CQ

MARCH, 1950

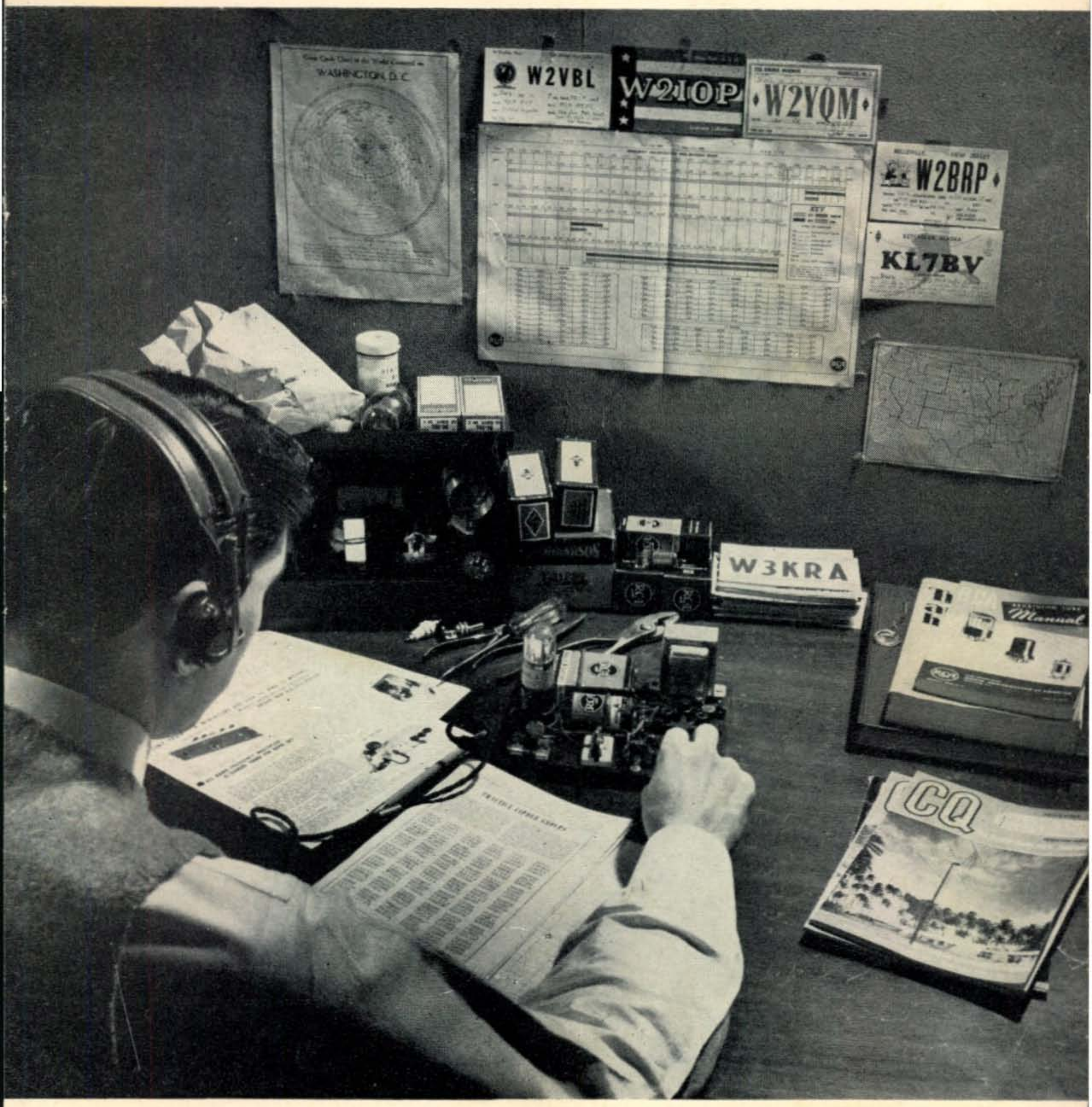
IN THIS ISSUE

$1,000 CASH PRIZE "HOME BREW" CONTEST

SEE PAGE 17

35 Cents

The Radio Amateurs' Journal



for the HAM, TECHNICIAN, NOVICE and SWL

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World's favorite premium crystal mike—the only high level crystal cardioid with dual frequency response. Lists at $39.50.

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Very popular super-dynamic. Ideal frequency response. High output. Acoustalloy disphragm. Lists at $36.50.

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Rugged, handsome Crystal or Dynamic. Extra quality features at minimum cost. List prices from $22.50 to $31.00.

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Low-cost all-purpose crystal and dynamic models. Rugged, dependable. Satin chromium finish. Lists at $10.00 and up.

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A roll call of Hams proves the popularity of E-V mikes. That's because E-V engineered response assures *clear, exact* voice reproduction...E-V high output provides more power! There's a model made for you in the complete E-V line—with all the *extra* quality, *extra* features, *extra* value you want! *Ask your E-V Distributor or write for Bulletin No. 104.*

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First to fit any mike with 5/8"-27 stand coupler. Finger-tip relay operation or microphone "On-Off." With or without mike.

SPEECH CLIPPER

Clips the peaks from speech frequencies which exceed a pre-set amplitude. Adds greatly to articulation and intelligibility in speech transmission, especially in the presence of high QRM or QRN. Holds modulation at 100%. With tubes. Lists at $24.50.

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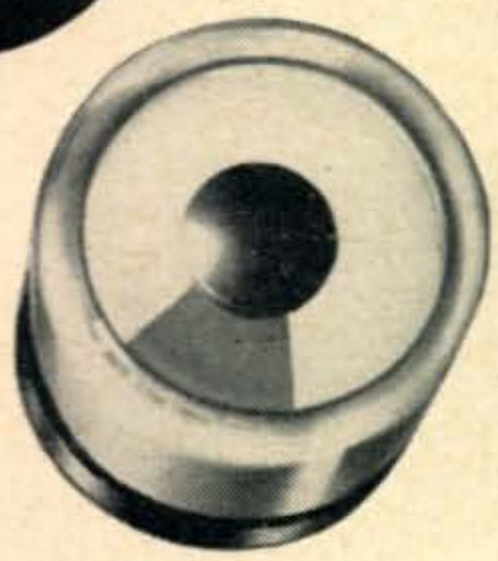
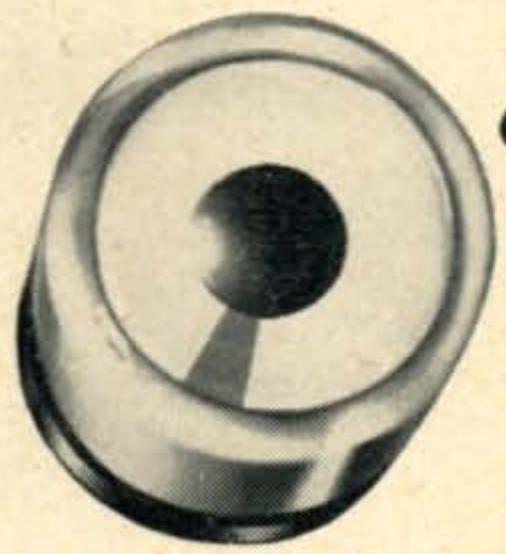
Export: 13 East 40th St., New York 16, N. Y.
Cables: Arlab

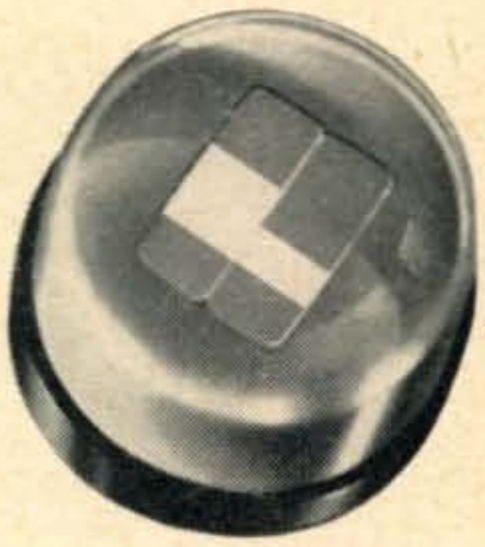
Make instantaneous peak readings *Economically* with Ken-Rad indicator tubes!



6E5



6U5



6AL7-GT

LET the flashing speed of electrons measure for you! Tubes are faster than a meter . . . besides, meters are damped, so won't respond readily to transient phenomena. You can use an oscilloscope for visual measurement, yes—but then cost lifts its head. Balance the price of a 'scope against the receiving-tube cost of any of the Ken-Rad indicator types! Your pocketbook will feel the difference.

Another advantage of Ken-Rad indicator tubes: very little auxiliary apparatus is needed. In most applications, a resistor or two sums up your list of extras.

How can you make use of this fine combination of speed, easy visibility, and real saving? By employing Ken-Rad tubes as modulator, volume-level, and resonance indicators, among other functions. There are several types from which you may choose. The 6E5 and 6U5 are Ken-Rad tubes of, respectively, sharp-cutoff and remote-cutoff designs. If you desire comparative readings, or wish to check two circuits at once, the 6AL7-GT dual-indicator tube serves ideally.

Moving far faster than a V-2 rocket, the tiny streams of electrons require careful control and deflection. Ken-Rad indicator tubes are built to exacting standards—they do their precision job well because they're made well! You'll want to see these fine tubes, inspect them, learn their low prices. Your Ken-Rad distributor or dealer has them . . . *so visit him today!*

K KEN-RAD

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LOOK BEYOND THE DATA SHEET!

182-JA26

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

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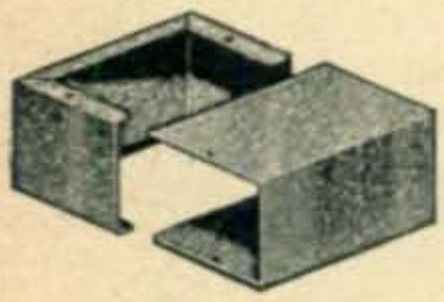
For BETTER PERFORMANCE
For GREATER UTILITY

BUD MINIBOXES



There are thousands of uses in the fields of radio and electronics for these new boxes. They are made from heavy gauge aluminum. The design of the box permits installation of more components than would be possible in the conventionally designed box of the same size. It is of two piece construction, each half forming three sides. The flange type construction assures adequate shielding. Available in etched aluminum finish and gray hammerloid finish.

Catalog Numbers Gray	Etched	Length	Width	Height	Dealer Cost
CU-2100	CU-3000	2¾"	2⅛"	1⅝"	$ .50
CU-2101	CU-3001	3¼"	2⅛"	1⅝"	.50
CU-2102	CU-3002	4"	2⅛"	1⅝"	.50
CU-2103	CU-3003	4"	2¼"	2¼"	.70
CU-2104	CU-3004	5"	2¼"	2¼"	.72
CU-2105	CU-3005	5"	4"	3"	.72
CU-2106	CU-3006	5¼"	3"	2⅛"	.72
CU-2107	CU-3007	6"	5"	4"	.81
CU-2108	CU-3008	7"	5"	3"	1.05
CU-2109	CU-3009	8"	6"	3½"	1.68
CU-2110	CU-3010	10"	6"	3½"	1.80
CU-2111	CU-3011	12"	7"	4"	2.34
CU-2112	CU-3012	17"	5"	4"	2.76

Prices 10% higher west of the Mississippi River

NEW SHIELDED COIL LINKS

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

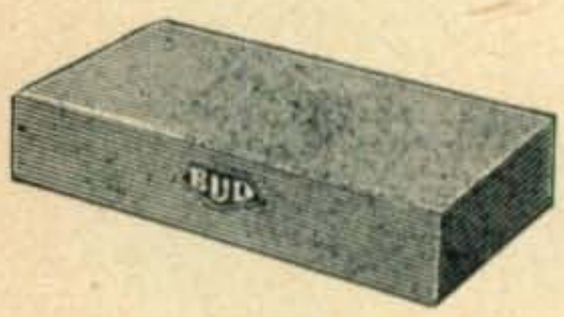
Catalog Number	Description	Dealer Costs
AM-1300	Used with RLS coils (150 W)	$1.53
AM-1301	Used with VLS coils (500 W)	1.89
AM-1302	Used with MLS coils (Kilowatt)	2.25

NEW ADD-A-LINK

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

Catalog Number	Used With	Number of Turns	Dealer Cost
AM-1303	RLS	3½	$ .52
AM-1304	RLS	4½	.54
AM-1305	RLS	5½	.63
AM-1307	VLS	3½	.52
AM-1308	VLS	4½	.54
AM-1309	VLS	5½	.63
AM-1310	VLS	6½	.72
AM-1311	MLS	3½	.81
AM-1312	MLS	4½	.96
AM-1313	MLS	5½	1.05
AM-1314	MLS	6½	1.14

BUD ALUMINUM CHASSIS



The construction and design of these chassis is exactly the same as our steel chassis. The aluminum chassis are welded on government approved spot welders that are the same as used in the welding of aluminum airplane parts. The gauges in the table below are aluminum gauges. As a result you can depend on BUD Aluminum Chassis to do a perfect job. Etched aluminum finish. NEW ADDITIONS TO THIS LINE ARE MARKED WITH AN ASTERISK.

Catalog Number	Depth	Width	Height	Gauge	Dealer Cost
*AC-430	4"	6"	3"	18	$ .78
*AC-431	4"	6"	2"	18	.78
*AC-432	4"	17"	3"	16	1.43
AC-402	5"	7"	2"	18	.69
*AC-429	5"	7"	3"	18	.81
AC-403	5"	9½"	2"	18	.81
AC-421	5"	9½"	3"	18	.89
AC-404	5"	10"	3"	18	.99
AC-422	5"	13"	3"	18	.98
*AC-433	6"	17"	3"	16	1.44
AC-405	7"	7"	2"	18	.81
AC-406	7"	9"	2"	18	.90
AC-407	7"	11"	2"	18	.96
AC-408	7"	12"	3"	18	1.14
AC-409	7"	13"	2"	18	1.02
AC-411	7"	15"	3"	16	1.68
AC-423	7"	17"	2"	16	1.43
AC-424	8"	12"	3"	16	$1.38
AC-425	8"	17"	2"	16	1.52
AC-412	8"	17"	3"	16	1.77
AC-413	10"	12"	3"	16	1.44
AC-414	10"	14"	3"	16	1.92
AC-415	10"	17"	2"	16	1.80
AC-416	10"	17"	3"	16	2.04
AC-426	11"	17"	2"	14	1.89
AC-417	11"	17"	3"	14	2.40
AC-418	12"	17"	3"	14	2.52
AC-419	13"	17"	2"	14	2.25
AC-420	13"	17"	3"	14	2.67
AC-427	10"	17"	4"	14	2.36
AC-428	13"	17"	4"	14	3.05

Prices 10% higher west of the Mississippi River

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Vol. 6 March, 1950 No. 3

In This Issue

OUR COVER—For some of us the memory of the days when we were in this kid's shoes is a long way back—to others it may be yesterday, today, or even tomorrow. No matter how long we've been in the game, however, we all wish the novice a bright future in the best avocation of all. May he be a winner!

Feenix, Ariz.

Deer Hon. Ed:

With spring fastly approaching, Scratchi's thoughts are recently turning lightly to thoughts of mobile operation on ten meters. There is being only one fly in ointment, howsomever, and this are that Scratchi's mobile rig are non mobile, to using old Latin expression meaning that rig are working fine but that the car wouldn't run if it were on top of a hill, out of gear, the brakes off, and a strong tailwind blowing.

One day spring fever is getting the best of me, so I are going to where car is stored in the barn and trying to start it. I are having lots of luck with it—all bad. Being determined to get the car fixed, Scratchi are finally talking local ham into towing me to town.

On way in I slip the car into high gear without my friend noticing, and generator are then turning over, so I proceed to have a fine QSO with some W2, Ah, Hon. Ed., this are the life. I are riding along with my feet over the windshield, one hand on the steering wheel, and one hand holding the microphone.

The QSO are suddenly interrupted when we have to slow down for traffic, on acct. generator is not putting out enough juice. We put car in garage and ask garage man to look it over and fix it. Repairman is looking a bit dubious, because it seems that my car was made before he was born, but he allowed as how he'd make a stab at getting it to run.

Several days later the serviceman got me on the land line and told me that he was giving up the whole thing as a bad job. He said he had checked over almost everything and it seemed to be ok, but the ignition system seemed to be out of order, and with all those wires running around the car (my mobile rig installation) he couldn't even tell what he was doing. He telling me to come down and take the thing off his hands.

Scratchi thumbed a ride to town, went to the garage, and climbed in the car. (This are made necessary because doors not working). The garage man was certainly right, the car wouldn't start. Somewhat discouraged, I turn on the ten meter receiver, to at least seeing if it still working. Gracious to goodness, ten meter band are reely hot, but having very high noise level. I decide at this point to try the car again, and, you could knocking me over with the transmission, but it starting and running like a million bux.

Without further ado I drive out of the garage and start home. The motor reely perking, and it sound like brand-new fifteen year old car. Noticing that receiver is still turned on, I turn it off when WHAM! the car stop running. Scratchi's razor-like intellect is not connecting these two circumstances immediately, but after several minutes I find that car will not run until the ten meter re-

(Continued on page 72)

"Thanks for the dope on the new Sylvania 807W"

—says Joe Furrier, W1PZ

Mr. Furrier is another radio amateur who likes the convenience of dropping in at his local Sylvania distributor for friendly advice . . . as well as for those top quality Sylvania transmitting tubes.

The Sylvania line now consists of 28 different types of transmitting tubes . . . especially engineered for amateur and small commercial stations. Latest addition to this outstanding line is the new ruggedized Type 807W, a smaller, vibration and shock-tested version of one of the most popular ham tubes.

All Sylvania transmitting tubes are listed, rated, and fully described in a new transmitting tube catalog, now awaiting you at your nearest Sylvania distributor (one of 340 throughout the country).

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★ ★ Letters ★ ★

MD's QNI

Editor, *CQ:*

In the month of April the directory of doctors and dentists who are amateur radio operators will be prepared for publication. Dr. Henry Tadgell, W1AGM, would be glad to hear from unregistered eligibles in the districts W6 to WØ, inclusive. Canadian eligibles may contact either W1AGM or the undersigned. Our first aim is to prepare a directory of doctors and dentists and the bands they work. Later it may become possible to publish all of the data in synopsized form in a larger directory.

Arthur W. Woods, M.D., W4GJW

Hobby Show Exhibit

310 Union St., Trenton, N. J.

Editor, *CQ:*

Enclosed is a photo of the Delaware Valley Radio Assn. exhibit at the Kiwanis Club Hobby Show held at the War Memorial Building in Trenton.

Messages were handled and amateur equipment demonstrated. The exhibit was in charge of Harold Lee, W2STU, and Richard Henrie, W2UPS. The old-time amateur gear portion of the exhibit was in charge of Ed Raser, W2ZI.

David Nabutovsky, Sec'y,
Delaware Valley Radio Assn.

Entomological Note

Box 537, New Port Richey, Fla.

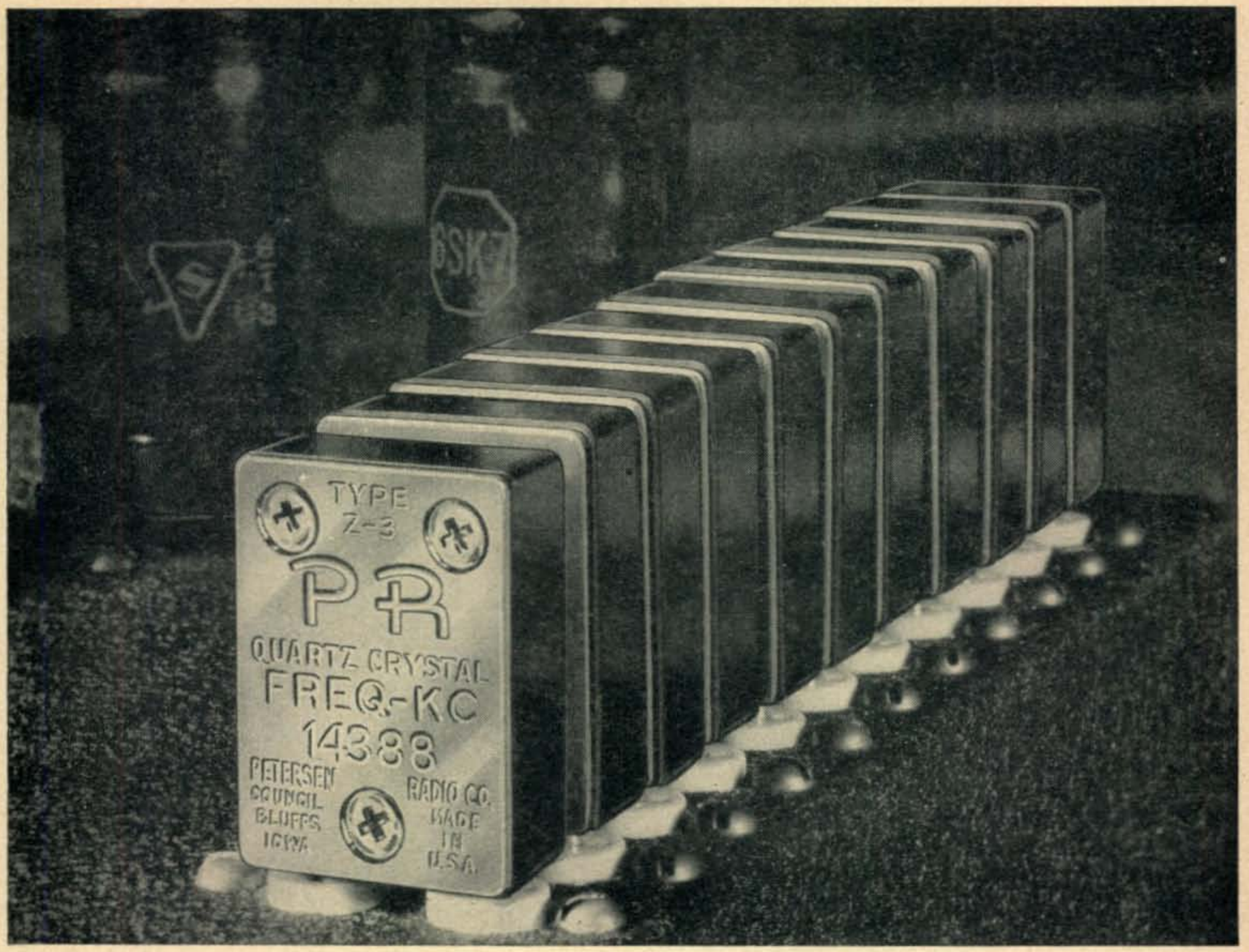
Editor, *CQ:*

You no doubt will get a kick out of this, but sincerely I am registering a comment right now which I doubt if anyone has called to your attention before.

I have the three most popular radio magazines issued each month, namely *CQ, QST* and *Radio News,* and after reading them file them on a shelf in my radio shack. Here is my kick—dont laugh, it's true! Ants, bugs, roaches, or silver fish enjoy eating the glue or paste binding on the *CQ* magazines so the covers fall off. They do not attack *QST* or *Radio News* bindings at all.

So there is my kick. I'm sure this occurs all through the south and tropics.

H. B. Doten, W4KJ



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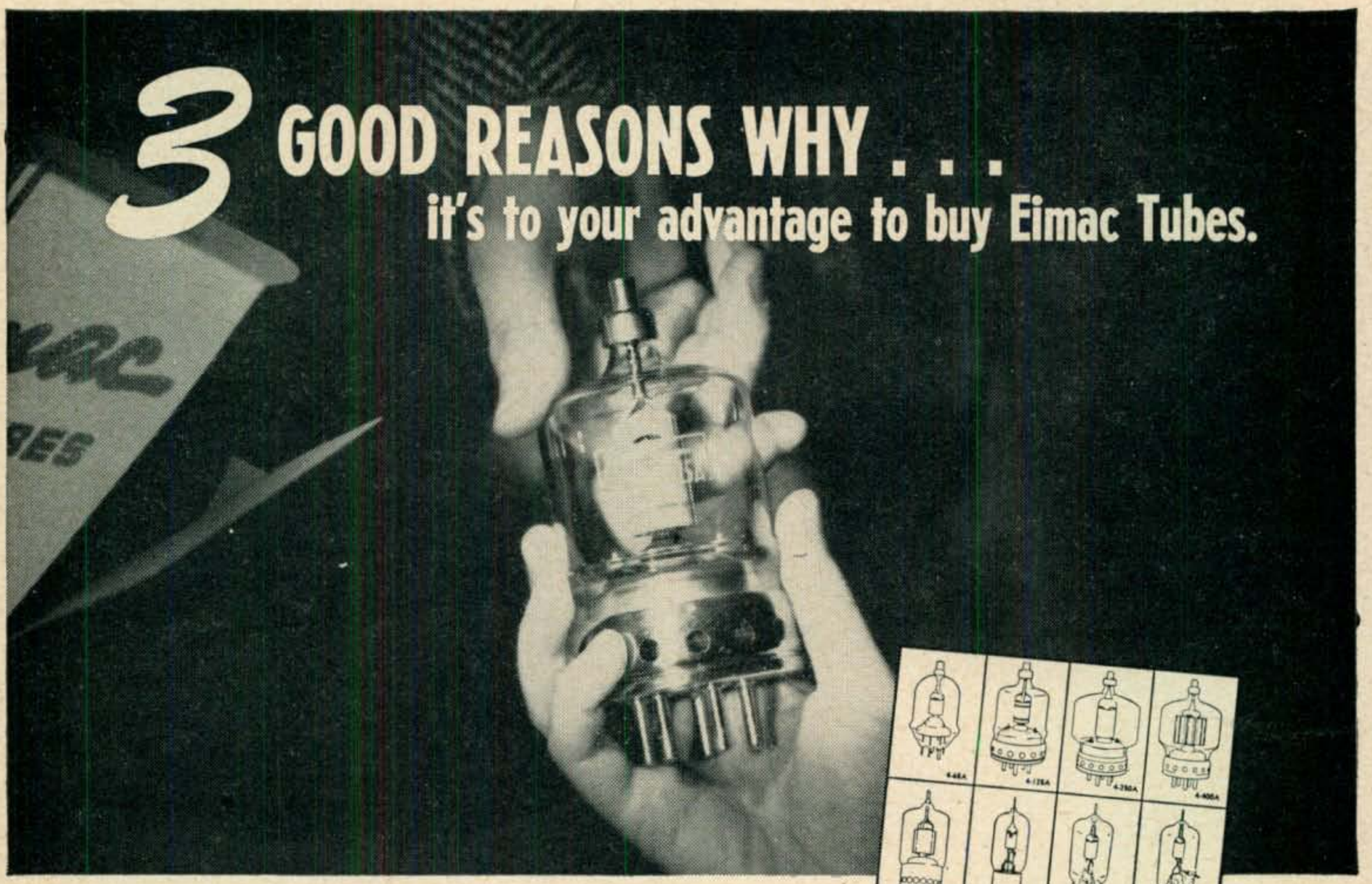

Availability

The leading radio parts dealer near you is an Eimac dealer. In his stock are tubes especially suited for every category of amateur service. And, in your locality there is an Eimac factory representative well qualified to assist in your technical problems. Their names, addresses and calls are listed below . . . drop the one near you a card—he'll be glad to help.

Adequate Data

Comprehensive application data is supplied with each tube. In addition to assist you in designing new or modifying your present equipment, the same data is available without charge by writing . . . Eimac, San Bruno, California. There is also a special packet of data titled "Tubes for Amateur Service." Ask for it.

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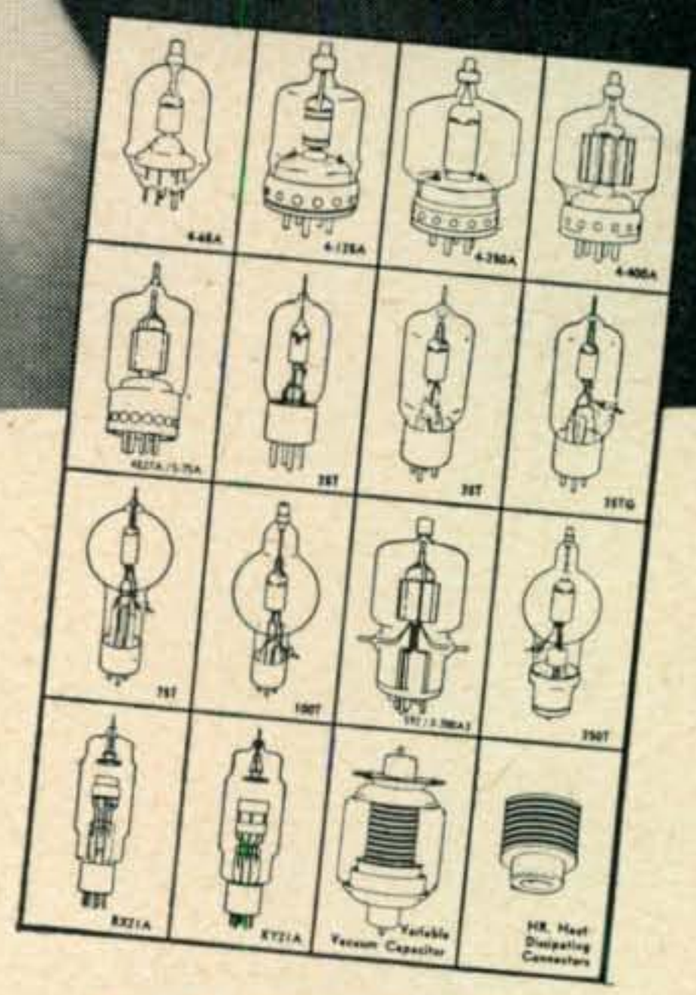
San Bruno, California



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239

ZERO BIAS

EDITORIAL

EVERY ONCE IN A WHILE SOMETHING COMES UP in amateur regulatory matters which causes us to wonder what all the shouting is about. It usually turns out that the several divergent opinions which are being voiced around the bands and in ham club meetings are based on different ways of looking at the same thing. We think the present divergence of opinion on the merit of FCC's latest proposal (quoted in full in January *CQ*), and, more specifically, the argument about the proposed Section 12.0 *Basis and Purpose,* falls in this class. Let's look at this proposal again.

> 12.0 Basis and Purpose—These rules and regulations are designed to provide an Amateur Radio Service having a fundamental purpose as expressed by the following principles:
> (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary non-commercial communication service, particularly with respect to providing emergency communications.
> (b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.
> (c) Encouragement and improvement of the amateur radio service through rules which provide for advancing skills in both the communication and technical phases of the art.
> (d) Expansion of the existing reservior within the amateur radio service of trained operators, technicians and electronics experts.
> (e) Continuation and extension of the amateur's unique ability to enhance international good will.

The first test, we feel, which should be applied to the proposed regulation is: "Is this rule in the best interest of amateur radio?" In this case we believe it is. As we see it, it is a statement by the FCC expressing the Commission's recognition of the value of amateur radio, and it is an implied pledge, by the Commission, that new regulations which may come in the future will be directed along the paths indicated in 12.0. The Commission, by thus going on record, is expressing its belief and faith in the future of amateur radio, and is expressing the intent *to direct its own future acts* in the path which the hams themselves have blazed during past years.

Let's look at another facet of the problem. Remember Atlantic City? That conference in 1947 was a tough one, and it is only because our representatives in the government believed in amateur radio as an institution that the fixed service took a severe cut in frequencies and the amateur service gained frequencies. The pressure was brought to bear, in other words, and the fixed service took it "in the neck." Next time—in 1952—the pressure will be much greater on all services, and the needs and value of each service will be weighed around a conference table before the U. S. position is prepared for presentation to the international body. Our friends, the FCC, will find the *Basis and Purpose,* part 12.0 of their regulations, of great value in backing up their case in behalf of the amateur service. Can we afford, in view of the urgency of competition, to deny our FCC this statement of its own belief in the standing of the amateur service as a radio service of value in the public interest, convenience, and nesessity?

Novice and Technician Licenses

We are pleased to note that the Novice and Technician classes of license, the creation of which *CQ* has repeatedly urged, are scheduled to become a reality on January 1, 1951.

The new Novice Class license, which will be good for one year only, and which is non-renewable, will provide the beginner with actual on-the-air code practice and in-his-own-station technical exercises which should bring him to the Class B level much faster than the old buzzer-and-text-book procedure. The frequencies to be assigned for Novice Class operation—slices of the 80-, 11-, and 2-meter bands, with c.w. only on the lower two ranges and either c.w. or phone in the 2-meter slice—have been well chosen, and should offer every Novice the experience which he needs most to develop into a good ham. We don't think the 75-watt power limit is going to cramp anyone's style, since the majority of amateur stations use a power input of 100 watts or less and don't have any trouble at all keeping themselves occupied and happy with ham radio.

Let no one believe that the mere existence on the books of the Novice Class will contribute appreciably to an increase in the rate of growth of the amateur body. It is a tool for the creation of more amateurs, and nothing more. It is up to all of us who are radio amateurs, and all who work in the interest of amateur radio, to make good use of this tool which we have earned in order to strengthen and revivify our ranks. Each group among us has his work cut out for him.

Radio clubs must increase the scope of their recruiting of prospective licensees. Perhaps they have been letting new candidates for licenses find their way to their meeting rooms. You all know how few new men are brought in in that way. Go out and get them. Contact the Young Peoples' groups in your local churches. Call on the local Boy Scout officials and explain the new regulations. Outline to them your club's program for the training of novices. Your local high school probably harbors many potential world-beaters in the ham game. Go out and get them.

But helping them to get their Novice Class licenses should not be the end of the road. One year of operation is a mighty short length of time for a youngster who has homework and school activities eating away at his time. The club must keep "working on" its new Novice licensees and help to make *good hams* out of them. This is a lot more than technical and operating proficiency, and includes indoctrination into organized amateur activity (traffic handling, contests, emergency communications work), and in the traditions of our game. It is a crying shame that the legends of the Wouff-Hong and the Rettysnitch and the writings of The Old Man are not required reading in every ham station. Maybe we can do something about this.

The manufacturers of ham equipment have to do their part, too. It is not enough that the advertising pages of *CQ* carry their usual display of quality components at reasonable prices. The manufacturers and distributors have a real job on their hands in assaying the requirements of our new brother hams and presenting to them components and kits which most clearly fit their needs. Kits, yes, there's the order of business. If we're going to preserve our status as technicians, we've got to see that our Novices attain a reasonable degree of technical proficiency before they convert to store-boughten gear, as so many of us old timers have done. Give the youngsters a break, you manufacturers, and give them the tools and components they need to become good technicians. They'll get around to buying your factory-built sniggle supers and half-gallon transmitters in due course! The most expensive store-bought receiver in the business doesn't make a man one whit better as a ham, but the experience gained in building a couple for himself before he "goes commercial" sure does.

And what about the individual hams—those who don't belong to a club, and who aren't in the ham supply business—what can they do? Simple! Remember that that kid who QRMs you with a 6 w.p.m. CQ smack on your net frequency is probably scared to death of his rig and that he'll be more than glad to QRX until he can operate without busting you up. He may be an NCS of your net before you know it! And when you work him between your QRL periods, don't give him the brush. We know it's tough to keep up a 6-w.p.m. QSO when your normal operating speed is 25-plus, but you'll be doing a lot for our avoca-

(Continued on page 60)

Staff Note

It is a source of great pride to the *CQ* editorial family to announce that Contributing Editor Robert Cheek, W3LOE, has received the Eta Kappa Nu Association award as the "Outstanding Young Electrical Engineer of 1949."

This award was established in 1936 by Eta Kappa Nu, national honorary electrical engineering fraternity, to recognize young electrical engineers for "meritorious service in the interest of their fellow men." The achievements that are considered in making selections are very broad, and include professional achievement, what the young engineer has done for his community, state, or nation, and how he has demonstrated his cultural development. Candidates are nominated by sections of the American Institute of Electrical Engineers, by faculty members of engineering colleges and by key men in the electrical industry.

Robert Chase Cheek was born in Charleston, South Carolina, on November 14, 1917. Most of his boyhood was spent in Savannah, Georgia, where he exhibited an early interest in science by collecting, identifying, and mounting the leaves of over 150 different trees and shrubs. Bob's native ability was recognized early and so he was permitted to take the full curricula for both the classical and scientific courses in Savannah High School.

By fall of 1936 he was able to enter the Georgia School of Technology (now the Georgia Institute of Technology) as a five year coöperative student in electrical engineering.

Upon graduation from college in 1941, he joined Westinghouse Electric Corporation as one of the several hundred graduate students employed by that Corporation each year. He served as chairman of the graduate student group until he completed the student course, becoming permanently located in the Central Station Engineering Section in January 1942.

Here, he continued his education by taking full advantage of the available opportunities, working in night school at the University of Pittsburgh under the Pitt-Westinghouse Plan. Less than two years later he received the degree of Master of Science and now has additional credits toward the degree of Doctor of Philosophy.

Since 1945, Bob Cheek has been the headquarters central station engineer assigned to the Southeastern District. An example of his analytical ability is his work on the comparison of modulation systems for power line carrier transmission. The analysis made by Cheek pointed to a solution of the problem that is now used as a standard reference work in the carrier field.

Some idea of the magnitude of the work which he has done is obtained when it is realized that

(Continued on page 58)

The Wide Spread Twin Five

E. MILES BROWN, W2PAU*

A high-gain 144-mc array suitable for "flip-flop" mounting.

IT HAS BEEN STATED that a simple dipole is a pretty unsatisfactory v.h.f. and u.h.f. antenna.[1] While this might be contested on some grounds, the fact remains that any type of antenna that affords some power gain over a dipole will greatly enhance the over-all station performance. The power gain of an antenna is reciprocal and is effective in both transmission and reception. This is amply demonstrated by the fact that most, if not all, of the outstanding work which has been done to date on our higher frequencies has been done with the aid of multi-element high-gain antennas. Beams with sixteen elements are commonplace, while many stations active on two meters are using thirty-two or more elements.

