CQ

AUGUST
1952

RADIO AMATEURS' JOURNAL

The "Snoop"

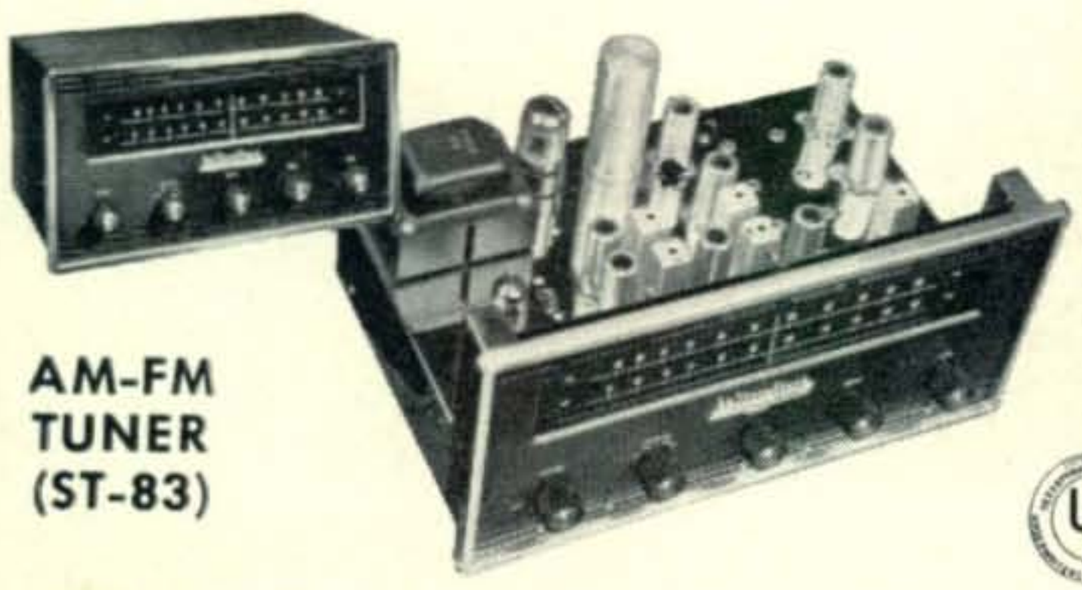
35c

hallicrafters presents

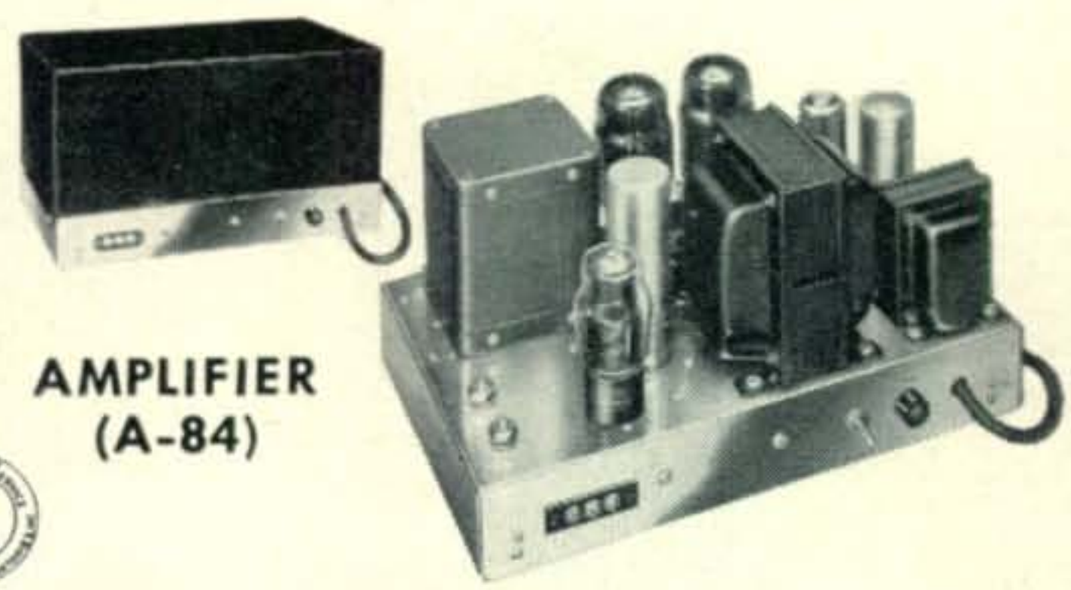
Super Fidelity!

A New Precision AM-FM Tuner and Amplifier. A.F.C. Eliminated*

Now you can hear the entire range of audible sound with ABSOLUTE MINIMUM DRIFT!



AM-FM TUNER (ST-83)



AMPLIFIER (A-84)

*The new Hallicrafters Precision-engineered chassis with temperature-compensated oscillator, eliminating need for A.F.C., is non-frequency discriminating and in conjunction with the ratio detector circuit, makes for accurate, even tuning.

ADVANCED DESIGN: Entirely safe, fully-enclosed case is first to receive Underwriters' Laboratories approval!

NO rf SWITCHING: Individual input for AM and FM eliminates need for rf switching, and increases stability.

PHONOGRAPH, TELEVISION, TAPE RECORDER INPUTS: Including cathode follower output, which permits remote control installations without frequency discrimination.

LOOP ANTENNA: Built-in.

10 Kc FILTER: Built-in.

SEPARATE AUTOMATIC VOLUME CONTROL, for AM.

MILITARY-TYPE FM ANTENNA coupling network, for uniform, increased sensitivity across the band.

TONE CONTROL amplifier for treble and bass, boost or cut.

Price $129.95

EXCLUSIVE: New output transformer with widest range ever produced heretofore.

GUARANTEED: Frequency range, 10 to 100,000 cycles per second, at 10 watts. Tests show records high as 3 to 200,000 c.p.s. under same conditions.

HARMONIC DISTORTION: Less than 0.25% at 10 watts level.

COMPLETELY SAFE: U/L Approved; entirely encased for shelf use or ease in custom installation.

POWER OUTPUT: 15 watts, maximum.

DAMPING FACTOR: 32:1, insuring maximum fidelity of square wave response under actual use with various loud speakers.

LOWEST INTERMODULATION DISTORTION: British KT-66 tubes provide 50% or less intermodulation distortion than amplifiers using different tubes!

ADVANCED CONDENSERS: Mineral-oil impregnated coupling condensers; power supply input condenser is oil-filled.

TEMPERATURE COMPENSATED: All components engineered to withstand continuous temperatures of 65°C.

Price $99.50

Thousands of "Hams" are asked by their friends for advice on high-fidelity systems and equipment. With Hallicrafters new Tuner and Amplifier, they can now recommend a name they can trust for precision craftsmanship, and full value . . . Hallicrafters.

WORLD'S LEADING MANUFACTURER OF PRECISION RADIO & TELEVISION—CHICAGO 24

hallicrafters

Hear ALL that your antenna pulls in, with G. E.'s brand-new

100 mc
200
300
400
500
600
700
800
900 mc

6AJ4 v-h-f, u-h-f R-F AMPLIFIER!

Heater voltage, a-c or d-c	6.3 v
Heater current	0.225 amp
Amplification factor	42
Transconductance	10,000 micromhos
Plate current	16 ma
Power gain at 900 mc, for 10-mc band width	7 db
Noise figure at 900 mc	15 db

YOU don't have to push G. E.'s 6AJ4 to get the ultra-high frequencies that will make your receiver all-band. This new triode was *designed* for u-h-f.

● So . . . tube noise level is low at all times! And the 6AJ4 has a high power gain. You hear clearly on every channel.

● Price? A real bargain. The 6AJ4 costs you less than the average panel meter! For the first time, you can enjoy fine u-h-f reception without strain on your pocketbook . . . and with the same tube that serves you well on 6 and 2 meters.

● Check 6AJ4 ratings at right, then see your G-E tube distributor for price and further facts. Bear in mind that this tube—now in quantity production for TV—is a *proved* performer in every respect! *Tube Department, General Electric Company, Schenectady 5, New York.*

KEY TO U-H-F!

● Here is a part chronology of G. E.'s pioneering work in the ultra-highs, much of it tube design that was basic:

1928 — Split-anode magnetron built and tested at 1,000 mc.

1930 — Magnetron made commercially available.

1935 — Centimeter waves used to measure speed and direction of aircraft.

1936 — Velocity-modulation tube developed.

1940 — Disk triode developed.

1942 — Lighthouse tubes introduced for radar.

This 24-year background contributes to the efficiency of new G-E u-h-f types like the 6AJ4. Knowing how *first*, has created greater G-E design know-how . . . from which you benefit in the superior performance of G-E tubes you buy!

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Minimum DRIFT with maximum HEAT!

Crystals in amateur service take a beating! Crystal currents often run high. To have real stability you want a rugged rock, one that will take the highest allowable heating without undue drift. That's where PRs come in. Even on the higher frequencies PRs stand firm . . . with less than 2 cycles drift per MC per degree Centigrade. With PRs you get everything . . . stability . . . long life . . . high activity . . . moisture and contamination-proof.

Get PRs at your jobber's. Accept no substitute! They're unconditionally guaranteed.

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

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CQ RADIO AMATEURS' JOURNAL

VOL. 8, NO. 8
AUGUST, 1952

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FEATURE ARTICLES

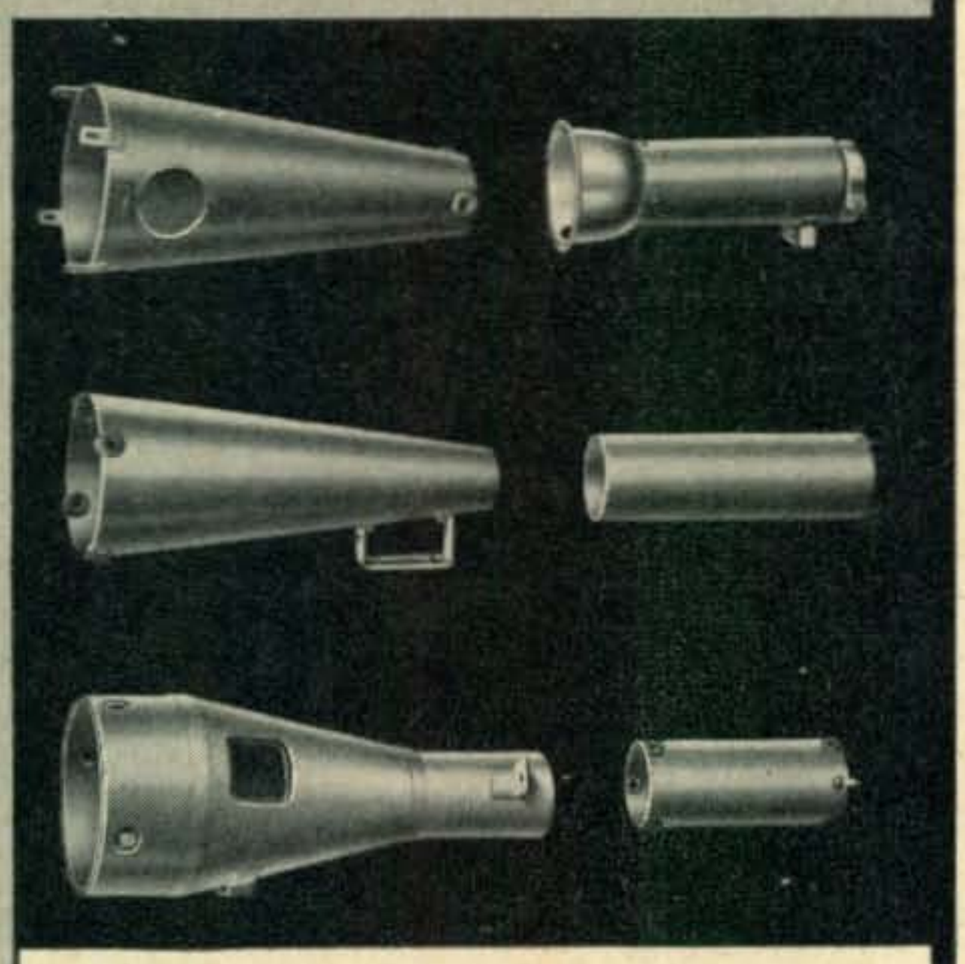
Departments

Miscellaneous

Designed for

M

Application



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M

Feenix, Ariz.

Deer Hon. Ed:

Please considering this a complaint. Great gobs of tea, Scratchi is ungruntled. Here I am, a grate authority on a subject, and you are having the collosus nerve to print—but holdings on, here I am raving on and not letting you know what about. In the April issue of your Hon. Magazine you are pubblesh-ing article called IPOIO by sum amchoor from Arizona way. Understanding, I not objecting to pubbleshing stuff from guy in Arizona, as this are one grate state, but who is this amchoor who writing the article? He is expert on IPOIO?

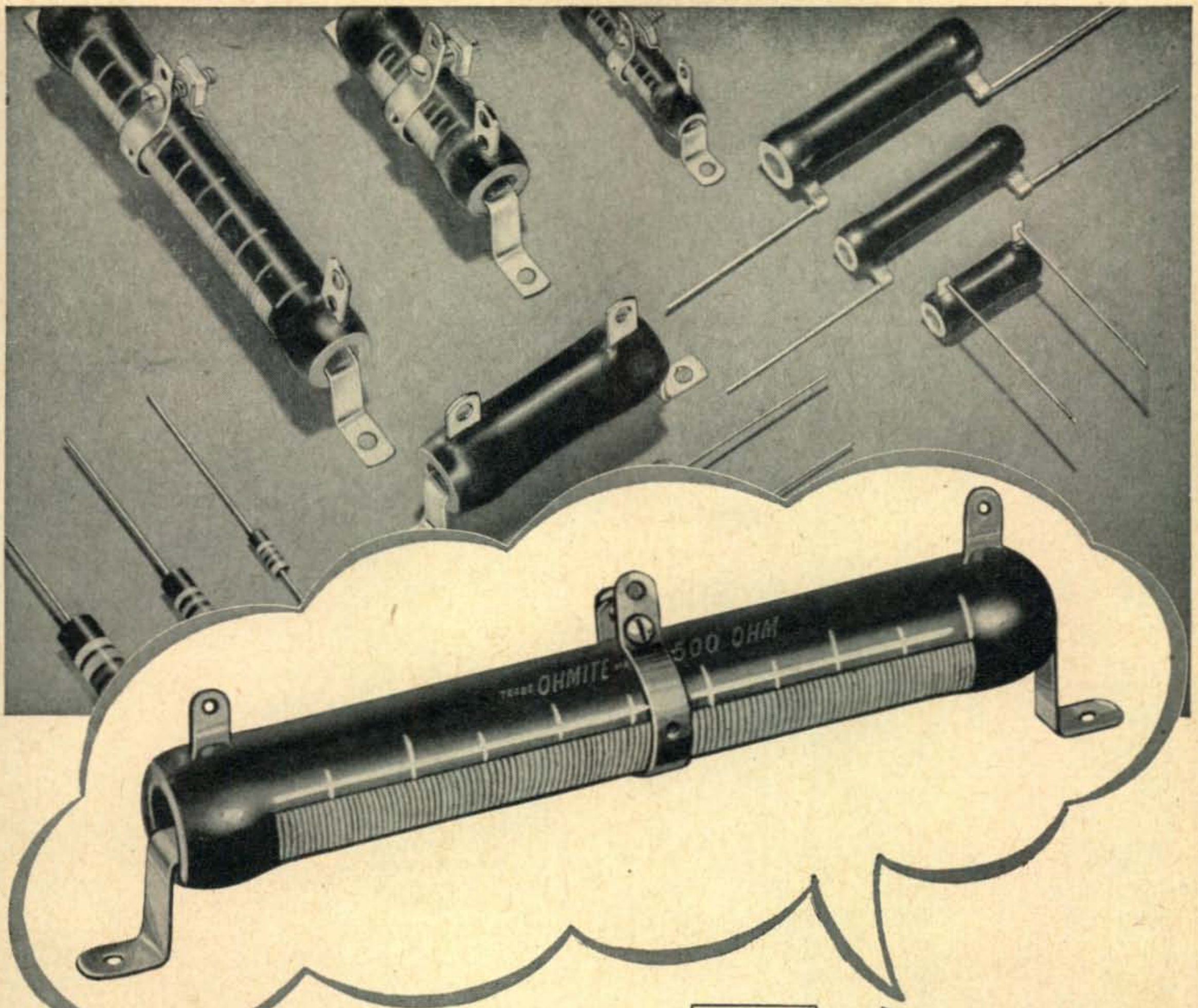
When you having glass arm from too much see-w, you are seeing Hon. Doctor, aren't you? When having toothake from eating too many peanut brittles, you are calling in Hon. Dentist, is not so? Well then, Mr. Hon. Ed., when pubbleshing article on IPOIO why not having it written by Hon. Expert, namely, Scratchi?

In case you wondering just how Scratchi come to talking about April issue, when here we have already August, it are mainly because Joe's Triple-Dip Hunky-Dory Ice Cream and Used Magazine Parlor are not getting any used April issues till yesstidday. (I are used to having subscription to your Hon. Rag, but getting into argument with Hon. Circulation Dept. and they not sending me any more issues. As I recalling, Circulation Dept. are taking short-sighted attitude and wanting sum money from me.)

If you having read April issue and article on IPOIO you recalling it about the inate perversity of inanimate objects; and, when Brother Itchi explaining to me what this is, I seeing red. Of natchurally, everybuddy seeing IPOIO at work now and then, like when toast falling on floor it always falling butter side down, but Scratchi are having Degree in IPOIO, and I not even consulted on article. To topping the cake, this author is from self-same city as Scratchi, good old Feenix, Ariz.

HA, so you are skeptickle, you are not believing Scratchi are expert? Thinking back to sum of my letters to you cupple years ago. Remember when I inventing SSSC (Scratchi's Sooper Sekrut Cadoodal-er)? That was the first anti-IPOIO device. Remem-

(Continued on page 66)



You rest easy when your rig uses Dependable

OHMITE RESISTORS

You can forget about resistor troubles with reliable OHMITE resistors in your rig. That's because these sturdy vitreous-enameled units have earned an unmatched reputation for dependability—among amateurs, engineers, designers, and servicemen the world over. And . . . the Ohmite line of wire-wound resistors is the most complete on the market, today, with types and sizes for just about every place in your equipment. You'll find it pays to . . . *be right with OHMITE!*

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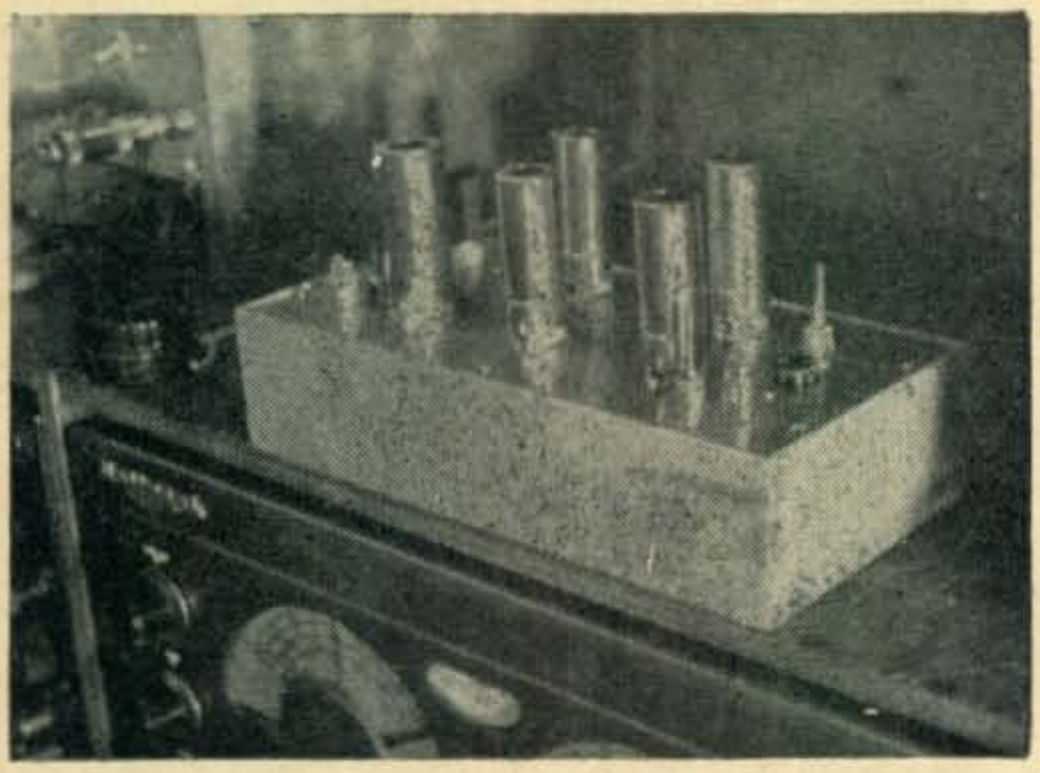
RHEOSTATS
RESISTORS
TAP SWITCHES

DEPENDABILITY with HIGH SENSITIVITY on 2 METERS

Tecraft

PRESENTS:

THE *NEW* CASCODE, CRYSTAL CONTROLLED, CONVERTER



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- HIGH SENSITIVITY—R.F. input less than 1 micro-volt for 20 db thermal noise quieting. Absolute sensitivity better than .1 micro-volt. Gain approx. 30 db.
- LOW NOISE FIGURE—approx. 4 db.
- 6 MC Pass band at 6 db down points. May be peaked to favor any portion of the band.
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- COPPER PLATED CHASSIS, FINISHED IN SATIN WHITE NICKEL. Low circulating chassis current, maximum resistance to tarnish.
- COMPLETELY SHIELDED—Heavy tin plate lining in hardwood instrument case. Available in Mahogany, Birch, Oak, Walnut, Korina.
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- USES 6BQ7, 2—6CB6 or 6AK5, 2—6J6 tubes.

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$5.00 deposit with order, shipped COD, FOB Hackensack, N. J. Check or money order with order, we pay transportation charges.

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Broad Band . . .

More on the "Mobile Issue"

Editor, CQ:

I believe that any issue devoted to one single phase of amateur operation is definitely a mistake.

Joseph Hotard, Jr.

New Orleans, La.

Editor, CQ:

My compliments for your wonderful "mobile" issue . . . it contains a wealth of details on mobile which is very interesting and very much appreciated.

Gaston Choquette, VE2KB

Montreal, Que.

Editor, CQ:

In answer to your editorial page query in the "mobile issue." Would you, as a reader, like to see more issues like this? I can give you a most emphatic YES!

If and when I do go mobile, I'll have all the dope available, and better yet, in one convenient package.

Will A. Connelly, WN6 (waiting)

Los Angeles, Calif.

Editor, CQ:

Before I forget, I wish to send just a word of "congratulations" for the fine job on the "Special Mobile Issue."

I am sure it has proven of great value to Novice and old-timer alike.

Charles M. Currier, W1QKK

Keene, N. H.

Editor, CQ:

I have just bought the May issue and think it is tops. I would like to see more of these kind of issues that are devoted entirely to one phase of amateur radio.

Wayne C. Freeburg, WØCSB

Hitchcock, S. D.

Editor, CQ:

Would I like to see more issues like this? NO!

A. H. Dangerfield, WØDE

Joplin, Mo.

Editor, CQ:

Liked this one and would like to see another one later.

Claude A. Heck

Riggins, Ida.

Editor, CQ:

Speaking for the Rutgers University Radio Club . . . we want to express our thanks to you for this wonderful issue. We believe it will stimulate much interest in mobile work.

Lt. Col. John M. Moss, W2QDU

New Brunswick, N. J.

Crystal Noise Generator

Editor, CQ:

In playing around with the crystal noise generator described by W6SAI (June 1952, CQ, page 25) I found that increasing the noise level caused my cascode r-f stage to oscillate.

Looking over the noise generator circuit for the cause, it seemed possible that the diode current flowing through part of the input circuit upset the operation of the second half of the cascode whose bias flows through the input coil.

Inserting a small blocking condenser in the generator output cured the trouble.

Philip F. Robinson, W1CK

N. Scituate, Mass.

re "A Report to Amateurs"

Editor, CQ:

Glad to see the constructive criticism of the ARRL showing up in my recent issues of CQ.

Lt. Col. F. J. Elser, W4GVU

Augusta, Ga.

Announcing the **NEW**

JOHNSON

VIKING MOBILE KIT

AMPLIFIER INPUT: 30 to 60 watts
BANDSWITCHING: 75, 20 and 10 meters
DASH MOUNTING, GANG TUNING
CRYSTAL SWITCHING, VFO PROVISION

Antenna loading problems solved in advance, the result of extensive development work. Efficiency assured, "cut and try" eliminated with specific antenna data!

240-141 kit complete, less tubes, microphone, power supply and antenna.

$99.50
Amateur Net

Unlike any mobile "ham rig" you've ever seen beforel Plenty of power, audio gain, 100% AM modulation combined with the utmost in operating convenience. Designed for economy of power and maximum utilization of power conversion equipment.

RF SECTION
Three ganged RF stages with an 807 output amplifier. All inductors for 75, 20 and 10 meters contained in transmitter. Bandswitch provides for one additional band. Adjustable links for each band, tailored for 52 ohm coax. Four crystal positions; Viking VFO will drive the Viking Mobile to full output.

MODULATOR
Three audio stages with pp ABI 807 modulators. Ample gain for either crystal or carbon microphones. 100% AM plate and screen modulation gives the Viking Mobile plenty of punch.

POWER
A full 30 watts input at 300 volts, 60 watts at 600 volts. An RF type fixed bias supply provides protection for amplifier, conserves plate voltage and improves efficiency by keeping modulator idling current low. Speech amplifier and exciter may be powered separately from modulator and PA for maximum flexibility.

OPERATING FEATURES
Equipped with PA drive control and front panel gain control. All RF stages and modulator are metered. "Tuning" position of function switch for "non-swish" VFO. Optional "push to talk" operation.

INSTANT BANDSWITCHING WITH VIKING MOBILE

Dash mounting with easy access to chassis. Crystal switch and meter locations reversible. 6-7/16" high, 7-1/8" wide, 10-5/16" deep; housed in a heavy steel case.

This ad tells only a part of the story of the VIKING MOBILE. Send for data sheet 711-K8 for full information.

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The VIKING MOBILE is another kit with the unique JOHNSON touch. Complete in every detail, supplied with step - by - step instructions, photos and drawings, any amateur can assemble and obtain superb performance from the VIKING MOBILE.

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TRIED AND PROVEN THE WORLD OVER

LETTINE MODEL 240
TRANSMITTER WITH MOBILE CONNECTIONS AND A.C. POWER SUPPLY

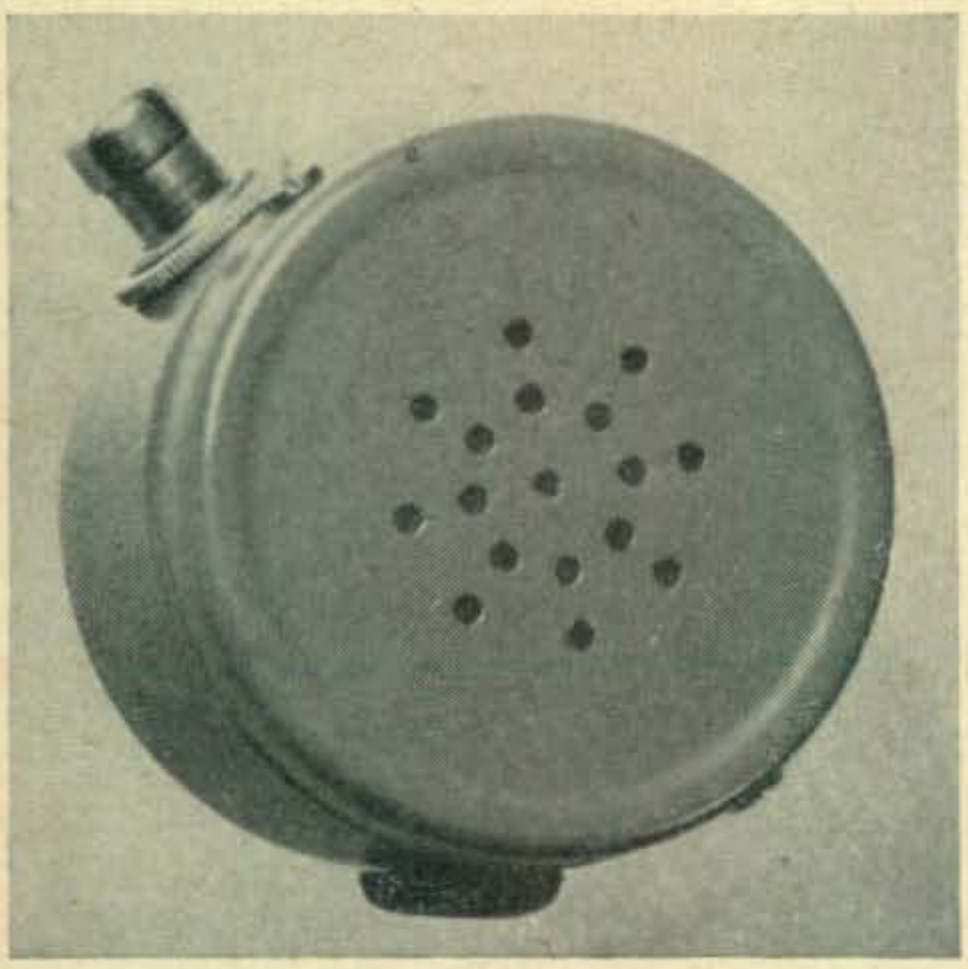
This outstanding transmitter has been acclaimed a great performer throughout the world. It is excellent for fixed station, portable or mobile operation. Even if you have a transmitter of your own you can't afford to miss this wonderful buy, direct from our factory, ready to operate.

The 240 is a 40 watt Phone-CW rig for 160 to 10 meters, complete with: (8 x 14 x 8) cabinet, self contained A.C. power supply, MOBILE connections, meter, tubes, crystal and coils for 40 meters. Tubes: 6V6 osc., 807 final, 6SJ7 crystal mike amp., 6N7 phase inverter, 2 6L6's mod., 5U4G rect. Weight 30 lbs. TVI instructions included. 90-day guarantee. Price **$79.95.**

$25 deposit with order — balance C.O.D.

80, 20, 10 meter coils $2.91 per set. 160 meter coils **$3.60**. Also for CAP, Broadcast, MARS, Marine, State Guard.

LETTINE RADIO MFG., CO.
62 BERKLEY STREET VALLEY STREAM, N. Y.



A push to talk mike case that will fit the famous FI Unit or a case to fit the new N. I. Both cases come in either push to talk or switch to talk. State preference.

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The Private Life of CQ

New Stock of Back Issues Available

The back issue sales of CQ have always been very high. Subscribers lose their copies or are borrowed and never returned. Many reference libraries are also in the market for back issues.

Recently as the stock of back issues began to deplete rather alarmingly, the Circulation Department began a program of repurchasing copies of CQ in excellent condition. In particular, they were after copies printed between March 1945 and the early spring of 1950. This search has been successful and well over 600 first-class copies of CQ were repurchased.

As a result the Circulation Department now has on hand a fairly large stock of CQ copies that have been out of print and on which back issue orders have been refused during the past year.

If you are interested in a back issue of CQ we urge you to look on page 67 and see if the copy you want is listed. If it is—order it as soon as possible. Copies are being bought up by many schools and libraries as fast as we can replace them. All copies are complete and in top condition.

Buddy CQ Rates

For quite some time the Circulation Department (they seem to be the only ones working this month) has had under consideration a plan to enable the friends and buddies of amateurs overseas to obtain CQ at a reduced rate.

The plan has been finalized and this is the first announcement. If you have a ham friend in a country where it is hard to get dollar credit, you can buy him a subscription to CQ—along with your own—at only $2 more per year. In other words, for only $5 you get a subscription for yourself and one for a ham friend anywhere in the world. You save another $2 on this special offer.

As a gift this will surely be sincerely appreciated. Many of us have little or no idea how difficult it is to get enough money out of some of the European countries to subscribe to CQ. They don't have newsstands—you know.

Think this one over, and by the way, if you want, we will accept for a limited time a combination two-year subscription for both parties at a rate of only $8. This saves you $4 over what you would pay if they were purchased singularly.

COMPARE! COMPARE! COMPARE!

Fellows — NOW is the best time to trade for a new receiver or transmitter. Our stocks are complete — our prices are LOW. I'll give you the best deal on your used equipment. WRL gives you • TAILOR-MADE TERMS • LOWER PRICES • LIBERAL TRADE-INS • COMPLETE STOCKS • PERSONALIZED SERVICE. You'll benefit most by dealing with WRL, "One Of The World's Largest Distributors Of Amateur Radio Transmitting Equipment."

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Leo I. Meyerson, WØGFQ

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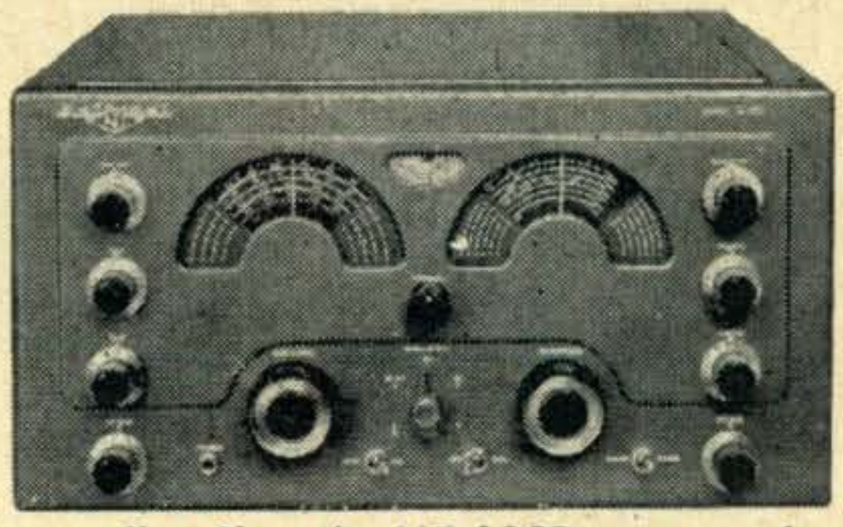
NEW NC-183D RECEIVER

FIRST IN COVERAGE—SELECTIVITY—BANDSPREAD



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SEE IT, HEAR IT, COMPARE IT!

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SW-54 RECEIVER

A complete superhet covering all major broadcast and short wave bands. Built-in speaker.

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25c
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NC-125 RECEIVER	$149.50
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SPEAKER (for HRO 50-1 or NC-183D)	$ 16.00

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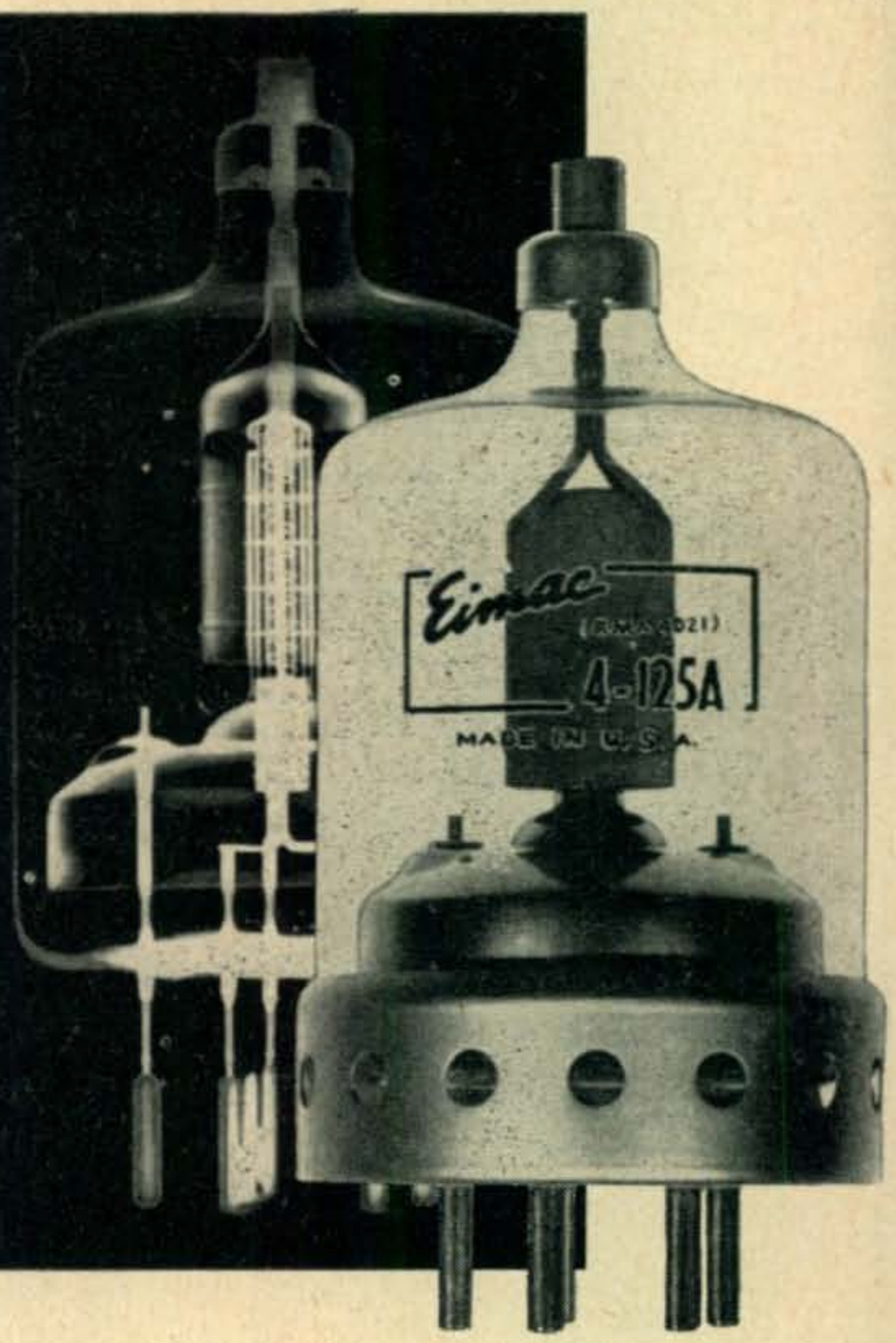
- ☐ New Catalog
- ☐ Radio Map
- ☐ SW-54 Info
- ☐ NC-183 D Info
- ☐ NC-125 Info
- ☐ Used Equipment List

Name_____

Address_____

City_____ State_____

Any Way You Look At It...



....the Eimac 4-125A is designed for economical, outstanding performance.

TYPICAL OPERATION (Frequencies below 120 mc.) Radio Frequency Power Amplifier and Oscillator Class C Telegraphy or FM telephony (key down conditions, one tube)	
D-C Plate Voltage	2500 volts
D-C Screen Voltage	350 volts
D-C Grid Voltage	-150 volts
D-C Plate Current	200 ma.
Driving Power	3.8 watts
Plate Power Input	500 watts
Plate Dissipation	125 watts
Plate Power Output	375 watts

Long service, low replacement costs, high output with low driving power and all-around outstanding performance are some of the reasons why Eimac's 4-125A is the most popular 125 watt tetrode. This power tetrode enables the use of simple circuit design and minimizes TVI grief. Through the extremely low grid-plate capacitances of the 4-125A neutralization problems are non-existant in most cases. Two 4-125A's in typical class C telegraphy or FM fone operation, with five watts of driving power, will handle a kilowatt input—or a pair in high level modulated service will take care of 750 watts input. Rated at a maximum plate dissipation of 125 watts, the 4-125A is excellent for use as an oscillator, modulator or amplifier. If you're rebuilding or planning a rig, you'll find the 4-125A a money saving way to get top performance.

The 4-125A has the Eimac features of a pyro-vac plate, controlled emission Y3 grid wire, low inductance leads and input-output shielding. Get further information from your Eimac dealer.

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Guest Editorial . . . .

Industry and the Amateur

The Radio Television Manufacturers Association is a voluntary organization of manufacturers with mutual interests—it is not an amateur organization by any connotation of the word. RTMA membership is composed of almost every major manufacturer in the industry. Formed in 1924 when radio was in its infancy, television was a Jules Verne fantasy, and electronics as it is applied today was unknown, RTMA is today a potent factor in the industry.

The purpose of RTMA is to act as an industry spokesman on problems which affect, not just one manufacturer, but many of them. It might best be described as an industry forum where needs and suggestions, all quite voluntarily, are crystallized. It promotes and merchandises the industry at work—the public relations—in short, you might say, the ARRL of Industry.

Because of its complex nature, RTMA is divided into a group of sections, committees and sub-committees covering the vast range of specialized fields in electronics today. And, as one would expect in an industry where hobbyists have played such a vital role, there is, within the RTMA, the Amateur Radio Activities Section. The purpose of this group, simply stated, is primarily to foster amateur radio, and to develop satisfactory markets for the important amateur industry.

A resolution prepared at the first meeting stated that "the basic objective of this Section shall be to promote the orderly development and expansion of the amateur radio hobby through cooperation of RTMA with other interested parties. This objective will be accomplished by exchange of information with interested groups, by being available for advice and consultation on matters pertaining to amateur radio and by reviewing the technical aspects of amateur radio as they pertain to the problems of radio and television manufacturers."

But, of course, since it is comprised almost exclusively of active radio amateurs, it is difficult to divorce one's hobby from one's business. For this reason, if for no other, the Amateur Radio Activities Section speaks from the heart as well as from the head. It has been a highly effective sounding board for amateurs to intercede on behalf of their hobby, with the entire television manufacturing industry. For example, take the case of television interference. To see how the Section performs, let us examine its organization.

It is composed of amateurs who are members, largely, of firms comprising the RTMA organization. There are in the Section such well-known names as Phil Rand, W1DBM; Al Kahn, W8DUS; Bill Halligan, Sr. and Jr., W9WZE and WN9OEP; Bob Cheek, W3LOE; Chairman, Dick Mitchell, W9LXO.

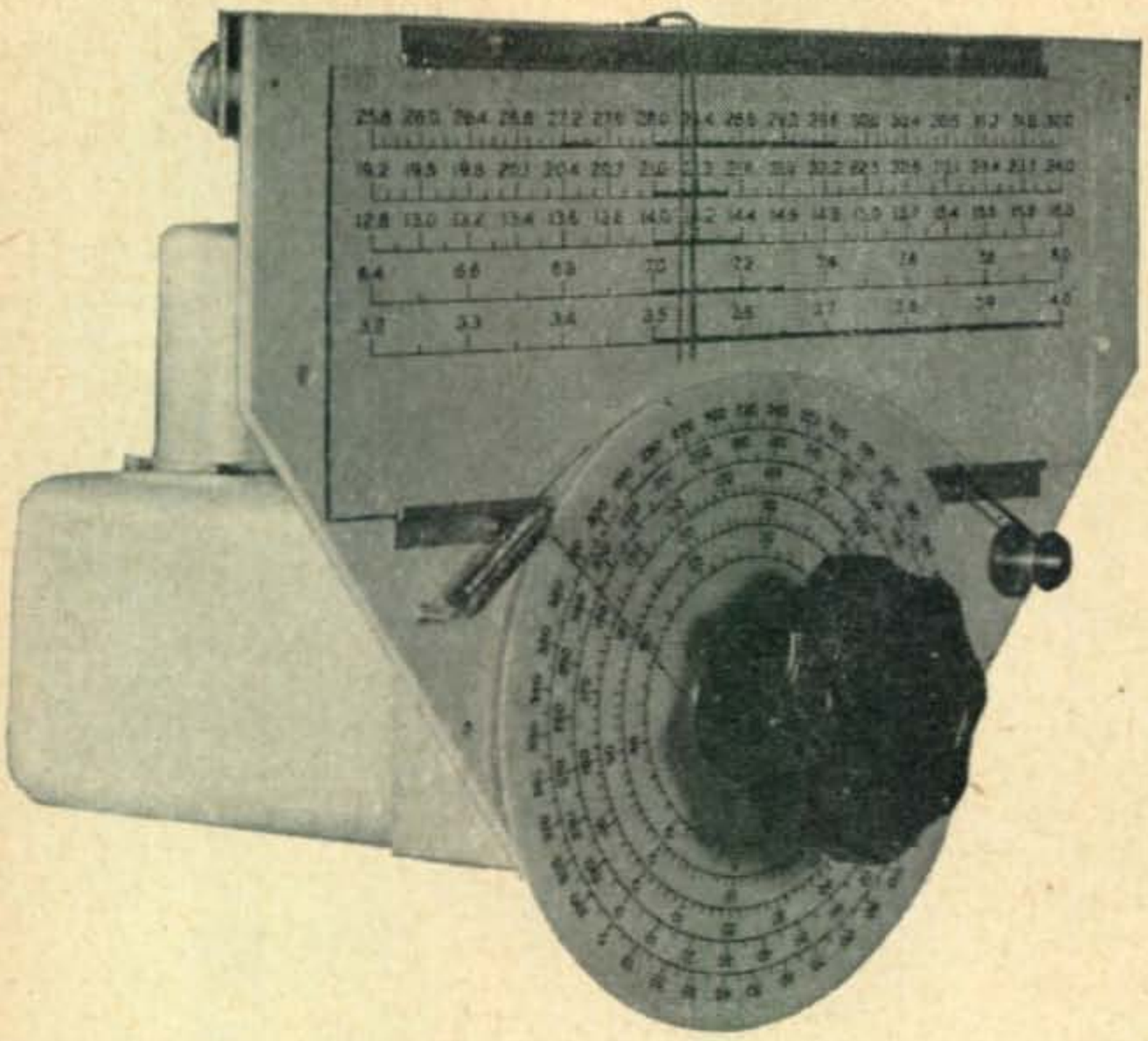
The Section is divided into three groups: Technical, headed by Al Pichitino, WØEDX; Legislative and Public Service Committee, headed by W9WZE; Promotion and Education Committee, headed by Larry LeKashman, W9IOP. The objective of the *Technical Committee* is to review and be available for consultation on the technical aspects of amateur radio as they pertain to the problems of radio and television manufacturers. To cooperate with interested groups for the promotion and publicizing of amateur radio, to secure cooperation of RTMA members in these objectives, and to originate and suggest programs which can be undertaken by RTMA is the responsibility of the *Promotion and Education Committee*. Finally there is the *Legislative and Public Service Committee* to insure maximum participation in the Civil Defense program by radio amateurs; to advise and recommend on legislative and regulatory matters as they affect amateur radio and special assignments. These committees, with the advice and consultation of the membership, perform the leg-work for the Section.

RTMA Amateur Radio Activities Section
Chairman Richard Mitchell, W9LXO

Upon the reorganization of the Amateur Radio Activities Section in September 1951 the Technical Committee made a recommendation that special material on amateur caused TVI be prepared for the RTMA Service Committee, with the suggestion that it be incorporated in the Service Notes sent out by all member companies. This recommendation was turned over to the Promotion and Education Committee who arranged with ARRL and other interested groups to prepare the recommended material. Through Carroll Hoshour, W9ELV, a member of both the Amateur Radio Activities Section and the RTMA Service Committee, the approved material was passed on to the Service Committee, who are now working on a program to inform all servicemen on facts about TVI, with the amateur placed in a most favorable light.

Another typical and important example of the work being performed by the Amateur Section will shortly be formally announced with the release of a new short wave contest to be sponsored jointly by the Boy Scouts and the RTMA. The objective of the contest is to introduce thousands of Boy Scouts to amateur radio. Thus, while working for a sound and profitable industry, the Amateur Radio Activities Section is contributing its influence toward the overall development of the hobby. A little known, but important facet of amateur radio, the RTMA Amateur Radio Activities Section is a sterling example of the high esteem held for amateurs and their hobby, by all segments of the electronic industry.

LAWRENCE L. LeKASHMAN, W9IOP



. . . the 70E-8A VFO is back

For those of you who are not acquainted with it, the Collins 70E-8A is an extremely accurate, stable variable frequency oscillator. Off the market since 1949, it is now back again.

The 70E-8A is permeability tuned, and has a linear range of 1600 kc to 2000 kc. Sixteen turns of the vernier dial are required to cover the 400 kc range.

We utilize a secondary standard, continually checked against WWV, in the factory calibration of this oscillator. A special corrector mechanism in the 70F-8A produces the linear calibration curve. The table below shows typical calibration characteristics for the various ham bands.

BAND (meters)	Freq. (mc)	No. of dial divisions	kc/dial division	Oscillator Harmonic	Multiplier Sequence
80	3.5 — 4.0	500	1.0	2	x 2
40	7.0 — 7.3	300	1.0	4	x 2 x 2
20	14.0 — 14.35	175	2.0	8	x 2 x 4
15	21.0 — 21.45	90	5.0	12	x 2 x 3 x 2
11	26.960 — 27.230	54	5.0	16	x 2 x 4 x 2
10	28.0 — 29.7	340	5.0	16	x 2 x 4 x 2
6	50.0 — 54.0	533.3	* 7.5	30	x 2 x 5 x 3
2	144.0 — 148.0	200	*20.0	80	x 2 x 5 x 4 x 2
1¼	220.0 — 240.0	500	*30.0	120	x 2 x 5 x 4 x 3
¾	420.0 — 450.0	666.6	*60.0	240	x 2 x 5 x 4 x 3 x 2

*As read on 7 mc band.

If your Collins dealer hasn't yet received his supply, he will have it soon. The net domestic price of the 70E-8A, complete with dial, is $97.50.

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

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

11 W. 42nd St., NEW YORK 18 1930 Carpenter Blvd., DALLAS 2 2700 W. Olive Ave., BURBANK

"the Snooper"

Ç. O. BISHOP, W7HEA*

As one of the first to witness the initial demonstration of panoramic reception (in 1941) I have always held a warm spot for this extraordinarily useful system. While many amateurs use it, and swear by it, many more are seemingly unaware of what this gadget can do and how valuable it can be during QSO's or just hunting DX.

