up to 44 mc and on the 25th in the afternoon there was sporadic-E up to 46 mc. Then in the morning of December 29th the sporadic-E MUF shot up to 48.5 mc but no 6-meter signals have been heard.

Now here is something really cute—W6WKU, who says he is not a v-h-f man, sends us a clipping of The Hollywood Reporter's—Rambling Reporter column which says, and here we quote: "How about this? According to the *Illustrated London News* a man in Capetown,South Africa, recently picked up a live telecast on his set direct from B.B.C. London—6000 miles away". The next day the same columnist had this to say; "This'll explain yesterday's item about the chap who picked up a live telecast in Capetown from B.B.C. London. Seems B.B.C. engineers discovered a freak stratospheric condition that occurs twice yearly and makes such reception possible. Coverage of the freak was fixed by B.B.C., with the *Illustrated London News* on tap in South Africa to see it." Gosh, here we sit around racking our brains, and the B.B.C., at least twice a year, can fix reception up around 50 mc. Hey, Ferrell get busy on this—what's matter with you?

Out Tortilla Flats way, W6WNN says that W6JRM has been sick and activity just about the same way, too bad . . . Bish, W7HEA, had to fuss with a broken water pipe on January 7th when 6 meters opened into Montana, etc. So he again missed number 44. W7JPA was luckier,

144-Mc Honor Roll

	States	Dist.		States	Dist.
W8UKS	15	6	W4FBJ	7	5
W8WJC	14	6	W8PYY	7	4
W8WXV	13	5	W9PK	7	4
WØNFM	12	4	W1CTW	7	2
W9TKL	12	6	WØBZE	6	3
W1JFF	12	4	WØGOK	6	3
W1IZY	12	4	W8DRZ	5	4
W1PIV	12	4	WØWG	5	4
W3KUX	12	5	WØHXY	4	2
W3RUE	11	5	WØJHS	4	2
W9BBU	11	5	WØRNC	4	2
W3GKP	10	5	WØKPQ	3	2
WØIFB	9	6	WØDDX	3	2
W9AB	9	5	WØMZH	3	2
W9ZHB	9	4	W8YEG	3	2
W2JPA	9	4	W4LNG	3	1
W1CTW	9	3	W9UIA	2	2
W9LWE	8	5	WØSV	2	1
W9IPO	8	5	W2RPZ	2	1
W3GV	8	5	W5FSC	2	1
			WØZJB	1	2

Have ALL THE FUN
SAVE 2/3 THE COST

Build YOUR OWN TEST EQUIPMENT

Heathkits are beautiful factory engineered test equipment kits supplied complete but unassembled with all parts — tubes, grey aluminum cabinets, punched, formed and plated chassis, calibrated panels, ready wound coils and complete detailed instruction manuals for assembly and use. With costs zooming up, Heathkits save the labor cost of assembly enabling thousands to have equipment which they otherwise could not afford.

1 *Heathkit* VACUUM TUBE VOLTMETER KIT

Everything you want in a VTVM. Shatterproof solid plastic meter face, automatic meter protection in burn-out proof circuit, push pull electronic voltmeter circuit assuring maximum stability. Linear DC and AC scales. AC and DC full scale ranges of 3V-10V-30V-100V 300V-1000V. A total of 24 ranges. Isolated DC test prod for signal tracing and measurements of voltage while instrument is in operation. An ohmmeter section accurately measuring resistance of 1/10 ohm to one billion ohms with internal battery. Extremely high input resistance 11 megohms on all ranges DC and 6.5 megohms on AC. All these features and many more are the reasons hundreds of radio and television schools are using Heathkit VTVM's and recommending them to all students. Like all Heathkits, the VTVM kit is complete, 110V. 60 cycle power transformer, 200 microamp meter, tubes, grey crackle cabinet, panel, test leads, 1% ceramic precision divider resistors and all other parts. Complete instruction manual. Better start your laboratory now.
Shipping weight 8 lbs..... **$24.50**

2 *Heathkit* SINE AND SQUARE WAVE AUDIO GENERATOR KIT

The ideal instrument for checking audio amplifiers, television response, distortion, etc. Supplies excellent sine wave 20 cycles to 20,000 cycles and in addition supplies square wave over same range. Extremely low distortion, less than 1%, large calibrated dial, beautiful 2 color panel, 1% precision calibrating resistors, 110V. 60 cycle power transformer, 5 tubes, detailed blueprints and instructions. R.C. type circuit with excellent stability.
Shipping weight 15 lbs..... **$34.50**

3 *Heathkit* CONDENSER CHECKER KIT

Checks all types of condensers, paper mica — electrolytic — ceramic over a range of .00001 MFD. to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage of 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill.
Shipping weight 7 lbs..... **$19.50**

4 *Heathkit* SIGNAL TRACER KIT

Reduces service time and greatly increases profits of any service shop. Uses crystal diode to follow signal from antenna to speaker. Locates faults immediately. Internal amplifier available for speaker testing and internal speaker available for amplifier testing. Connection for VTVM on panel allows visual tracing and gain measurements. Also tests phonograph pickups, microphones, PA systems, etc. Frequency range to 200 Mc. Complete ready to assemble. 110V. 60 cycle transformer operated. Supplied with 3 tubes, diode probe, 2 color panel, all other parts. Easy to assemble, detailed blueprints and instructions. Small portable 9" x 6" x 4¾". Shipping Wt. 10 lbs..... **$19.50**

5 *The* NEW 1949 HEATHKIT 5-INCH OSCILLOSCOPE KIT

New improved model of the famous Heathkit Oscilloscope. Building an oscilloscope is the finest training for television and newer servicing technique and you save two-thirds the cost. All the features and quality of instruments selling for $100.00 or more. Supplied complete with cabinet, two color panel, 5BP1 tube, 2 5Y3 tubes, 2 6SJ7 tubes and 884 generator tube. Power transformer supplies 1000 volt negative and 350 volt positive. Sweep generator 15 cycles to 30 M. cycles. Has vertical and horizontal amplifiers. Oil filled filter condensers for long life. Complete blueprints and instructions included.
Shipping weight 25 pounds.
Express only..... **$39.50**

6 *Heathkit* FM AND TELEVISION SWEEP GENERATOR KIT

A necessity for television and FM. This Heathkit completely covers the entire FM and TV bands 2 megacycles ot 230 megacycles. The unit is 110V. 60 cycle transformer operated. Uses two 6J6 tubes, two 6C4 tubes and a 6X5 rectifier. An electronic sweep circuit is incorporated allowing a range of 0 to 10 MC. A sawtooth horizontal sweeping voltage and phase control are provided for the oscilloscope.

The coils are ready assembled and precision adjusted to exact frequency. As in all Heathkits, the best of parts are supplied, Mallory filter condenser, zero coef. ceramic condensers, all punched and formed parts, grey cackle cabinet, 5 tubes, test leads, etc. Better get it built now and be ready for the FM and TV business. Shipping Wt. 6 lbs... **$24.50**

7 *Heathkit* SIGNAL GENERATOR KIT

Every shop needs a good signal generator. The Heathkit fulfills every servicing need, fundamentals from 150 Kc. to 30 megacycles with strong harmonics over 100 megacycles covering the new television and FM bands. 110V. 60 cycle transformer operated power supply.

400 cycle audio available for 30% modulation or audio testing. Uses 6SN7 as RF oscillator and audio amplifier. Complete kit has every part necessary and detailed blueprints and instructions enable the builder to assemble it in a few hours. Large easy to read calibration. Convenient size 9" x 6" x 4¾". Ship. Wt. 7 lbs..... **$19.50**

ORDER DIRECT FROM THIS AD.
WE WILL SHIP C.O.D.
Add Postage for Weight Shown

HEATH COMPANY
BENTON HARBOR 22, MICHIGAN

snagging W7KVU for state 35. WØKQO and WØMZJ were also worked during this good two-hour opening. W9QKN, near Chicago was heard which is well into the double hop zone and pretty uncommon during the winter months.

XE1KE and XE1GE report a very good sporadic-E opening to W5 on both January 6 and 15. Between 1840 and 1932 CST, on the 5th, W5AJG, W5DC, W5DXB and W5ML were worked. On January 15, conditions were excellent for over three hours with W4EQR, W5EVA, W5ESZ, W5FFM, W5ITL, W5LKP, W5ILY, W5OLA and W5VY putting in potent signals. From some of these new calls, looks like W5 activity is on the upswing again.

144-mc and Higher

A suggestion has arisen in certain quarters that the question of antenna polarization on 2 meters be settled by directly polling and taking a vote of the active 2-meter gang. Frankly, *CQ* does not believe that such a proposal is workable and only an instant of reflection is needed to discredit the idea. As we know, verticals are in use in most of the east, a portion of the south and southwest. Therefore, numerically speaking it is estimated that the ratio of vertical to horizontal users would exceed 4 to 1. Certainly, few amateurs are going to vote for a polarization that they are not using.

Ruddy, W4LNG, operated portable last summer from Cape Cod and was able to work 7 states and 3 call areas out to 240 miles. Now from his home QTH in Atlanta, Ruddy has only 3 states, his greatest DX being 160 miles. Kinda shows the nice spot the New England boys have . . . W8YEG writes that he is temporarily inactive . . . Earl, W5JLY, says that activity is showing signs of coming alive again in San Antonio. Earl would like us to also show the DX range with the Honor Roll listings for 2 meters. What say about that gang?

Reported during VHF contest that W2ER was heard in Pittsburgh . . . Out in Washington with the Sad Sack Net it is rumored that W7AWX, Yakima, worked over to Seattle. Although only 110 miles it crosses some pretty high mountains. W7AWX has about 600 watts to a pair of VT-127As . . . KZ5AY passes on the information that some of the Lima, Peru, gang are on 144 mc now, including OA4BV, OA4BE, OA4DI and OA4DX.

It is with deep regret we record the passing of WØQZA. Jack's untimely death came as a shock to all of the 144-mc gang in the Kansas City area. Jack had been very active on the old 2½-meter band and had the very-highs at heart. Jack will be sorely missed, but his experimenting days with us will live on.

W2DZA advises that a 235-mc net operates in northern New Jersey nightly at 2100 EST. Equipment ranges from converted TR4s to crystal control, powers from 10 to 40 watts, and antennas from 4 to 12-element beams. Alex says that with only an hour's labor the TR4 can be put on 235 mc. Even though it is only a rush box and modulated oscillator it is a long step in the right direction, the bigger stuff can come later as techniques improve. Last summer the gang watched for signals from New England, but to no avail. Skeds welcomed with anyone on the east coast . . . W8NQD is expecting to be on 235 mc within the near future as this seems the logical band to try out experimental gear, etc.

Cal, W1CTW, hastens to correct us about an item a few months back concerning his working

HARVEY has TV-FM-SSSR es xmittrs rcvrs

XTALS

20 meter xtals for a buck! Mounted in holder with ½" pin spacing. Also 40 and 80 meter and 6 and 13 mc bands at the same low price.

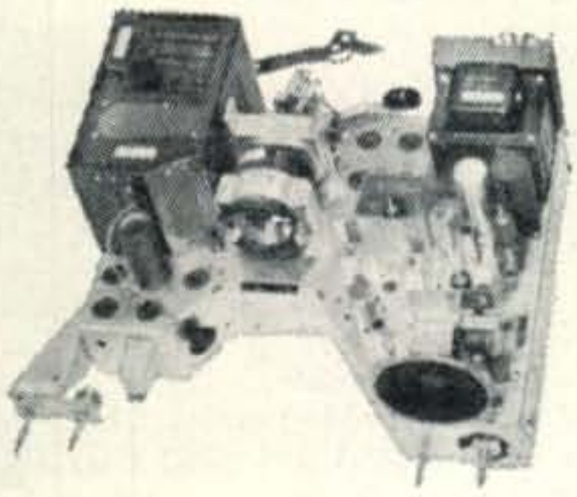
Specify your frequency.....**$1.00**
5 mc precision xtal, many uses.....**$1.95**
Special 8 mc xtals for 2 meter xtal control.. **1.50**
Lucite adapter for ½" xtal holders..... **.35**
Include 10¢ postage with your crystal order.

1616 TUBE

Half wave, high vacuum rectifier. Filament 2.5 volts, 5 amps; peak inverse 5500 volts; peak current .8 amps; surge current 2.5 amps; average plate current .130 amps. List price $7.50, Harvey Special Price, *while they last*.....**95¢**

NEW 1949 TECHMASTER TV KIT

All parts mounted as shown



Exactly the same as the RCA 630TS chassis, complete kit of parts, including pre-wired and aligned RCA front end, punched chassis, with all major components and sockets mounted, etc., all RCA tubes including kine, complete manual with service notes, all RCA. New, simplified instructions. (Free circuit and parts list on request.) *Shpg. Wt. 85 lbs.*

$198.50

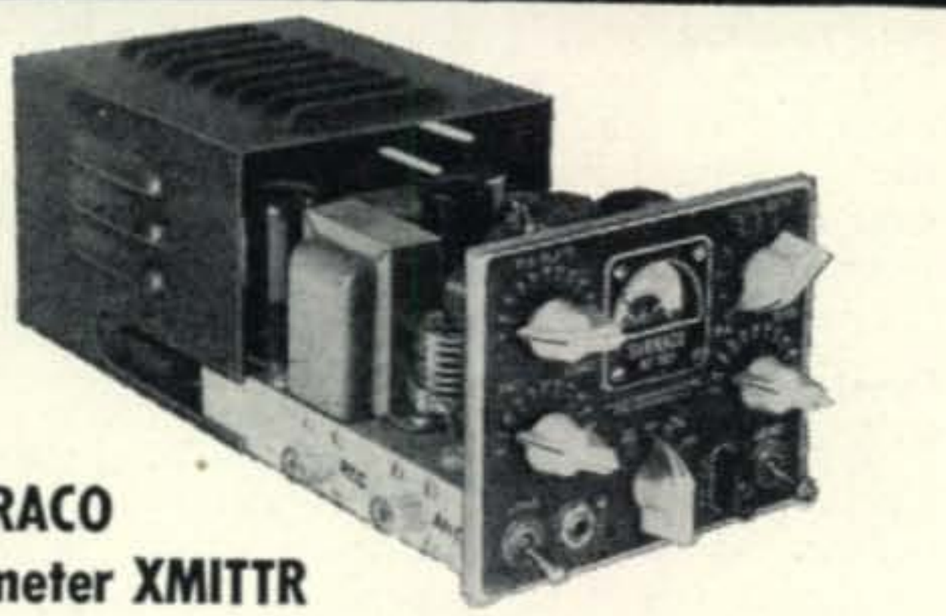
All in stock for immediate delivery.