Yours truly has viewed the rapid progress in 144-mc antenna development with considerable consternation. There had been a time when our little six-element beam could hold its own. Lately, the ambitious operators on this band had been running rings around us with their monstrous signal squirters, and something had to be done.

Located in a fairly settled suburban neighborhood, complete with TV antennas on almost every house, we were naturally somewhat reluctant to go *all out* on a 144-mc beam. The size of even a sixteen-element affair similar to the W3HWN design[2] would stand out sufficiently to provoke an almost steady stream of TVI reports —deserved or otherwise. We had previously pushed our little six-element beam up to the dizzy height of sixty-five feet on a shaky "A-frame." Constructing a sixteen or thirty-two element beam would also call for a financial investment in a new tower. Height is almost as important as antenna power gain here in the flat lands of southern New Jersey. Theoretically, field strength at a distant receiving location is directly proportional to the height of the transmitting antenna above the average elevation of the terrain over which the signal is propagated. Therefore, unless one lives on a hilltop, it is a pretty good assumption that doubling the antenna height above ground will approximately double the field strength at a distant point. This corresponds to a four-times power gain, or a full S-unit improvement. Rather than throw away the height-gain by lowering our antenna below its carefully rigged sixty-five feet, we aimed at developing a high-gain beam that would be reasonably small and fairly light in weight. Secondly, we also wanted to be able to flip this array from vertical to horizontal polarization, and that gets to be quite a problem with some stacked arrays.

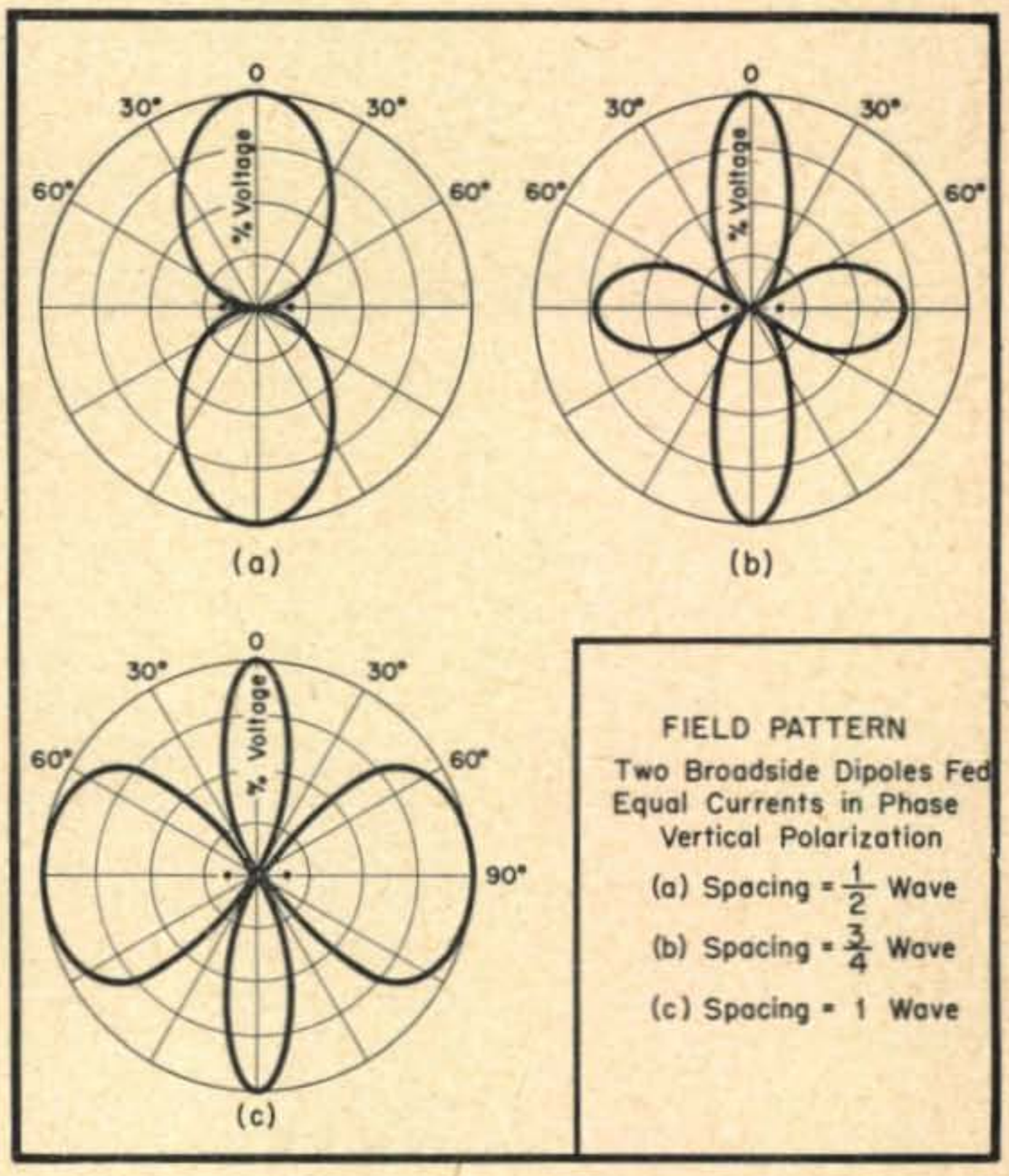
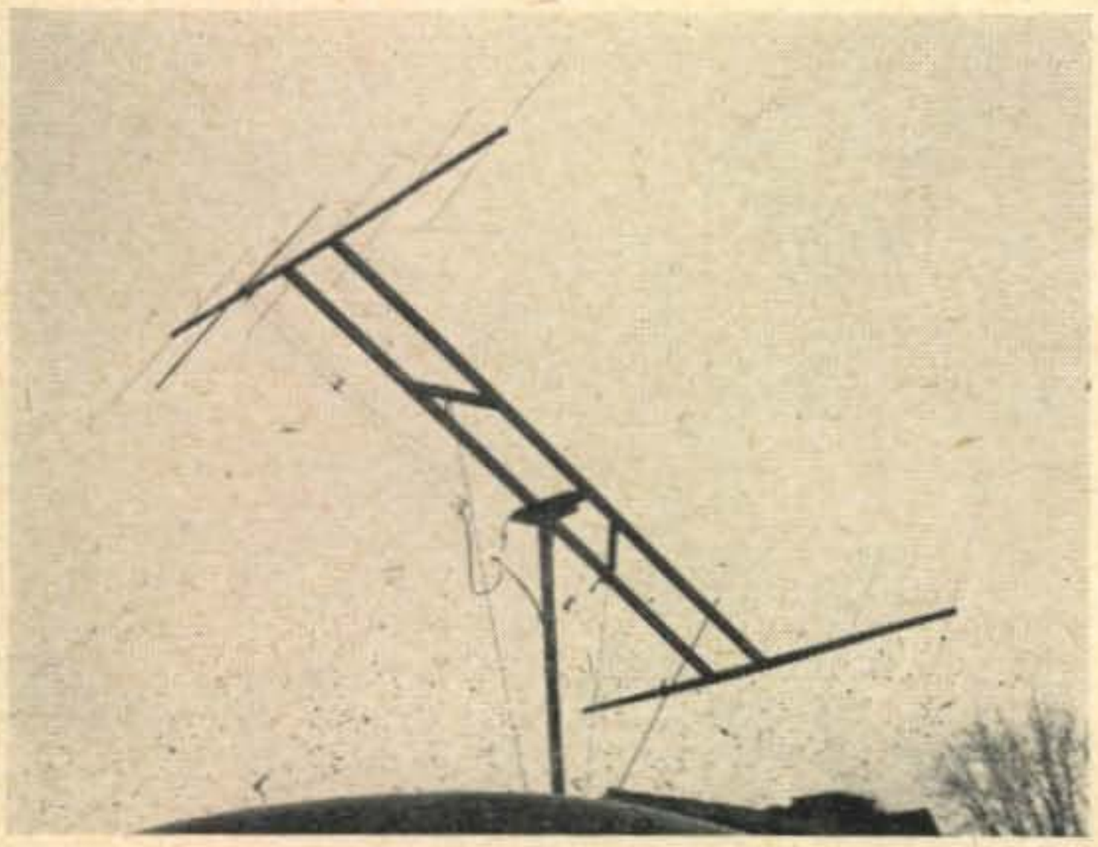


Figure 1

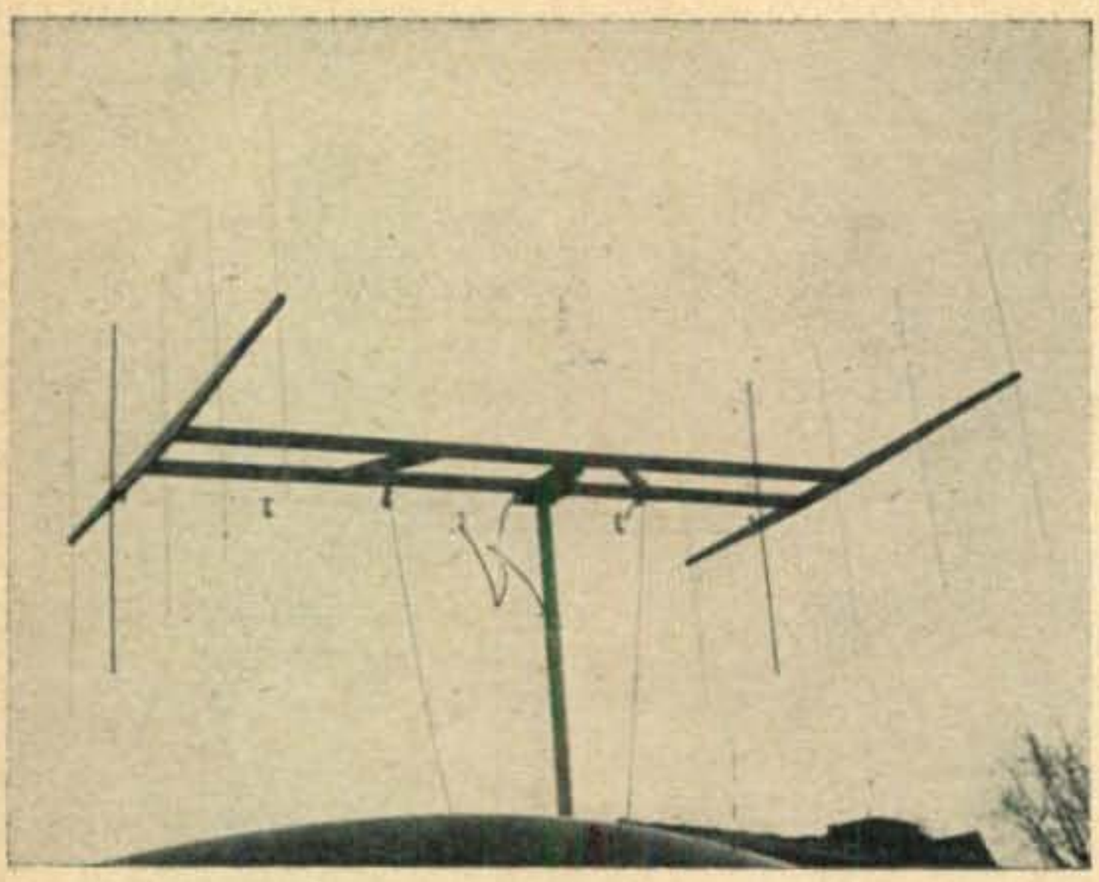


The antenna being "flopped" from vertical to horizontal polarization. The assembly is mounted on a "mobile" support—on the door hinges of ye ol' faithful Plymouth. The feedline matching section and the "flip-flop" ropes are clearly visible.

*V.H.F. Editor, CQ. Address correspondence to: 88 Emerald Ave., Westmont, N. J.

[1] C. F. Hadlock, "Making the Higher Frequencies Pay Off," *QST*, page 25, January, 1949.

[2] P. Hertzler, "16-Element Array for the 144 Mc Band." *CQ*, page 7, October, 1946.



Here's how she looks in the vertical-polarization position.

A Ten-Element Beam is Born

After many tedious hours spent plotting field patterns, calculating the effect of directors, reflectors and screens at various spacings and considering the feedline losses and matching problems, we came up with a design which seems to solve our particular antenna problem quite nicely.

The specifications look something like this:

Gain	14 db, or a power gain of 25 over a dipole.
Feed Impedance	300 ohms, balanced line which is fed at the center of the array for ease in flipping over to change polarization.
Beam Width	Vertical Polarization—26° to half-power point. Horizontal Polarization—44° to half-power point.
Front-to-back Ratio	10 to 1 voltage, or about 20 db.
Minor Lobe Response	Less than 30% of the main lobe (voltage), or about 15 db below main lobe.
Weight	Less than 4 pounds.
Cost	Around $3.00, not including labor.
Mounting	Single mounting point, adaptable to mechanical flip-flop systems.

Design Theory

Just in case this begins to look like a something-for-nothing proposition, let us touch briefly on the theory involved in the design of this antenna. The field pattern of a dipole when viewed along the axis is a circle. If we mount a second dipole broadside to the first, space them one-half wave apart and feed them both in phase, the pattern becomes a figure eight. If the spacing between the two driven dipoles is increased, the lobes of the figure eight pattern will begin to sharpen up. Also, a pair of side lobes will be formed. As we reach the point of full-wave spacing, there is actually more power being radiated in the side lobes than in the main figure eight lobes. However, and this is the interesting point, the main lobes are very sharp—only about 28 degrees to the half power points. *Figure 1* shows the evolution of these patterns.

Now, for the time being, forget those two dipoles and consider the famous Yagi or parasitic array. Many articles have been published showing the possible field patterns which may be developed with a system of parasitic directors and reflectors.[3] Conservatively speaking, it takes the mathematics of Einstein and the patience of Job to calculate the field pattern and gain of one of these simple little gadgets. Rather than attempt to figure the performance out on paper, and being a lazy sort of fellow, we built up a little five-element Yagi using 0.2-wavelength spacing and "Handbook" dimensions. In spite of the three directors and one reflector, the feed impedance was not zero, or infinite, and, as a matter of fact, it was a cinch to match to a 300-ohm line. The field pattern looked like that shown in *Fig. 2*.

When put on the air, the Yagi seemed to work o.k. over the whole two-meter band without noticeable degradation of performance on the high end of the band, despite the fact that it had been cut for 144.5 mc. In short, there was no doubt that the five-element pre-cut parasitic array was a thoroughly practical antenna.*

It was apparent that the nearly ideal antenna would combine the sharp main lobe features of

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[3] D. C. Cleckner, "Parasitic Beam Patterns," *CQ*, page 25, July, 1948.

* Much to our surprise it proved to be equal in performance to the old reliable six-element beam, notwithstanding the difference in heights that favored the six-element by about fifteen feet.

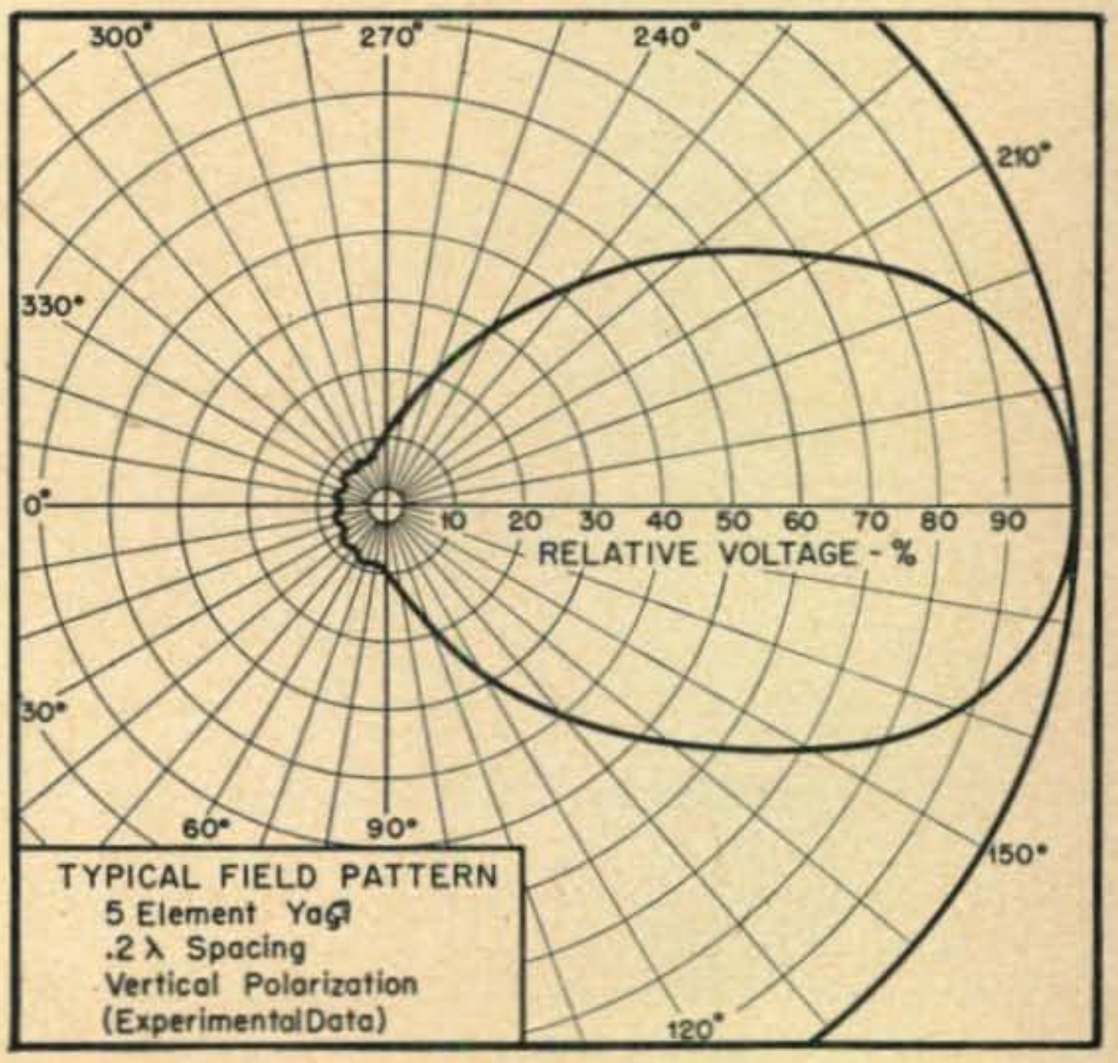


Figure 2

Fig. 1c and the smooth uni-directional single lobe pattern of the Yagi (*Fig. 2*). Thus, the idea of using two five-element Yagi antennas at a spacing of a full wavelength was born. The resultant pattern is shown in *Fig. 3*. This pattern is for vertical polarization. When the array is operated to obtain horizontal polarization, the broadside stacking of the two Yagi antennas seems to have a negligible effect on the sharpness of the forward lobe, and the field pattern is that of a single five-element Yagi. This pattern is shown in *Fig. 3* as the dashed line. All of these patterns have been verified by measurements, using a 1/3-scale model (420 mc) in the laboratory and using the full-scale array after it was erected in many on-the-air tests with stations at various distances in several directions.

What Makes a Beam Beam?

Before someone asks why we are talking so much about field patterns and so little about "power gain," it should be emphasized that these

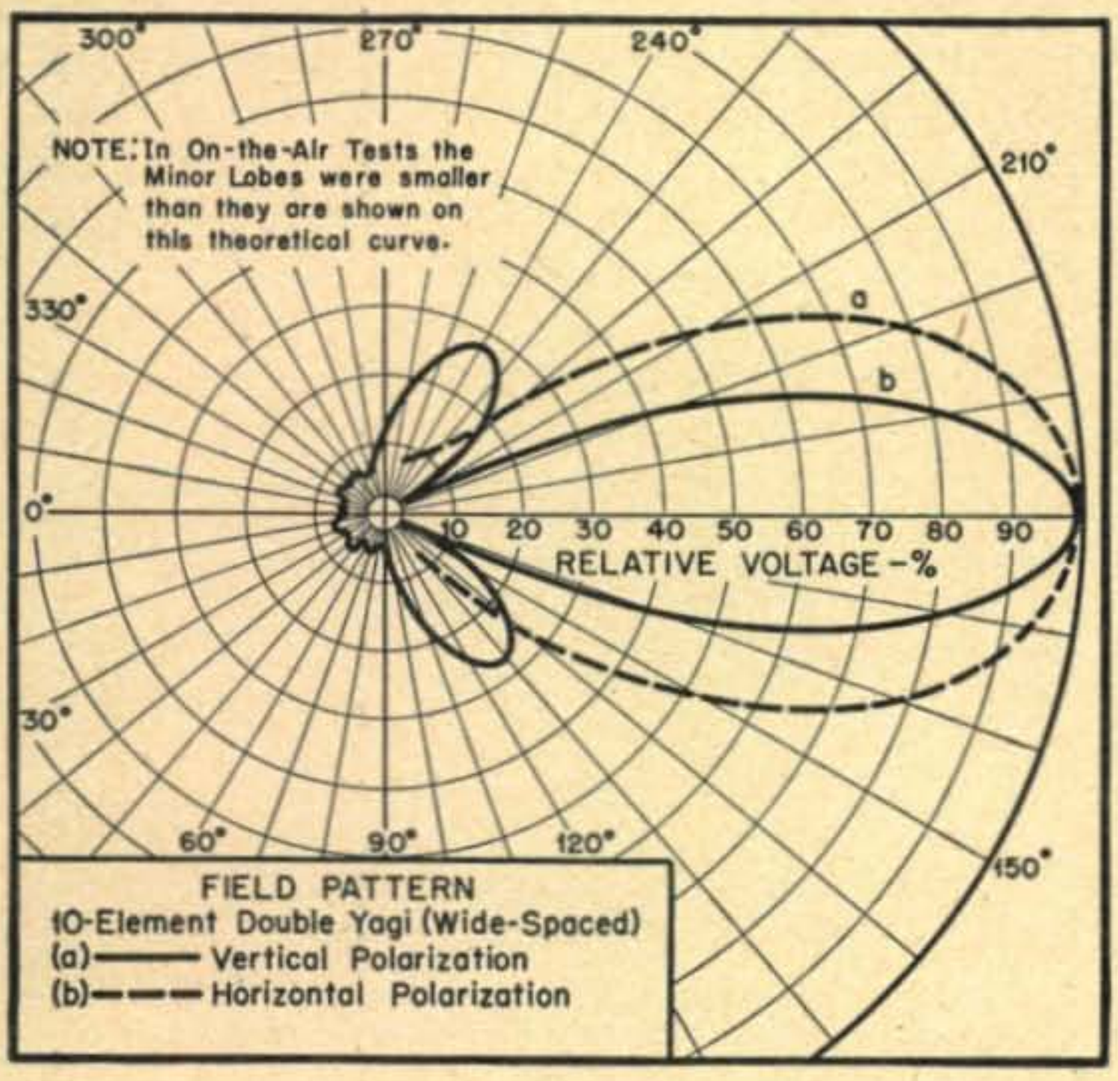


Figure 3

two factors go hand-in-hand. A highly-directional antenna is a high-gain antenna, if we neglect considerations of the "power efficiency" in the array itself. An analogy which illustrates the effect of high directivity is the old garden hose parable. If you want to fill a can on the other side of the yard with the garden hose, you would use the sharpest "beam" that the hose can produce. Antennas work much the same way—you can pour more power into the other fellow's receiving antenna with a sharply directed beam than you can with a fine spray, or a broad coverage pattern. As for the power efficiency of the Twin-Five beam, tests have shown that the losses in the elements themselves are practically negligible when compared to the radiated power.

We have both calculated and measured the field pattern of the 10-element dual Yagi with the full-wavelength spacing, and we have done the

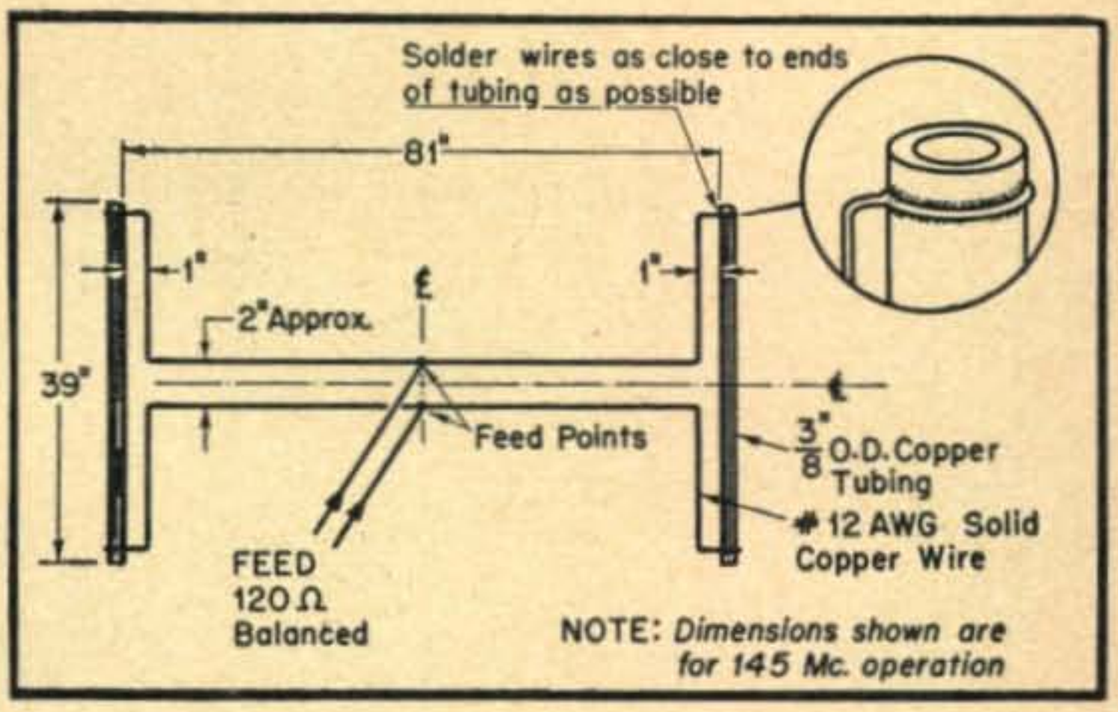
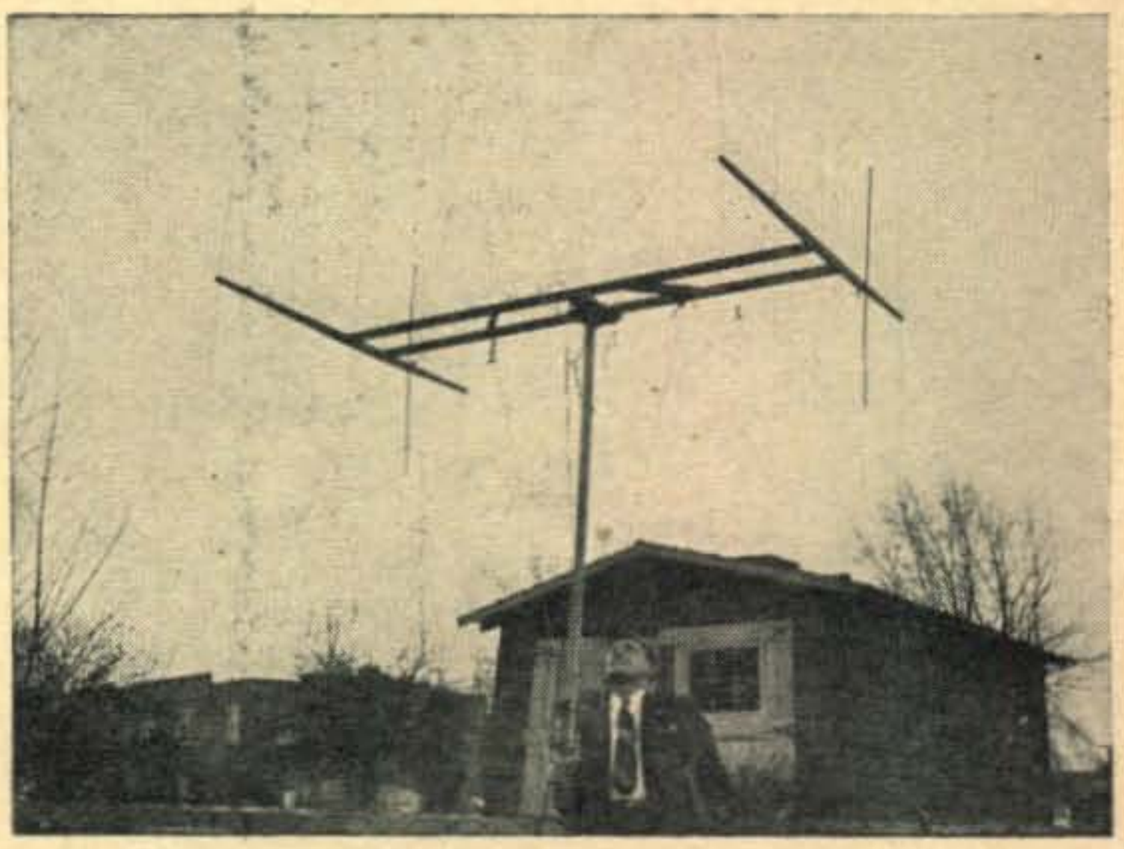


Fig. 4. The radiators and the feed wires.

same with many popular type arrays. Both theoretically and experimentally, the pattern of the double Yagi is sharper than most 144-mc beams. As a matter of fact, it may be laid inside the pattern of the familiar 16-element beam.[2] The obvious conclusion from the foregoing is that the double-Yagi has more gain than the 16-element job. We have calculated the gain to be 14 db, or a power gain of 25 over a dipole.

It is quite easy to obtain very "optimistic" results from on-the-air tests. As an example, using a Twin-Five at the QTH of W2EH, Collingswood, N. J., a series of tests were made with W3KBA, Dover, Pa., at a distance of about 100 miles. Using the W2PAU signal on the same frequency as a reference level, the double-Yagi showed the surprising gain of two full S-units over the standard 6-element beam formerly used by W2EH. Since this 6-element affair reputedly has a gain of 8 db over a dipole, it should follow that the double-Yagi has a gain of 20 db over the same dipole! In more practical terms, the new antenna made it possible for W2EH to override the signal from W2PAU at the Dover, Pa., receiving location, whereas with the former antenna, the two signals were approximately equal in strength. Such an improvement is most obvious in the presence of heavy QRM!



Look, Maw, only one hand! There aren't many 144-mc arrays with a measured gain of around 14 db which can be handled this way.

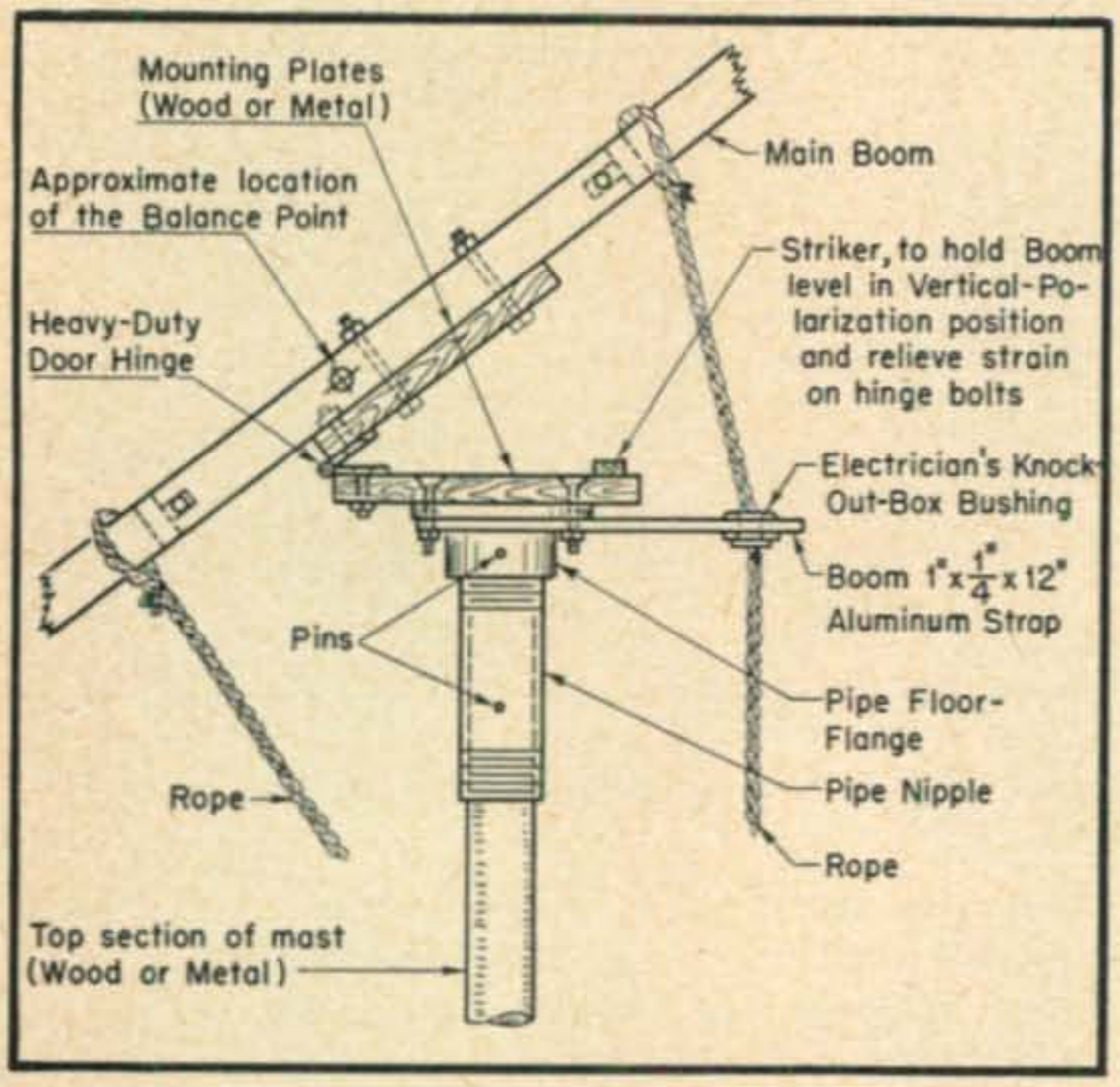


Fig. 5. Suggested hinged mounting for "flip-flop" operation.

The actual mechanical design of this beam will probably depend largely on the tastes of the builder. Of the several models which have been built since we unveiled the basic design, no two are mechanically alike, although the performance of all the models is uniformly excellent. We personally are partial to the use of a wooden element-support frame, since it avoids the possibility of noise caused by intermittent metal-to-metal contacts in the antenna assembly. It also simplifies the problem of weatherproofing, since there are no joints required between dissimilar metals.

For the parasitic elements, we used solid aluminum wire, 0.143 inches in diameter, sold in the local hardware store under the name of "clothesline wire." Some conservative mechanical engineers might criticize this choice of material on the basis of inadequate strength, but we have had antennas constructed of this material up on our mast for over three years with no signs of damage due to wind, ice, or roosting birds! The material is cheap, readily available, has low wind resistance, and, because of its small diameter, collects very little ice. Its weight is practically negligible.

The driven elements are folded dipoles, one section of which is made of 3/8"-o.d. copper tubing; the fed section is formed of #12 AWG copper wire, actually an extension of the open-wire phasing line which connects the two Yagi sections. Copper was chosen as the element material in this case mainly because it is easy to solder. The problem of establishing and maintaining a permanent, low-resistance contact between the copper feeder wires and aluminum elements was one which we would rather avoid.

The general layout of the beam is shown by the photographs. *Figure 4a* shows the radiators and their feedlines schematically. The spacing of the wires which form the dipole feeder section is not critical, as a half-wave section of line does not act as an impedance transformer, and the distance from the main feed point to either dipole is one-half wave. This system of feeding the beam produces an impedance at the central feed point which is one-half the feed impedance of the individual Yagi sections.