To set the record straight, CQ is proud to have obtained this feature material thoroughly covering the construction and utilization of panoramic reception. —Editor.

This is an article about *panoramic reception*, what it is, how to get it, and what to do with it after you have it. With panoramic reception the eyes have something to do besides stare at the S-meter because we are able to see displayed on the face of a scope tube not only the signal that we hear in the loudspeaker, but also every other signal on the band for a certain number of kilocycles either side of that signal. The amount of the band visible depends upon the unit being used and the settings of its various controls. Each signal is displayed on the scope as a trace, or pip, starting at the base line, rising to a sharp point, and returning to the base line. This pip will appear in a direct frequency relationship to the other signals on the band, with the lowest in frequency becoming visible at the left-hand side of the scope, the signal being heard at the center of the display, and those higher in frequency on the right.

As we tune from signal to signal the pips will move across the face of the tube, new ones appearing in the direction we are tuning and others disappearing on the far side of the display. The signal being heard in the loudspeaker is always in the center of the tube. By adjusting the controls on the unit we are able to vary the portion of the band under observation from the maximum sweep width for which it is designed, in the case of this unit one megacycle, to zero sweep width. At the latter setting we are looking only at the signal being heard at that time. The height of the various pips is proportional to the signal intensity with the stronger signals making the highest pips. The width of the pips at the baseline depends upon the design of the unit and the actual width of the signal in cycles or kilocycles. Since the design width is a permanent factor, signals that are broad in respect to bandwidth will show up that way while the sharper signals will appear narrower on the scope.

There is nothing new about panoramic reception

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as commercial units have been on the market for some time. It has not met with the widespread use it merits due to several factors. Probably the greatest drawback has been the unfamiliarity of its use and advantages to the greater number of hams. The commercial units have some limitations but anyone that has ever worked with a pan for a short time would not be without one. The most popular of the commercial units was designed to have its input tied into the i.f. of the receiver, normally at the output of the first detector or mixer stage. Since the i.f. of most receivers is in the vicinity of 455 kc. the amount of the band that could be observed is limited to about 100 kc. each side of the center frequency, or about 200 kc. maximum.

Before attempting to describe how panoramic reception is accomplished let's look at what takes place in the conventional receiver when we are listening to a signal. A signal of a certain frequency enters the receiver from the antenna and passes thru a tuned circuit to the r.f. amplifier tube. There it is amplified and goes on through other tuned circuits to the signal grid of the mixer tube. This mixer tube also has a signal from the tuned circuits of the oscillator being fed into it. This oscillator frequency is such that the difference between it and the signal frequency will equal the i.f. of the particular receiver in use. This new frequency is present in the plate circuit of the mixer tube and is passed thru the various stages of the i.f. amplifier to the second detector where it is converted to audio frequency, amplified, and made audible.

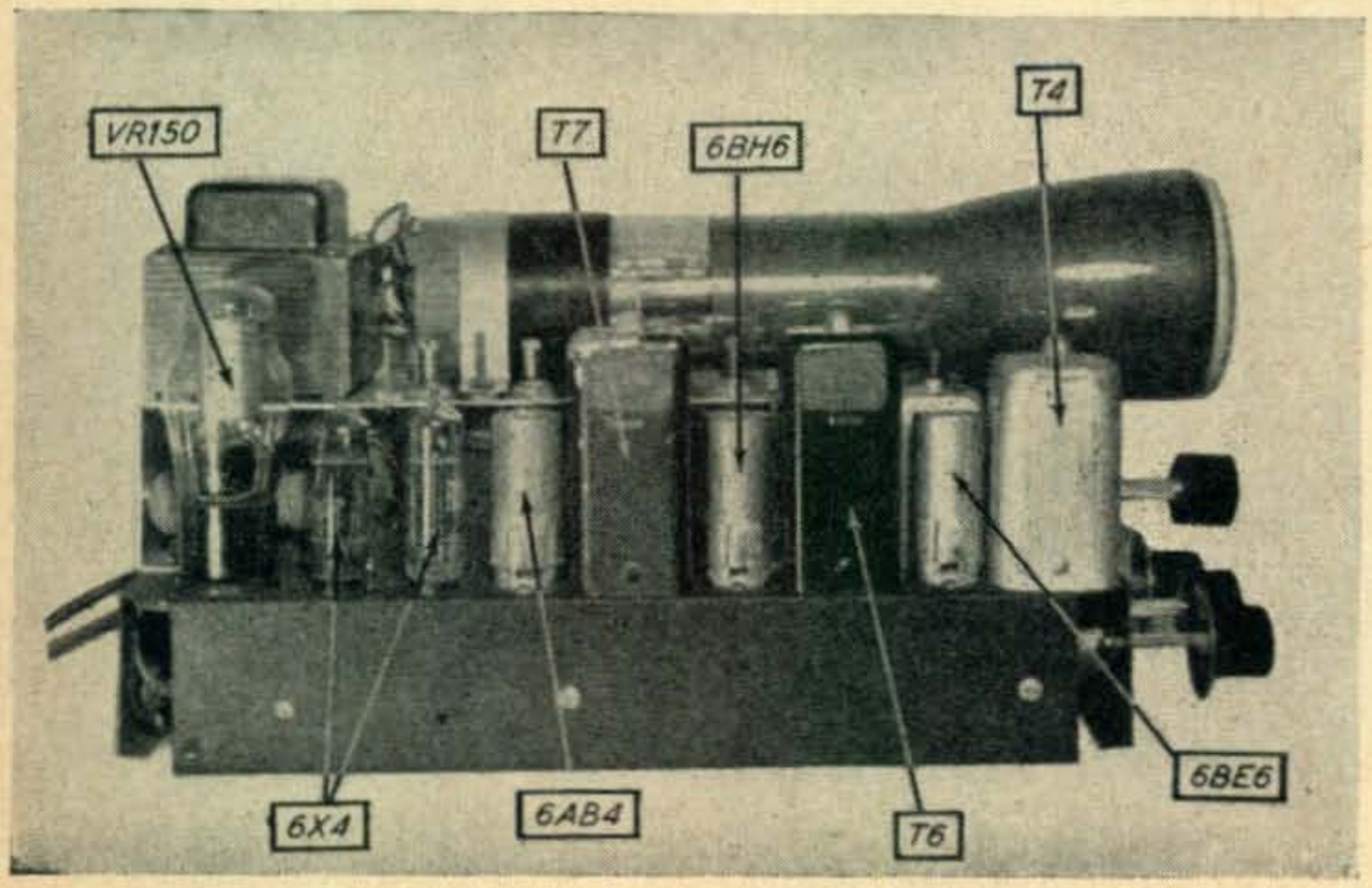
Returning to the front end of the receiver we find that the r.f., mixer, and oscillator circuits are all variably tuned and generally ganged and brought out to a single control. The only one of these three tuneable circuits that actually selects the signal to be passed on through the receiver and become audible is the oscillators. The others help in the selectivity and amplification of the desired signal, but really have no part in its selection. Consequently we can leave the r.f. and mixer circuits stationary or fixed tuned, vary only the tuning of the oscillator and receive signals over a certain range of frequencies. The amount of the band that can be covered in this manner depends upon how much selectivity we have in the fixed tuned circuits of the r.f. and mixer. By suitable design these tuned circuits may be made to pass a desired band of frequencies with uniform amplification. The oscillator tuning remains the only one that must be varied to receive the signals over this band. If instead of tuning the oscillator manually, we use a reactance modulator[1] and do it electronically, we have one of the basic requirements for panoramic reception.

We know that the selectivity of a tuned circuit is directly related to its frequency and that the lower we go in frequency the greater this selectivity becomes. Some of the commercially available panadapters operated at an input frequency of 455 kc. and had a sweep width of 200 kc. All signals from 355 kc. to 555 kc. were visible on the scope with the one at 455 kc. being the audible signal from the receiver. Considering 455 kc. as the resonant frequency of the circuit at the input to the adapter, a little figuring will show that the signals at the 355-kc. and 555-kc. points are 22% off resonance. This off resonance percentage is one of the limiting factors of the band-width which can be swept when using panoramic reception.

It becomes evident that if we wish to view a wider portion of a band and still keep the off resonance percentage within reason, we must use a higher input frequency for the adapter. This is what we have done in the panoramic adapter or the "Snooper" we are going to describe.

The *Snooper* was designed to be used in conjunction with the RME *VHF-152*, or similar converters having their i.f. around 7 mc. With minor adjustments it can be adapted to other frequencies. Its sweep width, that is the amount of a band visible on the scope at one time, is one megacycle. Percentagewise the signals at the band edges are detuned by only 14% so reasonable definition of signals 500

1 For a discussion of reactance modulators see "The Useful Diode Modulator," Robert H. Weitbrecht, CQ. April 1952, p. 18.



The complete panoramic unit is built up on a BUD CU-1991 scope cabinet and chassis. The corners of the chassis have been cut off for access purposes. Four controls are brought out through the front panel.

kc. either side of the center frequency is possible. A three-inch scope tube is used. The components are all standard and readily available service items. The design is such that duplication should be no problem. Considerable time was spent to make the design as simple as possible and yet not secrifice efficiency.

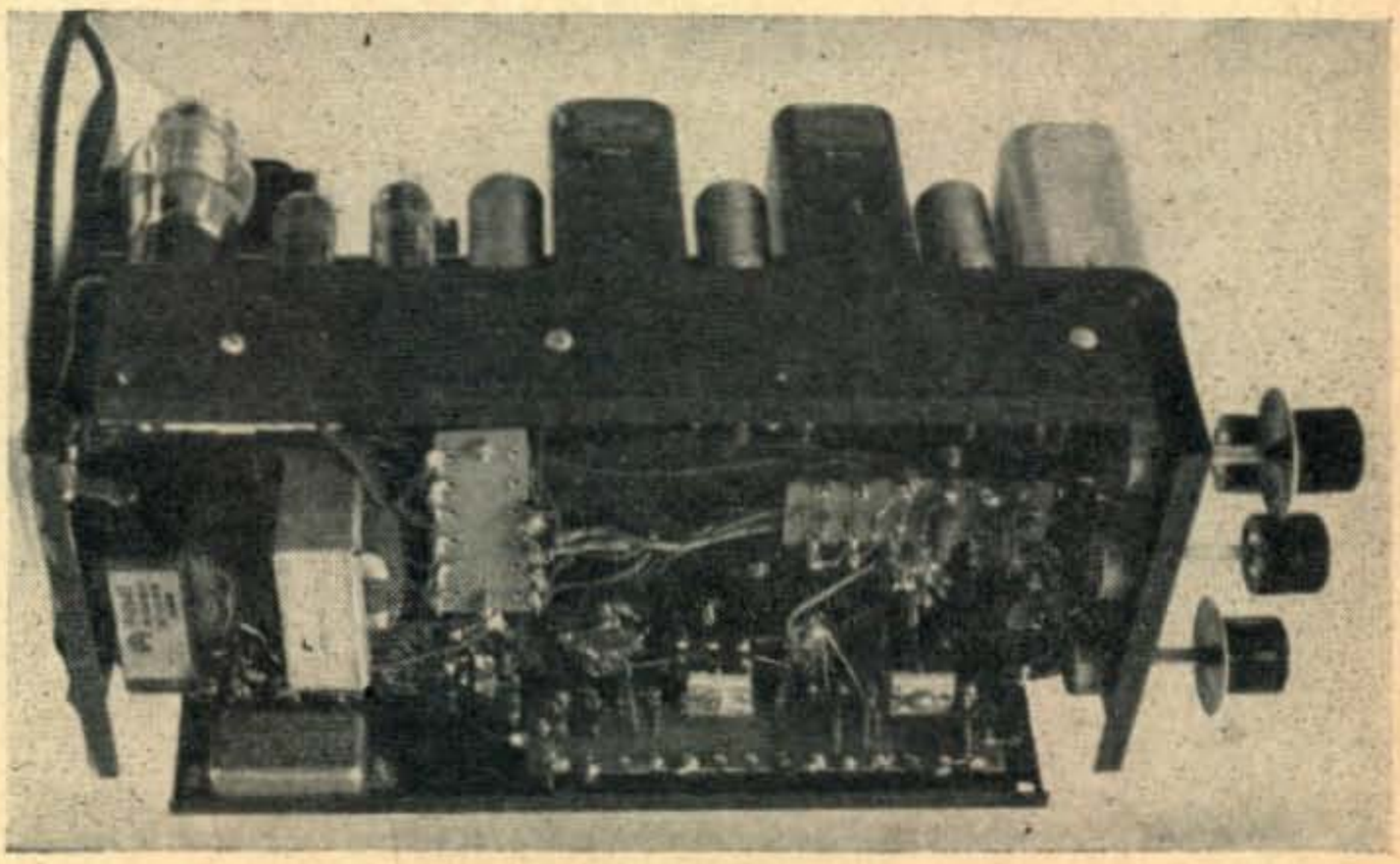
The input of the *Snooper* is through a short piece of co-ax which is connected to the antenna terminals of the communications receiver along with the output of the converter in use. The 1st r-f stage, a grounded-grid 6AB4, has this signal coupled to the cathode by a 100 $\mu\mu$f. condenser, *C1*. This will afford a good signal transfer and has very little, if any, effect on the signal entering the regular receiver. The output of the 1st r-f is transformer coupled to the input of the 6BH6 2nd r-f, which is in turn transformer coupled to the 1st mixer. Two stages of r.f. are necessary to give the desired band pass and are so designed that the signals at the band edges of 6500 kc. and 7500 kc. have a very decided boost over those at the center frequency. This is done to help compensate for the normal peaking of signals around the center frequency due to the selectivity of the circuits in the converter. Condensers, *C4* and *C5* are 3-30 $\mu\mu$f. compression trimmers mounted under the chassis and are used to set the bandpass of the r-f stages. The gain control is placed in the cathode of the 2nd r-f stage.

The 1st mixer, a 6BE6, has its oscillator frequency controlled by the 6AK5 reactance modulator in such a manner that it may be varied plus and minus 500 kc. around a center frequency of approximately 10.5 mc. The output frequency of this mixer is 3.5 mc. It is transformer coupled to the second mixer where the frequency is changed to 175 kc. Right about now some one is saying "Why the dual conversion?" Referring back to the 1st mixer, we find that its oscillator frequency is being varied plus and minus 500 kc. around the center frequency. The signal grid of this tube has 7 mc. as its center frequency. This is also the output frequency of the converter and the one to which the communications receiver is tuned. Since in a mixer, the oscillator frequency is higher than the signal frequency by the amount of the i.f., and since we are varying this oscillator back and forth 500 kc. each side of the center frequency, the frequency of the oscillator must be 500 kc. or more from the 7-mc. signal frequency, or it will be audible in the communications receiver output as it passes over that frequency.

The next logical question, "Why not stay on 3.5 mc?" is a little easier to explain. Since we mentioned earlier that the selectivity of circuits increases as the frequency is lowered and since we want the pips on the scope to be as small as possible at the base line, it becomes necessary to convert the 3.5-mc signal to some lower frequency, in this case 175 kc. The frequencies used in this dual conversion are not mandatory since they were picked primarily because transformers for them are standard stock items and readily available. Any other combination that meets the above requirements would work just as well.

To return to the 6AK5 reactance modulator, it is one of the few critical parts of the *Snooper*. A wide variety of tubes were tried and none of them worked satisfactorily, except the 6AK5. The control, *R13*, in its cathode, is the linearity control and is used to adjust the sweep so that the excursion of the oscillator is equal both sides of the center frequency. The sweep pad, R35 is one of the semi-fixed controls mounted on the super structure with the scope tube. It is used to set the maximum sweep width that can be controlled by *R36* which is a front panel adjustment. The center frequency control is *R37*. It is another front panel adjustment used to set the position of the pips on the base line of the scope. More about these adjustments and controls later. The modulator is controlled by the sawtooth horizontal sweep voltage, a portion of which is coupled into the sweep pad control by *C26*.

During the design of the *Snooper* considerable trouble was encountered with the 175-kc i-f amplifier. Being a v-h-f man at heart my pride suffered a terrible blow when that low frequency i-f strip refused to behave. At certain sweep widths the pips had jagged edges, long tails, and everything else no self respecting pip would put up with. A lot of work and a little thinking brought out the following facts. The sweep rate used is 60 cycles and assuming a signal at the input of 1 kc. in width, a little figuring shows that the signal is only present in the i-f strip for .0000166 of a second. We are actually am-



A peek under the chassis shows the neat construction with the liberal use of terminal boards. The "Snooper" is actually a double conversion superheterodyne with a frequency modulated first oscillator stage.

plifying some pretty short pulses. Since it takes a definite length of time for the magnetic field to develop and reach maximum and then decrease to zero in the transformers, and since they are being fed short pulses, shock excitation was causing self oscillation in the windings. The long time-constant circuits created by conventional bypassing normally used at these low frequencies aggravated this condition.

As a partial solution stray capacity was held to a minimum by bringing each lead from the i-f transformers through the chassis via individual holes spaced as far apart as possible. Reduction in size of all the condensers in the strip was an improvement but eventually a point was reached where the 6BH6 amplifier took off merrily on its own. The final solution to the problem came when a simple form of bridge neutralization was used with the 6BH6 i-f amplifier tube. Since the signal voltages are reaching a pretty high value by this time, the 6BH6 is operated with much higher bias than is normal and the plate and screen voltages are made correspondingly higher to enable the tube to amplify in a linear manner. A.v.c. or a.g.c. are not practical in a rig of this kind because the slight lag placed in the circuits by its use distorts the pips on the scope. Also sudden changes in carrier amplitude such as occur under modulation are damped out and a true picture of the signal characteristics cannot be obtained.

The detector uses a 6AB4 tube in an infinite impedance circuit. This type of detector is a natural for this work as it will handle large signal voltages without distortion and still load the i-f transformer very lightly. Its output is a positive going pulse and in this case it is sufficient to produce the pips on the scope without further amplification. Maximum pip height without overload is about one and one half inches. An audible signal can be heard by using a pair of phones, or the phono input of the receiver connected to *J1* when pips are appearing on the scope.

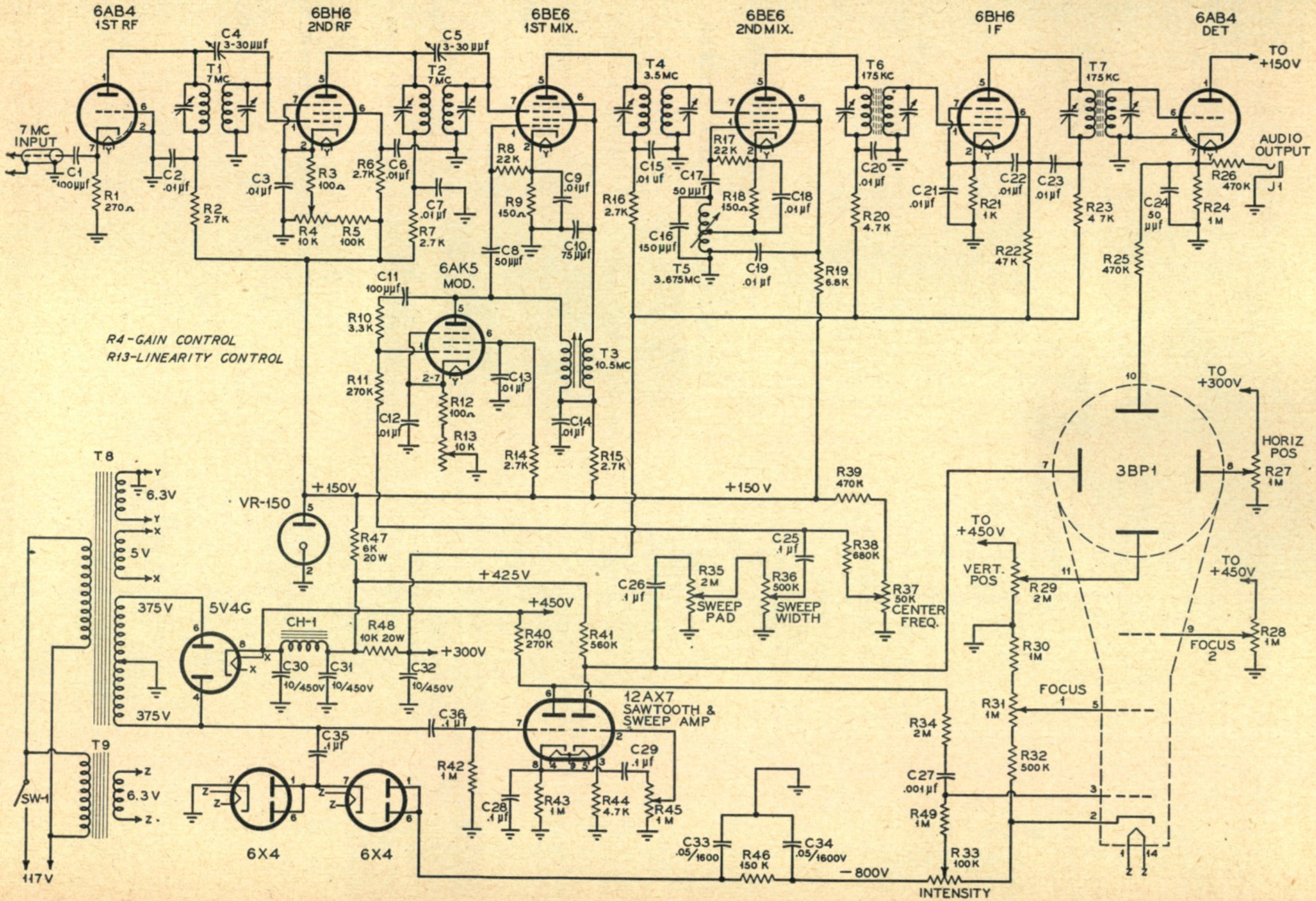
The saw-tooth voltage for the horizontal sweep in the scope tube and control voltage for the reactance modulator is developed in the first half of the 12AX7 and amplified in its second section to the required value. The voltage phase and magnitude at pin 6 of the 12AX7 is such that it can be fed to the intensity grid of the scope as a blanking pulse. The 2-megohm resistor, *R34*, with *C27*, limits the voltage to the point where the return trace, or fly back trace, is not visible on the face of the scope.

A cathode type rectifier, the 5V4G, was used since the voltage out of the power supply under load is just about the working voltage of the filter condensers. Since the 5V4G requires just a little longer to reach operating temperature than the rest of the tubes, they are all ready to draw current when the voltage is available and no initial surge is present. Two 6X4s are used in a voltage doubler circuit for the negative high voltage for the scope

(Continued on page 18)

Parts List and Schematic

C1, C11—100 $\mu\mu$f
C2, C3, C6, C7, C9, C12, C13, C14, C15, C18, C19, C20, C21, C22, C23—.01 μf.
C4, C5—3-30 $\mu\mu$f. Compression trimmers
C8, C17, C24—50 $\mu\mu$f.
C10—75 $\mu\mu$f.
C16—150 $\mu\mu$f.
C25, C26—.1 μf., 600v tubular
C28, C29, C35, C36—.1-.1 μf., 600v dual bathtubs
C27—.001 μf.
C30, C31, C32—10-10-10-μf., 450v FP389P Mallory
C33, C34—.05 μf., 1600v CD buffer condensers
All condensers not labeled are CD Discaps, 500v rating
R1—270 ohms, 1/2w
R2, R7, R14, R15, R16—2,700 ohms, 1/2w
R3, R12—100 ohms, 1/2w
R5—100,000 ohms, 1/2w
R8—22,000 ohms, 1/2w
R9, R18—150 ohms, 1/2w
R10—3,300 ohms, 1/2w
R11, R40—270,000 ohms, 1/2w
R17—22,000 ohms, 1/2w
R19—6,800 ohms, 1/2w
R20, R23, R44—4,700 ohms, 1/2w
R21—1,000 ohms, 1/2w
R22—47,000 ohms, 1/2w
R24, R30, R42, R43, R49—1.0 megohm, 1/2w
R25, R26, R39—470,000 ohms, 1/2w
R32—500,000 ohms, 1/2w
R34—2.0 megohms, 1/2w
R38—680,000 ohms, 1/2w
R41—560,000 ohms, 1/2w
R46—150,000 ohms, 1/2w
R47—6,000 ohms, 20w IRC
R48—10,000 ohms, 20w IRC
R4, R13—10,000 ohms, Q11-116 IRC control
R27, R28, R31, R45—1.0 megohm Q11-137 IRC control
R29, R35—2.0 megohm Q11-139 IRC control
R33—100,000 ohms, Q11-128 IRC control
R36—500,000 ohms, Q11-133 IRC control
R37—50,000 ohms, Q11-123 IRC control
7 SQ screwdriver slot control shafts for IRC controls
SW1—76-1 IRC on gain control
T1, T2—Miller 512-Y-1, remove 5 turns from each winding
T3—Miller B-320-C
T4—Miller 512-x-1 remove five turns from each winding
T5—Miller B-321-C
T6, T7—Meissner 16-5728, 175 kc. iron core input i.f. or similar
T8—Merit P-2951 325-325 a.c.-70 ma., 5v-3a, 6.3v-3.5a.
T9—Merit P-2945, 6.3v-2a.
CH1—Merit C-2987, 16h.-50ma.
J1—A-1 Mallory fone Jack
1—5V4G
2—6X4
2—6AB4
1—12AX7
1—6AK5
1—VR150/30
2—6BE6
1—3BP1
2—6BH6 Scope Tube
7—147-925 Amphenol Steatite 7 pin sockets
2—147-500 Amphenol Bakelits 7 pin sockets
1—59-406 Amphenol Bakelits 9 pin sockets
2—77-MIP-8 Amphenol Octal Sockets
1—59-417 Amphenol 3BP1 Sockets
1—5-401 Amphenol Tube Shield
6—5-402 Amphenol Tube Shield
2—420 Miller terminal strips (short)
2—440 Miller terminal strips (Long)
3—52 Cinch Dual tie points
1—55 Cinch 5 tie points
2—HR Black National Knobs
2—HRS-3 Black National Dials
1—80073 Millen 3" Scope Bezel
1—CU-1991 Bud Scope Cabinet and Chassis


6AB4
1ST RF
6BH6
2ND RF
6BE6
1ST MIX.
6BE6
2ND MIX.
6BH6
IF
6AB4
DET
7 MC INPUT
C1 100μμf
R1 270Ω
C2 .01μf
R2 2.7K
C4 3-30μμf
T1 7MC
C3 .01μf
R3 100Ω
R4 10K
R5 100K
R6 2.7K
C6 .01μf
C5 3-30μμf
T2 7MC
C7 .01μf
R7 2.7K
R8 22K
C9 .01μf
R9 150Ω
C8 50μμf
C10 75μμf
T4 3.5MC
C15 .01 uf
R16 2.7K
C17 50μμf
R17 22K
R18 150Ω
C16 150μμf
T5 3.675MC
C18 .01μf
C19 .01μf
R19 6.8K
T6 175KC
C20 .01μf
R20 4.7K
C21 .01μf
R21 1K
C22 .01μf
R22 47K
C23 .01μf
T7 175KC
R23 4.7K
C24 50 μμf
R25 470K
R24 1M
R26 470K
J1
AUDIO OUTPUT
TO +150V
R4-GAIN CONTROL
R13-LINEARITY CONTROL
6AK5
MOD.
C11 100μμf
R10 3.3K
R11 270K
C12 .01μf
R12 100Ω
R13 10K
C13 .01μf
C14 .01μf
R14 2.7K
R15 2.7K
T3 10.5MC
10
TO +300V
HORIZ POS
R27 1M
3BP1
T8
6.3V
5V
375V
375V
5V4G
CH-1
R48 10K 20W
+300V
C30 10/450V
C31 10/450V
C32 10/450V
+150V
VR-150
R47 6K 20W
+425V
+450V
R40 270K
R41 560K
C26 .1 μf
R35 2M
SWEEP PAD
R36 500K
SWEEP WIDTH
C25 .1 μf
R38 680K
R37 50K CENTER FREQ.
+150 V
R39 470K
TO +450V
VERT. POS
R29 2M
TO +450V
R28 1M
FOCUS 2
R30 1M
FOCUS 1
R31 1M
R32 500K
R34 2M
C27 .001μf
R49 1M
R33 100K
INTENSITY
-800V
C33 .05/1600
R46 150 K
C34 .05/1600V
T9
6.3V
SW-1
117V
6X4
6X4
12AX7
SAWTOOTH & SWEEP AMP
C36 .1 μf
C35 .1 μf
R42 1M
C28 .1 μf
R43 1M
R44 4.7K
R45 1M
C29 .1 μf

SNOOPER

(from page 16)

and standard. .05/1600 auto radio buffer condensers were found adequate for filtering this supply. They are both cheap and small. Since the heater-to-cathode voltage on both the 6X4s and the scope tube is very high, a separate filament transformer was used for these tubes and the winding is left floating above ground. The power transformer may seem small for anything with so many tubes but the actual current drain is under 55 ma., and since 150 ma. heater type tubes are used everything is within its rating by a suitable margin. Everything, that is, except the choke and since a 50 ma. one is all that will fit in, it is used. Since it runs cool and does not saturate it apparently is big enough for the job.

By now it is evident that the *Snooper* is just a dual conversion receiver, electronically tuned over a given frequency, and producing a positive voltage pulse for each signal present within its frequency range. These pulses become visible as pips on the face of the scope tube and appear in direct frequency relation to each other. Let's take a few signals from the antenna through to the scope and see just what happens.

Assume we are listening to a signal on 29 mc. using a converter whose i.f. is 7 mc. The signal is picked up by the antenna and passes the r-f and mixer circuits of the converter at 29 mc. In the mixer this frequency is changed to 7 mc. and goes on to the output transformer, through the cables and to the inputs of the communications receiver and the *Snooper*. The regular receiver does a few things to the signal and it comes out audio. So far all the circuits associated with this signal have been tuned right on the nose and it has had clear sailing. We also have other signals coming through the converter to the receiver both above and below the one to which we are listening. These we can find by tuning the regular receiver each side of the 7-mc. point we are using as the converter output frequency. Since now the tuned circuits of the converter have remained stationary these signals above and below 29 mc. are being passed along by circuits slightly off resonance and consequently their strength decreases as we tune farther and farther from the center frequency. The greater the selectivity of these tuned circuits the more these off center signals are attenuated. This is of no concern in the regular receiver as we are listening to the 29-mc signal only, and it is coming in on the nose with no loss due to detuning.

Since the *Snooper* is also hooked to the input of the regular receiver, this 29-mc signal and those on the side bands are also present at its input, and here a different condition exists. The r-f stages are so designed that the signals appearing at either side of the center frequency of 29 mc. are boosted in strength and appear at the grid of the 1st mixer in approximately the same relative signal strengths that they had at the antenna. Now when the oscillator of the mixer is varied through its range by the reactance modulator, its frequency change is such that each signal present at the mixer grid from 28.5 mc. through the center frequency of 29 mc. to 29.5 mc. will at some time produce the necessary 3.5-mc output frequency and be passed on to the rest of the circuits and be displayed on the scope and appear there as a sharp pip. Since the sweep rate of this action is 60 cps these pips will be stationary on the scope, and will appear in their proper relationship to each other. We see every signal present on the band at that time. Just imagine what that looks like any wintery Sunday afternoon. It's a spectacular sight, believe me.

END OF PART I

In Part II the author will discuss how he has actually found the "Snooper" to be invaluable in normal QSO activities. How it works in net operation, how you can actually report factually on the other fellow's modulation and its many other uses. The author will also describe the alignment and construction of the "Snooper."

PRESENT and PROPHETIC

BARBECUE AND SUDS BUST HAMFEST

The Lawton-Fort Sill Radio Club of Lawton, Oklahoma, has announced that their Third Annual Barbecue and Suds Bust Hamfest will be held during Sunday, Sept. 7th, at Craterville Park, Oklahoma.

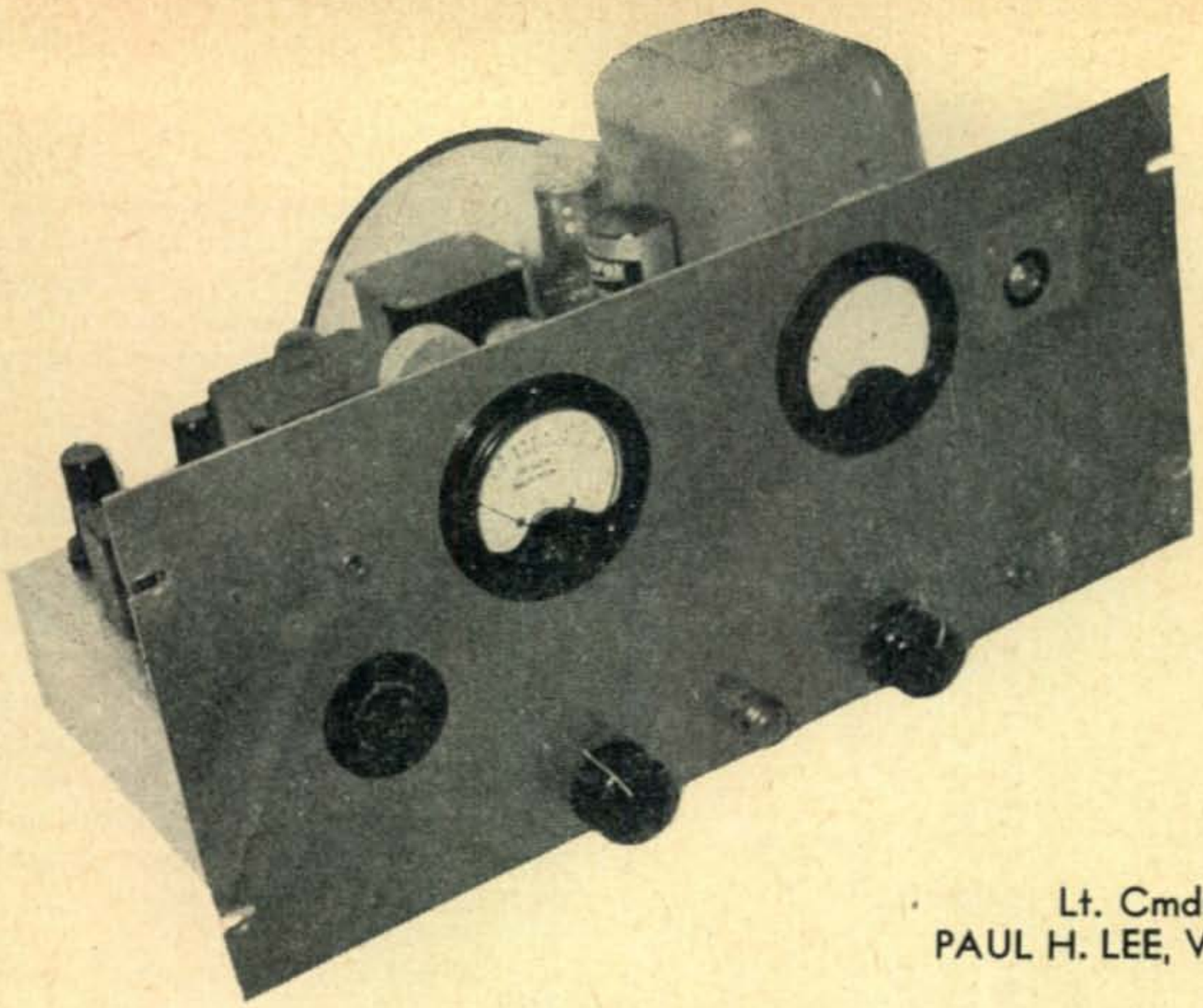
Advance registration, at $1.50 per person, may be obtained from R. L. Hawkins, Box 892, Lawton, Oklahoma. Admission at the gate will be $2.00.

This may well be your last chance before winter sets in, to enjoy an outdoor party with your friends. There will be an exhibition of rigs, mobile gear and old time radio equipment, as the feature attraction. Don't miss it.

LONG ISLAND FEDERATION HAMFEST

The Federation of Long Island Radio Clubs, Inc., representing nine radio clubs on Long Island and Brooklyn, has scheduled its 16th annual Hamfest and Dance for Friday evening, September 12th, at Lost Battalion Hall, Elmhurst, Queens. Hams from the metropolitan area as well as those from other sections are invited; There will be a prize for the amateur from the greatest distance away, as well as favors for the ladies. All the best features of a good hamfest program will be included, and the fellows are urged to bring their YLs and XYLs for dancing.

Tickets are $2.00 for hams, $1.25 for XYLs before the night of the hamfest, and 50c extra at the door. Tickets may be obtained from Julian N. Jablin, W2QPQ, FLIRC Secretary, at 147 Charter Road, Jamaica 3, New York.



Lt. Cmdr.
PAUL H. LEE, W4RXO*

More Modulation $ per Dollar $

Generally when someone starts talking about putting more wallop into their modulation the conversation drifts to speech clippers and other murderers of a good waveform. Actually there are a number of different methods that effectively accomplish the same purpose. At least one of them, the "limiter or compression" amplifier, has a natural sounding output. For a "signal of distinction", try this in your modulator. —Editor.

Some time ago we decided to build a limiting audio amplifier for use with our 800 watt phone transmitter. The advantages in the use of this piece of gear are such that we feel than many of our brother amateurs will be interested in it. Limiters have been used by broadcasters for quite a few years, but for those who may not be familiar with broadcast station practice, let us define a "limiting amplifier", or "compressor". It is nothing more nor less than an audio amplifier with an a.v.c. circuit built in, to limit the peak audio output to some predetermined level.

Figure 1 shows the limiting effect which is performed by the amplifier described herein. A glance at the curve will show that after the start of limiting action at the knee of the curve, a 20 db increase in input produces only a 12 db increase in output, a 30 db increase in input produces only 16 db increased output, and so on. It is obvious then, that one of these limiters, used ahead of a properly designed modulator in a phone transmitter, will produce a signal with a higher average value of modulation, without danger of overmodulation.

At this point, someone is sure to raise his voice and say, "Why, I can do that with a peak clipper!" Well, sure you can! You can take a perfect audio waveform, and chop off the peaks, and you will have a high average value of modulation, without overmodulation. But look a little further and see what else you have done by this chopping process. You

* *4 Oak Street, Isle of Palms, S.C.*

have ruined the original waveform, and have brought that ugly word "distortion" into the picture. Chopping off the peaks creates various high-order audio harmonics and undesired frequencies, which cause the signal to be broad. One must then go to the trouble of including a low-pass filter in the output circuit of the modulator, to remove these undesirable components from the signal. Such a filter involves high voltage components, which add cost to the transmitter. Furthermore, the modulator may easily be overdriven, causing further spurious signal generation. The intelligibility of the voice signal suffers, because of the distortion of the waveform, and if the thing is carried to the extreme, the speaker's voice becomes unrecognizable and unintelligible.

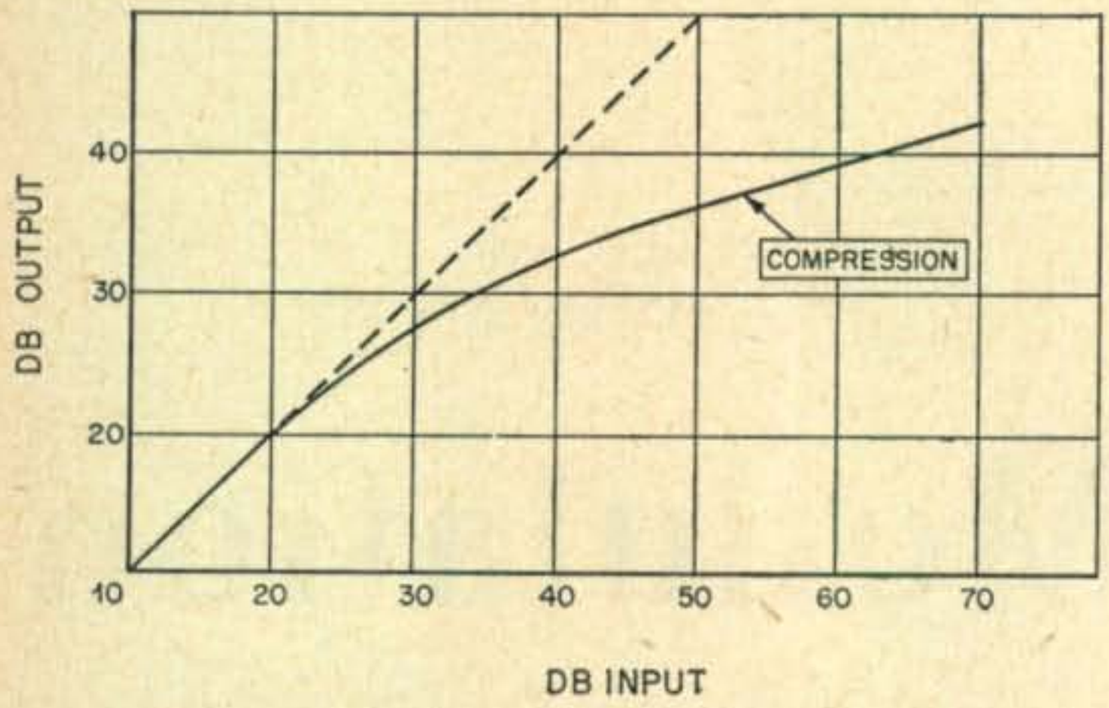


Fig. 1. This graph shows the limiting or compression effect of the audio system described by the author. When used on the air it results in a higher average value of modulation without overmodulation, or destruction of voice quality.

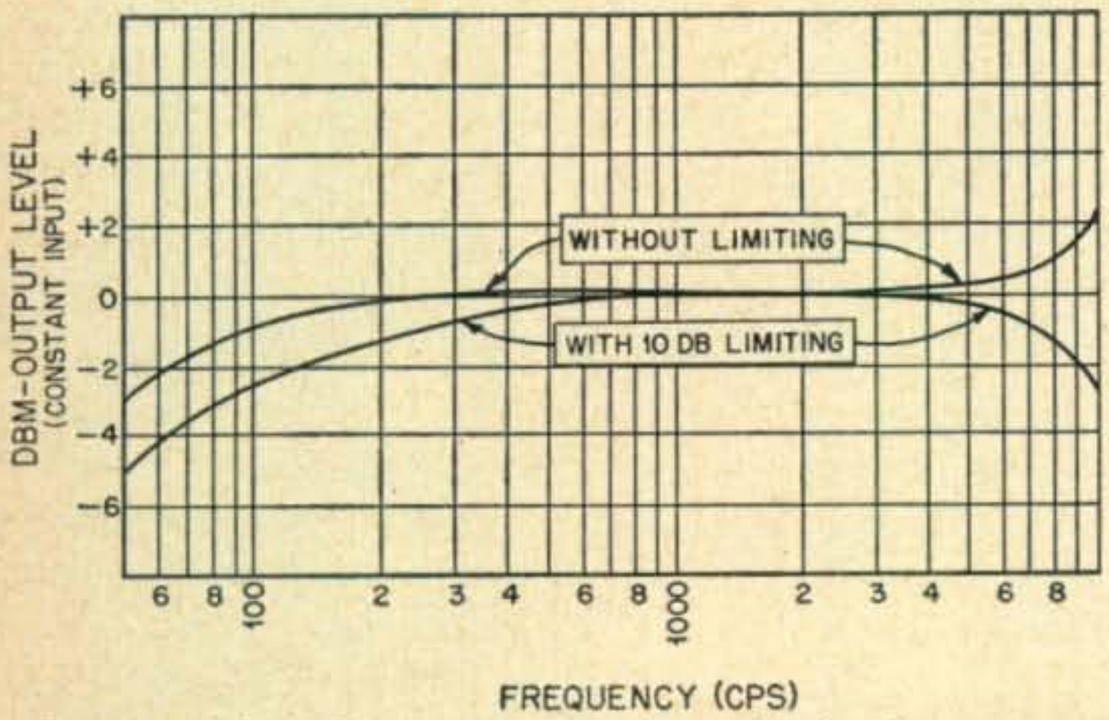
The author is one of those people who believe that once a good audio signal is created, at the microphone, it should not be distorted or destroyed. The phone signal on the air should be *clean,* and by "clean" we mean not only free from spurious r.f. emissions, but also from audio distortion. The signal on the air should *sound like the speaker's natural voice,* and have "personality" and "presence". There are some signals on the air in our phone bands which sound rough, distorted, and overdriven. Roughness caused by distortion due to clipping or overdriving does not increase intelligibility thru QRM—on the contrary, such a signal is harder to read under poor conditions. The clean, undistorted signal will always get through better. This fact is well recognized by commercial and military communications people, who make good use of such limiters as this on voice circuits to insure a high average level of modulation without over-modulation.

Now let's stop the preaching, and get down to business. Here we have a limiting amplifier, which when used ahead of your modulator, will enable you to raise your average audio voice level 8 to 10 db without over-modulation. It has a reasonably good frequency response, and very low distortion, even under severe compression conditions. The frequency response, and distortion-versus-frequency curves, made with *General Radio* audio measuring equipment, are shown in *Figures 2 and 3.* Take a look at these curves and see how *clean* an audio signal this gadget puts out, yet how packed with audio wallop it is. For anyone who desires to roll off the high frequency response a bit more, it is easily done by the use of fixed condensers from grids to ground on the 6N7 stage, or by the use of a large plate bypass condenser in the final r.f. amplifier.

The Design

The unit shown in the photographs is built to mount in a standard 19" rack, with an 8¾" panel, and on a 17" x 10" x 3" aluminum chassis. The circuit, shown in *Fig. 4,* is simple enough. It consists of a pre-amplifier stage permitting the use of crystal, or high or low impedance dynamic microphones. Anyone who is interested only in a high impedance input may omit the input transformer. The triode-connected 6AC7 gives a bit more gain than a triode-connected 6SJ7—either one will be satisfactory. The 6SK7's operate as a variable-gain stage, with their bias controlled by the a.v.c. voltage from the rectifier section of the 6SQ7. The 6SQ7 derives its excitation from the 6N7 grid circuit, with the threshold of compression being determined by the setting of the 1-megohm potentiometer in the 6SQ7 grid circuit.

The output level of the amplifier is determined by the setting of the dual potentiometer in the 6N7



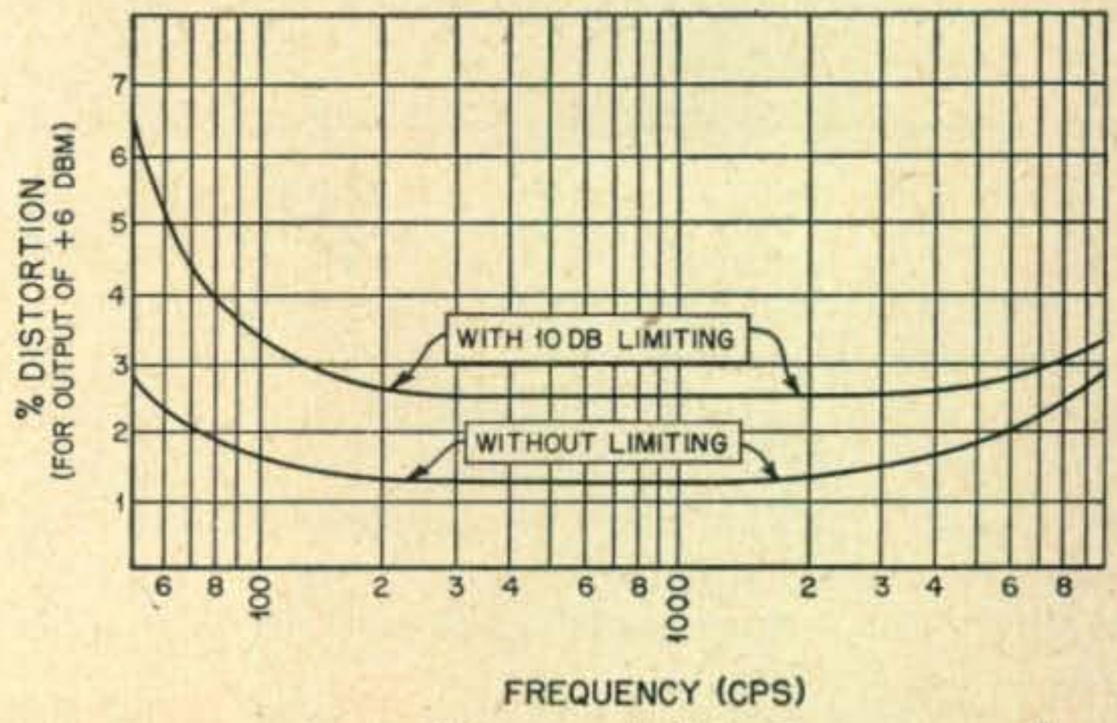


Fig. 2 and 3. Tests were made with the limiter amplifier to ensure a very minimum of distortion even under severe compression. The frequency response, with and without compression, is shown graphically at the left. See text for comments on the high frequency "roll-off." At the right is the graph of distortion versus frequency. Over most of the speech range the distortion increase with 10 db compression is only slightly over 1%.