MILLEN 92105 SSSR

Selectable single sideband reception will remove 95% of your QRM difficulties. Use with any rcvr having 455/456 IF. Other IF by changing crystals to your IF. *Shpg. Wt. 10 lbs.*

$75.00

NOTE: All prices are Net, F.O.B. N.Y.C. and are subject to change without notice.



SUBRACO 10 meter XMITTR

Compact mobile xmittr for "dashboard" mounting. Measures only 5½" x 4½" x 6½", weighs only 6 lbs. Designed to operate at 30 wts. input. Uses 6V6 Tritet xtal osc. quadrupling from 7 to 28 mc driving 2E26 Class C mod. amp. High level Class B modulator capable 17 watts audio. Built-in Coax antenna relay; p.t.t. switch. All controls front panel including illuminated meter, xtal jack, etc. Plate requirements: 300-400 volts at 140-180 ma. *Shpg. wt. 8 lbs.* Less tubes **$79.95:** including complete set tubes..... **$87.50**

Collins 75-A $375.00

80, 40, 20, 15, 11 and 10 meter ham receiver. Automatic noise limiter, high sensitivity, double conversion. With speaker in matched cabinet. *Shpg. Wt. 93 lbs.*

COLLINS 32V-1 $475.00

Desk transmitter, 150 watts cw, 120 watts phone. Built-in VFO covers 10, 11, 15, 20, 40 and 80 meter bands. Built-in power supply. *Shpg. Wt. 128 lbs.*

GE FM TUNER

Only a few left of this unusual buy. Covers 88-108 mc range, uses guillotine tuning. Designed for export and tropicalized, has power inputs for 110 to 250 volts 60 cyc. *Shpg. Wt. 30 lbs.*
HARVEY SPECIAL PRICE

$49.50

Hammerlund FS-135C Frequency Standard

Makes your receiver an accurate frequency standard with marker signals every 100kc. Includes low drift 100kc crystal, 6AU6G tube, complete instructions. Brand New. Only a few left.....**$6.95**
Order one or more spare tubes, 6AU6G....each **65¢**

Telephone: LUxemburg 2-1500

hrc HARVEY RADIO COMPANY INC.

103 West 43rd St., New York 18, N. Y.

into W2 on 235 mc when 144 mc was dead. Seems like Cal heard W2HWX quite often, but worked him only once. The difference, no doubt, due to the rush box used at W2HWX. One night W1CTW heard W2HWX tell W2KU (in Brooklyn, 40 miles away) to go back on 144 mc, as he could not copy him on 235 mc, while at the same time Cal was reading W2HWX solid at 210 miles. Shucks, just pardon our enthusiasm.

Last, but not least, out in Arizona on 420 mc the Phoenix boys are preparing to start jumping over the mountains into Winslow at 150 miles. Nice haul, but rugged territory.

For last minute 144-mc news see page 83.

6-meter Propagation Log

Dec. 23—HC2OT heard KZ5AY around 2045 EST. Aurora visible—no reports.

Dec. 24—Nothing reported.

Dec. 25—W4EID worked W5FND and W5BUV from 1830 to 1850 EST. Only report.

Dec. 26, 27, 28, 29—Nothing reported.

Dec. 30—Minor ionosphere storm of short duration in evening. W9NJT reports auroral scattering near 6 meters.

Dec. 31—Ferrell heard W4LNG from 1108 to 1112 calling CQ6. W4EID worked W8CMS and W2RLV during same period.

Jan. 1—WØINI worked 8CMS at 1110 EST, poor conditions, probably auroral induced sporadic-E as ionosphere storm started in early evening.

Jan. 2 and 3—Nothing reported.

Jan. 4—W5FSC worked W4GMP, W9ALU worked W4LNG, WØKPQ got W4LNG W4GMP and W4EQM, all between 1956 and 2117 EST. Sporadic-E.

Jan. 5—Nothing reported.

Jan. 6—XE1KE and XE1GE worked into W5 from 1940 to 2035 EST. W9ALU worked into W4 and W5, while W5FSC worked only into W9. W8NQD also into W5. All this during the same period.

Jan. 7—W8CMS reports opening to W4 and W7. W7ILL worked into W7 and VE7 while the W7s worked into WØ and eastern W7. Mostly 1930 to 2100 EST.

Jan. 8, 9, 10, 11, 12, 13, 14,—Nothing reported to date.

Jan. 15—Terrific XE1 opening into W5 from 1755 to 2035 CST. W4EID also worked W1ATP, other signals scattered, reports incomplete.

Jan. 16—Scattered contacts, W2AQW and W3BES worked W5HTZ in morning. W5ML reports the W8s around noon. Reports incomplete.

Jan. 17—Nothing reported.

Jan. 18—Mild ionosphere disturbance, W8CMS worked VE3ANY on aurora.

EMERGENCY

A.E.C. **C.A.P. Nets** **Local Nets** **Field Day Tests** **Vacation Use**

ALLIED'S Terrific "Buy" in an All-Band All-Purpose Auxiliary Transmitter

HALLICRAFTERS HT-17 ONLY $39.50

WITH COILS FOR ALL BANDS

You can stop looking for that auxiliary transmitter you've always wanted for emergency use—for your annual Field Day week-end tests—for Net tie-in—for vacation use! Here's the ideal CW job at a whopping saving of over $30! Originally priced at $71.50—now yours at ALLIED for only $39.50 *while they last.* Now—have what you want without construction, labor or worries. The HT-17 has conservative 10 watts output on 80, 40, 20, 15 and 10 meters. Uses 6V6GT crystal oscillator driving an 807 final; matching network for any antenna or for driving high-power amplifier. Controls: Plate Tuning, Antenna Loading, Standby, Meter Switch, Power on-off. Rear terminals for antenna, ground, key, external modulator. Satin-black metal cabinet, 12⅞ x 6⅞ x 7⅞". For 105-125 v., 50-60 c. AC. Complete with tubes and coils for all bands. Less crystal. Shpg. wt., 25 lbs. *Quantity Limited—Order Now!*

97-580. F.o.b. Chicago, ONLY..... **$39.50**

Beginners—Get on the Air for Less Than $100!

Yes—you can get a complete station at ALLIED for less than $100! Includes: HT-17 Transmitter complete with coils for *all* bands; Hallicrafters S-38 Receiver; a quality handkey; headset; Bliley 40 meter crystal; antenna wire and insulators; ARRL station logbook; Amateur Radio Callbook—everything you need to get on the air—at amazingly low cost!

97-636. Complete Low-Cost Ham Station, f.o.b. Chicago, ONLY.. **$97.50**

Terms: $19.50 down, $6.89 month for 12 months

Send for the Leading Amateur Buying Guide

You'll find *everything* you want in receivers, transmitters, instruments, parts and station equipment in our up-to-the-minute 180-page Catalog. Get it today. And get *every* buying advantage at ALLIED—fast shipment, money-saving values, top-quality equipment, ideal easy-payment terms, square trade-in deals and down-to-earth help from ALLIED's old-time Hams. For full satisfaction, get and use the ALLIED Catalog!

Have Every Buying Advantage

- *World's Largest Stocks*
- *Top-Quality Gear*
- *Money-Saving Prices*
- *Ideal Time Payments*
- *Square Trade-In Deals*
- *Speedy Shipment*
- *Ham-to-Ham Service*

Keep Your ALLIED Catalog Handy

ALLIED RADIO

Everything for the Ham

FREE

ALLIED RADIO CORP., D. L. Warner, W9IBC
833 W. Jackson Blvd., Chicago 7, Ill., Dept. 16-C-9

☐ Send FREE 1949 ALLIED Catalog
☐ Enter order for HT-17 ☐ Low Cost Ham Station
Enclosed $..... ☐ Full Payment
☐ Part Payment (Bal. C.O.D.)
☐ Send Time Payment details and order blank.

Name.....

Address.....

City.....*Zone*.....*State*.....

DX

(*from page 48*)

NY4LB 10-20 phone, and *NY4DD* pounds brass on 20. Their QTH for QSLing purposes can be found in the usual spot.

W2RDK always used to be a good 40-meter DX man and it seems that he still likes that ol' band. I'm listing some of his 40-meter stuff thinking that some of the frequencies will come in handy for a few of you. Look 'em over . . . *KJ6AB* 7045 0600 (all times are GCT), *KM6AK* 7050 0700, *HR1AT* v.f.o. 0300, *CN8AN* 7060 0700, *HC1AW* 7010 0320, *UB5KAF* 7000 0500, *IS1-AFM* 7025 2300, *UR2KAE* 7010 to 7050 0600, *ZC1CL* 7040 2300, *ZC6UN* 7040 0500, *ZC8PM* 7060 2250, *TF3C* 7033 0650, *FE8AB* 7015 0500 *UA9KAA* 7025 0600, and *UA9KWA* 7025 0400. Charlie says W3BES nabbed *ZD2N* on 7070. Now for Zone 23 on 40, boys.

By the time you read this, *EL3A* should be on the air again, as Rupert Lloyd has been reassigned to Monrovia. During his sojourn to the States he was given the call W4OJU and enjoyed some QRP DXing.

W1MIJ gave himself a fight talk resulting in his getting courage to write me a letter. Look at this: "For a long time I wondered what would happen if a 'cog' rather than a 'wheel' wrote in some dope." That's what it said in part. Since he got out of the Army he had been using a folded dipole hanging in his apartment and with it he worked 24Z and 70C. Power at W1MIJ is 80 watts. After using this indoor thing for a while he decided to see what could be hung up outside. Before the antenna was 12 hours old—3 new countries and one new zone. I'd say he is getting a good start . . . for a "cog."

No "CQ" QSL Bureau

Many 5 and 10 cent rumors have come to my attention lately to the effect that CQ is sponsoring, or is going to sponsor, a QSL bureau. Let us record here and now that we are **not.** We feel that QSL cards are being adequately handled by the agencies now engaged in this activity.

OE1AW is a little worried because he thinks many of the DX boys might believe him to be a pirate or phoney. He wants it correctly understood that he is 100% O.K., will QSL 100%, but still must work undercover . . . I suppose, 100%. Read on my friends, and you will find his QTH.

VQ2DH says there are three stations there, quite active on 10 and 20. In addition to himself, there are *VQ2PL* and *VQ2JO*. 2DH says he would actually like to work more Ws, if the job of QSLing wasn't so tough. Maybe some club around the country would be glad to give him a lift.

A note from *CE7AP* was very welcome, and Bill says that with the arrival of his XYL and the junior YL, the available DX hours have slackened off. However, in the two months of operation, he has worked 23 zones and 33 countries.

Fellows... LET'S GET ACQUAINTED!

SEND FOR MY *NEW* W.R.L. CATALOG—the most complete listing of Ham equipment ever assembled!

WORLD FAMOUS GLOBE CHAMPION

R.F. Section a complete 150 watt XMTR—Provisions for ECO—Automatic Bias on Final & Buffer—Voltage regulated Oscillator and Buffer—Class B Speech modulator—150 Watt input from 10 thru the 80 meter band—complete with tubes and meters including 1 set of coils—Specially crated for safe shipment.

KIT FORM $279.00

WIRED $299.00

NBFM MODEL $199.00

LEO I. MEYERSON
WØGFQ
CU ON 10-20 & 75 METERS

WRITE FOR COMPLETE DETAILS

GIANT RADIO REFERENCE MAP

Just right for your control room wall. Approximately 28" x 42". Contains time zones, amateur zones, leading shortwave stations, monitoring stations. **25c**

E-Z PAYMENTS

WRL offers the **lowest** E-Z Payment Plan in the country. Any responsible person with a steady job can buy on time from Leo. **No red tape—no delays!** Financing our own paper saves you money!

LIBERAL TRADE-INS

Leo offers more—use your present equipment as a trade-in. Tell me what equipment you have—what equipment you want—let's trade.

PERSONAL SERVICE

WRL is the World's Most Personalized Radio Supply House for the amateur. Getting acquainted with Leo will help you get on the air **faster** and for less money.

WORLD FAMOUS GLOBE KING

Unconditionally guaranteed 275 Watts phone and CW. An advanced design XMTR giving efficient performance on 10 - 11 - 15 - 20 - 40 and 80 meter bands.

Ready to go— Kit form $379.45

Wired $399.45

Save Money On Reconditioned Equipment—Write For Our Big List!

FAST SERVICE ON FOREIGN ORDERS

WRITE—WIRE
PHONE 7795

World Radio LABORATORIES INCORPORATED
EVERYTHING IN RADIO
COUNCIL BLUFFS, IOWA

WRITE TODAY

WORLD RADIO LABORATORIES
744 West Broadway
Council Bluffs, Iowa

CQ-3

Please send me.
- ☐ Radio Map
- ☐ New Catalog
- ☐ 40 Watt Globe Trotter Info.
- ☐ 150 Watt Globe Champion Info.
- ☐ 275 Watt Globe King Info.

Name .....

Address .....

City..... State.....

and expects, by the next issue, to have pushed his way into the Honor Roll. He located some more storage batteries and now operates with power between 3½ and 13 watts. The rig consists of a 6V6GT crystal oscillator, and an 807 amplifier. The antennas are two long wires, one of them

Ben Stevenson, W2BXA, holding the trophy he won for making postwar W.A.Z. No. 1.

being five half-waves in length, while the other consumes 14 half-waves of wire . . . frequency used is 14,012.

W4VE rubs it in by saying he took his family to Florida for the Christmas holidays to get out of the snow. Doc had W2IOP visit him recently, and I suppose now that boss LeKashman has been there, Doc will expect another zone out of it . . . It makes us feel good when we receive letters from guys like *ZC1CL,* congratulating us on the recent World-Wide DX Contest. . . W2PEO is getting a bang out of 80-meter DX with QRP, having worked *ZC8PM* 3515, and *FA8BG* 3510, as well as numerous Europeans. He is running about 50 watts input. Eric admits that a good location is 99% of the battle.

HL1AA is returning, or has by now returned to the States and will resume DXing as W9ESM. He should be easy for me to work now. ZL2GX lacks only one card, from Zone 17, for his WAZ. Let's see if we can squeeze one out for him.