The critical dimensions of the array are summarized below:

Reflector length	40½ inches
Radiator length	39 inches
Director lengths:	
#1	36¼ inches
#2	36 inches
#3	35¾ inches
Spacing between adjacent elements	16 inches
Spacing between Yagis	81 inches

These dimensions were chosen for optimum performance near 145 megacycles. It is strongly recommended that the element sizes and dimensions be held fairly close to the values shown, unless one is willing to experiment with tuning and matching adjustments. However, a few general suggestions might be offered as a guide to those who would prefer to alter certain features of the design. If optimum performance is desired for a frequency other than 145 megacycles, all dimensions should be multiplied by a factor equal to the ratio between 145 megacycles and the desired frequency. If larger element diameters are to be used, the lengths of the elements should be reduced approximately 2% for each 50% increase in element diameter. If a tubular

(*Continued on page 66*)

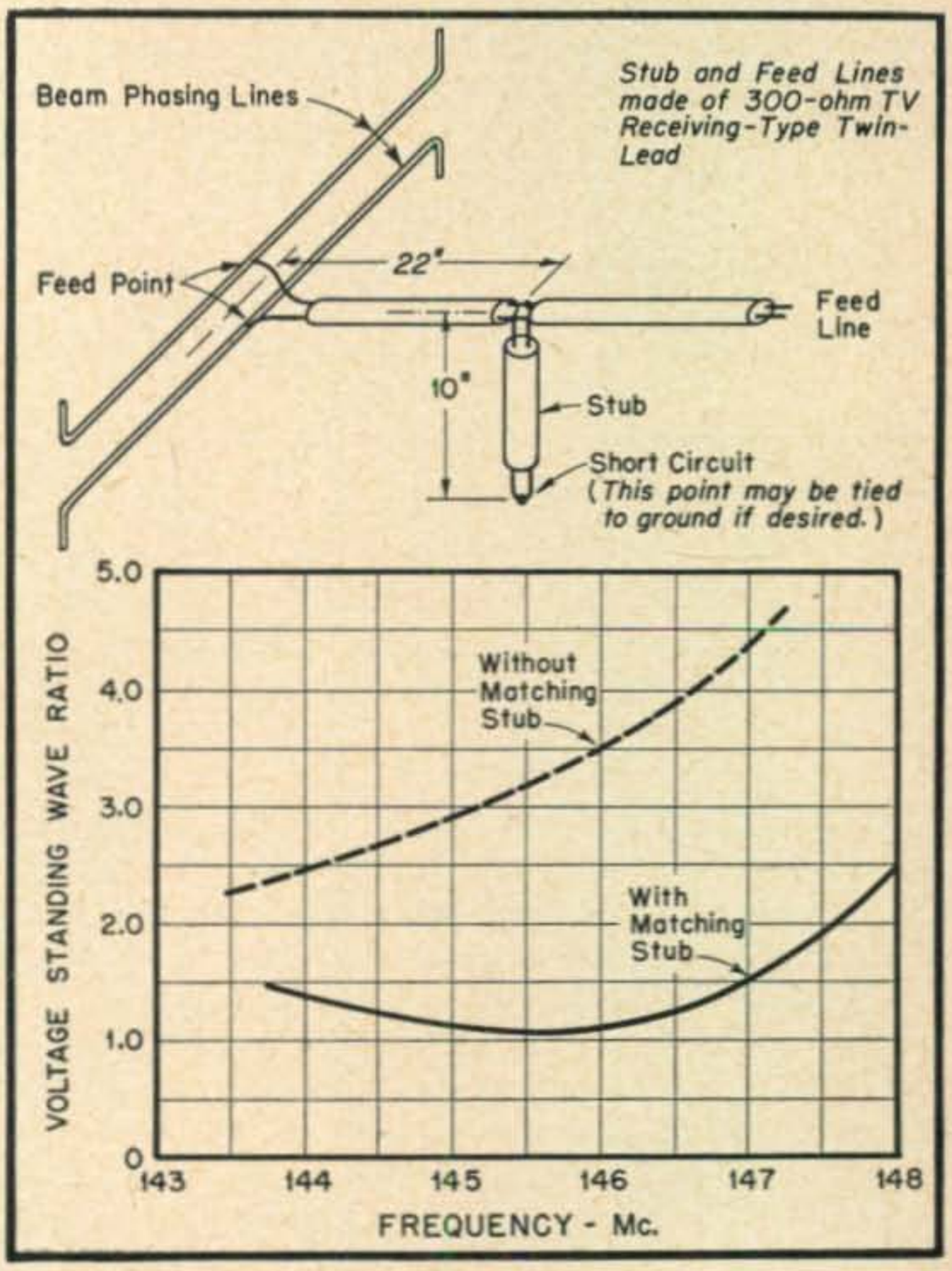


Fig. 6. The details of the matching system and a plot of the voltage-standing-wave-ratio on 300-ohm twin-line with and without the matching stub.

A 500-Watt Final Amplifier of Modern Design

ADRIAN E. CLARK, JR., W2PDH*

A pair of 812Hs in the final makes a nice setup for the ham who wants to boost his power with a minimum of fuss and bother.

THE ART CRITIC who once said, "Simplicity is the keynote of good design," little realized how much this was to apply to a much later problem of design—the r.f. amplifier.

We have made many "rushed together" rigs since the ever-happy day the bands opened. Like so many hams who had no prewar rigs to warm up and get on the air, we were over-anxious. We fired up on 80 meters. The rig was hurried, and little thought was put into the design or lay-out. It worked, but this was to be the beginning of many such attempts to get on the air in a hurry. As the other bands opened we shifted, and wound up making a new rig. More rush and more haphazard construction. They worked, but that was all. Finally the yl wanted to hear something besides the buzzing of code, and we went on ten. That did it— 807s, 813s took off like jet fighters being chased by comets. Our hurry-up policy now paid off. We were definitely unhappy.

Our "bread and butter" talents lie in the commercial art field, and so we talk and think best with a pencil and scrap of paper. Thoughts of the ideal rig began to pour out in the form of small sketches that gradually narrowed down to the rig that, on paper, should work best and be simple and inexpensive to build. This time old "hurry-up" was fired, and we proceeded carefully.

With surplus rampant as it is, our problem of lining up parts for the high power was made much easier. Many of the parts were already on hand from the many rigs we spoke of. The remainder were found, and we were on our way.

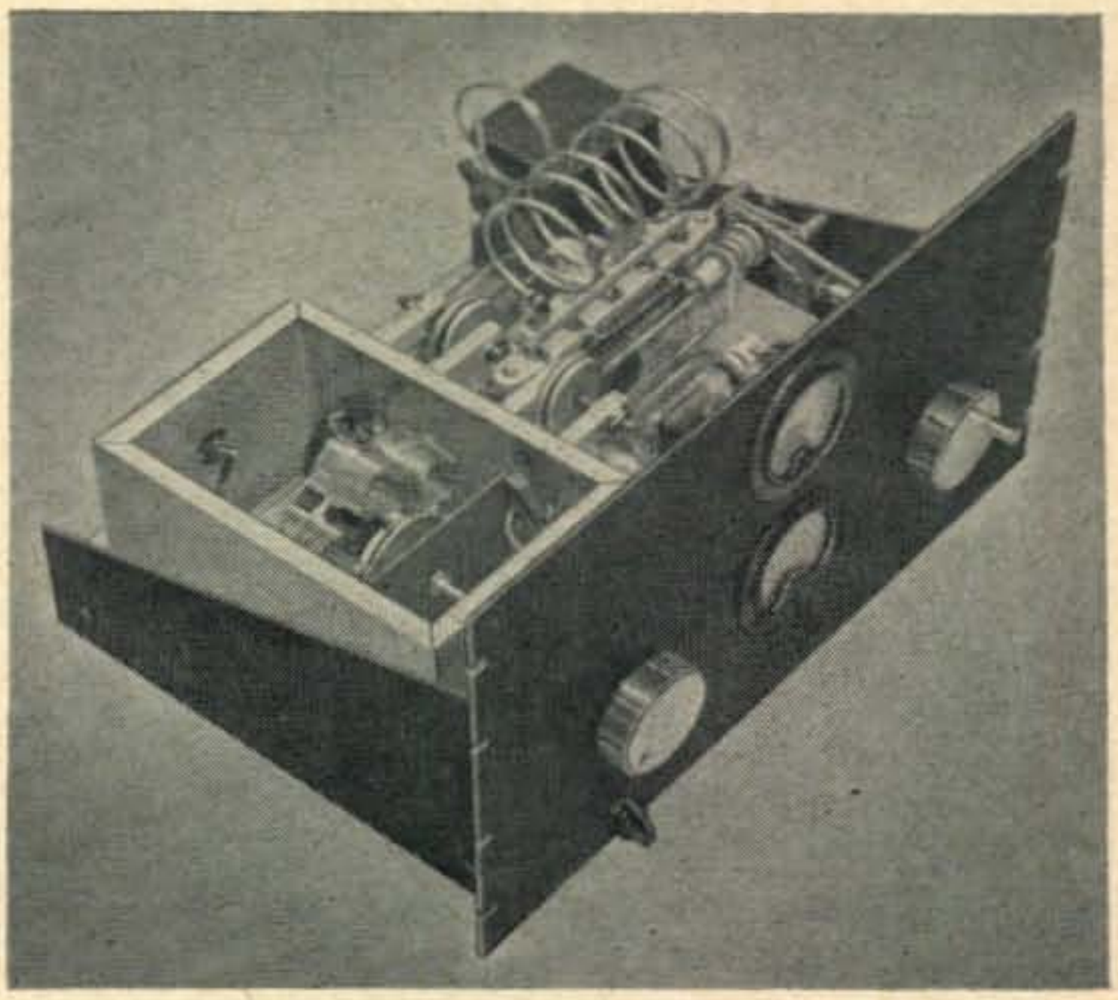
The power we had was 1000 volts at 250 ma, but we were sure of going higher in power sooner or later, so our tubes had two jobs to do—to operate efficiently at low power and also at high power. The coils and condensers were chosen for the high power requirement. Our toughest problem was tubes. With so many good ones on the market, we had to think this one over.

The Tubes

In keeping with our love of simplicity, the tubes to be used had to be triodes. Inasmuch as the amplifier tank was to handle 500 watts, eventually from 10 to 80 meters, we had little trouble in narrowing our choice down to the 812H. This low-drive triode is rated at 1750 volts with a maximum of 200 ma per tube and requires the low drive of 3 to 4 watts on the grid. They proved extremely easy to neutralize on all bands. The rated d.c. grid current is only 25 ma or under—and perferably under. They should not be run any higher than the rated maximum.

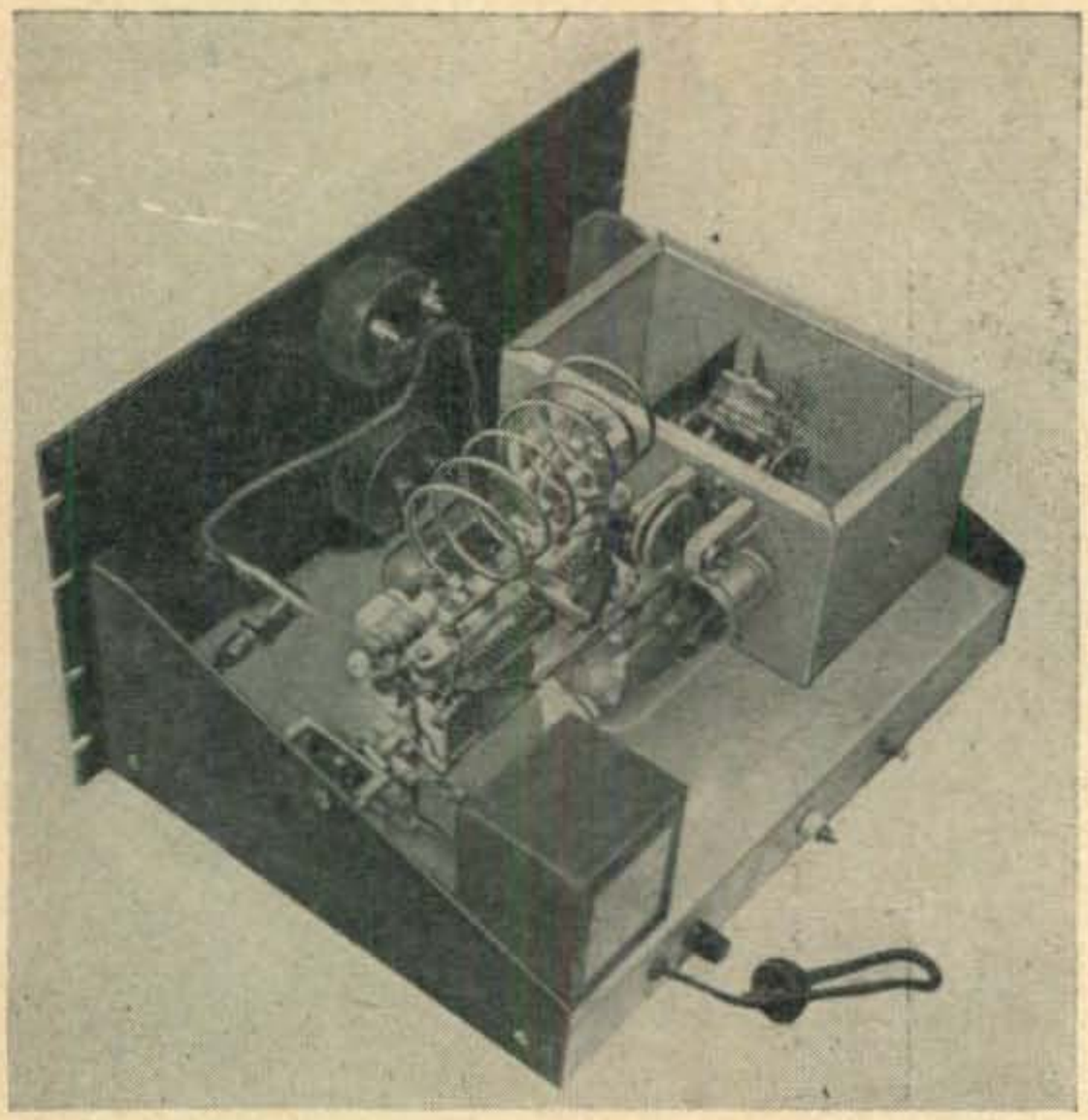
We subjected the tubes to heavy temporary overloads on the off-resonance loading, and they stood up admirably. There was no apparent injury whatsoever. The manufacturer attributes this to the graphite anode and heavy duty construction. The 812H is rated for handling 85 watts plate dissipation, which accounts for the high performance of the amplifier when chasing around the band to duck out of the weekend QRM. The graveyard is full of tubes that couldn't take even the slightest off-resonance current whenever the frequency was shifted up or down a few kc.

If the graphite anode shows a dull cherry red when operating at maximum, don't let it worry you; the manufacturer claims this is quite normal under certain conditions. Just be sure it does not brighten beyond the dull cherry color. The manufacturer also recommends the strict adherence to the grid current rating of 25 ma or under. He claims the operation at 20 ma is insurance of a long life for the tube. This is where we operate and find the efficiency to be excellent. The 812H



Modern design was the keynote in laying out the front panel. The left-hand control is the grid tank condenser, while the plate tuning control is at the right. The knob under the grid tank control is the grid band switch.

* *47–05 39th Ave., Long Island City 4, N. Y.*



This view illustrates the chassis layout pretty well. Be sure the filaments of the 812Hs are in a vertical plane.

is, both physically and electrically, just what we wanted.

The Grid Circuit

The next step in our planning was "what to do about the grid, shielding, bias, layout, etc." We had a coil turret we had used in the plate tank of a low-power rig, and so decided to use this instead of the usual plug-in coil for the grid circuit. The turret was center-fed with 150-ohm links. Whereas the coils were fine in the original rig, we discovered they needed to be pruned in the grid of our amplifier to get them to load. Shorting the turns is very inefficient and is not recommended. We recommend that they be put into the circuit "as is" until you are ready to test, and then determine whether pruning is needed or not—some layouts will not need it. Our grid condenser is about 50 μμf per section and is mounted directly under the coil turret on the underside of the chassis. The turret is mounted on a flat sheet of aluminum which is bent at the end for bolting to the chassis. The shield housing is mounted over this, covering the coils and providing a place to mount the tube sockets and neutralizing condensers. Band switching and tuning are controlled from the front panel by the use of extensions.

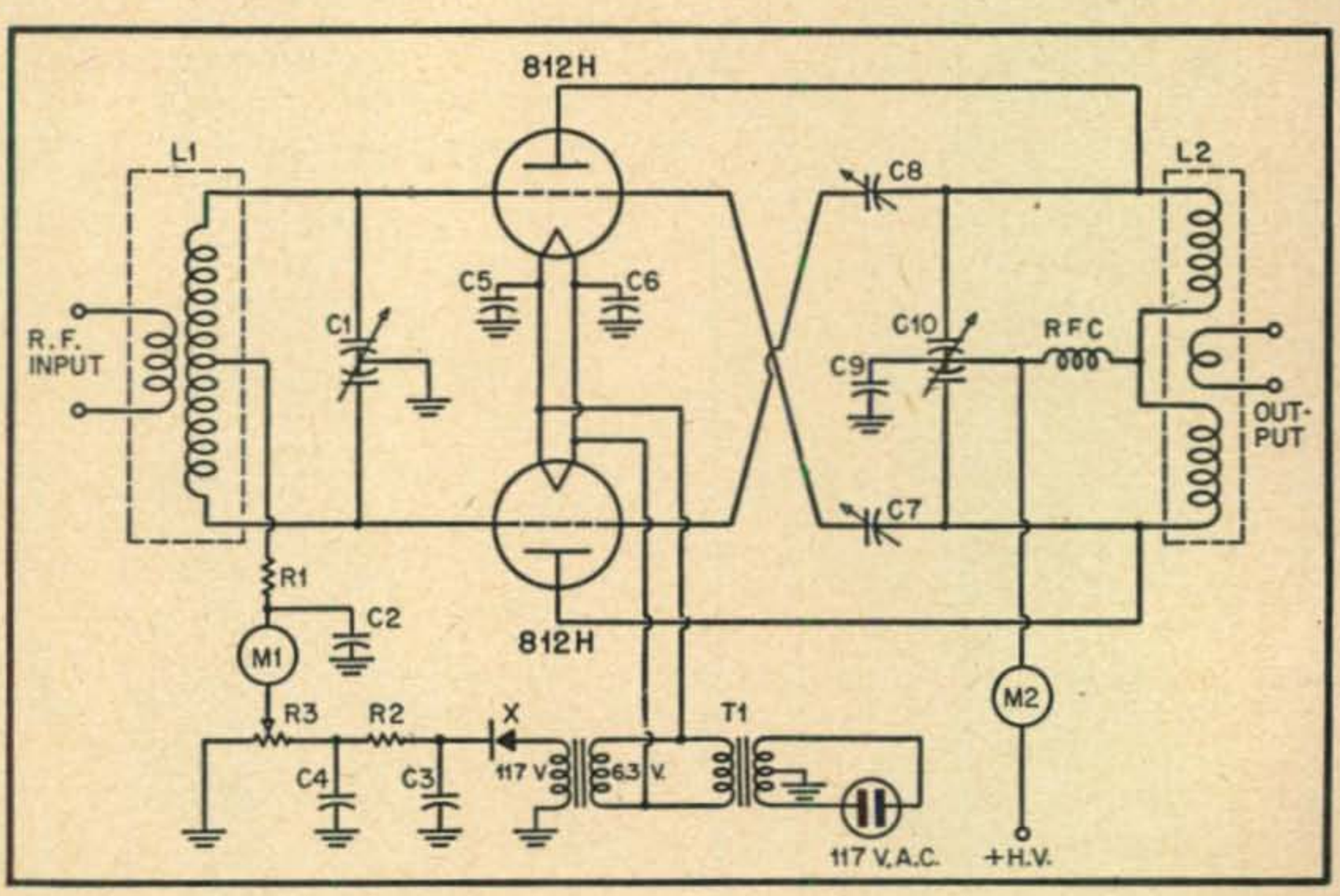
Grid Bias

It was at first planned to use good old battery bias. We decided against this because the necessity for a new battery always comes during an elusive DX QSO, and we would never have the spare on hand. The simplest system is a combination of fixed and grid-leak bias, just enough to protect the tubes with no signal and the proper amount during signal operation.

There have been some fine articles on grid bias and some fine systems developed. This is a point of personal preference, but we have devised a rather unique method of using a standard system. It is a combination of fixed and grid-leak bias.

The fixed bias is obtained by the use of a 6.3-v filament transformer giving about 1 amp, hooked

(*Continued on page 52*)



C1—50 μμf per section, .03″ spacing
C2, C5, C6—.01 μf, 600 volts
C3, C4—20 μf, 150 w.v., electrolytic
C7, C8—neutralizing condensers, 3-10 μμf
C9—.001 μf, 5000 w.v.
C10—dual transmitting condenser, 75 μμf per section, 0.100″ plate spacing
R1—10K, 2 w.
R2—1500 ohms, 2 w.
R3—bias control, 5K 25 w. potentiometer
L1—grid turret, center-tapped and center-linked. (Bud XCS-1, B&W JTCL, or equivalent)
L2—500-watt variable-link plug-in coil assembly. (Bud VLS series, B&W TVL series, or equivalent)
RFC—Radio Frequency Choke, 1 millihenry, 500 ma
T1—filament transformer, 6.3 v. at 10 amp
T2—filament transformer used as bias transformer, see text
M1—grid milliammeter, 0-100 d.c. ma
M2—plate milliammeter, 0-500 d.c. ma
X—100 ma dry-disc rectifier

$1000 Cash Prize "Home Brew" Contest

A contest—open to all hams, technicians, and almost-hams—that you can win, whether or not you're a CQ subscriber, if you can and do build the type of gear which has helped to make amateur radio our greatest reservoir of technical proficiency.

IN ORDER TO ENCOURAGE THE HOME CONSTRUCTION of ham gear, we are pleased to announce our contribution to the cause, a $1000 cash prize "Home Brew" contest. We're dividing the loot up into a Grand Prize of $250, six Second Prizes of $100 each, and three Third Prizes of $50 each. All *CQ*'s friends, with the exception of staff members and the judges, of course, are eligible to enter and win. One need not be a *CQ* subscriber to win.

What to Enter

In order to limit the entries to gadgets which the widest possible cross-section of ham radio will find of interest, we've decided to hold the power limit on transmitters to 75 watts input. While it is granted that a 1-kw rock-crusher can indeed be a technical jewel and a model of workmanship, it is felt that the 75-watt limit will be productive of more units which the average ham will find attractive. On receivers and test/measuring equipment the field is open, with no limit to the number of tubes, etc. You can "let yourself go" if your entry is in one of these classes.

The Initial Entry

The first thing to do in order to enter a unit in our contest, after getting the bugs out of it, of course, is to prepare an article, along the same lines as a *CQ* article, complete with photos, drawings, etc., and fire it in to the "CQ CONTEST EDITOR, c/o Radio Magazines, Inc., 342 Madison Ave., New York 17, N. Y." before the June 30th deadline. The preliminary judging will be done on the basis of these "Initial Entries." Under no circumstances send the devices themselves to us until you have heard from the judges.

The Final Entry

After the judges have had a chance to go through the Initial Entries which have been received on or before the June 30th deadline, they will select the 20 units which appear to be "tops" and will send a written notice to that effect, together with a request for the actual device itself, to the entrant. If you get such a request, it is up to you to see that your entry (the receiver, transmitter, etc.) is shipped to us via express or freight, prepaid and insured, within 10 days after the postmark of the request for shipment. All Initial Entries other than the 20 top ones will be returned to the other entrants at this time.

The Final Judging

Within 45 days after you've shipped your Final Entry, you will be informed by the judges of your standing. In the event that yours is one of the lucky ten, we'll be holding your entry until the announcement of the winners appears in October *CQ*. If you're not among the ten lucky ones, we'll ship your Initial Entry and your Final Entry (the gadget itself) back to you at that time. If you're a winner, we'll send your Final Entry back in due course, but we'll hold onto your original manuscript for subsequent publication in *CQ*.

THE RULES

1. Entries may be transmitters having an input power of 75 watts or less, communications receivers, or test/measuring equipment, such as monitors, field-strength meters, etc.

2. The Initial Entry, a complete written and illustrated article describing the entered unit, including circuit diagram and parts lists, must be in the hands of the judges by June 30, 1950.

3. If the Initial Entry is adjudged to be among the top 20 of the entries received, the judges will request that the unit, itself, be shipped to *CQ* for test and further study. The entrant will make such shipment, prepaid and insured, via express or freight, within ten days after request by the judges.

4. Subsequent to the final judging, which will in no case be later than 45 days after the request for shipment, as detailed in rule (3), *CQ* will return all entries and equipments to their owners by prepaid and insured shipment—excepting those 10 entries which are adjudged to be the prize winners. The winning units will be returned, by the same means, immediately after the public announcement of the winners in October 1950, *CQ*. The winning *Initial Entries* (see rule 2) shall become the property of *CQ*.

5. Entries will be judged on the basis of technical merit, quality and accuracy of the written material and circuit diagrams and photographs which constitute the initial entry, and workmanship on the part of the constructor.

6. All components used should be standard, readily-available catalog items of reputable manufacturers. All resistors should be standard ASA values where applicable.

TVI-Proofing the Command Transmitter

SAMUEL J. LANZALOTTI, W2DVX*

The Command-type transmitters are frequently a source of TVI when they are used "as-is." Here is a detailed description of how, by the application of the principles previously published in CQ, you can clean up yours.

THE CHANCES ARE you're having trouble with TVI if you're using an SCR-274N Command-type transmitter. Not that this unit isn't a first-rate performer on the amateur bands. It is, but unfortunately its major component, the BC-457, unaltered and by itself is capable of producing a spectrum of harmonics so strong that television receivers, even a considerable distance from the 457, may be completely blanketed.

This occurred at W2DVX and required a step-by-step procedure which, when completed, proved so effective that it is now possible to couple the BC-457 running at 70 watts on 75-meter phone into the input of a television receiver with no audible or visual signs of interference.

If you own an SCR-274N, here are the requirements.

1. Complete shielding.
2. Insert chokes and by-pass all power and other leads.
3. Feed the antenna with coax through a low-pass filter.

The cover of the BC-457, regardless of the louvres, must be made to function as a complete shield. This is done by using one layer of ordinary window screening, preferably copper, cut to size and installed over the louvres on the inner side of the cover and fastened down with 4–40 screws, as illustrated in *Fig. 1*. It is also necessary to cover the openings that are located in the back between the cover and the chassis with screening, as shown in *Fig. 1*. All other holes, if larger than ⅛ inch in diameter, should be screened or filled in with blind machine screws. This is necessary to keep all the r.f. confined within the BC-457. To further the shielding, cut out two pieces of copper or aluminum (approximately 3 to 10 mils thick) that will fit neatly under the two small felt padded covers located on top of the large overall cover.

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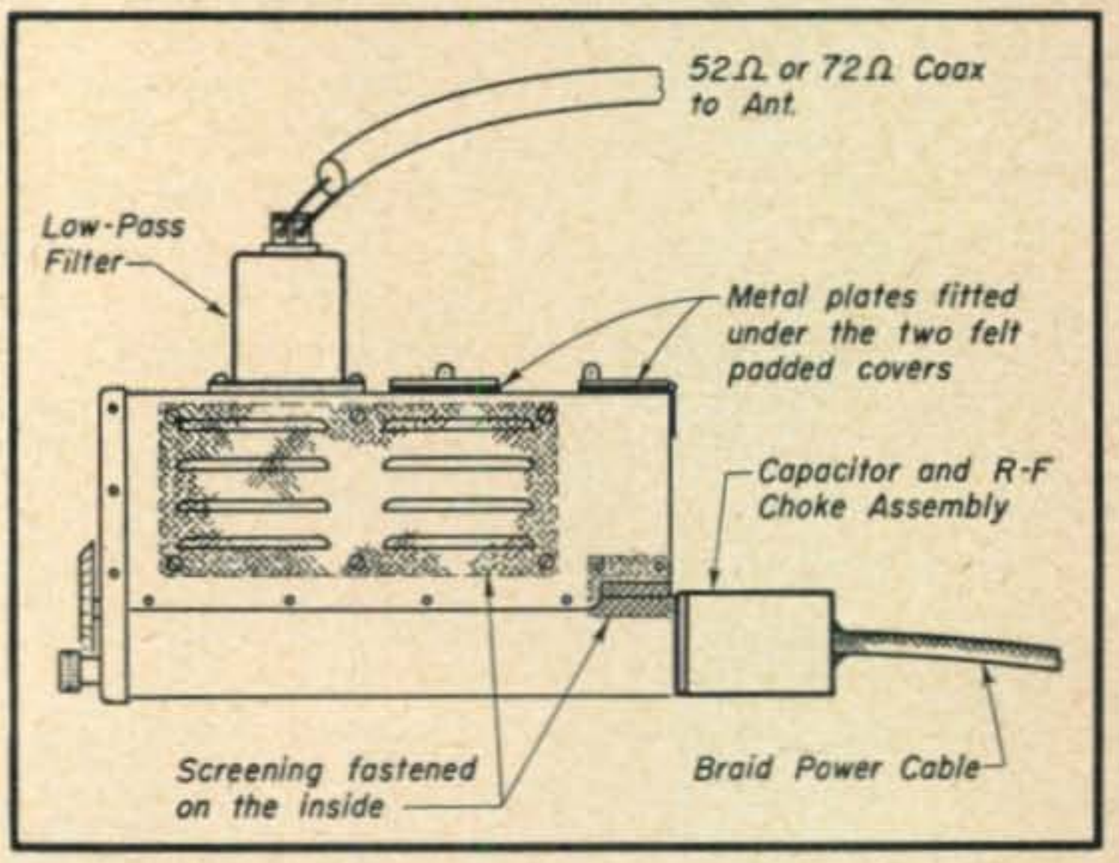
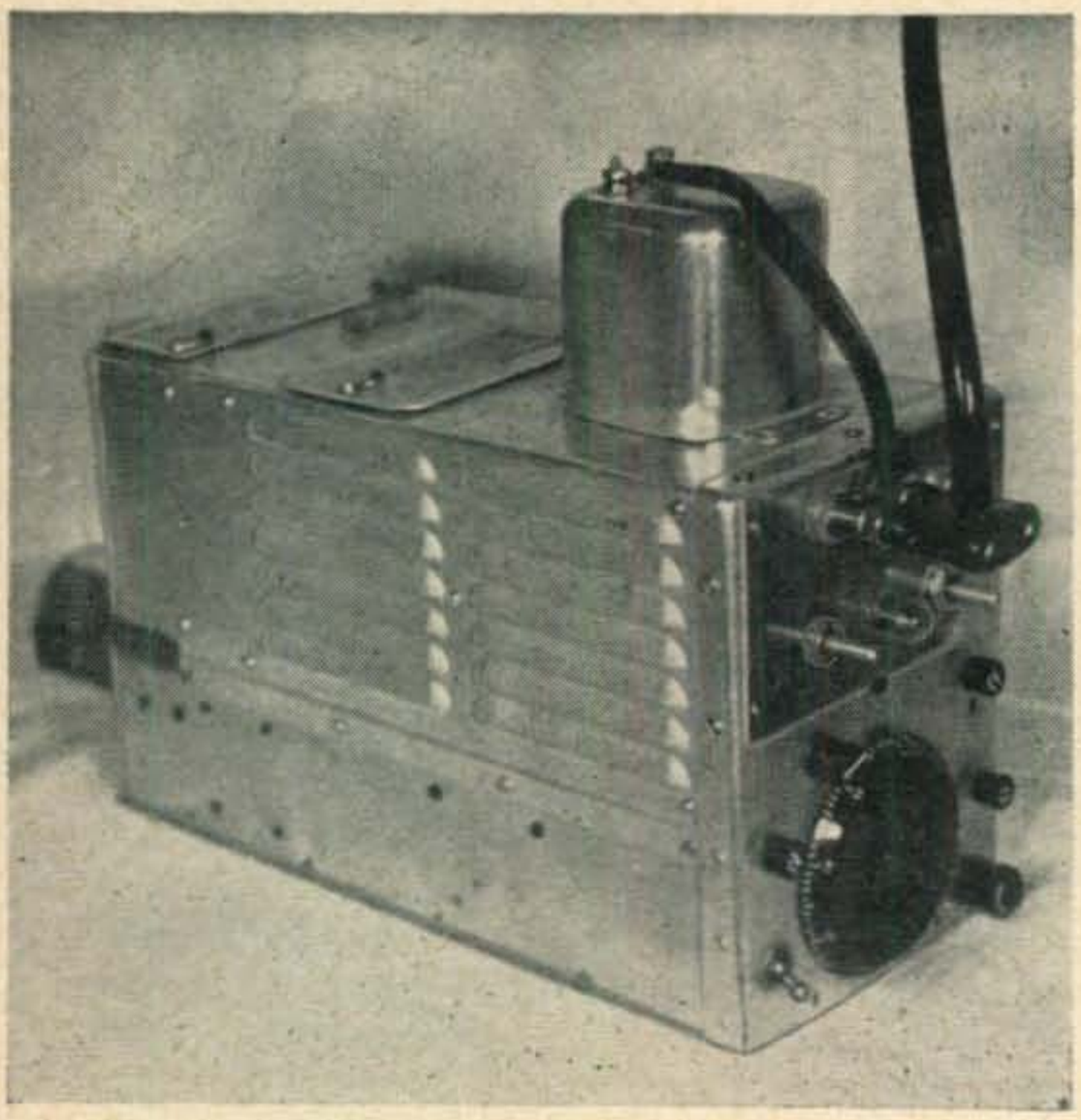


Fig. 1 illustrates the side view of the TVI-proof Command transmitter. The penthouse on the top holds the low-pass filter for the coax output line, the doghouse at the back houses the filter components for the shielded power-supply cable.



The penthouse that this Command transmitter has sprouted holds a very effective low-pass filter which keeps harmonics out of the antenna.

Filtering the Power Leads

The next and most critical step is the fabrication and assembly of the r.f. chokes and their shields. It isn't necessary to purchase r.f. chokes if a stock of enamel wire is available. All chokes are wound with No. 20 enamel wire, close-wound on a ⅜-inch form to a coil of approximately 2 inches. The chokes are then fully covered with electrical tape (adhesive tape is satisfactory) to hold the coil firm and also to serve as an insulat-

ing medium between the shield and the coil. All the r.f. chokes are shielded individually in a 5/8-inch dia. (or larger) metal tube made of either copper, brass, or aluminum, as shown in *Fig. 2*. The choke coils had an inductance of 3.9 μh and a *Q* of 135; however, by covering the choke with tape and a tubular shield of 5/8-inch dia., the inductance dropped to 2.2 μh with a *Q* of 60, which was still satisfactory. It is best to use chokes with the highest *Q* possible, but in this particular case, space was also an important factor, and since some sacrifice in inductance and *Q* could be tolerated, it was decided to make the assembly as small as possible and still get results. It is very important that every choke coil be shielded individually. The r.f. chokes mounted in their shields were arranged in a turret-like

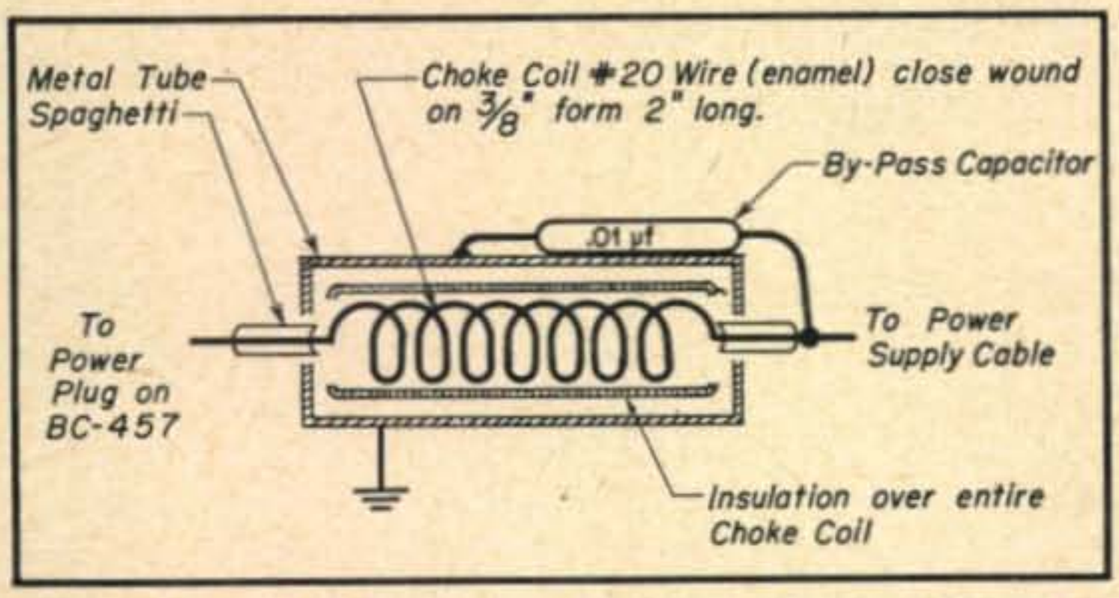


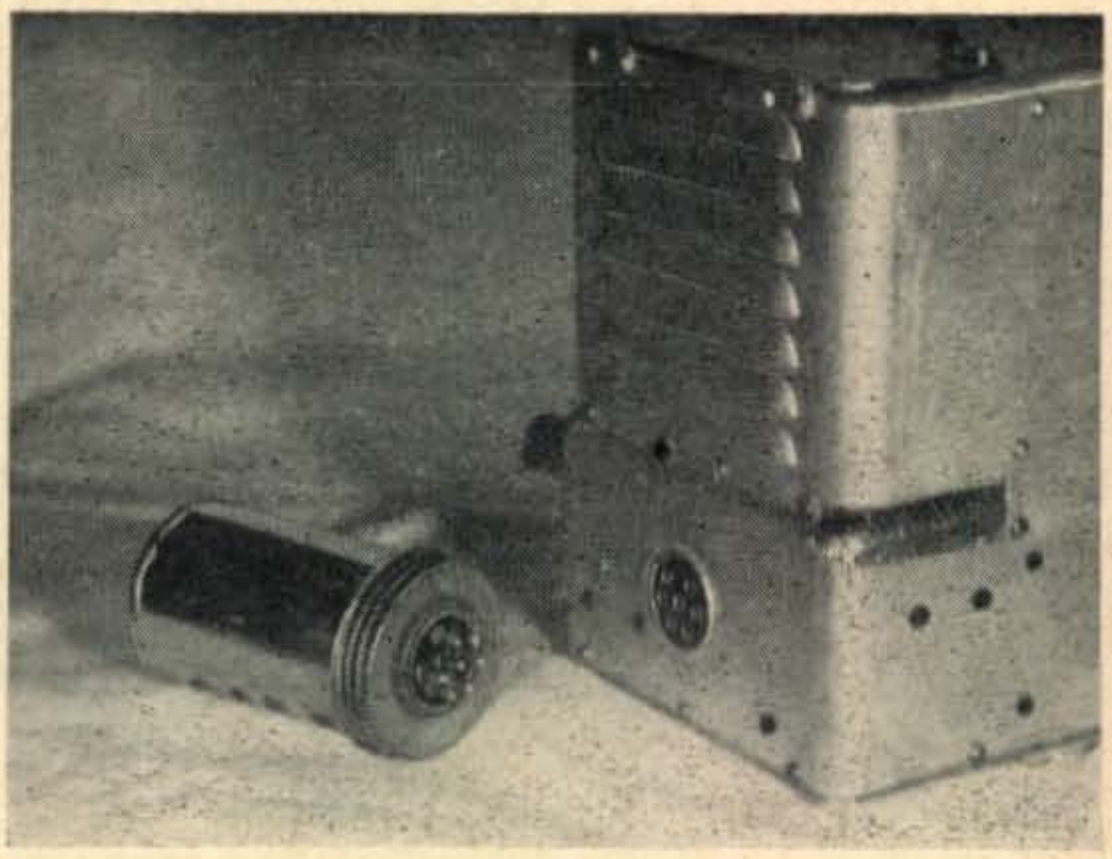
Fig. 2. Each of the individual power leads is filtered by its own LC network, as illustrated above. A "bundle" of these filter units fits into the rear doghouse.

manner, strapped together with tape and slid into a No. 8 tin can, thereby shielding the entire choke assembly. It is very important that this shield cover the entire choke and bypass assembly and be firmly bonded to the chassis of the BC-457. It was found necessary to strap the entire assembly to the chassis of the BC-457 with a heavy bracket.