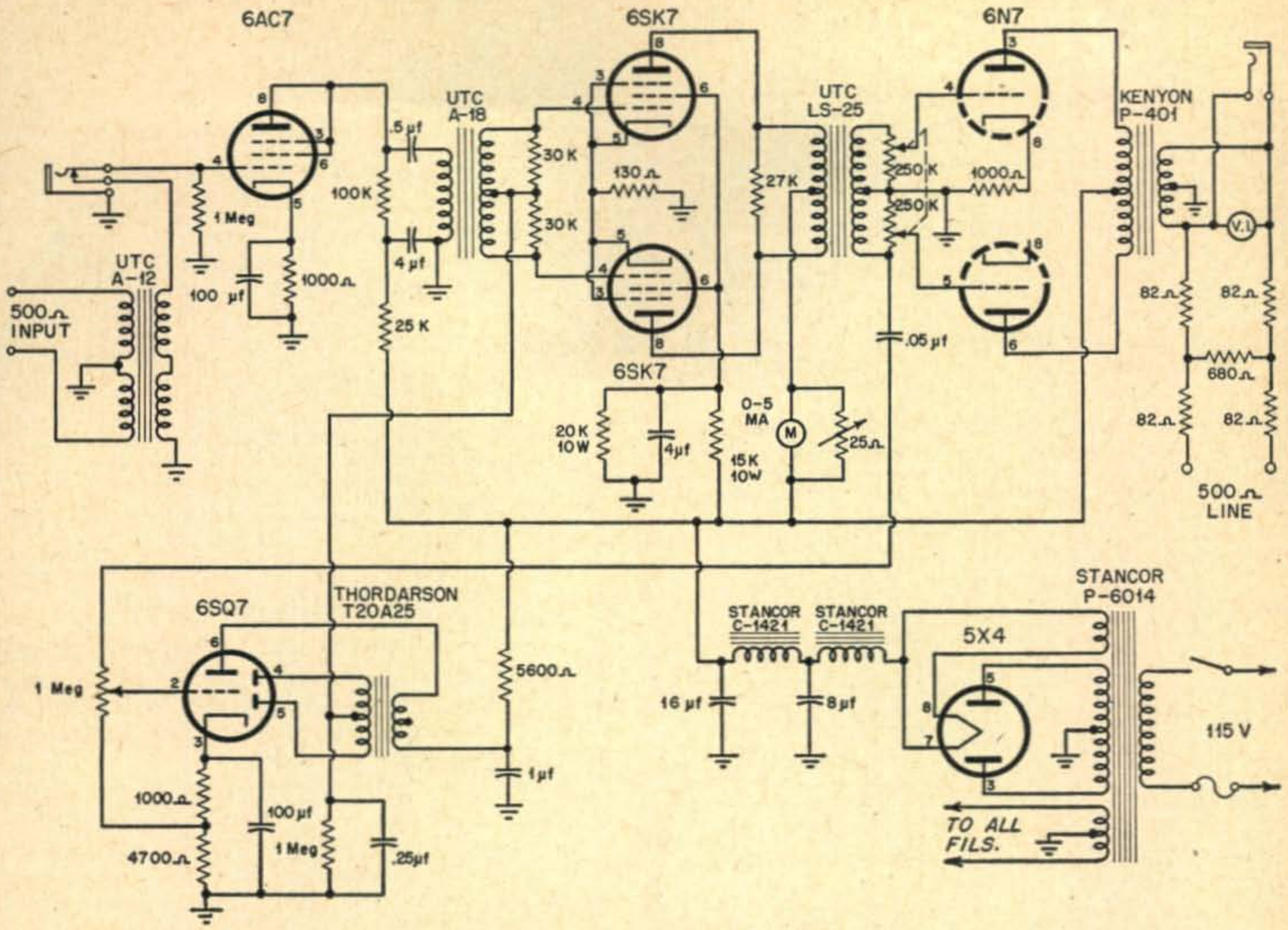


Fig. 4. Schematic of the limiter amplifier. All parts values are shown in the diagram.

stage. The 6N7 is operated "Class A". The use of a volume indicator meter on the output is recommended, so that you can actually see the effects of compression on the average output level. A 6 db pad is inserted in the output circuit to give the output stage a resistive load to work into. If this is not done, the volume indicator will read incorrectly and will appear to "float" at certain audio frequencies.

You may wonder why we use two 6SK7's in push-pull. The answer is very simple. The use of push-pull permits us to do without the usual filters which are necessary in an a.v.c. circuit to prevent unwanted feedback and oscillation. Elimination of the filters enables us to accurately control the gain recovery time by means of the time-constant circuit described below. If we had to use a filter in the a.v.c. voltage circuit, our recovery time duration would be determined by the minimum amount of filter which we could get away with, and this is one disadvantage of limiters which use a single variable-gain tube whose gain is controlled by a dual-diode rectifier fed from the amplifier output.

The plate current meter in the 6SK7 stage, corresponding to your receiver "S" meter, actually shows the amount of compression. As compression occurs, the plate current drops from its full-scale steady state. The scale of the meter may be calibrated directly in "db compression". A full-size sample scale is shown in *Fig. 5.*

The "attack time" of the limiter circuit is on the order of .001 seconds for full gain reduction. The "recovery time", required for the unit to return to 90% of full gain, is determined by the time constant of the parallel resistor and condenser in the ground return of the 6SQ7 rectifier circuit.*

Experience has shown a 1-megohm resistor shunted by a 0.25 µf condenser to be well-suited for voice operation. The recovery time is sufficiently long to prevent the amplifier gain from varying at the syllabic rate of normal speech, and yet it is short enough to prevent loss of low level passages due to a prolonged reduction of gain. In operation at W4RXO, the "gain reduction" meter hovers around 6 db during normal speech, and the output level is set to give 95% modulation with about 10 db limiting. This may sound excessive to the broadcast boys, but remember that in amateur work we are dealing only with voice transmission and not with high quality program material.

Construction

Two-watt fixed resistors are used throughout, except for the 15,000 and 20,000 ohm resistors in the voltage divider circuit for the 6SK7 screens, which are 10-watt wire wound resistors. Note the use of good quality transformers. This contributes

(Continued on page 62)

*If you would like to experiment with the "recovery time," the following table will be of interest.

R	R x C	90% gain recovery
10 megs	2.5	5.2 seconds
5 "	1.25	2.6 "
2.5 "	.625	1.3 "
1.25 "	.313	.65 "
.5 "	.125	.26 "

CQ's World Wide DX Contest

In keeping pace with the times, the CQ World Wide DX Contest for 1952 includes the new 21-mc band. Remember there is now contest activity in the five principle DX bands.

In general the rules are identical to those employed within the past two years. No major changes are anticipated in the log sheets. However, please note that contest logs will ONLY be available from the CQ DX Committee, c/o W6QD, 1140 Crenshaw Blvd., Los Angeles 19, Calif.

Completed logs must also be sent to the DX Committee address to insure prompt handling. Logs sent to the CQ Editorial office may be seriously delayed.

(Due to the changeover in the Editorship of CQ the World-Wide Contest has for the past few years borne the brunt of considerable criticism. It is felt, however, that this contest will run very smoothly due to the very capable management by the DX Committee. It is anticipated that preliminary and claimed scores will be printed in the February and March issues of CQ.)

1. **Contest Period:**
   PHONE SECTIONS: 0200 GMT October 25 to 0200 GMT October 27.
   C.W. SECTIONS: 0200 GMT November 1 to 0200 GMT November 3.
   (See time chart for local times and dates.)

2. **Bands:** The contest activity will be in the 3.5, 7, 14, 21, and 27/28 mc. amateur bands.

3. **Competition** will be divided into four sections as follows:
   (1) One-operator phone section
   (2) Multiple-operator phone section
   (3) One-operator c.w. section
   (4) Multiple-operator c.w. section
   Stations in both phone sections may contact each other, and stations in both c.w. sections may contact each other, but no contacts between phone and c.w. stations will be allowed.

4. **Equipment:** There will be no limit to the number of transmitters and receivers allowed, and competitors may use the maximum transmitter power permitted under the terms of their licenses.

5. **Serial Numbers:** C.W. stations will exchange serial numbers consisting of five numerals, the first three being the RST report, and the last two being their own zone number. Stations in Zones 1 through 9 will prefix their zone number with zero (01, 02, 03, etc.) Phone stations will exchange serial numbers consisting of four numerals. The first two being the readability and strength report, and the last two being their own zone number. Phone stations in Zones 1 through 9 will prefix their zone number with a zero (01, 02, 03, etc.).

6. **Contacts:** Contacts between amateur stations on different continents shall count 3 points; contacts between amateur stations on the same continent, but not in the same country, shall count 1 point; contacts between stations in the same country, for the purpose of obtaining zone and/or country multipliers, shall be permitted, but no points will be allowed for these contacts. More than one contact between stations on each band will not be permitted.

7. **Multipliers:** Two types of multipliers will be used: (1) a multiplier of 1 for each zone contacted on each band, (2) a multiplier of 1 for each country worked on each band.

8. **Awards:** 1st, 2nd, and 3rd place certificates will be warded for each of the four Sections as follows:
   A. To the highest scoring stations on each SINGLE BAND in the following areas:
   (a) Each call area of the U.S.A.

CQ WORLD-WIDE DX CONTEST SCHEDULE

TIME ZONE	STARTING TIME	ENDING TIME
Greenwich Mean Time (GMT) (London)	Saturday, Oct. 25, 0200 Saturday, Nov. 1, 0200	Monday, Oct. 27, 0200 Monday, Nov. 3, 0200
U. S. A. Eastern Standard Time	Friday, Oct. 24, 9:00 P. M Friday, Oct. 31, 9:00 P. M.	Sunday, Oct. 26, 9:00 P. M. Sunday, Nov. 2, 9:00 P. M.
U. S. A. Pacific Standard Time	Friday, Oct. 24, 6:00 P. M. Friday, Oct. 31, 6:00 P. M.	Sunday, Oct. 26, 6:00 P. M. Sunday, Nov. 2, 6:00 P. M.

• CQ'S WORLD-WIDE DX CONTEST LOG •

CALL 4X4RE COUNTRY Israel PHONE ☐ C. W. X

LOG FOR 14 MC. BAND (Use separate log for each band.)

CALL LETTERS OF OTHER OPERATORS NR. OPERATORS one

DATE (GMT)	TIME (GMT)	STATION	SERIAL NUMBERS		FILL IN ONLY WHEN QSO IS A MULTIPLIER		POINTS (1 or 3)
			SENT	RECEIVED	WAZ ZONE NR.	NAME OF COUNTRY	
Nov 1	0700	CE3AG	57920	57912	12	Chile	3
"	0703	HZ1KE	58920	58921	21	Saudi Arabia	1
"	0706	W4KFC	59920	58905	5	USA	3
"	0708	4X4BX	59920	59920	20	Israel	
"	0710	CR5AC	56920	56935	35	Port. Guinea	3
TOTAL NUMBER ZONES, COUNTRIES, POINTS:					5	5	10

This is a sample contest log showing the method of entry and the totals. Contacts for each band are to be kept on separate sheets. This will make scoring faster and insures your correct total being applied for the proper band. Note: In the "Name of Country" column it is only necessary to list that country when the QSO counts as a multiplier.

(b) Each licensing area of Canada and Australia
(c) All other countries

B. To the stations having the highest combined total on ALL BANDS (or more than one band) in the following areas:
(a) Each call area of the U.S.A.
(b) Each licensing area of Canada and Australia
(c) All other countries

Certificates will also be awarded to each operator of each winning station in the multiple-operator sections.

9. **Scoring:** The contest score for each single band is the sum of the zone and country multipliers of each band, multiplied by the contact points of that band. The total all band score is the sum of the zone and country multipliers of all bands, multiplied by the total of contact points on all bands.
A. Everyone who sends in a log for a single band is eligible for a single band award only.
B. Those who submit logs for two or more bands will be eligible for the all band award, as well as the single band ward.
To check your own zone number and continent for scoring purposes, refer to our country list form.

10. **Zones and Continents:** as defined in CQ and the CQ DX Handbook, as well as on the W.A.Z. maps, will be recognized, and for continental boundaries, the same as used for W.A.C. will be recognized. Should any question arise as to the positive location of any station, the official definitions will be final. Copies of the country list and contest logs are available from the Los Angeles address listed below, upon receipt of a stamped, self-addressed envelope, or in the case of overseas stations, unattached postage stamps.
All logs must be postmarked no later than December 15, 1952. Send logs direct to:
Herb Becker, W6QD,
DX Contest Committee,
1140 Crenshaw Blvd.
Los Angeles 19, Calif.

Operating Suggestions:

Attention: Foreign Amateurs! It is recommended that you give the call letters of the station you are working at the end of a transmission, instead of just "BK," as this would prevent much QRM of stations piling on and calling you.

We suggest that overseas phone operators indicate which end of the band they are tuning, or which portions of the phone band (American or foreign) they intend to tune. On 28 mc, where the band is 1700-kc wide, it is extremely important that overseas phone stations specity the approximate frequency they intend to tune. C.W. stations, likewise, could greatly assist by indicating where they intend to tune. We think if the above principle is used by all, it will result in far less QRM, as well as fewer useless calls.

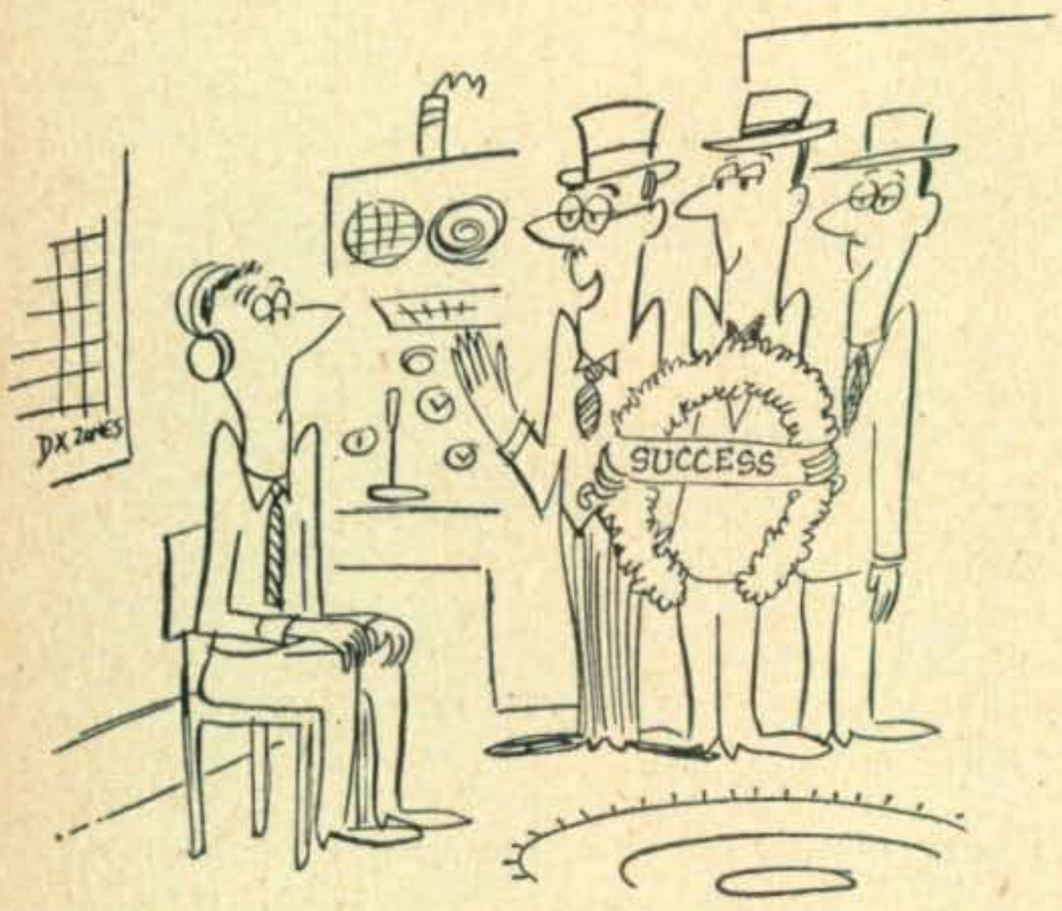
Foreign amateurs, remember scores are based on the greatest number of different countries and zones as well as stations worked. Do not concentrate on working only U. S. stations, this is a world-wide competition!

Adventure in PODUNK

Somewhere in Pennsylvania—W5RXC/3

It was with the usual misgivings that I unloaded the rig and started the job of trying to get an antenna in the air. Compared to the old QTH in Albuqurque, I was positively enclosed by trees and power lines.

I had carted the rig almost two thousand miles. To be honest I had looked forward to the change with a good bit of enthusiasm. The location looked ideal from that distance. I would have the room for rhombics, a brace of them if I so desired. I was to have free rein over a plot comprising close to fifteen acres. Better still, it was all located almost 200 miles from the nearest TV station and twenty miles from the nearest town of any size. In short, had the destination been located in Arkansas it would have been, frankly, backwoods. In Pennsylvania, though, nothing is backwoods, according to the natives at least.



". . . the reception was hardly what I expected . . ."

My first remarks upon my arrival concerned the TV antennas which had popped up like gourds in wet weather. They were not ordinary antennas. You have heard of stacked arrays. These were piled, five . . . six . . . eight antennas high with elaborate rotators and towers ranging up to ninety feet. I was told, in tones reserved for idiots and flat land furriners that Philadelphia, Washington and, sometimes, New York came through fine. After a few minutes you "got usted" to the snow and it didn't bother you at all. I examined two of the layouts and wasn't a bit surprised to find that two boosters were the practice rather than the exception and there were brave souls considering adding a third. My hopes fell lower than an underground antenna.

After examining the fifteen acres I found that if I did any hamming it would probably be with such an antenna. The house was neatly boxed by power lines. Not the low voltage type, although they were there too, but the nice 22,000 volt kind with 440 branches finishing the square. Further, the house was nicely shaded in summer. To be honest it was shaded the year around by trees towering even higher than the power lines. My escape in the best direction was neatly blocked by a combination electric-telephone line.

With the assistance of a protractor and a little high school geometry, or was it algebra, I started figuring line heights. When the brain racking was finished I had what I had suspected all along. In short, the lines were too low to go under and too high to go over. With fifteen acres at my disposal I was neatly enclosed in a plot smaller than a city lot.

With tears in my eyes I unpacked the beam. At least I had a two story house to hang it on. It was assembled and while the local populance watched "another TV antenna go up" it was dragged vertically through the trees to THE TIN ROOF. From my perch I tried to figure which wire to put it on a level with and finally decided on one of the higher 440 lines. After the usual amount of profanity and nine skinned knuckles it was sitting securely in position.

It didn't take long to see that loading an antenna five feet above a tin roof is entirely different from one in space. I finally compromised and it loaded very nicely pointing East. Unfortunately it didn't seem to radiate pointing in any other direction.

By seven, that first evening, I had realized that the antenna was a flop. I also had eight small children and almost as many adults standing around wanting to know why I had put up the antenna if I didn't have a TV. All the explaining did no good but by noon of the following day the word had spread that Podunk had a broadcasting station.

(Continued on page 64)

Converting the PE-101-C Dynamotor

GORDON H. MILLAR, W9KUZ* and WILLIAM WOLLIN, W9GWK*

This is a useful project for the mobileer. As the author points out, the backbone of many mobile installations, the PE-103 is becoming more and more expensive and harder to find. A substitute had to be found and the "lowly" PE-101-C came to the rescue. —Editor.

With PE-103-A power units fast disappearing from the surplus market (even at $29.95) a recent attempt was made to see what could be done with an inexpensive dynamotor. While looking through the collection of surplus equipment in the shack, we came upon a shiny, brand new PE-101-C. This unit was originally used to power the BC-645 and

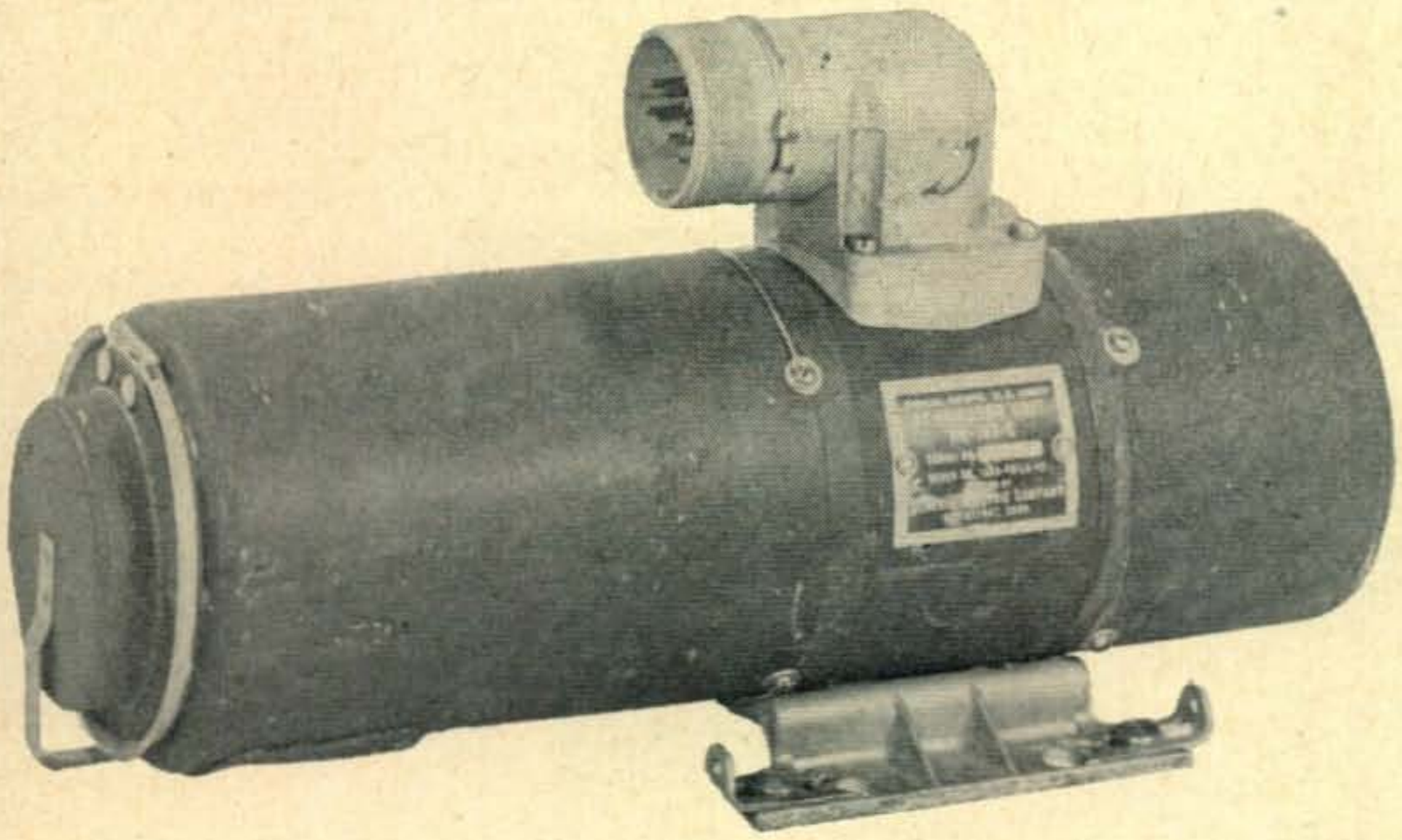


Fig. 1. The PE-101-C is no thing of beauty and first appearances would disclose little if any potential use in ham radio.

we had invested less than $2.00 in it. After some deliberation and a little tinkering here and there it was decided that this unit could be made into an efficient mobile power supply without too much effort. As the transmitter to be used was intended to operate at about sixty watts input some investigation into the innards of the PE-101-C was in order to see how seriously we had to take the 20 ma. high voltage rating. We found, upon dismantling the unit (which was sacrificed to the cause), that the 20 ma. rating of the high voltage winding may well have been about 200 ma. for ICAS, so, in view of this, we promptly embarked on our modification project.

The PE-101-C

The PE-101-C is a multiple-winding dynamotor which is shown in *Fig. 1* in its original form. It has the appearance of a large balogna sausage with a goose neck on top. One end encases a sealed-in-oil 800:1 reduction gear unit which was used in the original installation to key the transmitter. The dynamotor was designed to operate on either thirteen or twenty-six volts by placing the primary windings either in series or parallel. The ratings on the name plate are for continuous service and are as follows:

Input Volts-13/26 Input Amps-12.6/6.3
DC Output Volts-800/400 Output Amps-.020/.135
AC Output Volts-9@80 cps. AC Output Amps-1.12

After disassembling one of these units we concluded that the secondary windings were identical, and that even under conditions of continuous service the 800 volts could be rated at least at 135 ma. In amateur mobile service (except for the extra windy rag chewers) this rating could be substantially increased.

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*204 North Pinckney St., Madison 3, Wisc.

Figure 2 is a schematic diagram of the windings in the unit and their electrical relation. Note that there is only one ground point at the negative high voltage. The primary windings are completely separate so that there is no problem of positive or negative ground.

For the application described we decided to use a six volt charge, twelve volt transmit to take full advantage of the dynamotor output. The dynamotor will work well on six volts for low power installations. The following are measured output ratings under load for twelve and six-volt operation. These are simultaneous ratings.

Twelve Volt Input	Six Volt Input
Pin M to ground	Pin M to ground
Pin H to ground	Pin H to ground
610 volts @ 150 ma.	300 volts @ 90 ma.
325 volts @ 125 ma.	160 volts @ 110 ma.

In spite of the fact that the transmitter that we used imposed the above load on the power unit, this is no indication that this is the upper limit of loading. During none of the tests did the dynamotor even get warm. The voltage ratings listed above may be increased about ten volts by removing the fan.

Conversion of the Dynamotor Unit

Taking a pair of side cutters, remove the safety wires from the bolts which secure the aluminum end bells, and loosen, but do not remove, the eight bolts. Open the cover on the long end and remove the four countersunk bolts which are visible. Slide both end bells off. With a pair of pliers remove the pin from the end of the armature shaft which connects to the gear box drive. With a long screw driver that has a good clean end, reach in through the open side of the reduction gear mounting bracket and remove the four bolts holding the gear box in place. Remove the gear box.

Take off the snap ring on the goose-neck fitting and remove the top. Clip the wires close to the disk and tag them if the color code is not legible. Then remove the entire top assembly.

Now, turn the dynamotor over and remove the mounting plate. Replace the bolts in their original holes, leaving the base off. With a sharp half-inch drill carefully drill two holes in the base so that when the wires which are sticking out of the top of the dynamotor are fed through these holes the base will fit snugly up against the frame of the unit in its original position, but on the side from which the goose-neck was removed. The wires will now protrude through the holes that you have drilled in the base, which may be bolted on in this position by slightly enlarging the mounting holes in it and using the bolts which originally secured the goose-neck. These bolts should be shortened a bit so that they will not interfere with the field windings inside. Bolt the base plate on. (If the base plate is bent, do not try to straighten it as the metal will fracture.)

Pull out the thin white wire marked *cam switch* and discard it. If the a.c. is not wanted remove the brushes and their wires.

Take the long end bell and cut it down to the same length as the short one and provide mounting notches. You will have to find the best way to do this, as we have bent more than one in this operation. Cutting on a lathe seems to be the best way. (At this time if the extra ten volts is necessary remove the fan from the end of the armature shaft.) Replace the end bells.

This completes the conversation of the dynamotor. To make a neat job mount the entire unit on a three by five by twelve inch chassis (as shown in *Fig. 3*) in which you can place the relays, filters, etc. In our installation the entire unit was shock mounted.

The Control Circuit

For either six or twelve-volt operation the low

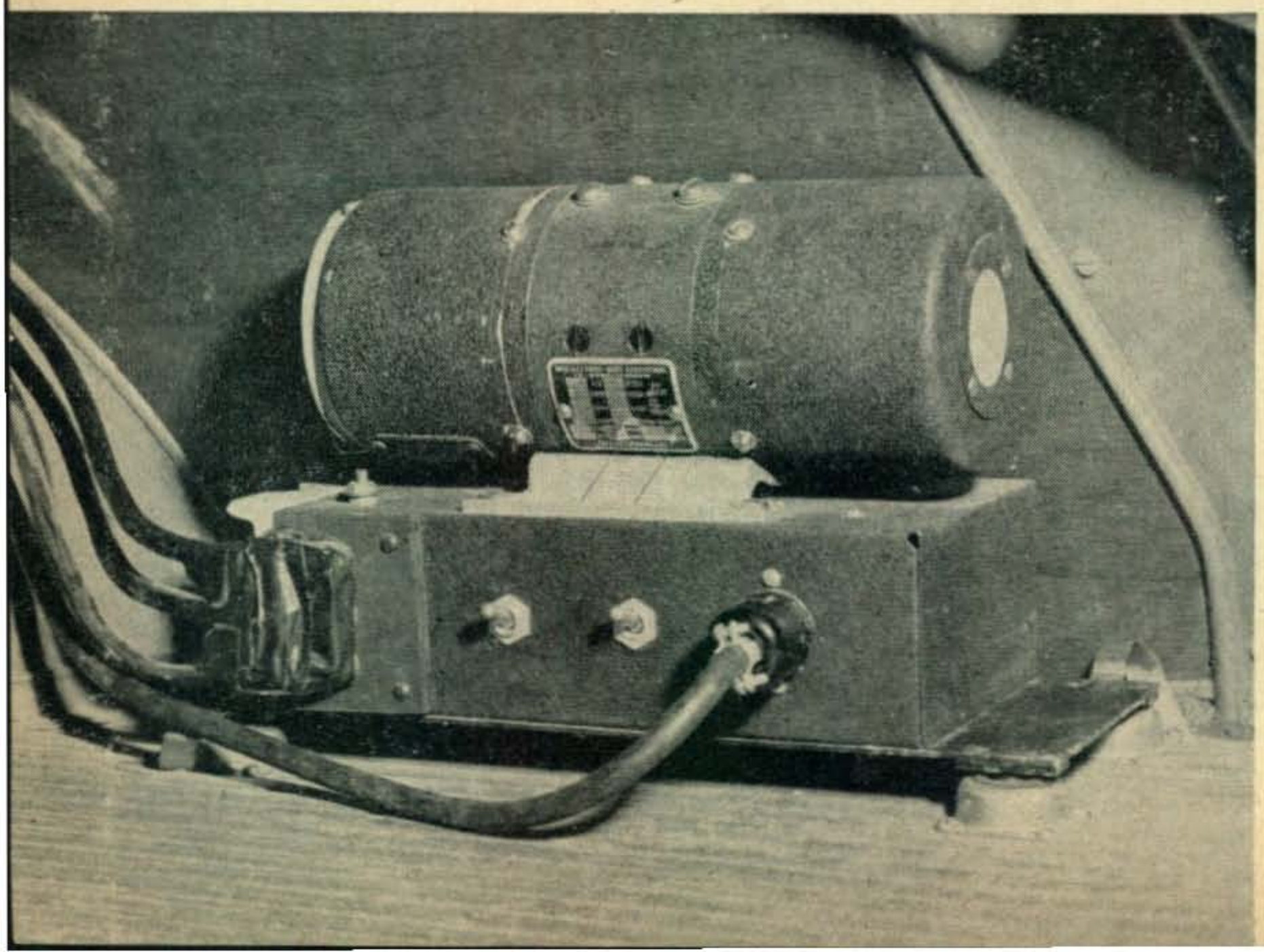


Fig. 3. This is the converted unit. The gooseneck connector is removed and whole dynamotor turned over to put the opening at the bottom facing the new chassis containing the filters, etc.

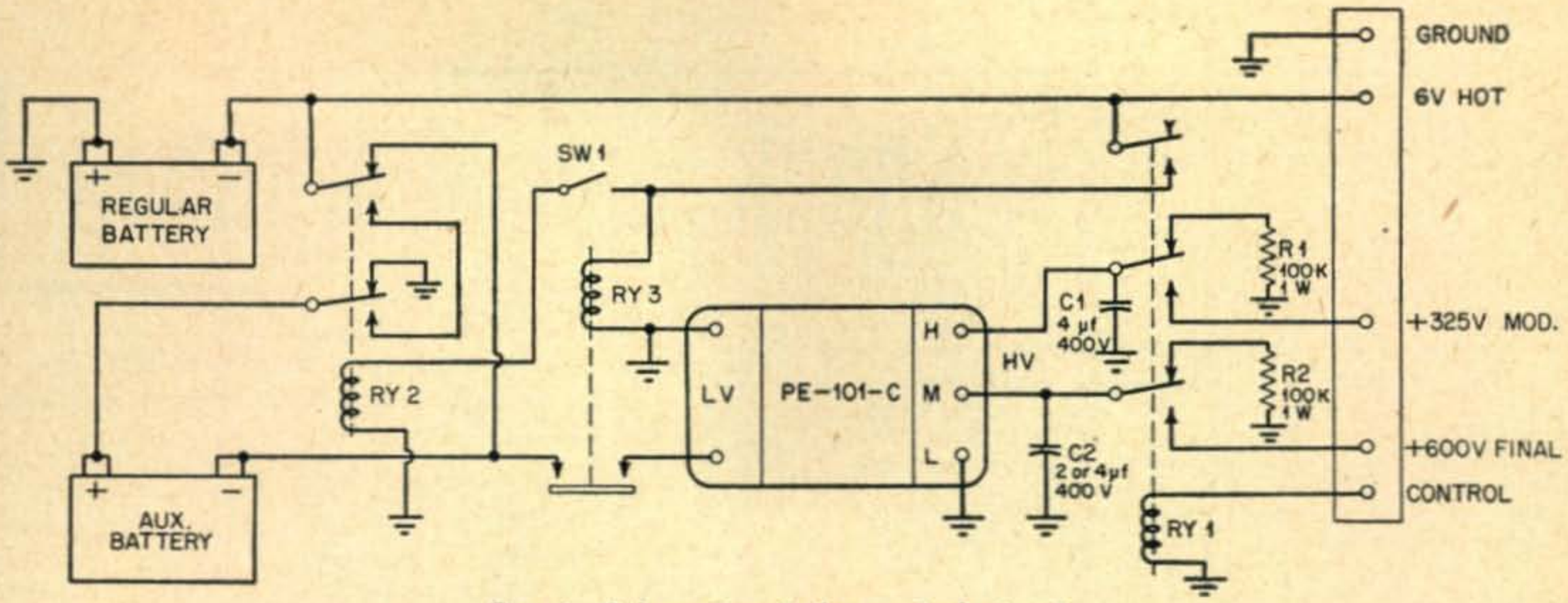


Fig. 4. Schematic of the control circuit.

voltage windings on the dynamotor are placed in parallel. In this installation twelve volts is used and the control circuit shown in *Fig. 4* employed. This circuit places the two batteries in parallel for charging and in series for transmitting.

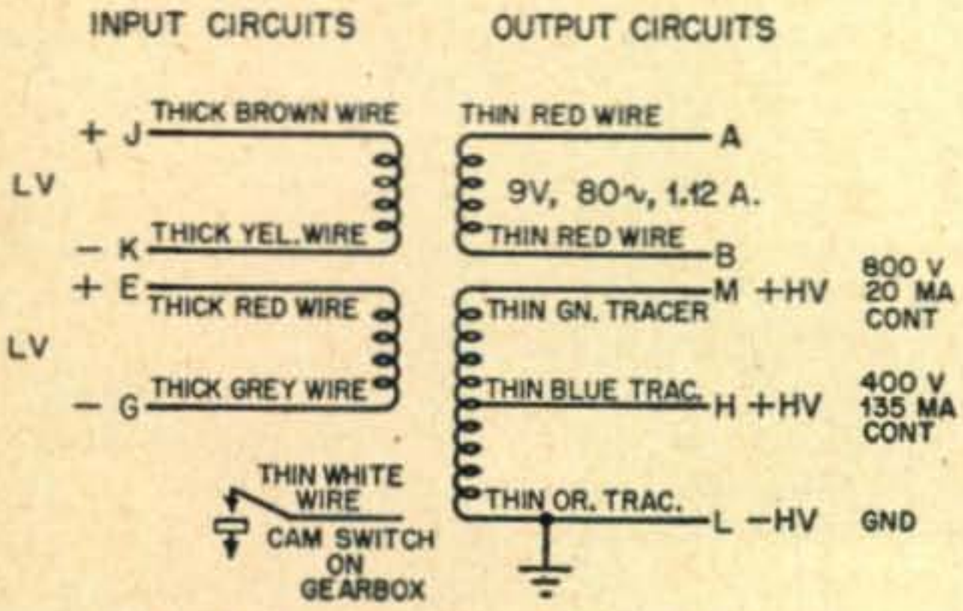


Fig. 2. Schematic of the windings.

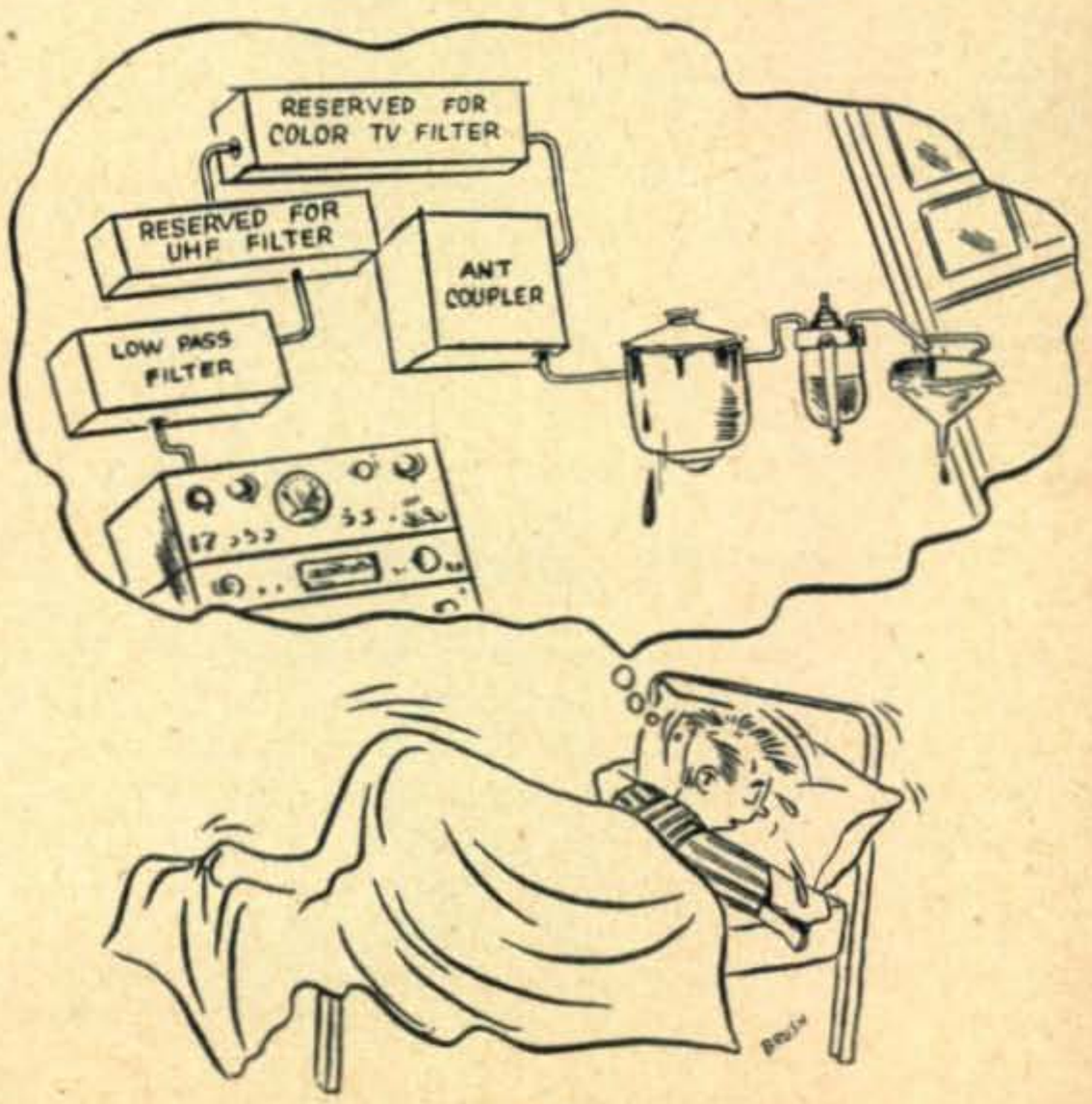
We first operated this circuit with some misgivings. Relay *RY2* switches the batteries from series to parallel as the occasion demands. In the event the batteries are not both of the same vintage, it may be possible, under starting conditions, to draw excessive current through the relay *RY2*. With the transmitter in question, however, this has never occurred and no trouble whatsoever has been experienced with the control circuit.

The circuit operates quite simply. Under normal conditions the batteries are operated in parallel so that the auxiliary battery will be kept fully charged. When the press-to-talk button is depressed for transmitting, the relays operate; the auxiliary battery is placed in series with the regular battery, and twelve volts is applied to the dynamotor. In the event low power operation is desired for initial tune-up or local QSO's, switch *SW1* may be used, which de-energizes the battery switching relay and applies only six volts to the dynamotor.

In the present installation the intermediate winding on the dynamotor is used for the modulator and oscillator sections of the transmitter and the high voltage winding used for the final. The transmitter uses a 6146 and runs about sixty watts input on AM phone.

Ry1—High voltage relay, Miniature type, TPDT
Ry2—Battery switching relay, 15 amp contacts min.
Ry3—Dynamotor starting relay SPST
Sw1—SPST switch, six volt-twelve volt switch.
C1—4 mfd. @ 400 volts, Filter capacitor
C2—4 or 2 mfd. @ 800 volts, Filter capacitor
R1, R2—100,000 ohm resistors @ 1 watt

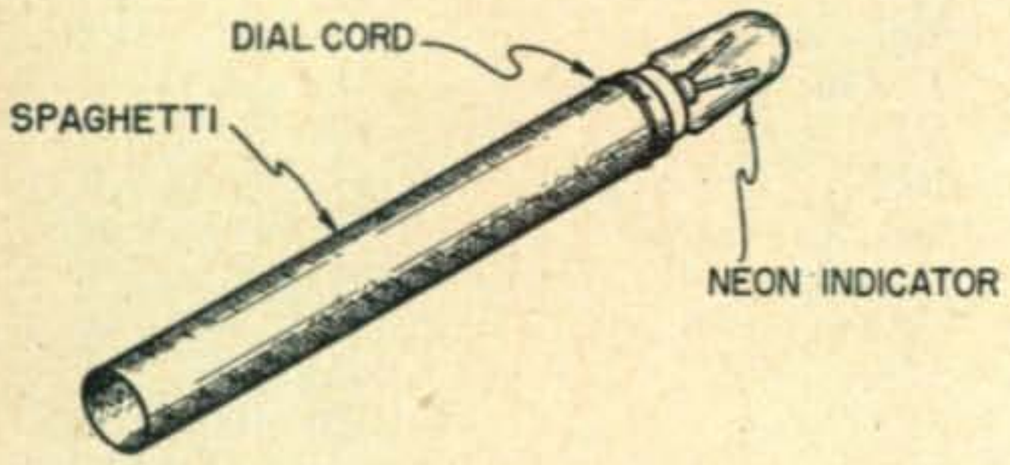
These dynamotors are still available for $2.95 plus shipping, and when this is considered with the cost of the relays and filters the total cost is about $15.00. The only disadvantage (if it is one) is the auxiliary battery. Most hams who use PE-103-A's find the extra battery helpful. The added expedient of the separate modulator winding and the flexibility offered by two voltage ranges (to our way of thinking) more than offsets the disadvantage of the extra battery. The unit is compact, too; its size, when converted, is smaller than the PE-103-A.



AFTER A NIGHT OF DE-TVI ING THE RIG

Inside the Shack and Workshop

Your S & W Editor still needs more good ideas for this column. Don't let your nifty stunts go to waste. Rough sketches of circuits are satisfactory, and if you have photos of the idea—send them along. Each idea is worth $2.50 in cash—or a year's subscription to CQ. All S & W contributions should be addressed to Shack & Workshop Editor, c/o CQ Magazine, 67 West 44th Street, New York 36, N. Y.

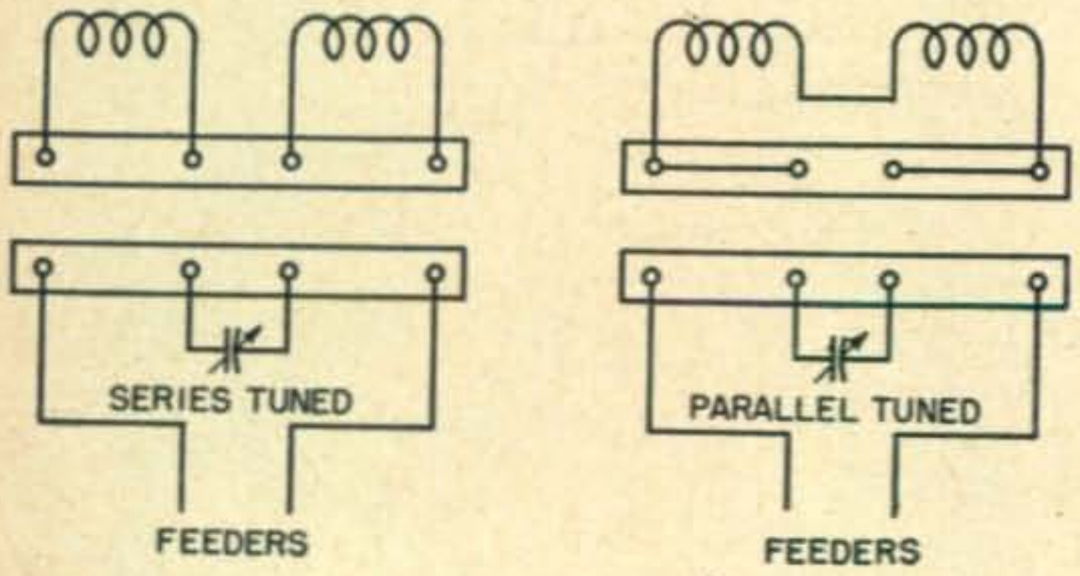


Neon Bulb Holder

There is no doubt that a neon bulb has many uses in the average shack. They are excellent inexpensive r.f. indicators. However, in holding the bulb in the fingers you can be flirting with a severe shock, or a painful burn.

A simple holder for a neon bulb can be fashioned in a few moments from a piece of giant spaghetti or large diameter fibre tubing. Screw the bulb into one end of the tube and secure it with a turn or two of dial cord. The result is a convenient shock-proof holder.

Otto Woolley, WØSGG

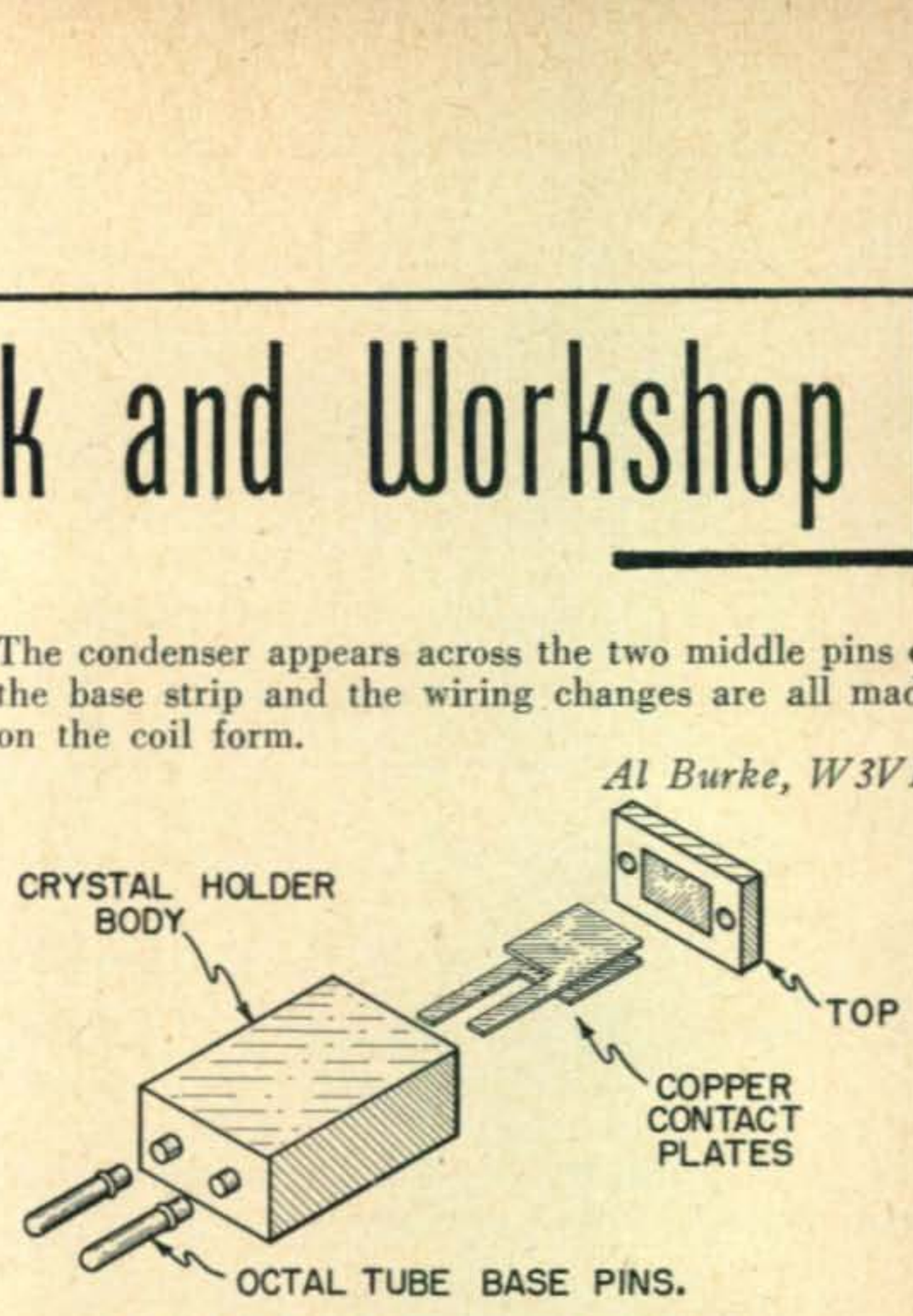


Series/Parallel Tuner

While this idea is not new it is something that has many uses. At W3VR it has been used to tune the feeders of an 8JK antenna. This antenna has series tuned feeders on 20-meters and parallel tuned feeders on 10-meters. Usually this can only be done with clips and at least two tuning condensers.

In the schematic note that regular B. & W. coils have been slightly modified to permit parallel tuning. The condenser appears across the two middle pins of the base strip and the wiring changes are all made on the coil form.