FB8AB, a good old DX man, is trying to get back on the air. I think there is some gear en route to him but up to the date of his letter he had not received it. It will be good to hear Paul again and let's hope it's soon.

We also have word from *YK1AA,* ex-AR1RJ, saying that YK is the new prefix for Syria . . . in fact they have been using it since January 1st.

W1CH told W6AM he is back in business after putting his rotary beam back on top of his steel mast. It was previously blown off in a wind storm. W6AM worked *ZC6UN* on 14,350 phone at 1500 GCT. *ET3AB* told Don that his QSL cards will come from W6EZN in Fullerton, Calif. A couple of months ago, we heard that ET3AB had gone back to England, so this must be a new one on the air over there, as he is apparently running a kw on 20 phone . . . the antenna is a 3-element beam.

W2YW (ex-W2GTZ) spent about five months in Europe getting personally acquainted with G6-ZO, G5LI, G2CNN, and PAØNP. He tried to

LARGEST SURPLUS STOCK in the COUNTRY at the LOWEST PRICES!

BRAND NEW TUBE!

304TL
each _____ 90c
Four
for _____ $3.00

DYNAMOTORS & INVERTERS

BD-77—Dynamotor Unit 14v in, 100v, 350 ma out with relay fuse box and filters. FOB Chicago only _____ $5.75

DM-21—Dynamotor: Part of BC-312 and BC-314. 14v in, 235v, 100 ma out _____ 2.47

PE-101-C—Dynamotor unit; 12 or 24v in. outputs 800v, 20ma. 400v, 135ma. 9v, 1.1A _____ 2.75

PE-55—Dynamotor unit: 12v in, 16 amp, 500v out. 200ma. FOB Chicago only _____ 3.75

PE-206—Inverter unit, rotary converted, 28v. in, 80V at 500VA, 800 cy. out. FOB Chicago only _____ 3.95

DM-32A—Each 95c. Three for _____ 2.00

DM-53—Dynamotor used with the BC-733. 24v. in 240v., 60ma out. New _____ 2.95

BC-604 20-28 FM TRANSMITTER

For 11 and 15 meters; can be operated on 10 meters by use of proper xtals; 10 channel pushbutton xtal controlled, with all tubes, meter, schematic, case and covers; less crystals.

Used, excellent, with dynamotor —
FOB CHICAGO only _____ $14.95
Used, good, with dynamotor _____ 18.95
Used, good, without dynamotor _____ 8.95

BC-684 27.0-38.9 FM TRANSMITTER. Same as above except for freq. range.
New, FOB Chicago only _____ 24.95
Used _____ 19.95

APN-1 RADIO ALTIMETER

Complete 420 mc transmitter-receiver unit, complete with all plugs, indicators. BRAND NEW. FOB Chicago only _____ $34.50

ALTIMETER TRANSCEIVER RT-7/APN-1

Frequency 418-462 mc. FM with 14 tubes including 3- 12SJ7, 4- 12SH7, 2- 12H6, 1- VR150, 2- 955, 2- 9004. 24v Dynamotor, used, in working condition _____ $7.95

VHF DUMMY ANTENNA

Ideal unit for attachment for VHF transceiver while adjusting transmitter. 3 units hooked up in parallel will help tune up VHF transmitter.
New Condition _____ 3 for 95c

SMASH VALUES IN RADIO RECEIVERS

BC-454—RCVR	NEW	$7.95
BC-456—MOD	NEW	2.95
BC-457—XMTR	NEW	6.95
BC-458—XMTR	NEW	7.95
BC-459—XMTR	EXC.	9.95
BC-696—XMTR	EXC.	14.95

CONDENSER

2 MFD, 4000V, Pyranol _____ ea. $2.95
4 for _____ 10.00

PE-117 UNIVERSAL POWER SUPPLY

6 or 12 v input; out. 145 v and 90 v. less, vibrator, voltage, regulator and rectifier tube; ideal mobile power supply unit; excellent condition. FOB Chicago, only. each _____ $2.95

CROSS POINTER INDICATOR

Dual 0-200 microamp. movement in 3" case. Each movement brought out to 6-term, receptacle at rear. Originally used in ILS equipment. FOB Chicago only. New, only _____ $1.95

BC-709 INTERPHONE AMPLIFIER

Ideal for aircraft, booster for telephones, etc. FOB Chicago only _____ $3.49

SURPRISE PACKAGE

20 pounds assorted radio parts. A $25.00 value for only _____ $1.95

BC-733-D

Localizer receiver of the blind landing system. Companion to the glide path receiver. Also contains 90 and 150 cycle band-pass filters. 108.3 to 110.3 mc by relay selection of crystals in the local oscillators. Wide pass-band on 6.9 mc. IF's ideal for FM. Has a wonderful AVC system using rectified output of an RF oscillator as power supply for 100v DC bias. With relays, crystals and 10 tubes: 3- 717A 2- 12SG7, 1- 12SQ7, 1- 12A6, 1- 12AH7, 2- 12SR7. Schematic furnished! Condition: used, excellent. FOB Chicago, only _____ $3.95
New, FOB Chicago only _____ $9.95

EE-8 ARMY FIELD TELEPHONE

Sturdy, highest quality telephone at less than price of a better-class toy. With ringer. Requires only two flashlight batteries for each phone and two wires between each phone. Excellent condition. Used. Each _____ $7.95

GEARED TUNING DIAL

5 band, vernier. Freq. range from 3.2 to 32 mc. BRAND NEW. Ideal for many applications. An excellent buy _____ $1.39

APS-13 UHF ANTENNA

Suitable for 400 mc citizen band, ideal for UHF experimenters. With director and reflector elements mounted. BRAND NEW. 2 for _____ $1.49

BC-659 TRANSMITTER-RECEIVER UNIT

FM transmitter-receiver, crystal controlled, two channels, freq. range 27-38.9 mc, 13 tubes 2 crystals. NEW _____ $16.95

BC-620 TRANSMITTER-RECEIVER UNIT

FM transmitter-receiver, crystal controlled, two channels, freq. range 20-27.9 mc. 13 tubes, built-in speaker, dual meter for testing filament and plate circuits. Used, good _____ $9.95

VHF TRANSCEIVER

Ideal substitute for SCR-522, freq. range 140-144 mc, crystal controlled, 10 watts. The receiver section has two individual RF sections, feeding a common 3 stage 10mc IF amplifier. Both RF sections may be operated simultaneously, or either one individually. The receiver unit has 13 tubes. The transmitter is of straight forward design. Transmitter unit has 7 tubes, one #832 as final modulated by a pair of 6L6 and push-pull. Complete unit in case with tubes, crystals and diagram less dynamotor. EXCELLENT CONDITION _____ $14.95

FREE!

Our new 8 page catalogue featuring many excellent surplus values! Write for your copy today. It's FREE!

All shipments FOB Chicago or Los Angeles unless specified. 20% Deposit required on all orders. Minimum order accepted—$5.00. California and Illinois residents, please add regular sales tax to your remittance.

ARROW SALES, Inc. Dept. Q

Main Office:
1712-14 S. Michigan Ave., Chicago 5, Ill.

North Side Branch:
1802 N. Humboldt Blvd., Chicago, Ill.

West Coast Branch:
1260 S. Alvarado, Los Angeles, Calf.

get together with F8EO, but he was out of town. Reeve now lives in a big apartment building which has 17 TV antennas within 100 feet of his own 20-meter sky wire. He says that in spite of this, he does get a chance to get on the air, once in a while, with no one squawking.

The other day I received a letter from a fellow located in Kuwait who hopes to have permission to get on the air by the time you read this. If you hear him operating c.w. on 7075 or 14,150, I guess we can figure he received his license. He says he will hit other frequencies when he gets other crystals. The chances are, his first rig will wind up with a 6L6 in the final. (What's the matter Herb—his call a trade secret?)

W7LAR seems to do his best work in the morning with his 150 watts. . . W6COD, who did a lot of the operating at W2OEC, is now doing a bit of work at K4USA in Washington. He says he still expects to get back on the West Coast. . . I am glad to see W3PA now in the Honor Roll. All his work is on 20 phone.

KL7KV tells me that Santa Claus brought him a 40-meter folded dipole, and he is quite happy with the results obtained from it. It seems that the Army teletype is on 6,990 and splashes all over the 7-mc band making it anything but pleasant to work.

Some of you may want to know what KP4HU is using, and if so . . . The rig winds up with an 807 running 45 watts, while the antenna is a 138-foot end-fed Zepp. Mac says his QTH appears to be lousy, but judging from the DX he works, looks are quite deceiving. Mac got a big bang out of working W.A.C. on 80 meters during the month of December.

W9RBI thought the last two weeks of 1948 might bring him some pretty good DX, what with the University of Wisconsin students going home for Christmas, but the best he could do was dig up three new ones on 20 phone and not one on 10. The three are: *ZD1PW, EA8CO,* and *FE8-AA*. Ross says, "I can't exactly say I chewed the rag leisurely with them." He thinks maybe he'll rest up on 14 megacycles for a while. I say, "He better get after the rest of that W.A.Z."

Here's what happened to W9WEN during 1948. Got married . . . moved to Waukeshaw from Chicago . . . bought a house . . . started a business . . . and, now he is waiting for his first Jr. op. Oh yes, he now says, upon the arrival of said Jr., he should be kept awake enough nights to add a few new ones.

W6RW sent in his "contribution" by stating that now he has been awarded W.A.Z., the Honor Roll carries him as 39 zones. Yes sir, fellows, the printer usually takes a lot of kidding, but this time, he really threw the type around with reckless abandon. I am surprised it wasn't printed upside down . . . But, really gang, let's not give him those 20 lashes, let's wait until next month and see what happens.

Cards are now coming through from *AR1WW*. He is W2VLG and is trying to QSL everyone worked.

W6UZX says that it looks like *PK4DA* may have to close down because of the situation now existing in the N.E.I. More on this later, I hope. He says that PK4DA has confirmed the death of our friend PK6XA, but at present, details are lacking. *(QSY to page 78)*

RADIO RADAR SONAR SETS

- SE (new)
- SF (new)
- SG (new)
- SN (new)
- SO-1 (used)
- SO-13 (used)
- SQ (used)
- CPN-6 (unused)
- APS-3 (used)
- APS-4 (used & new)
- APS-15 (near comp.)
- QBG-1 (new)
- TBM (used)
- TDE (used)
- RAK-7 (new)
- TBK-19 (new)
- RC-145 (new)
- RC-146 (new)

Send for add'l info.

INSTRUCTION MANUALS

Bc 312, BC 342.....**$1.25**
SCR 281 **$1.25** Mark 11 **1.00**
ZA Eqpt **1.00** SCR 508 **1.25**

VIBRATORS

TR 1210, 12 vdc, 5 pin.....**$1.00**
OAK V-6675, 24-32 vdc, 7 pin **1.00**
Mal. Type G534C, 12 vdc, 5 pin **1.00**
Mal. Type G629-C, 12 vdc, 4 pin **1.00**
Radiart VR2, 6 v. DC. 6-pin spec. **1.00**
Mfrs. quantities available.

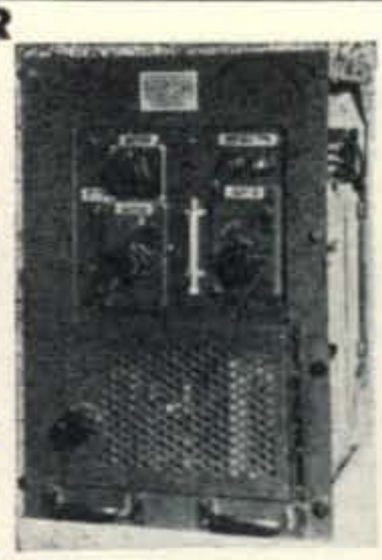
AN/ARC-3 AUDIO XFMRS

T-102, No. 55545 T-104, No. 55547
T-103, No. 55546 T-105, No. 55544
T-206, No. 55320
Price, each .....**$ .95**
MOD XFMR: PP 807's to PR 807's CL. "C" **$1.65**
DRIVER XFMR: 6V6 Driver to PP 811 Grids **$1.45**
UNIVERSAL OUTPUT: American ohms. Sec: 500/15/7.5/3.85 ohms, Silcor, PRI: 20,000/16,000/5000/4000 30db, con. Flat to 17,000 CY **$4.75**

MICROPHONE ELEMENTS

Carbon transmitter element for TS11-J, TS11-L, TS13-E, TS15-A **75c** ea.