All the coils are bypassed with .0033 and .01 μf capacitors. The power cable is shielded with heavy braid over its entire length, which, in this case, measured approximately three feet. The power supply need not be shielded; a breadboard supply is satisfactory.

The Antenna Filter

The low-pass filter used in the antenna circuit completes the isolation of all harmonics. The filter is similar to the Harmoniker described in the November issue of *Ham News*. The coils *L* are self-supporting and therefore need no form except for winding (*see Fig. 4*). The coils are close-wound on a 3/4-inch form, 14 turns, with No. 14 enamel wire. It is best to wind a few extra turns because of the spring-back effect of the coiled wire when slid off the winding form. This will also increase the inside diameter of the coil from 3/4 inch to approximately 13/16 inch diameter. Cut off all excessive wire except 14 turns and a sufficient amount of lead length. A large shield can should be used to house the filters. The coils should be mounted so that the distance be-



The doghouse containing the line filters plugs into the connector at the rear of the transmitter. The screening covering the slot at the rear corner of the chassis can be seen in this view.

tween any part of the shield and coil should be not less than 3/4 inch.

The capacitors *C* are 840 μμf; however, a value falling between 830 μμf and 840 μμf is satisfactory. A shield is located between the two filter sections. This shield is so placed as to prevent any opening between the two sections, as shown in *Fig. 4*. The capacitors *C* are terminated as close to the molded portion of the capacitors as possible to minimize lead inductance. Silvered mica or silvered ceramic capacitors having a zero temperature coefficient and a 500-volt working voltage rating should be used. The filter as described here should be used only with transmitters operating between 3.5 mc and 4.0 mc. No. 8 tin cans were used very effectively as shields for the low-pass filter and the choke assembly. No circuit changes were made except to add .0033

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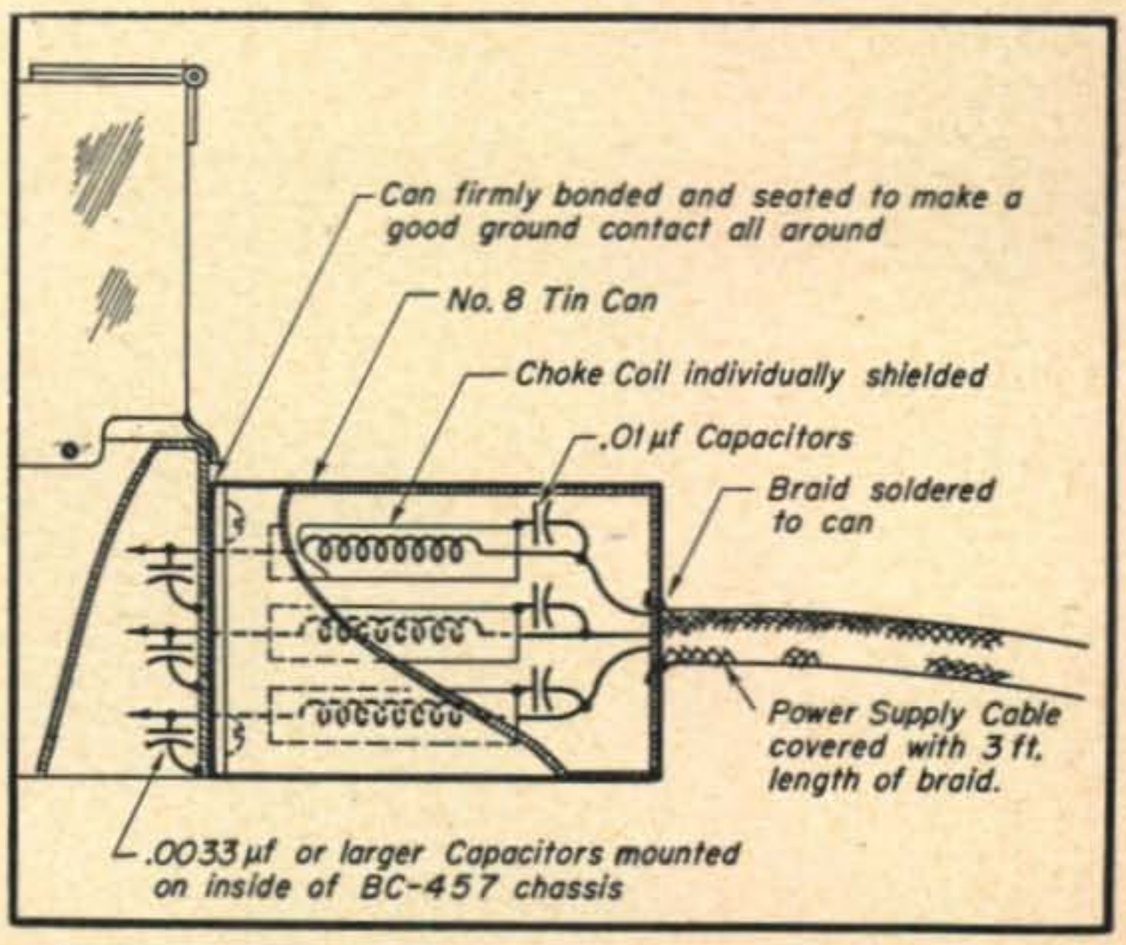


Fig. 3. A bundle of the Fig. 2 filter units is secured to the back of the transmitter and shielded as illustrated here. The .0033-μf condensers installed in the transmitter chassis as shown help out with the filtering job. A good electrical connection at each joint is essential.

The Omnibox

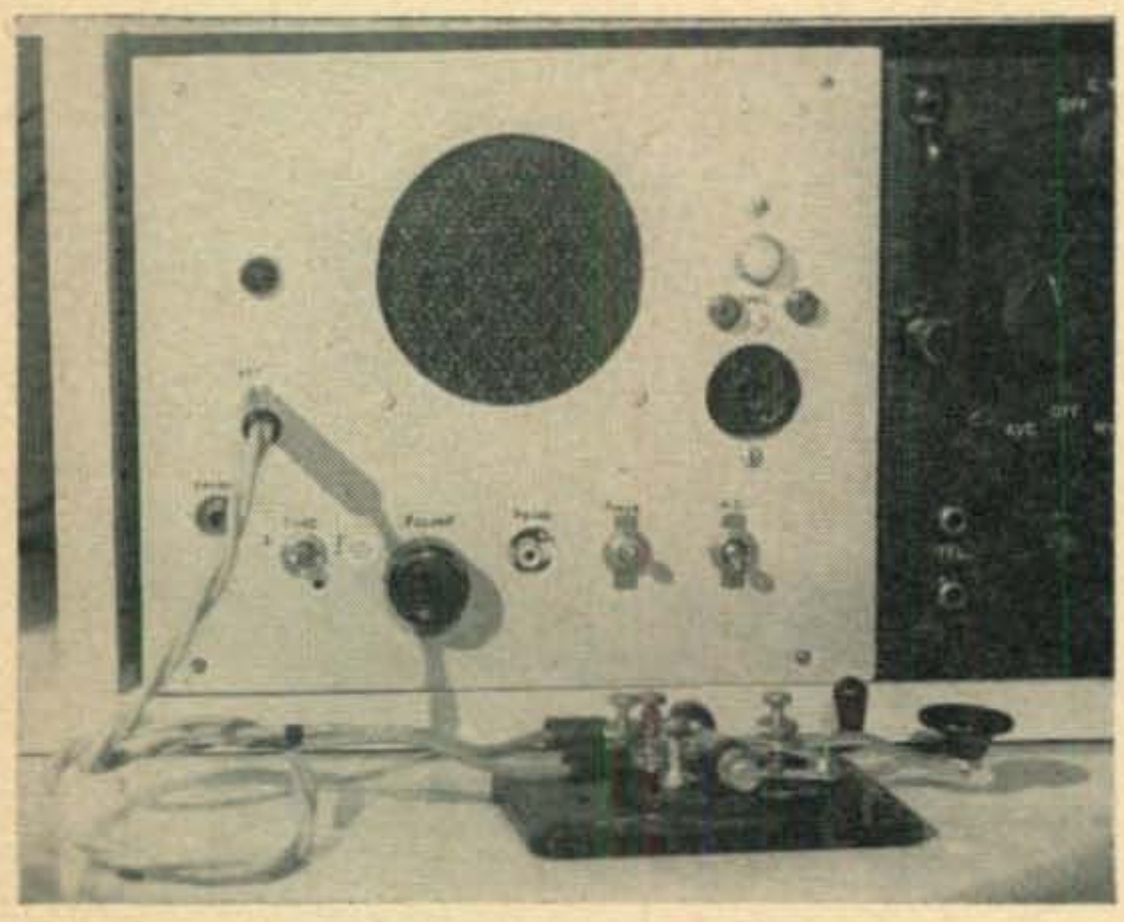
CECIL R. NELIN*

This combination tone generator, amplifier, power supply, and speaker is a gadget which can more than earn its keep around your shack. Many of the parts can be scavenged from that BC-456 modulator that's been kicking around the place.

JUDGING FROM THE TITLE this sounds like some gimmick hawked on the street by a shifty-eyed character who keeps a sharp lookout for the long arm of the law. Actually, it is a simple, logical combination of several pieces of equipment that I needed: a code practice oscillator, power supply for a command receiver, and a speaker for use with a BC-348 or command receiver. The amplifier was added as an afterthought for use with phono pickups and tuners, but required only a few more parts. It seemed rather foolish to build several pieces of equipment, each of them duplicating many parts of the other; hence this gadget, which combines maximum utility and convenience of use.

Many of the parts used come from the BC-456 modulator of the 274-N setup. These modulators are selling quite reasonably on the surplus market, and, after the oscillator is built, there will be a number of parts left for other uses. Many variations in this equipment are possible to suit the parts available. Instead of the two 6J5s, a 6SN7 could be used, or 12-volt tubes substituted using a 12A6 for the output, with suitable matching transformer. Use of 12-volt tubes would enable one to use the 12J5 tube found in the BC-456 modulator. Almost any audio power tube could be used in place of the 6V6 with appropriate change in the cathode resistor. Likewise, a 6X5, 6X4 or 84/6Z4 could be used instead of the 7Y4 which happened to be on hand.

* *1203 N. Walnut, Brady, Texas*



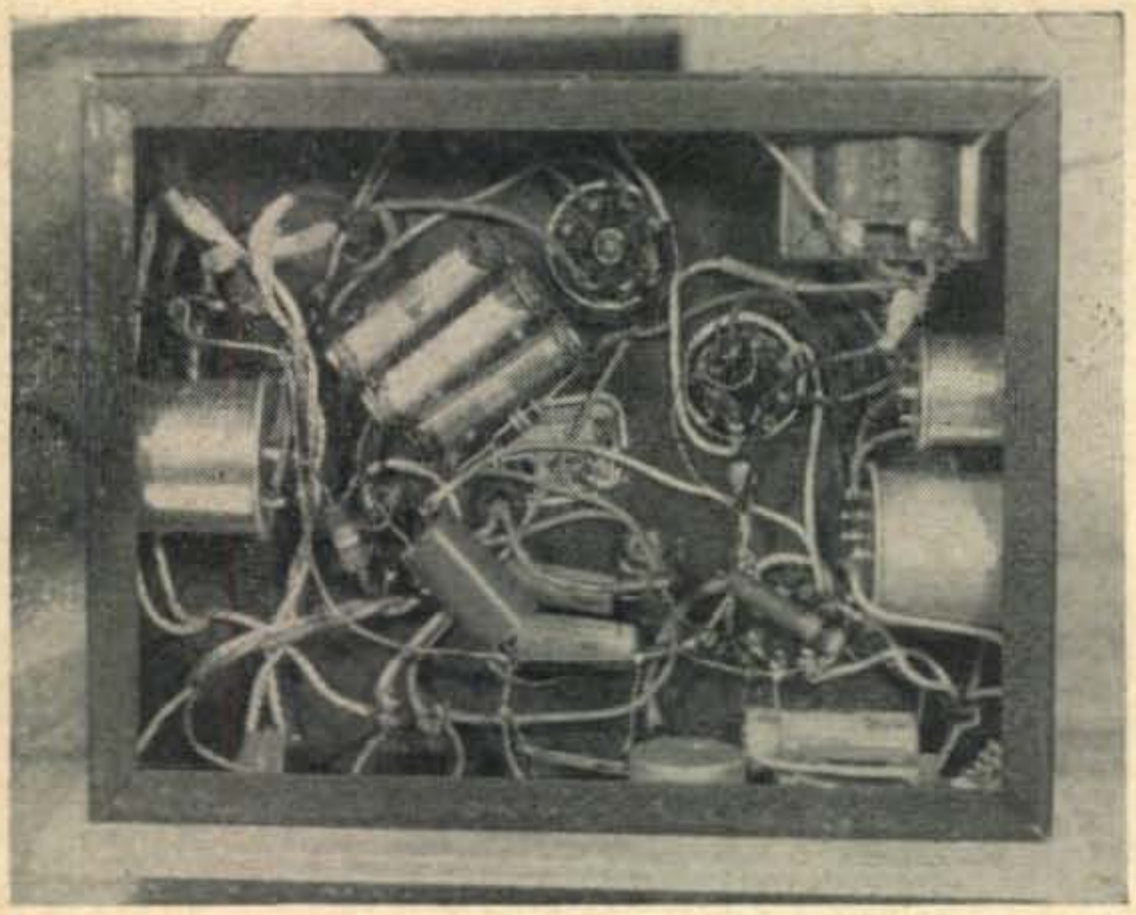
In the author's setup the Omnibox is mounted at the left of the BC-348 receiver. The large knob is the amplifier gain control.

Construction Details

This gadget would make an excellent project for the beginner; it would be useful long past the beginner stage and is not a difficult project. The entire unit is built on a 7″ × 9″ × 2″ chassis, which provided ample room to work with a minimum crowding of parts. The parts layout I used is far from ideal, because I used a chassis that had been punched for another use. There is nothing very critical about the setup, and it works satisfactorily. I did use a bus for all ground connections, since it is often difficult to make good ground connections on a crackle-finish chassis. The grounding of parts mounted with screws seems to be satisfactory enough. The front panel is ¼″ plywood, with the speaker opening covered with grille cloth, backed by a small piece of wire screen for protection of the speaker. Flocked grille screening is also available for this use. The cabinet uses a piece of 1″ thick white pine for the base, ¼″ plywood sides and top, with ½″ by ¾″ pieces added for reinforcing the top corners. The cabinet is finished in light enamel to match other furniture. Lettering on the front panel was done with a small pen and waterproof India ink, then given one light coat of colorless nail polish for protection. The nail polish should be put on with a minimum of brushing, as it may soften the enamel and smear it if brushed repeatedly. Decal transfers could be used for a more finished appearance.

The Tone Oscillator

The tone oscillator stage uses parts from the modulator and is the original circuit used in that unit. Perhaps the most difficult part of building an oscillator is getting, or modifying, a transformer to provide the desired note and waveform. This is no worry here, for the T-50 transformer from the modulator unit provides approximately a 1000-cycle note with very good waveform. Lower notes could be provided by shunting C_{8B} & C with larger values of capacitance, higher notes by reducing these values. The higher-numbered parts



The 7″ x 9″ x 2″ chassis has plenty of room for the mounting of the sundry resistors and capacitors without undue crowding.

since the B + supply voltage is about 265 volts instead of the 500 volts in the original unit.

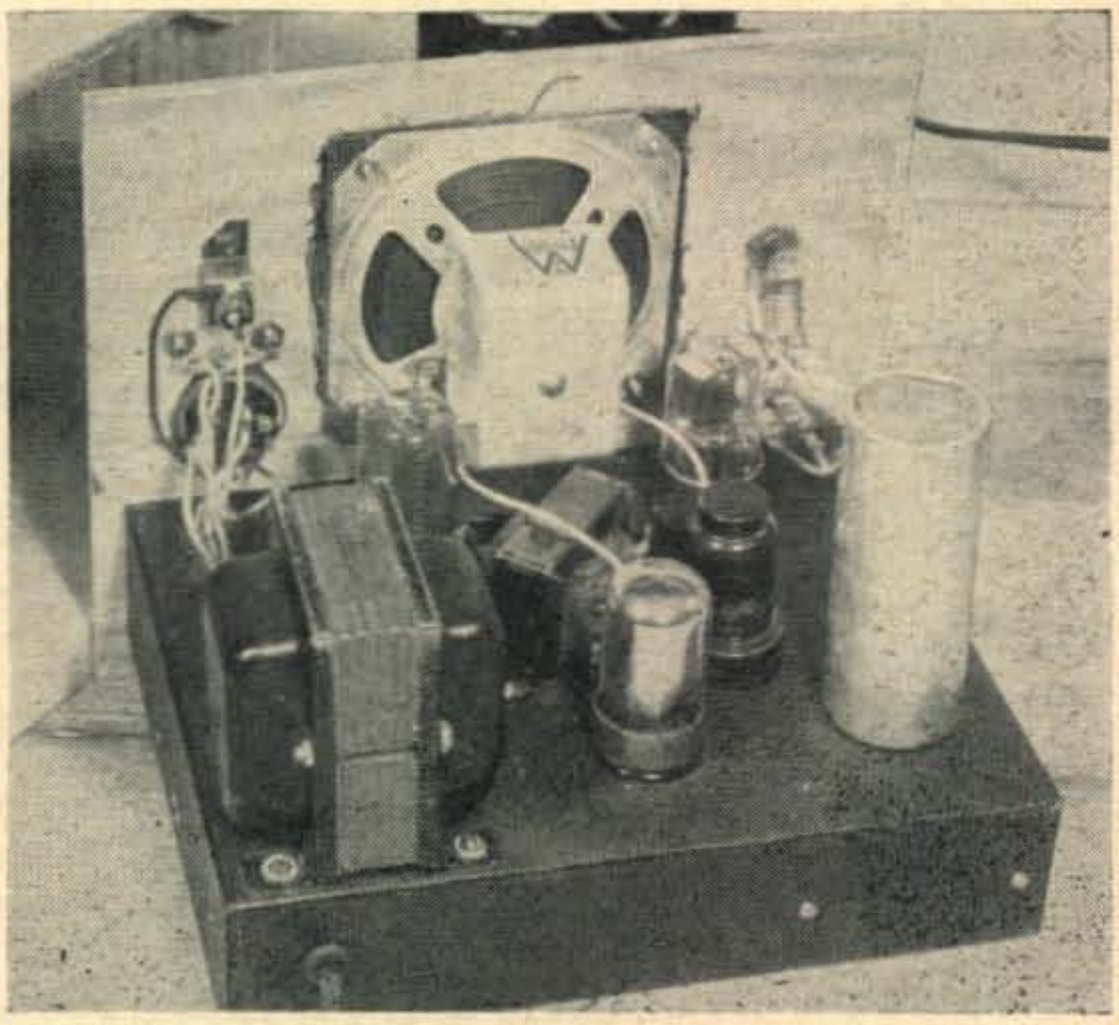
The Amplifier

The amplifier is a conventional two-stage resistance-coupled unit, using a 6J5 and 6V6. Ample volume for the small speaker is provided with a crystal pickup; a 6F5 or 6SQ7 could be used for more gain with changes of cathode and load resistors. These values can be obtained from most tube manuals. The phono input jack is permanently connected to the volume control, and all leads in the grid circuit of this stage are connected with shielded wire to avoid noise pickup. The cathode by-pass condensers are taken from the modulator, being C_{34}. The 20-μf section has its negative lead grounded to the case; the 5-μf section has both leads isolated so that the negative must be grounded. I had bad luck and damaged this condenser so that I had to substitute ordinary bypasses instead of using this unit. The output transformer is a 5000-ohm to voice coil unit. Since many surplus receivers have a 4000-ohm output, this may be easily used as a speaker for such units by simply inserting two pin jacks (J_4) in the primary leads of this transformer. One precaution must be observed: power must not be applied to the oscillator-amplifier section when the speaker is used in this manner, as B + would be applied to both jacks. When power is applied to the oscillator-amplifier section, the red pilot light provides a warning. The pin jacks (J_4) are also red as a reminder. Some builders may wish to provide voice coil connections to the front panel so that the speaker may be used with other equipment already having the proper output transformer.

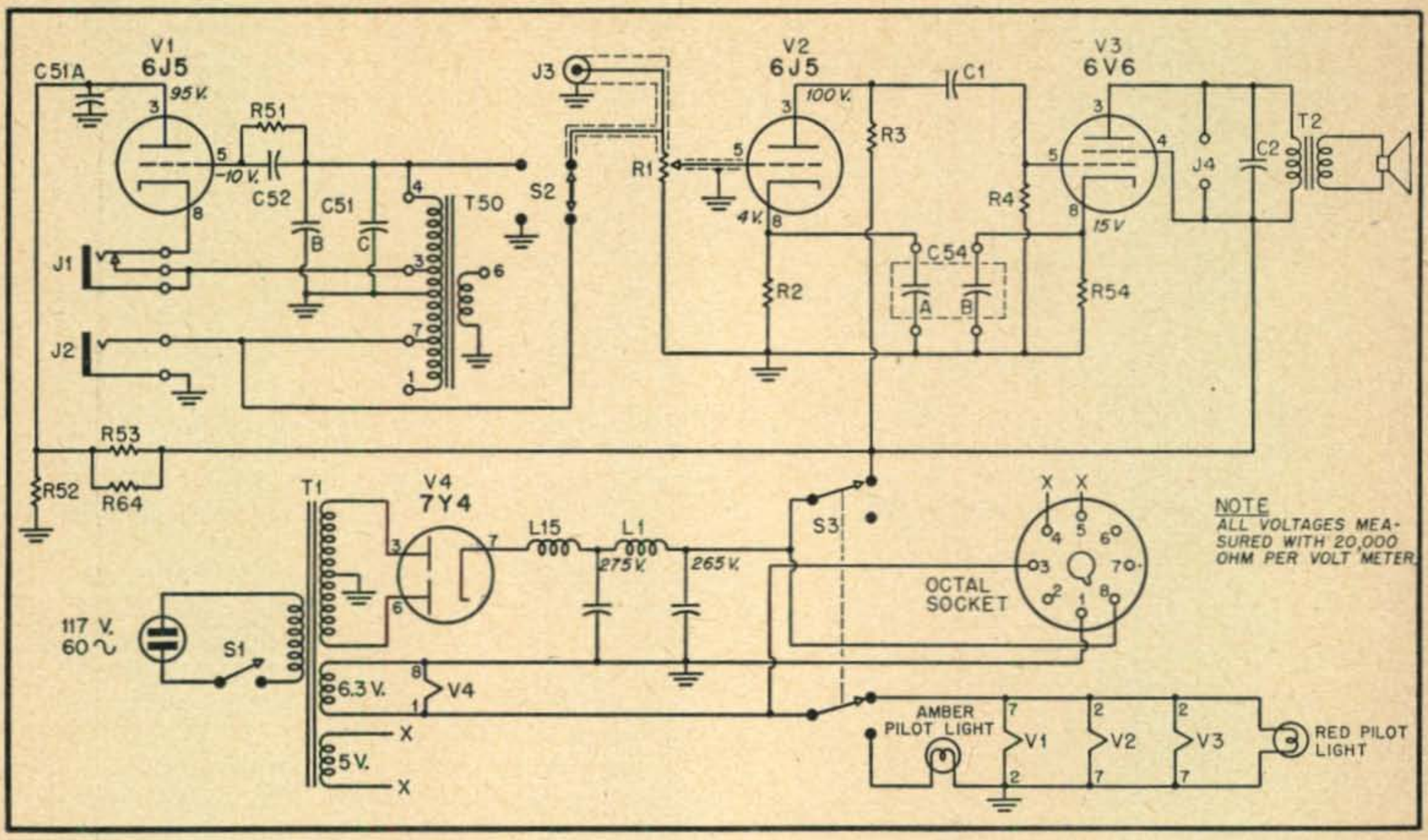
Power Supply

The power supply is a simple 70-ma supply, using choke input to give lower voltage, since many surplus units are intended to operate around 220–275 volts. The 6.3-volt winding has one side grounded with the rectifier tube always operating, the other lead going to S_3. S_3 controls both B + and filament power to the oscillator section. The octal socket on the front panel has power available at all times. With S_3 in the "on" position, power is supplied to the oscillator-amplifier, the red pilot light is "on," and about 20 ma of B + may be used from the front panel. With S_3 in the "off" position, power is supplied only to the octal socket, and the full output is available for external use. The amber pilot burns, showing this fact. Since a bleeder resistor has been omitted to provide maximum output, S_3 should not be thrown to the "off" position unless B + is actually being used from the octal socket; otherwise, the filters would charge to the peak output voltage of the rectifier and might break down under the increased voltage. The 5-volt winding is not ordinarily used; by connecting it in series-aiding with the 6.3-volt winding, 12-volt tubes can be used. Leads were brought separately to the octal socket to provide utmost versatility in the unit; it is simple to place the proper jumper in the male plug of any equipment used with this power supply when the 12-volt output is needed. L_{15} is a 50-ma choke from a command receiver, but it seems to function satisfactorily under the heavier load. A regular 70-ma choke could be used instead.

I find a short piece of twisted lampcord about 18″ long, with phone tips on one end and a phone plug on the other, very convenient for use with this equipment. With the tips in the key and phone plug in the key jack, it is ready for code practice. With the tips in the pin jacks (J_4) on the front panel, it may then be plugged into the phone jack of a receiver to use the speaker. You will probably want to make up a similar connecting cord for your own use. This cord may also be used later with a multi-meter to plug into meter jacks for tuning up equipment that you may build then.



The above-chassis layout can be seen quite readily in this view.



R1—500K volume control, audio taper
R2—3K, ½ watt
R3—100K, ½ watt
R4—500K, ½ watt
*R51—100K, 1/3 watt
*R52—300K, 1 watt
*R53—91K, 2 watt
*R54—360 ohms, 2 watt
*R64—100K, 2 watt
C1—.01 μf 600-volt paper
C2—.005 μf 600-volt paper
C3—10-10 μf 450-volt electrolytic
*C51—.05-.05-.05 μf 300-volt paper ES 692644 or 5414
*C52—.006 μf mica
*C54—5-20 μf 35-volt electrolytic ES 692647 or 5417
L1—10-henry 70-ma choke
L15—3-henries, 50-ma choke 5634 from command receiver

J1—phone jack, shorting-type, closed-circuit
J2—phone jack, open circuit
J3—phono input jack
J4—phone tip jacks, Red
S1—s.p.s.t. toggle switch
S2—make one, break one circuit, toggle switch
S3—d.p.d.t. toggle switch
Speaker—4-inch PM speaker
T1—70 ma 600-volt c.t. replacement power transformer with 6.3-volt and 5-volt windings
T2—output transformer, 5000 ohms to voice coil
*T50—Tone oscillator transformer 6307** or ES 691026
V1, V2—6J5
V3—6V6
V4—7Y4

*denotes part from BC-456 modulator
**Part #6307 from BC-456A has no tap 7—use tap 1 or 6 instead

come from the modulator unit, and the parts list also includes identifying numbers that will be found printed on these parts, usually in red.

The oscillator works nicely when keyed in the cathode circuit, and the voltage across the key is low so that there is no danger of shocks. A closed circuit jack is used for the key, and, if a metal panel is used, the jack must be insulated from it, as the entire jack and key are not at ground potential. Output to the phone jack is fixed, being taken from the #7 (600–ohm) tap of T-50. With 8000-ohm phones the volume is moderate; with 600-ohm phones it may be too loud. In that case, a small resistor of about 1000 to 5000 ohms could be used in series with the phone jack to reduce the volume to the desired value. Speaker volume, however, is variable with the volume control. Tap 6, from which output to the grid of the next stage is usually taken, was not used, because it had a higher level than desired. Switch S_2 is a surplus item I had; a d.p.d.t. switch may be used instead. This switch turns off the tone by grounding the oscillator grid and also disconnects the oscillator output from the volume control. It seems to be difficult to avoid leakage pickup of the 1000-cycle note of the oscillator, so it is allowed to operate only when the tone is desired. The cathode resistor of the 6V6 output (R_{54}), as well as R_{52} and R_{53}, which are bleeders for the plate supply of the oscillator tube, are all mounted on a convenient terminal board which may be removed intact from the modulator. R_{64} from the other terminal board of the modulator is shunted across R_{53} to provide correct voltage for the oscillator tube,

MARS QSO Party Results

THERE'S AN OLD SAYING ABOUT THE TURTLE, that he can't make any progress unless he sticks his neck way out. Well, that saying might also apply to the Military Amateur Radio System.

MARS Chiefs really stuck their necks out when they opened up the MARS frequency for a system-wide QSO party during the first weekend in December and then asked MARS members to send their comments and recommendations to the Headquarters. Some of the amateurs couldn't even wait for normal-channel mail service. They had to fire up the ol' transmitters and get their comments off the chest in a ham-to-ham contact.

The logs are finally tallied, and the Number One winner turns out to be none other than our old friend and first member of the MARS-Army, A4NGX, otherwise known as Major Griffin L. Davis, Arlington, Virginia, of the Second Army-Tenth Air Force area.

He was pushed all the way by A9PDS, Arthur O'Neil, MARS stalwart of South Bend Indiana, Fifth Army, Tenth Air Force Area. Actually, A9PDS made the most contacts, but lost out on the multiplier. O'Neil scored 833 points with 119 contacts in seven Army/Air Force areas. Davis, with three less contacts, racked up 928 points by snagging that all-important eighth Army/Air Force area. Both winners had QSO with all six Army/Air Force areas. A9PDS worked AK2HS, Labrador MARS-Air Force station, while A4NGX was in contact with AK2WP, Newfoundland MARS-Air Force station, and AE3US, Ankara, Turkey, MARS-Army station.

Both operated on three frequencies (6997.5, 3497.5, and 14405) Davis with Xmtr pwr of 180 watts, and O'Neil running 650 watts input to a single wire antenna through a pi network.

Winners in the other four Army/Air Force areas are:

First Army-First Air Force—A1RGB, Joseph Meyers of Meriden, Connecticut, 128 points; Third Army-Fourteenth Air Force—A4EDA, Robert Preddy of Creedmore, North Carolina, 444 points; Fourth Army-Twelfth Air Force—A5NRK, Merwin Forbes of Albuquerque, New Mexico, 288 points; Sixth Army-Fourth Air Force—A7RFE, Richard Hulse of Phoenix, Arizona, 336 points.

Other MARS stations making high scores in the contest included:

First Area—AF2AIR, A1JJY, A1MMN, AF2VL, A2DRM and A2BX.

Second Area—A3HCE, A3LGT, A3HIX, A3EGN, A3ECP, A4FJ, A3GJY, A3ANK, A3NBC, A3USA, A3KDF, A4PPP, A3KNK, AF4FAN, AF8EAV, AF4OWS, AF8PQK, AF8CFY, AF8GAV, AF3FMC, A4KMG, A4EEP, A3OSK, AF8BDM, A4WAH, AF4FAN and A4JLV.

Third Area—A4GMJ, A4CYC, AF4CQR, AF4BJE, A4DIY, AF6YWQ, AF6FNS and AF6FAK.

Fourth Area—A5OCK, A5ZU, A5NQG, A5ZM, A5MYM, A5NPX and AF5OBB.

Fifth Area—AFØIC, A9BIN, A9HZG, A9FSN, A9CQU, AØGWU, A9GXW and A8RTN.

Sixth Area—A7FBA, A7JTF, A6BRT, A6BCV and A7MTW.

Most of the comments were favorable. A few didn't like the idea of a QSO party on spot frequencies, as it were. A3LGT thought there was "too much QRM due to each and every station being on the same (or nearly the same) frequency." A3NHB termed the party a "huge success but (there are) quite a few members (who) have some very rough notes to clean up as with power over 500 watts and a little a.c. in pwr supply they cut a mean hole in 3497.5 and 6997.5 kc."

A3HCE suggests that the next QSO party should be held on a band 25 to 50 kc wide so "we have a chance to move one way or the other to get out of QRM from others."

A4NGX and A4EEP, on the other hand, both commented on the value of the spot frequency QSO as a first-rate example of why we need net discipline. Both are positive that radio amateurs are the most courteous persons on earth. And MARS Chiefs think so too. Only three cases were reported where a contestant moved in on top of someone else and "hogged" the whole show.

A typical Martian in the contest was A9PDS whose transmitter ran 650 watts input to a single wire antenna through a pi network. He logged 58 contacts and his comment on the QSO party pretty well sums up the gist of all comments received. He said, "I had a wonderful time and am only sorry there weren't more stations participating. Perhaps next year." Who could say it better?

Arthur O'Neil, A9PDS, MARS contest winner, is shown watching another Martian, Wilber Monigan, operate his home station, A9RE.

Putting Surplus Meters to Work

R. L. PARMENTER, W1JXF*

A great many of those meters with weird scale markings can be made into useful units for your rig if you're willing to spend an hour or so working them over.

SINCE THE WAR'S END the surplus markets have offered a wide assortment of meters suitable for amateur use at exceptionally attractive prices. Some of these, the 50, 100, 200 and 300 direct current milliammeters, are usable "as is." These bargains have been pretty well taken care of at this writing, leaving some of the less desirable units still on sale. However, many of these are adaptable for amateur use and require only a little missionary work on the part of the buyer. The prices on some of these less desirable items are very appealing, and it is likely that many readers have acquired some of these, along with others, in "deals" where one purchased several meters in order to get one or two which were needed for some particular application. Why not put some of these others to work? The lack of know-how need not be a formidable obstacle, since the job may not be a difficult one.

The problem simplifies itself somewhat due to the fact that the tremendous demand for semi-precision meters during the war was met by the manufacturers by more or less standardizing their products. As far as it was feasible, meter cases and "works" were standardized pretty much, the result being that many meters covering different ranges were actually the same meter under the skin. Since all meters used in radio work are essentially current measuring devices (current flowing in a coil produces a torque which is used to pull a needle across a calibrated scale), the answer is fairly obvious. The d.c. milliammeter could be adapted to cover a great deal of territory, as is exemplified by the garden variety of voltohmeter. A 0–1 d.c. milliammeter would, by the judicious use of shunts, be suitable for measuring current even up to hundreds of amperes. When multiplying resistors are incorporated in other units of the same basic type, voltmeters of almost any desired range will be the result. When copper-oxide rectifiers are added, values of alternating current can be ascertained. This is, of course, just what the manufacturers did. A 0–1 d.c. milliammeter served many purposes where a reasonable amount of sensitivity was required and where the loading of 1000 ohms per volt could be tolerated. Where a higher range of current was to be checked, perhaps a 0–15 d.c. milliammeter would be used with shunts to take care of the particular values encountered.

The happy result of all this is the fact that many meters now on the surplus market are basically fairly low range d.c. milliammeters which are suitable, with a little modification, for the plate and grid circuits of the amateur transmitter. There are really only two steps in accomplishing this. First, the basic movement must be determined, and, second, shunts must be fabricated and installed. In some cases new scales may be added, but most of the time the existing scales may be used.

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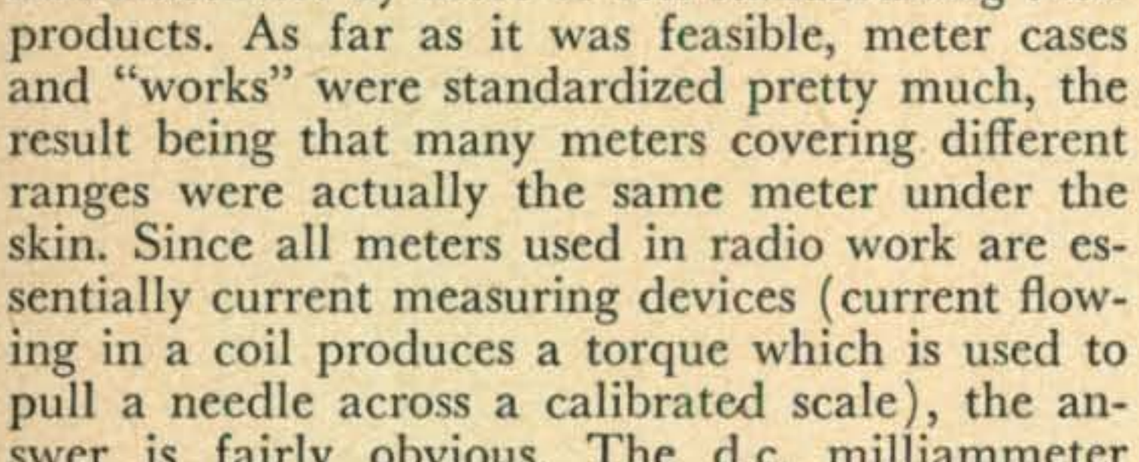


Fig. 1. This is the fundamental circuit for learning the true range of the movement itself once the meter under test has been stripped of its shunt or multiplier.

Determine the Basic Range

To determine the basic range of the meter, it must be removed from its case. Do this only on a clean section of the workbench in a location which is free from dust and bits of metal—such as filings. *Handle with care,* keeping in mind that this is a precision instrument and that the bearings are jeweled the same as a watch. Mechanical shocks must be avoided, since it doesn't take a great deal of a jar to fracture the jewels or to knock the pivots out of the bearings. If the meter at hand is a high range milliammeter or ammeter, you will probably note a shunt, a coil of wire, connected across the main terminals. In the case of an ammeter, it may be a solid bus of copper. This will have to be removed from the unit. If it is a solid busbar, you may find that it is made right onto the heavy brass terminal screws, and in this case the assembly may be lifted out. These screws will have to be replaced by others of about the same size. Use brass screws for replacement.