Al Burke, W3VR

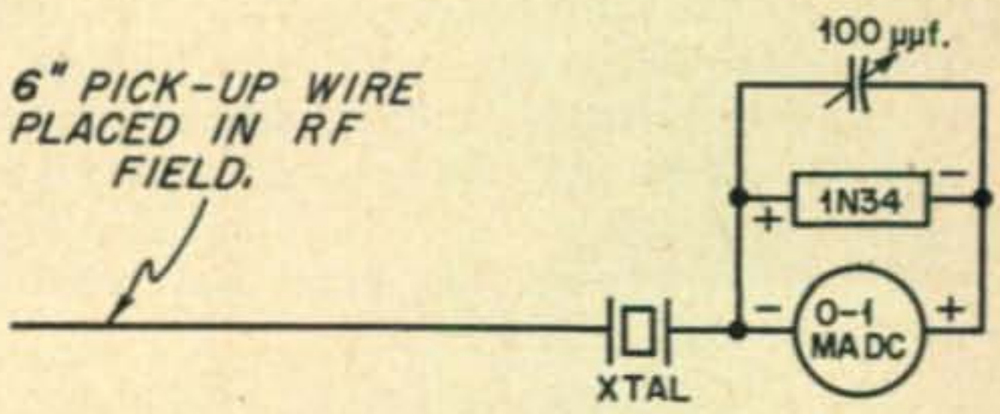


Modified Crystal Holder

To easily rework your surplus crystal holders have one-half inch spaced pins which are too big to fit into FT-243 crystal holders, I use pins removed from an octal tube base. These are just right to telescope into the larger size crystal socket pins, making a perfect fit for the FT-243 holders.

The first step is to unscrew the top of the crystal holder and remove the crystal and plates. Melt the solder in the holder pins and pull out the two copper contact plates. Then saw off the crystal holder base pins leaving a 1/8 inch stub. Next crack an old octal tube base and remove the pins. Clean out the solder and file off the ragged edges where they were riveted in the base. Now reinsert the two copper contact plates, fit on the new pins and re-solder.

Robert B. Kuehn, WØHKF



Spot Frequency Checker

The gadget in the accompanying schematic may be used to spot check your v.f.o. if you must operate with the crystal controlled boys on a net frequency. The meter will show a very sharp deflection at the crystal frequency. The variable condenser is necessary in order to bring the crystal circuit to within a few cycles, otherwise the antenna and the position of the circuit in the r.f. field may have a pulling effect. Observe the polarity indicated in the schematic as this is very important.

From the "MARS Bulletin"
L. G. Tompkins, W4PJI

Amateur Teletype

A Bi-monthly Department Edited by WAYNE GREEN, W2NSD*

Would You Care For Some?

Writes W8HP: "Detroit is, at long last, on the amateur RTTY map!!!! I noted in your last bulletin that one W8BYB was listed as having a machine and, therefore, interested in teletype. So, armed with this information, I called him on the phone—made a date—kept it—and was greeted by one of the great surprises of my life: W8BYB was READY TO OPERATE—all set up and looking for someone to talk to him! To make a long story short—admitting meanwhile that I had had a printer for nearly a year and had not even connected it up to see if it worked—I jumped into the business with both feet, and can now report that on June 3rd we had the FIRST DETROIT QSO ON RTTY! I have done nothing but eat, sleep, think, work, and dream RTTY for the past 30 days. But not since 1924, when I made my first Australian DX (80 meters) have I had so much pure fun. *It has been wonderful* and we are just getting started out here. Very shortly we will have another going—W8DLT—who has a model 26 machine. Three of us on the air should make it especially interesting."

The activity of the FCC in the amateur teletype field seems to have catharticized a lot of fellows into rather feverish interest in getting ready to get on the air with printers. The upsurge in my mail has really been quite a surprise to me though, considering that the heat of summer is upon us and the attics and cellars, wherein lie most of the hamshacks, are practically unbearable. That and vacations should have slowed things down; what is it going to be like in the fall? No complaints—just amusing.

Most of the letters want to know where more information on amateur teletype is available. The answer to that is that there is precious little information available. The best way to go about learning about teletype is to read this column and get together with the nearest amateur that has some teletype gear. Don't be surprised if he can't answer your questions, though, for even a lot of the gang that are on the air still have only a sketchy understanding of the details. The procurement of equipment was discussed thoroughly in the June column, so if you ask me about it I will only refer you to that source.

Mystery Exposed

The rapid influx of new faces in the amateur teletype ranks has brought about a demand for more information on the subject. Herewith is a simple approach to the operation of a teletype machine via radio.

Teletype machines normally operate by means of d-c pulses sent along a wire line. All we have to do in order to operate these machines from a radio signal is to convert the received signal into similar d-c pulses. For this job we use the regular station receiver and a "receiving converter."

Radio teletype signals on the lower frequency bands use type F-1 emission which is called frequency shift keying or FSK. As the name implies the frequency of the transmitter signal is changed by a fixed amount when keyed, rather than going on and off as with c.w. This fixed amount of shift has been standardized at 850 cycles between the two signals. To identify the two they are called "mark" and "space," with the mark signal generally being the higher frequency of the two.

The station receiver is used to change the received FSK signals into two audio tones which are also 850 cycles apart. (With the b.f.o. on, tune your receiver into any teletype signal and you can hear this.) In order to get a minimum of trouble from fading, noise, and interference these audio tones are adjusted for mark to be 2125 cycles and space 2975 cycles (still 850 cycles apart). This choice of audio tones avoids possible trouble from harmonics of the 850 cycles which might be set up due to multi-path reception, producing tones of 850

Chart 1

	Mark	Space
Receiver Local Oscillator:	7567.125 kc	7567.125 kc
Received Signal	7110.000 kc	7109.150 kc
Difference (i.f. signal)	457.125 kc	457.975 kc
B.F.O. Frequency	455.000 kc	455.000 kc
Difference (audio tones)	2125 cps	2975 cps

Chart 1, illustrating the change in frequency of the received FSK signal as it passes through the component circuits of the normal receiver.

cycles, 1700 cycles, 2550 cycles, and 3400 cycles. Note that the mark audio tone is lower than the space audio tone due to inversion in the receiver caused by the local oscillator being higher in frequency than the received signal. **Chart 1** shows how the frequencies change as they go through a normal receiver. In this case the transmitting station is on 7110.000 kc., that is his mark signal is on this frequency. The space signal is 850 cycles lower, or 7109.150 kc. In order to receive this signal correctly the receiver local oscillator (455-kc i.f.) must be tuned to 7567.125 kc. This results in 2125 cycles output for the mark signal and 2975 cycles for the space signal. Thus the inversion is obvious.

Figure 1 shows a block diagram of the normal teletype receiving setup. So far we have converted the radio FSK signal into audio tones. The next operation is to convert the audio tones into d-c pulses. This is accomplished in the

* *Address all letters and correspondence to 1379 East 15th Street, Brooklyn 30, N. Y.*

receiving converter, the only piece of equipment that must be built by the amateur to receive teletype signals. Figure 2 shows the function of the receiving converter. The audio tones are first put through the limiter, a triode, which removes all but the loudest tone, thereby eliminating extra noises and leaving the audio tones clean. Next the tones are fed through a filter which is so tuned as to pass only one small band of frequencies.

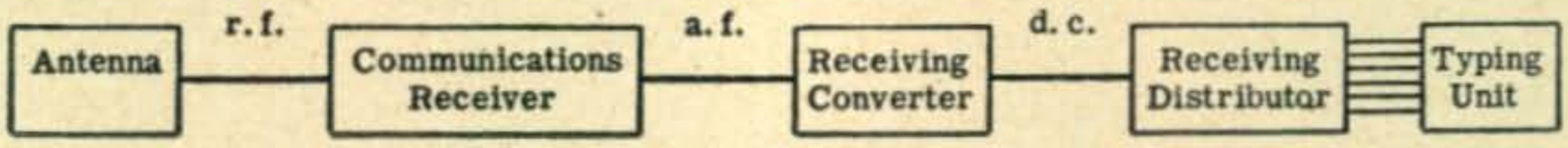


Fig. 1. The receiver setup of the normal teletype station, showing sequential arrangement of the basic component units.

The mark filter is tuned to pass 2125 cycles and therefore passes the mark audio tone and rejects the space tone. The space filter passes the space tone and rejects the mark tone. Following the filters is a detector which merely rectifies the audio outputs of the filters and applies the d-c voltage to the grid of the mark or space d-c amplifier. The detectors are usually small diodes such as a pair of 1N34's or a 6H6. The d-c amplifiers are normally 6V6's since they have enough plate current to operate the polar relay easily. The polar relay has two windings, one operated by the mark d-c amplifier plate current and the other by the space d-c amplifier. The d-c amplifiers are

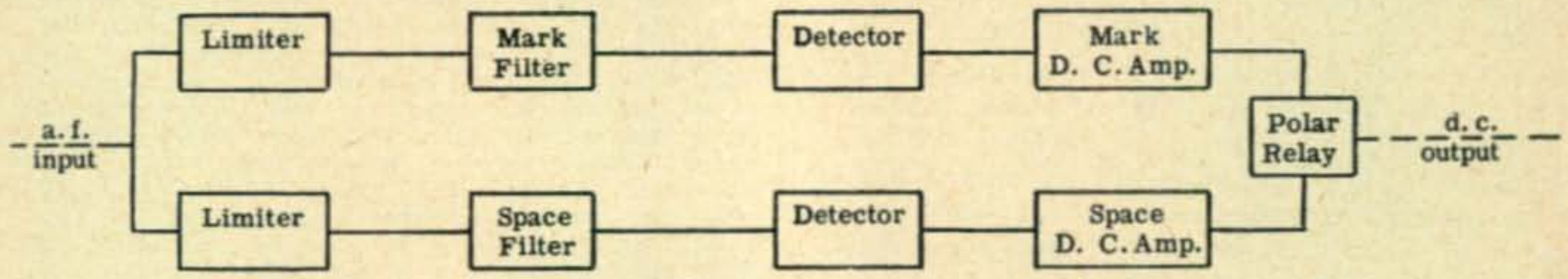


Fig. 2. Sectional diagram of the receiving converter, which converts the audio tones from the receiver into d-c pulses.

normally biased to cutoff so that no current flows through them until either a mark or space signal comes through. The polar relay has a single-pole-double-throw contact which furnishes d-c pulses to the distributor when operated.

Returning to Fig. 1 we see that we have now changed the receiver radio signal from radio FSK to d-c pulses. Thus we are able to connect the output of the receiving converter to any teletype machine and receive radio teletype. The receiving distributor, the next indicated block, is a part of the teletype equipment and is merely a switch which separates the units of the teletype code so that the five selecting pulses will go to the selecting mechanism on the typing unit and the sixth pulse will go to the sixth pulse or printing solenoid, causing the selected letter to print. The make-up of the teletype code was discussed in the December 1951 CQ, and the operation of the distributor in the February 1952 column. Polar relays were discussed in the June column.

All of the parts and circuits used in the receiving converter are simple with the exception of the filters. The W2BFD circuit was described in the November 1946 CQ. the W4OLL circuit will appear in the September 1952 CQ. On the west coast the W6AEE circuit is quite popular, while here in the east most of the fellows are using the new W2BFD circuit. The 1946 article explained how to construct the filters for the W2BFD circuit. These were made from midget output transformers. The W4OLL article will show how to build the filters using the new torroid forms. For those that are lazy the VHF Teletype Society has the W2BFD filters available at $16 for a complete set of four units, two for mark and two for space. The W6AEE circuit uses the filters from the BC733D surplus receiver which are originally tuned to 90 cycles and 150 cycles. Instructions for the conversion of these units to the mark and space frequencies are almost exhausted, but I do have a few copies on hand. A complete circuit daigram, parts list, instructions, and a full scale template are available from the VHF Teletype Society at cost: $3.50.

How much, then, would a complete teletype setup cost? The machine, as stated in the June column, will cost about $55 plus shipping, a total of maybe $70. The receiving converter will cost up to $50, depending on your parts supply. Additional control circuits and the audio oscillator for transmitting would add another $50 at the most. Complete converters, with all control circuits, all set to go can be bought custom-made for a little over $150. My complete converter and associated equipment cost less than $25, but then I had a good supply of tubes and parts. The maximum total then would be $220 for the complete teletype station, not counting the station receiver and transmitter. The minimum cost might be about what it cost me: $80. Hoot mon!

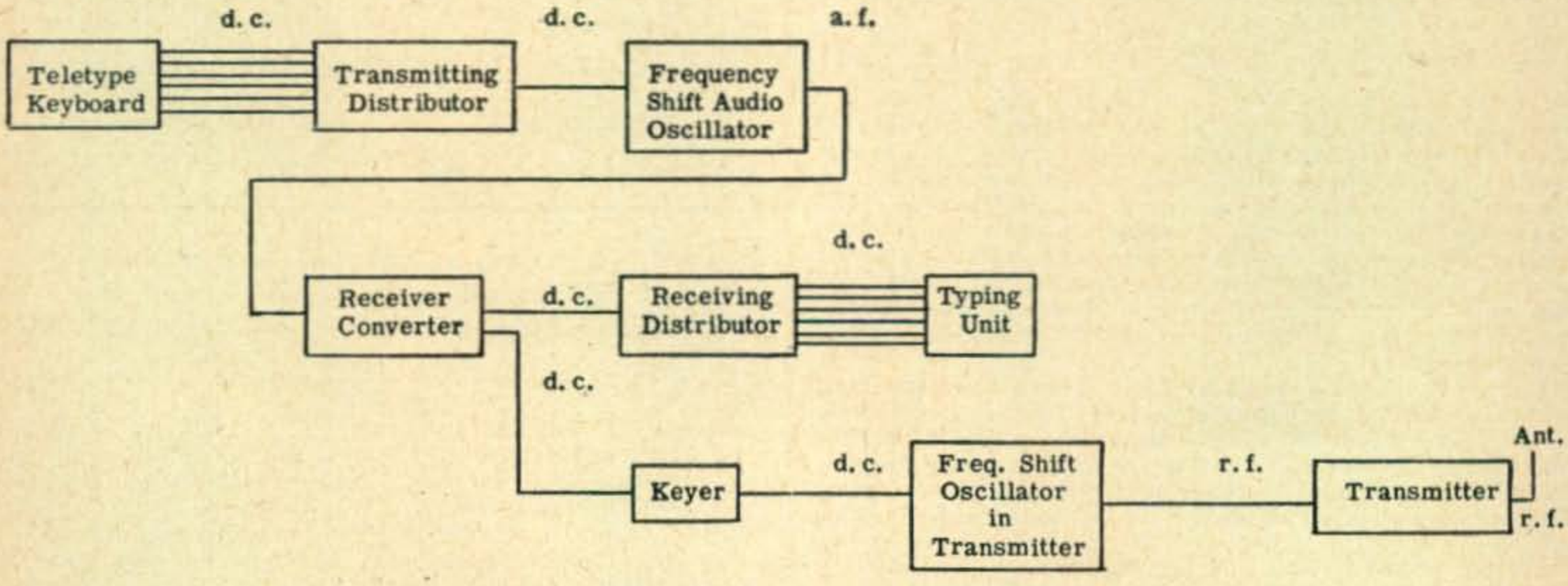


Fig. 3. The complete teletype transmitting chain. The typing unit prints on both transmit and receive.

Transmitting

In order to transmit teletype only two small extra circuits are needed. These two units are the audio frequency shift oscillator and the frequency shift keyer for the station transmitter oscillator. The relation of all of the units is shown in Fig. 3. When the keyboard is being used you naturally want to have the printer show what you are sending as well as to have the signals go through the transmitter.

The transmitting distributor is part of the teletype machine and serves to put the selected code in time sequential order so that it can be sent by means of one set of wires as d-c pulses. Without this distributor you would have to use one wire for each of the five selector pulses and one for start and one for stop. The audio oscillator, a small two tube affair, is tuned to 2975 cycles and the d-c pulses from the transmitting distributor connect an extra capacity across the circuit, lowering the frequency to 2125 cycles. In this way the mark and space tones are generated and then keyed by the keyboard. These audio tones are fed into the receiving converter which is disconnected from the receiver by the transmit-receive switch and connected to the audio oscillator output. Referring to Fig. 3 again you will see that this will give local copy when the keyboard is used. A second polar relay, connected in parallel with the first in the receiving converter, sends d-c pulses to a diode frequency shift keying unit such as described by Robert Weitbrecht in the April 1952 CQ. This diode connects to the transmitter oscillator and shifts the frequency by 850 cycles with the d-c pulses. This FSK signal is then amplified as much as either your purse or the FCC maximum power regulations permit and fed into an antenna.

One phase of amateur teletype that might not have been properly stressed, particularly in this column, since it is a phase of amateur radio that I have had little to do with, is traffic handling. This can be a major service of RTTY since the use of teletype would so greatly simplify and speed such doings. Correspondence with W6KYV has brought this point to mind. Dave, on top of the Brass Pounders League in the last issue of QST, and among the top three listed for over a year, has gotten the teletype bug and has recently put in a complete set of equipment, including tape gear. Optimum traffic handling would require, in addition to the regular printer, a tape transmitter and reperforator. With this equipment the incoming signal can be copied on the printer and punched into tape at the same time. Then if there are any corrections they can be swiftly made by feeding the uncorrected tape through the tape transmitter and have the reperforater make a new tape of it. Whenever a mistake is encountered it can be corrected on the manual keyboard and then the tape turned on again. With this type of equipment you can feed all of your traffic through at 60 w.p.m. without a falter and read a good book or build equipment while it all happens. I wonder how much time a fellow like Dave could save every month with RTTY?

History

W7LU: ". . . you might be interested in some RTTY history. Back in 1922, just 30 years ago, while I was pounding brass for the Federal Telegraph Company here in Portland, I had some first hand experience with commercial RTTY. The Federal Company operated a commercial radio telegraph service between Seattle, Portland, San Francisco, and Los Angeles using the Poulsen arc equipment. In experimenting with teletypes they were confronted with the problem of converting audio tones into d-c pulses. This was solved by use of a device known as the Hall jet relay. It consisted of a helix of fine resistance wire connected in series with the winding of a d-c relay and a battery, current being adjusted so that the wire was very hot with no signal. A fine jet of air (from a reservoir) was directed through the helix so that with no signal the jet had no cooling effect on the helix. Then the audio tone from a telephone receiver placed close to the helix would "spread" the air jet, cool the wire, and the relay would operate. Crude though this device may sound, it operated fast enough to follow teletype pulses. One could even whistle dots and dashes across the room and the relay would respond faithfully. Except for static and fading the teletypes operated fairly well, but the system was not stable enough for long-period commercial service."

Types of Printers

There are about six different models of teletype machines in common use by amateur stations. The largest percentage of the stations use the model 12 printer and the rest are split up among the model 14, 15, 19, 21A, and 26 machines. The model 12 and 21A machines are the only models presently available to the amateurs from commercial users at a reasonable price, hence their popularity. Actually, there is a great shortage of the new machines and both the commercial companies and the armed forces are having difficulty getting enough of them. Thus, even if you had the $3000 purchase price for a new machine you would have a hard time finding one.

The model 12 printer is pretty old-fashioned and generally makes quite a bit of noise compared to the newer machines. The 12 prints on the page type teletype paper which comes in rolls or in large boxes fanfolded. This printer consists of a typing unit, a keyboard unit, a table, a cover, and a polar relay. The typing unit uses solenoids to select the letter to be printed (see Feb. 1952 CQ, page 29), thus differing from the newer machines which use a mechanical selection system rather than an electrical one. The thinking behind this is that it is easier to teach repairmen to fix mechanical failures than electrical ones. The typing unit has a motor on it which furnishes the power to print the letters and other functions such as line feed and carriage shift. This motor may be either a d-c unit with a governor or an a-c model; either way the speed of rotation should be 1725 r.p.m. The motor must be quite close to this speed in order to synchronize the printer with the transmitted signal. The keyboard unit, in addition to the thirty-two keys, also has a motor, either d.c. or a.c., which runs at 1800 r.p.m. This motor has both the transmitting and receiving distributors geared to it. Both the typing unit and the keyboard unit slide along metal tracks mounted on the teletype table and plug into a jack strip which is also mounted on the table. The jack strips are mounted back to back in the middle of the table; the typing unit plugs in the back and the keyboard into the front. The keyboard unit is shown on page 26 of the Feb. 1952 CQ.

A keyboard perforator for punching teletype tape.

The model 14 is a much smaller and newer printer than the model 12. This model prints on paper tape rather than the page type paper. There is a drum on the right side of the case which holds the tape and feeds it through the typing unit and thence to the floor or waste basket. The keyboard unit of this printer has only a transmitting distributor mounted on it since the typing unit uses a mechanical receiving distributor. This transmitting distributor does not use a separate motor as does the one on the model 12, but takes its power from the motor on the typing unit by having a gear that meshes with the typing unit when the keyboard is plugged in.

When a tape printer such as the model 14 is used on circuits with the page type printers, as is almost invariably done in amateur work, it is necessary to rig up some sort of counting device to indicate when a full line of type has been sent, otherwise the page printers would have a pile of type all jumbled together at the end of the line. Thus, those using the tape printers must be careful to send signals for carriage return and line feed even though they do not need them for their own machines. Three methods are in regular use for counting the letters: 1) A ruler is mounted so that the tape passes by it and shows when a line is completed. 2) A stepping relay mechanism is used to count the letters and flash a light when the end of the line comes. 3) An electronic counter (a simple circuit consisting of a contact which is made each time a letter is printed, a condenser, and a neon bulb), which flashes a small neon bulb when the line end is reached. Of the three methods the last is the simplest and most foolproof. The circuit for this operation was devised by W2MYL and a copy of it is available from this department on request.

The model 15 printer is a much more modern unit and is in widespread commercial use today. The military model of this printer is known as the TG7B and quite a few of these units were sold as surplus. The 15 keyboard unit is similar to the 14. The typing unit is a page printer but has one major difference from the model 12 in that

the paper stands still and the basket of type moves back and forth with the typing. The model 12 is like an ordinary typewriter and the paper and carriage move as the letters are typed. The 15 also has a mechanical receiving distributor.

The model 19 is quite similar to the 15 but is more elaborate in that it has tape equipment built into it. This machine has the same keyboard and typing unit as the 15 but has a reperforator and tape transmitter added. The function of these tape units is described adequately in the Feb. 1952 **CQ** on pages 27-28.

The model 21A is only a typing unit and is completely different from any of the other machines. This model was used by Western Union in a multiplex system with one large distributor operating several machines. The units are quite small and operate almost silently. They print on a narrow gauge tape. There is no motor used in them, rather they use a set of solenoids for selecting the character to be printed (like the 12) and a heavy solenoid to make the letter print and advance the tape. The 21A is in wide use as auxiliary printers and repeaters for the living room (where their quietness and smallness fit them for use). They are also handy for under-the-dash mounting for mobile operation. The difficulty of course is the distributor, but that problem is being solved in many ways: W2RWV has made a distributor from an old electric fan motor: W1AFN is making up some face plates for the distributors, so the problem is about solved.

Finally, there is the model 26 printer. This unit is in wide use by the Bell Company and is similar to the models 14 and 15. The keyboard is just like the 14 and 15, but the typing unit is quite different. This unit prints on page paper and the paper and roller (platen) move back and forth with the typing. Like the 15 it uses mechanical receiving distribution. The big difference is in the type which is in a small horizontal wheel (or drum). All the other model printers mentioned have their type in a basket like a normal typewriter, while the 26's type is in a wheel similar to the method used in a two dollar toy typewriter. This wheel spins rapidly around until the selected letter is in front, then a hammer hits the letter (or pallet) and causes it to jump out of the wheel and hit the paper. The 26 is not as wear-proof as the basket style of type carrier and is not usually put into 24 hour-a-day operation. This is no problem for the amateur since the machines are used only a small fraction of the time that they would normally be under commercial conditions.

Mail

One thing about the mail surprises me a bit. I know that there are quite a few amateurs that are violently emotional about teletype, yet I have not had any letters from them yet giving me any indication as to why anyone should feel like this. The recent proposal by the ARRL to restrict all FSK teletype to the novice section of the 40 meter band indicates that forces are at work, but I sure haven't heard from them. If this feeling exists outside of the ARRL inner circles why hasn't even one single such letter come to me?

What sort of things do I find in the mailbox after the mailman has passed and is trudging down the hot humid Brooklyn street? Waaal: **W4KDQ**: "I operated an AN/GRC-26 (wotin deworlt is that?) while in the Army and know what enjoyment can be derived from two-way radio teletype communications. I would be interested in learning if anybody in Southern Florida is doing any radio teletype on an amateur basis, and if not, I'm willing to make the plunge solo." **W1BGW**: "Have a model 12 printer that I obtained through W2BFD and also a 21A. Also have receiving converter as per W2BFD and receive commercials and government stations OK. Waiting for F1 to be authorized on the low frequencies. Will probably be on 80 meters with F1."

W4VRX recently moved to Louisville and now has started out with a new call (ex-W3QPD Erie), new antenna, new YL, and a new motor for his model 12 printer.

W1MFY offers to help any hams interested in RTTY in his area (Maynard, Mass.) since he has Army teletype experience.

W8PTF (Dayton) and **W4PCT** expect to be on two meter RTTY soon, thus stepping up the activity out Ohio way. Maybe that will get Jerry (W8WJC) back on again. Might even get ol' Sam, W8UKS, to get a printer to go with his receiving converter now that he is back on the high frequencies and leaving ZS6DW alone on 75 meters with the static.

WØOOT: "Am quite interested in traffic work and think teletype would really be the deal for getting the stuff across the country."

W3QIR: "My work here (Warrenton, Va.) in the Army is entirely with RTTY from simplex up to the biggest multiplex systems known so far. Actually my work is a teletype terminal repairman and I am exposed to all this all the time and I'd like very much to get on with my own teletype station."

More and more of the fellows are all set for the opening of F1 on the lower frequencies, and most of the mail discussed the various aspects of the FCC proposals in Docket 10073. I wish I had room here in CQ to answer some of the questions that are asked and mention some of the many interesting things that are discussed in these letters. Part of this function is taken care of in a monthly bulletin put out by the Amateur Radio Teletype Society.

(Continued on page 63)

One of the seats of teletype activity in the east; W2-JAV. Shown are the model 12 printer (left) and the model 14 (right) with the cover removed.

A Noise Limiter for Everyone

WILLIAM S. GRENFELL, W4GF*

The Second Part of Two Parts

In the first part of this article the author discussed the nature of noise interference and how it could be clipped or limited in superheterodyne receivers. Shunt type limiters were analyzed and an example circuit was shown. In this part the author describes the operation of series and full-wave limiters.

—Editor.

Series Limiters

The series or open circuit limiter depends on the limiter diode conducting at normal signal levels and opening on high modulation amplitudes or noise peaks. Since the diode is in series with the only audio path to the audio stage it will very effectively clip the noise peaks. *Figure 6(a)* is a representative half-wave series limiter circuit. The number of parts needed are the same as for shunt limiter. With respect to a shunt circuit, the position of *R3* and the diode are interchanged and the diode polarity is reversed. Unlike the shunt limiter, however, the series limiter will clip the noise voltages right down to the same level as the modulation peaks. The germanium crystal type diode is not suitable in a series limiter since the back resistance is too low, enough to permit a considerable amount of the noise pulses to get through the diode, whereas the vacuum tube diode will be completely cut off for all voltages above the clipping level. *Table II* contains typical circuit values.

C_1 = 0.05 uf	R_3 = 500k	R_4 = 1.0 Meg	
% limiting	$(R_3+R_4 \| R_2)/R_1$	R_2	R_1
100%	3/1	500k	125k
50%	3/2	475k	200k
40%	6/5	375k	225k
30%	1/1	300k	250k
0-100%	3/1	500k pot.	125k
C_1 = 0.05 uf	R_3, R_4 = 1.0 Meg		
% limiting	$(R_3+R_4 \| R_2)/R_1$	R_2	R_1
100%	2/1	400k	166k
50%	1/1	285k	250k
40%	4/5	250k	275k
30%	3/5	220k	310k
0-100%	2/1	400k pot.	166k

Table II. These are representative values for use in the series limiters shown in Figure 6.

Clipping Levels

In the series limiter the values of all resistors *R1, R2, R3* and *R4* have an effect on the threshold level. Where *R3* equals *R4; R3* plus *R4* in parallel with *R2* should equal *R1* for 50% limiting and should equal twice *R1* for 100% limiting level. If a limiter is to be connected to a detector having

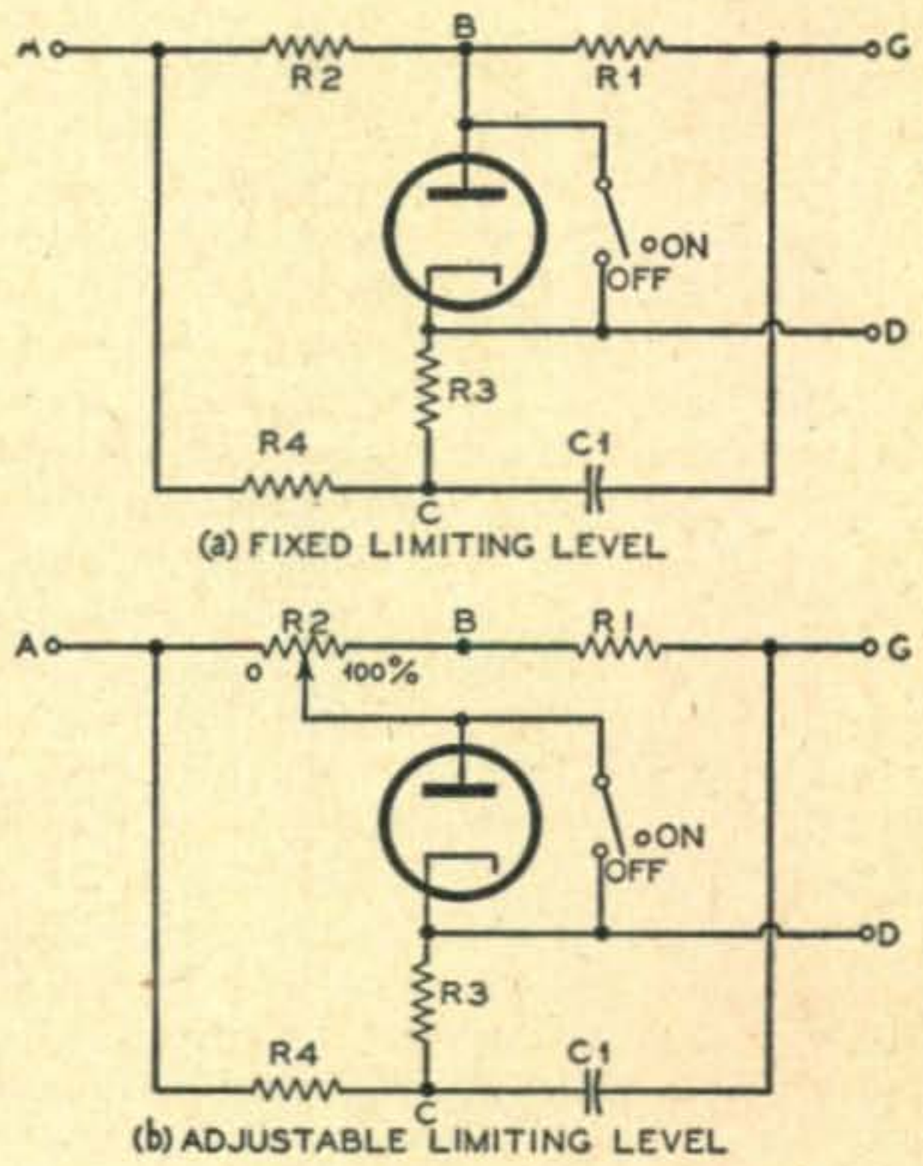


Fig. 6. An improvement in limiting action will result in the use of a series type circuit when compared to the shunt type (see July 1952, CQ). The primary advantage is that the series type will clip noise peaks down to the same level as the modulation peaks.

a 500k load, the sum of all the conducting branches of the limiter and the new load resistors should equal 500k. If it is desired to make the clipping level adjustable, *R2* can be a potentiometer and the diode plate connected to the variable arm, *(see Fig. 6 (b))*. Zero to 100% modulation level of positive peak clipping can be selected as the contact arm of *R2* is moved from point *A* to *B*. Moving the contact arm from *B* toward *A* will have the effect of increasing the audio volume level as the percent clipping is decreased. If such action is found undesirable, the diode plate can be left

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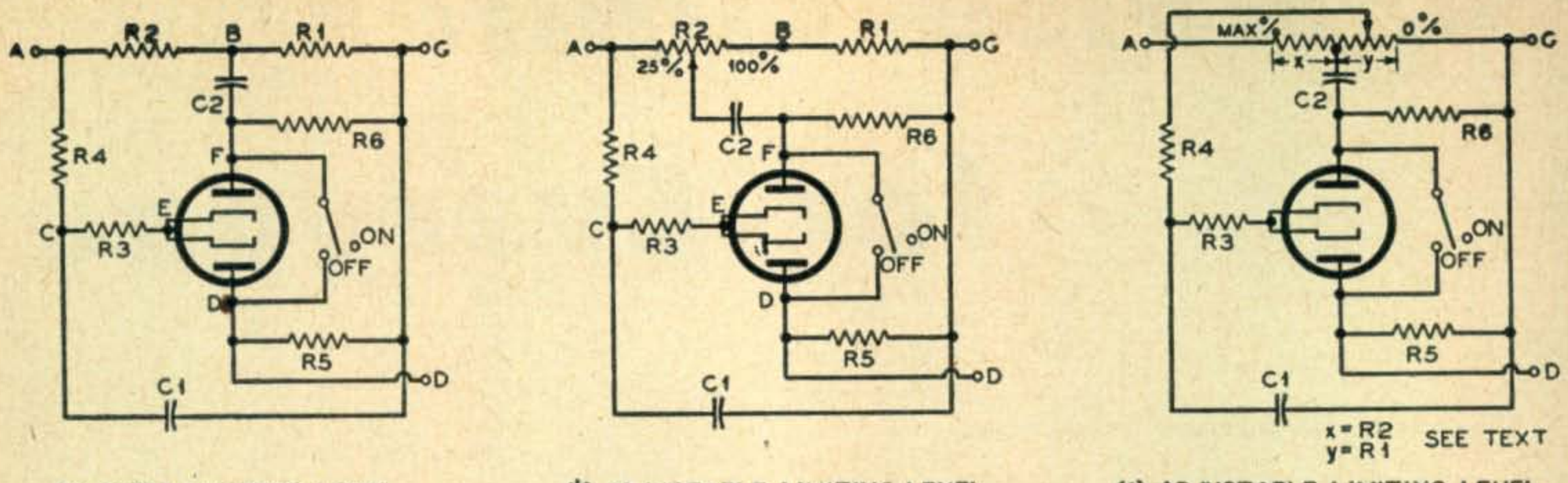

(a) FIXED LIMITING LEVEL

(b) ADJUSTABLE LIMITING LEVEL LIMITED MINIMUM RANGE

(c) ADJUSTABLE LIMITING LEVEL RANGE 0 TO SELECTED MAXIMUM

Fig. 7. Far superior results in noise limiting ability may be obtained by adapting existing circuits to "full-wave" operation. Probably the most desirable feature of this type of circuit is the adjustable level which permits it to be used on c.w. signals. Circuit (C) should be of greatest value to phone and c.w. operators alike since it permits clipping to practically "carrier level." Clipping at this low level must be employed to preclude earphone and speaker "blasting" when searching for weak DX signals.

at the junction of *R1* and *R2* (point *B*) and *R4* connected to the variable arm of *R2* instead of point *A*. The circuit values should remain the same as for the circuit of *Fig. 6(b)*. As in the shunt limiter, if two diodes are available for use in the half-wave series limiter they should be connected in parallel. This will lower the effective internal resistance and permit higher audio output as well as a more nearly constant clipping level. The clipping level will change somewhat with the carrier strength, the level being somewhat higher for weak signals than that indicated in the table. Unlike the shunt limiter, however, for a given incoming carrier strength, all noise and modulation will be clipped to the same amplitude regardless of the amplitude of the noise peaks. Thus, if the level of the limiter threshold is set for clipping at the average modulation percentage of the incoming signal, the modulation will get an even break with the noise, at least on the positive peaks of noise on carrier. This still leaves the negative peaks due to noise clipped at no less than 100%, still of considerably greater amplitude than the average level of modulation of the usual transmitter. All that needs to be done to cure this deficiency is to add another diode in a full-wave limiter circuit to secure equal limiting of both positive and negative noise peaks. Full-wave clippers are commonly used in low-level phone transmitter speech clippers, so why not in receiver noise limiters?

The Full-Wave Noise Limiter

The full-wave limiter circuit which affords the best limiting action with the least additional parts is the series diode type *(see Fig. 7)*. The diodes are arranged so that with any d.c. output voltage from the detector, both sections will be conducting. The audio voltage will then be coupled to the audio amplifier through *C2* and the two diodes. On peaks causing large negative voltages at *B*, diode *E-F* will cut off and on noise or modulation peaks tending to reduce the carrier to zero, diode *D-E* will cut off. A study of *Fig. 7(a)*. The diodes action will show that the threshold levels of this limiter beyond which clipping will occur are zero (ground) voltage and the voltage at point *C*. Thus to get symmetrical clipping action the resistance used at *R3, R5* and *R6* must fix the diodes at a voltage halfway between point *C* and ground. For this condition, *R5* and *R6* should be twice the value of *R3*. See *Table III* for full-wave series circuit values.

Clipping Percentage Levels

In the circuit of *Fig. 7(a)*, if the connection to *C2* is moved from point *B* to point *A*, the clipping threshold will be at 33% where *R3* equals *R4* and 25% when *R4* equals twice *R3*. Thus, if *R2* is a potentiometer with *C2* connected to the variable arm, a clipping level between 100% and 25 or 33% can be selected *(see Fig. 7(b))*. It should be noted that this circuit provides a high audio output at the most useful clipping levels (25 to 40%) but that for a clipping level of 100% the audio output will be down to about one-third or one-quarter of the total audio voltage available from the detector. Those who will be satisfied with a 100% clipping level can get it without the necessity of a full-wave circuit since the second detector is already clipping the negative peaks at 100%. For those who are listening for amateur phone signals or short wave broadcast signals, a maximum limiting level of 50% should be quite satisfactory. While a lower limit of 25 to 33% will be satisfactory for modulated signals, it will still not be a good noise limiting level for weak c.w. signals. Clipping down to practically "carrier" level is desirable since on many c.w. signals the beat frequently oscillator (BFO) may be the strongest signal being rectified by the detector. Thus, with the BFO turned on for c.w. reception the limiter's "automatic" bias is no longer controlled by the incoming signal but instead becomes a relatively large and steady value, the level being controlled by the amount of BFO energy fed to the detector. While lack of automatic bias for a limiter might at first glance seem to be undesirable, it is actually an advantage for c.w. reception. If the noise limiter threshold level is choked down for good action on

weak c.w. signals, and a crowded amateur band is being searched for some elusive DX, no sudden earsplitting blasts are heard when the stronger signals are encountered, all signals being held by the limiter to the same audio level. Thus, an adjustable full-wave limiter can successfully meet the widely different requirements for noise free reception of both c.w. and modulated signals.

C_1 = 0.1 uf	C_2 = 0.02 uf	R_3, R_4 = 500k	
	R_5, R_6 = 1.0 Meg		
% limiting	R_2/R_1	R_2	R_1
100%	2/1	500k	250k
50%	1/2	250k	500k
40%	1/5	125k	625k
33%	---	0	750k
33-100%	2/1	500k pot.	250k
C_1 = 0.05 uf	C_2 = 0.02 uf	R_3 = 500k	
	R_4, R_5, R_6 = 1.0 Meg		
% limiting	R_2/R_1	R_2	R_1
100%	3/1	5ook	166k
50%	1/1	333k	333k
40%	3/5	250k	415k
25%	---	0	660k
25-100%	3/1	500k pot.	166k

Table III. These are the component values to utilize in the construction of a full-wave limiter of the types shown in Figure 7.

There is a modification of the *Fig. 7(a)* which will provide good limiting for both c.w. and modulated signals[5]. Referring to *Fig. 7(a),* determine the maximum limiting level desired (the author recommends 40 to 50%) and from *Table III* determine the values of *R1* and *R2* necessary. Instead of using two resistors for *R1* and *R2* use a potentiometer which equals the sum of *R1* and *R2* and has a fixed tap which comes nearest to the same resistance ratio as *R1* to *R2*. Then connect *C2* to the tap and *R4* to the variable arm of the potentiometer instead of to point A. This circuit *(see Fig. 7(c))* will allow selection of any limiting level between zero percent modulation and the maximum value chosen.

[5]Loren G. Windom, "Modernizing the Prewar HRO," QST, p. 51, June 1949.

Additional Notes

Incorporating any of the limiter circuits described into a conventional superheterodyne receiver should be relatively easy. The circuits of *Fig. 8* are representative of the more common second detector circuits. Dotted lines are shown for the connections to be removed before insertion of the limiter. The existing detector load resistor should be removed. Insert the limiter circuit chosen with points *A, G,* and *D,* of the limiter circuit connected to the corresponding lettered points as shown on the sample second detector circuits. No special care need be taken in the wiring of the limiter circuit except the usual precautions for low level audio circuits. Long leads in the audio path should be avoided if possible, otherwise shielded wire should be used. For the series limiter circuits, care should be taken to keep down any possible capacitive coupling between the input and output of the limiter. The leads to the on-off switch should be as short as possible and should be kept apart. The switch should be of low capacitance when in the open (on) position. The AVC circuit for the receiver should be left undisturbed if at all possible. The connection of the limiter at point *G* into the detector circuit should be to the same point as that of the detector load resistance before modification, even though it may not be at ground (for example, certain delayed AVC circuits).

The values of the various resistances given in the *Tables* do not have to be copied exactly, as a tolerance of 10% or even more will not materially affect the circuit operation enough to be detected by ear. In the full-wave series circuit, *C2* can be made the same size as the receiver's regular audio coupling condenser to which the limiter output is to be connected. The circuit values given in the *Tables* are for second detectors having a 500k load resistor before modification. For detector circuits having a substantially different load resistance, change the values of all the resistors given in the *Table* for the limiter circuit chosen, by the ratio of the load resistance to 500k. For example, for a 200k detector load, multiply each resistance value given in the *Table* by 2/5. *C1* then should be increased by a ratio of 5/2. *C2*

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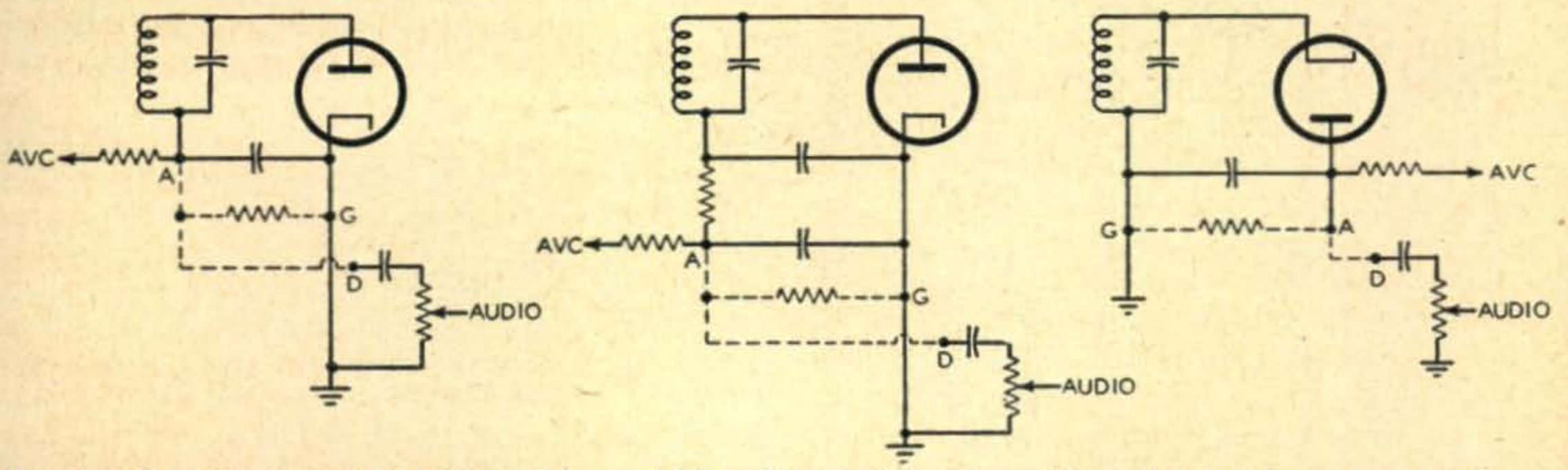


Fig. 8. All of the material in this article would be of negligible value without data on how to put it in your receiver, or how to modify your present circuit for improved performance. Shown above are the three most commonly employed a.v.c. circuits. Points A, D and G correspond to similar junctions in Figures 5, 6 and 7. Any of those noise limiter circuits maybe inserted by removing the load resistor and replacing it with your selection of the best circuit.

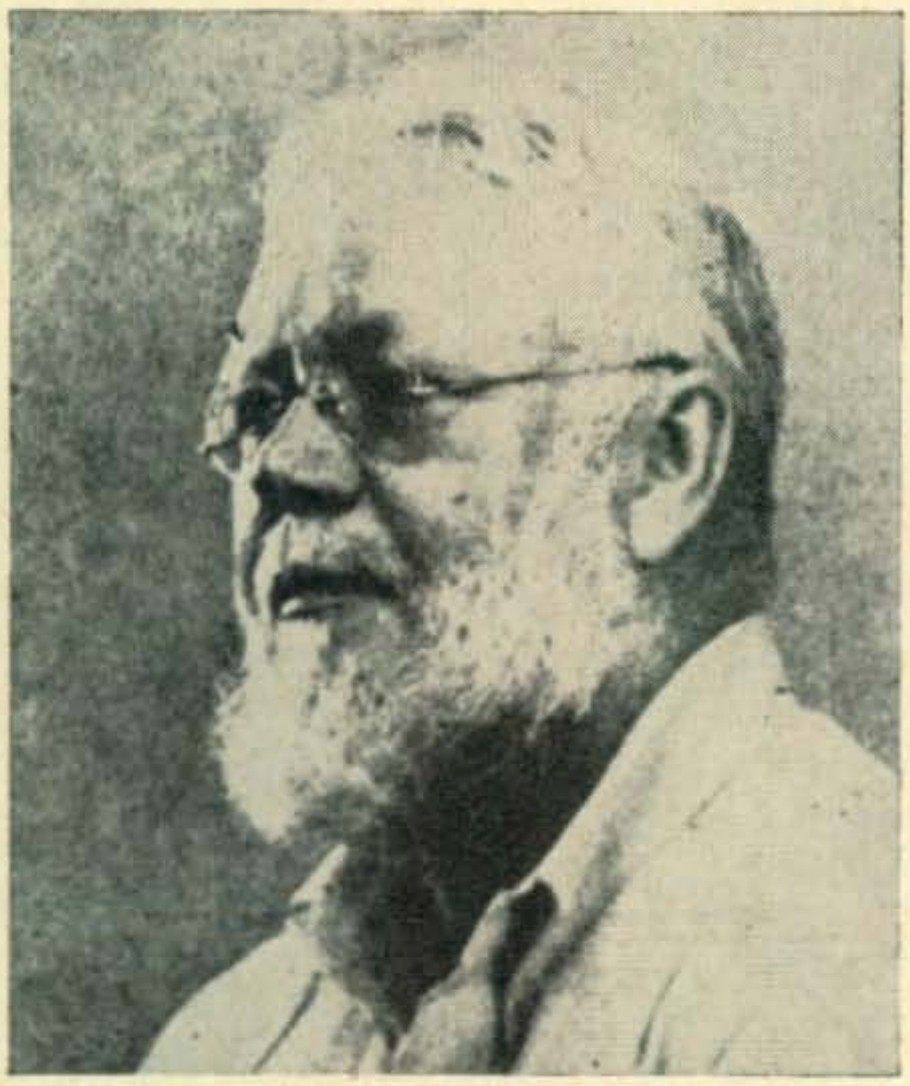
Men of Radio

WILLIAM R. WELLMAN

PART IV

In this installment the contributions of Fessenden, Alexanderson, and Poulsen are detailed, together with the historical developments that resulted in tremendous strides given radio by their inventions —Editor.

Just about the time that Marconi wireless was beginning to assume a position of supremacy in the commercial field, two new methods of generating radio waves were developed that threatened to displace the spark transmitter: the arc converter and the high-frequency alternator. Eventually, they did relegate the spark to the scrap heap; legislation against the interference created by the spark was the final blow. But the history of radio is a story of rapid change and development; for a while the arc and the alternator were in keen competition, and during that period it should be noted that they afforded the first really reliable communication between America and Europe. Finally, both were themselves forced into obsolescence by the vacuum tube transmitter.



Reginald Aubrey Fessenden

The high-frequency alternator was originally conceived by Professor Reginald A. Fessenden, prolific wireless inventor and the father of wireless telephony, and was designed, built and perfected by E. F. W. Alexanderson of General Electric. The arc transmitter was invented by Valdemar Poulsen.

The Marconi Company had established what was intended to be a direct link between the United States and England through the medium of stations located at Cape Cod, Massachusetts and Poldhu, Cornwall, only to discover that contact became difficult, if not impossible during the summer months because of static. The distance to Europe had to be shortened by the use of a station in Nova Scotia. That might have been an appropriate time for reconsideration of the prophetic statements made by Sir William Crookes, some years before Marconi began his experiments: "What remains to be discovered is . . . . firstly, a simpler and more certain means of generating electrical waves . . . secondly, more delicate receivers, which will respond to wavelengths between certain limits and be silent to all others. . ." The more sensitive receivers, in the form of the coherer and the new Marconi magnetic detector had appeared, and Sir Oliver Lodge had developed methods of tuning that helped to exclude undesired signals; the wireless race had taken on some of the aspects of the ancient race between heavy armor and bigger guns. The time had arrived for the development of "more certain means of generating electrical waves. . . ."