MASTER OSCILLATOR UNITS



M.O. units designed for oper. in 2-18mc. TBK transmitters. Flexible plug in unit using Type 860 Tube in ECO circuit. Tunes 2000 to 4565 kc in 6 bands. Elements are enclosed in shock mounted oven assembly, and has freq. monitor PU link coupled to output. Net Wt.: 138 lbs. Dim.: 21 in. dx14½ in. Wx25½ in. H. New (with tube). **$150.00**

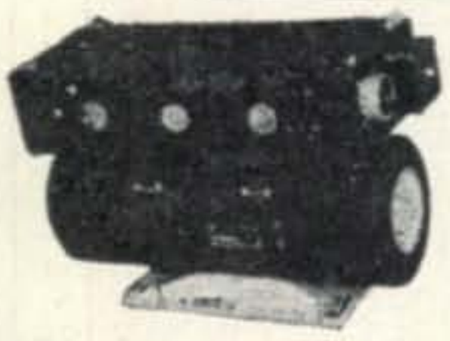
HEADSETS

Dynamic mike and headset combination. A high quality, efficient unit, used in B-19 tank Xmtrs. Mike and phones complete, new.....**$3.75**
Headbands: HB-1, HB-4, HB-30. New....**25c** each

30' US Army Signal Corps Radio Masts

Complete set for the erection of a full flat top antenna. Of rugged plymold construction telescoping into 3 ten-foot sections for easy storage and transportation. 2 complete masts hardware, shipping crate. Shipping wt. approx. 390 lbs. Sig. Corps 2A289-223-A. New.....**$39.50** per set

NBFM AFMRS, 465 KC. with CIRCUIT DIAGRAM..... **$2.55**



PE 218-E: Input: 25-28 vdc, 92 amp. Output: 115 v, 350-500 cy. 1500 volt-amperes. Dim: 17"x6½"x 10.". New (as shown). **$49.95**

PE 218-H: Same as above except size: 16½"x6"x10" **$49.95**

PE 218-H, used, good cond.....**$25.00**
PE 206: Input: 28 vdc, 38 amps. Output: 80 v, 800 cy, 500 volt-amps, Dim: 13"x5½"x10½" New **$12.50**
GE 5D21NJ 3A: Input: 28 vdc, 35 amps. Output: 115 v, 400 cy, 485 volt-amps. Dim: 9"x4½" diam. New **$49.95**

POWER EQUIPMENT

Step down transformer: Pri: 440/220/110 volts a.c. 60 cycles, 3 KVA. Sec. 115 v. 2500 volt insulation. Size 12"x12"x7".....**$40.00**
PLATE TRANSFORMER. Pri: 117 v. 60 cy. Sec. 17,000 v. at 144 ma. with choke. Oil immersed. Size: 26"x29"x13" Amertran.....**$120.00**
Fil. Trans. UX6899 Pri: 115 v. 60 cy. Sec: Two 5V 5.5A windings 29 KV Test.....**$24.50**
Voltage Reg. Transtat "Amertran" type PH 2KVA load. In: 90/130 v. 50/60 cy. Out: 115 v. **$40.00**
KS 8767: Fil. Xfmr. Pri: 115 v. 60 cy. Sec: 2 wdgs 5v. at 5 amp. each. 15,000 v. ins.....**$15.00**

COMBINATION TRANSFORMERS

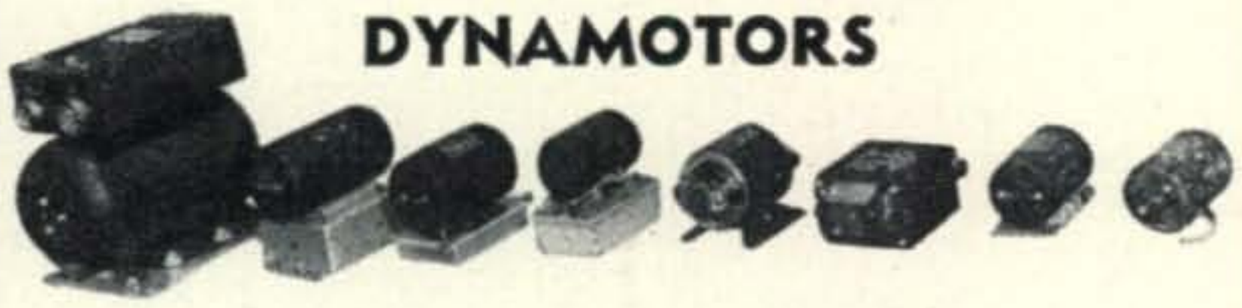
T2G 167, 650 v, 2 ma; 650 vct 65 ma; 6.4 v. 4 amp; 6.4 v, .6 amp; 2.5 v, 1.75 amp. (Ideal for pan-adapter applications) **$5.25**
No. 5104, 800 vct, 150 ma; 5 v, 3 amp; 6.3 v, 6.25 amp. **$6.95**
KS 8931, 585 vct, 86 ma; 5 v, 3 amp; 6.3 v, 6 amp **$4.25**

HAND GENERATORS

GN 35: 350V, 60MA, 8V, 2.5A. New, w/cranks **$12.50**
GN 45: 500V, 100MA, 6V, 3A. Used, Ex. Cond. w/cranks.....**$12.50**

Typewriter Desk Wells Mounted on Steel Panel for Standard Rack Mfg. 10½" H x 19" W x ⅛" Thick. Well is 22" Wide, 20" Deep, Affording Full Working Space. Grey Crackle Finish. New .....**$9.90** ea.

DYNAMOTORS



Type	Input Volts	Input Amps	Output Volts	Output Amps	Radio Set	Price
BD 77KM	14	40	1000	.350	BC 191	**$20.00**N
PE 73CM	28	19	1000			**$14.00**LN
DM 416	14	6.2	330	.350	BC 375	**$24.50**N
ZA .0516	12/24	8/4	12/275	.170	RU 19	**$15.95**N
DY-2/ARR-2	28	1.1	250	3/.110	RU 19	**$ 5.50**N
DM 36	28	1.4	220	.060	ARC-5	
DM 53AZ	14	2.8	220	.080	SCR 508	**$ 8.75**N
DM 21	14	3.3	235	.080	BC 733	**$ 7.00**N
DM 21CX	28	1.6	235	.090	BC 312	**$ 3.45**N
DM 25	12	2.3	250	.090	BC 312	**$ 3.45**N
DM 28R	28	1.25	275	.050	BC 367	**$ 2.49**LN
DM 33	28	7	540	.070	BC 348	**$ 8.75**N
DM 42	14	46	515	.250	BC 456	**$ 5.50**
			1030	.110	SCR 506	**$ 6.50**LN
			2/8	.050		
PE 55	12	25	500	.400	SCR 245	**$ 5.25**LN
PE 86	28	1.25	250	.060	RC 36	**$ 3.95**
PE 101 C	13/26	12.6/	400	.135	SCR 515	**$ 5.25**N
		6.3	800	.020		
			9 AC	1.12		
BD AR 93	28	3.25	375	.150		**$ 4.95**N
23350	27	1.75	285	.075	APN-1	**$ 3.50**N
35X045B	28	1.2	250	.060		**$ 3.50**N
ZA .0515	12/24	4/2	500	.050		**$ 3.95**N
B-19 pack	12	9.4	275	.110	Mark 11	**$ 9.95**N
			500	.050		
D-104	12		225	.100		**$14.95**N
			400	.200		
DA-3A*	28	10	300	.260	SCR 522	**$ 8.95**N
			150	.010		
			14.5	5		
#5053	28	1.4	250	.060	APN-1	**$ 3.95**N
DA-7A	26.5		1100	.400	TA-2J	**$25.00**N
CWD-21AAX	13	12.6	400	.135		**$17.50**N
	26	6.3	800	.020		
			9	1.12		
PE 94	28	10	300	.260	SCR 522	**$15.00**
			150	.010		
			14.5	5		

*For PE 94: Less Filters & Relay
N—New LN—Like New.

In the January column, I said something about *HL1BA* being called a "bootlegger" by some of the boys, but he always insists he will QSL when he gets back to the States. Apparently, this was misinterpreted by a few, as he really is no bootlegger at all; in fact, he is W2MQD and will definitely QSL everyone he works. Sorry, boys, if I gave you the wrong impression, but guess I didn't toss the words together just right.

WØPRZ is a 10-meter phone DX man and runs a kilowatt to a pair of 304-TLs in a grounded grid final. The antenna is a 6-element wide-spaced rotary . . . It should be old news to you by this time about KH6VP operating portable on Guadalcanal as *KH6VP/VR4.* He is none other than Bill "W.A.Z." Shuler, ex-W7BE.

One of the outstanding Italian signals, I1IR, holding his complete transmitter.

Up Canada way, it looks like VE3ACS has not been doing very much in the DX business lately. He says it looks as though he is going to have to increase his power from the 50 watts he is now using. . . We are glad to get a zone and country list from VE1NE, and welcome him to the Honor Roll. He goes in at 32Z and 91C. . . *VO6EP* said he heard a station, the other night, on 20 phone, and of all things, signing "VO6EP." He says he would like to get his hands on the so-and-so. . . VE3BNQ is still sticking to his 65 watts on 10 phone, and judging from his 35Z and 92C, I would say he is doing all right on one band. . . VE4RO finds DX a little slow, what with the Christmas rush and the holiday hubbub; however, he has picked up three . . . *AR1OD, LU1ZA,* and *VP8AJ.* . . Then, VE7HC works *LZ2P* who claims he is O.K. Time will tell, but the QTH he gives will be found in the regular section. Gord says he might make a trip down in this neck of the woods sometime during March. If he shows up looking like he did in his picture in the February *CQ,* he will certainly scare the local talent.

KH6CT told W6VFR that *VR3A* will be on the air until April on Thursdays and Saturdays in the evenings, his time. I also hear that *ZB1AD* is now back home in England, his call there being G3CZI. . . G2PL keeps saying he is getting too old to be active . . . on the air, that is, but still continues to add new ones, countries, that is. G2PL says his boy is 8½ years old, so it is obvious that he is getting on. Yeah, Peter, and to think I knew you when.

W9RNX overheard *ZD1AS* saying that he was leaving for England about the middle of January, and this would leave no one on 10 phone in Sierra

GENERATORS:

HOMELITE ENGINES: Consist of a 30 Volt DC, 50 ampere (1500 watt) generator driven by a single cylinder, two cycle air-cooled gasoline engine approx. 3 HP. Rope or electric starting. Prices: As is.....$39.50 Tested.....$49.50

DELCO ENGINES: Consist of a 12 Volt DC 750 watt generator driven by a one cylinder, four cycle air-cooled gasoline engine approx. 2 HP, with self-starter and voltage regulator. Used to charge batt. in Gov't. vehicles. Price: Tested.....$79.50

MOTORS:

6 or 12 Volt AC-DC Heavy Duty reversible motor with 5/16" x 7/16" shaft. Price .....NEW: $2.95

6 Volt AC-DC Motor—Ideal for auto fans, models, etc. Shaft ¼" x ⅞". Used—Tested.....$1.50

Model Motor—12 Volt AC-DC ⅛" double end shaft. Size: 2½" L x 2½" W x 1½" H. Price.....$1.50

110 Volt 60 cycle, Ball Bearing, approx. 3500 RPM 1/25th HP. Shaft: 3/16" x ⅝". Motor size: 6½" L x 4" H. Converted type. Price $2.95

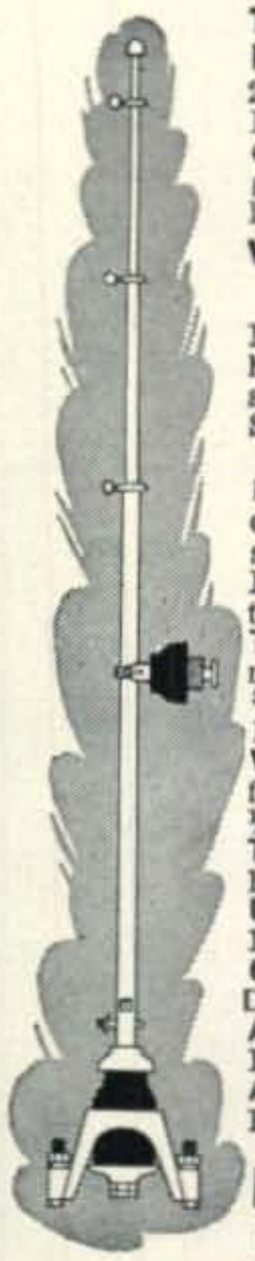
Hand Tool Motor—12 Volt AC-DC 5600 RPM. 3¾" L x 1¼" Diam. with splined shaft ¼" D x ½" L. Price.....$2.95

10 METER MOBILE RECEIVER

Receiver 10 Tube AM Set. Fixed frequency coverage 30 to 41 Megacycles. Complete with tubes and separate 6 Volt DC Filtered Power Supply. Equipment was removed from police cars and is in good condition. Rec. Size: 9" L. x 7½" W. x 6" H. Power Supply Size: 7" L. x 6" W. x 5" H. Price: Used..$18.95

SELSYNS: 110 Volt 60 cycle, 78411 Size V.....$5.95 Pair
2J1G1—110 Volt 60 cycle, Instructions...$3.00 Pair

ANTENNAS FOR ALL USES:



TELESCOPING ANTENNA WITH BASE INSULATOR: Four section, steel, extends 6'2" to 23'6". Diameter taper from 1-1/16" to ½". Each section fitted with adjustable locking clamp. Can be adjusted to length required for freq. Brown glazed base insulator and stand off. (Illustrated at left). Price $12.95

WHIP ANTENNA FOR MOBILE AND STATIONARY USE

MP-48 Mast Base Mounting with heavy vertical Coil Spring, insulated at top to receive Mast Section MS-53. Mast Base only $2.95

MAST SECTIONS: For above MP-48, tubular steel, copper coated, painted—in 3 foot sections. Bottom section MS-53 can be used to make any length. MS-52-51-50-49 for taper. Screw-in type. Any Section. Price: Each.....$ .50

TAPERED STEEL MAST—40 foot with hinged mounting plate. Eight sections tapered 2¼" to ¾". Isolating insulator in bottom section. Price $18.95

WHIP STEEL—24 ft. two piece. Bottom section 4 ft. long. Taper ¾" to ¼". Bottom Sec. threaded ½". Price $2.50

TELESCOPING STEEL ANTENNA—3 Sections, 94" long. Telescoped 40". Size: ¾" to ¼". Price.$1.75

UHF ANTENNA—24" with small rubber Mtg. Size: 1¾" Diam. x 4" long. Price.....$1.95

GUY WIRE—Aircraft type, rust resistant. 3/16" Diam. 1,500 lb. test. Price per foot.....$ .02

A-27 PHANTOM ANTENNA—Used for loading BC-375, BC-191, and other transmitters. Price.$1.49

A-62 PHANTOM ANTENNA—Used for loading BC-604 Trans. around 10 meters. Price.....$1.49

NEW ANTENNA ROTATOR (Shown at right)

Ideal reversible motor for rotating all types of antennas at the top. Weighs only 4½ lbs. Size: 7½" L, less shaft. Gear box and Mtg.: 4¾" x 3½". Motor size: 5" L. x 2¼" D. Shaft size: ⅜" x 1½" threaded. Operates from 24V. DC, 2 amps. 4.5 RPM or 36 V.A.C. Torque: 70 lbs. per inch. Price $8.95

TRANSFORMER (FOR ABOVE)—110 V. 60 cycle Primary; 36 V.A.C. Sec. Price.....$2.95

ANTENNA POSITION INDICATOR:

Ideal for indicating direction of antenna from a remote position. Units are same as illustrated and have 0-360 dial scales. Complete with two autosyns and 12 Volt 60 cycle Trans., and wiring instructions.

Price $6.95

NEW TRANSFORMERS and CHOKES by POWER CONVERSION CO.