If the unit is by chance a meter which was designed for some alternating current application, such as a.c. milliamperes, or some voltage range, you will find a small rectifier. This should be cut out of the circuit for d.c. This may not be necessary, but while you have the meter open it is just as well. The rectifier may be used for some other application, such as adapting a d.c. meter for a.c. readings. In the case of an r.f. ammeter (thermocouple type) which has too high a range

to be usable as is (i.e. 0–5 or 0–10 r.f. amps), both the thermocouple and the shunt may be removed.

There is another type of meter that has been quite common as surplus, the multi-range voltmeter or kilovoltmeter. These often have three or more terminals for making connections for different ranges but sometimes these are merely the basic movement with one built-in multiplier to raise the basic range up to the lowest that it was to be used on. For instance, it was often a 0–1 d.c. milliammeter with a built-in resistor. External multipliers were used, with a switching arrangement, to obtain other ranges to correspond with the scales shown on the meter face. In this case it will be necessary to remove the one multiplier to reduce the meter to its basic movement. This is mentioned so that the reader will not be confused and wonder how the meter could be used for higher voltage ranges.

If you have the meter at hand reduced to its basic movement by the methods outlined heretofore, you may now hook it up in a temporary set-up, as shown in *Fig. 1*. Before hooking up the battery, which for most purposes will be a 1½-volt dry cell, make sure that the potentiometer, R_1, is set at zero, or near the negative end, so that there will not be a high potential applied to the movement at first. *CAUTION:* The meter that you have may be in the order of 200 or 500 microamperes basic movement. These are delicate, and keep in mind that they require only ⅕ to ½ milliampere for full scale reading. Keep the potential and current down to start to be on the safe side.

It has been assumed that the reader has a multimeter available. If not, individual meters of known accuracy may be substituted for the meter of the multi-range type. Incidentally, if the exact values for R_1 and R_2 are not available, others may be used since a considerable variance from the values shown is permissible. Set the multi-meter on a high range such as 100 milliamperes at first, and just touch the connection to the battery, noting the degree of swing of the needle. (Note polarity of meters when hooking up.) If it is slight, make the connection and adjust the potentiometer and vernier until a full scale reading is obtained either on the multi-meter or the X-meter, whichever occurs first. By comparing the readings of the two meters, it will be easy to determine the approximate full scale reading of the unknown. It may be necessary to reduce the range of the multi-meter to some lower range in order to get a good reading.

When the full scale reading of the basic movement has been determined, it will be well to affix a notation on the outside of the meter case for future reference. You are now ready to increase the meter reading up to the value desired for your particular application. There are really two methods of doing this: first, determine the resistance of the meter, and then, by calculation, determine the amount of resistance needed in the shunt to obtain the range desired. Second, by inserting the meter in a series test circuit similar to *Fig. 1* and by cut and try, determine the correct shunt value.

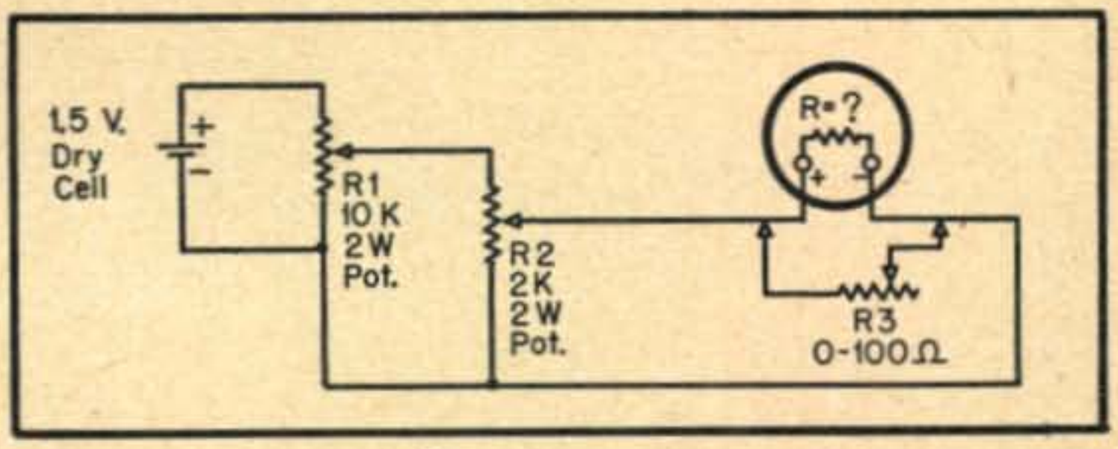


Fig. 2. To determine the internal resistance of the movement is a simple matter in this circuit.

What is the Internal Resistance?

The internal resistance of a meter may be determined by a setup as shown in *Fig. 2*. R_1 and R_2 may have the same values as before. With R_3 out of the circuit, adjust R_1 or R_2, so that full scale deflection is obtained. Now, without changing the settings of R_1 or R_2, carefully adjust R_3 until exactly one-half scale deflection is obtained. Greater or lesser values may have to be used for R_3, depending upon the internal resistance of the meter. This is so since the internal resistance of a 0–1 ma meter might be about 100 ohms, whereas that of a 0–15 ma meter might be in the order of 2 to 5 ohms. When half-scale deflection is obtained, the resistance of the rheostat will be equal to the internal resistance of the meter—since half of the current flowing in the circuit will be passing through the shunt and the other half through the meter. This value is a measurable amount if a good ohmeter or resistance bridge is available, and this should also be noted on the outside of the meter.

When the internal resistance of the meter is known, it is an easy matter to wind up a shunt for the desired current range. For instance, a small r.f. ammeter was determined to have an internal resistance of 1 ohm and a full scale reading of 2 ma. We would like to shunt this for a full scale reading of 50 ma for use in the grid circuit of a triode amplifier. We know that, by Ohms law, an inverse proportion exists between the current flowing in each branch of a parallel circuit and the respective resistances of the branches. Then it is obvious that if the meter resistance is only 1 ohm and only 2 ma must be allowed to pass through it, this would leave 48 ma to be passed by the shunt. This relationship might be expressed:

where I_m is the current through the meter
I_{sh} is the current through the shunt
R_M is meter resistance
R_{sh} is the shunt resistance (unknown)

$$\frac{I_m}{I_{sh}} = \frac{R_{sh}}{R_M}$$

solve for R_{sh}

$$R_{sh} = \frac{I_M R_M}{I_{sh}}$$

(*Continued on page 65*)

An Economical 25-watt Transmitter for the Beginner or the Advanced Amateur

OTTO L. WOOLLEY, WØSGG*

The 6V6 oscillator and 6L6 amplifier combination has always been an attractive one to those interested in low-power operation. Stripped of all unnecessary "refinements," the unit described here should be a valuable addition to any shack.

THIS TRANSMITTER IS DESIGNED to provide reliable and clean-cut low power operation for phone and c.w. on all bands from 160 to 10 meters. Basically, the circuit is not different from that used with good results by many amateurs in the past, although a few modifications have been made to add to the operating convenience and signal quality. The rig runs at an input of about 20 watts on phone and 25 or a little better on c.w. The components in the speech section have been chosen to give a rising response in the most useful voice range, providing the audio characteristic so desirable for communications work. Break-in operation is allowed by keying the oscillator along with the amplifier; however, this arrangement gives a rather chirpy signal on the highest frequency bands, as is usually the case with keyed oscillators on 20 meters or above. Therefore, a keying selector switch has been incorporated to allow the oscillator to run continuously on bands where chirp may be a factor.

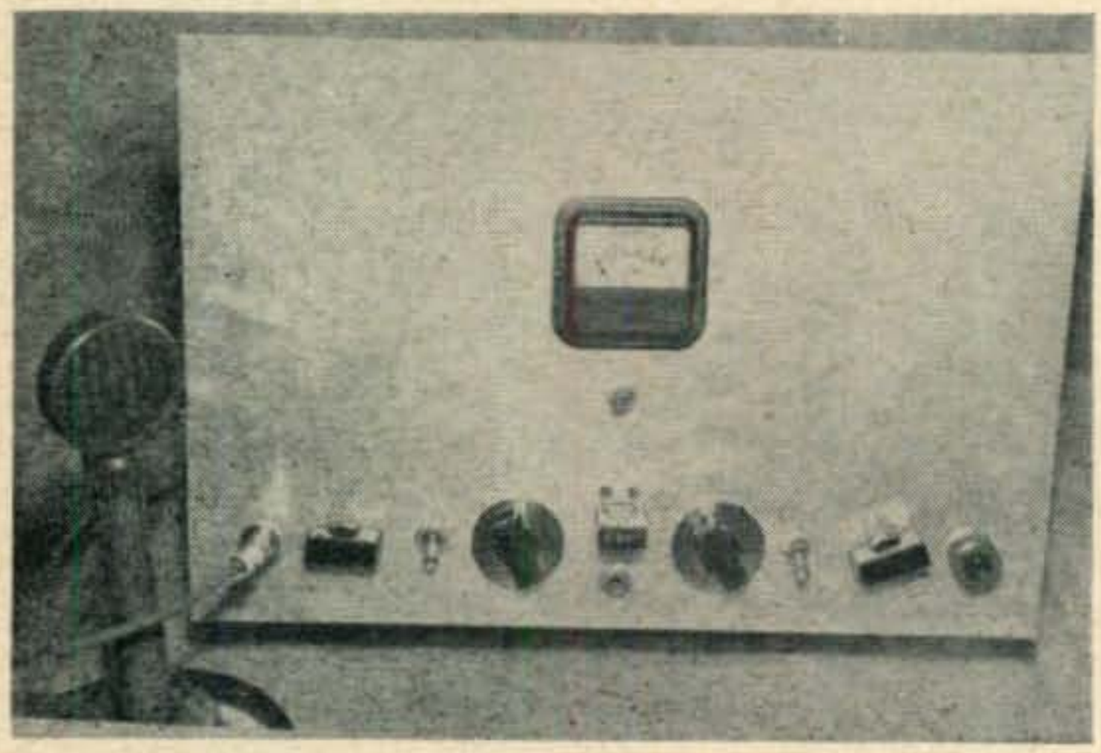
The Layout

Layout of the parts as shown in the photographs results in the r.f., voice, and power supply sections each occupying a proportionate share of the chassis, and with this layout the wiring leads are short and direct. The only long leads are the d.c. and filament supply, and these will be inconspicuous and out of the way if they are bunched and kept close to the chassis. The layout also provides a fully symmetrical panel grouping. A meter is arranged to measure the grid and plate current to the final amplifier, the choice of functions being made with a switch on the panel.

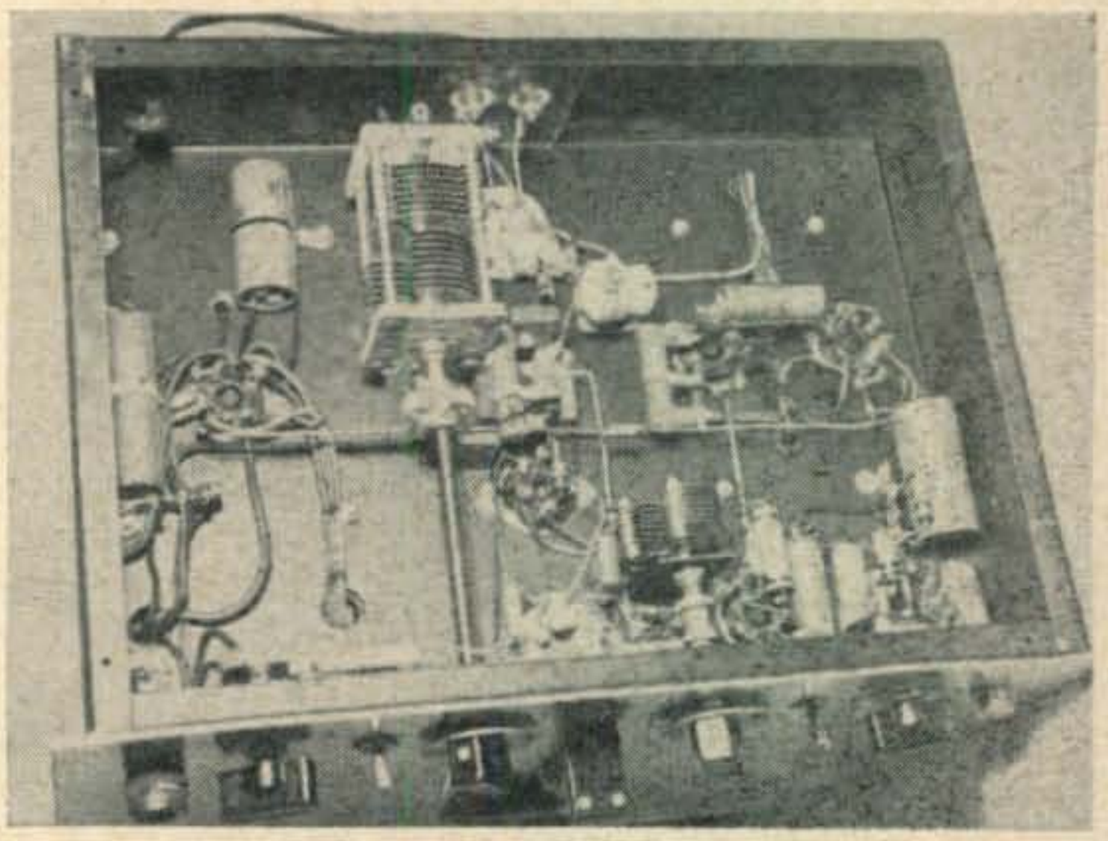
Receiving tubes are used throughout with 6V6s in the oscillator and modulator, 6L6 final amplifier and 6SS7 and 6C5 speech amplifiers. The rectifier is a 5U4G. Plug-in coils are a practical necessity to cover the wide frequency range, and the specifications for these will be found in the coil table. Chassis size is 10 by 14 by 3 inches deep, with a panel 11 by 15 of aluminum. Any high impedance microphone of reasonable output will fully modulate the rig.

The oscillator is the familiar hot cathode type and will operate well with any of the crystals usually available for amateur frequencies. The output on the second and third harmonics is useful, and it is advisable to double frequency in the

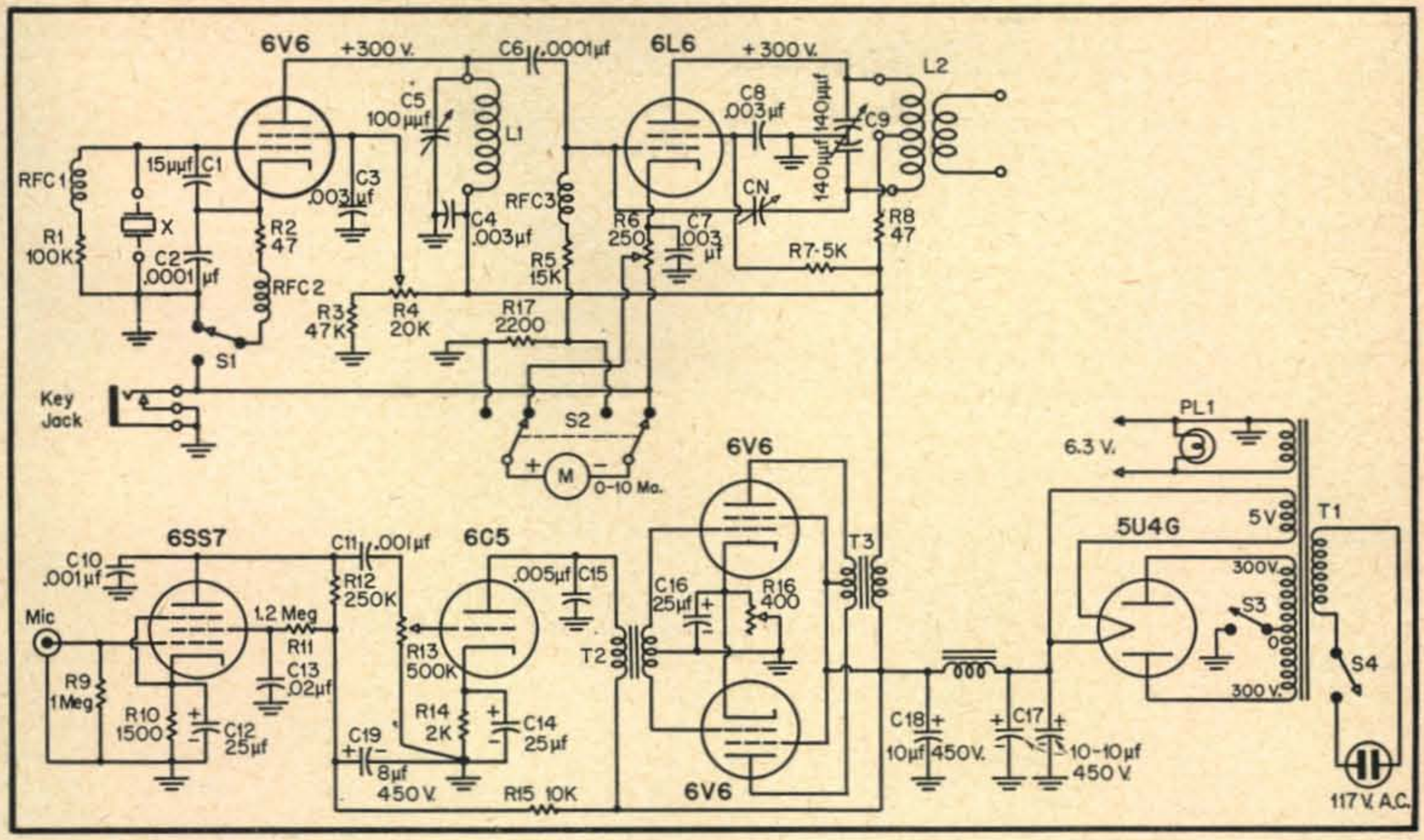
*535 E. Platte Ave., Colorado Springs, Col.



Front panel of the transmitter. The meter switch is directly under the meter. Across the bottom of the panel, from left to right, are: microphone connector, excitation control and a.c. switch, keying selector switch, oscilla- for tuning, B– switch, audio gain control, and pilot lamp.

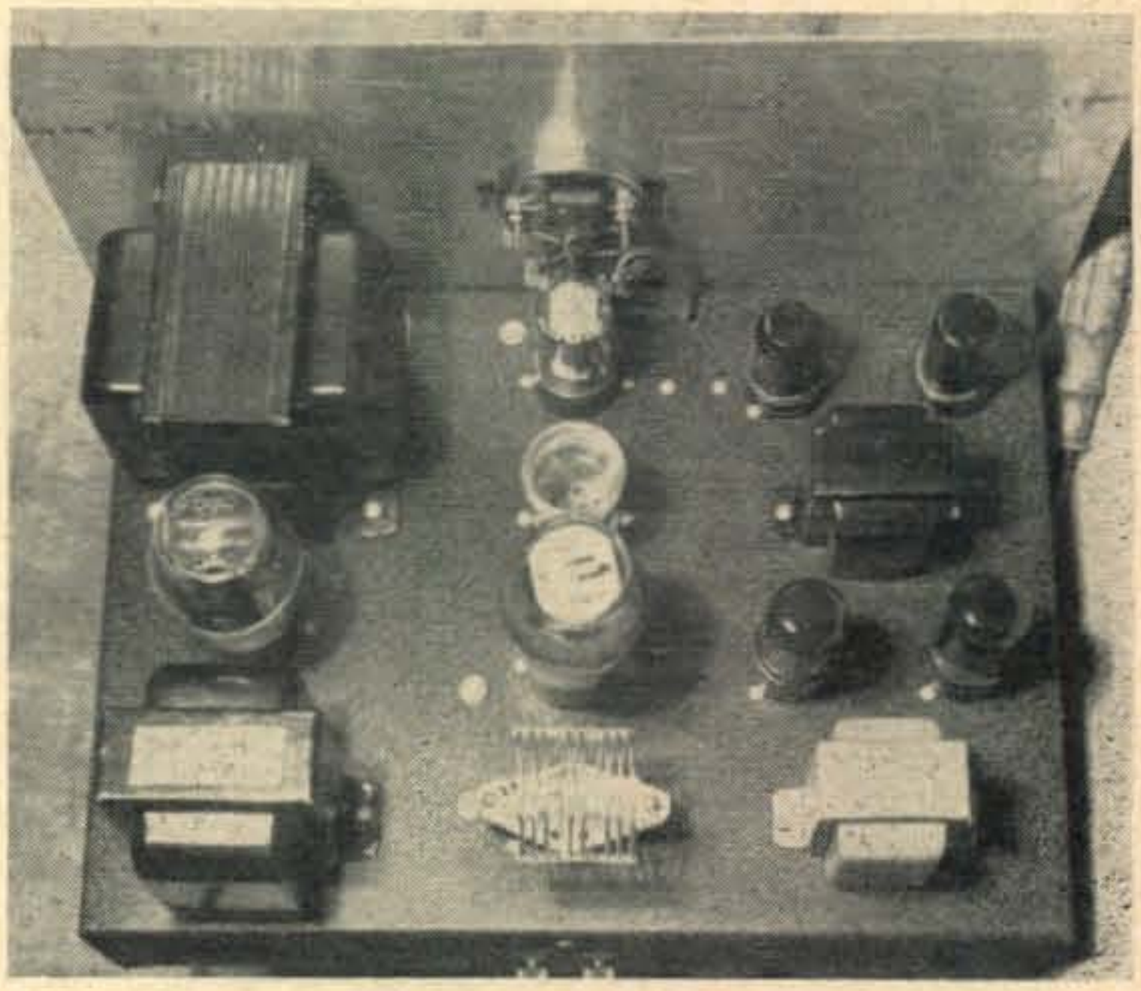


Under the chassis. Most of the components may be identified easily. A grounding bus is run close to all sockets, and the unused socket points on the coil socket make convenient tie points. The base of the final amplifier is almost hidden by its associated parts. The neutralizing condenser is at the right of the final tuning condenser.



C1—15 μμf, ceramic
C2, C6—100 μμf, mica
C3, C4, C7, C8—.003 μf, mica
C5—100 μμf, variable
C9—140 μμf per section, variable
C10, C11—.001 μf, mica
C12, C14—25 μf, 25 volts, electrolytic
C13—.02 μf, paper
C15—.005 μf, paper
C16—25 μf, 50 volts, electrolytic
C17—10-10 μf, 450 volts, electrolytic
C18—10 μf, 450 volts, electrolytic
C19—8 μf, 450 volts, electrolytic
CN—Neutralizing condenser (National NC-600)
R1—100K, ½ w.
R2—47 ohms, ½ w.
R3—47K, 10 w., wire-wound
R4—20K, 2-watt potentiometer (Mallory A20MP)
R5—15K, 1 w.
R6—250 ohms, 10 w., adjustable wire-wound
R7—5K, 2 w.
R8—47 ohms, 1 w.
R9—1 meg., ½ w.
R10—1.5K, ½ w.
R11—1.2 meg., ½ w.
R12—250K, ½ w.
R13—500K volume control
R14—2K, ½ w.
R15—10K, 1 w.
R16—400 ohms, 10 w., adjustable wire-wound
R17—2.2K, ½ w.

L1, L2—See Coil Table
L3—6-henry choke (Thordarson T-20C55 or equivalent)
T1—300-0-300 volts, 200 to 250 ma, with 6.3 and 5-volt windings
T2—audio interstage transformer, single plate to p-p grids
T3—10-watt modulation transformer, 6V6s to 4500-5000 ohms
S1—s.p.d.t. toggle switch
S2—d.p.d.t. toggle switch
S3—s.p.s.t. toggle switch
S4—s.p.s.t. switch mounted on R4
PL1—6.3-v. pilot lamp
M—0-10 ma meter



Above-deck view of the parts layout. The power supply occupies the left portion of the chassis, the r.f. section is in the middle, and the audio components are along the right. The output posts are on the chassis backdrop.

oscillator when possible. For 10-meter work with a 40-meter crystal, it will be necessary also to double in the final amplifier. Crystals of good activity in the 9-mc region will give sufficient third harmonic output to drive the final straight

(Continued on page 51)

Structural Stresses in Antenna Supports

LOUIS H. HIPPE, W6APQ*

The mechanics of structural stresses in masts and towers take an awful lot of math and physics in order to get the exact answers. Here's a simplified discussion of the problem which should help us to erect bigger and better sky-hooks.

THOSE SKY-HOOKS of varied and sometimes devious design that we see supporting all types of antennas throughout the country can be beautiful of appearance, but hazardous in structure. There are several types of supporting structures, among which are wooden masts, pipe masts, wooden latticework towers, steel towers, and telephone poles. Each of these has its particular characteristics as to stresses and strains, all of which must be taken into consideration when designing and constructing.

To begin with—a structure of any kind to support antennas must be considerate of the neighbors. They are in themselves the first potential hazard to your antenna support if they wish to protest. Should they make a protest, the next enemy of your structure is the building code and the building inspector in your locale. If you get by the first two hazards, the next enemy is the elements, especially wind of high velocity.

We have placed these events in the above order because the average ham just builds his structure and erects it in his enthusiasm to get on the air. Fortunately, the majority have enough "structural engineering feel" and common safety sense to build their mast or tower strong enough and guyed well enough to withstand most of the shocks to which such structures are exposed. However, certain pertinent facts should and *must* be given lots of thought.

* *10636 Victory Blvd., North Hollywood, Calif.*

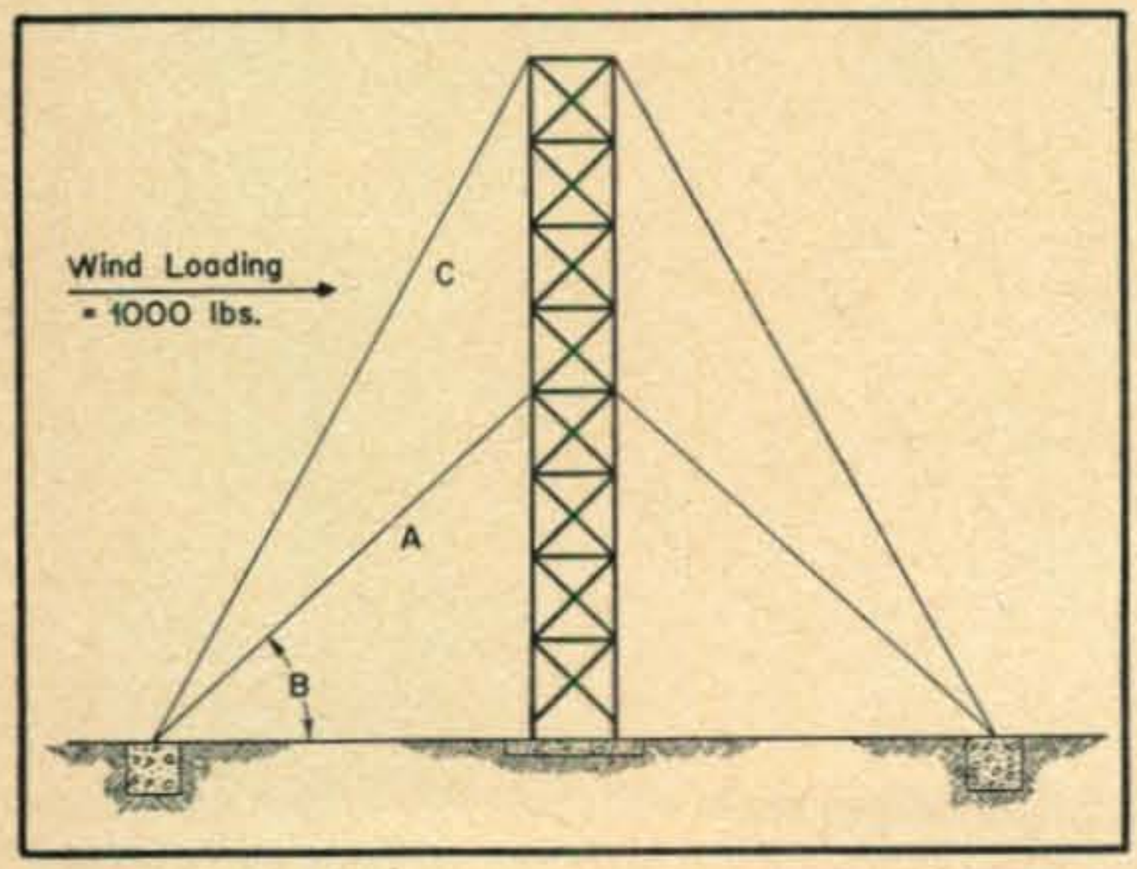


Fig. 1, showing wind loading, anchorage, and guying on a 50-foot tower. Explanation is in text.

The simplest way to approach the engineering problem involved is to consult a Structural Engineer. Your city Building Inspector will help you with your design problem, too—if you can find one who is sleepy enough not to realize what he is doing and has nothing else to do at the moment. Both the Engineer and the Inspector have facts and formulas as well as figures at their command which are at your disposal in the design of your particular type of structure. These formulae and pertinent information are all contained in the Code Book of Building Specifications. Stresses and strengths of various kinds of wood are also contained in this helpful book.

The Telephone Pole

The latticework tower of wood construction, believe it or not, is considered by the Engineer and Building Inspector to be the poorest kind

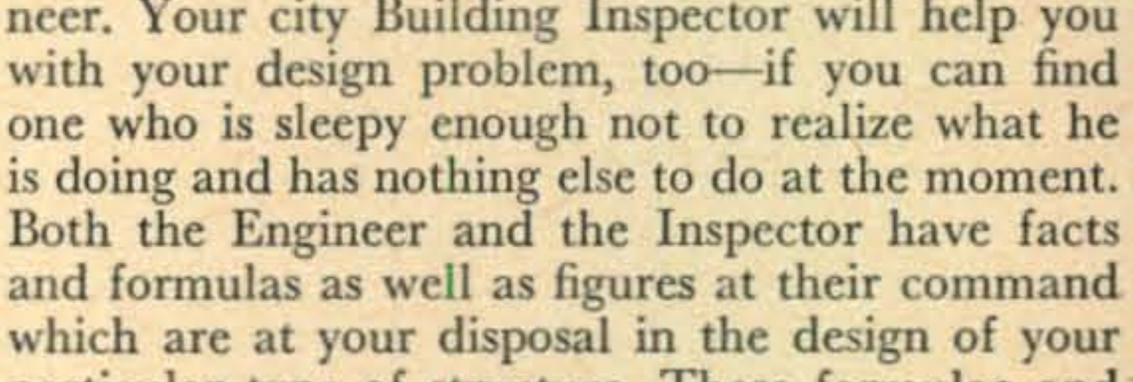


Fig. 2. Note how the wind follows around the telephone pole in "A," creating burbles front and back which cancel each other. In the square tower at "B," the structure receives the full blast of the wind, plus the burble at the rear which causes additional stress due to the vacuum formed. The triangular tower at "C," though it has a burble at the rear, cuts the wind better on the front face, with consequently less thrust.

of structure, while a telephone pole is considered best. This is among the wood structures, mind you. To qualify the statement—it is almost physically impossible to figure a safe top load for the lattice tower. The same goes for shear stresses from earthquakes. There is no practical formula for wind resistance or top loading. This is because of the criss-cross characteristic of the construction. The Building Inspector, then, will figure wind resistance on a "flat plate" basis. This is actually an advantage, since it does not allow for the spaces between, which, of course, cut down resistance considerably.

A tapered tower has a distinct advantage over one of straight construction. The taper has the effect of getting greater stability; it presents less

surface to the wind at the top and lowers the center of thrust, thus lowering the point of guying.

The triangular lattice tower is even better than the four-sided model from a construction and wind loading standpoint. In addition, if you taper it, you have tops in lattice tower construction with wood as a material. Steel, of course, takes precedent over all as the ultimate in structural material for durability and lasting qualities. It probably becomes cheaper in the long run, too, because of this.

Now what about guying? First we must know what the wind pressure is going to be on our tower. The Building Code for a 50-m.p.h. wind says 20 pounds per square foot, flat plate loading. That's the maximum figure for a margin of safety. In most cases the actual code says 15 lbs. per sq. ft. from 1 to 30 feet of height and 20 lbs. per sq. ft. from 30 to 60 feet of height.

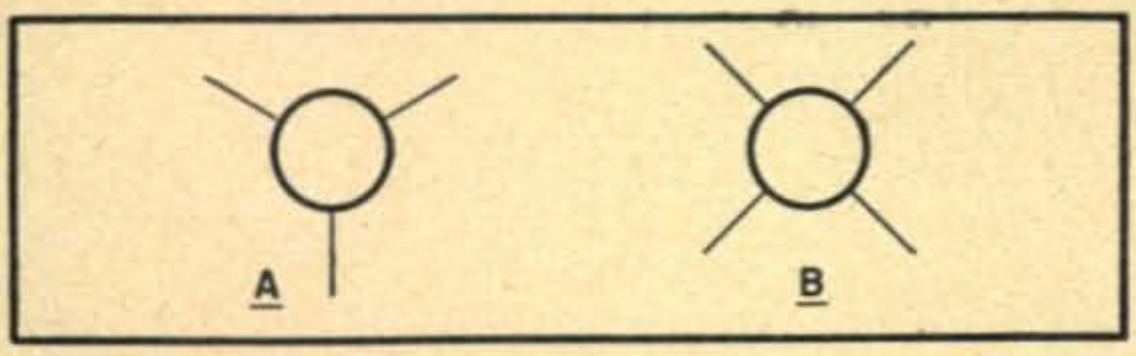


Fig. 3. Through three guys, as at "A," are usually sufficient, the use of four, as at "B," gives better strain distribution.

If you want to figure the actual wind loading on your particular tower, the following formula can be used.

$$F = 1.28(.0028) \times A \times V$$

where

F = force in pounds per square foot.
A = area in square feet.
V = velocity in feet per second.

Note: 1 mile per hour equals 1.48 feet per second.

The figures you arrive at will be interesting—and appalling. But it will be a revelation, for it will give necessary, practical information on guying. It is interesting to note that a 15-foot lattice tower of proper design and anchorage does not require guying. A 50-foot tower requires guys at both top and center.

Let's take a look at *Fig. 1* for a moment. In a hypothetical case, if you have an arbitrary wind load on the center guy wires of 1,000 lbs., the engineer adds at least half that figure again as a safety factor to compensate for tower weight off balance, and upon the angle "*B*" of the guy with respect to earth, and the placement of the guy above center on the tower. In this case the engineer used the figure 1,730 pounds. *That is the pull on the guy "A" in the diagram.* In order to cancel the weight pull, there must be as much or more weight in the concrete "dead man" to which the guy is fastened. In this case it would be almost a ton at each of the guy anchors. The same weight anchor should be at each of the corner feet of the tower! Think what the pull must be on the top wires. Is it any wonder, then, that antennas and towers can come crashing down in 35 to 40 m.p.h. gusts?

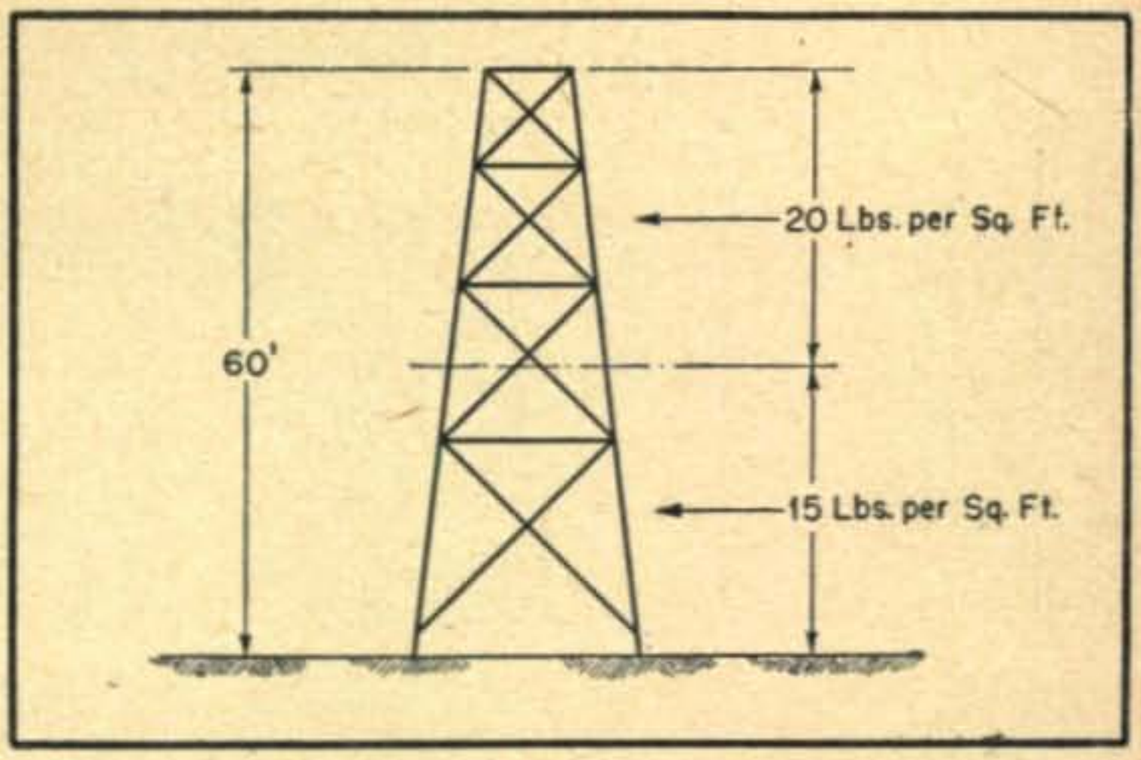


Fig. 4. How wind pressure is distributed on a "flat plate" basis in a fifty m.p.h. wind.