Reginald A. Fessenden

Professor Reginald A. Fessenden began his career in the employ of Thomas A. Edison, while Edison was engaged in laying underground conduits for the lighting of New York's streets. Later, he became one of Edison's assistants at the Llewellyn Park laboratory, and eventually advanced to the position of chief chemist. He was attracted by the then new field of wireless and left Edison's employ to take up the duties of director of wireless research with the United States Weather Bureau. It is interesting to note that, even as early as 1901 the Bureau was aware of the future possibilities of radio in studying meteorological conditions.

Fessenden was stationed at Cobb Island, Maryland with his three assistants and was given considerable latitude in his choice of avenues of investigation. An important feature of his arrangement with the government was the granting to him of full rights to any inventions he might develop while in government service.

Soon after starting work at Cobb Island, he became convinced that transmission of the human voice by wireless offered unusual possibilities. Two points need emphasis here: at that time there existed no apparatus for the generation of continuous, or undamped waves, so essential to radio telephone work. The second point is that during his entire career in wireless, Fessenden seems to have been motivated primarily by the desire to develop wireless telephony. With the crude and unsuitable apparatus at his command, he made a test that was

successful over a distance of about a mile. The test was far from perfect, but he was more than ever convinced that it would work over longer distances, if only he had a method of producing a continuous wave. When he eventually resigned from government service, he continued his experiments and although DeForest and others made very valuable contributions, Fessenden achieved the distinction of being the first to attempt wireless telephone communication.

The Electrolytic Detector

By 1902 he had gained recognition through the invention of a new, more sensitive detector. It consisted of a very fine, silver-coated platinum wire, the tip of which just barely dipped below the surface of a cup of nitric or sulphuric acid. One form of this detector is illustrated in *Fig.1.* When the silver-coated platinum wire, known as Wollaston wire, was allowed to dip below the surface of the acid, the silver was dissolved, leaving an extremely fine contact between platinum core and acid. Fessenden called his new receiving device a "liquid barreter", but it soon became known as the electrolytic detector. It was an immediate success, and a new corporation, the National Electric Signaling Company, was organized to exploit it, along with his other inventions. The National company was one of the earliest American wireless firms, but it entered a field already partially controlled by the Marconi Company.

Very soon after the formation of the National company, it became evident that commercial message handling was to become an extremely lucrative field and plans were drawn up for the construction of stations in Europe and America; the first U.S. station was located at Old Point Comfort, near historic Fortress Monroe, Virginia. Helen Fessenden, the inventor's biographer, relates some interesting stories concerning the tests carried out at this station. Rivalry between companies was keen, and at times ruthless. In an attempt to ruin Fessenden's tests, the rival company instructed its operator to keep his key closed whenever Fessenden's station was on the air, but apparently Fessenden's associates learned of this plot and also found a method of obstructing it. The method was simple: just as long as the rival operator was supplied with whiskey he would stay off the air. During one important test, the operator ran out of beverages and threatened to begin "jamming" again until he was placated by a new supply.

Rotary Gap

In 1905 the National company's permanent station was completed at Brant Rock, Massachusetts. The equipment installed in this station included a significant improvement. In place of the usual open, fixed type spark gap, Brant Rock used a rotary gap, consisting of a motor-driven wheel with contact studs arranged equally distant around its periphery. The wheel rotated between two fixed contacts, the result being that the spark discharge passed from one fixed contact to the wheel, then to the stationary contact on the opposite side of the wheel. The effect of using this gap was a signal that was much easier to copy; where the ordinary fixed gap gave a ragged note, often difficult to distinguish from static, the rotary gap afforded a musical note. Soon after the introduction of this gap, operators found that they could identify a station even before hearing its call letters; this was because each transmitter was designed to emit a distinctive note.

The European terminus of the National Electric Signaling Company's trans-Atlantic link was to be at Marihanish, Scotland, but the opening of that station was delayed until well after Brant Rock was in full operation. In January, 1906, with the opening of Marihanish, Fessenden became the first to accomplish regular two-way service across the Atlantic.

Prof. Fessenden, although pleased with the tests at Brant Rock. still felt that much better results could be obtained if he had a method of generating continuous high-frequency impulses. Taking a rather direct approach to the problem, he decided that such waves could best be produced by a rotating

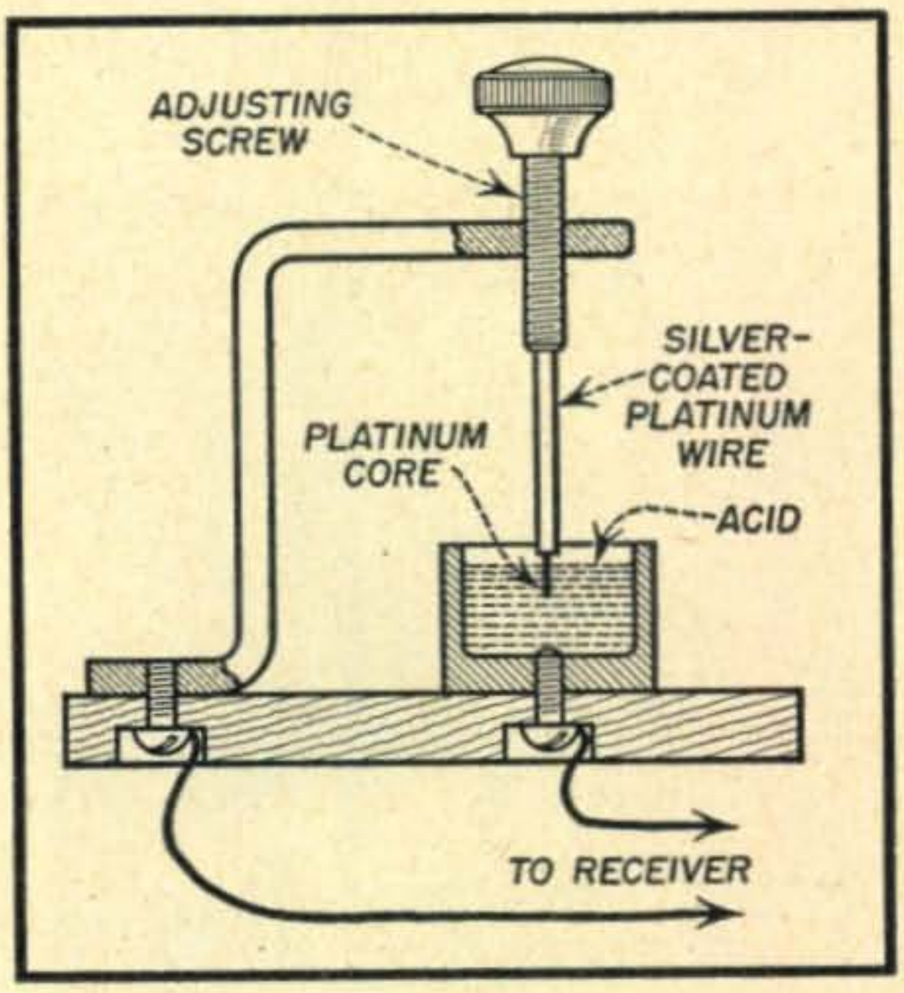


Fig. 1. Electrolytic detector

machine—a high-frequency alternator. The fact that such machines were limited to possibly a few hundred cycles per second did not deter him. He turned the idea over in his mind finally took it to the firm that seemed best equipped to develop it: General Electric Company, largest producer of electrical machinery.

E. F. W. Alexanderson

The possibility of building a generator to develop a hundred thousand cycles per second would have seemed ridiculous to most engineers of that day, but not to the young man Fessenden met at General Electric—E.F.W. Alexanderson. Alexanderson, a Swedish engineer, had started as a draftsman at G-E only a few years earlier. He tackled what seemed to be an impossible task, but in time delivered the first unit to the Brant Rock station—an alternator intended to generate one kilowatt of high

frequency energy. Fessenden's biographer suggests that the professor was not satisfied with the completed machine, that it did not deliver a frequency as high as expected, and that he took it to his own shops and rebuilt it, after which it delivered about 80,000 cycles. More important is the fact that Alexanderson designed and built the machine, carried it to the high degree of perfection that made it one of the two most important sources of radio waves and gave Fessenden the instrument that enabled him to make the first radio broadcast in history.

First Radio Broadcast

Fessenden's earlier tests of wireless telephony had been point-to-point tests. The obvious method of testing his new equipment would have been to transport a receiver to selected points and listen for the signals from his transmitter. This seemed to be slow and expensive. Wireless had progressed to the point where there were numerous shore stations along the Atlantic coast, not to mention the many ship receivers. Why not use these in a test? He went ahead with plans to send speech and music to all stations within listening range of his transmitter, and with this in mind he carried out the first radio broadcast on Christmas Eve, 1906.

Dr. E. F. W. Alexanderson

Fessenden opened the program by sending the "CQ" or general call to all stations, and announced the purpose of the test. The first number was a phonograph recording of Handel's "Largo". This selection was followed by what would today be called "live" entertainment. When arrangements were being made for the test, it was learned that no one at the station, with the exception of Fessenden, had any musical talent. He could, and did play the violin, and his rendition of Gounod's "O Holy Night" established him as radio's very first performer. Reception of the broadcast was reported from as far south as Norfolk, Virginia and when the program was repeated a week later on New Year's Eve, results were even better; reports came in from all along the Atlantic Coast from Massachusetts to the West Indies.

During his career, Prof Fessenden produced a number of very important inventions in addition to the electrolytic detector and the original idea of the high-frequency alternator. One of the greatest of these was the heterodyne receiver, ancestor of the superheterodyne. It was modestly described by the inventor as "undoubtedly the most efficient form of receiver in existence. . . . " In considering this invention, it must be remembered that Fessenden arrived at the idea of mixing the incoming signals with a second source of energy, all without benefit of vacuum tubes.

Fessenden's optimism concerning the Alexanderson alternator was soon justified; by 1909 Alexanderson had designed and built a successful 2-kilowatt machine and had applied for patents on the idea. That same year, radio dramatically demonstrated its value as a life-saving device in the collision between the White Star liner Republic and the steamship Florida. Through the heroic efforts of operator Jack Binns of the Republic, the loss of life in the accident was remarkably low.

A week after the Republic collision the Navy department asked for bids on the construction of a powerful station to be located near Washington, D.C. the new station was to be capable of maintaining contact with ships 3,000 miles at sea. Seven bids were received, and the most satisfactory was the one offered by Fessenden's National Electric Signaling Company.

Valdemar Poulsen

Meanwhile, there had been important developments abroad. Valdemar Poulsen, a Dane, had developed another new source of radio waves, based upon the operation of the direct current arc. The arc had been widely used in street lighting, prior to Edison's invention of the incandescent lamp, and in investigating its properties, W. Duddell had learned that when an inductance and a capacitance were connected in parallel with an arc it produced a "singing" effect. This was found to be due to generation of a high-frequency alternating current by the arc, despite the fact that it was supplied with direct current. Duddell had been able to produce only a high-frequency audio note with the arc; Poulsen gave the matter intensive study and was able to generate radio-frequency currents, thus opening the way to an entirely new method of radio transmission.

In his study of the arc converter, Poulsen also solved several other pressing problems. First of these was the rapid erosion of the arc carbons. This was overcome by the introduction of powerful electromagnets to pull the arc into a curved path, thus causing it to strike from the side, rather than the end of the carbon. Still later, a motor drive was added to turn the carbon on its own axis, thus constantly presenting a new striking area. Conduction of the intense heat of the arc from the arc chamber was solved by using copper, in place of

carbon as one of the electrodes; copper of course, offered a much higher rate of heat conduction than carbon. A further development was the use of a hollow copper electrode with circulating water for cooling. The efficiency of the transmitter was tremendously increased by burning the arc in an atmosphere of hydrogen instead of air. *Fig. 2* illustrates the principle of the arc converter.

Within a few years, Poulsen had designed and built a powerful transmitter, using his arc converter, at Lynby, near Copenhagen, Denmark. It was not long thereafter that the arc transmitter was offering the Alexanderson alternator some serious competition. The Federal Telegraph Company became the leading manufacturer of arc transmitters in this country, and several long-distance links between continental United States and overseas points had been set up.

With the development of the arc and the alternator, it soon became evident that the old spark transmitter was rapidly becoming obsolete. At this point it might be well to consider the relative merits of the two new systems, in order that later developments may be fully understood. The alternator, of course, produced the desired radio frequency directly, without conversion and for that reason was the more efficient. However, in order to maintain an absolutely constant radio frequency, which was highly essential, the speed of the alternator had to be kept constant within very close limits. The arc was somewhat more compact; it had the disadvantage of requiring considerable attention in the way of carbon replacement and cleaning, but this was offset by the fact that most repairs to an arc transmitter could be performed by the station staff, whereas the alternator required spe cialized attention.

European versions of the alternator soon entered the field; the basic principle was about the same as in the Alexanderson machine, except that the method of producing the desired radio frequency was somewhat different. French systems used several alternators mounted on one shaft, thus reducing the number of poles needed in a single machine. German high-power stations used the Goldschmidt alternator which depended upon the utilization of the principle of resonance to build up large currents within the machine as well as the multiplication of frequencies through the interaction of currents in the rotor and stator windings.

At the beginning of World War 1, there were two German companies operating trans-Atlantic circuits. One used the Goldschmidt alternator, while the second used a machine developed by the German General Electric Company. Powerful stations had been built at Nauen, Germany, Sayville, Long Island and Tuckerton, New Jersey operating at 10,000 meters. About the same time, the Marconi system established two new links operating between Carnavon, Wales and New Brunswick, New Jersey and Stavanger, Norway to Marion, Massachusetts.

By 1915, Alexanderson had built a successful 50-kilowatt alternator, and Guglielmo Marconi made a special trip from Europe to Schnectady, New York to witness the test. A duplicate 50-kilowatt machine was later installed in the Marconi station at New Brunswick. The largest arc transmitter of that period was about 30-kilowatts.

The great Navy station at Arlington had commenced operations in 1912. As mentioned earlier, Fessenden's company had obtained a contract for some of the construction work at Arlington. It was to be expected that he and Poulsen, as the advocates of the advocates of the two leading systems of wireless transmission, might become rivals. This rivalry did indeed crop up; Fessenden pressed for installation of Alexanderson alternators at Arlington, while Poulsen insisted that arcs be used. Nothing was settled by the controversy, for the Navy Department wisely decided to install both systems.

Long Distance Transmission

At this point it might be interesting to digress from a discussion of the arc and alternator to review the interesting events that transpired at Arlington during 1915. On July 28, engineers of the American Telephone and Telegraph Company effected radiotelephone communication between the Arlington station and Honolulu, Hawaii a distance of 5000 miles. During the same tests, contact was

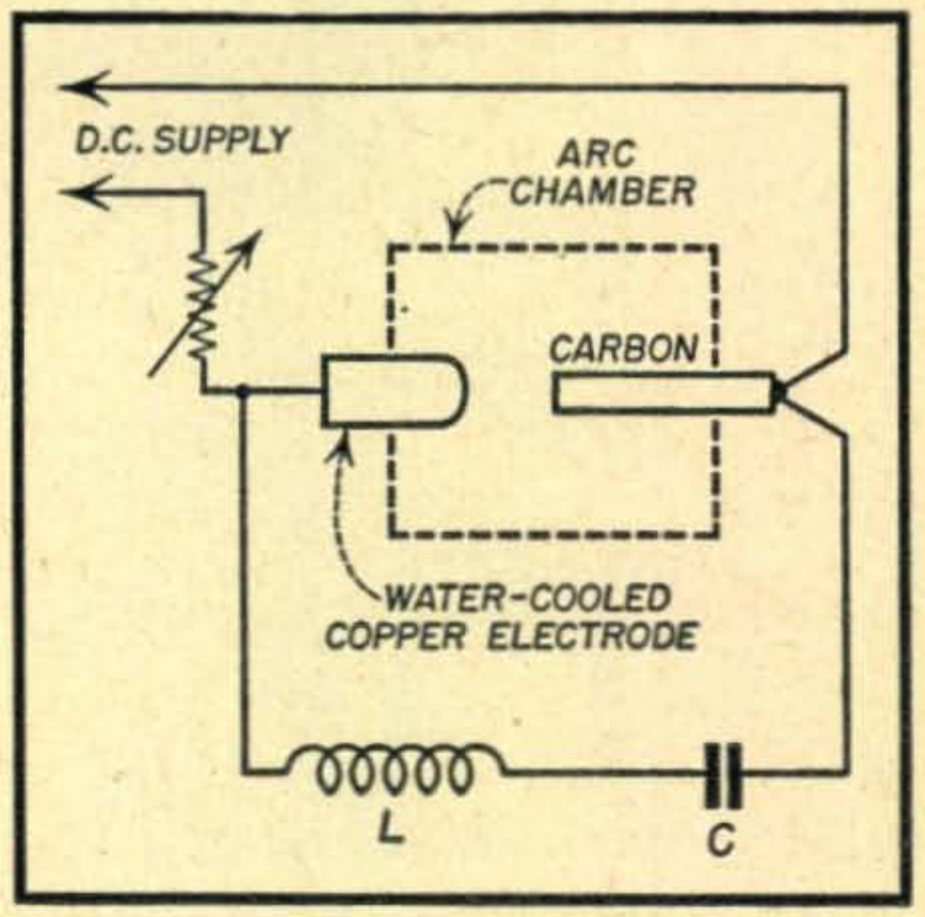


Fig. 2. Poulsen arc converter

made with Darien, Panama. Fessenden's dream of long-distance radiophone communication had been realized and the popular fancy had been directed toward the future of radio. Some readers may remember a song hit of 1915, inspired by the Arlington tests: "Hello, Hawaii". Later that year on October 26, radiophone signals from Arlington were heard at the Eiffel Tower in Paris.

With the American declaration of war in 1917, all foreign-owned radio stations were taken over by the Navy Department. All commercial interests were submerged, and the tangled patent litigation was halted. Under pressure of the conflict, tremendous advances were made. A 200-kilowatt Alexanderson alternator was installed at New Brunswick and afforded the most reliable trans-Atlantic communication thus far. The station's call, NEF, was regularly heard on portable field receivers with

(Continued on page 60)

A Monthly Department Edited by LOUISA SANDO, W5RZJ*

Another year—for YLRL—and another group of officers takes the reins to guide the club for the coming term. Congratulations to W7HHH, Bea Austin, in winning the election as president; W3JSH, Dottie Wickenhiser, vice president; W3UUG, Miriam Blackburn, editor of *YL Harmonics*. Continuing in the posts they so ably filled during the last year are W1BCU, Peg Wells, secretary-treasurer, and W1QON, Eleanor Wilson, publicity chairman. W1BCU has moved to a new QTH—and a mighty fine one we hear—and her new address is Woodland Road, Foxboro, Mass.

Bea Austin, W7HHH, new president of YLRL.

Of course the election included District Chairmen, and following are the new ones for '52-'53. Don't forget to send the one in your district news of your doin's for *Harmonics*.

1st—W1RYJ, Esther Routhier
2nd—W2EEO, Madeline Greenberg
3rd—W3QPJ, Clara Burke
4th—W4LAS, Mable Banks
5th—W5NES, Harriett Sanders
6th—W6HTS, Mildred O'Brien
7th—W7OVW, Irma Aufang
8th—W8FPT, Wava Harlan
9th—W9GME, Grace Ryden
10th—WØKOY, Inga Hoffman
VE—VE3BTE, Rose Hallifax

* *Address all letters and correspondence to 959C-24th, Los Alamos, New Mexico.*

Getting back to the new officers, they're known to most of you through QSOs over the air, but a few highlights for the record. Prexy **W7HHH** is EC for the area around Bend, Oregon, and says her main activity at present is acting as net control for the Oregon Emergency Net. She also is NC for the 75-meter YL net each Monday p.m. Bea has WAS, WAC, RCC, ROWH and two Public Service Certificates. As to the station set-up, W7HHH has three separate r.f. sections, on 10, 20 and 75, with common power supply and modulator. Each has a pair of VT-127As in the final with about 500 watts power. The receiver is a National 173. Like a good YL Bea likes to share the spotlight with her OM—she is so proud that Carl, W7GNJ, won the O.A.R.S. award for being the outstanding amateur of the year in Oregon. So she has a good example to follow!

Vice president **W3JSH** has been active since 1939, when she was licensed as W2MIY in Albany, N. Y. Activities there were ORS, RM, BPL, SRA for ARRS, secretary of Albany Radio Club. She QSY'd to Washington, D.C., in June of '41 as radio engineer with the Signal Corps and her call became W3JSH. Dottie met her OM at a Washington Radio Club party—he was in the Navy—and they were married in '43. Wick is W3KWA, ex-W8KWA. They returned to Coraopolis, Pa., in '45, but the FCC crossed Dottie up by changing call areas so she was still stuck with W3JSH—says she, try it on CW some time! For some years Dottie was inactive due to the arrival of jr. YLs, now aged 7, 5 and 4, but she is once again devoting more time to hamming. During the past year she has been an active ORS in W.Pa., participated in C. D. parties, leading section in the April one. She also holds A-1, RCC, CP-35, WAS on 80 meters, and is now awaiting certificate for WAC, also advanced class modification. She has participated in YLRL parties and nets, holds Worked New Hampsnire certificate No. 30. Recently she was bitten by the DX bug when working New Zealand on 80. Present score, all since this February mostly on 14-mc, is 75 countries. The equipment set-up at present is: PP 805s, 150-500 w., BC-342 Rx with Q5-er, and half-wave Zepp, plus BC-610, 600w., Super Pro RX, and Zepp or 7-mc doublet. Dottie has been a member of YLRL almost since its beginning. Other interests include swimming, knitting, Junior Women's Club, and American Assoc. of University Women.

Editor **W3UUG** also has been on the air since 1939, but she is strictly a phone op, with most of her time spent in the YLRL nets on 75 and 20, plus regular skeds with her OM's sister, W8VWL. Miriam has four jr. ops to help share her time—Bobby, who just graduated from high school, Barbara 13, Carl 11 and Jeanne 4. Miriam's OM is W3MPO. Their station set-up consists of a 6-ft. rack transmitter with three separate r-f sections for 75, 20 and 10. They are v.f.o. on all bands. The receiver is a Collins 75A-2. Antennas are a 4-element beam on 10 and a 3-element beam on 20, both mounted on a 27-ft tower, and two half-waves in-phase on 75.

Good luck to all you YLs, and may it be a good year for YLRL!

YL Get-togethers

The 2nd annual W9-YL get-together held at Chicago in May was a huge success according to chairman W9GME, with 17 YLs attending—W9LOY, FXO, BCB, GME, AYX, KQC, LRT, KXL, MYC; WN9s RUJ, QMA, RWV, SSL, QYG, SYX, SEZ and WNØIRD. On Friday a.m. May 23rd the gals were on the BC program "Ladies Fair" and W9GME won some prizes. Then they took a trip to the 1952 Audio Fair, and in the evening W9GME held open house. On Saturday the YLs had a banquet at Math Iglar's Casino, followed by prize drawing. On Sunday they visited the elaborate ham shack of

W9DXX, Chicago's most prominent YL op. On Monday the YLs made a tour of the Hallicrafters plant, had luncheon together, and all were greeted by Bill Halligan, with time for ragchewing and photos.

The YLs of New Mexico attempted to get together at a state ham picnic on June 1st, but with hundreds of miles separating them in this state of wide open space, plus a day of rain, not many attempted the trip up 9000-ft. Capillo Peak. W5DRA, RFK, RMH, RQK and RZJ made it, and we were especially happy to meet Teev and Deloris in person after contacts on MARS. RQK is a hardy gal— not only did she make the picnic, but the next weekend joined the Albuquerque 2-meter Field Day atop the Sandia Mts.

With the Clubs

Chicago is again in the spotlight, this time as the location of the newest of the YL clubs. To be known as LARK—Ladies' Amateur Radio Klub—the girls have chosen W9GME chairman. YLs attending the first meeting included W9FZO, GME, MYC, LOY, KXL, BCB and WN9s QYG, RWV and SEZ.

The May meeting of the **NYC YL Club** was held at the QTH of W2BTU, Kit, with W2EEO, RAQ, QWL, PZA, IQP, MVV, EUL, VXC, OWL, WN2IGA, Helen Zaparn, Eva Hudson and Ruth Schlitt attending. W2MVV and EUL were welcomed as new members. The "dark secret" was won by hostess Kit. This "dark secret" is a fund raising scheme and some the NY YLs think other clubs might like to try. It is in the form of a raffle run at each club meeting. Members present each pay ten cents and numbers are assigned and one drawn for the winner. The winner then must provide the "dark secret" (to cost less than 50c) for the following meeting. Money collected on the raffle is used for cards the club sends for birthdays, weddings, births, illness, etc.

New YL's

If you've been following this column for a long time you'll remember a writeup about the "Three Brown Hams" of Electra, Texas—W5IZL, Ruth, her OM W5HFS, and son W5FYZ. Now they are the "Four Brown Hams" with W5FYZ's XYL getting her own call, W5TEB. Bonnie and her OM are at Minden, La., and she and Ruth keep regular skeds on 40 meters.

From W9LQP we hear that his XYL is now WN9SSL. Shirlene works daily on 146.8 mc. and on 80 meters. She would very much like to contact other YLs on 80 for a slow CW YL daytime net, and she would like to know if any WNs in the Chicago area are interested in 11-meter operation. Adds her OM, "We have three jr. ops, 14 months, 2½ years and 4 years, so it shows that small children are no problem." We just wonder if Shirlene herself would have written quite that—hi!

Here and There

In the May issue we asked about active YLs in Utah for the benefit of those seeking WAS/YL. From WØDD, Director of the Rocky Mountain ARRL Division, comes this note: "May I suggest that you sometime listen to that 1-kw signal on about 3970 kc (Transcontinental Phone Net) or 3935 kc (FARM net) coming from Natalie in Salt Lake City. Her call is W7OOK. She's a swell message handler." Tnx, OM!

From **W9CIR**, Jessie Harton, come interesting details of her stay with her OM in the Philippines for some 14 months. They now are Stateside again, stationed at Amarillo, Tex., and Jessie hopes to be on with a new W5 call soon (original call was W5HWK), after all these months of inactivity, for since the Philippines acquired their independence amateur operation has been forbidden. Jessie really felt it was the irony of fate that should send her OM, and her, to a country where ham operation is prohibited. Only radio contact with the States has been on MARS frequencies.

"But our stay here has been wonderful," says Jessie. "Our quarters have been spacious and our help supreme. I've had a house-boy who even planned my meals, plus a laundress and a yard-boy. It has been a lazy life of ease and much social activity. We go to Manilla for diversion and to Baguio, the summer capital of the Philippines high up in the mountans. This tour of duty has been most educational for me, but still it's good to be returning to the good ole USA." As soon as she gets her kilowatt rig, 150-watter and HQ-129X out of storage, we'll be hearing Jessie on the bands again—but without all that help wonder how much time she'll find for hamming!

From Kenneth Merring of Lake Ariel, Pa., a request for YLs to send him their QSL cards. Ken is 13, in junior high, and is studying for his Novice ticket. He has built his own receiver and is working on a transmitter. Maybe a little encouragement in the way of cards will help the cause along.

A wonderful letter from **ZS6GH** with news of the ZS gals, and telling of her vacation trip to Southern Rhodesia and the Victoria Falls. Along the way Dianna met ZE1JE, Molly, one of the two YLs in the whole territory, who has been accorded the honor of being elected president of the Radio Society of Southern Rhodesia.

ZS6GH, herself, has been appointed treasurer to the Johannesburg Branch of S.A.R.I. Dianna also is on the committee for incapacitated persons which looks after the applications for ham licenses and equipment for those who need help. Dianna says there are three YLs who are hospitalized and who have gained so much from ham radio—ZS5NE, Enid; ZS5NX, Heather, and ZS5MT, Jocelyn. A fourth, ZS5BP, Pearl, is blind.

ZS6WF, Kate, left South Africa and is now living in Lusaka, Northern Rhodesia. She is the first YL in that territory, and has the call VQ2KR.

33 es CUL. W5RZJ

YLs who met at Chicago in May for the 2nd annual W9-YL get-together. Left to right, seated: W9LOY, FZO, BCB, GME, AYX, WNØIRD and WN9RUJ. Standing: WN9QMA, WN9RWV, W9KQC, WN9SSL, W9LRT, WN9QYG, W9KXL, W9MYC, WN9SYX and WN9SEZ. Photo by WN9RQF.

On 15 Meters - Quick!

H. N. LEM, W2CTE*

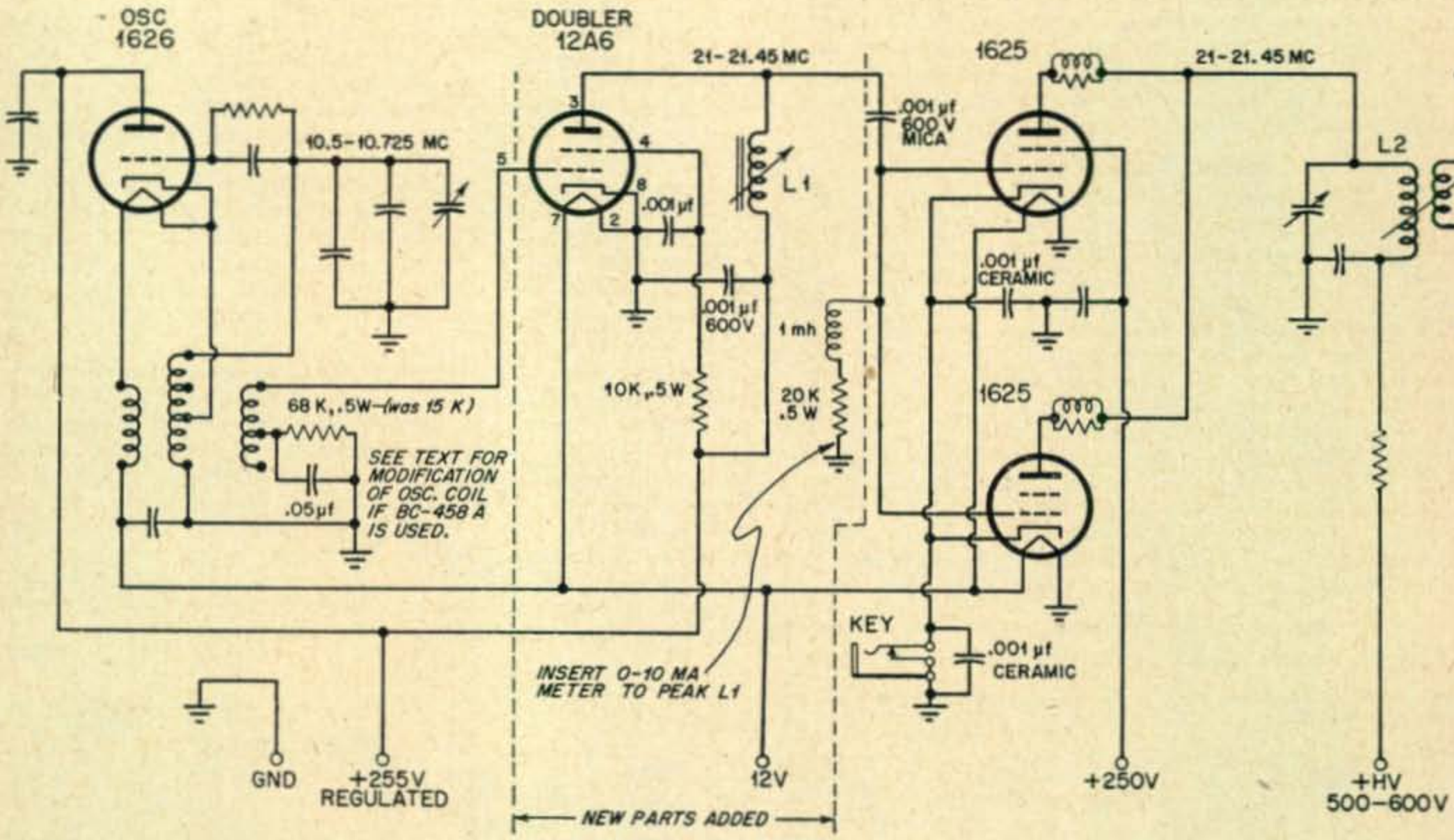
Another of the apparently endless uses of the versatile BC-459—getting on 21 mc. with a minimum of fuss and bother. —Editor.

Command-Set transmitters can be converted to cover the new 21-mc band with a minimum of effort. Two conversions, applicable to the BC-459A (7-to-9.1 mc.), and the BC-458A (5.3-to-7 mc.) transmitters are described below. The simpler conversion consists of shifting the oscillator tuning range to cover 10.5 mc. to 10.725 mc. and operating the parallel 1625's as frequency doublers. To accomplish these objectives, do the following:

Next, remove three turns from the top of the amplifier tank coil.

The amplifier padder now becomes the main tuning condenser. Remove its shaft lock, and add a shaft extension, plus a knob, for easy adjustment. It may be necessary to dismount the padder from the chassis to remove the shaft lock and to enlarge the hole in the side of the chassis to accommodate the shaft extension.

Mount a midget phone jack in the lower left-hand corner of the panel, and connect it between the 1625 cathodes and ground. Bypass the cathodes to ground with a .001 μf. ceramic condenser.



NOTE

UNLISTED PARTS ORIGINAL AND UNCHANGED.

L1– 7T #22 PE WIRE ½" LONG, ⅝" DIA CERAMIC SLUG-TUNED FORM.

L2– 5T, DOUBLE SPACED ON ORIGINAL AMPLIFIER COIL FORM.

Fig. 1. Modification schematic. The dotted lines enclose the optional doubler stage, which affords added output and stability.

BC-459A

Oscillator: Decrease the capacity of the padding condenser, located under the oscillator shield can; so that the oscillator tunes to 10.725 mc. when the dial is set to 9.1 mc. The shield must be in place while checking frequency.

Amplifier: First, disconnect both the amplifier tuning condenser (the one ganged with the oscillator condenser) and the neutralizing condenser.

Connect the power supply, plug a key in the jack, check your frequency, tune the 1625 plate tank to resonance, couple an antenna, and you are on 21 mc.

BC-458A

In addition to the above, putting the BC-458A on 21 mc. requires modifying the oscillator coil as well as the amplifier coil. Remove five turns from the top of the oscillator coil, and rewind the amplifier coil. The new winding consists of five turns of the original wire, wound to occupy every other groove

(Continued on page 65)

*5118 Seventh Ave., Brooklyn 20, N. Y.

Ionospheric Propagation Conditions

Forecasts by GEORGE JACOBS, W2PAJ*

A look at KV4AA's *DX and Overseas News* Department for June 1952 and consistent monitoring of the 15-meter band indicates that last month's DX analysis of the new band is running pretty much to form.

Realizing that many readers of these propagation analyses are as interested in network and traffic handling activities as they are in DX, the analysis of the 15-meter band this month continues investigating the potentialities of the new band for domestic transmissions.

Normal Minimum Skip Range

When speaking of domestic transmissions, I am referring to transmissions within the United States itself. In most cases transmission paths within the USA do not exceed 2500 miles. It can be shown that for a frequency of 21 mc., these transmissions, when made possible by reflection from the normal F-layers of the ionosphere, will be single hop transmission. A study of MUF data appearing in CRPL Series D Publications "Basic Radio Propagation Predictions" indicates that the minimum skip distance for one hop 15-meter F-layer transmission will vary between 1100 to 2200 miles depending on time of day and season of the year. Except for limited ground wave coverage, and possible sporadic-E transmission, it will generally not be possible to work other stations on 15 meters at distances less than at least 1100 miles away from your transmitter. This, of course, is due to the skip effect of shortwave transmissions. This calculate minimum skip distance of 1100 miles seems about what we would expect—it's a little longer than the normal minimum skip on 20 and a little shorter than the normal winter skip, during this part of the sunspot cycle, on ten meters.

For domestic circuits, as for DX transmissions, 15 meters is a daylight band, except possibly, for transmissions via sporadic-E layers. Varying with the seasons of the year, 15 meters will generally open early in the day, with the skip out at about 2200 miles. As the sun moves overhead at the middle (reflection point) of the path, the layers of the ionosphere become more heavily ionized, and the skip distance for a particular frequency decreases. For 15 meters, the minimum skip distance is between 1100 to 2200 miles, depending on the circuit, time of day and season of the year. As twilight approaches, the skip distance lengthens again until the MUF for the path drops below 21 mc. and the circuit drops out. Although we are now discussing the 15-meter band, it is interesting to note that these same general skip distance characteristics are noticed on all bands with the exception that the minimum skip distance drops as frequency is decreased.

Typical skip distances and times of day that the 15-meter band is expected to be useful for domestic one hop transmissions is indicated in the following table:

SEASON	BAND OPEN LOCAL STANDARD TIME (NOT GMT)	MINIMUM SKIP DISTANCE MILES
North-South Paths:		
Winter	0800-1700	1100
Fall, Spring	0730-1830	1500
Summer	1600-2000	2200
East-West Paths Above 37 Degrees North Latitude:		
Winter	0800-1700	1300
Fall, Spring	1030-1900	1800
Summer	1730-1930	2200
East-West Paths Below 37 Degrees North Latitude:		
Winter	0730-1730	1200
Fall, Spring	0800-1900	1400
Summer	1300-1930	1900

From this table we can see that the 15-meter band may be quite useful for long distant domestic network and traffic activity, but of little use for reliable communication to points less than 1200 miles from your transmitter.

"Short Skip" Effects

So far we have been discussing normal transmission from the regular F-layer of the ionosphere. Sporadic-E transmissions will be possible, during certain times, and its effects on 21-mc, will be quite interesting. Sporadic-E transmission characteristics should follow very closely the pattern of behavior observed on 10 and 20 meters. Sporadic-E transmission is expected to occur more often on 15 meters than it does on 10 and less often than it occurs on 20 meters.

As on other bands, Sporadic-E transmissions should be more prevalent during the summer months and are more likely to occur between 0700 and 1430 *LOCAL* time, with openings at all other hours of the day and night not uncommon. The skip distance for Sporadic-E transmissions will be shorter on 15 meters than on 10, but longer than the skip distance on 20. For example, if so called "short skip" Sporadic-E transmission is noticed simultaneously on 10, 15 and 20 meters, you will note that the strongest stations heard on 20 may be 450 miles away, on 15 meters about 650 miles away and on 10 about 850 miles distant.

We have now examined ionospheric transmission

(Continued on page 46)

* *Address all correspondence to 3620 Bedford Ave., Brooklyn 10, N. Y.*

EAST COAST TO: (Centered on Washington, D.C.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Scandanavia	Nil	Nil	1100-2000 (1-2) 2000-2300 (3)	0230-0430 (1)
Great Britain & Western Europe	Nil	Nil	1100-2030 (2-3) 2030-2300 (3-4)	0000-0700 (2)
Balkans	Nil	Nil	1030-2000 (1-2) 2000-0000 (3)	0000-0530 (2)
Central Europe	Nil	Nil	1100-2000 (2-3) 2000-0000 (3-4)	0130-0500 (2)
Southern Europe & North Africa	Nil	1900-2230 (1-2)	1000-2100 (2-3) 2100-0100 (3-4)	0000-0600 (2-3)
South Africa	Nil	Nil	1830-2300 (1-2)	0100-0500 (2)
Near East	Nil	Nil	1000-1900 (0-1) 1900-2330 (2-3)	0100-0300 (1-2)
Central America & Northern South America	Nil	1700-0100 (3-4)	1100-1500 (3-4) 1500-2300 (3) 2300-0500 (4-5)	0000-1000 (3-4)
South America	1800-2200 (0-1)	1400-2100 (2) 2100-0100 (3-4)	1000-2100 (1-2) 2100-0700 (3-4)	2330-1000 (2)
Hawaii	Nil	2300-0300 (1-2)	1500-0200 (1-2) 0200-0500 (3)	0430-1030 (2)
Oceania	Nil	2200-0230 (1-2)	1230-1530 (2) 2000-0200 (1) 0200-0500 (2-3)	0600-1030 (1-2)
Guam	Nil	Nil	1230-1600 (1-2) 1600-0200 (1) 0200-0500 (2-3)	0800-1100 (1)
Japan	Nil	Nil	1200-1530 (2) 2000-0200 (1) 0200-0330 (2)	0630-1000 (1)
India	Nil	Nil	1300-2000 (0-1) A 2330-0030 (1) E 1600-2330 (0-1) E	Nil
Philippine Islands & East Indies	Nil	Nil	1200-1400 (1-2) 0000-0200 (1-2)	Nil
West Coast USA	Nil	1800-2000 (1)	1530-2300 (2-3) 2300-0300 (3-4)	0300-0900 (3-4) 0900-1200 (2)

CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Great Britain & Western Europe	Nil	Nil	1200-2100 (2) 2100-2330 (3-4)	0100-0600 (2)
Central Europe	Nil	Nil	1200-2130 (1-2) 2130-2330 (3-4)	0200-0530 (2)
Southern Europe & North Africa	Nil	2000-2200 (1)	1100-2100 (2-3) 2100-0000 (3-4)	0100-0600 (2-3)
South Africa	Nil	Nil	1900-2330 (1-2)	0130-0500 (2)
Central America & Northern South America	Nil	1700-2200 (3) 2200-0100 (3-4)	1200-2300 (3-4) 2300-0600 (4-5)	0100-1000 (3-4)
South America	2000-2230 (2)	1500-2200 (2) 2200-0130 (3-4)	1130-2300 (2) 2300-0800 (4)	0100-1030 (3)

CENTRAL USA TO: (Centered on St. Louis, Mo.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Hawaii	Nil	0000-0300 (2)	1500-0300 (2) 0300-0530 (3-4)	0430-1230 (2-3)
Oceania	Nil	2200-0200 (1-2) 0200-0400 (2)	1300-1500 (2) 1500-0300 (1) 0300-0630 (2-3)	0700-1200 (2)
Japan	Nil	Nil	1300-1600 (2-3) 1900-0300 (1-2) 0300-0730 (2-3)	0800-1100 (1-2)
Philippine Islands & East Indies	Nil	Nil	1300-1700 (2) 1700-0400 (1-2)	Nil
India	Nil	Nil	1230-1600 (1-2) A 1600-2100 (0-1) A 2200-0030 (1) E	0900-1100 (0-1)

WEST COAST TO: (Centered on Sacramento, Calif.)	10 Meters	15 Meters	20 Meters	40 Meters
		ALL TIMES IN G M T		
Europe	Nil	Nil	1400-2200 (1-2) 2200-0000 (2-3)	0400-0800 (1)
South Africa	Nil	Nil	1300-2100 (0-1) 2100-0200 (1-2)	0300-0530 (1-2)
Central America & Northern South America	Nil	1800-2200 (2-3) 2200-0230 (3-4)	1330-0030 (3-4) 0030-0600 (4-5)	0300-1200 (4)
South America	2100-0000 (1)	1700-2300 (1-2) 2300-0230 (2-3)	1300-0100 (1-2) 0100-0800 (4)	0400-1000 (2-3)
Hawaii	Nil	2200-0600 (2-3)	1700-0300 (3-4) 0300-0700 (4-5) 0700-1100 (1-2)	0500-1400 (4)
Oceania	2200-0300 (1-2)	2000-0300 (1-2) 0300-0530 (2-3)	1800-0430 (1-2) 0430-0800 (2-3)	0700-1300 (2-3)
Japan	Nil	2200-0300 (1) 0300-0700 (2)	1600-0400 (2-3) 0400-1000 (3-4)	0900-1200 (2)
Philippine Islands & East Indies	Nil	2300-0300 (1) 0300-0630 (1-2)	1530-2000 (2) 2000-0600 (1) 0600-1000 (1-2)	1100-1330 (0-1)
Marshall Islands	Nil	2300-0500 (2)	1700-0500 (2-3) 0500-1000 (3-4)	0800-1400 (2-3)
Guam	Nil	2300-0530 (1-2)	1500-1800 (2-3) 1800-0600 (1-2) 0600-0900 (3) 0900-1100 (2-3)	1000-1200 (2-3)
India	Nil	0200-0400 (1)	1430-1700 (2) 1700-0500 (1) 0500-0800 (1-2)	1130-1300 (0-1)

Symbols for Expected Percentage of Days of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more

Special Note: The letter "A" appearing after the expected percentage figures is used to denote that the azimuth of signal arrival will probably be best over the "Asiatic Path." The letter "E" denotes an azimuth favoring arrival over the "European" path.

characteristics for one hop 15-meter circuits. To complete the investigation of the 15-meter band potentialities for domestic circuits it is necessary to examine groundwave characteristics.

Groundwave propagation is a function of power, antenna characteristics and ground conductivity. In general, average groundwave coverage on 15 meters will not greatly exceed 50 miles over land and possibly a little further over water. Between the frequency range of 2-30 mc., groundwave propagation, with all transmission factors equal, decreases with an increase in frequency. Groundwave coverage can be expected to be less at 21 mc. than at 7 or 14, but somewhat greater than at 28 mc.

This completes the analysis of the new amateur 15-meter band. For domestic transmissions the band will generally not be usable for distances less than 1200 miles, except during Sporadic-E transmission when the skip may shorten to about 600 miles and for groundwave transmission ranges up to about 50 miles.

Significant ionospheric disturbances are expected during the periods of August 1-3, 8, 12-14 and 25-30. In general, during disturbances, poorer radio propagation conditions are noticed on night circuits passing through or near the auroral zones. During certain types of disturbances, although short wave transmission may be considerably degraded, VHF transmissions may be enhanced.

Since relative absorption will be low on the 15-meter band, it will be an ideal band for low power enthusiasts. Since the band is 450 kc. wide, its use can considerably alleviate the present congestion on 20 meters, and as more and more amateurs direct their daytime operations to the 15-meter band, some noticeable decrease in the terrific QRM should be observed on 20 meters, especially on the phone section of the

In effect, the addition of the 15-meter band more than doubles the frequency spectrum available for long distant daytime operation.

General Propagation Conditions

August, 1952

In Northern Latitudes, June 22nd marked the period of summer solstice, when the sun reaches its most northernly point above the equator. On this day the sun starts its apparent travel towards southern skies, and moves nearer to the earth. The effects of this southernly solar movement upon radio propagation is that during August (especially during the last week), there is generally noticed a slight rise in daytime MUF's, and a slight lowering of nighttime MUF's. During the present stage of the sunspot cycle, these changes will not have any significant effect on amateur transmission, and propagation conditions on amateur circuits during August should be quite similar to what they had been during July. Just to be nostalgic, during the period of high sunspot activity (1947-1950), the propagation changes during August were very significant and August was the month that marked the opening of ten meters for world wide DX.

Analysis for this month's forecast is based upon a predicted smoothed 12-month running Zurich sunspot number of 45, centered on August, 1952.

New WWV Warning

On July 1st, the Central Radio Propagation Laboratory of the National Bureau of Standards started broadcasting new short term radio propagation forecasts over the NBS radio station WWV operating on standard frequencies of 2.5, 5, 10, 15, 20 and 25 mc. These new forecasts are designed to indicate ionospheric conditions (especially for North Atlantic transmission paths) at the time of the announcement and also how good or bad propagation conditions are expected to be for the next 12 hours.

These forecasts are prepared four times daily at:

0500	GCT	referring	to	the	interval	0600-1800	GCT
1130	"	"	"	"	"	1200-2400	"
1700	"	"	"	"	"	1800-0600	"
2300	"	"	"	"	"	0000-1200	"

and are transmitting on WWV, in International Morse code at 19½ and 49½ minutes past the hour. Each forecast is broadcast for a period of about six hours until the next forecast is made. For example, the forecast made at 0500 will be first broadcast at 0519½ and then at half-hourly intervals through 1119½, with the next broadcast at 1149½ announcing the new forecast made at 1130, etc.

The new forecasts consist of a letter and a digit. The letter indicates present propagation conditions and the digit indicates expected quality of reception for the next twelve-hour period. The letters used are N, U and W, signifying that radio propagation conditions are normal, unsettled (erratic), or disturbed, respectively. The addi digit is the forecast of expected quality of propagation conditions on the following NBS-CRPL scale:

Digit (Forecast)	Propagation Cond.	Letter (Current)
1	Useless	W
2	Very Poor	W
3	Poor	W
4	Poor to Fair	W
5	Fair	U
6	Fair to Good	N
7	Good	N
8	Very Good	N
9	Excellent	N

For example, a forecast of "N6" issued at 0500 GCT, and first broadcast on WWV at 0519½ GMT indicates that at 0500 North Atlantic conditions were normal, and conditions were expected to be fair to good for the period 0600-1800 GCT. (For all practical purposes GMT and GCT, can be considered identical.)

This new improved propagation service of the NBS can be of considerable use to amateurs and will be discussed again next month.

Europe:

No ten-meter openings expected and only a very occasional opening possible on 15 from Southeastern USA to Southwest Europe . . . Fair conditions on 20 during daylight hours improving to good a few hours before sundown local time . . . Fair conditions on 40, fair to poor on 80, however, absorption and atmospheric noise levels are slowly decreasing and during the last week of August an improvement on these "all dark" circuits should be noticed, especially for New England and Canadian Maritime locations.

South America:

Poor conditions on ten, but an occasional opening expected, especially during the last week of August . . . Fifteen meters is expected to provide good reliable DX circuits from all countries of South America to all areas of the USA . . . Twenty meters is expected to be very good to Latin America, with the band open for about 20 hours a day . . . DX possibilities on 40 meters should be fairly good. On quiet nights signal levels are expected to be strong during the all dark period, however, high noise levels may mar transmissions on many nights . . . Less frequent openings are expected on 80 meters.

Africa:

No ten-meter openings expected . . . Not many 15-meter openings expected . . . High absorption will still limit 20-meter openings to an erratic nature . . . Some 40-meter openings possible, but not many expected on 80 meters.

Australasia:

Some possibilities for an occasional opening on 10 meters from the Pacific Coast, the MUF is not high enough to permit these paths to open to the Mid-West or East Coast . . . Some fair 15-meter openings are expected from the Pacific Coast and some of these openings should extend to the Mid-West and East Coast . . . Conditions are improving on 20 meters on these circuits and fair openings are expected a few hours after sunrise local time and again a few hours after sunset . . . An increase in 40-meter openings is expected in August, especially during the last week . . . DX conditions are still rather poor for 80 meters and few, if any, openings are expected.