TRANSFORMERS:

INPUT: 115/230 V.A.C. 50 or 60 cycles.
OUTPUT: 2500-0-2500 V.A.C. (2000 V.D.C. after choke input filter at 500 MA.) CH-102.....$39.75

ALL FOLLOWING TRANSFORMERS 115 V.A.C. 60 CYCLE INPUT:

OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. CH-106.....$7.95

OUTPUT: 625-0-625 V.A.C. (500 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. CH-107.....$7.35

OUTPUT: 600-0-600 V.A.C. at 250 MA. 12 V.A.C. at 3 amps; 12 V.A.C. at 3 amps; and 5 V.A.C. at 3 amps. Designed for Army surplus transmitters. CH-108.....$6.90

OUTPUT: 250-0-250 V.A.C. at 60 MA. 24 V.A.C. at .6 amps; 6.3 V.A.C. at .6 amps. Designed for Army surplus Receivers. CH-109 .....$3.00

OUTPUT: 6.3 V.A.C. at 6 amps. CH-110.....$2.25

OUTPUT: 24 V.A.C. at 2 amps. CH-111.....$2.25

OUTPUT: 2.5 V.A.C. at 10 amps. Center tapped and shielded. Open frame mounting insulated for continuous operation at 5,000 Volts. CH-113.....$4.20

CHOKES:

CH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation $8.67

CH-116—5-20 Henries at 500 MA. swinging choke, 5,000 volts insulation $8.37

CH-117—8 Henries at 700 MA. filter choke, 7,500 volt insulation $12.90

CH-118—5-20 Henries at 700 MA. swinging choke, 7,500 volt insulation $12.45

All Above Items Are Brand New . . . Not Surplus!

COMMAND RECEIVERS:

BC-455—6 to 9.1 Mc.....USED: $6.95

MOBILE DYNAMOTOR—6 V. for Comm. Rec. No. USA/0151 .....$1.95

TRANSFORMER—CH-109—for Command Rec.....$3.00

AC POWER SUPPLY & SPEAKER

Completely wired power supply and speaker with volume control C.W. and on and off switch, housed in metal cabinet. For command receivers with connections to plug into receiver and 110 Volt 60 cycle line. Voltage output: 250 V. 50 MA., 6.3 V. and 24 V.

Price: Completely wired $14.95

Price: Kit of Parts only..... 9.95

COMMAND TRANSMITTERS:

BC-457—4 to 5.3 Mc.....NEW: $9.95.....USED: 5.95

BC-458—5.3 to 7 Mc.....NEW: 8.95.....USED: 5.95

BC-456 MODULATOR—for Comm. Trans.....USED: 2.50

TRANSFORMER—CH-108—for Comm. Trans..... 6.90

DYNAMOTORS:

INPUT:	OUTPUT:	STOCK NO.	PRICE
9 V. DC	405 V. 95 MA	DM 635 X	$3.95
12 V. DC	220 V. 100 MA	D 402	3.95
12 V. DC	440 V. 200 MA	D 401	7.95
12/24 V. DC	440 V. 200 MA & 220 V. 100 MA	D-104	9.95
12/24 V. DC	F/No. 19 MARK II	P/S No. 3	9.50
13/26 V. DC	F/BC-645	PE 101	2.95
12/24 V. DC	500 V. 50 MA.	USA/0151	1.95
28 V. DC	F/Comm. Receivers	DM 32	1.95
14 V. DC	230 V. 100 MA	DM 20	3.95
9 V. DC	450 V. 60 MA/with Blower	D 9450	3.95
28 V. DC	400 Cycle Inverter (Reconditioned)	MC-149 F	12.95

TRANSFORMERS:

Primary 110 Volt 60 cycle; 24 Volt Sec. 1 amp.....$1.95

Primary 110 Volt 60 cycle; 24 Volt Sec. .5 amp..... 1.50

Primary 110 Volt 60 cycle; 12 Volt Sec. 1 amp..... 1.50

Primary 110 Volt 60 cycle; 14-14 Volt Sec. 15 amp. at 14; 7½ amp. at 28.....$4.95

MISCELLANEOUS:

TU-17 or 25 for BC-223—Price: New.....$4.50

TU-5, 8, or 10 for BC-375 w/case—New..... 3.95

Cable for BC-223 w/PL-150 each end..... 1.75

Cable for BC-375 w/PL-61 each end..... 1.75

Cable for TCS EQ/65F7, 65F10, or 65F13..... 2.95

Vibrator Pack 6 Volt DC input, 220 V 50 MA output.... 4.95

Plug for I-82 Indicator PL-118 ..... 1.00

Plugs for LP-21 Loop, PL-112, or PL-108 ..... 1.00

COAXIAL CABLE U.H.F.
125 Ohm, Polystyrene beaded, cotton covered. Amph. 76-30. Price: 50 Ft. Roll.....$1.25 Two Rolls:.....$2.00
70 Ohm, Cable 8 ft. lengths w/conn. AN 3106-14-8ST; each end. Price:.....$.55 ea. Or Two for $1.00

ADDRESS DEPT. CQ • ALL PRICES ARE F.O.B., LIMA, OHIO • 25% DEPOSIT ON C.O.D. ORDERS

FAIR RADIO SALES • • 132 SOUTH MAIN ST. LIMA, OHIO

Leone. W6OMC heard from some source that ZC8PM soon will be no more. Through another source, we heard he was going to be there for about a year. Take your pick. No, New Britain is not a different country.

I imagine most of you, by the time you read this, will have one weekend of the ARRL DX contest tucked away in your log, and just about ready to dig into the second weekend. It looks as though I will be on the road at least one of the weekends, but will try to get my share of the fun out of whatever time is left. Let's hope you boys add a few new ones, and if you do, I imagine I will be hearing about it shortly. "Well, OM, that's the dope on that OB. 73. CU agn and stuff." Oh. . . excuse me! I just heard this being rattled off on the air. See you on the low end: 73.

QTHs

AR1WW	**W. B. Prechtl, 705 Patterson Street, Elimra, New York**
EK1GW	**Glen Ward, Mackay Radio, Tangier, Morocco**
EL3A	**Rupert A. Lloyd, Foreign Service Officer, American Legation, Monrovia, c/o Department of State, Washington, D. C.**
ET3AB	**Via W6EZN**
HL1AA	**QSL to W9ESM**
HP1LP	**Via W6ADP**
LZ2P	**Via Box 212, Sofia**
MB9BJ	**Via R.S.G.B.**
NY4's	**Box 35Q, Navy 115, c/o F.P.O. New York, New York**
OE1AW	**Via W2NFR or PAØBK**
W7KPA/VP2	**Via APO 855, c/o P.M. Miami, Florida**
YK1AA	**R. Jalal, Technical Institute of Radio, P. O. Box 35, Damascus, Syria**
4X4RE	**Box 4099, Tel Aviv**

YL's FREQUENCY

(from page 52)

ning 70 watts. Take a look at their receiving line-up: a 4-element beam into an R9'er, into an HF 10-20, into a DB22A, into an HQ129X!

Well, what do you know—W2QHH, Howy Bradley, who has been striving for WAS/YL (with only W. Va. yet to go), has in the meantime made another record—WAC/YL. The girls he listed for WAC were I1MQ, Ada; ZS6KK, Marie; PY2KT, Eliasa; J2AHI (now JA2KG), Iris; VK3YL, Austine, and W1FTJ, Dot. Right now Lenore, W6NAZ, is designing a special certificate for Howy. Any other candidates?

YL runner-up to Howy for WAS/YL, by the way, is Bea, W7HHH, with YLs in 41 states worked so far.

YLRL Anniversary Party Scores

Speaking of working YLs in the States, we've just received from Lou, W1MCW, the scores of the YLRL Ninth Anniversary Party held last November. To Annette, W4LKM (operating her OM's station W4CWV) goes the "Littlefield Cup," donated by W1MCW, for rolling up a total of 33 YL stations worked in 20 states. Other top scorers were W3OLY, Helen, and W7HHH, Bea, with 31 and 25 YL stations, respectively, in 20 states, and W7FTX, Clarice, with YLs in 19 states. W1FTJ, Dot; W6CIC, Ruth, and W6-QOG, Helene, (operating W6MBD) got 18 states each,while W7LIZ, Edith worked YLs in 17 states,

and W1BEQ, Eunice, 16. Top score on c.w. was made by W7JFB, Miriam, with YL contacts in 12 states. The c-w prize, donated by W7FTX, is a plastic paper weight with "internal" carving. We only wish space permitted listing all the participants and their scores . . . All W districts were represented, and Canada and Great Britain, as well.

Congratulations to Lou, W1MCW, for receiving the BERTA award from the Radio Society of Great Britain. Lou is the only gal in the U.S.A. to win the award, for which she completed two-way contacts by radiotelephone with stations in twenty-five British Empire Dominion Radio Districts and fifteen British Empire Colonial Areas.

At long last the personal paths of your former and present column editor have crossed. For two years, despite constant correspondence, we've "just missed" meeting, both in the East and on the West Coast. So it was indeed pleasant to rag-chew over luncheon recently. Amelia and the OM are now settled in Greenwich Village in downtown New York and are busy writing for *Coronet, Colliers,* and other publications. Faced with the problem of having to start from scratch to gather equipment for her station, nevertheless Amelia hopes to have W2OLB back on the air shortly.

From Liz, W3CDQ, we learn of a newly licensed XYL in D.C., Barbara Houston, W3OQF. And what do you think of this unique announcement card Barbara and her OM recently sent out?

Speaking of new YLs, we've tried several times recently to include the names and calls of YLs who are happy over newly received tickets, but every time "blue-pencil LeKashman" has decreed "no space." So, while many of these are no longer "new" calls, still we'll include those we've gathered since the last listing in these pages: W5PDU, Marjorie Morgan; W7MUT, Sister Mary Charlotte; W2ZIK, Yetta Shulim; W2ZFP, Kathryn Pontius; W5PCH, Mary Zelinger; W7MUD, Rita Lemke; W6EJQ, Dorothy Guyton; W9FLU, Mary Rhein; W5PAS, Nell Johnson; W6EHA,

Genevieve Malette; W4EDI, Mildred Brewster; W5PAD, Margie Zelinger; W2YVH, Elizabeth Orpin; W5OTQ, Esther Lourey; W5OTU, Anne Maring; WØJJC, Jeanne McAllister; W1RLQ, Grace Swenson; W5OVH, Amelia Aldrich; W6DRI, Beatrice Ward; W6DST, Marguerite Maurshardt; W6DTH, Catherine Rochlitzer; W8DNF, Martha Robinson; W5PFE, Julia Kenker; KL7UG, Elsie Weed; WØNHQ, Virginia Shank; W9FZO, Helen McKeral; W1ZRO, Mary Torpey; W7MZM, Mary Ford; M9FZX, Clara Rhein; W2ZPR, Lillian Longley; W1RTB, Nell Waterman; W2ZLB, Kathleen Fox, and W1RTN, Opal Wilkinson.

The other day, while idly scanning the local scandal sheet, our eyes focused on bold 2-inch letters declaring: "33's YOUR LUCKY NUMBER." That "33" brought us up short. Then, below the banner heading and scattered with four-leaf clover designs, we discovered an A&P ad for their 33 Ann Paige varieties of preserves. Oh, well, we'd known it could have no connection with YLRL, but still 'twas nice to see that someone else believes "33" is "lucky"! So—33, and CUL.

Flash! Aurora Opens 144 Mc

During the severe ionosphere storm of Jan. 24-25 auroral-type scattering of 144-mc signals was heard. This is the first positive evidence of ionospheric scattering at these frequencies.

W9PK reports fuzzy carriers in the 2-meter band around 2000 CST Jan. 24. He then worked on c.w. W9EHX and W4FBJ, then WØKYF and W3RUE (415 miles); hearing W9ASM and W9FVJ. Similar effects were observed after 1700 CST Jan. 25, W9PK working W3RUE, W4FBJ and W3QKI; hearing W9ALU, W9ZHB and WØZIS with auroral fuzz. No phones readable. Beam aimed directly north.

MARS ACTIVITIES

(*from page 40*)

Proper recognition of outstanding contributors will be made by the Air Force.

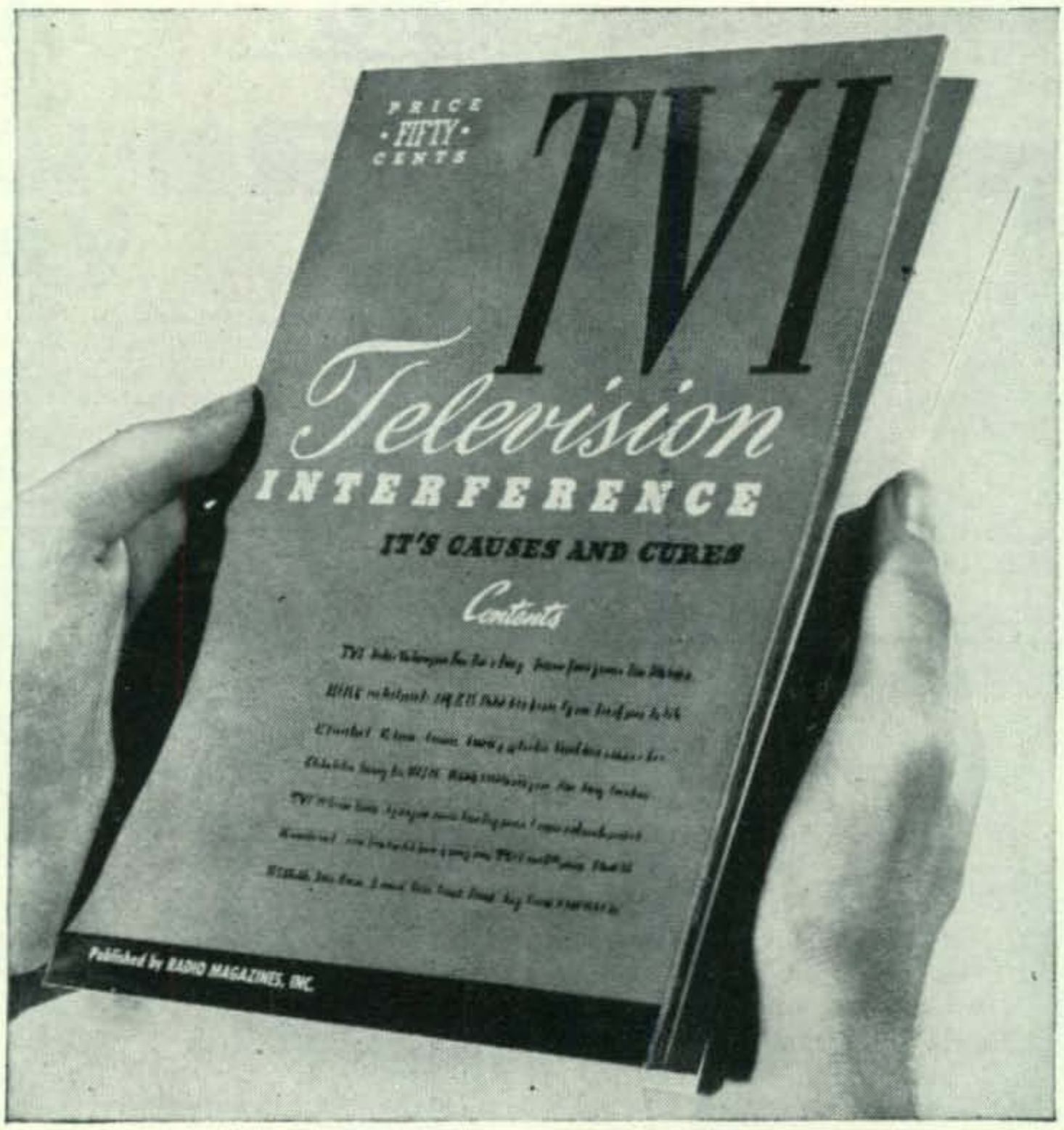
Headquarters, Scott Air Force Base and 3310th Technical Training Wing, located at Scott Air Force Base, Ill., is conducting a recruiting drive for civilian instructors. Instructors in wire equipment maintenance and instructors in general communications to start at the Civil Service P2 rating, $3727.20 per annum, are wanted.