Wind loading is only one factor to be considered in structure. In addition, there are shear, compression, bend, top loading, and vertical or column loading. In figuring top or column loading, the weight of the beam in total, pipe connector and rotating motor, must all be taken into account. In figuring wind loading, the largest flat area of the boom surface should be used.

For a moment let's go to the other extreme and look over some of the characteristics of the telephone pole. An advantage a telephone pole has over a tower is that the pole requires no guys, provided at least 15% of the total length is in the ground. The engineer figures 18% for a safety margin.

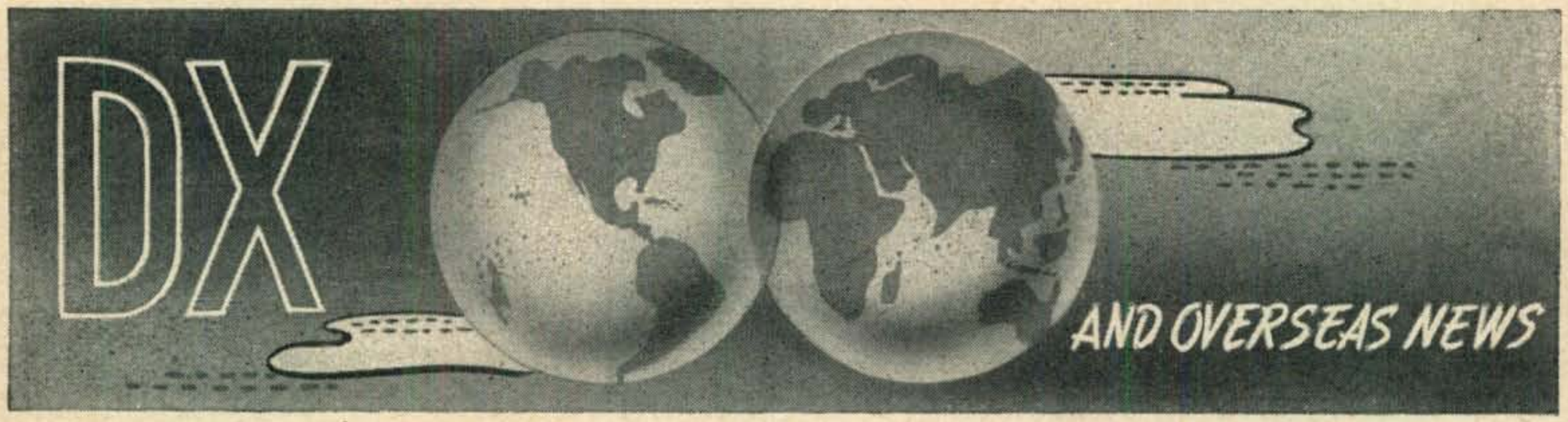
Telephone poles for lights or communications are usually exempt from building permit. This is not to say that for an individual a permit may not be required or the Building Inspector consulted before you erect one. But telephone and light poles have been used by the thousands for many years, and their safety is well established. They will stand a heavy top load (almost a half ton with 700 lbs. legally allowed), far more than the average ham will ever use. They are also treated to withstand weather and underground livestock.

Psychological Considerations

With a telephone pole the ham is allowed two swell arguments for its erection. The neighbors are used to seeing and living with telephone poles. Their objections will not be as pronounced as with other types of structures. In case they do make a kick to the building inspector and he orders the pole down, it can be pointed out by comparison that other services are then violating the Building Code. There you have him, for he won't try to argue the point with the local light and telephone company. After all, their poles are on public property and therefore present a greater hazard than the one on your private estate!

There are two additional ways to circumvent the neighbors making a kick to the City Building

(*Continued on page 42*)



Conducted by HERB BECKER, W6QD*

WAZ CERTIFICATES go to eight DXmen this month, and we of *CQ* want to offer our heartiest congratulations to them.

177	W6IFW	Lee H. Owens	40–177
178	G5VU	S. W. P. Henton	40–124
179	W2PEO	Eric A. Roberts	40–212
180	KG6AL	Wayne J. Sulser	40–103
181	W7ENW	W. P. Hagestad	40–157
182	W6OBD	Lee Sheridan	40–131
183	W6BUD	Ray C. Halkney	40–153
184	W6LS	Leo Shepard	40–142

None of the above really needs an introduction, but some attention should be given to KB6AL. While out on Guam, Wayne worked all zones, as well as 103 countries. However, when he was transferred Stateside, he had only 38 confirmations, but he kept at the two missing ones until he got them. I believe that in practically each of the other cases, zone 23 was the one needed to complete their WAZ.

Honor Roll

Those of you who looked at the Honor Roll in the February issue, and whose zone totals are below 37, are probably calling us all sorts of names, because that's exactly where the Honor Roll was chopped off. Here is what happened. . . . You see, my boss wanted a better printer, and the February issue was the first one this new guy had tackled. The size of the type used in setting up the Honor Roll was just too large to allow any more calls to be listed, and when we knew about it, it was too late to make the change without holding up the whole magazine. I think the printer has found some smaller type and sincerely hope you fellows who were short changed will be back in there by the April issue.

As mentioned last month, you fellows in the Honor Roll who have previously reported Newfoundland will be having one less in your country total, inasmuch as Newfoundland, as a country, doesn't exist any longer.

The Mailbag

G. E. has just issued a revised DX log and Country List which appears in the January-February, 1950 *G.E. Ham News*. It's a neatly printed job, and this issue contains the Zone number after each and every country. Those of you who cannot obtain a copy locally may get one simply by writing to: Lighthouse Larry, General Electric Company, Schenectady, New York.

YO3RF told W6AM that he is QSL Manager for Rumania and that all QSLs and correspondence for YOs should be sent only to P. O. Box 95, Bucharest. They are now licensed for 50 watts output. . . . Here's something else which should interest most of us; YO3RI is ex-YR5I, YO3GK is ex-YR5W, YO3GH is ex-YO3A, YO7WL is ex-YQ5B and YO2BU . . . . . W6AM was also told by *ON4QF* that a registered QSL card to *CZ2AC* came back with a notation "unknown." Speaking of ON4QF, he told W6IFW that he is still planning to go to *PX* and *CZ*, so keep your ears and eyes open. Mick doesn't know exactly when he can shove off, but says he will try to let us know far enough ahead of time to get it in print. Better keep your ears open, as something might happen that he will leave for PX in a hurry.

HC2JR kicks through with a bunch of new countries which include good ones like ZD1FB, VS9AH, CT3AV, and ST2KR. . . . W7PGS worked and got a card from *ZC6UNR*, who is apparently located in Tiberias, Israel, and at the United Nations Headquarters. . . . W4TO head a guy signing *MC1BH* on 14055 who said he was in Cyrenaica, and to QSL via the R.S.G.B. No, Buck, that isn't a separate country from Libya. I would like to sort of add, however, that Buck didn't work him, as MC1BH said he was going to QRT and go to the "cinema". . . . Guess we ought to thank W4TO, while we're thinking about him, for rounding up the DX contest log from *AP5B* and forwarding it to us.

W1DQH can get a good night's sleep at last after finally hooking *AC4RF*. Dick brings up a pretty good point in reminding us that *UA1BQ* is in Zone 18, being located on Dickson Island.

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

The operating position at I1RC/Trieste. An 828 occupies the final seat in the transmitter, while a BC-312M, behind a converter, does the receiving.

W. A. Z. HONOR ROLL

CW & PHONE

WAZ

W1FH	234
W6VFR	231
W2BXA	226
W6EBG	225
W3BES	224
W6ENV	224
W6GRL	223
W6MEK	222
W3GHD	221
W6ADP	221
W8BHW	218
W6PFD	218
W3LOE	217
G6ZO	217
G2PL	216
WØYXO	215
W6SN	214
W6ITA	214
VK3BZ	212
W2PEO	212
W6SAI	210
W6FSJ	210
W3EVW	210
W2AQW	208
W8HGW	208
W6MX	207
VE7ZM	206
W4BPD	206
W9VW	206
W7GUI	205
W6DI	204
W6MJB	204
W6TT	204
W6SYG	204
W4CYU	203
W6RM	202
W6SC	202
W6OMC	202
W6PKO	202
W7AMX	201
PY1DH	201
W6DZZ	201
W6MVQ	200
W6OEG	200
W9KOK	200
ZL2GX	200
ZL1HY	199
VE7HC	198
W2IOP	197
W6AM	197
PY1AJ	196
W6WB	196
G2FSR	196
LU6DJX	195
W6NNV	195
G4CP	195
W9NDA	194
VE4RO	194
W6GAL	193
W6AVM	192
W6HX	192
W6ZCY	191
W5KC	191
ZS2X	191
VK2DI	191
W6PQT	191
W6RW	190
VK3JE	189
W6RBQ	188
WØNTA	188
CE3AG	188
W6AMA	186
W2CZO	185
W6PB	185
W6SA	184
W6UCX	184
W6AOA	181
W6KRI	181
W6SRU	181
VK2ACX	180
W6EFM	180
W6TI	180
W6DLY	179
W7DL	177
WØUOX	177
W6IFW	177
CX1FY	176
W6IBD	176
W1AB	175
G3DO	175
W8SDR	175
W6WKU	174
W6CIS	174
W6TS	174
W7FZA	174
W6PCS	174
W6TZD	173
W6UZX	173
G5YV	172
OK1LM	172
W6SRF	171
LA7Y	171
WØSQO	171
PY1AHL	171
W6BAM	170
W6VE	170
W6PZ	169
VK4HR	169
KH6BA	169
W5AFX	169
ON4JW	169
W6JZP	168
W6RLN	168
W6RLN	168
W6ANN	167
W6GDJ	167
W6UHA	167
VK3CN	167
W6EPZ	166
W6DUC	166
KH6MI	166
VE7GI	165
W6EAK	163
W6YZU	163
VE7VO	162
W6KUT	161
KH6IJ	161
W6PDB	161
W6PUY	160
W6BVM	159
W6LN	157
W6CYI	157
W6PH	157
W7BD	157
W7ENW	157
WØOUH	157
W7BE	156
W6BAX	155
G3AAM	154
I1IR	153
W6KEV	153
W6BUD	153
OK1HI	153
W6BPD	152
VK2QL	151
OK1SV	151
W6LRU	150
W6LEE	150
W6FHE	150
W6EYR	150
OK1FF	148
OK1CX	147
W7DXZ	146
W6AYZ	146
VE6GD	146
W6WWQ	146
W9NRB	145
W6MUC	145
W6QD	145
W6LER	145
ON4TA	144
W6LDD	144
G3BI	144
JA2KG	143
W6LS	142
W6CEM	136
W6RLQ	136
OK1WX	135
G3AZ	133
W6TEU	133
W6RDR	133
W6OBD	131
W6MHB	130
W7GBW	127
G8IP	127
W7ASG	127
G5BJ	126
PK6HA	124
G5VU	124
W6NRQ	123
W6MLY	123
W6BIL	119
ZS6CT	113
KG6AL	103
W7KWA	98

39 Zones

W3KT	214
W9ANT	212
WØNUC	211
W4AIT	211
W3IYE	209
W2HHF	208
W3JTC	208
W2NSZ	207
W1ENE	203
W8NBK	203
W1JYH	202
W1BIH	202
W9RBI	201
W9IU	201
W2HZY	200
F8BS	198
W5ASG	196
W2GWE	195
VE3QD	195
W3OCU	192
W3JNN	191
W3EPV	191
W3DPA	191
W2AGO	191
W1AWX	191
W2CWE	190
W4GG	189
W8RDZ	184
W3DRD	183
W4INL	183
W1DQH	181
WØEYR	180
VO6EP	179
W1ZL	178
WØDU	178
W3DKT	177
I1KN	177
W8SYC	177
W9MXX	177
KP4KD	174
W8CVU	172
W3JKO	171
W2WZ	171
W9LNM	170
W2KMW	170
W9LM	170
VE3IJ	170
W6CTL	169
W1NMP	169
PY2AC	168
W2CYS	167
OK1VW	167
KH6MI	166
W8LEC	166
W2CNT	166
W6CTL	166
W4DKA	165
W9VND	164
W4LVV	164
W3KDP	162
W4BRB	162
G5DQ	160
G5DQ	160
W9FKC	160
W6EHV	159
WØGKS	158
W4OM	158
WØAIW	157
I1AY	157
W6JK	157
G8KP	156
W9YNB	155
W7PGS	154
W4VE	153
G6QR	152
W2RDK	152
G2AJ	151
W6BZE	149
SM5WI	148
DL2KW	147
G2WW	147
W8VLK	147
W2COK	146
W2GUR	146
W2MEL	145
W2BJ	145
KH6VP	145
W9TQL	144
VE3AAZ	143
TF3EA	142
W6BXE	142
W9DUY	140
G6BQ	140
G3FJ	139
W6ID	139
KH6PY	139
OK1AW	138
GM3CSM	136
W6LGD	136
W8WWU	136
OE1CD	134
W9ABA	134
G2BD	132
G5RV	132
W7ETK	132
VK4RC	131
W6TE	131
W5CPI	130
VR5PL	124
W6MI	124
W6ATO	124
G3AAK	122
DL1DA	121
G8RL	120
G5WM	120
W7BTH	120
W6NTR	119
W6MUF	118
DL3DU	118
G6BS	117
W6NRZ	117
W7HXG	115
G3QD	116
G3TK	114
W6JWL	114
W6VAT	110
W6EYC	105
W7GXA	105

CW & PHONE

38 Zones

W6LEV	103
W6WJX	101
W7LEE	91

38 Zones

W2PUD	180
CM2SW	174
W8KPL	166
W3IYE	161
W8FJN	160
W2RGV	156
W3LVJ	145
W4AZK	145
W8ZMC	143
ZS2AT	139
W2WZ	138
W9FKH	135
W4FPK	131
G8IL	131
G5CI	130
W2PQJ	130
W3ZN	129
G6LX	126
W9MZP	126
FE8AB	126
GW3AX	123
W9TB	122
GW4CX	120
WØFET	118
W6ETJ	109
W7EYS	107
KL7PJ	107
G3ZI	107
W9NZZ	98
C1CH	84

37 Zones

W2HMJ	178
W1KFV	168
W2ZA	160
W4RBQ	147
W4IWO	146
W3WU	146
GM2UU	142
W8EYE	142
W4ML	138
W2AYJ	133
W9TQL	129
WØAZT	129
W4DIA	129
VE3ACS	128
W3FYS	124
VE1EA	116
WØFWW	108

PHONE ONLY

39 Zones

W6DI	192
W6VFR	165
W7HTB	161
HB9DS	145
VE7ZM	145

38 Zones

W4CYU	173
W2BXA	173
W1HKK	153
W9NDA	152
W6KQY	145

37 Zones

XE1AC	182
W1JCX	170
W3LTU	169
W9RBI	166
W8REU	163
G2PL	154
W6WNH	153
G3DO	153
W6PXH	152
W8BF	146
W3JNN	136
W6TT	133
G6LX	124
F8VC	124
G2AJ	121
W6AM	108

36 Zones

W1NWO	165
W1MCW	160
VK3BZ	155
VK3BZ	153
W7MBX	144
W4ESP	141
W9HB	139
W9BZB	136
GM2UU	135
W6PDB	130
W4INL	129
W1FJN	128
G6BW	127
W8AUP	125
WØHX	118
VE3BNQ	115
G5YV	106
G6WX	105
W3DHM	96
W6SA	92
F8DC	87

35 Zones

W4HA	140
W6PCK	135
PK4DA	132
WØEYR	130
W6CHV	128
W2RGV	126
G8QX	123
W8ZMC	122
W2GHV	121
CE3AB	121
W9CKP	117
W9HP	117
G3FU	115
WØPUE	114
W5LWV	108
W4OM	106
W3PA	105

34 Zones

HC2JR	138
W9RNX	132
W5KC	125
W6UZX	120
W8BIQ	120
W4LZM	117
WØANF	115
W4LZM	114
W9MIR	113
W1BPH	105
W8UIG	100
W41WO	99
W8QBF	92

33 Zones

W5ASG	134
M9MIR	123
W9WCE	117
W5ALA	116
W2ZW	115
VE3BQP	108
WØANE	106
W9BVX	103
W2PQJ	100

Here's the spot where G2PL's well-known signal originates. The "outboard" mounting of the RME-70 is one answer to the "foot room" problem.

Normally, there are mostly UAØs in Zone 18.

WØFWW finally found time between servicing radio sets to check his log and bring his Zone and country totals up to date. The result of this check revealed four additional Zones and eleven countries. Better check again sometime, Lew! . . . WØDU claims Christmas business kept him off the air quite a bit in November and December, but he managed to get on long enough on December 24 and 25 to give himself a Christmas present in *FN8AD* and *AC4NC*. As Ray says, "Boy, what a Christmas present!" To top this off, his Jr. Op. and XYL gave him a Cycle Master.

W1NWO knocked off *MP4BAE* on 28 mc and *VS7SN* on 14. . . . According to W9LI, *EA6AF* has a new QTH which you will find in the usual place. W9LI got *UAØKFD* for Zone 19. . . . While in the good old 9th district, I had better tell you that W9ANT worked *AC4RF* on December 30, as did W8ZY. From what I can gather, there were other W9s in there logging him also. That was country 213 for Glen.

Gee . . . gosh . . . the mail bag is full of 'em! W9VW says he didn't think he would ever live to see the day when *AC4RF* was S8 and being QRM'd by *AC3SQ*, who was S9 plus. From what Hal writes, it looks as though AC4RF and AC4NC were very consistent during the evening hours the last two weeks in December. The funny part, too, was the fact that, apparently, they were just getting through to W8, W9, and WØ. W9VW didn't work AC3SQ, but did add AC4RF and NC, and let's not forget that he had previously worked AC4YN, which gave him his WAZ. Hal winds up by saying, "Things are in pretty bad shape when you can work an AC4 easier than you can work W6QD." I'm not hard to get! . . . How about a bribe? . . . . Now, up pops W9EVI telling me that according to OQ5EB, there are nine new Belgian Congo stations, and they are all with the American Presbyterian Congo Mission. Their QTHs will be found at the end of the column.

Last month we announced the WAZ of G2FSR, and it just occurs to me that he made it in the nick of time. Here's why. John is now located in Hongkong and is signing *VS6JH*. Most of you will recall that he was VS4JH before returning to England a couple of years ago. John tells me that he and *VS6AX* are running into a little trouble with Ws constantly getting on the frequency of the station they are working and trying to break in. He thinks all the boys should know that they are both going to be there for a couple of years, and there should be plenty of time for everyone to work them. These boys are darn good DXmen, and I would hate to see them being forced into black-listing any offenders. John also says that, naturally, everyone doesn't use this practice, but it does make it bad for a lot of Ws when just a certain few persist in this frequency hopping business.

AC4RF is being worked by quite a few of the boys these days, and it appears to us, as it does to many of you, that all of these QSOs have not necessarily taken place in Tibet, or, for that matter, in Zone 23. As you know, AC4RF was located in Lhasa for a while, and then when he shoved off, he operated portable. Some of these QSOs were made in Zone 23, while others were not. The safest thing for you, of course, is not to pass up working another Zone 23 station if there is any doubt about AC4RF being in Zone 23.

1949 DX Contest Logs

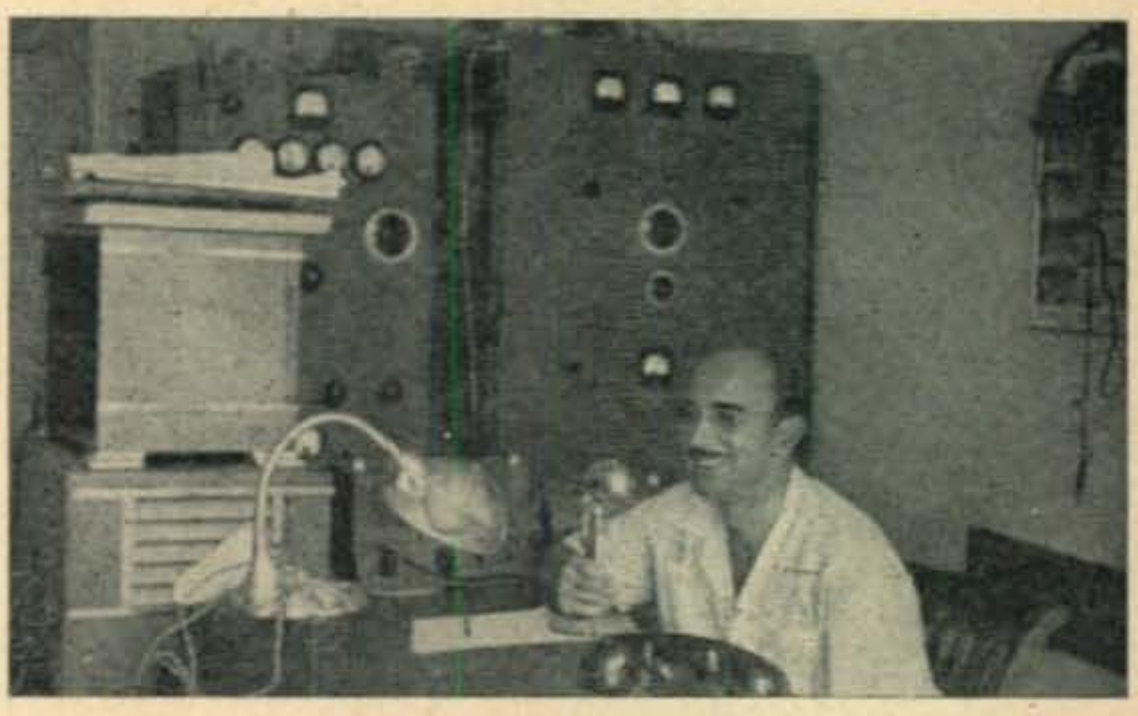
A few of the boys have written in after noticing their contest scores were not published in the January issue, wondering if their logs had arrived and if they were overlooked. The chances are that all your logs are in, but, at this time, it is almost impossible to run through about one thousand logs checking to see if a certain few are on hand. The scores I ran in the January issue were only a few that could be rounded up, either direct or through the grapevine, by November 15. Please be patient, fellows, and the official results will be announced as soon as possible. At the best, it looks like it will be May or June, since there is a terrific amount of checking and tabulation to be done.

Well, look who's here . . . old BERS-195, Eric Trebilcock. The old timers will know about Eric, but for the benefit of those who have never heard of the guy, he is one receiving station that is darn near a legend. He doesn't hold a transmitting license but probably could pound brass with the best of us. He started to log DX in 1926, and to date, he has 101,700 log entries. Since the war, he has heard 40 Zones (HAZ) and 200 countries In reply to his BERS-195 Heard Card, he has received cards from 39 zones and 163 countries. Incidentally, he recently logged a W6QD-W6CEO QSO. . . . Well, it at least proves that I was on the air. . . . ? ?

If you hear G3HCL, you better give him a blast and say, "Hello!" He is none other than ex-ZC1CL, MD1D, etc. Dan is now in England and his present QTH will be found at the end of the column.

W4TO was optimistic and sent a couple of cards to *ZC4AK*. Both cards came back and Buck sent them to me with "Pirate" scribbled on them. By the way, you fellows overseas should get a QSL card from W4TO.

(Continued on page 61)



PY2CK pauses in QSO to send his 73 to all his friends via CQ.

The 6-Meter Observing Project

O. P. FERRELL, Project Supervisor

MARY T. BERGEN, Administrative Aide

EVELYN UHL, Tabulator

(This work is supported in part by the non-profit cost-reimbursement Contract No. AF19(122)–72 and modifications with the U. S. Air Force, through the sponsorship of the Geophysical Research Directorate, Air Materiel Command.) The work of this project is conducted at the following address, and all mail should be addressed to RASO, c/o Radio Magazines, Inc., 121 South Broad Street, Philadelphia 7, Pa.

Status of the 6-meter Project

Total Number of Work Group Members:
North America—344
Oceania — 1
South America— 11
Total Number of Screened Observations—6335 (1/1/49–5/22/49)
Number of Reports Received (to date)—1422
Observers Inactivated (12/20/49–1/20/50)—4
New Observers: TI2AFC, VE3BBX, W1EZV, W2ARK, W5DYB, W5LJG, W5NXM, W4NJD, W5PVR, W6FGS, W6OB, W6UQG, W6YHR, W8OJN, W8RHM, W9UWP, WØANU, YV5AE, YV5BV, Barton, Hale, Redmond, Skinner, Zahradnick

Final Tabulations Available

In order to facilitate increased coöperation among the RASO 6-meter observers outside of North America, a plan has been set up to enable the national physical laboratory of each country whose radio amateurs contribute to the project to obtain copies of the final tabulated reports.

Representatives and Project Coördinators in all countries outside of North America have been notified. Exchange of information and reports has been arranged and has been in force between Canada and the United States since the formation of this project. This new plan, however, will enable radio amateurs anywhere in the world who contribute to the project to be able to advise their national physical laboratory or leading scientific organization that reports containing their observations are available upon request through authorized channels.

6-Meter Project May Help in Proving New Theory

For a number of years many of the 50-mc group have been aware of the apparently close correlation between erratic sporadic-E reflections and the scattering from the aurora borealis noted during severe ionospheric storms. On some occasions the two phenomena are so well mixed that it is impossible to tell them apart, except by noting the azimuth of maximum signal arrival. While a lot has been said qualitatively in amateur radio publications about this effect, it has for a large part gone completely unnoticed by the research laboratories.

Within the past year, Booker and Gordon, of Cornell University, have derived a new theory of tropospheric and ionospheric turbulence scattering. In a paper presented at the fall URSI-IRE meeting, it would appear that this theory may be applicable to the auroral sporadic-E effects observed at 50-mc. A source of quantitative data to prove or disprove the turbulence effects in the ionosphere are incorporated in the final tabulated reports submitted to the U. S. Air Force. Thus, although this project was initially organized to collect sporadic-E observations, the auroral scattering obesrvations that have been submitted may soon be playing an important part in this adjacent field. Coöperation in the use of the amateur 6-meter observations is being established, once again expanding the beneficial aspects of this hobby.

SPECIAL NOTICE

50- and 144-mc Operators

A unique situation wherein amateur radio may play an important part is likely to develop in certain portions of Colorado, Nebraska, Kansas, Oklahoma, and Texas. We are interested particularly in obtaining the names of amateurs who have operated either 2 or 6 meters and who are located in fairly open and fairly quiet radio receiving locations. If you are in one of the areas mentioned below and would like to participate in an unusual radio experiment, please send a postcard to the RASO Office. A questionnaire will then be sent to you giving you further information on the requirements.

Operators are desired from the following areas:

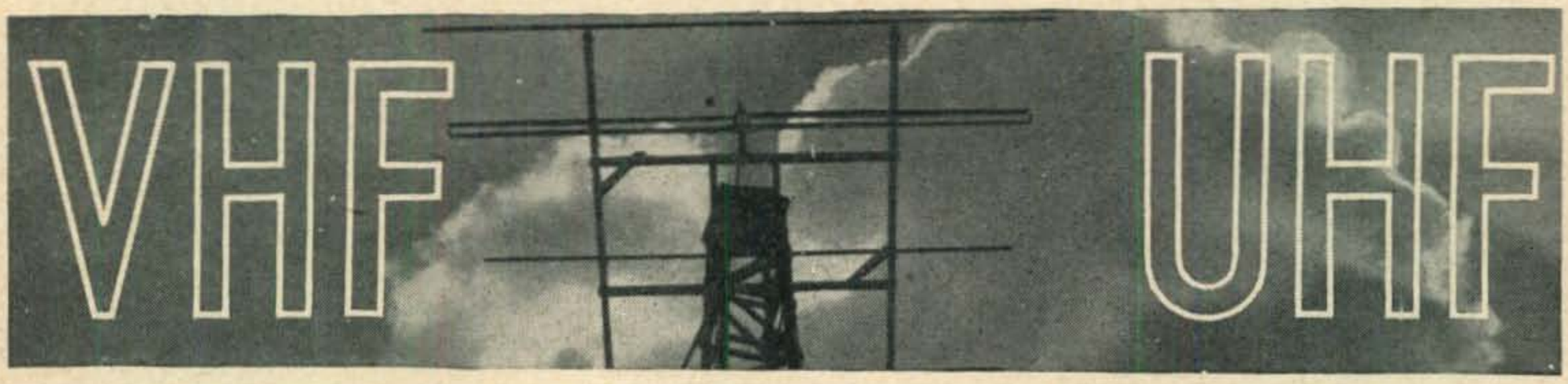
Colorado—within the following counties; Logan, Sedgwick, Phillips, Yuma, Kit Carson, Cheyenne, Kiowa, Bent, Prowers, Baca.

Kansas—West of the line formed by these counties; Washington, Clay, Dickinson, Marion, Butler, Crowley.

Nebraska—West of the line formed by these counties; Jefferson, Fillmore, Hamilton, Merrick, Nance, Greeley, Garfield, Rock, Brown, Cherry.

Oklahoma—West of the line formed by these counties; Kay, Noble, Logan, Canadian, Caddo, Kiowa, Jackson.

Texas—North or West of the line formed by these counties; Handeman, Cottle, Motley, Floyd, Hale, Lamb, Bailey.



Conducted by E. M. BROWN, W2PAU*

AS WE PREDICTED last month, the v.h.f. air-waves are filled with contest post-mortems. Wow! What a contest! Ye Ed's ears are still ringing with the countless "CQ Contest" calls, the squeaks and growls of heavy heterodynes, the groans from our hopelessly overloaded receiver . . . or are the walls of the shack still reverberating the echoes of the battle? It's a good thing that we are typing this column and not dictating it, as our voice has QSBd to a weak S1 from overwork!

Viewed from our vantage point in the Philadelphia area, the 1950 V.H.F. Sweepstakes was the biggest, the roughest, and the loudest demonstration of v.h.f. activity that the hams have ever staged. Good ol' Club Spirit was rampant, and the clubs had recruited many contest enthusiasts normally found only on frequencies below 30 mc. Record-shattering scores were run up. Good tropospheric propagation conditions made possible many extended-range contacts in spite of the mid-winter date selected by the contest committee. Around this section the six-meter signals found no hard spots in the ionosphere, so the two-meter and six-meter specialists competed on approximately an equal basis.

The official story of the contest results will be found only in a competitive publication. Let's hope that we may know the truth before too many months have passed, for the sort of enthusiasm which the v.h.f. operators displayed this year was a rare thing, and deserves all possible encouragement!

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* *Send all contributions to W2PAU, 88 Emerald Ave., Westmont, N. J.*

W2BV, winner of the Amateur V.H.F. Institute of New York's 1949 2-meter mileage contest, receives his trophy, an engraved cigarette lighter, from Ye Ed, W2PAU, while Frank Feckel, W2EXB, assistant op during the contest, looks on.

We are in a good position to pass along our grapevine version of the highlights of this year's fray. In the Philadelphia area, a three-way struggle among the Frankford Radio Club (last year's winners), the South Jersey Radio Association (number three, last year) and the York Radio Club (a lusty newcomer to big-time S.S. competition), led to the biggest turn-out yet recorded in this region. Winding up near the top of the heap were W2SAI with 228 QSOs in 9 sections, W3BES with 212 in 8, W3KKN at 210 in 8, W2BV with 169 in 10, W2PAU with 181 in 9, and many other fine scores too numerous to set forth here. It should be emphasized that these results are strictly unofficial, and have been gleaned through eavesdropping on those contest post-mortems mentioned above. In New York City, the Amateur V.H.F. Institute, tired of being runners-up for two years in a row, put on a vigorous campaign to get the boys back on the air for the contest and managed to put a team of about 50 members in the field. Early rumors put W2FHJ, W2LVQ with 170 contacts in 8 sections, W2DFV at 165 in 8, W2MCG with 145 in 6, W2PIX at 141 in 6, all near the top of the totem pole in the New York City area.

Most popular contestant according to the South Jersey delegation was W3KWF/8, operating portable in the West Virginia section. He gave many of the stations in this section their first West Virginia contact. Also much in demand was W2PCQ's mobile unit. Harold very kindly suspended operations at his home QTH which is in the Eastern New York section, and drove over to make a special low-powered set-up in the Western New York section to give the gang a chance at the added section. W4AO was active with his new high-powered rig and a 32-element beam. Ross made Virginia an easy-to-get section. Whether due to poor propagation conditions or lack of contest activity, the New England states were not too well represented, and this fact helped to limit the scores of the New York boys, who normally could figure on several extra section multipliers to the northeast.

No person in his right mind would classify the activity of the contest weekend as "normal." We feel, however, that the distribution of activity is somewhat representative of the normal distribution of v.h.f. operations in our section of the country. There were relatively few contestants who set up special v.h.f. rigs for the contest only, and these were, in the main, noted for their un-purified signals, their low-frequency "powerhouse" tactics, and their general lack of sympathy for the native v.h.f. band dwellers. Most of the stations in this category will soon disappear from the bands until the next v.h.f. sweepstakes, if our experience during the past two years is any criterion. The backbone of the contest activity was provided by the regular

operators of the two- and six-meter bands, which is why we are devoting so much time to an analysis of the contest results.

The six-meter band got a fair share of the attention. It is likely that the picture on six was slightly less typical than it was on two, since there are many of the boys who had six-meter coverage on their commercial receivers and converters. They found it easy to toss a low-powered rig together to take advantage of the possibility of working a few more stations on this band. A large percentage of the six-meter stations were also heard piling up points on two meters. Six-meter specialists, devoting full time to this band alone, managed to dig up in the order of 50 stations. W2BAY ran up a total of 40 QSOs in 6 sections. Perry Ferrell logged 47 stations on six. This compares with the total of over 170 stations worked in 10 sections by W2BV, operating exclusively on two meters from approximately the same geographical location. There were, of course, many stations heard on two that were not worked.

From a standpoint of ground-wave range, the two bands checked out to be approximately the same. We managed to scrape out a c.w. QSO with W1HDQ (approximately 190 miles distance) on six meters, and we had to use the same sort of tactics on two meters. At our location two meters seemed to have the slight edge, but this may be due to the more favorable antenna location. The same relationship was noted on other extended-range QSOs. In almost every case the two-meter signals of a given station were stronger than the six-meter signal of that station. Of course, there seemed to be a slight "band opening" on two which apparently did not extend down to 50 mc, but we have noticed this condition so often this winter that we have come to consider it practically "normal."

The contest gave us a fine chance to observe, statistically, which antenna polarization was most prevalent in our section. W2JAV of Hammonton, S. N. J., (144.3 mc, 500 watts) tried several CQs in all directions using horizontal polarization. Finally he got a response from the north. When asked how he was doing with his horizontal polarization, the guy on the other end came back with remarks to the effect that he was d—n well using *vertical* and cut out the funny business! Ye Ed got 3 good QSOs on horizontal, W3OWW of Stewartstown, Pa., W3AIR and W3RE both in the Washington, D. C., area, out of a total of 148 two-meter contacts. This may serve to demonstrate what we mean when we say that you will have a better chance of working stations on the northeast Atlantic coast if you use vertical polarization!

Pro and Con

A little comment on the pros and cons of contests on our v.h.f. bands seems in order. During the past weekend there were many hard feelings built up by the all-out contestants who valued a contest QSO more than they valued the friendship of the fellows whose rag-chews they were breaking up with their VFO tactics. There were cases where high-scoring contestants were apparently black-balled by members of opposing clubs who wanted to keep the individual-high score under the club banner. There were too many downright dirty signals cluttering up the bands, making it impossible to hear those weak signals coming in from the remote sections. There were the inevitable cases of rapid equipment sale, whereby a contestant suddenly withdraws from the contest and transfers his equipment to another club member, who proceeds to work stations at a heck of a rate because of the novelty of his call-letters. There were plenty of cases

The Rochester, N. Y., V.H.F. Group. Organized in 1949 to promote v.h.f. activity in the Rochester area, this group has built up interest in the higher frequencies by equipment demonstrations at the local hamfest and by sponsoring an operating competition. The present high state of the art in Rochester is a tribute to their efforts.

where the requirements for "bona fide resident club membership" were rather loosely interpretted. Although these tactics were not generally employed, there is no doubt that they were used to a certain extent. No particular group was exclusively guilty of these sins. If the shoe fits. . . .

Ye Ed is in no position to "throw the first stone," being in the situation of operating the v.h.f. bands year 'round, and at the same time having a big interest in the outcome of the club competition. We noted with interest the editorial comments of Bill McNatt, W9NFK, editor and publisher of the *V.H.F. News*. Bill draws the analogy between the type of contest we just went through and a thorough-going binge. That is a most apt comparison, Bill. Some of the operators got downright "mean" on their binge, others seemed to be having a lot of fun. The true nature of the individual operators showed up, clearly. Some of them will have hangovers and may well be ashamed to show their faces on the band for some time to come. Others may have learned something from the experience and will be back, mellowed therefrom. Some of the neophyte contestants got their first taste of v.h.f. activity, and of these, some are bound to like it. Others made a big investment in equipment just to get in on the fun, and they won't want to see it going to waste throughout the year. In short, we may possibly have gained more than we lost.

At least, the sudden increase in activity, even though temporary, opened the eyes of many of the gang to the fact that we can work distances a good deal greater than "line-of-sight" even in mid-winter. Enough on contests. . . .

UHF Activity, Commercial Style

A new u.h.f. broadcast service was initiated in January, 1950, when KC2XAK, an experimental station of the N.B.C., commenced regular operations. Operating on frequencies of 530.25 (picture carrier) and 534.75 (sound), the new station will carry the same programs as WNBT, N.B.C.'s New York outlet.

This new service is of interest to u.h.f.-minded hams, since it provides a powerful and dependable signal not too far removed from our 420 mc band. The 420-mc operators in the Bridgeport, Connecticut, area can, by stretching the tuning range of their receivers to 535 mc, be assured of at least one good u.h.f. signal for checking propagation conditions, receiver adjustment, etc. The techniques used by the designers of this installation may serve as a guide to the pioneering hams who are attempting to utilize our u.h.f. bands to their fullest extent.