Asia:

No ten-meter openings expected . . . Some 15-meter openings possible from the USA West Coast to the Far East, but lower MUF's and higher absorption will not permit any openings from Central or Eastern USA . . . Twenty-meter openings are expected from most sections of the USA to most areas of Asia. Conditions may be erratic and at best signals may be weak. High noise levels and absorption will not permit many openings on 40 or 80 meters except for a few spotty ones from the Pacific Coast to the Far East and from Eastern USA to the Near East. In general, Pacific Coast transmissions are favored to Far East locations and East Coast transmissions are favored to Middle East locations.

Gathered By DICK SPENCELEY, KV4AA*

Congratulations to the following on his entry to WAZ:

No. 279 KG6GD Irwin W. Peters 40-143

We also welcome the following new arrival to the Honor Roll:

KG4AF 35-162

Ham activities, in the DX department, have picked up considerably with spells of excellent conditions on 14 mc. and the appearance of several 'new' ones. We trust this trend will continue through July and August with promised activity in such spots as PX, VS4, VS5, FP8, FO7 and ZC3.

Things move along so fast in the DX world that, by the time this column is read, many items may come under the heading of "ancient history". Thus, some of our "flash" items will just be 'faint echoes" when brought to your attention. This is due to unavoidably time lags in setting up CQ, printing, etc. which cannot be helped. We do our darndest, however, to spread the good word on "hot items" via the QSO route from KV4AA.

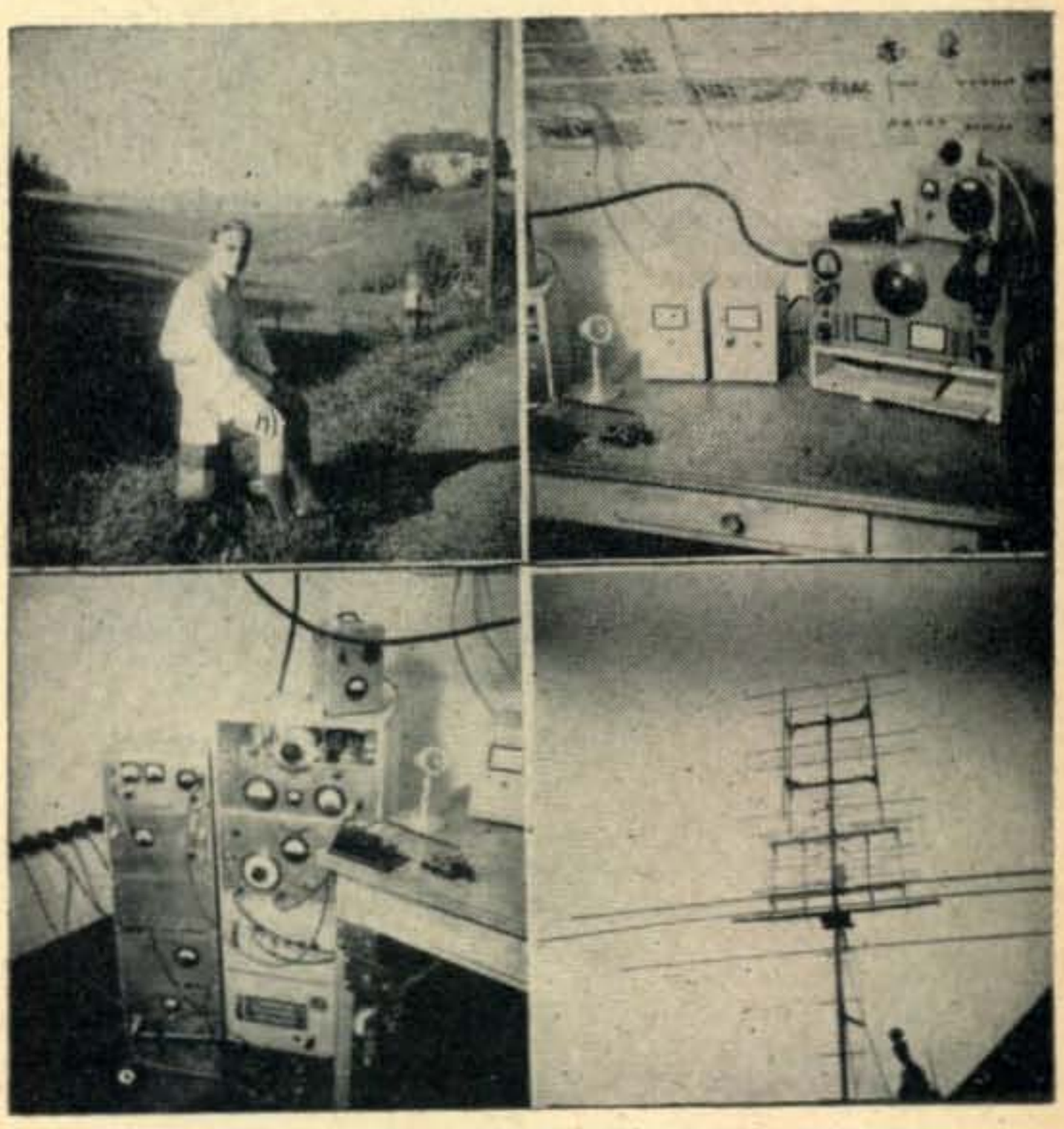
At Time Of Writing

EA9DC/IFNI. We have finally received a fairly stable answer to the universal question, "When will Crescencio go to Rio de Oro". This comes from XE1AC who advises that EA9DC will return home to EA8AW and possibly from Rio de Oro some time in September. This will depend, in good part, on the favorable response from W stations worked from Ifni; i.e.: One dollar with each QSL for airmail reply. Expenses ran high in Ifni the main one being the cost of gasoline which set Crescencio back an average 500 pesetas per operating day. It seems that every station which has expended a little effort has been able to add Ifni for a new one and our collective thanks for his successful efforts on phone and, especially, CW, from May 11th to June 10th, go without saying.

HZ1MY, FL8MY, 4W1MY. We quote a letter from Dick dated June 3rd: Here is the latest news from this part of the world. In regards to FL8MY, I worked only 160 stations, (May 23-24) I left a day early due to the fact I was thoroughly disgusted with the whole thing. I could not work any CW due to the fellows piling on my frequency and calling when I asked them not to. The European fones were the same way. I could have made three times the contacts if they would have operated like they should have. Will be in 4W1MY on the 20th and 21st of this month and if it happens again I will quit trying to give these boys a new country as I can get the country myself and let the rest look out for themselves. We will see how it works out this month. The FL8 cards will be in from the printers in a couple of days. I will make them out and send them as soon as I receive their QSL card. The regular mail takes about three months and much is lost, I would say about 50%, also, no registered or special delivery mail as that has the habit of disappearing because they think it is valuable. The best way is plain airmail (in envelope) as we get first crack at plane mail. Hi Hi! There is a station at Cameron Island signing VS8VB which is one of my boys there. He is running 10 watts. So please start the ball rolling as to classifying the place. Cameron Island has recently started to issue its own stamps etc. Also the classifying of Quartar which is a separate Sheikdom under British protection, not a part of Bahrein Island. Vy 73's and see you from 4W1MY. (Sig.) HZ1MY.

TA3AA (W6OME) got on the air May 29th and has been busy ever since. Andy runs a BC610 with rhombic directed at Washn D. C. He asks that you do not call on his frequency. His stay will be two years and he is out to give everyone a TA QSO. See QTH's.

WØELA/VS5. Last word from Clyde advises that operation in Brunei is planned for the week of July 10th/17th thereby taking advantage of the peak conditions predicted for that period. The call of VS5ELA will probably be used and it is possible that VS6CG and JA2BQ may go along. License has been granted for operation in Brunei only but it is hoped that permission will be given enabling Clyde to put some time on the air from Labuan, VS4, and Sarawak, VS5.



View of DL3FM, Karl Lickfeld, Muljeim, Germany: Upper left, Karl; Upper right, receiving gear, HRO and xtl converters. Lower left, transmitters 144 mc., 140 watts and 14/28 mc., 250 watts; Lower right, 12-element phased array, 430 mc., 2 element yagi for 28 mc., and dipole for 14 mc.

ZC2MAC's activity continues but contacts with east coast stations have been practically nil.

Contacts have been reported by W1FH and W5FXN with a station signing **FO7AW/Clipperton** in June. We consider these questionable as our information has it that Pacific storms have made landings on Clipperton highly improbable during the three weeks preceding these contacts. Should HB9AW have been there we feel that much more activity would have been noted. Clipperton has an average height of ten feet over sea level and is wave swept during storm periods.

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* *A monthly department. Address all correspondence to Mr. R. C. Spenceley, Box 403, St. Thomas, Virgin Islands. U. S. Air Mail rates prevail.*

VR7AB has been active giving his QTH as "Bob Freeman c/o Postoffice Nauru Island via Ocean Island (Gilberts)." From VE7VC, who was his first North American contact, we are advised that VR7AB runs 25 watts to a single 807, is an ex-G station and operates the teletype station there. He received license to operate there via the local P.O. The island is under British administration. This island seems far enough removed from other groups to be considered 'on its own' but decisions will have to be made through the usual channels pending proof of his authenticity. We might add here that reports have been received that the P.O. on Nauru knows nothing of this station. So . . . time will tell.

Familiar to all are the husky signals of W2UWD, Bob Turrell, of Binghamton, N. Y., which emanate from the rig pictured above. Bob runs 700 watts on all bands with rotary beams on ten and twenty. Receiver is an NC240D and a DB22A.

ZC3—W2QHH reports a fb letter from Christmas Island (The ZC3 one, not the VR3 one) from one Dave Laing who states he is all set to go with a fifty watt xtl rig. (Several 7-mc. xtls) He awaits his ZC3 call. Dave is an Australian and has an Indian for a second op. See QTH's.

G3AAM reports on MP4K—activities as follows: MP4KAB and MP4KAF leaving for U.K. shortly. MP4KAC leaving for stateside, MP4KAD is QRT. This leaves MP4KAE who will be on regularly 020.

Exploits

It will be good news in CW circles to know that **HI6TC** was recently QSO'd by W4FIJ for his first W CW contact. 085, 0440z. QRS. See QTHs. . . . . W7GUI reports hearing **VU5AB**, Nicobars, 100 0350z. . . . W2ESO reports **ZD8B** On 7003 0015z. ZD8B was also heard by W7BD 080 1500z. . . . LA6U advises that **LB6XD** and **LB6ZD**, Jan Mayen, were scheduled to return home around June 25th. . . . From ZS6BW and West Gulf Bulletin we hear that Van, ZS2MI (No. 2) is now home and has been replaced with **ZS2MI** (No. 3) consisting of two ham ops, Barry and Steve. QSLs go to ZS5AZ. See QTH's. . . . From same sources we hear that Bob and Arthur Hemsley leave South Africa for approximately two months operating on St. Helena on September 23rd. The call will be **ZD7B**. . . . GW3ZV reports **ZC6AG** is active in Jerusalem. See QTH's. . . . A new DJ prefix has appeared. Two of them are **DJ1AC**, Kaethe, and **DJ1AD**, Hilde, both YLs and both fine ops. . . . W6SAI reports that WØAIW will be active from FP8 around July 1st using a 32V and 75a. . . . W1CPT reports **VQ1MD**, 045, and 8**W4AF**. See QTH's on latter. . . . W1NWO advises that QSIs for **9B3AA** should go only via 9S4AX. The new call will be LZ3AA. 9S4AX has been receiving cards for one "ZA3B" he wishes to advise that this station is unknown to him. . W1NWO also states that an expedition similar to KON-TIKI left France aboard the raft "HERETIQUE" with Dr. Bombard. Radio will be used and the call is **3A8D**. . . .

the DX GRAB BAG

A resume of DX stations recently worked or heard from North America. Times are GMT and abbreviated frequencies 14 mc:

C. W.

C3MC	036	1600	YI3BZL	089	1330
CR4AI	010	0055	YU1CX	019	2110
CT3AB	038	2025	ZB2A	030	2245
CP1BK	050	0130	ZC4RX	068	2020
CN2AD	002	2115	ZD4BF	078	2155
CP1AF	001	2050	ZB1CQ	017	2220
CU3YY	052	2145	ZD1SS	046	2240
CX4CZ	015	2230	ZP9AH	077	2245
DU1FM	098	1440	ZP5AV	078	2250
DU1GT	093	1245	ZC2MAC	020	0815
DU6IV	060	1200	ZM6AA	002	0420
EA9AP	003	1700	ZD2HAH	071	1735
EA8BE	072	1920	ZA2AB	055	2010
ET3Q	063	1545	ZB1HLW	020	2220
EA6AU	125	2120	ZC4XP	020	2010
FN8AD	050	1500	ZD9AA	032	1830
FK8AE	050	1500	ZD8B	7003	0015
FQ8AP	072	2115	ZP1TH	078	2200
FD8AA	072	1730	ZC4RS	060	2005
FF8AF	012	1820	5A2TD	080	2000
FQ8AK	035	2115			
FB8BE	105	1300	PHONE		
FI8AB	100	1500			
GD3UB	020	2355	AG2AC	150	2115
HZ1AR	058	1500	CP5EA	190	2300
HZ1MY	030	2305	CN8GD	320	2140
HE9LAA	007	2130	DU9VL	195	0840
HB1HY/HE	020	0100	DU1JI	196	1420
I5ZC	045	2055	FB8BE	100	2045
I1NU/Trieste	065	2220	FI8AC	262	1055
			GD3UB	345	2230
JY1OG	056	2030	HI6TC	300	0210
KW6AZ	091	1310	HC8MM	120	0405
KJ6AR	078	0550	HZ1MY	131	0015
KC6QL	078	1455	HH5SS	320	2250
KC6DX	108	1335	JA2MB	298	0150
KX6AH	090	1240	KX6AH	270	0610
LZ1KAB	070	2030	KW6BD	261	0830
LB6XD	020	0150	KJ6AW	265	0740
LUØAC	100	1200	MF2AA	320	2115
MI3US	086	2245	OQ5PE	150	2110
MP4BBD	048	0345	OD5AZ	200	1645
OE7AZ	054	2145	OE13SC	285	2145
OY2A	045	1510	PJ5RE	170	1300
OE13USA	018	1410	ST2GL	160	1645
OY2Z	001	1930	SP9KKA	340	1700
SP2KGA	018	1920	TA2EFA	170	2045
SP5AB	022	2135	VS2DB	310	1500
TF3AB	090	2130	VQ5DQ	210	1730
UAØKKA	090	1330	VQ4AC	112	2040
UAØFR	040	1300	VR3C	132	0840
UA6KPA	050	1645	VR2AP	170	0505
VS6AE	040	1405	VK9DB	150	0640
VS1DU	097	1410	VS1ES	304	1040
VS2DH	100	1415	VP2LE	335	2225
VS6CG	060	1417	W6HQH/KM6	209	0545
VP3TF	024	2340			
VS1CZ	060	1500	WØEGY/KJ6	267	0835
VQ3BM	060	0510			
VS2CV	040	1515	XZ2SY	310	1445
VR4AF	7032	1100	XZ2SS	275	1340
VR7AB	011	0650	XZ2ST	VFO	1455
VR1A	065	0605	YI3BZL	150	1640
VK9BI	108	1300	ZP5CB	190	2300
VR2CK	053	0605	ZC6UNJ	304	2000
VS7NG	070	1445	ZD2HAH	210	1625
VQ4HJP	025	1750	ZK2AA	170	0710
VQ9AC	053	1400	ZK1BC	308	0635
VU2EJ	032	0200	ZP4BB	284	0020

Thanks to WØTKX, XE1AC, TI2TG, W5NMA, W9NDA, W5MPG, W5IHP, W5FXN, W5ADZ, W5ASG, W5JUF, W5FFW, W5EGK, W7HIA, W5CTM, W9RBI, W7MBX, W5DML, W5AWT, W8NBK, W5LXY, VE3KF, W5DMR, W5BGP, W5FNA, W5ALA, VE3CCK and the West Gulf DX bulletin.

F7BB advises via W8PQQ that the **PX1BB** expedition planned for June has now been delayed until sometime in July.

ZS2MI nabbed W7GUI for his first W QSO. This is ZS2MI No. 3. . . . **4X4RE,** on again after three month layoff, grabbed EA9DC. . . . **W9GIL** is up to 150 with LB6XD, FL8MY, KC6DX, YI3BZL and HI6EC. . . . **W6VFR** adds ZC2MAC, EA9DC and FL8MY. . . . **W1DSF** made it 100 with TA3AA and went on to grab YI3BZL, EA9DC, KP6AF, ZD1BJ, EL2A, VP8AP and MI3AB. . . . **W2HMJ** made it 200 with EA9DC. . . . **G6QB** rises with ZK2AA, ZD9AA, EA9DC, KM6AX and ZC2MAC. . . . **G3FXB** hooked JY1AJ, ZC2MAC, EA9DC, and FL8MY on 14 and CE4AD on 3.5. . . . **W1HE** nabbed SU1AD and EA9DC. Time to QRO a bit Wally. . . . **G6YQ** went to 187 with FL8MY and EA9DC. . . . **OQ5RA** hooked SM1BSA to complete WASM and continued with FL8MY, JY1OG, KC6DX, OY2Z and UM8KAB. . . . W9AND recd his WAP certif from NZART (No. 177). . . . **KG6ABW** made it 90 with KV4AA. . . . **W2AGW** QSO'd VU7FK who said QTH Bahrein. . . . **W6SN** recd cards Nos. 231/2 from FB8BB/ZZ. . . . **KP4OD** hooked OD5AB (Lebanon). . . . **W6TZL** went to 140 with such as VR4AF, LB6XD, KS6AA, CR6AF and VQ5CW. . . . **W6NTR** added 11 for 173. . . . **W3EPV** ups to 223 with LB6XD, FL8MY and EA9DC while **W2WZ** also reaches 223 with EA9DC. . . . **W6SYG** rises to 235 with all the late ones. . . . The 39 zoners duel for top spot with **W5ASG,** 231, just topping **W9RBI,** 230 and **W2NSZ,** 228 close behind.

Are You A Ham-pest?

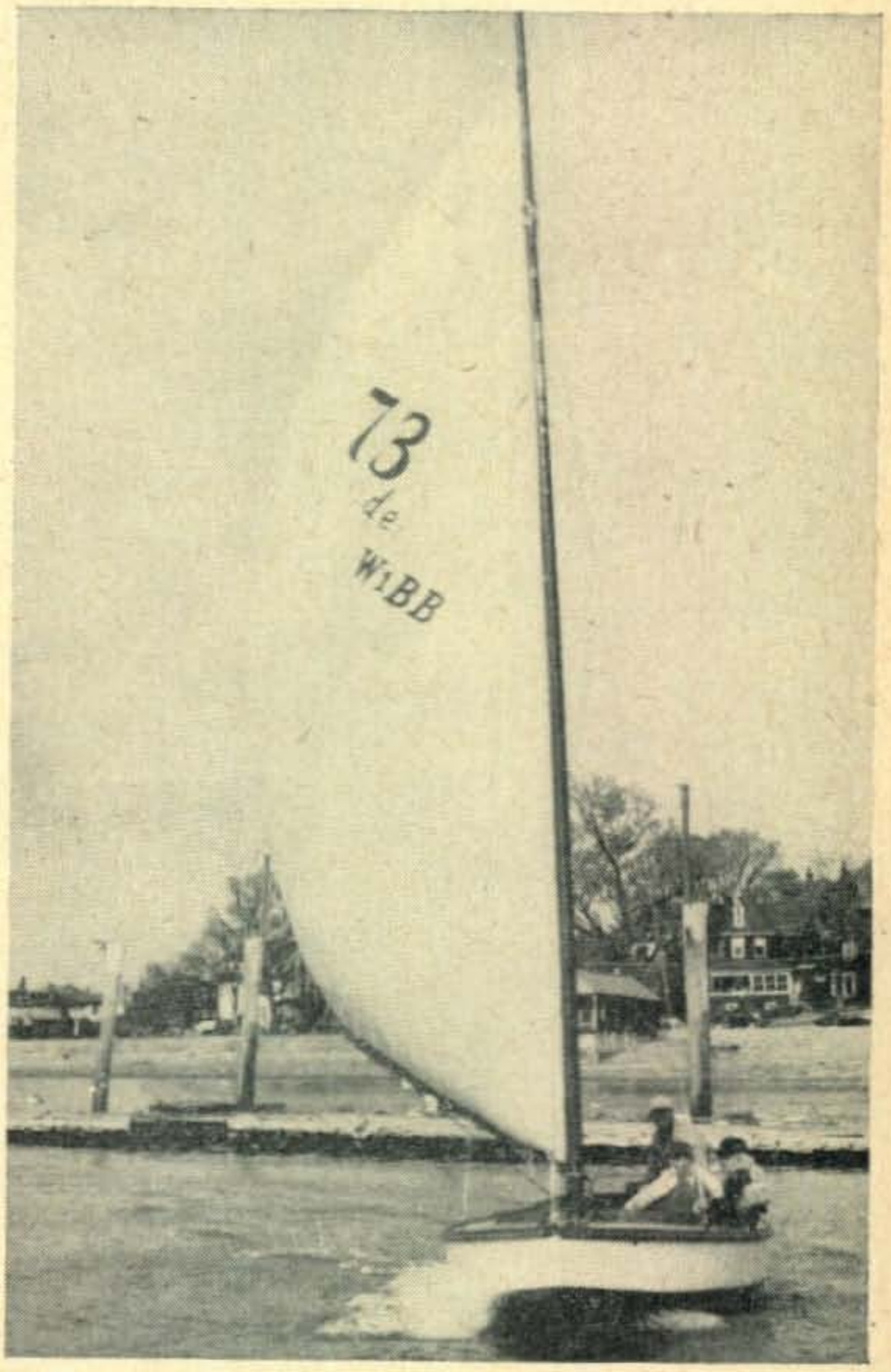
We love ham radio. As a hobby we don't think anything can touch it. Like anything else, to make it more enjoyable, consideration must be shown to others. A little thought, beforehand, will keep you out of the following categories and do much toward making the DX bands more livable.

To Ham-pest No. 1, The tester, we say, if you must "test" keep your tuning up periods to a minimum. WSM-TV could be tuned up from scratch in half the time I've heard some of the boys harassing their 807's. Remember, when you test during DX rush hours you are always QRM'ing one or two QSO's then in progress. You wouldn't like it—Don't do it.

To Ham-pest No. 2, The longwinded CQ'er, we say, before CQ'ing listen on your frequency, are QSO's going on there? If so, QSY to a spot where you won't foul things up. At most times quiet spots may be found where your CQ won't do any damage and will have more chance of being answered. And don't tell me you're rockbound, that went out with the mustache cup.

To Ham-pest No. 3, The CQ DX caller we say that such a call may get you an overseas contact but it will never get you a new country unless it's your first day on. Let the DX do the CQ'ing and you do the listening. It's easier, It's nicer, It's more effective.

W6DLY adds LZ1KAB, ZC2MAC and others to tie with G6QB at 40-213. . . . **WØANF** brings his phone total up to 136 with such as W6HQH/KM6, YI3BZL and EA9DC. . . . **VE4RO** ups to 229 with FI8AB, LB6XD, ZC2MAC and others. . . . **XE1AC** asks his CW score be deleted and heads the phone list with 217 thanks to FI8AC and EA9DC. . . . **KC6QY** made it 163 phone for W6AM. . . . **W4EPA** adds OQ5PE, EA9DC and ZD2FFB for 134. . . . **G6RH** is 236 with EA9DC and FL8MY. He seeks QSL from WØOZW/KS6 '48. Any help? . . . . **W6MX** goes to 227 with VP2GH, LZ1RF, EA9DC, and OY3IGO. . . . **W6GDJ** ups to 216 with KH6IJ and W6SAI close behind with 215. . . . **W1MCW** adds six on phone which brings Lou to 190. . . . **W3EVW** ups to 234 CW and 154 A3. . . . **W3GHD** makes it 239 with FL8MY who also helped Bob reach 170 phone. . . . **W6AMA** made it an even 230 with EA9DC, LB6XD, ZC2MAC and EAØAB. . . . **W2GFW** goes to 160 with AP4A. . . . **EA9DC** pulled W2BXA out of temporary retirement for No. 235. . . . **W3FQB** upped to 170 with EA9DC. . . . W8NBK added LB6XD and FL8MY to reach 234. . . . **W6EPZ** totalled 201 with EA9DC and YI3BZL. . . . **W3SPI,** Jules, of W4LIU and TA3FAS, starting all over again, rang up 105 countries after only a month's time, latest include KW6AZ, KM6AY, VS6CG, DU1JI, FM7WH, ZP8AH and YS1O. . . . **W1NWO** A3'ed to 193 with FY7YB. . . . **ZL1QW** ups to 130 with ZC4XP, VP6AA and FO8AC.



This is how a 160-meter specialist spends an August afternoon.

21 Mc.

Consistent operators on this band have been rewarded with some very nice openings. Take the report of **W4COK** (ex-W2COK) who runs an 829 and three-element rotary. Bill says: "On Saturday, June 7th, from 1800z to 2230z the band opened wide at this QTH. Never heard anything like it, Europeans were booming in S9. WAC was speedily made as follows: 1800z PY6DU, 1950 CT3AN, 2040 HZ1MY, 2100 HB9FU, 2220 VK4HR, and, 2230 KZ5AW. (This may well be the first W-WAC on this band. Any takers?) Also worked were: OZ5BK, EA3CY, ON4FT, I1BCB/Trieste, PAØVU, PAØJJ, PAØKX, PAØNS, PAØQF, PAØUN and ON4VU. Heard were 9S4AX and ZE3JJ." Bill now has 23 countries on 21. . . . **ZL1HY,** who is on 21-mc daily at 0100z, advises no Asians have been heard on the band from the Pacific side. . . . **HB9FU** advises that HB stations are limited to frequencies between 21250 and 21450. . . .

Here and There

We are investigating the possibility of a new country. This is RUANDA URUNDI located southeast of the

Belgian Congo near the borders of Tanganyika and Kenya. Our informant, OQ5RA, states that this country does not have the same government or political set-up as the Belgian Congo and advises that Congo officials agree that this might well be considered a separate country from the ham viewpoint. At present there are two hams in Ruanda Urundi, OQ5CZ, 14 CW and OQ5DZ, 14 phone. We have suggested to OQ5RA that these hams be given a new prefix or different numerical call, say, OQ8, as a step in the right direction. We will keep you informed.

This is the neat setup of Dick Ehrhorn, WØFID. Licensed in 1947, at the age of 13, and already holding WAS, WAC, WBE, DUF, CP35, DXCC, and RCC certifs., WØFID will be a station to be reckoned with in the years to come. Transmitter, running a KW to PP 813s, is entirely home designed and built. FID is presently soaking up electrical engineering at the University of Minnesota.

W3ENK/KG6 writes that he will not receive a new KG6 call. The FCC advised him, under new ham regulation, to use W2AOS/KG6 during his Guam stay. Chas. has been W2AOS for the past 32 years while also holding W3ENK for 18. W3ENK will be cancelled. See QTH's. . . . **W6NZW** is the new call of W7KXS/W9MKZ. Louis has already knocked off 89 countries in 90 days. . . . **W1RWP** traded "first Vermont" for "WAC on 7MC" with ZC4XP. Nice going Stan. . . . **KV4AU**, Bud, leaves for new CAA post in Knoxville, Tenn. . . . **VP5BF** arrived back in Caicos after brief Jamaica stay. . . . **DL7AH** seeks ZP and HR QSO's while rising to 69 on 3.5 with CX1FY, CE3AG and PY2AJ. . . . **W1FH** and **XE1AC** were pleasantly surprised with hand-made cards from EA9DC/Ifni. . . . **W4JOU** and XYL dropped in on KV4AA while W2CTO visited W1CPT. . . . **W2AGW** seeks QSL's from VR4AC '49 and VR4AD '50. . . . **GM3CSM** met W6AM at Scottish airport on Don's recent European tour.

That **2Z2AA** you heard seems to have been a ship off the Spanish coast. . . . **G3GUM** worked EH5IF who gave his QTH as S. S. Bonaventura bound from Sydney to Montreal. . . . **VK1NL** (Heard Is.) says cards are back from printers now but he has received only 55 QSL's from 203 QSO's. . . . **W2AIS** (/MM, ZC8PM) now shows up from W2AIS/KH6. Pat arrived on May 22nd and is ass't engineer at the FCC monitoring stn. at Kanehoe. . . . We hear from **W6SAI** that FI calls are now legal and calls have been issued from FI8AA to FI8AF. Also, OD5 calls seem to be in the clear. Clearance on these will have probably come through from the FCC by this time. . . . **MD6BZL/P** was heard during BERU field day. This was apparently YI3BZL racking up FD points.

F7BB, 3A2AQ, reports W results were rather dismal during his stay in Monaco April 21/25. A satisfactory number of contacts were made on 7/14-mc phone and 3.5/7/14-mc CW but few W's were contacted. Fifty watts were run into a long wire and V beam. He was accompanied by F7AS (W6KEN). Officials and hotel personnel extended every courtesy and were extremely helpful. . . . **W6PQT** is now in the Veterans Hospital, San Fernando, Calif. (Ward 10) and would appreciate hearing from his many overseas friends. . . . **CT1CL** wishes it to be known that he is on from 0500/0700z and 1800/2300z week-days and all day Sats and Suns, looking for those new ones. He runs 50 watts to an 807 and three-element beam. . . . **WØFYY** reports interesting trip with USAF eclipse expedition during February. Mary visited Azores, Tripoli, Saudi Arabia and Iceland. Ham activity took place in Tripoli where the call 5A2TU was issued and many contacts were made at 32,000 feet from 5A2TU/AM. Operating time was also put in at HZ1AB. . . . We regret error in March CQ advising that QSL's for Feb/July '51 SVØAB operation by W2SUC/KL7 should go to W2KUC. This should, of course, read "to W2SUC home QTH". . . .

Endorsements to Honor Roll appearing in July issue:

W6VFR	40-246	W9RBI	39-230
W3BES	40-243	W2NSZ	39-228
W6ENV	40-242	W3DPA	39-226
WØYXO	40-241	F8BS	39-225
W3GHD	40-239	W3EPV	39-223
G6RH	40-236	W2WZ	39-223
W6SN	40-236	W1HX	39-208
W6SYG	40-235	W3DKT	39-206
W2BXA	40-235	W9LNM	39-205
W3EVW	40-234	W3KDP	39-193
W8NBK	40-234	GM3CSM	39-180
W2AGW	40-230	W2HMJ	38-200
W6AMA	40-230	WØTKX	38-180
VE4RO	40-229	W8EYE	38-172
W6MX	40-227	OZ7BG	37-163
W7GUI	40-223	W4EPA	37-133
G2PL	40-218	KG4AF	35-163
W6GDJ	40-216	ZL1QW	35-124
KH6IJ	40-215		
W6SAI	40-215	**PHONE ONLY**	
G6QB	40-213	XE1AC	39-217
W6DLY	40-213	W6VFR	39-177
W8HGW	40-211	W9RBI	38-202
W6EFM	40-209	W2BXA	38-193
W6TI	40-208	W3BES	37-188
W6EPZ	40-201	W3GHD	37-170
W6EHV	40-193	W1NWO	36-193
W6NGA	40-178	W1MCW	36-190
W6NTR	40-173	W5ASG	35-159
KG6GD	40-143	W3EVW	35-154
W5ASG	39-231	WØANF	35-136

Next complete Honor Roll appears in the September issue.

The Southern California DX club Inc. elected new officers on June 5th as follows:

President	W6BUD
Vice Pres.	W6VBY
Recording Sec'y	W6AOA
Corresponding Sec'y	W6MUR
Treasurer	W6UQQ

Meetings are held regularly on the first Thursday of each month, 8 pm, at Cliftons Cafeteria, 7th and Broadway, Los Angeles, Cal. Visitors are welcome.

Bud, **DL4LQ**, commenting on the UA situation, says the UA's seem to limit their QSO's to Iron Curtain countries and only occasionally contact other Europeans. QSL's to DL4's were cut off quite abruptly several months ago. Bud goes on to say that 3.5 CW is a Fb band in Europe as 7-mc is crammed with commercial phones. He is looking for NA and SA QSO's between 3500/3600

(Continued on page 68)

A Monthly Department Edited by HERB BRIER, W9EGQ*

Not so many years ago, the only way the average amateur could obtain a transmitter was to build it himself. Today, he has the choice of buying or building. Buying a manufactured unit is certainly easier, but is usually considerably more expensive than building it. It also deprives one of the sense of achievement derived from building a major part of one's station. Then too, many amateurs enjoy building equipment as much as operating it. Unfortunately, lack of tools or work space often prevents them from doing so.

Recognizing these facts, a number of manufacturers have brought out complete kits to be assembled by the purchaser. They offer certain advantages over either buying a manufactured transmitter or building one from "scratch." First, the kit usually costs less than an equivalent manufactured unit. In fact, it may cost less than it would to buy the components individually. Furthermore, a kit offers the insurance that every part will fit.

Possibly the most important feature of the better kits is that all holes are drilled and punched, eliminating most of the drudgery. Construction consists of mounting the components and wiring them according to the very complete, step-by-step instructions and drawings furnished. As a result, the constructor enjoys almost all the advantages and few of the disadvantages of building his own equipment.

From time to time, the *Novice Shack* will report on kits which seem particularly suited to the needs of Novice operators. The first one to be reviewed is *The Philmore Novice Transmitter Kit, Model NT-200*, manufactured by The Philmore Manufacturing Co., Inc., New York 3, N. Y., and distributed by amateur radio supply houses for $29.95.

The assembled kit features a standard circuit. A 6V6 is used in a Pierce crystal oscillator to drive the 6L6 output tube, which is coupled to the antenna through a simple pi-section network. Its rated twenty-five watts input to the 6L6 is furnished by an a-c operated power supply, employing a 5Y3 rectifier tube, and capable of 370 volts output at a rated current of ninety milliamperes.

Although coil specifications for only the 3.7-mc and 27-mc bands are furnished with the kit, the transmitter will operate on all amateur bands between 3.5 and 30 mc. by plugging in appropriate coil and crystal. Power output on frequencies above 7.3 mc. is less than on lower frequencies (because the 6L6 is operated as a frequency multiplier) but is sufficient for satisfactory low-power work.

To test whether the average Novice could assemble

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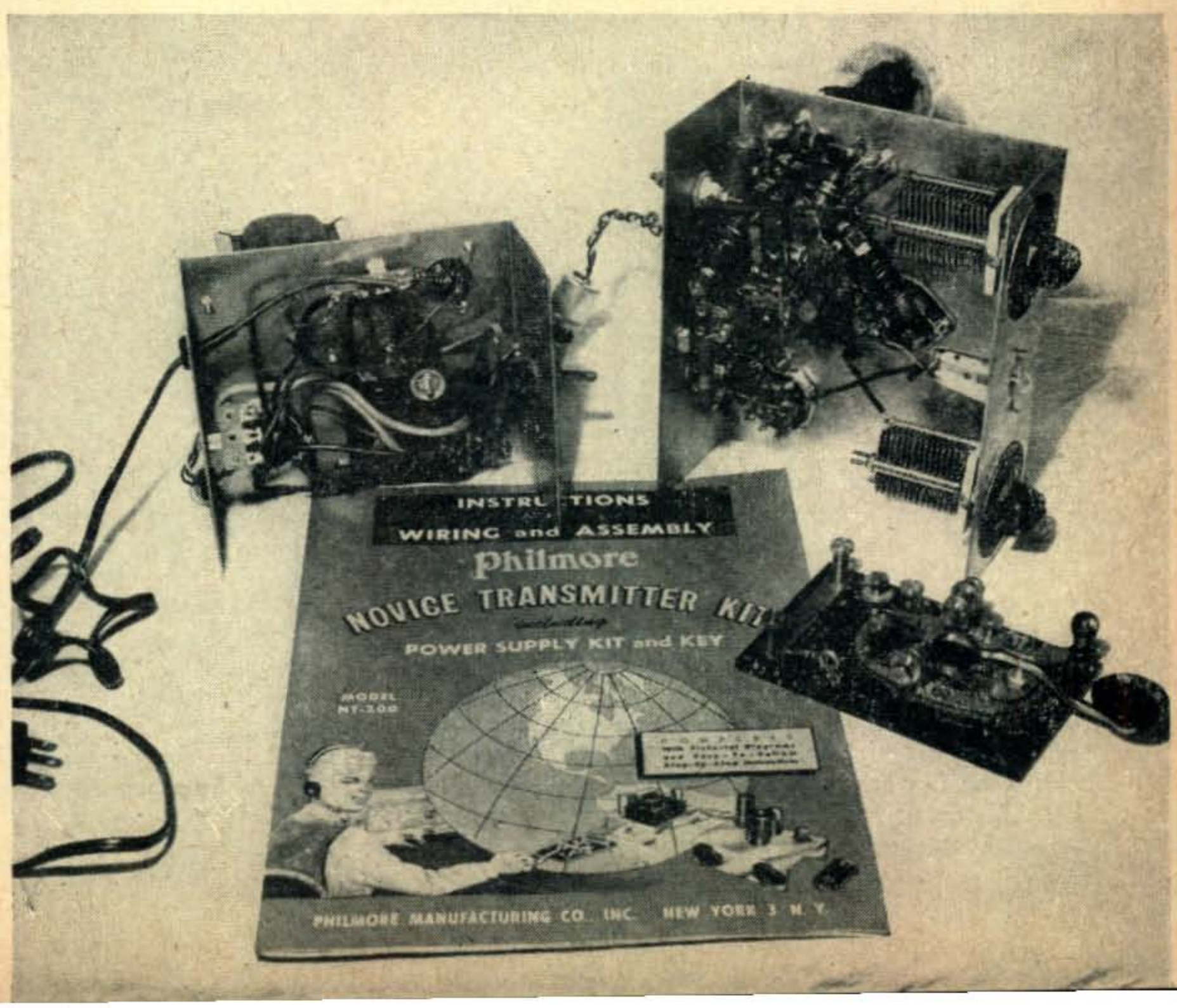
* *Address all correspondence to 385 Johnson Ave., Gary, Ind.*



This is the complete Novice Transmitter after being wired and tested on the air. The instruction booklet uses pictorial type schematics. These have been found to be the easiest to understand and follow. The unassembled kit sells for around $30.

the kit without supervision, I turned it over to Martin Yuriga. He is the sixteen-year-old son of W9CWB and is a prospective Novice. His previous radio experience consisted of building a small receiver with his dad's help and the usual instruction received in a High School Electric Shop.

Using pliers, screw driver, soldering iron, a length of rosin-core solder, and a drill with which to make two ⅛-inch holes in each coil form, it took Marty three evenings of leisurely work to assemble the kit. Both the transmitter and power supply worked the first time. I then loaded up an antenna approximately 150 feet long on 3.68 mc., and worked the following:

Date: June 16, 1952

12:35 AM: W8BJC, Wooster, Ohio. Report: 579X.

1:15 PM: WN9QQF, Kennilworth, Illinois. Report: 579X.

1:32 PM: WN9SSJ, Chicago, Illinois. Report: 599X.

These results speak for themselves. For an input of twenty-five watts, a random-length antenna about twenty-five feet high, and conditions certainly no better than average, three calls and three contacts is not a bad average!

I would make two suggestions to anyone building this or a similar type transmitter. Connect the chassis to the best available ground—water pipe, radiator, etc. Tap *L1* for increased flexibility in loading random lengths of wire. A tap at the twenty-fifth turn and eery subsequent fifth turn should be sufficient.

Here, when the full forty-nine turns were used, *C1* tuned very near minimum capacity, and *C2* tuned at maximum capacity. Loading was quite light and the strength of the second harmonic on 7.36 mc. was almost as strong as the fundamental signal at a distance of half a mile. After shorting out fifteen turns, *C1 tuned* at two-thirds maximum, *C2* at one-third maximum, loading was fully controllable, and the second harmonic dropped six "S" points.

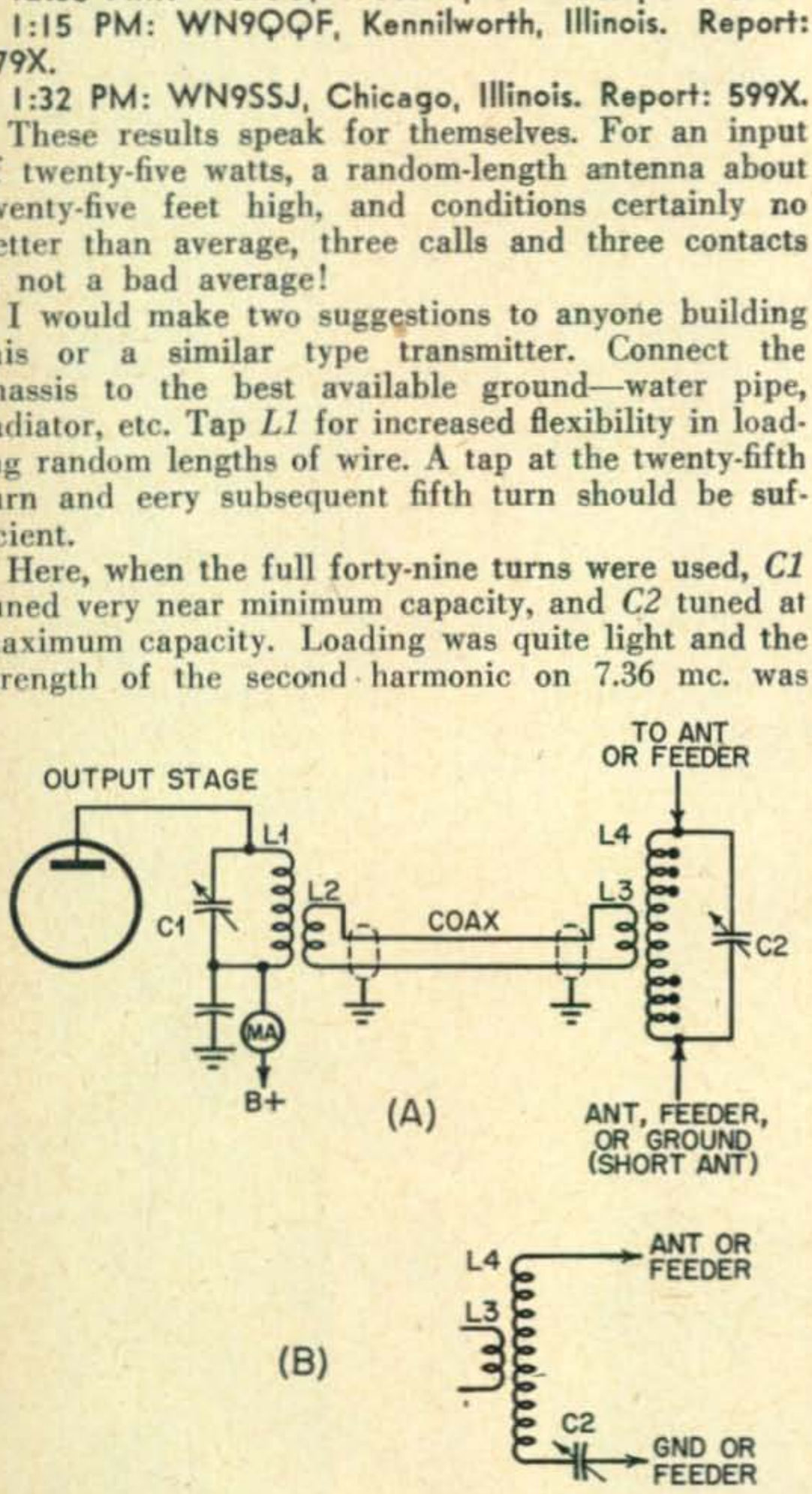


Fig. 1. Typical parallel-resonant tank circuit and simple antenna tuners. Use circuit "A" for a single wire antenna that is an integral multiple of a half-wave, or less than a quarter wavelength. Use circuit "B" for a single wire that is an odd multiple of a quarter wavelength. For adequate harmonic suppression, C1 should have a capacity of at least 200 $\mu\mu$f. at 3.7 mc., assuming a plate voltage to plate current ratio of five (500 volts at 100 ma., or 300 volts at 60 ma., etc.). Prune L1 so that calculated capacity is used to resonate it to operating frequency. C2 and L4 may duplicate C1 and L1. L2 and L3 may contain from one to six turns, depending on construction, type of antenna, etc. Three or four turns is a good starting point.

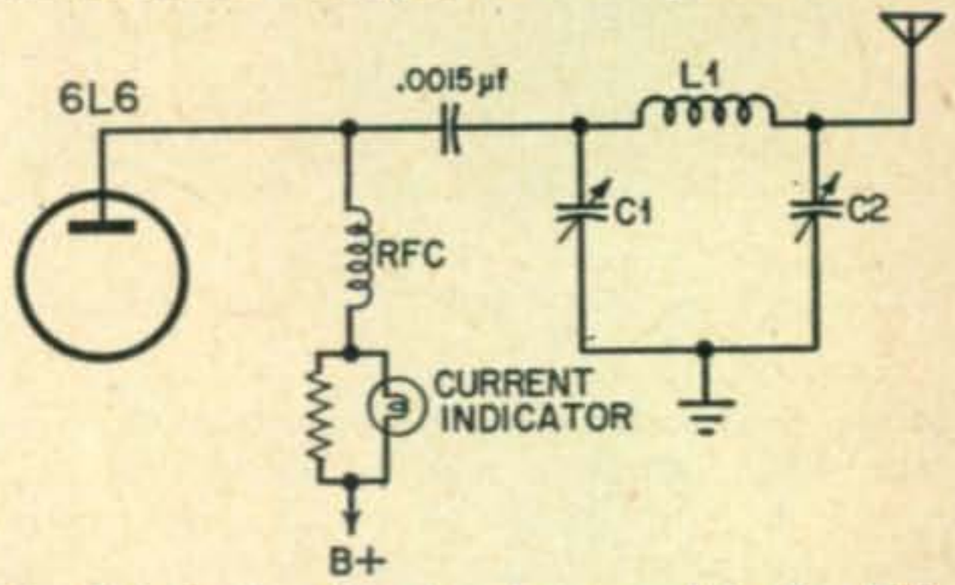


Fig. 2. This is the pi network as used in the Philmore transmitter.

Output Tank Circuits and Harmonic Radiation

From my mail and from talking to various Novices, it appears that they are puzzled about what happens when they connect an antenna to a transmitter. Also, a number of them have received notices from the FCC for harmonic radiation, making them vitally interested in learning how to avoid getting another. Knowing the answer to the one makes it easy to solve the other.

There are two types of output circuits commonly used in amateur transmitters. One is the pi network, such as used in the **Philmore** transmitter and in several other commercial transmitters and kits. It serves the dual purpose of providing the load into which the output tube works, at the same time, matching it to the antenna. The other is a parallel-resonant tank circuit, plus a separate antenna tuner, as sketched in **Fig. 1.** This arrangement is used in most home-built transmitters and in several commercial ones.

Before discussing the relative merits of the two circuits and outlining, step-by-step, how to adjust them, it is important to understand their fundamental purposes. They are: 1. To put as much as possible of the power generated by the transmitter at the desired frequency into the antenna, without exceeding any of the ratings of the transmitter or associated equipment, or exceeding the power input authorized by the class of license held. 2. To prevent the power unavoidably generated at other frequencies by all transmitters from reaching the antenna.

The Pi Network

The pi network meets the first requirement easily. With one, almost any length of wire can be made to accept power without difficulty. This does not mean that any piece of wire becomes a good radiator when fed through a pi network. It merely means that if circumstances require using a random-length antenna, the pi will make the best of a bad situation.

To tune a pi network, connect antenna and set both input and output condensers, **C1** and **C2** of **Fig. 2,** to maximum capacity then do the following:

1. Apply plate and screen power.
2. Tune **C1** to resonance as indicated by minimum plate current.
3. Decrease capacity of **C2** until plate current increases an arbitrary amount.
4. Retune **C1** for minimum plate current, which will now be somewhat higher than that established in step No. 2.
5. Repeat the adjustments of **C1** and **C2,** always adjusting **C1** last, until normal plate current is drawn by the final amplifier tube, or until resonating **C1** causes a barely perceptible dip in plate current, whichever occurs first.

This last adjustment produces optimum output for the circuit constants being used. Further loading will increase plate current slightly, but output at the desired frequency will not increase proportionately. It may even decrease, and output at undesired frequencies will probably increase. **Overcoupling is one of the causes of excessive harmonic radiation.**

When adjusting any transmitter, keep the key closed no longer than absolutely necessary. When the final amplifier tank circuit is out of resonance, the entire plate input power is dissipated in the tube. When the amplifier is unloaded, the tube screen current climbs

to a high value, as do the r-f currents and voltages in the tank circuit. Any of these conditions can damage valuable equipment, if allowed to continue for longer than a very brief period.

If either condenser should tune at minimum capacity, short out or remove a few turns from the coil and start over. If, on the other hand, one of them tunes at maximum capacity, even after varying turns in **L1**, connect a small fixed condenser in parallel with it. These remarks pertain to frequencies below 27 mc. At 27 mc. and higher, output capacity of tube and distributed capacities usually make it impossible to end up with too little capacity, and the range of capacity in the variable condensers will supply any additional capacity ever likely to be required.

Parallel-Resonant Tank Circuits

For simplicity in explaining the adjustment procedure for a parallel-resonant tank circuit with a separate antenna tuner, we will first assume that the antenna is a half wave long. See **Fig. 1A.**

Adjusting **C1** and **C2** follows almost the same pattern outlined for adjusting a pi network. **C1** establishes resonance, and **C2** determines loading. An important difference is that in this arrangement, there will be one definite setting for **C2.** Varying in either way from this point will cause decreased loading.