For additional information interested persons may contact the Civilian Personnel Officer at Scott Air Force Base, Ill.

Key Clicks

The article "The Improved Dipper," by Wilfred M. Scherer, W2AEF, in the February '49 issue of *CQ* should have included the following constructional note: In order to avoid self-resonance of the variable capacitor frame at 200 mc, the following step must be taken. Before reassembling the capacitor remove insulated washer found at the front bearing and substitute a brass washer (silver plated would be preferable) of the same thickness as the original one, approximately.034".

Announcing—



TELEVISION INTERFERENCE
Its Causes and Cures

A new Handbook by Radio Magazines, Inc., covering in detail the important facts of TVI. The TVI Handbook is edited to fill the pressing requirements of amateurs and other technicians confronted with the problems of TV interference, or otherwise unsatisfactory television reception. Included in its thorough treatment of causes and cures are a comprehensive set of TV screen photos depicting all types of reception, many case histories, preventative design data, and other equally pertinent facts. It is a vital publication for radiomen wherever TV is on, or about to go on the air.

Price 50c, plus 10c postage, or order from your local dealer.

CQ—Radio Magazines, Inc.
342 MADISON AVE., New York 17, N. Y.

Enclosed find $.....for.....copies of the TVI Handbook

Name.....

Address.....

City.....Zone.....State.....

DX PREDICTIONS

(*from page 45*)

minor ionospheric disturbances. Phones possibly 0745 to 0900 CST. C-W until 1045 CST. *10 meters*: On a few afternoons out of the month the band may open 1645 to 1730 CST. Signals will be strong, but opening is undependable.

West Coast to South Africa

40 meters: Signals build up out of the noise after 1600 PST. Peak conditions 1830 to 2015 PST. Band closes after 2200 PST. *20 meters*: Extensive opening 1415 to 2345 PST. Phones peak 1845 to 2030 PST. C-W best from 1600 to 2215 PST. *10 meters*: Band opens 0700 PST with weak signals. Conditions improve about 10 db with peak 1115 to 1230 PST.

West Coast to Europe

40 meters: On ionospherically quiet days signals slowly build up after 1700 PST. Peak from 1900 to 2130 PST, however atmospheric noise is very high at *this* end of the path. *20 meters*: Scattered weak signals 0545 to 0730 PST. Weak c-w also from 1130 to 1300 PST. Phones fair to good on quiet days only from 1300 to 1515 PST. Band will close suddenly. *10 meters*: Unsteady opening from about 0930 to 1200 PST. Peak around 1100 PST.

West Coast to Deep South America

40 meters: Band opens between 1645 and 1730 PST. Conditions generally good from 1930 to 0130 PST the following morning. *20 meters*: Signals improve and build up after 1500 PST. Signals good 1800 to 0215 PST the following day. Few scattered signals audible 0445 to 0530 PST. *10 meters*: Extensive opening starting suddenly 0645 PST to 0715 PST and lasting until 1730 to 1830 PST. Peak conditions 1400 to 1700 PST.

West Coast to Middle East

40 meters: High noise levels and auroral zone absorption will keep conditions poor. Possibly a short peak around 1900 PST. *20 meters*: Erratic conditions mostly suitable for c-w only between 0630 and 1500 PST. Phones best between 1245 and 1430 PST. On good days the band may reopen around 2045 PST with strong signals. Conditions very unsteady, but might remain open until 2330 PST. *10 meters*: On a few especially good days out of the month, a fair opening centered around 0915 PST. Not dependable!

West Coast to Southeast Asia

40 meters: Signals start breaking through after 0230 PST. Very high noise level on far end this month. Band closes down gradually between 0600 and 0730 PST. *20 meters*: Band opens just before local midnight, but closes around 0200 PST. Signals good. Reopens suddenly 0745 PST with strong signals that gradually drop into the noise after 1200 PST. Phones especially 0815 to 0930 PST. *10 meters*: Extensive opening that should be a fairly regular performer 1600 to 2015 PST.

West Coast to Australasia

40 meters: Good opening from 2300 to 0730 PST the following morning. *20 meters*: C-W starting at about 2030 PST. Phones after 2300 PST. Band closes around 0345 PST. *10 meters*: Broad opening starting at about 1230 PST. Signals fair then improve over 12 db after 1830 PST. Closes around 2115 PST.

SCRATCHI

(*from page 8*)

In movie I are beginning to think maybe things will work out as Hon. Mama says, when a little noise at side of me make me look closely at Itchi. He are snoring. I are so mad I are getting up and leaving Itchi and of course Gregory quite flat. I are going home in station wagon, not even caring how Itchi get home.

When I get home whom should I be seeing making mama laugh like crazy over funny jokes but good old Scratchi being sparkling and joking and satisfied with self. He are back with much

success on secret mission. I ask what are all this secret stuff and Scratchi say he show me if I come out to ranch with him. Remembering poor old Itchi sleeping off his dinner in movie house we stop by and gather up still-snoring Itchi and all go back to ranch. Meanwhile I are feeling little bit ashamed about wiles I play on poor sometimes foolish but always so sweet and gentle Itchi. Anyway, he didn't catch any fancy ideas.

At ranch Scratchi are proudly displaying whole bunch of boxes of stuff he are having brought back with him from Los Angeles. "All this is govermint surplus proppity and I are getting all sorts of bargains", he are saying. "Scratchi are going to have biggest and shiniest rig in all Southwest". I are asking him what are all this about a secret mission. He say he got sooper-secret tip about big sale in L. A. and he not telling anyone till he are getting first chance at big bargains.

I were so scairt Scratchi were in big nest of bad peoples all this time that I just collapse in giggles. This is why I can see there's only one fellow for me, and that's Scratchi. I tell Hon. Mama that goes for all the hams I know, that they are not jerks (like she are saying, only not in that langwige). Don't you agree, Hon. Ed.?

Most as always,
Lil O. Watanabe

CHOOSING YOUR RECEIVER

(*from page 25*)

To sum this up, the amateur working in the 14, 21, and 28-mc frequency range will have to keep both his ACA requirements and image selectivity requirements in mind when choosing his receiver. If he insists upon the best performance in both respects he must use a double conversion receiver with its probable restriction against general frequency coverage and its additional expense. However, he may use a single conversion receiver if he is willing to compromise either his ACA or his image selectivity. In the u.h.f.-v.h.f. bands ACA requirements are not so rigid and the use of a high i-f frequency is clearly indicated. In the 3.5 and 7-mc bands image selectivity is more readily obtained and the customary 455-kc i-f frequency and crystal filter work well.

Frequency Stability

While stability has always been a major worry of the prospective buyer, most present-day receivers do rather well in this respect. In general the burden of stability falls on the high frequency oscillator. Manufacturers now use voltage regulator tubes on the supply voltage for the high frequency oscillator as a matter of course. Negative temperature coefficient compensating capacitors have become common within the last few years and are widely used. However, the type of approach that we use in our v.f.o.s, high *C* circuits or Clapp-type oscillators, are not used as yet because they do not lend themselves as readily to wide frequency ranges. These might well become commonly used should the "amateur-bands-only" receiver become more popular.

There is one step toward stability that has not yet become popular with manufacturers for reasons as yet unknown. This is the simple ap-

proach of reducing the power input to the receiver. Obviously the lower the power input can be held, the lower the temperatures around the chassis will be and the easier any compensation problems will become. For example, a high *Gm* tube such as the 6SG7 can be run at an operating condition giving a *Gm* of 2000 with a total screen and plate current of about 4 ma. The 6SK7 run under typical conditions draws a combined screen and plate current of nearly 12 ma to give the same *Gm*. Especially in those sections of the receiver where signal voltages are normally low, this extra current cannot be justified and simply represents additional dissipation and heat.

Similarly the audio power output enters the picture, since the audio output tubes frequently consume nearly as much power as the rest of the receiver. Few amateurs seem to be aware of the fact that 0.1 watt of audio power will make a lot of noise in a modern speaker. When using headphones a few milliwatts will be all one can tolerate. From the point of view of receiver stability and the infrequent use it gets, the high power audio system ought to be a separate unit. Those few people who really have a use for it could buy it separately. Most of us could easily get along with a few tenths of a watt, for example a 6J5 output tube. At present we may be paying a rather high price in cost and performance for the convenience of having the receiver "double in brass" as a PA system.

Distortion

Our last major consideration in our list of performance characteristics is distortion. Most of us have become so familiar with the distortion worries of the high-fidelity audio enthusiasts that we immediately associate the word distortion as concerning audio fidelity alone. However, the growing use of speech clippers and similar devices should convince us that preoccupation with high-fidelity audio systems has no place in the consideration of efficient *communication* systems.

There are two other types of distortion which do concern us. The first of these is known as cross-modulation, and is due to the action of non-linear characteristics in the tubes ahead of the detector. A non-linear amplifier will act somewhat as a modulator and if two signals are impressed on its grid a certain amount of the modulation on the second signal will be combined with the modulation of the first signal, and vice versa. The effect will be similar to a loss of selectivity and can become quite serious. The older remote cut-off pentodes were a good solution to the problem and are still widely used. It must be admitted that the new high *Gm* tubes with the so-called semi-remote cut-off characteristic are not as effective in cases where strong local fields from undesired transmitters exist. In these cases a receiver designed around the older tube types may be more effective. A similar criticism has been leveled at the triode converter circuits which

have become popular recently because of valid claims of better noise figures when using them.

The second major distortion to concern us is known as negative clipping and is a distortion in the diode detector circuit. If the diode load circuit is not carefully designed it will be observed that the negative modulation peaks will be clipped off whenever the modulation percentage exceeds a definite limit. In many communication receivers this effect will occur at modulation percentages as low as 50%. The effect observed in a communication receiver may simply be that the receiver "garbles" every signal in a tight QRM spot. In all fairness to the designers of these receivers, the diode load circuit was undoubtedly compromised in order to secure more effective action from the very simple noise limiters they contain. Here again, as in so many things, the designer has been forced to weigh extra circuit complication and cost against the public evaluation of the results.

While we have considered a number of the important characteristics of a communication receiver there are still a large number we haven't even mentioned. For example, it is mighty important for the operator to have the right tuning rate on his dials for the frequency range and the degree of ACA he is going to use. Likewise there are serious considerations regarding the pros and cons of mechanical vs. electrical bandspread. Then there are the purely personal decisions regarding the necessity for noise limiters, b.f.o.s, antenna compensators, etc., which will depend upon the operator's habits and his interests in the amateur bands. And of course we should not forget the matter of styling, trim, and dials. All of these matters are unfortunately beyond the province of our present discussion.

The Future

It is always interesting to speculate about the future and what it will bring us. The present time is an extremely interesting time in the development of amateur radio. NFM and SSB, two new modes of communication are now getting serious trial. Both have advantages to offer the amateur but both are experiencing difficulties in getting started because they require a little bit different kind of apparatus than we have been accustomed to use. Our receivers will have to be modified in order to take full advantage of their possibilities. So it is quite possible that the amateur's communication receiver may be an entirely different machine five years hence.

In the meantime ours is not a passive role. The manufacturers must please us sufficiently to make us buy their equipment. Therefore, the shape of things to come lies in our hands, depending upon what we *demand* when we buy. If we are disappointed at the choice today it is because we have led these people to think in terms of chrome plate and fancy dials, not in terms of signal/noise ratios and image selectivity. We can demand the best, and get it. But we must *know* what we want. It's really up to us.

ZERO BIAS

(*from page 11*)

front end, and you get in the i.f., what can be done except to put in traps in the antenna circuit—and you usually have to fight to be allowed to do this. Why should the amateur be expected to cover the neighborhood with a box full of traps and fix up the sets? It is the dealers' job! But I know from experience there are not many who are willing to do this.

Maybe what we need is a mass uprising on 10 meters, such as having all the amateurs go on the air for one night. The resulting flood of complaints to the FCC probably would cause them to issue an order for all amateurs to keep quiet hours. But that wouldn't be any worse than the situation is now, and might bring things to a head.

Edward L. Traub, W2EYV

It is that kind of spirit we need. Individual hams aren't fighting this thing alone by any means. Every reputable manufacturer and distributor, every amateur organization and publication is working on the problem. Sure it's a lot of work, but with that bum tooth you finally get to the dentist. With TVI you'll finally start cleaning up the rig, educating the neighbors, cooperating among clubs—or we're all going off the air to stay, just like the tooth that is neglected will come out to stay.

Remember—
Cooperate But Operate!

PROPOSALS TO FCC

(*from page 54*)

should be revised to stiffen operating and experience requirements for admission to privileged types of operation, i.e.; radiotelephone on frequencies suitable for medium to long distance communication. The national interest, of course, requires that entrance into the body of the amateur radio fraternity by government license be simple, and further, equipment requirements must be both simple and economical to foster entry of new and young blood who may in the future as in the past and present enthusiastically serve both industry and the governmental services in the tremendous fields of communications and electronics.