KC2XAK is located atop Success Hill, Stratford,

(Continued on page 42)

Inside the SHACK AND WORKSHOP

Filing your CQs

This idea may be useful to those fellows who keep their back issues of *CQ* in a binder. Generally I have found it necessary to stumble around through several issues before locating the particular month that I am seeking. If I use the December yearly index, it solves part of my troubles. But, to cut the hide-and-seek to a minimum (even in a binder), I have put the name of the month on the front edge of each issue.

This is easily accomplished by taking a single issue and bending it over the edge of a table or desk in order to spread the front edges. Then, using a pencil or a ball-point pen, I mark the appropriate date. When all the issues are in the binder, any month may be instantly picked out.

Nathan Tumminello, W3ELH

Coil Shield from Old Metal Tubes

The metal shells of old tubes make excellent coil shields if care and a little patience are exercised in removing the old tube elements. First, the tube base is carefully removed by prying up the places where the metal shell is crimped to the base plug. Then carefully work a knife blade around the edge of the base and slowly pry it off. The leads from the inner glass base will stretch, so this can be accomplished quite easily.

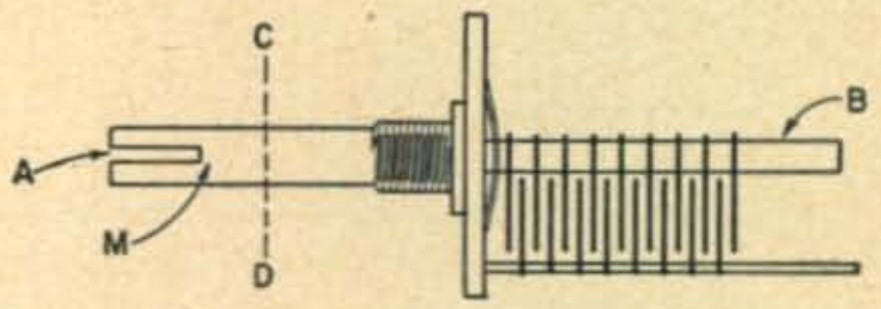
Next, with a pair of pliers snap off the glass tip that was used to seal off the vacuum in the tube. Lay the tube shell on a cloth to prevent scratching, and with a tack hammer and center punch knock out the glass interior. Clean out the interior, leaving only the metal shell. Using a rat-tail file, cut the apron or lip inside the shell to a reasonable diameter to allow free passage of the coil form and leads. Drill the proper size hole in the top of the shell to mount the form.

Make the leads from the coil extra long to permit easy insertion into the base pins. Solder a wire to the inside of the shell, near the shoulder, to bring the shell to ground potential. Bring all coil leads through the base pins and carefully work the base plug up into position. After the coil has been pruned and the range may be covered by the slug, crimp the edges of the metal shell back on the base plug.

Antonio G. O. Gelineau, KP4FN

Ganging Surplus Tuning Condensers

A surprisingly large number of surplus condensers, especially those low capacity values which are useful in v.h.f. work, have no provisions for ganging. However, I have used the following method with great success. A cross-section view is shown similar in appearance to many of the silver-plated models. Note that most of these units have a bore in the shaft at *A*. The size of this bore is such that shaft extension *B* would be a very tight fit. Accordingly, saw off a portion of the shaft at line *CD* and force fit it on extension *B*. This latter process is best worked in a vise, making sure that the saw cut is "square." Tighten the jaws of the vise until the extra coupling section is rigidly in place.



Peter J. Saveskie, W2JFE

6-meter Bandscanning Converter

This system of scanning the lower end of the 6-meter band has been in use for several months and has proven very helpful in getting in on the DX openings. It is slightly different from the one described last month by W9ZHL (*CQ*, February, 1950, page 28), since the drive motor continuously rotates a small trimmer condenser that parallels the oscillator tuning condenser. The motor is a "Green Flyer" phono motor with two speeds—33 1/3 and 78 r.p.m. The motor first drives a stepdown gear with a ratio of about 11 to 1. This in turn rotates the small tuning condenser at a speed of 3 to 7 r.p.m., or in other words, the desired portion of the 6-meter band is swept 6 to 14 times per minute (remember the capacity change is twice the shaft speed). The gear box itself was removed from a Firestone automobile radio dial.

Undoubtedly, different small gear trains and boxes are available in surplus, some possibly with larger stepdown ratio than mine. As a safety feature, and one that should be included in all similar installations, we have a Mercroid switch in series with the motor which kicks off on any overload (for example, should the gears bind, etc.).

Orin L. Chappell, W6TMI

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DESIGNED FOR THE REVOLUTIONARY 16 inch RECTANGULAR TUBE!

Now at last, see the whole picture exactly as transmitted on a big 16" rectangular screen. No lost corners! No corner distortion! The new black face increases the contrast, eliminates glare. Even old films are reproduced on this new history-making National chassis with a sharpness and clarity never before achieved!

ALL-NEW CHASSIS features a highly sensitive turret tuner, four stages of I.F. for extra gain in fringe areas, and a full 4 mc. video bandwidth for magnificent "hair-line" fidelity!

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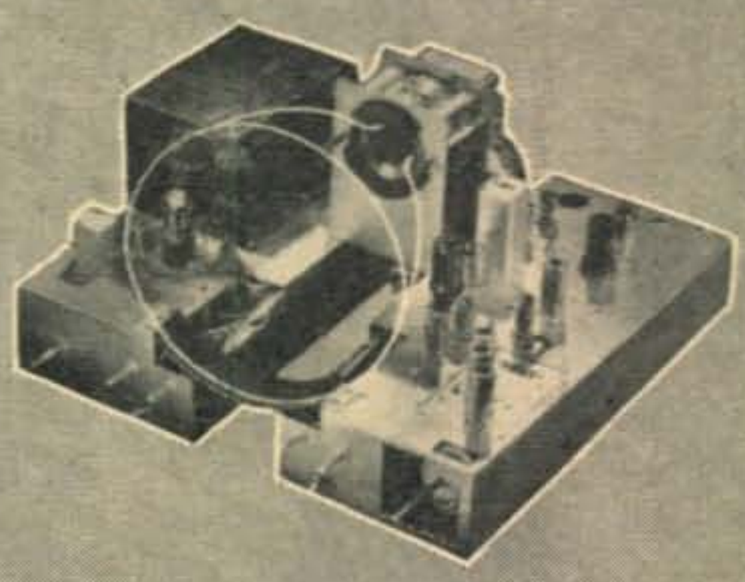
See the Whole Picture!



MODEL TV-12C 12½" CHASSIS

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Conducted by RALPH V. ANDERSON, W3NL*

THE PROPOSED CONSTITUTION for the Maritime Mobile Amateur Radio Club was mailed to all MMs listed by the Secretary. The response to questions has been terrific. The Secretary is compiling the results, and the Constitution, as suggested by the majority, will be mailed to all MMs as soon as possible. Memberships are coming in quite well. If you haven't yet done so, send in your five bucks with information on your station to W3NL.

"Commodore" Ady, W6YYT; Andy, W3NL; and Robby, W3ICW, could be found roaming the streets of Washington one night during January. Ady took advantage of a few days off and flew to Washington and New York, visiting the operators of several stations which regularly work the MMs. W2ZGE, American Merchant, was heard on the Voice of America on Christmas Day at 1915 GMT, telling the world about ham radio, sea-going style. W6HK, Frank, has established a network of stations consisting of W6GAI, W6LYD, and W6RIA. This net guards the frequency of 28.772 each day at 1600 and 2000 GMT.

Short Story

While in the Red Sea bound for New York, Herb, W1LDH, (SS. Steel Voyager) contacted an old buddy, Hutch, W5ZXI (SS. Fullerton Hills), bound for the Persian Gulf from Germany. It appeared they would meet in the Suez Canal.

While QSO, Hutch remarked he was out of razor blades and tooth paste. His face had that 5 o'clock (MM time) shadow and his teeth, a golden bantam look. Herb decided this should never do. Suppose Hutch had the opportunity to visit a harem while in Arabia? One never knows! It was decided the articles should be hauled from one ship to the other. Herb made up two packages, just in case the first one should land in the drink.

All was silent between the two until within ground wave distance. Sure enough, both were in the Suez Canal moving slowly toward each other; S-meter readings started to climb higher and higher. But now a new situation arose—darkness had come over Suez. With S-meters off scale, how could it be determined when the ships were abeam? Perhaps a Greek or Norwegian ship might be the recipient. Hutch, having been a Boy Scout many years ago, secured his trusty flashlight to use blinker when he thought they were approaching. Herb, not trusting his throwing arm, enlisted the services of a Cleveland Indian fan to do the honors. A blinking light appeared. The big moment had come! Everyone held his breath. The ships were 50 feet apart. The first, then the second, package was hurled. Both landed on deck! Back to the rigs, "Mission Suez" was completed. Even though the packages didn't land in the drink, the boys still think it was a close "shave."

Shorter Story

W2PFL/MM, while QSO Dallas, was asked if anyone was aboard who would like to speak to anyone there. W2PFL immediately thought of the storekeeper who was born in Dallas 59 years ago, and routed him out. The only one he could think of was his brother, as he had not been in Dallas for 20 years. Furthermore, due to a family quarrel he had not spoken to his brother for 25 years. The hams prevailed, and soon the brothers were talking. Things between them were patched up and arrangements made for a family reunion as soon as possible.

Still Shorter Story

W5OTF dragged his Globe King aboard the Gulf Pass and set it up in the masters quarters. All ready to operate, he found to his sorrow that the incumbent "sparks," W2KEZ was already blasting the ether with his 400 watts. Apparently the honeymoon didn't last long, because now W5OTF can be heard putting out CQs from the Gulf Key.

Calling Frequency

Many reports have been received in response to the request for a "calling frequency." While many frequencies have been suggested, it appears that 29.640, in use by the Chicago and St. Paul clubs, is used by more individual mobile operators than any other single frequency. These two mobile clubs are now using this frequency in conjunction with law enforcement agencies. If this frequency were universally adopted for mobile calling, and monitoring established, it would be a decided advantage to any mobile during an emergency. Since it appears that this frequency would call for the fewest changes throughout the country, it is therefore proposed that 29.640 be established as the universal calling frequency for ten meter mobiles. How about it, mobile clubs?

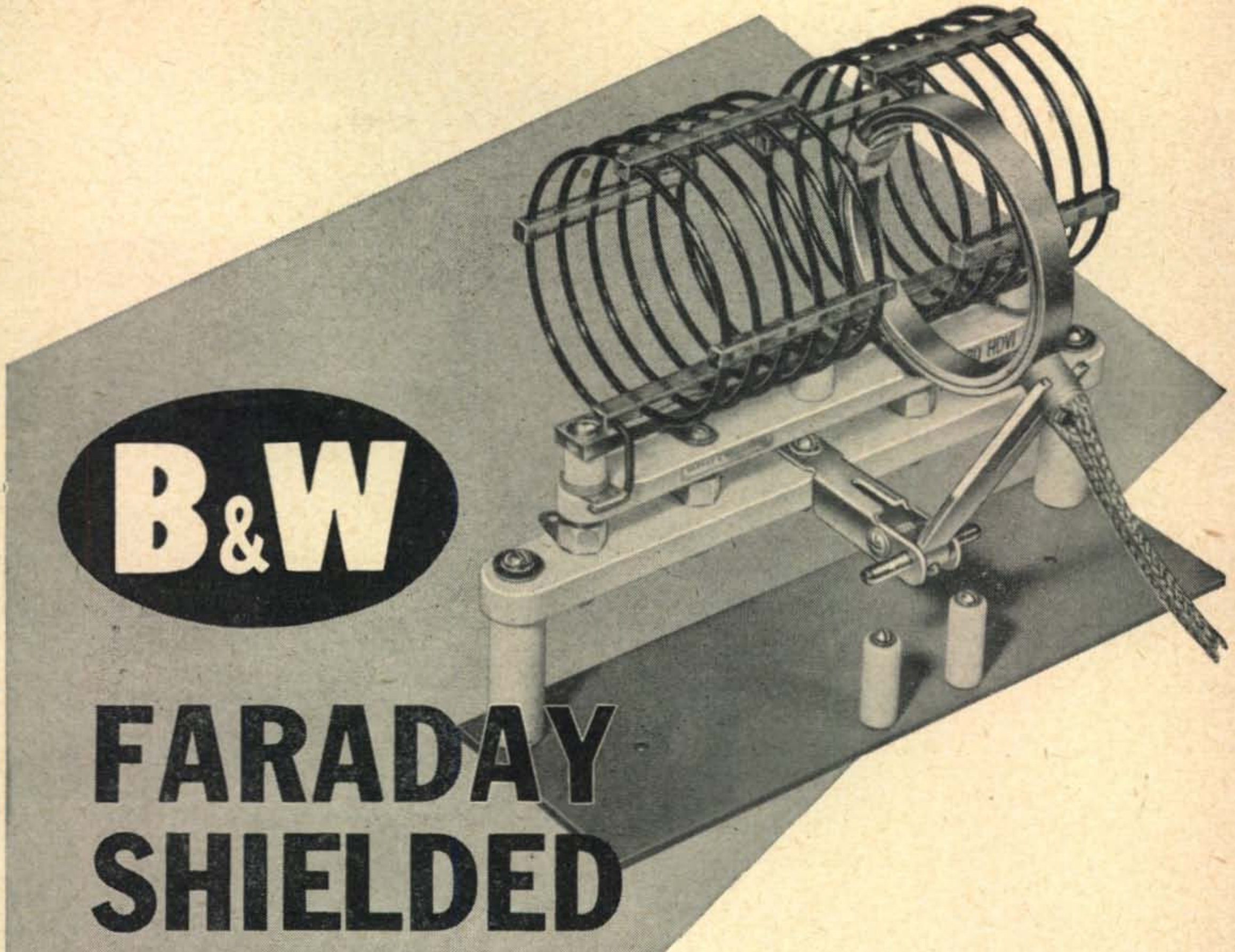
There have not been sufficient suggestions for the proposal of a calling frequency for other bands.

Mobile QSLs

Many of the fellows have asked that this column appeal to the fellows once more to please QSL mobiles and to please mark the card as a mobile QSL. This appeal has also been made in other

(Continued on page 60)

** Send contributions to R. V. Anderson, 2818 Que St., S.E., Washington 20, D. C.*



B&W

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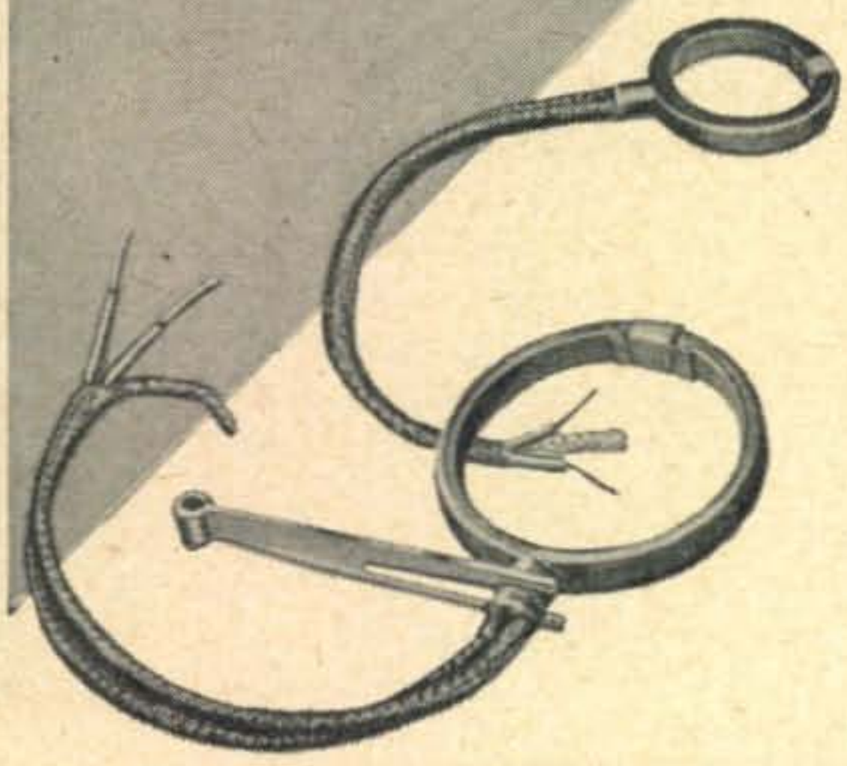
. . . for reducing TV and BC interference



Barker and Williamson offers amateurs an effective method of reducing harmonic or spurious signal radiations, normally transferred by capacity coupling, that are always present with a conventional open wire link.

These shielded links are adaptable to all conventional link-coupled circuits and with external antenna tuning units or, in conjunction with harmonic reduction filters of either the low-pass or band-pass type. Available for B&W HDVL, TVL, TVH and BVL Series.

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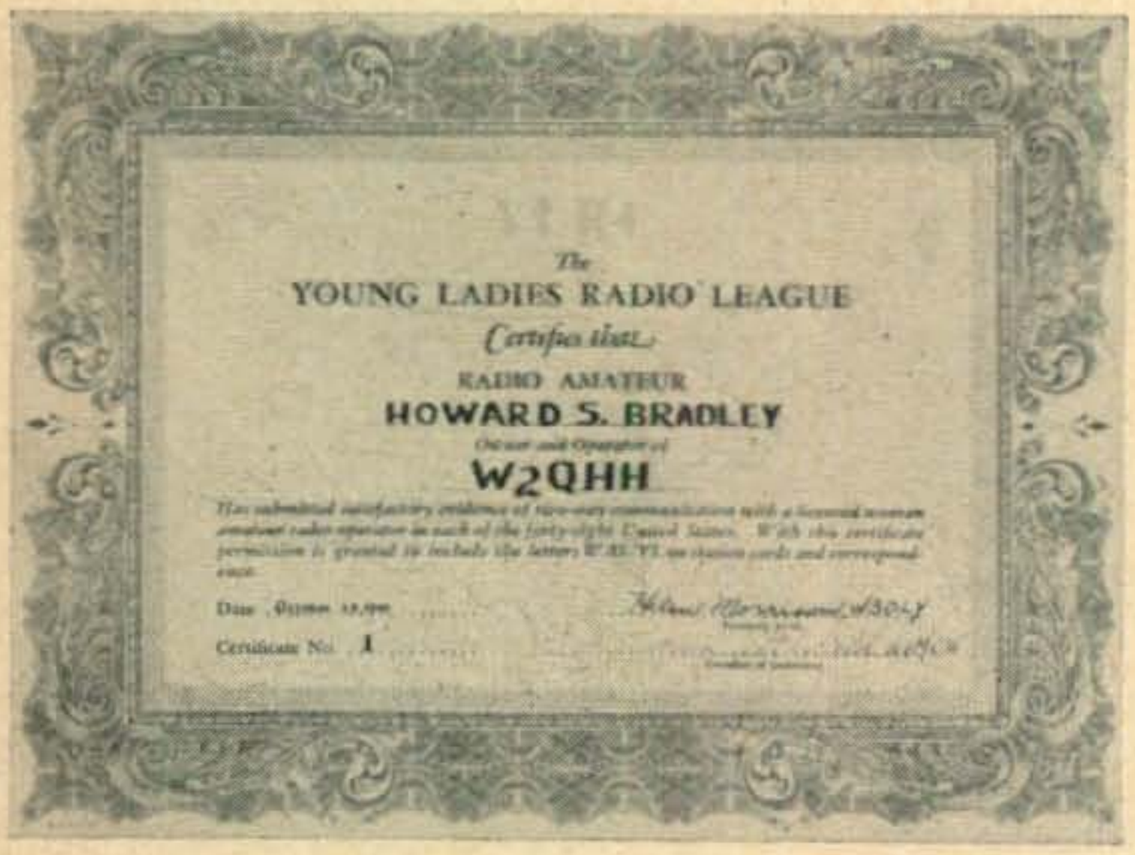
Conducted by LOUISA B. DeSOTO, W7OOH*

IT'S FUN TO RECEIVE so many pretty Christmas cards, and my thanks to all who sent them our way. It is fun, also, to have the notes that accompany the cards, and much of our news this month was gleaned in that fashion.

Hope you all had a pleasant holiday season. Ours was most unusual, and we just have to tell you about it. After visiting W5CA and his XYL at Tijeras (near Albuquerque, N. Mex.), we spent several days visiting the Indian pueblos in the Rio Grande Valley, watching the various Indian dances (Matachina, Corn and Buffalo), making new friends, eating delicious new (to us) food (such as chile and venison, parched corn, piñons, paper bread—made of blue corn and just as thin as paper), and coming back with some lovely gifts of handmade pottery and turquoise and silver jewelry. It seemed a far cry from the world of radio, yet within a few miles are Sandia Base, Los Alamos, etc. That's one of the wonderful things about this great Southwest—the amazing contrasts. . . . No, I'm still not working for the Chamber of Commerce—hi!

From Lil, W2PMA, we learn that the New York City YL Club has as its new officers W2RAQ, Catherine McFadden, president; W2QWL, Mignon Rosenfeld, vice president; W2QGK, Sophie Lash, secretary, and W2TTO, Catherine Wallach, treasurer.

** Associate Editor, CQ. Send contributions to Verde Valley School, Sedona, Arizona.*



Here it is—WAS/YL certificate No. 1, mentioned in last month's column.

From San Diego the club news is of their Christmas party held at the home of W6ZYD and W6AMQ, with eight couples present. They had a 23-lb. turkey with all the trimmings, exchanged gifts, sang songs and had a general gabfest. The YL Club, by the way, has voted to support the AEC project in San Diego. The AEC is trying to get a headquarters building in Balboa Park for an emergency station, and the YL Club is planning to provide a transmitter and receiver for 40 meters.

By the way, we owe Jean, W6ZYD, an apology. Twice in this column recently in photo identifications her call has come out as W6ZXD instead of ZYD—if that printer's devil slips in again, Jean, guess you'll have to change your call! And last month in the same group picture Neva was identified as XXI instead of W6YXI.

Bea, W7HHH, writes: "Guess I forgot to tell you about a wedding that I attended a couple of months ago. Phyllis Coe, W7KSA, became the bride of Ed Long, W7ENC. They are making their home in Sitka, Alaska, where Ed is affiliated with a BC station. Phyllis worked with the Red Cross during the war and afterward in England, Europe, Korea and Japan. Ed was with ACS, so Alaska is no new adventure to him. Phyllis hopes to be on the air soon."

The following, labeled "from just an old-timer in Erie, Pa.," came our way: "First let me apologize for crashing in on the 'YL' frequency. In the 30-odd years I have been a ham on both phone and c.w. I have always admired a good first, clean note and good spacing. The other night I heard W2ZRO, who has nightly skeds on 3554. She has one of the most perfect fists I have ever heard. Have found out that she is totally blind and is a high school student and lives in Scottsville, N. Y. Oh, yes, by the way, you can take the weight off your bug if you work her, but brother be prepared when she comes back—hi!"

YLRL Anniversary Contest

The 10th YLRL Anniversary Party was lots of fun and the gals were all in there working hard. The scores all having been laboriously checked by W3NNS, here are the results: Winner, W7HHH, Bea Austin, who now takes possession of the Littlefield Cup. Bea's score was 3781 points. The high scorer in each district will receive a certificate, and they will go to: W1FTJ,

(Continued on page 60)

V.H.F.—U.H.F.

(from page 35)

Connecticut. The 210-foot tower raises the effective height of the antenna to about 400 feet above sea level. The antenna itself is similar in general appearance to the familiar FM Pylon, and measures approximately 40 feet, top-to-bottom. (You've gotta make 'em big, even at u.h.f.) The antenna has a rated power gain of approximately 20 over a dipole, and is omni-directional. Horizontal polarization is used. A specially-developed r.f. transmission line is used to minimize feeder losses.

The picture-carrier transmitter is expected to put out close to a kilowatt on peaks, and the f.m. sound-transmitter runs at about half this power. Emissions are in accordance with present-day low-band TV standards. Both transmitters utilize a number of relatively small tubes (4X150As), effectively operating in parallel, to achieve this output. The antenna gain boosts the effective radiated power to over 15 kw.

The purpose of this experimental installation is to explore the possibility of commercial utilization of the available u.h.f. channels. Special receivers will be installed in typical home locations in the area to be served by the new transmitter, and numerous mobile and fixed-point field strength surveys are planned to provide propagation data.

420-Mc Activity in South Jersey

At the insistence of the members of the local "420" net, Ye Ed recently spent a very pleasant evening at the home of W2JRO, Camden, listening to the activity on this band. These boys have made surprising progress in the past few months. Solid S9 signals over distance up to 10 miles were the rule, not the exception. The only reason that we didn't hear more "DX" was that there wasn't any activity beyond the members of the net! Smitty's rig uses a pair of 316s in a line-controlled modulated oscillator. Plenty of r.f. was in evidence—enough to flash a neon bulb easily and light a "twin-lamp" on the 300-ohm ribbon feeding the 16-element beam. The biggest signal on the net frequency was W2WUP's. Walt was pushing a pair of 703s into a 24-element beam. W2OQS has his 316s boxed up in a solid shield-can to reduce radiation losses in the shack. He had also painstakingly trimmed most of the insulation from between the wires of the 300-ohm ribbon feed line! W2ZNB was in there with a pair of 6J6s running about 12 watts input. The most popular receiver was the APS13, practically un-modified. However, all the signals were plenty copyable on a very haywire super-regen which used a self-quenched 955 as the detector! The fellows are having a lot of fun on this band, and are looking for new fields to conquer. They admit that they have a long way to go; they want good r.f. amplifiers for the receivers, low-loss feeder systems, more power, higher-gain antennas, etc., just as much as the next guy, but in the meantime they are active on the band, learning a lot about how these frequencies behave.

From where we were sitting, it seemed to us that 420 mc looks like the only ham band where the fellow with a one-tube modulated oscillator and a super-regenerative receiver can get on the air, find some activity, and compete on nearly an equal basis with the other fellows on that band. The equipment we saw was certainly not fancy—there were no plumbing nightmares or precision machine-shop jobs in sight. The compact phased antenna arrays can be soldered together in a matter of minutes. In short, what are the fellows waiting for? This looks like the early days of the old five-meter band all over again! No TVI was in evidence—there's a big incentive!

Among those stations active in the Camden-Philadelphia area are W2s-OQS, JRO, ORS, PWP, QPC, PEN, RJQ, UNH, WUP and ZNB; W3s-GNA, AYG, IJO, KEA. If I missed any, let me know!

Six Meters in Review

There have been a few reports of ionospheric DX during the past month, but on the whole, conditions might be classed as relatively quiet. Sporadic E provided most of the excitement, and the early days of December brought almost nightly reports of "short skip." These were, in general, pretty spotty openings, and no records were established for activity or signal strengths. The MUF climbed tantalizingly close to 50 mc on several occasions, but, perhaps due to lack of day-time activity, very few long-range QSOs resulted. The automatic beacon transmissions of VE1QZ were logged on a few occasions (as reported in last months column), but to date Oscar has had bad luck in timing his listening periods to take advantage of the transient conditions that made these reports possible. He missed a QSO with W7QLZ on December 14 by a matter of minutes!

In other parts of the world, things were a little livelier, the South American reports showing frequent extended range contacts. KH6PP continued to prove that things are different in the Islands by knocking off a flock of ZLs on the evening of the 10th.

Things looked a little better for the Ws on December 31 when an excellent F-layer opening developed between the Hawaiian Island and the U. S. west coast. KH6PP worked K6BF and VE7DU (a new country for Gene) with very strong signals both ways, which held up for over an hour. Very few stations were active, at this time, so the opening almost passed unobserved.

We have little information on the status of the band during January. On the 8th, HC2OT broke through for QSOs with some of the W5s. We'll try to dig up more information on this one before next month! A big ionosphere storm scheduled for the weekend of the S.S. contest failed to materialize, much to the relief of the two-meter contestants!

See the RASO News Letter for more six meter notes, and keep those reports coming in. . . . . See you next month 73 Brownie

ANTENNA SUPPORTS

(from page 29)

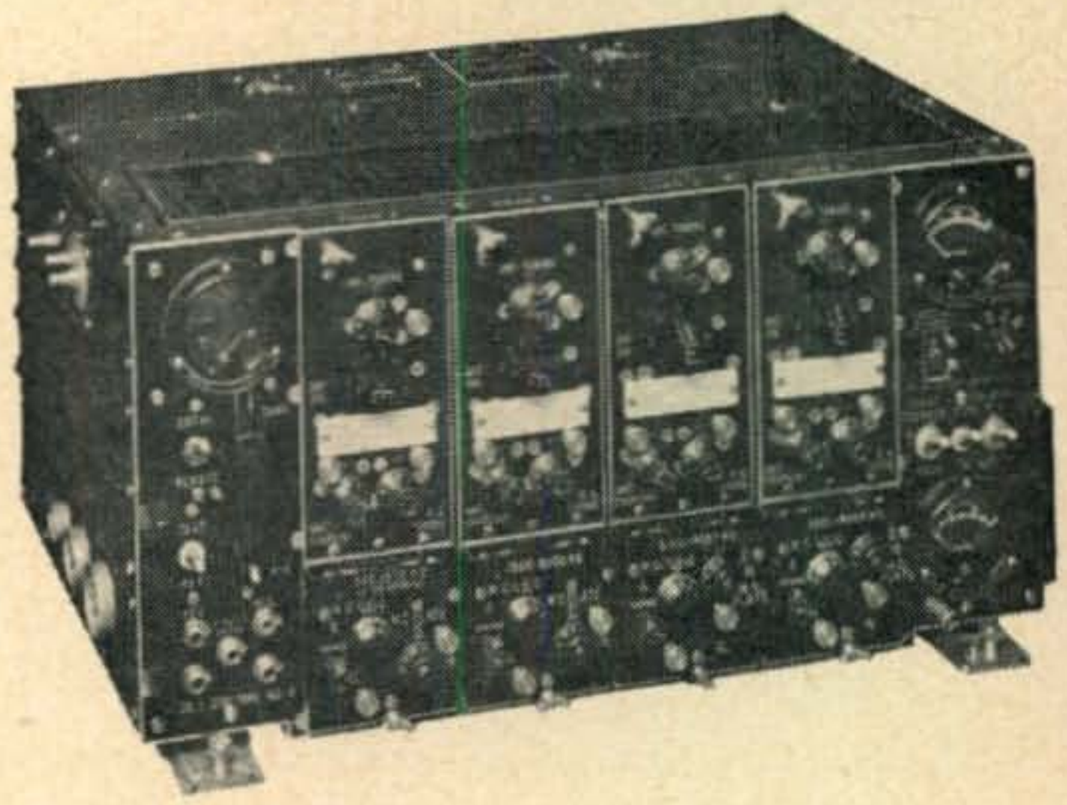
Inspector; join the AEC and enlist the neighbors' aid in erecting the mast or tower structure. When they know what the AEC stands for, they will be more than willing to help through a sense of importance. If there is one disgruntled neighbor who does make a squawk, being a member of the AEC presents a wonderful argument to the Building Inspector for leaving the tower or pole standing in the interest of good citizenship and public welfare. But—you had better be sure that your tower meets all mechanical and structural safety requirements if you want to convince him.

Wind loading is not so great on a telephone pole. In fact, 2/3 of the total factor values of the previous formula can be used in computing wind loading on a round pole. A glance at *Fig. 2* will show why.

Now the question regarding final placement of your supporting tower. If you intend to mount your tower on your house or garage roof, be certain the roof is sufficiently "beefed up" to support the added weight. The garage is the most logical of the two because it's easier to work on the rafters from the inside. Guying presents less of a problem too. When placing your guys *do not guy simply to the four corners.* It's a good way to lose your roof with wind loading on the tower. Come down three or four feet on the corners of the garage.

Esse's Special Offer

NAVY MODEL ATD AIRCRAFT RADIO TRANSMITTER



Frequency ranges 200 Kc. to 15,800 Kc. Power output 50 watts CW, 40 watts phone. This transmitter designed for location in cockpit or points adjacent on Navy type single or double cockpit planes. Powered from ship's 24 to 28 V. Source Maximum current drain 18 amps. The model ATD is furnished complete with the following units:

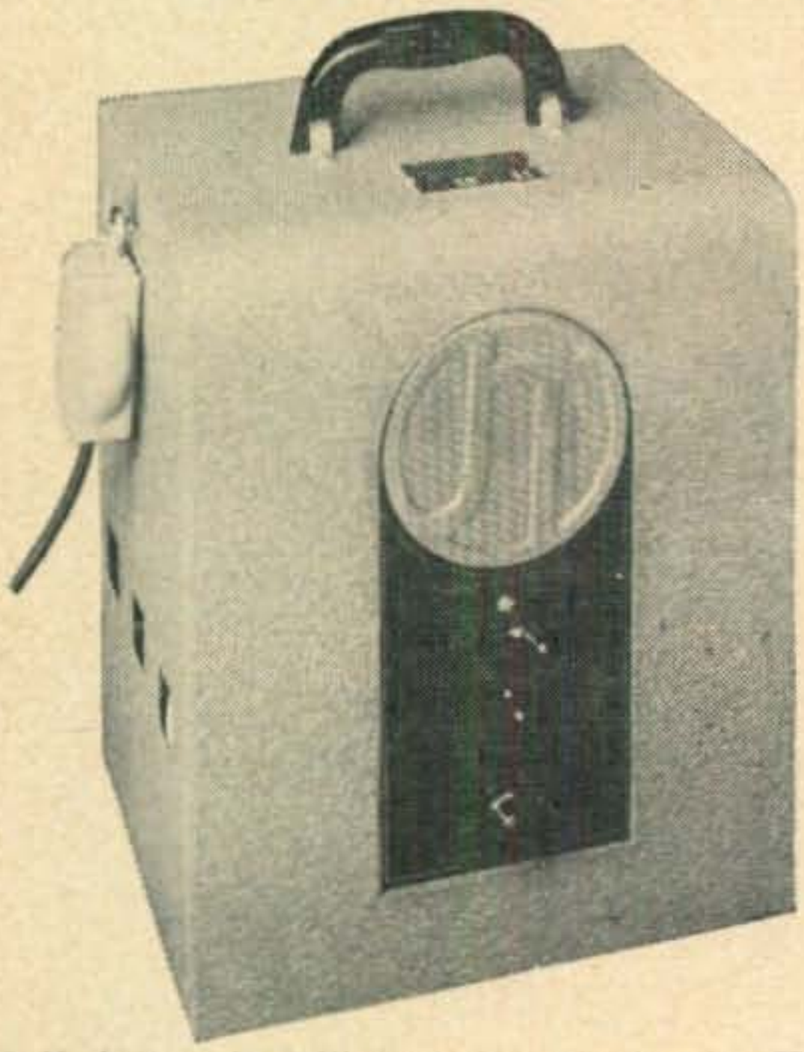
1 type CRR-52253 aircraft transmitter unit consisting of one set of mounting racks and 4 tuning units as follows:
- 1 type CRR-47207 tuning unit 200–540 Kc.
- 1 type CRR-47208 tuning unit 540–1500 Kc.
- 2 type CRR-47210 tuning units 3000–9050 Kc.

1 type CRR-21748 dynamotor assembly unit.
1 type CRR-55079 remote indicator unit.
1 type CRR-23280 remote control unit.
1 set of operating spares in spare parts box consisting of spare tubes, condensers, motor brushes, etc.
Necessary plugs for attaching cabling.
Moisture and dust-proof covers for transmitter and dynamotor.
1 Instruction book.

The unit is remotely controlled to select any one of 4 frequencies and to start and stop the transmitter. The ATD aircraft transmitter is manufactured by Bendix and is truly as fine a piece of equipment as we have ever purchased. The unit is ideal for aircraft installation, marine installation or for amateur uses. We have only 8 of these units in stock; therefore, rush your order.

Brand new **$225.00**

JEFFERSON–TRAVIS MARINE RADIO TELEPHONE



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

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

These units were manufactured and made to sell for much more than our asking price. From reports and information obtained by E.R.C. before the purchase of these sets, we were told that they are operating from 35 to 50 miles off the coast to shore stations or between other aircraft. We were not fortunate enough to obtain a large quantity of these units; therefore, rush your order to assure your purchase of one of these excellent bargains. This is brand new factory-packed merchandise. Our Price **$79.50**

BATTERIES, Suitable for above equipment

Willard rechargeable storage batteries, brand new.

6 V. battery in spill-proof clear plastic case. Housed in metal case for easy mounting. Also, this battery is applicable for a wide range of uses where battery power is needed. Shipped dry. Uses standard battery electrolyte available at any drugstore, 1.265 specific gravity.