Find the proper setting for **C2** with the coupling between **L1** and **L2** or between **L3** and **L4** loose enough that tuning **C2** causes only a moderate variation in amplifier plate current. This reduces the reaction between **C1** and **C2** to a minimum. Once **C2** is set, increase coupling to bring the plate current to the desired value. Retune **C1** to resonance after each adjustment of coupling, but do not touch **C2.** Use no more coupling than necessary to draw the desired plate current. Observe the same precautions against over-coupling as with the pi network.

To tune an antenna an odd number of quarter waves long, connect **C2** and **L4** as in **Fig. 1B.** Tuning adjustments are then as above. Suggestions for tuning other lengths and types of antennas are given in the figure.

Comparing The Two Circuits

On the basis of the above, the pi network seems to have an advantage over the second arrangement in tuning single-wire antenna systems. Remember, however, that getting power into the antenna is only half of the battle. It is equally important to keep power at undesired frequencies out of it. In this, the simple pi network is almost always inferior to the arrangement of **Fig. 1.**

There are several reasons for this. One is that undesired frequencies must force their way through two tuned circuits in the second arrangement compared to only one with the pi network. Another is that, although a pi section looks quite simple, it requires many calculations to establish optimum values to match a certain plate load to a given antenna while providing adequate discrimination against undesired frequencies. The more the antenna characteristics differ from those assumed in the calculations, the more the probability of harmonics reaching the antenna increases.

As many who have link-coupled a center-fed doublet to one can attest, using a parallel-resonant tank circuit does not automatically eliminate spurious radiation. It does have one advantage over a pi network, however. The proper value of **C1** can be calculated, and will normally remain substantially unchanged, no matter what type of antenna is used. The truth is, however, that a single tuned circuit between the final-amplifier tube and the antenna is insufficient to insure positive protection against harmonic radiation.

A pi network is working at its best when feeding a low-impedance coaxial-fed antenna or antenna tuner. Enough said. At any rate, a tuner of some sort is required to feed a balanced antenna from a pi network, which is essentially a single-ended device.

Whatever the circuit, check locally the strength of your harmonics, in order to save the FCC the trouble of doing it for you.

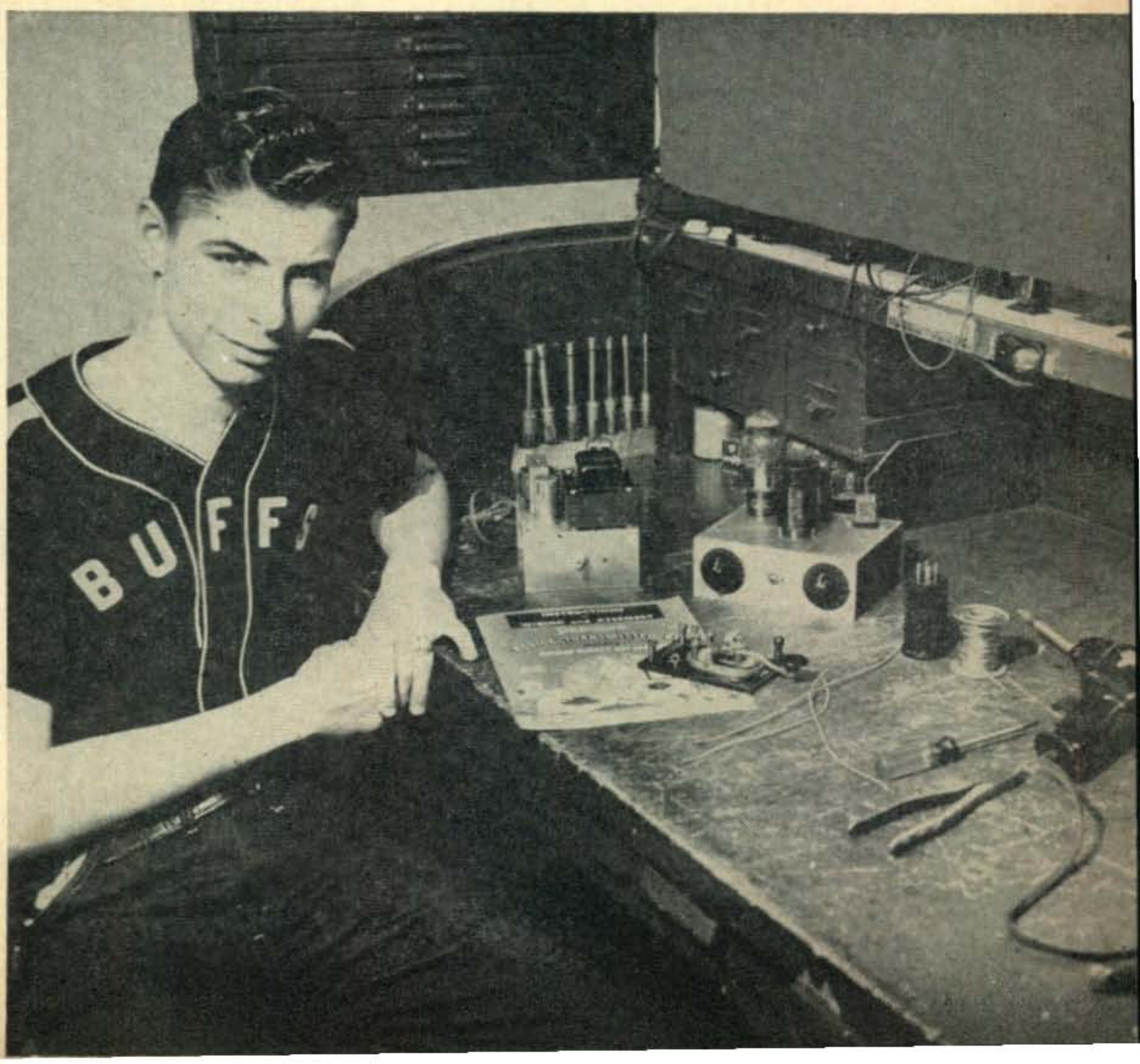
Letters And General News

There have been many occasions during the past few months when "short-skip" or "sporadic-E" contacts have been possible on the 27-mc band. Unfortunately, most Novices missed them, because they did not know the band was open. Similar opportunities will be possible for the next several weeks, and we will soon be in the period of the year in which normal "F-layer" transmissions are most likely. I suggest taking advantage of these opportunities.

CQ's monthly propagation prediction charts will indicate when "F-layer" contacts are most likely, but the short skip type is unpredictable. The best thing to do is to monitor the 28-mc band for activity. Any time that 28 mc. is open, it is safe to assume that 27 mc. is also open. If you do not hear anyone to call, try a CQ of your own.

It is probably just as well for certain Novices that **WV4AZ,** Christiansted, St. Croiz, Virgin Islands, mentions NO call signs heard.

(Continued on page 67)



This is Martin Yuriga, sixteen year old son of W9-CWB. Martin completely assembled and wired the Philmore Novice transmitter kit. The tools he used are at the right.

the VHF news

Edited by
W. E. "BILL" McNATT, W9NFK/5*

William A. Copeland, WØYKX

One of the real old time VHF men, Bill Copeland, WØYKX, died in Rochester, Minnesota, on the morning of June 5, 1952. Funeral services were held at Woodbine, Iowa.

Bill was well known—and will be long remembered—for his staggering "states worked" total on 5 meters; his 12-element 56-mc beam; his consistent 270-mile ground-wave coverage; his devotion to the "ultra-highs" as they were termed, pre-war, where he spent all of his operating time for many years.

After the war, Bill went to 50 mc., but his illness made operating very difficult. A couple of years ago, the Copelands moved from Woodbine to Rochester, where Bill bought and operated the Minnesota Hotel, so that he could have constant medical attention. Whenever possible, Bill participated in Rochester's ham activities; he had a kilowatt rig ready to use on six meters, but was seldom able to fire it up. —WØTKX.

Texas Takes Two-Twenty Title

On June 16 at 0530, W5ONS, Victoria, Texas, and W5AJG, Dallas, made contact on the 220-mc band to set a new record of about 288 miles. This broke the long-standing record of 275 miles made on June 29, 1949, by W1CTW and VE1QY.

A number of attempts at a contact had been made previously by Herb and Leroy, but—until the record setting contact was made, Leroy had been unable to hear W5ONS, who had heard W5AJG several times, as had W5FSC, Houston, and W5AXY and W5BDT of Austin. W5FSC also worked W5AJG on the morning of the 16th at a distance of about 230 miles.

W5ONS uses a 6BQ7 crystal-controlled converter, a twin-5, ¼-wave-spaced beam 55 feet in the air, and not pointed exactly on Dallas at the time of the contact. The transmitter consists of a 6AG7 crystal oscillator tripling to 24 mc., a 6V6 tripler driving two 2E26s in cascode which drive an 829B tripler to the 220-mc band at 8 watts input. Eventually, this will be used to drive a 4-65A.

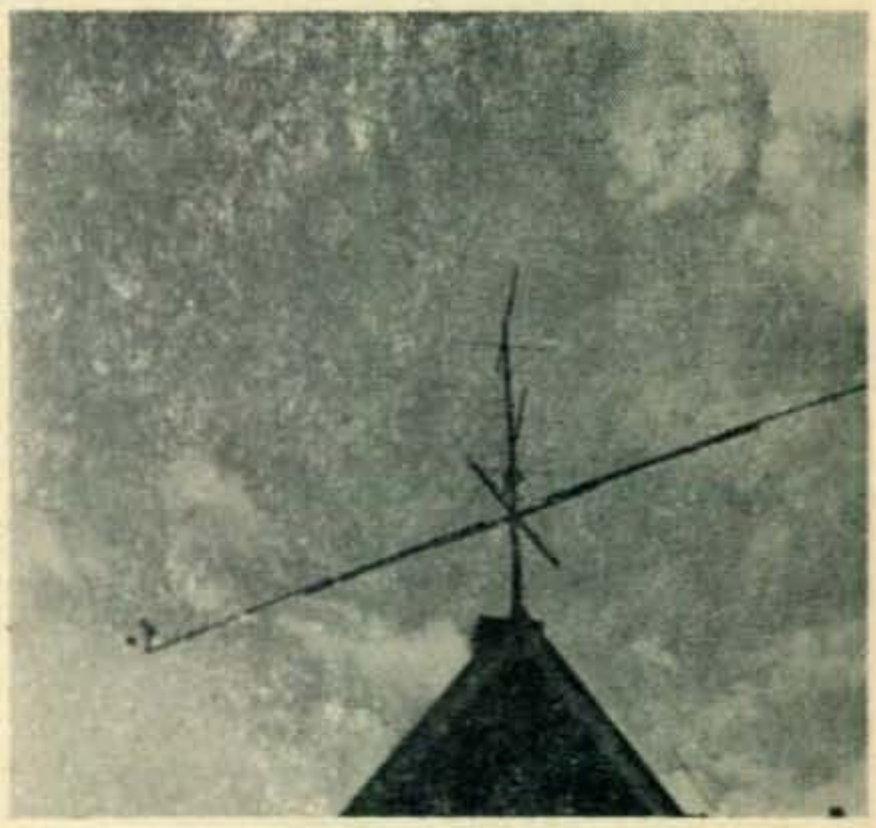
W5AJG uses a converted 522 with an 829B final running about 55 watts input. The beam is a 16-element array 30 feet above ground. For receiving, Leroy uses a Navy type CG-50BM preselector with lighthouse tubes into a 6J6 mixer-oscillator, crystal controlled. He is now building a new converter inasmuch as he is dissatisfied with the present receiving system.

W5FSC, Houston, made his first 220 mc. two-way contact on June 10 with W5AXY and W5BDT, Austin, and the contacts have been repeated a number of times. Bud also works W5ONS. The gear at W5FSC consists of a 6BQ7 crystal controlled converter; the transmitter is a converted 522 with an 829B final amplifier, now under construction. The antenna is a twin-5 beam, 75 feet in the air above the arrays for six and two.

W5AXY and W5BDT, Austin, now operate 50, 144, 220 and 430 mc. W5FSC, Houston, and W5ONS, Victoria, are on 50, 144, and 220 mc. W5AYU. Houston, is on 144 and 430 mc.

Considering the low powers and small antennas being used in the southern area on 220, at this writing, the band appears to have better possibilities for consistent long-haul on ground-wave than two-meters. However, this largely remains to be proven.

W4HHK, Collierville, Tennessee, has a good chance to get one end of a new 220-mc record when he gets on the band, because stations in Houston, Austin and Victoria, Texas, are all looking for him. Just remember, however, that the Republic of Texas is of adequate size so that the 220-mc record can be held. between Texans, for a long time if the gang will only support the idea. The attainment, on 220 mc, puts



The twin-five two-meter beam of PAØALO

Address all letters and correspondence to 2515 LaBranch, Houston, Texas.

the Texans in possession of two records: W5QNL, Texarkana, Texas, and W6ZL hold the 2-meter DX crown; now, W5AJG and W5ONS possess the 1¼ meter crown. —*Waldo, W5FEK.*

W2DZA, Teaneck, New Jersey, kindly provides information regarding 220 mc operation in the New York City area. Active stations, according to Alex, are W2KQ, W2BQK, W2BVJ, W2HRN, W2DZA, W2IQQ, W2IQR, W2IRA, W2LWN, and W2QOX. The majority uses crystal control and superhet receivers. Antennas range from 5-element Yagis to 12 and 16-element arrays. (See a forthcoming issue for a description of W2IQR's rig. —VHF Ed.)

Activity usually begins at about 10:30 every night, and the peak occurs when the gang gets together on Sunday mornings at 10:30. The band is scanned periodically during these sessions in order to pick up any new stations. Plans are under way for a Sunday evening session at 8, the purpose being to establish contact with the group on 220 mc in the Boston area, active at that time. All hams interested in 220-mc. activity in the area of New York City are invited to contact Alex H. Knights, W2DZA, 278 Frances St., Teaneck, New Jersey.

W8WRN, Columbus, Ohio, reports that the "big news" on 220 in Ohio is that the "Barefoot Queen"—W8BFQ—and W8WRN finally hooked up on 220 mc., just in time for the contest! Ken worked Margaret in the evening of June 7th with fair signals both ways. Ken used an AX9903 with about 45 watts input and 6 half-waves in phase with reflectors, only about 32 feet in the air. No other signals were heard during a listening and calling period.

As for the contest, W8WRN says, "Made a total of 40 contacts: 1 on 6 meters, 1 on 220 mc., and the rest on two, 7 sections. W8BFQ made, I think, 177 in 12 sections. A lot of stations were on, but conditions were poor."

420 Mc Activity

W2QED reports that conditions during May continued poor for 420 mc. in the east. Rainfall was almost 3 inches above normal, and the long-range forecast was for it to continue into June. In spite of this however, the latter part of May produced good propagation on 420 mc. with signals hitting high values and staying there, night after night. W3BSV, 80 miles south of Seabrook Farms pinned the meter on every contact. On May 23, W2BLV and W3RKQ both worked W3BSV for the first time, and signals were S9 plus, all the way. Both repeated on the 27th, but signals weren't as strong. In addition, W2EH worked W3BSV. So, all in all, Ken comments, 420 wasn't in too bad a shape during the end of May.

New schedules at W2QED for the warm months: call CQ north for three minutes at 10 PM EDT, listen 3 minutes; at 10:15, the same to the northwest. At 1050, beam SW through Baltimore and Washington. At 11:15 PM., W2QED schedules W3BSV, south, and will tune the band after they sign. Schedules to the east will be arranged if you let Ken know that you're on. Active nights will be Tuesdays, Thursdays and Saturdays, regularly. In addition, W2QED will try to catch any openings.

W3GGR, Elkton, Maryland, reports that six stations are active there on 420 mc., but that they're using low-powered modulated oscillators. But, all are planning to improve their gear. W3GGR now has a converted ASB-7 receiver as a result of a visit to W2QED.

W2BLV now has crystal control on 420 mc., using an 832A tripler; W2HEK also has crystal control, with an AX9903. W3RKQ also has an AX9903 as a final, driven by the tripler. All put in fine signals at W2QED. Ken is still waiting for that opening to Washington, DC. W3OWW, one of the first stations on 420, is still off the band while rebuilding.

W8WRN, Columbus, Ohio, reports no contacts on 420 mc. because Harry, W8CPA, has a new jr. YL op and no time for the rig.

2300 Mc and Up?

WØMZA, Charles T. Butler, Joplin, Mo., will appreciate hearing from you if you can pass along any information about any kind of activity and equipment on 2300 mc. or higher.

"The transmitters of the future are not going to be on the bands requiring large antennas and bulky equipment," writes WØMZA. "The sooner the amateurs start pushing the practical frequencies up, the sooner we can compete with the military for advancements in antenna design and propagation knowledge."

Since this column is devoted to information and news about v.h.f., u.h.f., s.u.h.f., or just 50 mc. and higher, tell us, too, what's going on. Thank you.

Six Meters

W7HEA, "Bish", Toppenish, Washington (see his panoramic on the cover), reports 6-meters opened at 1927 PST on May 19, with W5SFW, Amarillo, Texas, breaking through, followed by W5MJD. The skip then shifted to New Mexico and produced QSOs with W5MYJ and W5FLH, for a quickie; then, back to Texas, to W5LIU, but he didn't last long. Back, again, to New Mexico, to W5MYI and W5MYJ, until 2040, when the band went dead until W6s started to come through at 2123. W6GQF, Long Beach, was the first to break through and the following were heard or worked, later: W6ANN, W6ABN, W6NLZ, W6CDQ. W6OMO, W6CSS and W6ZVD. Bish hit the sack at midnight, but the band was still open and W6s —from the L.A. area were S9 plus. On the 20th, WØUQM, Denver, was heard for a few minutes at about 1957. On the 21st, WØUQM was worked at 1922, and—at 1932—W6VES, Inglewood, California. Nothing else was heard. On the 31st, only W6ABN was heard, S9 plus, from 2318 until 2336.

W6TMI came through to W7HEA on June 6, at 1853, followed by W6QUK, W6EIB, W6CDQ, W6NLZ, W6BHR, W6VES, W6ABN, W6GQF, W6GCG, W6ANN and W6AJF (Hi, Frank!)—and, the band gave out at about 2217. On the 7th, Bish heard W6ANN at 0800 QSO W4CPZ, and W6GQF calling CQ, but had to leave for the "salt mine" (General U.S. colloquialism for "place of work or employment."—Perry told me to clarify these things, hi!—VHF Ed.) with the band open. "**#&!!!," says Bish. On June 10, 1909, W7HEA heard W8KZT CQing on c.w., but he faded out while still calling; his was the only signal heard—a hardy soul, according to Bish.

W5LFH — W9BPV 2-Meter Contact June 18, First New Mexico to Illinois QSO on Two, Approximately 1000 miles!

Ken Erickson, **W7JRG,** Billings, Montana, says that he's on 6, but that conditions haven't been very good. "We still haven't had the traditional 'big' opening," complains Ken. . . . Hod, **W9ALU,** Metamora, Illinois, has been active and participated in a few openings to W1, W4 and W5. . . . **W5FSC,** "Houston's only active 6-meter ham," reports openings on May 17 to W4; May 20 to W3 and W9; June 1 to W4 and W8; June 5 to W4; June 6 to W3, W8 and W9; June 7 to WØ and W4; WØ and Colorado on the 14th. And, on June 15, Bud picked up CO2WW for his 10th country; the band was also open for W1, W2, W3, W4, W5, W8, W9 and WØ!

W5LIU recaps 6 meter activity for May and June, as observed from Lubbock and Fort Worth, Texas: May 3rd (Lubbock)—Heard W6DSO; worked W6WSQ; 4th, worked W6WSQ, W6NLZ, W6TMI, W6ANN, W6ABN, W6DSO, and W6BWG; no others heard. May 11, worked W9EET; heard W8DWQ, W8BSQ, W9MHP, W9EWO, W9AFM; May 14, worked WØAEH briefly at 2038 CST; no others heard. W4MS, W9GYX, W8CMS and W8OJN were worked on the 15th. Next day, W4FBL was heard QSO W5SFW, weakly, at 1930. On the 17th, worked W4FBL, W9ARN, and W9ALU; heard W6ABN, W6WSQ on the 18th. May 19 worked W8OJN, W9MFH, W9MNY, W9MHP, W7JPA, W7HEA, W7JRG. Heard WØJOL, W7FLQ, W7FDJ, W8ECW, W9UIA. On the 20th, W9VZP, W9ASM worked; heard W9QUV, W9RQM, W9ALU, WØOUE. Last day at Lubbock, 21st, heard VE5NC; VE5CO, very weak.

On June 1, at Fort Worth, band open, W5LIU not on. On the 4th worked W7ACD, WØTJF, WØGPQ. Worked on the 5th, W9MFH, W9EET, W9RQM, W9VX, W9JXH, W9FCM, W8NQD, W8CMS, W8RFW, W7ACD, W7BKJ, W4DD, W4CVQ, WØTKX, WØGPQ, W3PCB, VE3AET; heard W8DOG and W9NSF; had to QRT at 1930, band still open. On the 6th, W5LIU worked W3RUE, W4CPZ, W4FIG, W9MNY, W6GQF, W6TMI, W6DSO; heard VE3DKW, W6ABN, W6WSQ, W6AJF, W6QUK, W8SQU, W8GZ, W9MFH, W9MHP, W9EET. On the 7th, contacts were made with WØTJF, WØTKX, WØGPQ, W7FGG; heard W6GQF, W6ANN, W7QNC. Activity on the 8th was short: Herb worked W8NNF in the morning, and then went fishing and swimming!

He says, "I guess the 5th district has had more than its share of 6-meter openings, this year—at least, that seems to be the opinion of everyone **outside** of W5! The openings haven't been unusually good, but there have been lots of them, and that helps a lot. I guess the past few years that I have been inactive have taken their toll of the 'old gang.' It's amazing how many new stations have been worked this year—it was a pleasure. One other thing: although I'm low on the list with only 30 states,

I haven't heard one state, this season, that would be new for me!"

W5SFW, Amarillo, Texas, recounts 6-meter activity from the Panhandle region: "On April 29, worked W6LOF, 2:55 p.m., crossband, 6 to 10; called by W6QUK, 3:10 p.m. and had a good QSO; band faded at about 3:30 p.m. Missed May 4th opening. On May 9, W9OCA called me, at 11:55 a.m., but was too weak as I was at the shop using the second rig, W5SFW/5, 35 watts to an 807 and 3 half-wave folded dipoles only 10 feet high! Called WØWKB at 12:15 p.m., but no reply heard. The band opened on the 11th with W9UIA at 7:05 p.m. Worked W9UIA, W9MNY, W9EWO, W9ASM, W5TCS, local, and W9MFH until 8:35 p.m. W4FBL was in for QSO 8:45 p.m. until fade at 8:55 p.m.

"Ken Erickson, W7JRG, Billings, Montana, was worked for a new state on the 13th at 5.45 p.m. The only signal heard, his faded out at about 6:25 p.m. On the 14th, W4FBL's beacon was heard from 10:10 until 10:30 a.m., fadeout time, but the band reopened at 11:15 that evening to W9MFH, until 11:50 p.m. On the 15th, both W8CMS and W8OJN were heard at the shop from 10:25 until 11:10 a.m.; called them many times, but they didn't hear the 'lil rig. On the 16th, the band finally opened to W4PQW at 6:12 p.m., the W4FBL beacon came through at 6:30 p.m. Finally, I worked W4FBL at 7:16 p.m., but the contact was spotty. At 7:50 p.m., W4MS hit the air with a good signal. At 8:45 p.m., a W8Q??, Ohio, was heard calling me, but faded out. On May 17, W9MFH came in at 1:00 p.m. and was worked by W5MJD and W5SFW/5. Bob barely heard my 35 watts. Called W9ARN at 1:22 p.m., but no results. Other stations were heard, but not logged. On May 18, W4LAW was the only station heard at 9:40 a.m. In the evening, the band reopened to VE5NC at 7:30 p.m. to 7:35 p.m. when he faded out. However, W5MJD worked him for another ten minutes after I could not hear him on the little shop rig. A good opening occurred on the 19th to W7. I guess it started when W7FLQ was contacted on 10 and tuned on 6 for my signals. On the first try, at 8:05 p.m., he was unable to copy me; at 8:20, he heard the carrier weakly on 50.160 mc. Finally, at 9:25 p.m., W7JPA was raised. Then, W7HEA—who, by far, had the best signal—was contacted; Bish was booming in at my home station, but W5MJD said his signal wasn't very good. At 10:25 p.m., W7FLQ and I hooked up: Charlie said he had heard me at about 8:20 p.m. Upon signing with him, I heard W6WSQ calling, and had a nice QSO with Mel; signals were good. At 10:25 p.m., worked W6GQF, then W6WSQ, again, until the band faded at 10:38 p.m. QSY to bed at 11:30 p.m., but I understand that the band opened, again, from midnight until about 1:00 a.m. when W6s and W7s worked each other. W5MJD then worked W7JPA until the band died, again.

"We really had a bang-up opening on the evening of the 20th of May. Band opened at 6:35 p.m. to VE3 and faded out at about 12:10 a.m. on the 21st, with WØURQ heard intermittently. On this opening, W5SFW worked VE3BOW, VE3AZV, W2RPO (Tonawanda, New York—a new state), VE3AH, W8CMS, W4CVQ, W4FQI, W4SMU, W9MXJ, W9RQM, WØJRP/5 (local), W9MFH, W4FLW; many others were heard, but QRM and lack of time didn't permit me a chance to work them. Stations heard were: W4NJA, W9ALU, W9VZP, WØOUE, W4OXC and—about 11:30 p.m., skip had shortened so much that I was hearing only W5FAL, Little Rock, Arkansas. The most consistent signal heard during this opening was that of W4CVQ; ol' Jake's 100-foot-high antenna must've been working, no doubt!

"Should've mentioned that WØURQ was heard at about 10:30 a.m., May 20th, but weakly. During this opening, W4FLW remarked that he had been working into W1 and W2, earlier in the evening. W4FQI was using a channel 2 TV beam with no apparent ill effects, here. KX6AH asked me to pass the word along that he will soon be on 6 with an 829B and a 40-foot high beam. So, look west for KX6AH after you read this; he was supposed to be on by June 15. On May 26, W4GFE St. Petersburg, Fla., was heard, weakly at 1:45 p.m.; then W4FBL, Jacksonville, Florida came through well from about 1:50 p.m. until 2:20 p.m., and then faded out at about 2:30 p.m. —73, Phil, **W5SFW**."

At last, some news from Paul Wilson, **W4HHK**, Collierville, Tennessee: "Since I last reported, it was my duty to have the old appendix removed, and I am just now getting around to climbing the tower, as before . . . cutting grass . . . and doing similar physical work. In early June, a small tornado storm damaged the two-meter beam, which is still down for repairs. Since the middle of May, I have operated the 6-meter beacon several hours, almost every day. For the first few weeks it was on 50.1 mcs., but is now on 50.4 mcs. There have been quite a number of openings, but so far W4HHK has no new states. On June 17, 1545, CST, XE1FU was heard on 50 mc., but not worked; his was the first XE sig heard this year. Numerous VE3, W1, W2, W3, W5, and W8 stations have been heard and worked. The six-meter set-up is still 12 watts input, groundplane antenna and HFS/NC183 receiver."

From **W5LFH**, Sandia Park, New Mexico, "We are pleased to report a QSO with W9BPV, Armington, Illinois, on two meters, 8:30 p.m., MST, June 18. His report, S9; my report, R5—S2 or 3 to S5, QSB. No. QSB, or very little, observed on W9BPV's signal. He was 'solid' for about 30 minutes while ragchewing with a local W9; we were afraid he was going to fade out before we identified him! He was also heard by W5NFU, Santa Fe, N.M. The contact was made with a 522 with about 250 volts plate supply; the antenna was a 12-element horizontal beam, 6 half-waves driven with reflectors. The receiver was a 6J6 neutralizer r.f. stage to a 6J6 mixer-oscillator, crystal controlled, to a 'Super Pro' as an i.f. and audio system. A new p.p. 4-65A final had just been completed, but wasn't on the air for the contact!—Dean Yearout, W5LFH." (**VHF Ed. Note**:—Unless someone can prove otherwise, I'm inclined to credit this contact to Sporadic E propagation, which seemed to be the only answer to the W5QNL—W6WSQ—W6ZL record contact, last year. This should again arouse new spirit and enthusiasm in the 2-meter gang, especially those who have been wondering if there is **really** anything "new" to be done on the band! Keep 'er going, gang!)

Two Meters

Well, W9BPV and W5LFH really turned in a job of DX for the year with 1000 miles or somewhat more on June 18, didn't they? Congratulations, Henry and Dean! Your QSO will probably result in a flurry of returning beams, transmitters and receivers; however, the main thing is—**be** there at the **right** time! The propagation media generally produces signal levels of several microvolts or better, so the average, well-maintained 2-meter station has a fighting chance, equipment-wise. Just "**be** there at the **right** time!"

VE7FJ, Vancouver, B.C., reports that the gang in his area have been trying for the past few years to work into Seattle, but—until recently—none had been successful. VE7JG has made the grade, often, but he is 40 airline miles southwest of Vancouver; likewise, the Victoria boys, about 80 miles south of Vancouver, have worked Seattle.

So, it remained for the pioneer 2-meter man in the Vancouver area, **VE7BQ**, to first work W7NQM and WN7PRW on May 16, using a pair of 4-125As and a 6J6 neutralized triode ahead of a VHF-152A. . . . VE7AME and VE7FJ both heard W7NQM, but were unable to QSO. VE7FJ also heard WN7PRW, but wasn't heard by him; WN7PRW could spot (locate) VE7AME's carrier, but VE7AME couldn't hear WN7PRW.

On June 14 and 15, **W7OKV**, Portland, Oregon, parked his car on top of Mt. Constitution (el., 2450 ft.) on Orcas Island, and had himself a very nice, exclusive "field day" working into Vancouver and Seattle. At one time, he was in a roundtable with VE7AIA and VE7FJ, Vancouver, B.C., and W7EVO and W7ONB, Seattle, Washington. However, the Vancouver and Seattle stations could not hear each other. W7OKV used his regular mobile rig, with a 2E26 final at about 12 watts input; the array was a portable twin-5, vertically-polarized. (How about trying horizontal, sometime, just to say you did—for about 6 or 8 months, fellows? —**VHF Ed.**)

Cuban VHF Report from CO2CT

"I've been reading your VHF column for a long time but . . . . had no time, before, to send a report. Now, enjoying a vacation in Miami Beach, I have time to write.

"In Cuba, the 'Radio Club of Cuba' started last year our VHF section. President, CO2EU, Vice President, CO2FN; Secretary, CO2CT; Vice-secretary CO2PA.

"VHF activity has been limited because of the difficulty in finding suitable gear and parts. This year, there are going to be several more stations active on 2 and 6 meters. A couple of stations are experimenting on 420 mc. (Esta muy bien, amigo; let us hear more! —*VHF Ed.*)

"Last year, I made several QSOs to W2, W3, W4, W8 and W9 on 6 meters with my 829B final, running 80 watts input, and a 4-element beam. The receiver

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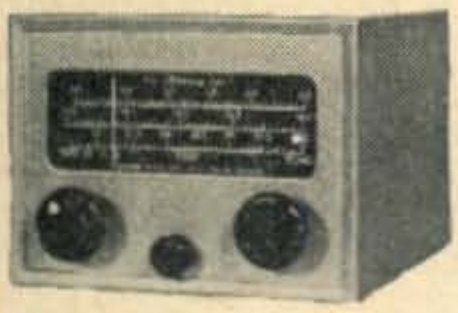

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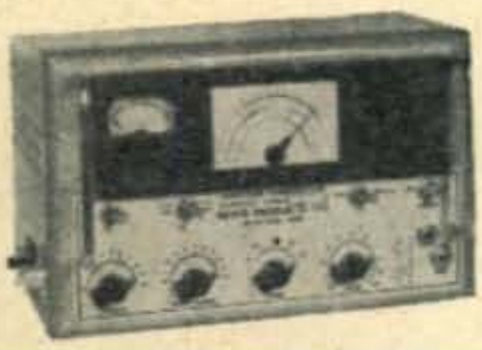

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was a 6J6—6J6 converter into an HQ129X. This year, I'm giving the final touches to my new v.h.f. rig, a pair of 4-125As with 450 watts on 2 and 6 meters. On 6, the antenna is the same 4-element beam; on 2, a 5-over-5 *horizontal* beam will be used. The receivers are Sylvan converters, cascode type,—one for each band—into a Hammarlund 'Super Pro' as i.f. and audio.

"My location in a Havana suburb is quite good—200 feet over sea-level; the antenna mast is 30 feet high over the two-story house. The 2-meter beam is on top of the 4-element 6-meter array; both are rotated by an Alliance 'Tenna-Rotor.'

"I also have an 813 final on phone and c.w. for 80, 40, 20, 15 and 10; also, on 20 c.w., I run a 'full gallon' to p.p. 450TLs. Standby receivers are an HRO and a Mallory v.h.f. 'Inductuner' using 6AK5, 6AK5, 6J6, tuning 50 to 240 mc. Also have a mobile rig, 6146 final modulated by a pair of 2E26s, in my '52 Mercury. The receiver is Gon-Set 3-30 converter; I operate 40-20-10 mobile phone.

"Other COs on VHF that I know of are CO2EV—on 6 meters; CO2QY—6 and 2 meters; CO2WL—6 meters; CO2FN—6 meters; CO6WW—6 meters; and CO2KJ—6 meters. Others are building—CO2PA, CO2EH, CO2XA, CO5MM, CO2CQ, CO2WF and CO2MF. Also, the Cuban Red Cross intends to use the v.h.f. bands for emergency nets. —Vy 73, 'Mike,' CO2CT."

Northwestern States

W7JRG now has a cascode converter using a 6BQ7. The 12-element beam will be in service by the time you read this. Ken's new final is nearly complete, but he'll use the 90-watt driver—phone, or c.w.—in the meantime W7HNI, Gillette, Wyoming, will be back on as soon as Ken, W7JRG, can use his "persuader." This hop will be about 100 miles longer than the Sheridan to Gillette path. . . . **W7HEA**, "Bish", writes that his 600-watt 2-meter final was expected to be on the air by the end of June; the ARC-5 is being used as a driver. W7JPA claims that he has been hearing signals, and accuses Bish. "But, I don't happen to be guilty this time," says W7HEA, "Think he'd better change his 'brand.'"

California Comments

Reg Perkins, **W6ZYH**, kindly observes, "I see there is a lack of v.h.f. news from the coast, again . . . last report I made . . . . I asked for L.A. 2-meter men to schedule me via 75 phone to coordinate 2-meter tests. No replies were received, but I did locate W6CDB, Torrance, who has been very cooperative. So far, nothing definite has resulted. Since we started the schedules, however, we've had fellows in the valley areas check with us, and the overall interest seems to have increased.

"W6CDB, W6ZL and some friends operated W6ZY/6 from Blue Ridge in the region of Sequoia Park. They worked a number of stations in the Bay area as well as in L.A. (Los Angeles). I think I was the last one to work them before they went home, on Sunday. Looking around the band, early, for any 'night owls' interested in a QSO with W6ZL/6, I found WN6——, Redwood City. Russ was running low-power to a 'J' (vertical) antenna. His carrier was heard, but the modulation was too low. If c.w. had been used, Russ would have had a good QSO.

"Regarding high-powered finals on 2-meters, I've noticed that the fellows using 4-65As and 4-125 design them to use a split-stator condenser for screen neutralization. Now, for mechanical ease of neutralizing, this is fine. But, I prefer separate neutralizing condensers because two tubes selected at random are very seldom exactly alike in their internal capacitance characteristics. As far as I am concerned, it has been much easier to neutralize by using a separate capacitor for each tube.

"Recently, I built an outboard r.f. stage using two 2C39A lighthouse tubes. These tubes have an average Gm of 22,000 and a Mu of 100. I use them in a grounded-grid circuit with 500 volts on the plates. The plate current can be varied from 65 to 35 ma.; two fans are used for cooling. The average current is about 50 ma., although I have run them as high as 70 ma., but the fan capacity isn't great enough to cool them."

Now comes a nice report from the San Diego area but it was unsigned by our friend who sent it in, although he has our name and address typed on it, very plainly. Please, fellows, always sign your name, address and call at the beginning or at the end of your reports. The date helps, too. Now, the San Diego report from the presently-unidentified reporter: The "Upper Ten Radio Club has been enjoying good QSOs on 2; their meetings are held in the AREC headquarters in Balboa Park. President, W6RVW, who has been in Pearl Harbor for several months; W6BYE, "Pappy", is vice president and has had held the reins since W6RVW left. W6GTZ, Frank, is secretary-treasurer, and the job keeps him busy. As for activity, some moderate DX has been worked by W6IBS, Vaughn, has had several contacts with W6EFS, Armonia, R5 S9, and also with W6BUT, Taft.

In late spring, WN6NKI/M was visiting W6IBS when contact was made, mobile to mobile, with W6IHK/M on LaCombre Point, 20 miles north of Santa Barbara, about 200 miles. W6IHK/M was using a 3-element beam and 50 watts input to the final; Bob WN6NKI/M, used a standard ¼-wave whip and 25 watts input to the final.

Get the dust off of your receiver and keep it tuned for W6IBS, Vaughn. This boy runs 500 watts input to a pair of 4-65As with a twin-5 antenna; he gets out, very well. He is, according to our reporter, the leader in the state of California for power input on v.h.f., the "King Pin," with 500 watts input.

New York Notes

W2NGA, Bronx, New York, offers an interesting answer to W7MBV's report (CQ, May, 1952, page 86) of hearing a W2N?? on 145.5 mcs. during the February 23rd aurora opening. "I believe," writes Doc, "that mine was the station heard by W7MBV . . . I am quite certain that I am the only W2N-- call operating on 145.5 plus, and am set up for both vertical and horizontal polarization. The time and date and frequency coincide perfectly with my log. I cannot say that I remember anything but flutter on the low end. —73, W2NGA."

Jim Kmosko, **W2NLY**, caught the aurora opening of May 26, and worked VE3RM, W9UCH, W9EGH and W4UMF. Heard W9SUV, W9EHX, W8FQK, W8KUW, W1BCN, W1IZY, W3IZD, W3PMG, W3BGT, W4AO, W3KWL, W2OPQ, W2SFK, W2UK and W2AZL.

"Tell the gang to spread out a little," Paul cautions, "Most stations occupied 144 to 144.3 mcs.; plenty QRM! However, all signals were extremely strong. W9EGH's signal changed to T9 for about 5 minutes before aurora fadeout. This is the first time I have experienced this on 2-meters; but, I have heard of it happening on 6 meters, before.

"If QRM get rough in the future on aurora DX," Paul advises, I'll operate on 144.2, or higher, instead of 144.05 mcs."

W2YXE, Troy, New York, worked 37 stations in the June v.h.f. contest and picked off VE3DIR, Toronto, for his first VE3. Conditions were't too bad, and it was expected that more signals would be heard from the south and west. Not many old standbys were heard; it was the first contest in three years that Paul didn't hear W2PAU or W3NLY. W8BFQ was heard, but—apparently—Paul's 100 watts couldn't hop the hills.

"I missed the last good aurora because of being out of town," Paul admits, "W2PV and W2OPQ worked W9UCH. I've taken quite a 'riding' for missing that one!"

Ohio Observations

Del Dehnhoff, W8VOZ, Van Buren, picked off Minnesota for a new state on 2-meters on the night of June 12. The opening lasted for only an hour and a half, according to Del. "Heard W9s DSP, LEE, EQC, EYN and WØs JHS, OAC and SV. Contacted about 'half' of those stations," concludes Del. . . . **W8WRN** says that 2-meter conditions "were lousy" during the first half of June. W9SUV, Arcola, Illinois, was heard frequently, and that's about all. The local gang, according to W8WRN, is becoming more active on Monday nights. WN8HPB, 145.05, Canal Winchester, near Columbus, is getting out in good shape. WN8HTJ is making fine progress, and hopes to get on 220, soon.

On June 4, W8YEG and family visited the W8WRNs and had a fine time. "Wig" is still working on the rig: a new beam replaced the one ruined by winds. W8YEG and family sure do hope to make Turkey Run, as does W8CPA, W8WRN, WN8HPB, W8BAX and W4OXC. In the meantime, W8WRN is trying to overcome power-line noise by locating the antenna in a "quiet" spot on the property. The utility company offers the usual "stalls" to avoid prompt remedial measures—"New underground lines won't go into service until next year."

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Turkey Run Topics

"Hope to see you at Turkey Run State Park, July 27th!"—Charles Hoffman, W9ZHL. (As usual, it will be a fine conclave of v.h.f. men. —**VHF Ed.**)

In and Around Chicago

Ken Caldwell, **W9NW**, reports that more WN9s are populating the band and increasing, of course, local activity. A few mild openings occurred during June, but Ken couldn't get on for them. The "weather net" is still going, with W9HKQ, W9BUM, W9EQC, W9GDM, and W9MGP still faithful to W9NW.

W9EQC, aurora, says that conditions during June, on 2, were much improved, the band being open to Michigan, many times with W8CVQ, W8JVP, W8BAN, WN8JGK, W8MRK, W8BTL, W8AKR, W8YIA and W8EGX. W8CVQ is again back in Illinois, at Downers Grove (W9PK's home town) for the summer months. . . . Ol' Beefy, **W9BFY**, aurora, is working on a new converter to improve his station; **WN9R.M**, Downers Grove, is very active, as is W9PK. . . . Many Novice stations are active in the Chicago area, as Ken, W9NW, reported —WN9RXQ, WN9RNE, WN9OKF, WN9QXP, WN9SPM, WN9PUO, WN9PPA, WN9SEF, WN9QHK, and WN9RXS.

W9MGP, Maple Park, is again active. In the Peoria area, W9SUV, W9LIR, W9BPV (That 'ol DXer!) W9MAL, W9LF, WN9QVK, and W9EHX keep the band going. In "Lee-banon," Indiana, W9EWO alternates between 6 and 2. . . . On June 11, **W8LPD**, Cincinnati, was worked by W9EQC, who heard W4PCT, Covington, Kentucky, but couldn't hook him. On the 12th, an opening to the north brought in signals from W9DSP and W9EYN; WØJHS was heard, but not worked. W9LEE and W9JBF, Wausau, had very strong signals. Earlier, on June 8, WØIHD, Overland, Missouri, was worked for the first time, this year, at W9EQC.

Two In "St. Lou"

Charlie Palmer, **WØIHD**, Overland, Missouri, reports that v.h.f. activity in the St. Louis area delved to a new low last winter, and that explains his lack of reporting.

As for the picture on page 52, June **CQ**, the "W9ZHL" identification should be "WØIHD." (Oops! —**VHF Ed.**)

"I hope W9ZHL didn't feel insulted—come to think of it, I guess we do look something alike." says **WØIHD**.

Charles says the old two-meter band is now more like it was about four years ago, when he first came on. Activity is building up to an all-time high. New stations are taking an active part in the net as well as the band. Most of them are new to v.h.f., but the old-timers are acquainting them with the proven techniques. . . . Old-timers on two will be glad to hear that Doc, **WØVMY**, University City, has recovered from his illness that inactivated him for the past year. He has moved to his summer home, Cedar Hill, and will use his other call, WØZEV. . . . **WØKYF**, Bill, still calls the roll faithfully, at 7:30 every Tuesday night, net night. . . . **WØYRX**, Ernie, is another good winter-time operator, improving his station at the same time. He now uses a 6BQ7 preamp ahead of his VHF-152A. A new antenna is also in process. . . .**WØECA** is newly on with and Eldico receiver, 522 transmitter and a vertical (Vertical?! —**VHF Ed.**) ground plane, 50 feet high; he is just about sold on a horizontal beam, however. . . . **WØNOY**, also new on two, was active on WERS during the war on 112 mcs. He uses a 522 transmitter-receiver and a ground plane vertical. (Vertical?! —**VHF Ed**). His receiving set-up is unique in that he uses a BC-459 for the variable oscillator to tune his 522 receiver. . . . **WNØFCX** is also new on two; he got on the band, the easy way. His Wyoming cousin aroused LeRoy's enthusiasm for 2, last summer, then LeRoy got his Novice license and his cousin shipped a complete two-meter rig to him. . . . **WNØFES** is the newest 2-meter station in this area. Bob uses a home-built, 2-tube converter, a Millen transmitter with 40 watts input, and a folded dipole antenna. . . . **WØIHD** recently added a tuning system to the 16-element array and will soon have a 6BQ7 crystal converter working.

On the other side of the Mississippi, **W9UED**, Belleville, Illinois, sports a new 50-foot tower and a 16-element beam and a 6BQ7 converter that really works. . . . **W9JON** is a new station in Belleville. . . . **W9RVF**, Glenn, is one of the "Faithful Few On VHF" in Alton; he was "there" during the winter. . . . **W9IFA**, Carrollton, checks into the net, regularly, as does W9KPS, Taylorville. . . . **W9BLL**, Alton, puts a nice signal into the St. Louis area. . . . **W9PHH**, Nan, recently came on the band from W. Frankfort, Ill.

"The aurora opening of May 26 reached its peak at about 5 p.m. CST, when I got in on it," reports **WØIHD**, "The only station that I contacted was W9UCH, Ft. Wayne, Indiana, but I heard W3KXI, W9EGH, W9MAL, W9EHX, W9BPV, and W9SUV. No other locals were on in time for the opening.

"In passing, Bill, I want to add my compliments to the editors for that May Mobile issue—it was a dandy, and has been of great assistance to me in taking some of the bugs out of my mobile installation. How about an all-VHF issue, sometime?"—WØIHD. (**VHF Ed. Note:** On behalf of the CQ staff, thanks, much! Re the "all-VHF" issue, a number of fellows have requested it directly to me. But, Perry's the "boss" so we'll have to see on what he decides. Of course, I'm for it, and I'm sure that Perry is, too, but it's a matter of preparation and selection of a date.)

The Great State of Texas

W5POG, Sherman, has been maintaining schedules with W5MWW, New Boston, at 12:30 p.m., with good results. George reports that a good opening occurred on Sunday morning, June 15th: he worked W5QVQ, Victoria; W5FSC, Houston; W5QIO, Beaumont; WN5UJK, Garden City; and W5JBW, Maplewood, Louisiana; and WN5TFK, Thibodaux, Louisiana. George's best DX on two at 450 miles. Also, worked W5AIE, McComb, Mississippi, and W5RCI, Marks. W5POG runs 150 watts to an 829B final, a 6J6 pre-amp to a VHF-152A, and a 5 over 5 antenna. On June 14, George worked WN5TKR, Oklahoma City, and W5UZW/5, Midwest City. W5POG's VHF DX Scoreboard total, 4 states, 1 call area, best DX 450 miles.

MEN of RADIO

(from page 39)

the forces in France. At the same time, many capital battleships of the U.S. Navy used arc transmitters. By 1918, the world's most powerful transmitter was in full operation at Bordeaux, France. Built by the Navy Department, it was designed to maintain regular, direct communication between the American military command in Washington and the expeditionary forces in France. The transmitter was a 1000-kilowatt arc.

With the return of peace, the Alexanderson alternator had definitely emerged as the victor in the battle between transmitting systems. Worldwide attention had been focused on the work of Dr. Alexanderson through a series of events. The Marconi station at New Brunswick, using his alternator, had carried Woodrow Wilson's ultimatum to Germany on October 20, 1918. Wilson and Secretary of State Lansing had been in constant communication with Washington while aboard the S.S. George Washington enroute to the Peace Conference, and radiotelephone communication was already in effect between New Brunswick and Brest, France.

Foreign-owned radio stations, including those of the Marconi Wireless Telegraph Company, were still temporarily in the hands of the government. Marconi had already initiated negotiations for exclusive use of the alternator, and was the only firm in a position to handle trans-Atlantic radio communications, hence the only organization interested in acquiring the alternator. Marconi stations here were controlled by the American Marconi Company, but this was an offshoot of the British Marconi Company and was owned almost entirely by English interests.

U.S. government officials, aware of the negotiations between Marconi and General Electric, felt

that control of the important alternator rights and consequent control of U.S. radio communications should not pass to foreign firms, especially in view of the fact that cable service were already in the hands of foreign companies, in April, 1919, Acting Secretary of the Navy Franklin D. Roosevelt wrote to General Electric suggesting that negotiations with Marconi be suspended until conferences with the Navy Department could be held.

Birth of RCA

The conferences resulted in a plan to form a new company to take over the American Marconi interests, and on November 20, 1919 the Marconi business was taken over by the new company—Radio Corporation of America. Dr. Alexanderson was chief engineer of the new company. A few months later, a patent stalemate between AT&T and Western Electric on the one hand, and GE on the other was solved by a licensing arrangement between these companies. Later, Westinghouse entered the picture. Westinghouse had interests in International Radio Telegraph Company which owned Fessenden patents acquired from National Electric Signaling Company. Another cross-licensing agreement was made between RCA, GE and Westinghouse in 1921. Finally, GE acquired an interest in Wireless Specialty Apparatus Company, which manufactured equipment for Tropical Radio Company, a subsidiary of the United Fruit Company.

Thus, as we have seen, the science of radio advanced several long strides through the efforts of three pioneers; Fessenden, Alexanderson and Poulsen. Although their right to niches in radio's hall of fame were well earned by reason of the discoveries already described, the total of their contributions could not possibly be detailed here. Poulsen, for example, was really the father of the modern wire recorder, for his telegraphone was the ancestor of that device. And Alexanderson went on to make important discoveries in such widely diversified fields as television, motors, generators, ship propulsion and electric traction. During a period of almost fifty years he averaged one patent each seven weeks for a total of more than three hundred. inventions.