Therefore, in order to foster further advancement in the continuing development of licensing requirements for the radio amateur, SARA recommends: (a) That all newly licensed amateurs be required to operate solely with type A-1 emission for the first year of their license period.

(b) That a further period of one year as a Class B licensee be required before becoming eligible for examination for the Class A license.

(c) That a demonstrated code ability of not less than 20 wpm be required as part of the Class A examination in the future.

(d) That the provisions of (c) above be required of applicants for renewal of Class A privileges, provided that this be not applicable until

at least one year subsequent to establishment in order that licensees currently applying for renewal may have adequate opportunity to prepare to comply.

(e) That consideration be given to providing for the licensing of youthful and other interested persons of initially limited experience and knowledge in order that the ranks of amateur radio may be opened to high school students, etc., to a far greater extent than is now the case. It is suggested that a new type of short term (6 months to 1 year) apprentice's license with relaxed code (5-8 wpm) and such technical and regulatory knowledge as is deemed necessary by the Commission, be instituted. This to be followed by examination for Class B and not renewable. Further restrictions as to frequency bands are suggested as 3700-3800 and 7200-7300 kc A-1 emission, and 145-148 mc A-1 and A-2 emission, frequency to be stabilized by piezoelectric crystals.

SINGLE SIDEBAND EXCITER

(from page 40)

the transformers. These tuning condensers are small Hammarlund APC condensers mounted on the top side of the chassis with the tuning control projecting through a hole of ample clearance to prevent short circuiting the rotor to chassis. Tuning is done from the underside of the chassis. The coils in each transformer are mounted on a Textolite rod fastened to the chassis between the tuning condensers so that the axes of the coils are vertical and coincident. The top coil is arranged so that it may be moved up and down on the rod to permit adjustment of coupling. Once the correct coupling has been determined, the coils may be cemented to the rod with Glyptal or other cement. The shield can should be mounted for greatest clearance between the coils and the side of the shield. Space should be allowed on the chassis for the mounting studs of the shield cans so that they may be removed and replaced easily. The lower coil should be the plate coil, with the plate connection made to the bottom end of the coil. The grid connection to the upper (grid) coil should be made to the top of the winding—as far away from the plate as possible.

The 90° r-f phase-shift transformer T_{1a}-T_{1b} is built in two parts with a low-impedance link coupling the two windings together. This was done in order to allow front panel tuning (r-f phase) of the secondary circuit without the necessity of mechanical couplings. The rotor of the secondary tuning condenser (C_{113}) should be insulated from the panel, and the control knob should not have a metal skirt electrically connected to the shaft. In the case of T_{1b} the side of the shield facing the panel may be cut out so that the shield may be removed and replaced easily.

It is important to minimize the inductance of the connecting leads of the pairs of mica condensers, C_{111} C_{112} and C_{114} C_{115}, by bending a lead from each toward the other (condensers

together and back to back) and soldering the pigtail leads together for the full length of the connection. The ground connection from each pair of condensers should be from the *center* of this double lead, and as short as possible. A soldering lug will serve nicely to fasten the assembly to the chassis. The lines taking signals to the grids of the modulator tubes may be any reasonable length, but should be soldered to the pigtail leads of the condensers as close to the condenser itself as possible. Failure to do this may result as inability to obtain balance in the modulators.

The 807 output stage is in a shielded compartment formed by an L-shaped piece of metal fastened to the chassis, the front panel, and the chassis bracket as shown in *Fig. 4*. The lower part of the tube is shielded from the output circuit by a standard 807 shield. Underneath the chassis, a short barrier shield separates the input circuit of the 807 from the modulator and carrier amplifier tubes. This is shown in *Fig. 5*.

The v-f-o input plug is shown on the rear apron of the chassis in *Figs. 4* and *5*. The exciter output plug is on the front panel to the left of the plate tuning control, but may be located on the rear apron if desired. The output lead should be shielded in this case to prevent feedback to previous amplifier stages.

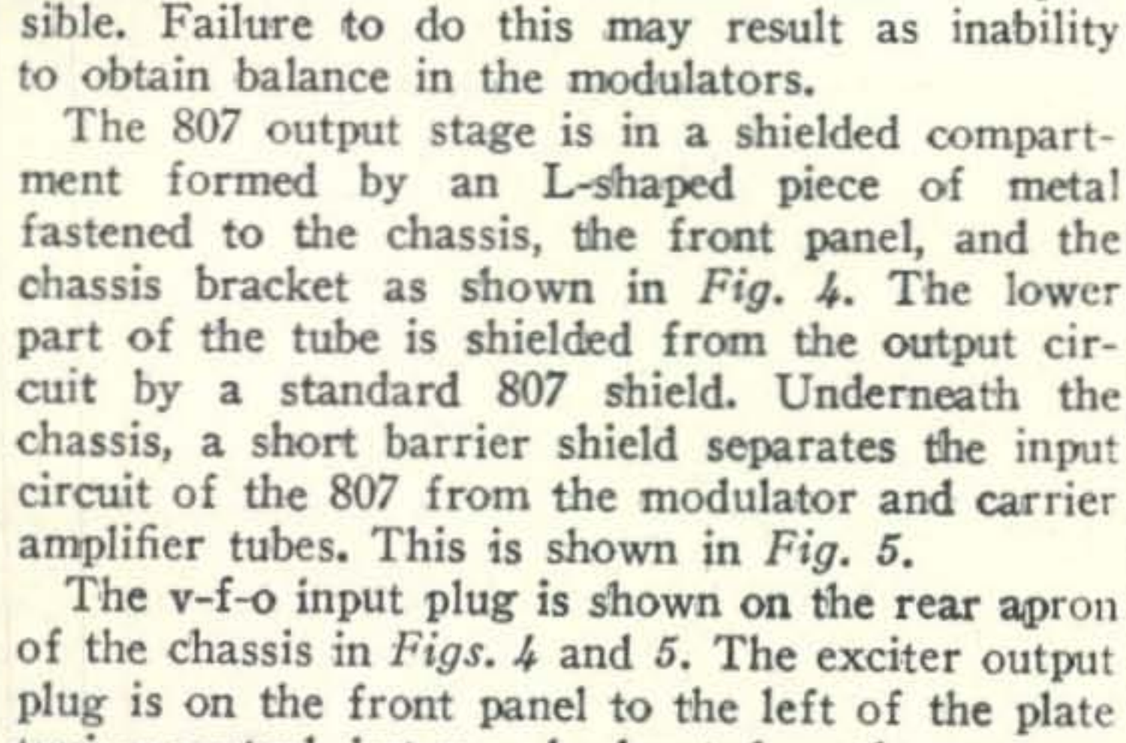


Fig. 7. Curve of total plate load resistance and "swamping" resistance for plate tank when driven stage reflects similar resistance.

The five tubes used in the modulator and carrier injection portion of the exciter should be so grouped and oriented that the five plate connections and the lead to T_2 are as short and direct as possible—this being influenced to a certain extent by the grid No. 1 (r-f input) circuit considerations. In fact, generally speaking, good mechanical layout will pay dividends in ease of initial adjustment and lack of "bugs" in the operation of the unit.

(Part II will appear in April CQ)

HIGH POWER

(from page 33)

desk. Plate voltage can thus be reduced for tuning up, or for occasions when full power is not necessary.

The hinged cabinet lid is fitted with an interlock switch in series with the coil of the primary contactor, so that no voltage can appear anywhere on the transmitter when the lid is opened.

One of the main ideas behind the design and

construction of this transmitter was the ease with which it could be switched from band to band at the operator's slightest whim. Naturally then, human nature being the perverse thing that it is, the new rig has stayed right on 20 c.w. since the night the lamp load was put away and the beam hooked to it. Performance has been gratifying, however; it has given a good account of itself in company which is, to say the least, swift. Plate dissipation is within ratings with the full gallon treatment applied; tone reports and keying checks are uniformly good.

OLD CALL BOOK

(from page 21)

My own little act of kindness paid off on a high percentage basis. I don't know just what the percentage is, but I can now afford to have a blonde secretary figure out the exact percentum as we dart hither and yon, from beer joints to night clubs in a taxi.

It all started with an old Radio Amateur Call Book that I had been using as a baffle between a 6L6 and an 813. Through some extensive experimentation and with the aid of a slide rule, I found out that an old piece of ply-wood answered the purpose as well as the book, so the result was one surplus call book (Fall and Winter 1947).

To proceed, one fine day, along comes a bulky letter bulging with QSL cards from a big executive. Also enclosed was a note informing me that he had been unable to obtain a call book and would I be so kind and generous as to distribute the cards to their rightful owners.

Sure thing, says I to myself, and I'll go him just one better. I'll send him my old call book and next time he can do it himself.

Honest, gang, I did not dream that he was practically a capitalist. I did not know him from Adam, so you see, so there was no motive behind my act of kindness. Three months later when I again received a bulky letter from this philanthropist, opened it and $7,400.00 fell to the floor in crisp new currency, I knew my act of kindness had paid off in large dividends.

As I picked myself and the currency from the floor, I was glad; glad that I never once lost my temper in my sixteen years of QSL forwarding. not even when I received lead quarters in payment for envelopes—even when I received round QSL cards, envelopes with no call letters in the upper left, envelopes without postage, envelopes with postage due, etc. In many cases, I admit, I gnashed my gums, but honest, fellows, I never went beyond that stage.

I have a couple of reasons for setting down the facts, but it is mainly because I am unselfish and would like to have others benefit by my experience. You could start out with your next door neighbor with the newly installed television receiver and when he questions you about strange lines across his screen, don't tell him that it might be someone using an electric razor in the vicinity, or that it might be due to sun spots. Break down, confess, and tell him all—perhaps some day he will reward you substantially. If he is 6' 2" and weighs about 240, however, I would advise sticking to the original story, even if he is in the rocks.

The other reason for setting down the facts is

this: For many years there have been numerous things I had a yen to do but never had the currency. Among these things was a yen to have a nice sea voyage. In fact, some of the fellows who had their cards mixed, or lost, have suggested same to me, but there was a strange glint in their eyes when they suggested it.

So I ask the gang to bear with me while I take the voyage because it might be some time before you receive your envelopes full of QSL cards. I am sure I will be full of pep on my return and will soon catch up with things, and perhaps in addition feel more physically fit. They say miracles happen, so I might come back even more mentally fit.

And, oh yes, fellows, I believe you might like to know more about the voyage. From where I now am sitting, it will be from St. Georges to the Battery in New York City, via the Staten Island Ferry—because, you see, the $7,400.00 is Chinese currency; that and 10c will cover the cost of the trip, very nicely.

Bon Voyage, gang.

LOW-NOISE V-H-F CONVERTER

(*from page 18*)

anything but strong local signals could be consistently copied. The noise content of these receivers was reminiscent of the bygone super-regenerative types! At some of these locations the converter just described was tried and the results were overwhelmingly favorable. It was like finding a new 2-meter band! Lifting the blanket of noise actually had uncovered a mass of signals which heretofore never existed. Not only had most of the noise been eliminated but many contended that each and every signal previously heard had been increased in level. Thus, several locations originally termed as poor for v.h.f. have been proved otherwise. These practical results merely substantiated the laboratory tests. Several commercial equipments were tested and compared with this converter, and for obvious reasons the actual figures will not be quoted here. However, suffice it to say again that all custom-built equipments were termed very much below par.

Finally, it might be added that grounded grid 6J4 stages have been used to great advantage during the war in many applications and are still being used in special equipments.

Many low frequency (100-400 mc) radar receivers[7] used these in the front end and many special pieces of apparatus had such stages as inputs for high-frequency i.f. systems. One noteworthy application[8] was the receiver used in the moon contact which gave a noise figure of 3.5 db at 110 mc for a bandwidth of 1 mc. With grounded grid 6J4 stages the 144-mc and 220-mc amateur bands can truly be made as pleasant to listen to as any low-frequency band. During the past year the author has realized his best DX since the opening of the band. To those who are using pentodes as grounded-cathode amplifiers, the challenge is in cathode-driven 6J4s.

7 Microwave Receivers, Radiation Laboratory, Vol. 23, Chap. 16.

8 Jack Mofenson, "Radar Echoes From the Moon," Electronics, April 1946.

Classified Ads

Advertising in this section must pertain to amateur radio activities. Rates: 25c per word per insertion for commercial advertisements. 5c per word for non-commercial advertisements by bona fide amateurs. Remittance in full must accompany copy. No agency or term or cash discounts allowed. No display or special typographical ad setups allowed. "CQ" does not guarantee any product or service advertised in the Classified Section. Closing date for ads is the 25th of the 2nd month preceding publication date.

BARGAINS: New and reconditioned Collins, National, Hallicrafters, Hammarlund, RME, Millen, Sonar, Meissner, Meck receivers, transmitters, etc. Reconditioned S38 $35.00, S40A $69.00, SX42 $199.00, HQ129X $139.00, DB20 $39.00, DB22A $49.00, HF-10-20 $59.00, VHF152A $69.00, RME45 $99.00, NC173 $149.00, VFX680 $39.00, NC46, NC57, NC183, HRO, S53, HT18, HT9, BC610, AR88D, Super Pro, other receivers, transmitters, VFOs. Easy terms. Shipped on trial. List free. Henry Radio, Butler, Missouri.

BC-348R converted for 115 v.a.c. operation. Excellent condition. $60.00. F. MacDonald, 849 Saratoga Street, East Boston, Mass.

WE REWIND any type transformer reasonable, new transformer guarantee. Frampton Transformer Shop, Box 109, Blackwell, Oklahoma.

COLORTONE QSLs! Snappy! Bright! Different! Quality craftsmanship! "No junk." Samples? Colortone Press, Tupelo, Mississippi.

SELL QST, 1926 thru 1946, reasonable; HRO $100; BC-610 modulator deck, $20; new Q'5er converted ready for power supply—$15. Might trade. Inquiries invited. W9DWI.

SELL: BC-459 and BC-453, neither modified, good as new, $15 each, both $25 prepaid. Want May 1947 CQ, quote price. W8DGG, 216 Weaver, Xenia, Ohio.

FOR SALE: VFX680, gray, $60.00. W7LQB, 333 W. Mo. Ave., Phoenix, Ariz.

QSLs? SWLs? America's finest! Samples 10¢. Sackers, W8DED, Holland, Mich.