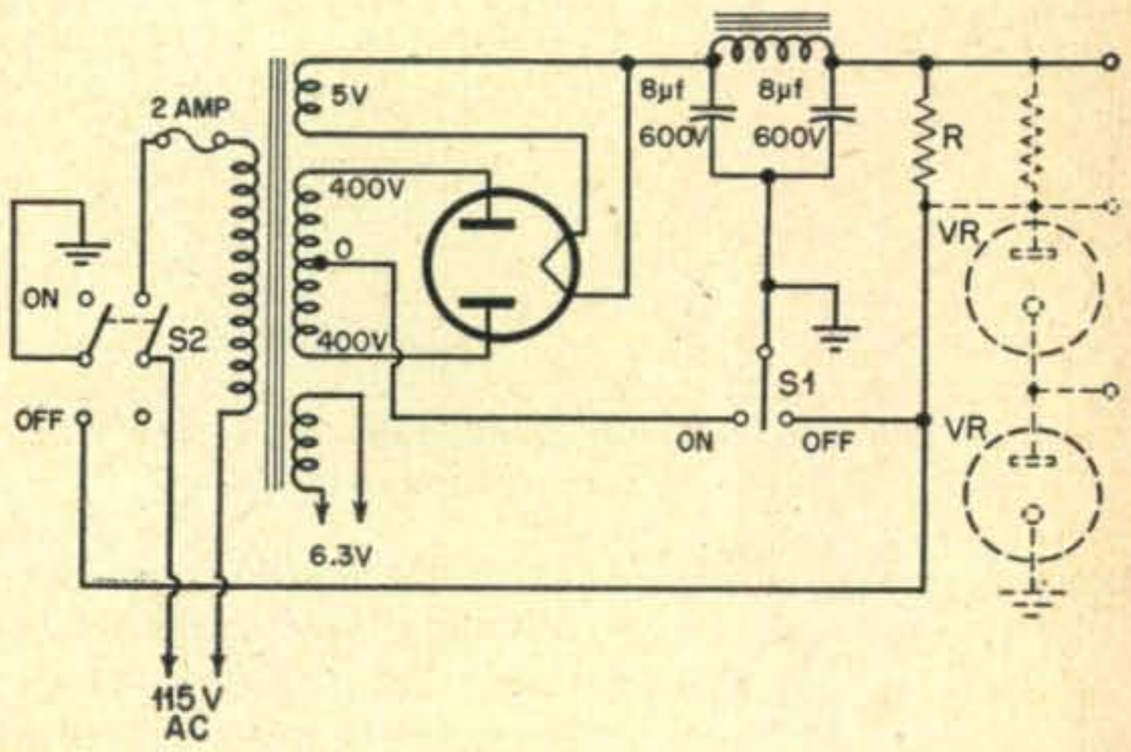
TO BE CONTINUED

Inside the

Shack and Workshop

SAFETY POWER SUPPLY

This idea probably will fall slightly short of revolutionizing power supply design techniques, but it at least neatly eliminates a common source of headaches in the construction of rectifier type d.c. supplies using LC or RC filter networks. It suggests a method of avoiding the expense and bulk of high wattage bleeder resistors, and it simplifies construction by eliminating the wasteful heat produced in the usual method of connecting resistors across the supply output terminals. Furthermore, it retains the desirable "shock-proofing" feature of draining off the dangerous potentials held on filter condensers. The circuitry illustrated in the accompanying figure is intended for general purpose supplies which are used under a variety of operating conditions, and it is suitable for supplies operating at any of the power levels encountered in average amateur practice. It should be particularly attractive for supplies furnishing anything over one hundred watts of power.



The d.c. "standby" switch, *S1*, is a single pole-double throw unit which completes the circuit through the supply by grounding the transformer center-tap when in the "ON" position. When thrown to the "OFF" position it breaks the d.c. path and places resistor *R* directly across the filter output terminals. No current flows through the resistor while the supply is furnishing power to a load, and with the switch in the "OFF" position, current flows only for a short time as determined by the RC discharge time constant. Consequently, *R* can be a one watt, medium resistance unit instead of the usually bulky and relatively expensive higher wattage item. Resistance values which produce a discharge time constant of two to four seconds will be satisfactory.

The dotted lines in the diagram indicate a method by which the series limiting resistor used with VR tubes could be made to serve also as the discharge resistance. In this case, resistor *R* would be omitted, of course. Returning the "OFF" side of the d.c. switch directly to the high voltage terminal without the resistance included in either of the two suggested methods is not recommended due to the excessive sparking which would occur inside the switch.

The d.p.d.t. switch in the transformer primary is included on the long-shot chance that after a period of use in which the supply is used in bench set-ups the load might be removed with the d.c. switch in the "ON" position, and the supply then turned off by throwing the a.c. line switch. Under these conditions the filter condensers would remain charged and a shock hazard would exist. The connections shown for the primary switch prevent this uncomfortable situation.

S. G. McDonald—W8ZSA/3

MODULATION

(from page 21)

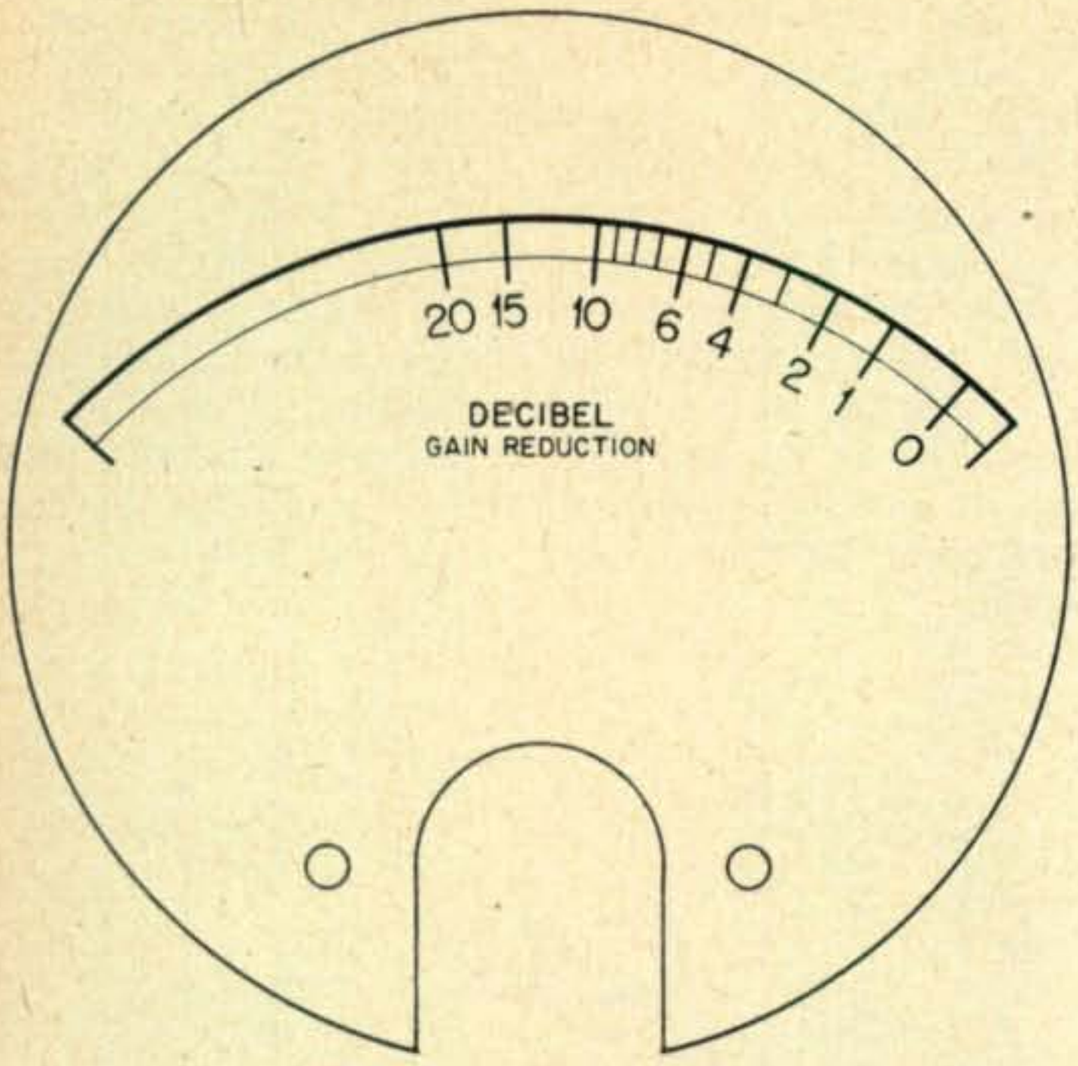


Fig. 5. This is a full size scale calibrated directly in db compression.

further towards the low distortion and good frequency response of the unit. The load resistors on the grid and plate circuits of the 6SK7's are necessary to prevent a sharp peak in response from occurring at about 4500 cycles, and to flatten out the overall response curve. The transmitter used in connection with the 6SQ7 is a 1:1.41 push-pull interstage transformer.

The unit should be built in accordance with good audio construction practice. Filament leads should be isolated and twisted, to minimize hum radiation. The physical layout should permit short grid and plate leads, and short ground returns direct to the metal chassis on all bypass condensers. The leads associateed with the input transformer and 6AC7 grid circuit should be shielded, to prevent hum and r.f. pickup in the input circuit. It is also well to shield the leads to the 0.25 megohm dual potentiometer, as the physical layout may not permit these to be short. The power transformer should be located in a corner of the chassis as far away from the input circuit as possible, to minimize hum pickup. After the unit is completed and tested, a bottom cover should be installed on the bottom of the chassis, to shield all components from possible r.f. pickup.

Here at W4RXO, we use this unit to drive a single 6V6, which in turn drives push-pull 813's in our 500 watt modulator. The limiter amplifier has more than enough gain, when operated from a dynamic or ribbon microphone, and we run with the gain control about 60% open. The unit may be heard on the low end of the 20 meter phone band, by anyone who is interested in hearing it before building it, but we guarantee that if you built it, you'll be more than pleased with the results, and justly proud of the "punch" and quality of your phone signal.

Above the deck the limiter amplifier is straightforward in layout. The arrow indicates the 25 ohm potentiometer across the "gain reduction" meter.

TELETYPE

(from page 32)

which has now weathered a year of life in this cruel world. Let me tell you just a bit about it.

Last July I decided that it was way past time for someone to take on his shoulders the task of setting up a communications link between the various interested teletypers, so I sent out a two page mimeo paper to the sixty or so amateurs that I knew were active to some degree. John (W2BFD) sent me a list of over 400 amateurs that had either written him for information or had purchased printers. I had figured that the maximum call I would have for a bulletin would probably be about a hundred so I tried to weed down the list by sending them all a copy of bulletin #2 and making them write in order to get more. They did and I had to send out over 200 of the next issue. By October it was 250 and the bulletin was seven pages long. Whew, what a folding and addressing job that was, it took an entire week-end. The start of this column in CQ and the interest spawned by the FCC proposed regulations has brought the demand to well over 500 a month.

The above paragraph is for historical purposes only so please don't write for copies of the monthly bulletin for they are dull, boring, and filled with exceedingly complex technical discussions. You wouldn't like my style of writing anyway.

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NOISE LIMITER

(from page 35)

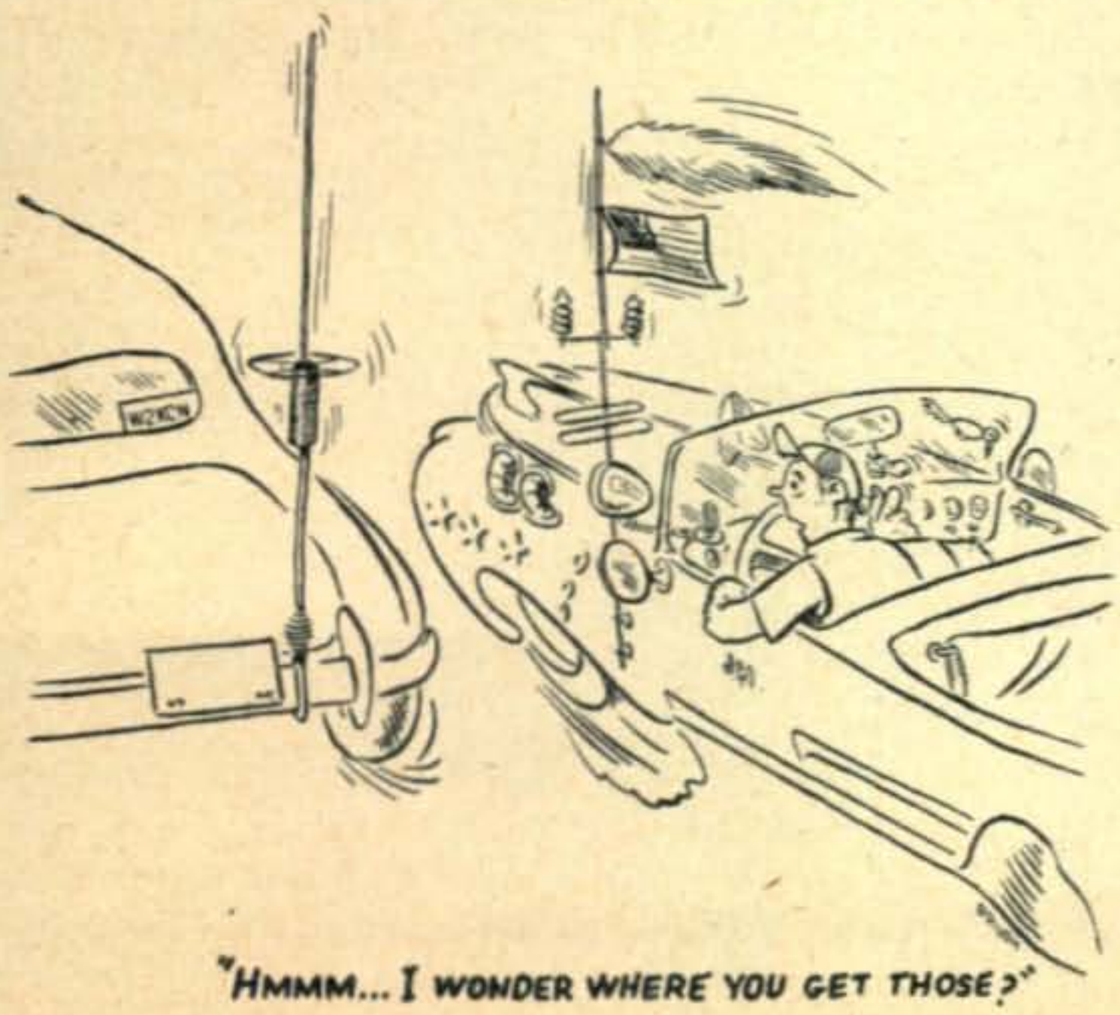
can remain the value given in the *Table* or can be made equal to the value of the receiver's regular audio coupling condenser.

It should be emphasized that for proper operation of any of the noise-limiter circuits shown here the i-f signal level at the second detector should be high enough to overcome the "emission potential" effects of the thermionic diode tubes used. If a particular receiver has low gain in the r-f and i-f circuits, and makes up for this lack of gain in a high-gain a-f amplifier, the performance of the noise limiter system may be compromised.

The value of the grid leak resistance of the following stage should be high compared with the detector d.c. load circuits. If it is not, the dynamic a-c impedance of the detector load may be sufficiently lowered to reduce the a-f output signal for a given percentage of modulation to the point where the clipping percentage may be raised above the expected value.

A safe rule of thumb to use in judging the effect of the audio stage grid leak is that it should be at least ten times the d.c. resistance of the detector load circuit. If, in a given receiver design, the grid leak resistance is too low, it might be well to try raising it. If it is not convenient to change this resistor (it may be the volume control assembly, which is sometimes messy to replace) it might be better to try re-locating the volume control on the output side of the first audio stage rather than in its usual location on the input side.

The author has used a full-wave series limiter for the past four years in a pre-war communications receiver and has found this circuit to be invaluable for picking weak amateur signals out of ignition, static and power-leak types of noise. Often signals almost completely obliterated by ignition noise without a limiter, can be rendered quite readable by use of this limiter circuit.



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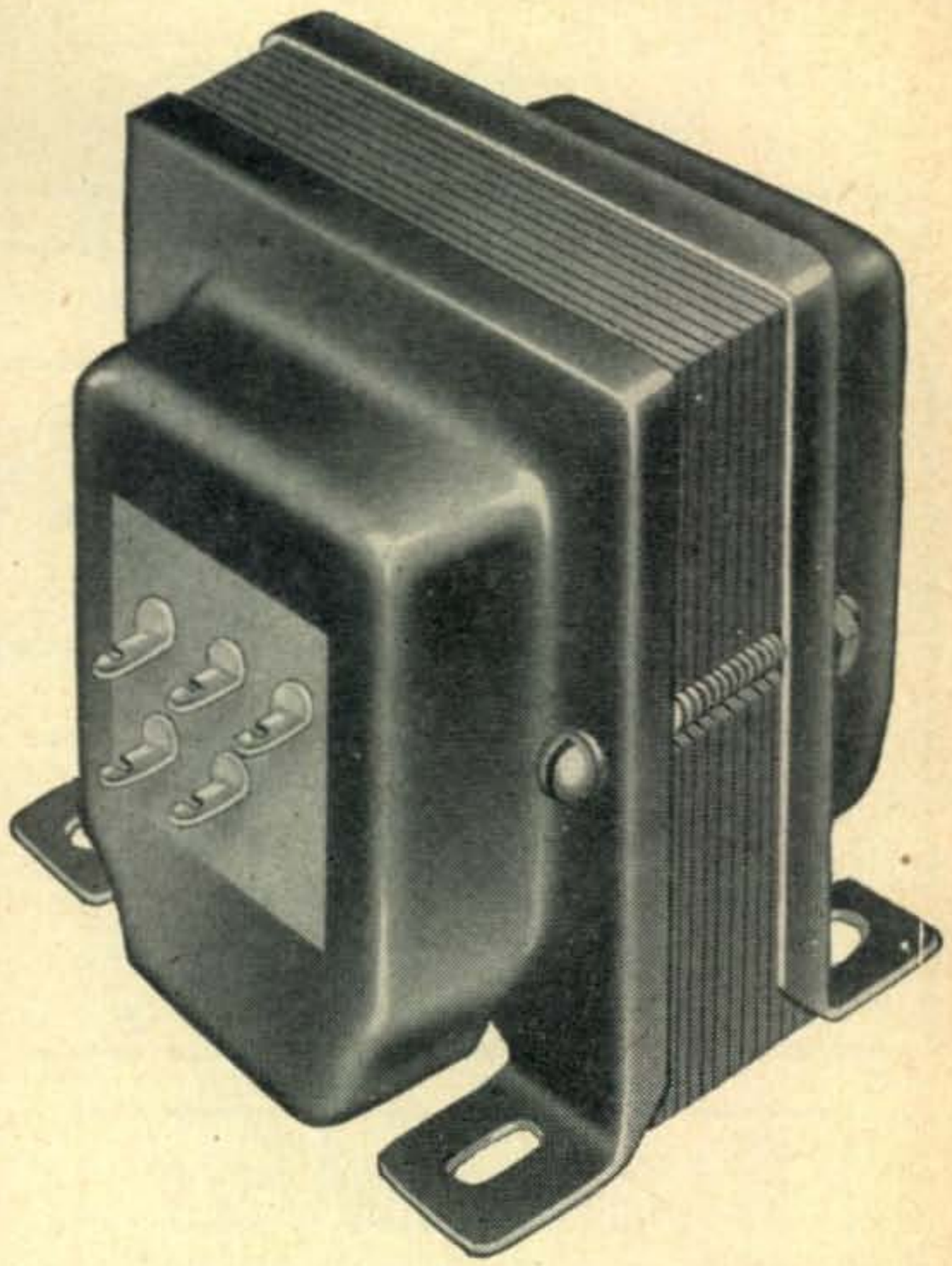

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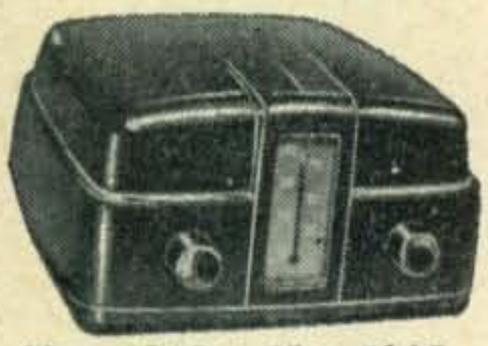

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PODUNK

(from page 24)

I was stopped in the post office. What was my frequency, would I play "Oh, What a Face?", how much did I get for a fifteen minute program? I pulled my hat over my eyes and quietly sneaked back to see if I could run a 200 foot feedline to a rhombic. The answer was "yes." Over a telephone line, under a power line and through four trees. I tuned up the beam again.

The following morning I got the announcement I had been dreading. "I heard you on the radio last night." Over and over I heard it. Those who hadn't heard me said they would listen that night. Again the town was on fire with "Podunk has a radio station". This would put Podunk on the map.

The reception was hardly what I had expected. That evening I was called on by a delegation consisting of the Mayor, the Postmaster and two TV owners. Would I move the transmitter to the hotel? Then I could say I was broadcasting from the Podunk Hotel. The owner of one of the garages offered to buy an hour a week "if the price was right." One by one the population called to see the transmitter and to talk on it. I became the most popular man in town, all because of BCI.

It was too good to be true and I knew it, so I started the job of keeping RF out of power lines with small hopes of success,. The rig was checked and double checked. With the assistance of the owner of a TV set, who strangely hadn't heard me, the antenna was raised and lowered to see if a minimum of RF transfer to the power lines could be found. The test was simplicity in itself. He wrapped the antenna of a field strength meter around his front porch light fixture and yelled the readings to me on the roof. A point was found where the needle read practically nothing and there the antenna was leveled.

The results were instantaneous and explosive. I was nearly mobbed when word got around that I had purposely fixed the transmitter so the town couldn't hear it. Someone started the rumor that I was a Russian Spy and I thought I was about to receive a trial by rope and tree for a few black days. All my explaining did no good. The antenna had to be put back where it was or I would be blackballed. It still hasn't been settled. Tonight a man called to say he was hearing me call Africa. For a moment the terror of the past looked over my shoulder. I would fix the radio, I told him. "Not on your life, you don't touch this radio," he said, "I'm the only person that can hear you. By the way, would you play Aba Daba Honeymoon for my wife? And, oh yes, I like marches if you have any."

A few minutes later the final pay-off came. I, an honest, law abiding ham, wanting no trouble from anyone, received a call wanting to know if I could fix a TV set so its owner could hear me. Also, if it wasn't too much trouble, could I fix it so he could see me? Anybody got any ideas?

ON 15 METERS-QUICK!

(from page 42)

on the coil form.

(Using a conventional frequency doubler as an output stage always incurs the risk of radiating appreciable power at both the subharmonic and harmonics of the desired output frequency. A link-coupled antenna tuner will greatly reduce the possibility of such spurious outputs reaching the antenna. Another possibility is to divide the parallelled 1625 grids and excite one from the present point on the oscillator coil assembly and the other from the point previously connected to the neutralizing condenser. This will convert the 1625 stage to a push-push doubler, increasing doubling efficiency and decreasing the probability of output on other frequencies. Also, note W2TCE's improved conversion described below. —Editor.)

A More-Efficient Conversion

After the thrill of the first few contacts on the new band has worn off, you may desire to go a step further and add a 12A6 frequency doubler between the oscillator and the 1625's. The added stage will permit the 1625's to operate as straight amplifiers, resulting in increased 21-mc output. It will also improve stability, because of increased isolation between the oscillator and the 1625's.

The portion of the diagram *(Fig. 1)* between the dotted lines gives data on the new doubler stage. To accommodate it, strip all connections from the 1629 tube socket and the crystal socket. Reconnect power leads removed from them to the power plug at the rear. Replace the 1629 socket with a piece of scrap aluminum upon which L1, the slug-tuned 12A6 plate coil, is mounted. Rewire the former crystal socket for the 12A6.

Note that the connection from the oscillator coil that formerly went to the 1625 grids now goes to the 12A6 grid, while the 1625 grids are connected to the 12A6 plate through a .001 μf. condenser.

Connect the grids of the 1625's to ground through a one-milli-henry r-f choke and a 20,000-ohm, ½-watt resistor. Raise the value of the former 1625 grid resistor—now the 12A6 grid resistor—to 68,000 ohms.

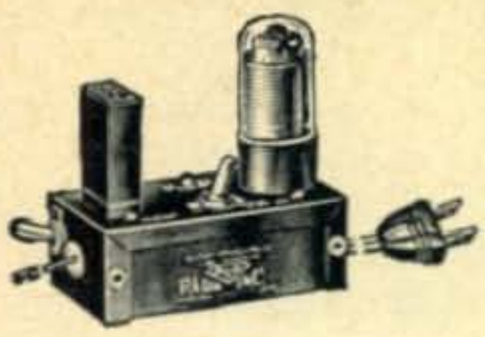
Tuning The Doubler

Insert a 0-10 ma. meter between the amplifier grid resistor and ground. With the plate and screen voltage removed from the 1625's, tune the oscillator to the center of the 21-mc band (21,225 kc.), and adjust the slug in *L1* for maximum meter deflection. It should be about five milliamperes at the center of the band, dropping fifteen to twenty per cent at the ends of the band.

If the grid current exceeds five milliamperes, decrease the size of the coupling condenser between the 12A6 and the 1625's or increase the value of the 12A6 screen resistor.

Neutralization of the 1625's was not found necessary. If instability is noted, try different 1625's; they are still cheap on the *surplus* market.

BUD
Frequency Calibrator
FCC-90



The elimination of drift is a vital responsibility of every amateur operator. To comply with Federal Regulations some means of accurately checking transmitter frequency must be available at every "ham" station. You can avoid a "pink ticket" for off-frequency operation by using the BUD self-powered frequency calibrator. The BUD FCC-90 consists of a 100 kc crystal oscillator that is completely self-powered. It will give 100 kc check points on all bands to 30 megacycles. This enables you to determine the exact band edges.

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SCRATCHI

(from page 4)

ber how it were a box to which you connecting wires that go to a meter, so no matter how you connect them, meter never goes offscale backwards? Also it were used for connecting geranium diodes so that they never wired in wrong? Hah, go digging that out of your files.

Not convinced? Remember when I going on single-sideband, and losing that one sideband so having no signal at all? What more trubble can you have with SSB than that? None. And what caused it? IPOIO. Or, how about the time Scratchi inheriting an island, and getting all set to make it a ham's paradise, when discovering that sekrut radar base are on next island, so can't even setting up radio at all on my island? This are 1/c example of IPOIO.

Needing more proof? Howsabout time I rushing home from vacation to go on the air, and finding bird nesting in antenna tuning network. That bird was most perverse inanimate object Scratchi are ever laying eyes on. Who would thinking up trick like that? IPOIO. Or, who you supposing it was that getting me in trubble when teaching ham the code on a tape recorder, and he running tape backward so result is he learning code backward? IPOIO, natchurally.

Well, Hon. Ed., I could going on with these examples, but you reeding back issues of Scratchi's letters to you, and every one are reel good example of IPOIO—and then you letting sum "expert" writing about it for you. Why this smart gentlefellow not even telling about reverse IPOIO, which are catching you when least looking behind you.

Let me give you example of reverse IPOIO, which other amchoor writer not even thinking about. Suppose you deciding to build hunk of equipment which you are knowing will go on 17 by 10 inch chassis. You figuring and figuring, and this is all the space you need. But you are foxy fellows, and you knowing that IPOIO will get you in the end, so you buying 17 by 13 inch chassis. You start to get the parts, and sure enuf, the transformers are all bigger than the catalogs said, and the toobs are larger than they supposed to be. So, there you are, with nice outfit, just fitting on the big 17 by 13 inch chassis. You say to yourself, AHH, you smart geenyus, you fooled IPOIO that time. So, then you start to put slicky new chassis in your steel cabinet, and you discover that cabinet made to hold 17 by 12 but not 17 by 13 inch chassis. HOWCOME? Reverse IPOIO. Not only that, trying to get steel cabinet to hold your chassis. Just trying, I dare you. When you calling radio store, you finding manufacturer have discontinued that model.

So, Hon. Ed., next time you want the reel dope, you coming to me. As anyone will tell you that knowing me well, when you want dope on IPOIO, you coming to horse's mouth Scratchi. I are so mixed in with this inate perversity stuff that you can never tell what might happening to this letter—you mite even forget to print it.

Respectively yours,
Hashafsti Scratchi

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NOVICE SHACK

(from page 53)

"Dear Herb . . . I've called many a "CQ WN," without response, although I can hear them by the thousands. So far, I've been able to work a few WP4's, and W8HEV (Ex Novice: Herb). I'm still pounding the key and hoping that some day the unexpected will happen." --Cedric, WV4AZ.

Pat, **KN2AIB**, is interested in learning the experiences of other Novices using 8JK antennas.

Bobby, **WN4USM**, offers a bit of sage advice in very few words. "I don't think that the Novice should start out with inferior equipment, because he may become discouraged. I had a cheap receiver and at night when everybody was on the air, I could not hold anyone for a solid QSO. I now have an HQ-129X and do very well."

"Dear Herb: My receiver was laid up, and I was itching to go on the air. I called up Mike Jaquish, an SWL friend of mine. He fixed up a phone patch to one of his receivers, and I made two QSO's. Neat, huh. 73, Al, **WN4UWA.**"

Louis, **WN6OXJ**, wants the address of WN6PJX. He says he wants to send her a QSL card. His address is: Louis Champion, WN6OXJ, Templeton, Calif.

WN2MAI reports on some of the happenings around Brooklyn. "I have been using a 125-foot antenna, fed with 300-ohm ribbon, which refused to "load up" during the rain. Getting tired of operating only in clear weather, I strung up 250 feet of No. 28 wire. It works fine. Yesterday, I worked my first W4.

"Ira, W2HMR, resorted to the same type of wire, because of landlord trouble, and worked Idaho the other day. Incidentally, I know that Ira has been writing to you regularly, but I'll bet he never mentioned being elected president of our local radio club. (Right. He did not—Herb.) 73, Spence, WN2MAI."

Ira, **W2HMR**, wrote quite a long letter about his experiences since graduating from the Novice ranks, with the conclusion that he had more fun as a Novice. He plans to try all possible types of amateur work to see which he likes best. Ira also reported that the interference caused by his television receiver was cured by covering the bottom of the chassis with a piece of sheet metal.

WN9SWL, Jo Ellen, was the first Novice YL operator licensed in Fort Wayne, Ind. Four more have now taken the examination.

Nick, **W1NOA**, reports that the Stamford, Conn., Radio Club planned to leave most, if not all, of their 144-mc work on Field Day in the hands of Steve, WN1TUC, and Fred, WN1UHU. They will also get a chance to operate the 3.7-mc band.

Nick has several projects under way. One is to groom Paul, WN1USF, for his General Class license as fast as possible; so that he can take over trusteeship of W1THX, Fairfield University. "Trouble is, Paul lives in Fairfield, and I live in Stamford; so I can't pound CW into him. He is a real reluctant dragon on thirteen w.p.m."

The other project is working with W1PCZ in encouraging their respective wives to get their Novice licenses. Come on, girls. Edith and Francesca are both nice names, but WN1—would add an extra touch to them.

Attention Atlanta, Georgia: "Dear Herb, While monitoring the 10-meter band tonight, I heard one of the local hams say there was not a single YL operator in the city of Atlanta.

"Just thought I'd pass along the information that there is one. I have been licensed since January, as WN4UMM. I have worked twenty-two states with a little sixty-watt rig I built myself. Thanks and 73. Sarah T. Abbott, **WN4UMM**, 839 McMillan St., NW, Atlanta, Ga."

Have you worked WN5WCG yet? The call is owned by Helen Mae Martin, of Gulfport, Miss. She is nine years old, four feet tall, and has just been promoted to the fourth grade in school. Helen can send and receive code at a speed of over ten w.p.m., and she wants to become a radio-telegraph operator when she grows up. Helen is a member of a radio family. Four of her five brothers also possess amateur licenses. Their call letters are: Bill, W5SKB; Ken, W5SKA; Bob, WN5VEA; and Pat, WN5USS.

We are a little pressed for space this month; therefore further items will have to wait for next month. Keep your news items and pictures coming. 73, Herb

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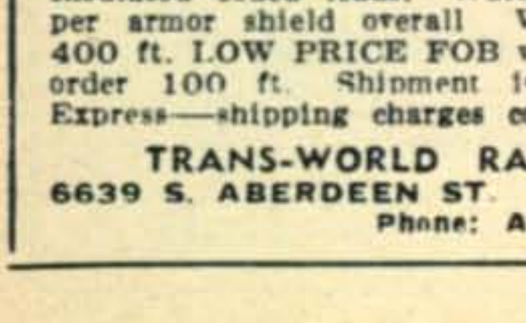

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DX and OVERSEAS NEWS

(from page 50)

with his 300 watts. . . . From **W1TW** we hear that VQ9AC says QSL via Box 217 Tangiers. (??) . . . . **OK1MB** reports that altho there are no officially licensed hams in Albania (ZA), he QSO'ed ZA2AB who said QSL via Box 35 Tirana. We await word from OK1MB when, and if, that QSL shows up. . . . Russ closes down **VK9XK** in August. QSLs should go to VK3XK. . . . **SV1SMX** has been very active. This is Greek ship SXS ARIES presently bound for USA from LU and return. QSL via RCA Buenos Aires. . . . **W4BRB** has been receiving QSL's from Europe for SV7UN. This station is unknown to him. Gene seeks 3.5 mc cards from HZ1KE, VP8AI, ZM6AK, OQ5BC, ZD4AB and PZ1LZ.

TI2TG finally hit 200 with KS6AA. . . . **G4CP** confirms VS8BJ on Kamaran islands with 10 watts, as mentioned in HZ1MY letter, but says he is QRT now. . . . **W8NBK**, Arkie, says **VK1BS QSL's** have all gone forward. . . . W3MIS advises **ZD3B** is now G3FHV and will answer any overdue QSL's. . . . **KH6ADY**, Ted, ex KV4AF, is now active from Red Bank, N. J. KH6ADY/2. . . . Cards covering QSO's with FB8ZZ up to Feb. 8th 1952 have been dispatched. (For those received.) QSL's for contacts with FB8ZZ after this date will have to await Joseph Kleins' return to France in 1953. . . . **F9RS** recd the "Helvetia 22" certificate. It was No. 4 for foreign hams.

QTH COLUMN

DJ1AD	Hilde Dunkelmann, 16 Travelmannstr. Luebeck, Germany
TA3AA	Andy Kirinich, TUSNG, Jammat, APO 206A, PM, N.Y.
VR4AF	Via W.I.A.(Australia) or VK2QZ.
KV4BB	Bill Thomas, c/o, C.A.A. St.Croix, Virgin Is. USA.
KV4BC	George Beers, Box 120, St.Thomas, Virgin Is. USA.
ZC6AG	Andre, c/o Belgian Consulate, Jerusalem.
VP7NV (W4COK)	Bill Frerichs, 223 Beverly Road, Cocoa, Fla.
W2AIS/KH6	H.T. (Pat) Miller, 283 Awakea Road, Lanikai, Oahu, Hawaiian Is.
KH6ADY/W2	Cmmdr. Ted Sharpe, Naval Ammunition Depot, Earle, Red Bank, N.J.
PJ2CC	L.Klein, 22 Piscaderaweg, Willemstad, Curacao, N.W.I.
DL4LQ	Cpl. Al Rugel, US 55147901, 75th Sig. Air/Ground Liaison Co., APO 46 PM, N.Y.
FL8MY/HZ1MY/4W1MY	Dick McKercher, Box 167, Jedda, Saudi Arabia.
ZC3—	Dave Laing, Radio VSM, Christmas Island, via Malaya.
ZS2MI (No. 3)	Via ZS5AZ. M.E.Brokensha, 6 The Drive, Durban North, Natal Union of South Africa
KC6DX	Phil Crockett, Truk, Eastern Caroline Is. via Guam
HI6TC	Tomao Cortimas, Marina de Guerra. Cuidad Trujillo, Dom. Rep.
OQ5CZ	Jean Blondel, Box 18, Kisenyi, Lac Kivu. Ruanda Urundi, Belgian Congo.
FQ8AJ	Jean Franco, Box 758, Brazzaville, FEA
FQ8AQ (FF8PG)	Pierre Gaillard, Box 21, Brazzaville, FEA.
8W4AF	Harbourage, Port of. Mocha, Yemen.
KH6APM	D.F. (Jonny) Johnson, Schofield Barracks, Box 565 APO 957 PM San Francisco.

Thanks to: West Gulf Bulletin, F9RS, W4FIJ, OQ5RA and W1CPT.

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BARGAINS: EXTRA SPECIAL! Motorola P-69-13 mobile receivers $29.50; Globe King $315.00; HT-9 $199.00; HRO-50 $275.00; Lysco 600 $109.00; HRO-7 $199.00; Collins 75A1 $275.00; HRO-5T $175.00; SX-71 $159.00; SX-42 $199.50; HRO-Senior $119.50; RME 2-11 $99.50; RME-45 $99.00; Meissner EX Shifter $59.00; S-40A or SX-16 $69.50; VHF-152 $59.00; HF-10-20 $59.00; SX-24 $69.00 Globe Trotter $79.50; Meissner Signal Calibrators $24.95 MB611 Mobile Transmitters $29.00; 90800 exciter $29.50; RCA Chanalyst $69.00; XE-10 $14.95; Gonset 10-11 converter $24.95; and many others. Large Stock Trade-ins: Free Trial. Terms financed by Leo, WØGFQ. Write for catalog and best deal to World Radio Laboratories, Council Bluffs, Iowa.

APQ/2 TRANSMITTER with tubes 210-500 Mc. $20, VHF 152 converter 2-6-10 $20, Simpson Model 488 TV Field Strength Meter like new $50, Genemotor 5.6 V in 400 V at 175 M out $20. W3RKQ, H. F. Swearer Box 1123, Wilmington 99, Del.

WANTED: your attendance at the Mid-American and Dakota Division ARRL convention, September 5, 6, and 7, 1952. Nicollet Hotel, Minneapolis, Minn.

IMMEDIATE DELIVERY: Power supplies for Bandmaster transmitters, $39.50 F.O.B. Alco Electronics, 102 Marston, Lawrence, Mass.

WANTED: Late model, all band, factory built ½ kw phone-CW transmitter. Sell large, unconverted, prop pitch motor for best offer. Hal Cushing, W1EUS, 16 Preston Drive, Manchester, Conn.

QSL CARDS? "Unbeatable." Samples 25c. Sackers, W8DED, Holland, Michigan.

QSL's! Interesting Samples 10c. Tooker, Lakehurst, N.J.

S-40A like new $63. New S-38B— $39. Want NC173. E. Tischler, 56 Carey Ave. Wilkes-Barre, Pa.

BACK ISSUES OF CQ—Now available, hard to get copies of CQ. See the back issue ad on page 67. CQ Magazine, 67 W. 44 St., New York 36, N.Y.

WANTED: APR-4, other "APR-", "APS-", "APT-", ARC-1, ARC-3, ART-13, BC-348, BC-221, etc.; TS-12, 13, 35, 120, 146, 155, 173, 174, 175, 323, other "TS-", particularly MICROWAVE equipment, Spectrum Analyzers; G-R, Ferris etc. units; 723A/B, 3C22, all tubes; Manuals, Meters, Parts, Cable. Littell, Farhills Box 26, Dayton 9, Ohio.

BARGAINS: New and reconditioned Collins, Hallicrafters, National, Hammarlund, Johnson, Elmac, Harvey-Wells, Gonset, Morrow, RME, Millen, Meissner, others. Reconditioned S38 $29.00, S40A $69.00, S40B $79.00 SX43 $119.00 SX42 $199.00, SX62 $199.00, SX71 $149.00, HRO5TAI $159.00, NC173 $139.00, NC183 $199.00, HRO5OT $249.00, HRO5OTI $299.00, HQ129X $139.00, SP4OOX $259.00, Meissner EX $59.00, Lysco 600 $99.00, Meck T60 $59.00 TBS50 $79.00 TBS50D $99.00, DB22A $49.00, VHF152A $59.00, Collins 32V1 $425.00, Collins 32V2 $495.00. Collins 75A1, others. Shipped on trial. Terms. List free. Henry Radio, Butler, Mo.

WANTED: Collins 310 series exciter or 32V2. State condition and lowest price. Paul Z. Haus, W2VH, 25 Upland Drive, Chappaqua, New York.

SELL: Millen Variarm VFO with Millen 90800 Exciter. Make offer. WØTDH.

FOR SALE: Complete mobile installation $40.00; Weston 0-5 microammeter $5.00; grid dip $10.00; 10-11 mtr mobile xmtr $10.00; 10 mtr 829B final $12.50; vernier dial $1.50; De-Luxe Grid Dip $35.00: 10 mtr converter $8.00. W. Deane 550 So. "G", Oxnard, Calif.

"COLLINS 30K-1 transmitter for sale. Filtered and screened. 4-250A final. 500 Watts phone. Stainless base. Base 789, Anderson, Indiana.

WANTED: manual for Navy Collins MBF. Will buy, borrow, or trade. Also want Panadaptor, preferably Navy surplus. Cash or trade. Eugene A. Wille, W9EKU, 3435 North 47 Street, Milwaukee 16, Wisconsin.

WANTED: Army walkie-talkies. State price, conditions and model number. Andy Andros. 249 North 48, Lincoln, Nebraska.

FOR SALE:New 300 watt phone-cw transmitter. VFO all bands. 6 ft. rack mounted. Write for free photos and details. Highest offer takes. W4LXB, 308 W. Markham Ave., Durham, N. C.

SELL OR SWAP: 810, 813, 814, HK54, 807, etc. Want grid dip meter and oscilloscope. WØSYA, 2619 So. Gaylord, Denver, Colo.

ATTENTION MOBILE HAMS

COMPLETE MOBILE PACKAGE — NOTHING ELSE TO BUY. OUTSTANDING MOBILE SIGNALS USE MOTOROLA EQUIPMENT—BACKED BY YEARS OF COMMUNICATION EQUIPMENT EXPERIENCE — WORLD'S LARGEST PRODUCER OF 2-WAY MOBILE EQUIPMENT.

A mobile transmitter with a double feature FM or AM at flip of the switch, the MOTOROLA FMT-30-DMS 27-30 MC. . . **$130.00**

P-7253 spring base rear—mount antenna. . **$23.13**

MOTOROLA P-69-13 or 18-ARS receiver with special noise limiter for use with any converter having 1440-3000 KC. **$60.00**

New Gon-set Tri-Band Spread Converter **$47.60**

3-30 famous Gon-set converter complete to connect to the P-69-13 or 18-ARS receiver **$44.75**

P-327-E Fire wall loud speaker **$7.50**

The above comes complete with all necessary accessories and mounting hardware. Order direct or through the Motorola National Service Organization member in your area.

NOTE: This Receiver and Transmitter is equipment which has been returned from the field, modified and rebuilt for Amateur Service.

For further information write to:

MOTOROLA INC.

Amateur Sales Dept. CQ August
1327 W. Washington Blvd., Chicago 7, Ill.
Attention: Harry Harrison, W9LLX
Telephone—TAylor 9-2200, Ext. 161

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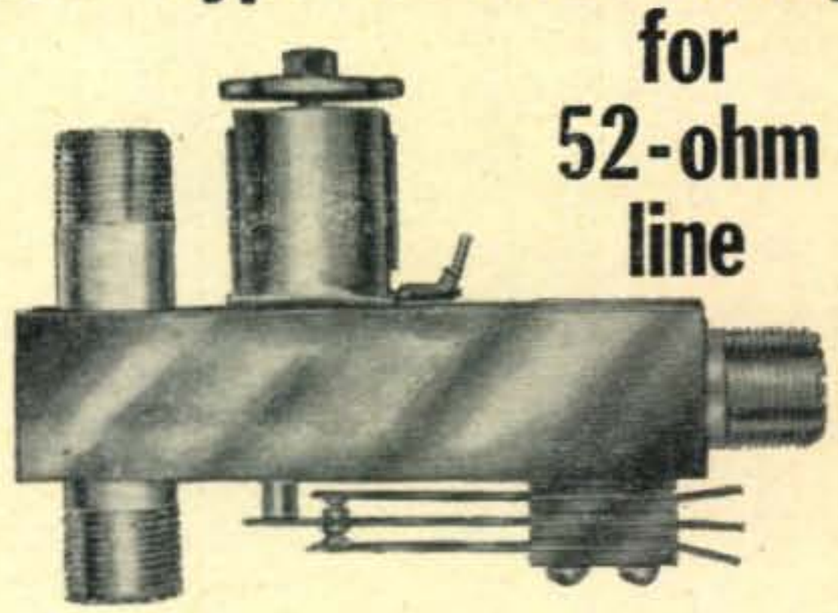

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For greater efficiency and maximum receiver protection use a 115 Volt A.C. model at the home QTH.
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(For more complete details, see May 1952 advertisement in CQ)

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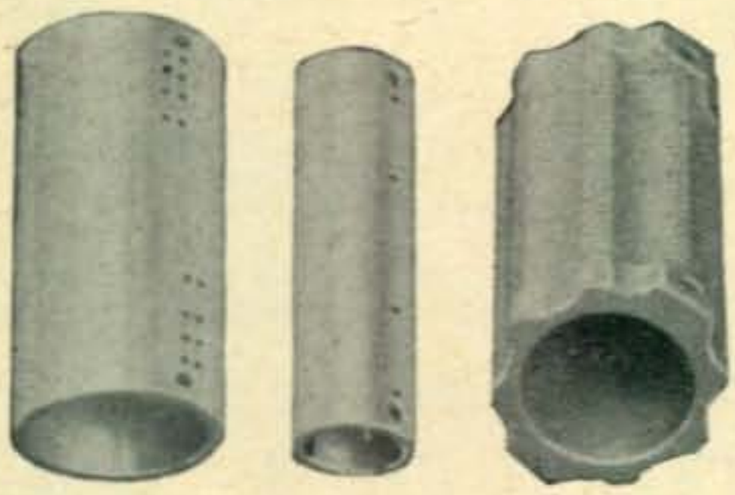
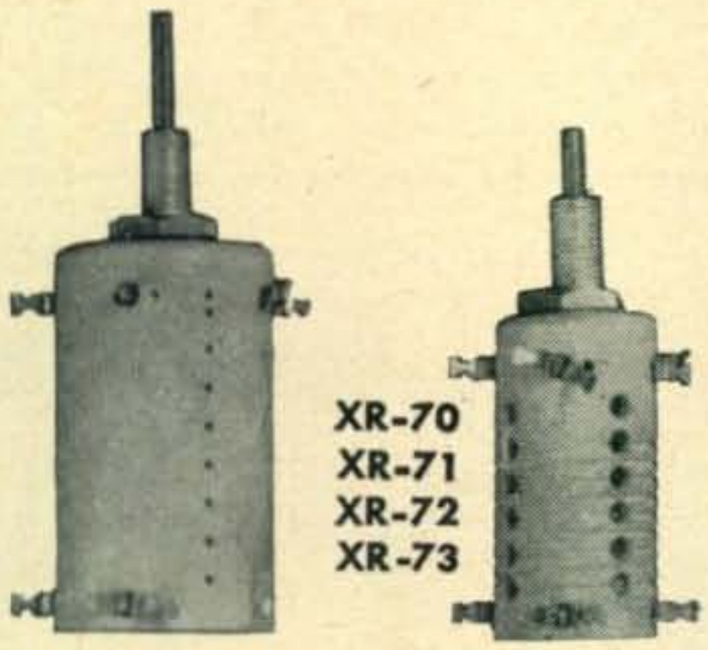


XR-13 XR-13A XR-10A



XR-60
XR-61
XR-62
XR-63

XR-70
XR-71
XR-72
XR-73

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National high-grade ceramic coil forms have been designed for a wide variety of communication and industrial applications. Types XR-13, XR-13A and XR-10A are primarily for use in transmitters, diathermy equipment, etc. The XR-60 and XR-70 series are permeability-tuned coil forms, conforming to JAN specifications, with either brass or iron slugs. Write for drawings and specifications.

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National proudly announces a brand-new receiver — the NC-183D — *every* feature you want in a truly modern receiver! Dual conversion on the three highest ranges (including 6, 10, 15, 20 and 40 meter ham bands) no "birdies"! Steep-sided skirt selectivity with 3 I.F. stages (*16* tuned circuits on the 3 high bands — *12* on all other bands, compared to 6 normally used) plus a new crystal filter. Approximately 1 microvolt sensitivity on 6 meters for a 10db signal-to-noise ratio! New, indirectly-lighted lucite dial scales! New miniature tubes for improved sensitivity! Bandspread on all bands, including new 15-meter band! New bi-metallic, temperature-compensated tuning condenser for drift-free operation! *Plus* all the time-tested features of the famous NC-183!

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RCA-5876
UHF "PENCIL" TRIODE

RCA-5734
TRIODE TRANSDUCER

RCA-6BQ7
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Revolutionary tubes ...by professionals with "Ham Tickets"

While these revolutionary tubes are not normally used in Amateur activities, they typify the advanced engineering that goes into the tubes you do use. What we especially wanted you to know is that these tubes were designed by professional engineers at the RCA Tube Department who are also Radio Amateurs.

Each tube represents a practical solution to an extremely tough design problem . . . as well as a tribute to the ingenuity of Radio Amateurs and their continuing contributions to the radio industry.

Here are some interesting facts about these tubes:

The RCA-6166 is a forced-air-cooled tetrode that can deliver a synchronizing-level power output of about 12 Kw in VHF-TV Service (54 to 216 Mc).

The RCA-6181, using ceramic-metal seals, is a forced-air-cooled tetrode capable of delivering a useful synchronizing-level power output of about 1200 watts at 900 megacycles in UHF-TV Service.

The RCA-5876 is a "Pencil" type high-mu triod for use in receivers at frequencies up to about 100 Mc. As an rf power amplifier the 5876 is capable delivering a useful power output of about 5 watts 500 Mc . . . and gives a good account of itself as a oscillator up to 1700 Mc.

The RCA-5734 Mechano-Electronic Transduce is used for the measurement of small mechanic vibrations up to 12,000 cycles per second.

And the **RCA-6BQ7** is a new low-noise twin triod especially developed for VHF-TV tuners. Incide tally, it's a fine rf tube for 2-meter receivers.

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