WANT CONTACT HAM able build pocket-sized transmitter-receiver, voice or impulse. Carry 75 feet. Write Box 162, Oakland 4, Calif.

SELL PE-103 DYNAMOTORS, six new, complete, sealed in original overseas moistureproof crates, $14.50 each. Six new BC-223-AX transmitters with diagrams, good for commercial and pleasure marine transmitters when converted, $18.50. HRO receiver and power supply 1.7 to 30 mc general coverage and ham band spread coils, $95.00. James Millen frequency standard $45.00. Hallicrafters HT-7 frequency standard, $15.00. Howard 437-A communications receiver, .55 to 43 mc, $35.00. Eight 2000 volt 8 mfd oil condensers, new $3.90 each. W6KEG, 1124 Parkway, El Monte, Calif.

HEY FELLAS! Got any radio parts you're not using? Such as receivers, complete xmitters, parts, etc. Why not sell them to us? This may be your chance to get some needed cash. Don't delay, send for our catalog listing the gear we are buying. Kindly remit quarter to cover cost, handling, and mailing of lists and equipment blanks. Your info is waiting, may we serve you? Radio Exchange, Box 215, Bayonne, New Jersey.

1948 ISSUES of *CQ* bound in book form—See page 74.

FREE SAMPLES of QSLs - SWLs. W1HJI, Box 32, Manchester, N. H.

ALMINUM TUBING, angles, channels and pipe. Write for list. Willard Radcliff, Fostoria, Ohio.

BARGAINS—NEW AND USED TRANSMITTERS—receivers—parts. Globe King $299.00; new 150 watt phone $199.00; 60 watt phone $99.00; Globe Trotter $57.50; 10 meter A.C. beam rotator $23.97; Abbott TR-4 $24.50; HT-9 $295.00; MB-611 $49.00; Silver 701, 800, 801, 802 $29.50 ea.; NC-173, SX-28 $149.00 ea.; HQ-129X, HRO $139.00 ea.; RME-45, SX-25, $99.50 ea.; RME-9D $39.50; SX-24 $75.00; BC-348, S-40 $65.00 ea.; S-20R $49.00; NC-44, S-38 $35.00 ea.; many others. Large stocks—trade-ins. Free trial. Terms financed by Leo, WØGFQ. Write for catalog and best deal to World Radio Labs, Council Bluffs, Iowa.

FOR SALE: 1 new HT-18 and 1 Shure dynamic mike, model 55, both used about 2 hours. Guaranteed. 1 Sky Champion receiver. Used but good. Need money. W6YUG, E. C. Scott, Route 2, Box 410, Lemoore, Calif.

SELL: HT-9 transmitter, 10-20-75 coils, two 814's, $250. W9MZW, Kingston, Illinois.

BC 221 frequency meters complete with calibration book and spare tubes, $35.00. Hays Sneed, W5RY, 643 Eagle Avenue, Jackson, Mississippi.

ST. LOUIS VICINITY. Partly built, complete kilowatt, spares, signal shifter, speech, first $200 cash. W9NTL, Newell, East Alton, Ill. Phone 44089.

ATTENTION ALL HAMS! Read "Practical Wireless"—Britain's foremost radio monthly. Keeps you posted with British-European news and views on latest developments and ideas in radio-television fields. Exclusive articles you cannot afford to miss by Britain's top radio men! For one year's subscription (12 issues) mailed direct to your address from London, send only $2.00 to George Newnes, Ltd., (P.W.27), 342 Madison Avenue, New York 17, N.Y. Two years $3.75.

FOR SALE: Collins 75A receiver 6 months old, excellent condition. First check for over $300 gets it. Howard M. Klingbeil, WØFPW, Bottineau, N. Dak.

DIPPERS: Have on hand limited quantity of improved models as described February issue of CQ. Calibrated 1.7 to 275 mc and with a-c line cord—$42.50. Please do not send money until advised of availability upon receipt of your order. W. M. Scherer, 100 E. Palisade Ave., Englewood, New Jersey.

FOR SALE: Temco 75GA transmitter $250.00; RME-45 and speaker $75.00. W. R. Conway, W6WNA, 7925 Ramsgate Avenue, Los Angeles, Calif. OR 1-7759.

HOTTEST SURPLUS LIST in the country. Electronics-hydraulics-aircraft-gadgets. Dick Rose, Everett, Washington.

WANTED: Rider's service manuals. State condition and price first letter. Ralph Senechal, W6PYR, 586 Hampton Road, Hayward, Calif.

NEED A NEW receiver or transmitter? Bil Harrison guarantees the best trade-in deal.

HALLICRAFTERS HT-9—a bargain! Complete with tubes and coils for 10, 20 40, 80. Black crackle finish. Now operating and on the air. Prefer local buyer. Only $175.00 complete. P. O. Box 949, New York 8, N.Y.

FOR SALE, locally, KW FM phone-CW rig, $225. W6UQQ, 144 East 57 Street, Long Beach, Calif. Phone Long Beach 29254.

HALLICRAFTERS SX-42, speaker R-42, 6 bands with FM. New August '48. Uncle Sam's calling. Best offer over $275. 1220 Belgrave Place, Charlotte, N.C.

WANTED: Used HT-18, state condition, age and price. Harold F. Cushing, W1EVS, 169 Mayflower Street, Elmwood 10, Conn.

ROTARY BEAM CONTROL CABLE, waterproof: 4-conductor shielded $6.50/C', 6-conductor shielded $8.50/C', RG-8/U 52-ohm coax $4.95/C, RG-11/U 72-ohm coax $15.00/C, RG-59/U small 72-ohm coax $6.95/C, 2 kw 95-ohm twinex $9.75/C. All types multi-conductor and coax in stock. W5EAL, 1110 Winbern, Houston, Texas.

COLLINS FOR SALE: No time to operate. Collins 32V-1, $400.00. Collins 75-A receiver, $300.00 Also VHF 152-A for $65.00. Dr. M. L. Redman, WØENK, Fargo, North Dakota.

HAMMARLUND HQ-129X with matching speaker, like new condition, $135.00 crated and f.o.b. Norfolk, Virginia. E. V. Crocker, W4KBS, 1715 Cromwell Road, Norfolk, Virginia.

FOR SALE: ART/13 unconverted. Frank Curtis, Jr., Virgil, So. Dakota.

HAMMARLUND HQ129X, slightly used, best offer, no speaker. Kindquist, 404 Riverside Drive, New York, N. Y.

CRYSTALS: Precision, low-drift mounted units; 3500 to 9000 kilocycles. ± 5 kilocycles $1.00. Exact frequency $1.50. Specify mounting. Quotations available other frequencies. Breon Laboratories, Williamsport, Penna.

COMMAND SETS: 274N/ARC-5 transmitters: 2.1-3 mc new $12.95, LN $9.95; 3-4 mc new $18.95, used $14.95; 4-5.3 mc new $6.95, used $4.95; 5.3-7 mc new $6.95, used $4.95; 7-9.1 mc new $14.95, used $12.95. Receivers: 190-550 kc like new $14.95, used $12.95; broadcast band LN $14.95, used $12.95; 3-6 mc new $9.95, LN $7.95, used $5.95; 6-9.1 mc new $9.95, LN $7.95, used $5.95. Receiver power transformers with 24 v. fil. winding $3.45. Receiver power supply kit complete $5.95. Transmitter power transformer with 24 v. fil. winding $6.95. Transmitter power supply kit complete $12.95 Receiver tuning shaft splines 25¢. Receiver and transmitter plugs 39¢. W5EAL, 1110 Winbern, Houston, Texas.

QSLs, SWLs. Quality cards. W5FAY Press, 6118 Goliad, Dallas, Texas.

OUR BUSINESS . . . Buying, totally and completely refinishing and selling . . . amateur radio transmitters. Transmitter Exchange, Wakefield, Rhode Island.

FOR SALE: 15" diameter TELECHRON 24 hour electric clock, 115 vac, 60 cycle, sweep second hand, red hand for GCT, $30.00 f.o.b. Valley Stream, New York, W2RPZ, 214 Munro Blvd. Valley Stream, L. I., New York.

WANTED—Issues of QST as follows: all issues before December 1924; 1925-Jan, Mar, May, July, Oct; 1927-Jan, Mar, Apr, May, June, Sept, Oct, Nov, Dec; 1928-Apr, May, June, Sept, Nov, Dec; 1929-Apr; 1932-Jan. All issues must be in excellent condition with both covers and no pages missing. Will swap CQ, Radio or QST for the above. Write Ed. Newman, 214 Munro Blvd. Valley Stream, L.I., New York.

COMPLETE HAM SHACK—BC348K with built-in supply 6" speaker and beam filter $130.00; SCR-274N transmitter and supply 100 watts on 40 meters $40.00; BC221T frequency meter built in supply $40.00; DuMont 3" scope model 224 perfect condition $80.00; ART 13 perfect condition extra calibration crystals untouched $140.00; Simpson 260 $25.00; signal generator I198A fine for spotting 7-15 mc, 110 vac $20.00; New K & E log-log-duplex-decitrig slide rule never used $10.00; 2 brand new sets Charvos 13 piece drafting instruments $30.00 value $20.00 each; 4 Astatic dynamic mikes brand new with 20 feet cable and fittings advertised by Montgomery Ward for $15.00, $10.00 each; Test Set I 149 contains 0-20 micro-ammeter $10.00; 2 brand new centrifugal blowers 4½" diameter, bid; Beacon receiver 4" x 4" x 4", bid; 2- 110 vac selsyns 3½"D x 5"L new, bid; 2- 110 vac selsyns 1½"D x 3"L, bid; 15 large chokes; 12 large transformers HV and Filament; miscellaneous input transformers and other; 2-12 volt copper oxide rectifiers; 2-SCR 274N broadcast receivers; 4" speaker; headphones; miscellaneous meters, tubes, connectors, jeweled lights, paper and dykanol condensers, all brand new army surplus. As priced, best offer (bid), or everything I own with lots more not listed for best offer over $500.00 It's worth over a thousand. If interested in the works, RUSH tentative offer for detailed and descriptive list of additional items. I'm moving in June. W7LQM, 1730 W. Dean Ave., Spokane, Washington.

WANTED: Collins transmitter (32JA) coils and technical manual or schematic. Name your price. A. E. Kaski, 158-10 Sanford Ave., Flushing, L. I., New York.

QSL's, SWL's. MADE the way you want them. Samples? W9BHV QSL Factory, 857 Burlington, Frankfort, Indiana.

WANTED: Teletype 1/40th HP synchronous motor. W6ITH, Moraga, Calif.

QSLs QUALITY CARDS priced right. Samples. W9UTL, 1768 Fruitdale, Indianapolis, Ind.

10-METER 3-ELEMENT BEAMS—$19.50. Send card for free information. Riverside Tool Co., Box 87, Riverside, Illinois.

PERSONALIZED book matches . . . call letters or name and address . . . samples with prices. Miss Amanda Martin, Box 1123, Rochester 3, N. Y.

QSL CARDS: New, original, exciting. New modern designs exclusive with us from one to multiple color cards. Your own design reproduced at small additional charge. Our prices are the most reasonable, consistent with quality work. Fast service. Send for free samples of price list. The W2PEO Press, 24 Villa Road, Larchmont, N. Y.

AMATEUR RADIO LICENSES. Complete theory preparation for passing amateur radio examinations. Home study and resident courses. American Radio Institute, 101 West 63rd Street, New York City.

QSLs. Samples for stamp. Henry L. Carter, Jr., W2RSW, 747 S. Plymouth, Rochester 8, N. Y.

WANTED: Aircraft Radios; BC-348, AN ART-13, RTA-1B, AN/APN-9, R5A/ARN-7, AN/ARC-1, AN/ARC-3, SCR-718, BC-788-C, I-152, MN-26-C. Tests set with TS or I prefix. State quanity, condition and best price first letter. HI-MU Electronics. Box 105, New Haven, Conn.

CQ Ad Index

THE HRO-7C

finest model of
the world's
most famous receiver

OVERALL DIMENSIONS:
Height 29", width 20¾' depth 14¾",
Net weight 95 lbs.

- **The incomparable HRO-7**
- **Power supply**
- **10" speaker**
- **Coils and coil compartment**
- **All in one convenient unit**

$372.45
(Prices slightly higher
(west of the Rockies)

National
EST. 1914
NATIONAL COMPANY, Inc.
MALDEN, MASSACHUSETTS

RCA RECEIVING TUBES

CW Ratings*

Tube Type	Max. Plate volts	Max. Screen volts	Max. Grid volts	Max. Plate Ma.	Max. Screen Ma.	Max. Grid Ma. (Note 1)	Max. Plate Dissipation (watts)	Max. Screen Dissipation (watts)	Power Output (watts) (Note 2)	Max. Freq. in Mc. (Note 3)	Grid Bias Calculator Factor (approx.) (Note 4)
RCA-6AG7	375	250	—75	30	9	5	9	1.5	7.5	30	22
RCA-6AK6	375	250	—100	15	4	3	3.5	1	4	60	9.5
RCA-6C4	300	—	—100	25	—	8	5	—	5.5	60	18
RCA-6F6	400	275	—100	50	11	5	12.5	3	14	30	7
RCA-6L6	400	300	—125	100	12	5	21	3.5	28	30	8
RCA-6N7	350	—	—100	30 (per plate)	—	5 (per grid)	5.5 (per plate)	—	14.5 (total)	30	35
RCA-6V6GT	350	250	—100	47	7	5	8	2	11	30	9

Note 1: 100,000 ohms maximum grid resistor

Note 2: Based on 70% plate efficiency

Note 3: Maximum frequency for full power output and input

Note 4: For pentodes, this is the grid-screen amplification factor

Absolute maximum ratings for amateur use exclusively

Use *RCA Receiving Tubes* in your new transmitter

These seven RCA receiving tubes are tops for r-f driver applications in amateur transmitters.

THE HIGH-FREQUENCY cw ratings for the seven popular RCA receiving types given above, mean that you can now obtain plenty of r-f power *inexpensively*.

These ratings are your guide to greater receiving-tube performance and maximum life in r-f service, such as crystal oscillators, buffers, doublers . . . and even low-power finals!

To get maximum performance from the tubes *you* pay for—buy RCA. For information on any RCA tube, see your local RCA tube supplier, or write RCA, Commercial Engineering, Section 58CM, Harrison, New Jersey.

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.