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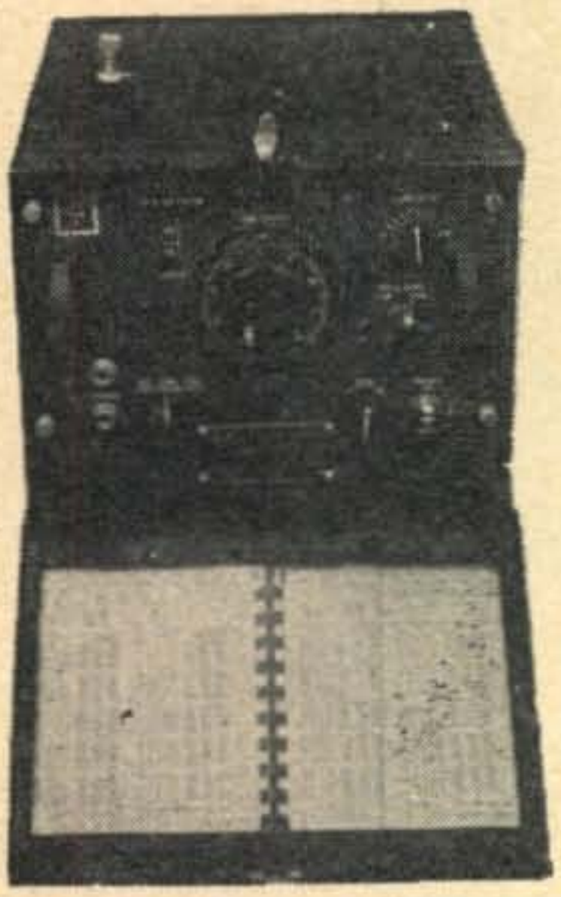
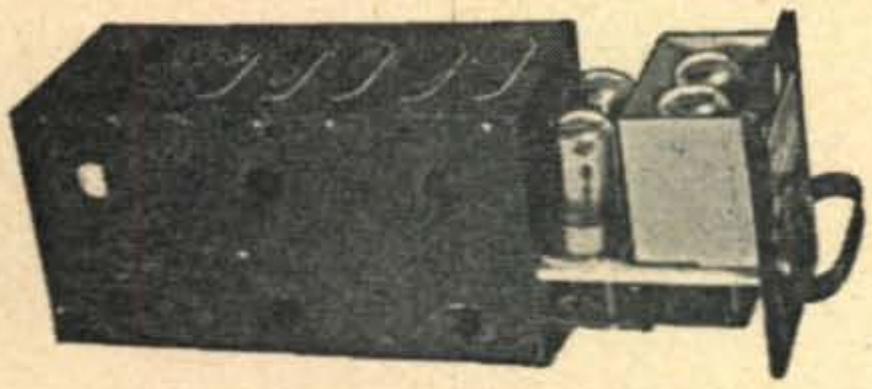


E2GO BC-221 FREQUENCY METER. Covers 125-20,000 Kc, Battery operated. **$89.50**
With modulation **$100.**00

TELRAD 18-A FREQUENCY STANDARD. Checks signals in the range of 100 Kc. to 45 Mc. with a high degree of accuracy. Self-contained power supply is 110, 130, 150, 220, and 250 V. 25-60 cycle AC. Complete with tubes, dual crystal and instruction book. **$24.95**



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Used for parts—shipped complete with the following tubes:
2 ..... 7 C5's
1 ..... 7 Y4
1 ..... 7 F7
Price ..... **$1.75** ea

TELEVISION SWEEP GENERATOR

MODEL 1215, made by Sarkes-Tarzian Co., Bloomington, Indiana. A beautiful piece of equipment housed in heavy gray steel case about 10" high, 18" long, 8" deep. Has output meter, adjustments for zeroing, base line, sync. phase, cutput attenuator, marker and channel dial controls, sync. output jack on front panel. 110 V. 60 cycle power supply and lighthouse type tubes included. Original cost over $600 each. Our 'price, brand new **$90.**00 Good used **$70.**00

RCA part No. 91445-511 IF Transformer. 455 Kc. 2nd IF. Lug connection on bottom. Recommended with 6SK7 tube. Mounted in .02 zinc can 1.375" sq. x 3.30" high. ... **.50**

IF TRANSFORMER. RCA part No. 91445-504 455 Kc. 1st IF. Recommended with 6SK7 tube. Grid lead 4 2/3" long. Lug connection on bottom. Mounted in .02 zinc can, 1.375" Sq. x 3.30" high ..... **.50**

IF TRANSFORMER, RCA part No. 970294-1. Permability tuned 10.7 Mc. 1st IF position. Recommended with 6BA6 tube. Lug connection on bottom. Mounted in can 1¼" sq. x 2 9/16" high ..... **.75**

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PLUNGER TYPE RELAY. Ideal for remote door lock control. 110 V. AC operation: New. ..... **.80**

RELAY, made by RBM. 110 V. 60 cycle AC., DPDT make before break blade type. 15 amp contacts. Coil shielded from contacts. Brand new .. **$1.00**

RELAY, Leach type 1024-A 100 ohm coil, DPST. 10 amp contacts. New **$1.25**

RELAY, Allied control type BJ. DPDT, Model 1PO5. 24 V. DC 5 amp contacts. Brand new. .... **.75**

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A close-out bargain

Clean, Sparkling Dishes in 2 Minutes Flat
Now you can free yourself of the everlasting drudgery of washing dirty, greasy dishes! Just put 'em in "Her Majesty" Automatic Dishwasher for a couple of minutes and forget 'em!

THIS IS THE MOST STUPENDOUS BARGAIN THAT WE'VE EVER OFFERED. THESE DISHWASHERS WERE MADE TO SELL FOR MANY, MANY MORE DOLLARS THAN WHAT WE ARE ASKING. THEY ARE BRAND NEW; IN FACT, STILL PACKED IN SHIPPING BOXES.

$12.50 each

Look at these Sensational Features

- Dishes Dry by Themselves!
- Easy to Use—Slip hose on faucet . . . put in dishes . . . turn on the water!
- Holds 16 Dishes at once . . . Extra Basket for cups, saucers and silverware.
- No Motor . . . No Electricity . . . No Expensive Plumbing!

ATTENTION AIRLINES!

BC-348 COMMUNICATIONS RECEIVER

BC-348 COMMUNICATIONS RECEIVER. 6 bands, 200-500 Kc. and 1.5-18 Mc. 2 stages RF, 3 stages IF, BFO, crystal filter, manual or AVC. Complete with tubes and 24 V. dynamotor. These receivers have been thoroughly checked in our work-shop and found in excellent condition.

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Converted to 110 V. AC 60 cycle **80.00**

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Attention Factories, Hams, Dealers, Individuals—Just Anybody

If you have surplus condensers, resistors, radio tubes, transmitters, receivers, power supplies, frequency meters, transformers, speakers, headphones, microphones, telephones, or anything else in our line that you no longer need or is surplus, write immediately to Esse Radio Company and get our offer. We are especially interested in large quantities. We offer cash and promise to answer immediately. Give us a full description in your first letter and quote us price. We will not answer any letter unless descriptions and price is quoted. During January of 1950, Esse purchased thousands and thousands of dollars worth of equipment.

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BC-610 Transmitters
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Hallicrafters, National, Temco, RCA, Collins, RME, Hammarlund, Millen, Meck, Harvey-Wells, Meisner, Sonar, McMurdo-Silver, Gonset, Stancor, Bud, etc. transmitters or receivers
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SCR-269F or G Automatic Direction Finders

WHAT HAVE YOU? Esse will buy. Factories, send us a list of that surplus.

PRECISION TEST EQUIPMENT

(Government Surplus Release)

Low Voltage CIRCUIT TESTER *Model 1-42*

Here is an instrument any mechanic that works on automobiles, boats, or airplanes would be proud to own and we offer it at a fraction of its original cost. The low voltage circuit tester is a self-contained trouble-shooting device for making a complete and rapid check of the generator—battery circuit, including current and voltage regulators which may be used. Battery voltage, regulator and cut-out settings, and generator performance can all be easily determined.
This tester is enclosed in gray heavy-guage metal box with a strong hinged top that, when opened, is supported by a slide rod and when closed, is latched by clamps. There is a carrying strap attached.

This instrument was manufactured for the Quartermaster's Corps, U. S. Gov't. Ordnance Dept. under most rigid specifications. It is comparable in beauty and dependability to instruments made today that sell for many many more dollars than our price. Electric Heat Control Company, Cleveland, Ohio, or the Heyer Products Company, Inc., Belleville, New Jersey manufactured these for the Army. Although the unit you receive may be made by either of these companies, it will be practically identical to that made by the other company and all are made under Heyer Products Company's design according to Gov't. specifications.

This instrument is 11 3/16" wide x 9 9/16" deep x 7½" high and can be used on either a 6 v or 12 v system. There is a metal chart attached to the lid of each unit which is easily readable while using the instrument. It shows settings of all controls and gives operation instructions to be used in conjunction with the operating manual which is included with the tester. One can quickly determine and correct trouble with this instrument. There are two battery leads with drive-in connectors (with spikes—lead coated) 8' long; ammeter lead (3-wire) complete with calibrated shunt, 6' long; voltmeter leads with alligator clip connectors and rubber insulators 8' long, and field rheostat leads with alligator type connectors and rubber insulators 5' long. The direct reading meter scale 4" in diameter with color-coded scales, along with the push-button switch, voltage selector (3-circuit toggle switch), meter polarity switch, utility switch, voltage-ammeter scale selector switch, field, rheostat, test selector switch, multisection load resistor, is used to control all operations and functions of this instrument. The master meter reads 0-60 volts and 0-60 amperes. One switch box indicator has following ranges; 0-9 volts and amperes, scale deviation—0-9 range in 1/10th of a volt, 0-18 in 2/10th's of a volt, 0-60 in 1 volt and ampere division, 0-9 in .05th of a volt and ampere. They are brand new. Each weighs approximately 14 pounds. Our price only made possible because of the fact that they are Gov't. surplus and we bought them at a "steal". Remember, this is truly the finest of instruments and we cannot over-emphasize that we believe it is the best bargain ever offered . . . .

Price $29.50 **Terms: Cash With Order**

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

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Sixth Annual Old Timers' Night

The Delaware Valley Radio Association, of Trenton, N. J., will sponsor its 6th annual Old Timers' Night and banquet on Saturday evening, April 15th, 1950, in the Terrace Room of the Hotel Stacy-Trent, in downtown Trenton.

Guest speakers will include OTs in the wireless game and men who have been prominent in all branches of radio for many years.

Reservations must be made by April 8th. A letter to Ed Raser, W2ZI, General Chairman, 315 Beechwood Ave., Trenton, N. J. accompanied with $5.00 for each reservation, will fix you up. Late comers who purchase tickets at the door will be taxed $6.00. As in the past, the party will be stag.

ECONOMICAL TRANSMITTER

(from page 27)

through on 10 meters. The excitation control in the screen circuit allows the drive to be set at 5 ma; however, on the lower frequencies the drive may be so great that it will be necessary to detune the oscillator plate circuit slightly to keep the grid current at the proper figure. Over-driving the final will only result in reduced output due to the lower screen voltage caused by the increased screen current through R_7.

Cathode bias is used with the 6L6 final to provide some protective voltage. This resistor is of the wire-wound type with adjustable slider, and this slider is used to tap the resistor so that the tapped portion serves as the shunt for the meter. With the 0–10 ma meter the shunt portion should be set to give a reading of one-tenth the actual current. Thus, when the meter shows 6 ma for the plate current, the true value will be 60 ma. The resistor across the grid side of the meter switch is large enough to have little effect, and the meter reads grid ma direct. A split stator condenser and center-tapped coil are used in the 6L6 plate circuit to allow the amplifier to be neutralized. This adjustment may be made by any of the usual methods explained in the various handbooks, and no trouble should be experienced, inasmuch as the neutralization is not at all critical. The neutralizing condenser was built from one of the large APC padder types by removing the rotor and stator plates, after which a 5/8" square of copper was soldered to the stator posts for one plate and a 5/8" disc of copper was soldered to a 6–32 machine screw threaded through the old rotor bearing to serve as a movable plate. However, small condensers made for the purpose are available, and their use will save quite a little work and time. The final may be loaded to 60 to 65 ma for phone work and 80 to 90 ma for c.w.

The Audio System

In the speech section condensers C_{10} and C_{15}

serve to reduce the high frequency response, while other components in the first stage have been chosen to attenuate the lows. The result is crisp, clean audio with high intelligibility. The 6V6 modulators operate class AB_1 and have ample modulation power for this rig. The modulation transformer should be connected for a 5000-ohm class C load when the transmitter runs at 300 volts and 60 ma of loading. The bias resistor R_{16} for the modulator tubes should be set to give –20 volts of bias. For c.w. operation the audio gain control is set at the minimum position, and the modulator tubes are allowed to draw current. This load on the power supply keeps the c.w. operating voltages quite constant with keying.

Condenser input is used in the power supply with a total of 30 μf in the filter sections. With this amount of filter, the rig is hum free when modulated, and the c.w. note is, of course, pure d.c. The rest of the power supply follows the usual pattern with the B– switch S_3 in the negative return lead of the transformer.

COIL TABLE

Oscillator Plate Coils, L1

160 meters—70 turns #26 D.S.C., close wound
80 meters—40 turns #26 D.S.C., close wound
40 meters—22 turns #26 D.S.C., close wound
20 meters—12 turns #26 D.S.C., spaced to occupy 1″
10 meters—5 turns #20 enamel, spaced to occupy 1″

Amplifier Plate Coils, L2

160 meters—B&W JCL or JVL 75 watt series
80-10 meters—B&W JCL or JVL, or Bud OCL or OLS

500-WATT AMPLIFIER

(from page 16)

in reverse with the large filament transformer used to supply the 812Hs. The 6.3-v leads of the bias transformer are connected across the 6.3-volt leads of the tube filament transformer; thus, the primary of the bias transformer delivers 117 volts of a.c. This is rectified through a selenium rectifier and filtered through an isolating resistor and filter condensers. NOTE: The *plus* sides of the condensers are joined to the chassis. All these components are mounted on the under side of the chassis.

This system employs an electronic switching action. When a signal is introduced to the grids, the voltage in the transformer and its components is overcome, and the required voltage is developed

across the grid resistors, as in any grid-leak system. When the signal is cut off for receiving, or in the up-key position, the bias transformer supply is switched back into the circuit, and thus the tubes are automatically protected. We have the fixed bias supply set at about 80 volts by means of the slider on the bleeder resistor. A static plate current of about 50 ma is present in the no-signal periods. This is quite normal and desirable and is adjustable with the slider on the bleeder resistor.

Mounting and Placement

As you can readily see, the layout of this amplifier is not adaptable to all circuit components. The main factor we had on our side was the balanced-rotor type condenser. The connectors at each end of this condenser make it ideal in so many ways. As can be seen in the photographs, the tube caps for the plates are connected with short leads at the one end and the neutralizing condensers at the other. The jack bar for the plug-in coil is easily mounted with simple hardware store brackets. There is no lead to speak of at each end. The jack bar is only half an inch over the condenser.

The rather odd placement of the r.f. choke in the plate circuit is again dictated by short leads. The long meter leads are of no consequence.

Perhaps the only item we neglected until too late was the mechanical driving of the plate condenser. We didn't give this any thought until the last and then discovered the condenser needed to be placed farther to the left to use only one right-angle drive instead of two, as we have in the photo. It does, however, give us a chance to use the vernier drive from the tuning unit of the BC-375, which is geared down so that the plate tuning is a fast spinning action. The resonant point on the plate condenser is reached quickly and accurately with the Beach knob with the little handle for the purpose. Here is another advantage of the 812H. We have been off resonance with the full power on the plate for unusually long periods of time, and we can find no breakdown in the tube or any effects that can be detected. It is surprising the amount of beating this tube will take.

We are fond of the knobs we have and would like to have as modern a meter to match. (Some day we will sit down and design a case to go with this modern stuff.)

The tuning knob for the grid condenser is at the left under the large knob for the band-switching and is to be balanced on the right with the knob for the link adjustment on the final tank. We have not put this in as yet because we have not settled our rack problem. However, we might add that this is an individual problem of each user.

Miscellaneous

The amplifier is built on a standard $10\frac{1}{2}'' \times 19''$ rack panel and a $17'' \times 13'' \times 2''$ cadmium-plated chassis. The brackets are necessary as there is no other connection to hold the panel to the chassis

HARVEY *presents the* ELDICO *Line*

ELDICO TVI FILTERS

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Get your free copy of Eldico's new book *"TVI Can Be Cured"*. Just drop us a postcard with your call, name and address and we'll shoot it right to you.

Eldico Transmitter Filters

Dual low-pass, 40 Mc cut-off, over 75 db harmonic attenuation. 52-72 ohm input and output. At other impedances use antenna tuning network. Good for 1 KW input, negligible fundamental attenuation. No effect on antenna performance.

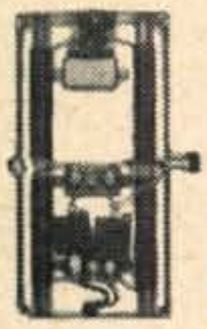
Model TVT-62, $7.99 kit, $10.99 wired & tested.

Shpg. Wt. 6 Lbs.

Eldico Receiver Filters

Hi-pass, 40 Mc cut-off, no attenuation to sigs above 40 Mc. Efficient on any manufactured set. Will not affect picture, quality or strength. Available for coaxial or twinex.

TVR 300 for Twinex—TVR 62 for Coax
Either model $1.98 in kit form
Shpg. Wt. 1 Lb. **$3.98 wired & tested**



Brute Force Line Filter

Similar to one on Page 508 ARRL Handbook. Will handle 1 KW. Completely filtered and shielded. **$5.98 in kit form, $8.98 wired & tested.**

Shpg. Wt. 6 Lbs.

GDA GRID DIP KIT

The most valuable piece of test equipment in the ham shack is the Grid Dipper. Build one with this kit and save countless hours in building, improving and de-bugging your rig. The GDA Kit builds an exact duplicate of the "Grid Dipper" and includes everything from the special handy case permitting one-hand operation down to a complete application and instruction book. With tube and internal power supply, range 3 Mc to 250 Mc in 6 steps, size 5½" x 2⅜" x 3". **Complete Kit $21.50**

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TVD-104 DIAXIAL COAXIAL FILTER

Matches impedance of pair RG8U or RG58U — or Twinex cables RG22U, RG57U, or any other approx. 100 ohm line. Same characteristics as TVT-62.

TVD-104..Kit Form.....$14.50
TVD-104..Wired and Tested..$17.95

R.F. BYPASSES — All AC Leads, power leads, relay and switch leads and every connection between chassis should be bypassed. Use our Hi voltage Ceramic for Hi Voltage, our button or feed thru's for medium and low voltages, our micas for AC, relay and switch leads.

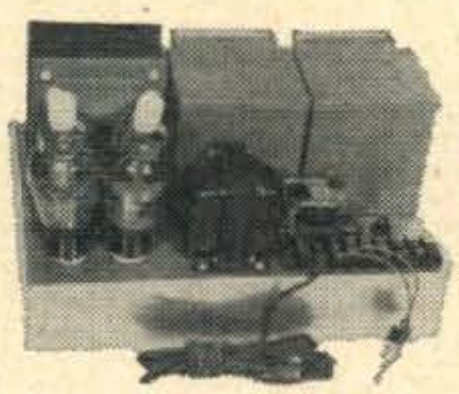
HI VOLTAGE CENTRALAB—7500V working — 50 MMFD. Tapped for 6/32 screws —The best for RF bypassing—**$.89 each.**

BUTTON CONDENSERS — available in various ranges and capacities. Automatically grounded through mounting screws 50, 100, 180, 500 MMFDS.
$.18 each $1.80 per dozen
2400 MMFD **.25 each 2.50 per dozen**

FEED THRU CONDENSERS. Just insert in hole in chassis, tighten nut and you have a feed through connection which is automatically bypassed to ground. Available in 50 MMFD with nuts. **15c each — $1.25 per dozen.**

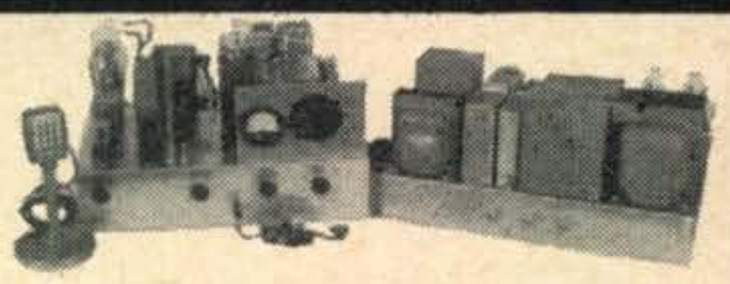
R.F. BYPASSING COMBINATION #1 — Enough to do a thorough job on any amateur transmitter — Contains 6 Hi voltage ceramicons, 20 button 30 feed throughs and 20 ceramicons. **A $16.00 combination for $8.95 per kit.**

TRANSMITTER FILTER COMBINATION #3 — Contains one TVT-62 Dual Transmitter Filter, two TVR Receiver Filters (Your choice of 300 or 62 ohms) and one Brute Force Line Filter.
A **$17.99** combination for **$14.98** in kit form
A **$27.93** combination for **$22.50** wired and tested



HV-1500 HIGH VOLTAGE POWER SUPPLY KIT

Here is a power supply that is designed to take it. Ultra-conservatively rated, will deliver under continuous service load 1500 v.d.c. at 350 ma. Kit includes plate and filament transformers, two filter capacitors and filter chokes, bleeder, safety plate caps, less 866 rectifier and chassis. The total cost is what you would expect to pay for the transformer alone.
Complete kit price.....$29.50
Shpg. Wt. 50 Lbs.

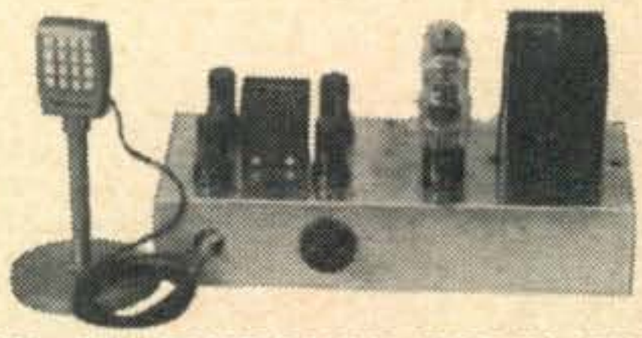


TR-1 TRANSMITTER KIT

A conservative 300-Watt phone and c.w. rig 6V6-6V6-6L6-813, Class B 811 modulators. All bands, 80, 40, 20, 15, 11, and 10. Exciter broad band, single control PA tuning. Three power supplies delivering 1500 v.d.c. at 350 ma, 500 v.d.c. at 200 ma, and bias supply. Punched chassis, hardware, tubes, transformers, capacitors, resistors, antenna changeover relay, meter, included. Shpg. Wt. 125 Lbs.....Only **$179.50**

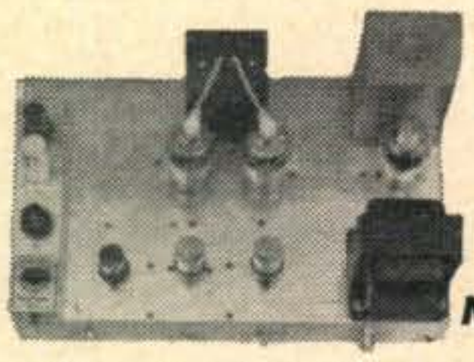
TR-75 TRANSMITTER KIT

Loafing along at 75 watts this is the c.w. man's buy of the year. Simple enough for the beginner to assemble. Punched chassis. Uses the time proven 6L6 oscillator-807 amplifier combination. Pi-network output. Husky power supply delivers 600 volts to the 807. Complete. Shpg. Wt. 50 Lbs.....Only **$34.95**



MD-40 LOW POWER MODULATOR

40 watts of audio, the MD-40 is a kit of the same superior parts that go into its bigger counterpart, the MD-100. In place of the 807's, two 6L6s are used. 200 ma. additional power available in MD-40-P. Complete, including the same standard communications Electro-Voice 915 high-level crystal microphone, only **$29.95**
MD-40-P with built-in power supply **$39.95**
Shpg. Wts.: MD-40—15 Lbs.
MD-40-P—30 Lbs.



MD-100 MEDIUM POWER MODULATOR

100 watts of audio, this AM modulator is designed to be assembled once and put into action...with no maintenance problems. Lineup consists of a 6SJ7, 6J5 audio amplifier driving a pair of 6J5s which drive two 807s. It is an ideal modulator for the quarter kw c.w. rig and is another Eldico complete package with punched chassis. It even includes an Electro-Voice 915 crystal microphone. At the low price of **$44.95** this is the kind of postwar price the hams have been waiting for. Speech clipper, if you want it, **$14.70** additional. Shpg. Wt. 35 Lbs.

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HARVEY RADIO COMPANY INC.

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except the grid condenser shaft bushing.

The shield can is a standard chassis, 5″ × 6″ × 9″. There is no room to spare in this can except in the length. A cover is on hand, but as yet we have not had to use it. We are going to put it on as a dust cover anyway.

The filament transformer for the 812Hs is mounted on the rear of the chassis (6.3 v at 8 amp.). This can be mounted on the same chassis as the power supply if so desired. The small bias transformer is mounted under the chassis where there is plenty of room for the rest of the parts for this power supply. The grid tuning condenser is mounted under there also.

The amplifier was first put on ten for the try-out, and the MB-611, a 30-watt mobile transmitter, was used to drive it. Our quality reports and checks were excellent. There is no hum, distortion, or parasitics. With those in the local rag-chew gang on ten who can tune NBFM in properly, we have gotten fine reports on the NBFM signal. We have often been complimented on the excellent signal for NBFM from most all the stations we work.

We are planning to use a commercially-made driver, the VFX 680, to drive a doubler into a final and go VFO. The grid is fed with 150-ohm Twin-Lead, as this is the best matching impedance for the grid turret. We are now satisfied that we have a good signal on the air and feel that the layout is a success. We are taking this opportunity to pass it on that others may gain some of the pleasure we are now having.

COMMAND TRANSMITTER

(from page 19)

capacitors on the inner side of the power plug, as shown in *Fig. 3*.

The BC-457 now shows no sign of TVI regardless of the operating frequency in the 3.5–4.0 mc band.

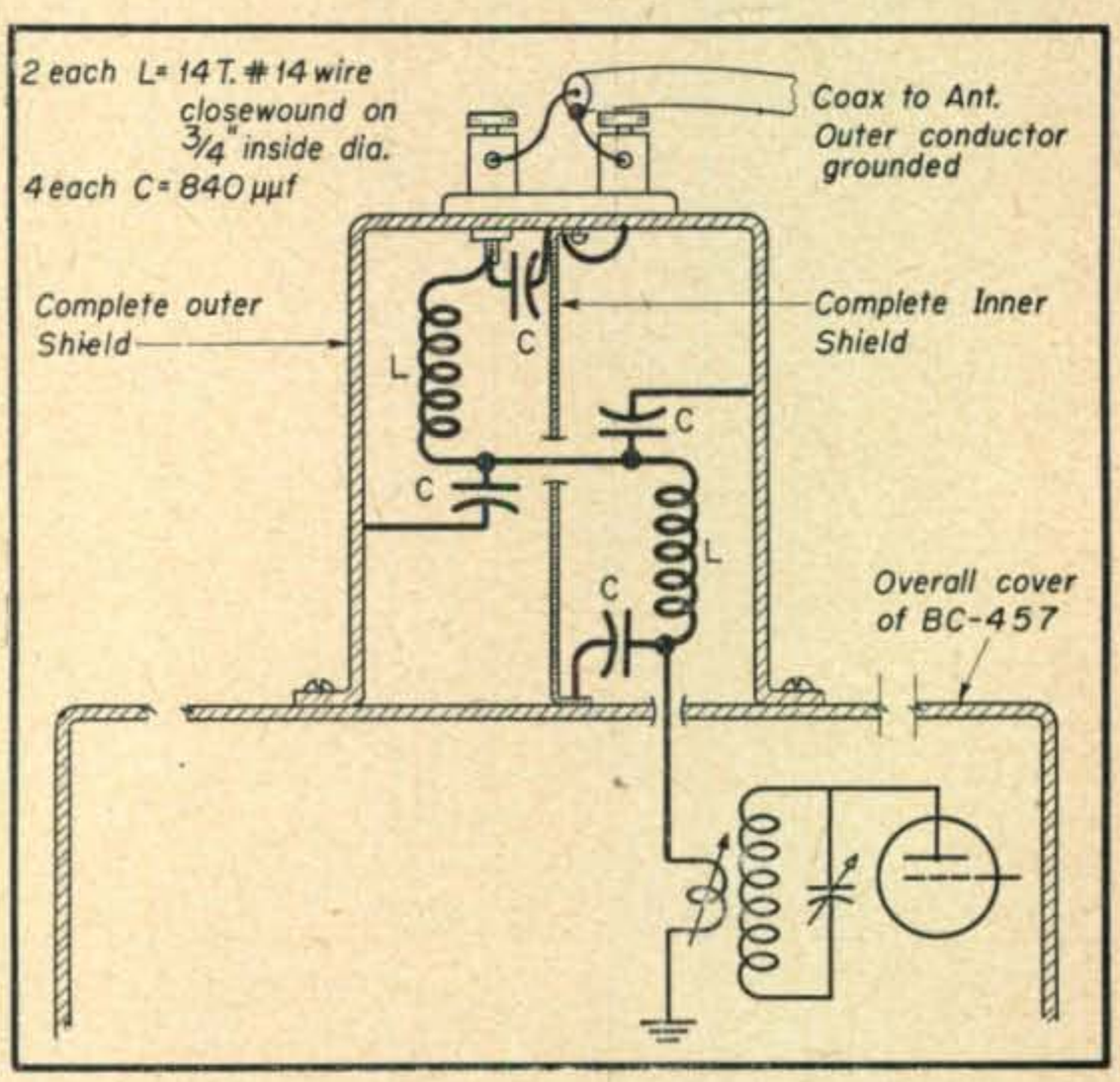

Fig. 4, showing what lives in the penthouse. The low-pass filter is a "must" for almost every 274N rig.

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Look at these NEW features!
Built-in power supply on separate chassis with heat resistant barrier the height and width of cabinet. Front of panel oscillator compensation control. Speaker matching transformer built into receiver with 8 and 500/600 ohm output terminals. Provisions for NFM adapter. Push-pull radio output. 10" speaker in matching cabinet. Voltage regulated oscillator; two tuned RF stages; manual and automatic volume control; Micrometer type dial with 20-1 precision gear drive and 500 division scale for logging purposes; Coils cover amateur bands from 1.7 to 30 mcs; Special coil provides 50 db signal-to-image ratio on 28 mcs band.

$349.00 ***Low Down Payments***

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ROBERT C. CHEEK

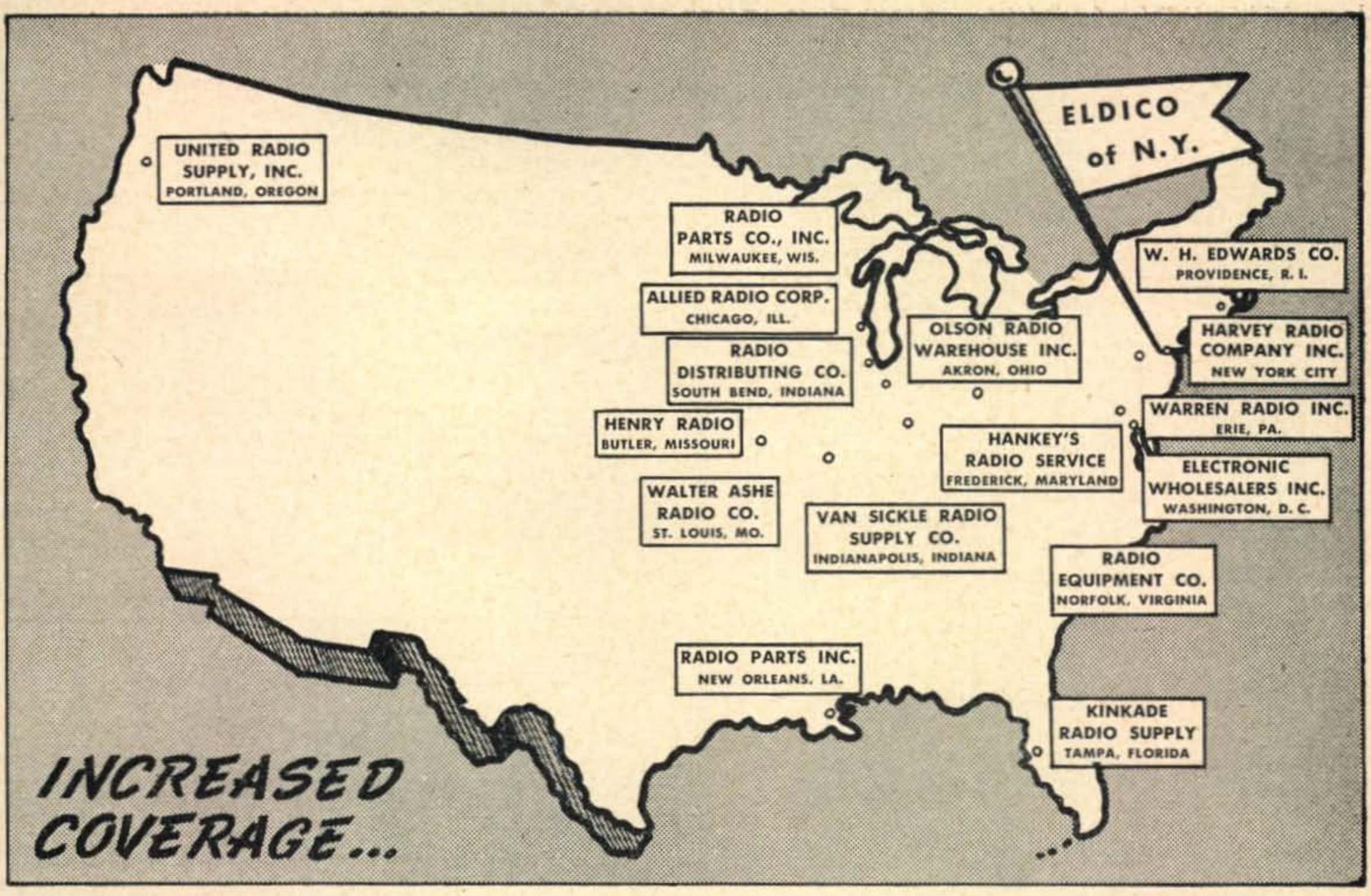
(from page 10)

he has written 16 technical articles for such magazines as *CQ, Electrical World, Electric Light and Power,* and the *Westinghouse Engineer.* He has presented a total of 9 technical papers to the American Institute of Electrical Engineers and other engineering societies.

In addition to presenting the papers mentioned above, Bob has lectured before 20 different sections of the A.I.E.E. and the I.R.E. on subjects such as generator excitation systems, power line carrier, electronics in the central station industry, modulation systems, and microwave applications on power systems.

It is interesting to note the wide scope of Bob's work. He has been involved in such things as the problems of grounding large power stations, and at the same time has invented an electronic multiplier. He developed a method of predicting safe loadings of power transformers and has contributed to the development of microwave communication equipment. He has published a method for calculating the impedance characteristics of power cables and has invented an AVC system for radio receivers. It is seldom that one engineer is involved in such widely different types of activity.

Bob's energy and ingenuity have resulted in the production of 23 recognized inventions. Three of these are issued patents and the other twenty have resulted in applications for patents or are being put in form for patent application. Again, these patents show a tremendous scope of interest. They range from such things as radio receiver circuits to methods for relay protection of transmission lines. A large number of these inventions are now being used.



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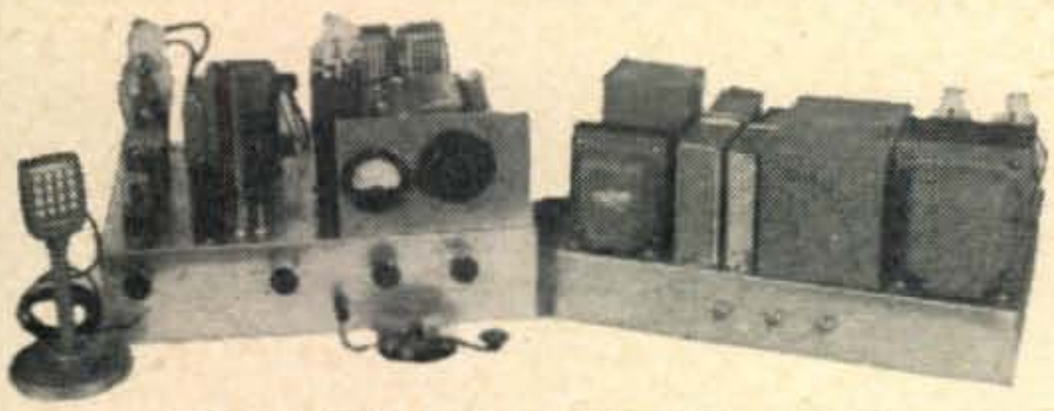

TR-1 TRANSMITTER KIT

A conservative 300-Watt phone and c.w. rig 6V6-6V6-6L6-813, Class B 811 modulators. All bands, 80, 40, 20, 15, 11, and 10. Exciter broad band, single control PA tuning. Three power supplies delivering 1500 v.d.c. at 350 ma, 500 v.d.c. at 200 ma, and bias supply. Aluminum chassis, tubes, transformers, capacitors, resistors, antenna changeover relay, meter, wire, hardware and coils included. Electro-Voice 915 high level crystal microphone part of the package. Plug in the crystal and line cord and you're on the air.
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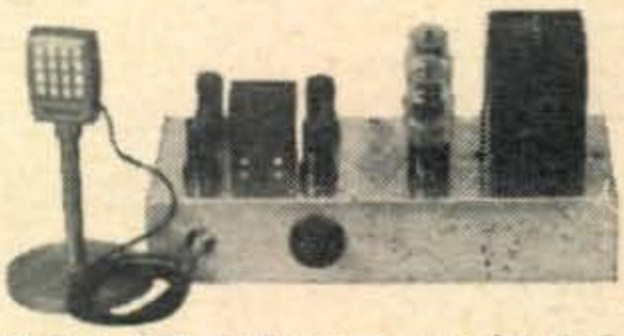
MD-40, MD-40P LOW POWER MODULATOR



40 watts of audio, the MD-40 is a Kit of the same superior parts that go into its bigger counterpart, the MD-100. The MD-40P is identical to the MD-40 with Power Supply added. In place of the 2,807's in the MD-100, a pair of 6L6's are used. Both units are designed to accommodate the Electro-Voice Speech Clipper for $14.70 extra. The MD-40 series includes the Electro-Voice #915 high level crystal microphone less stand.

MD-40 ..... 29.95 MD-40P 39.95

TVD-104—DIAXIAL BAND PASS FILTER

Equivalent of ELDICO'S TVD-62 filter except it is designed for use with the balanced transmission line such as a pair of RG-8/U, a pair of RG-58/U or RG-57/U—RG-22/U (95 ohm Twinax) —or any other, approximately 100-ohm impedance line.

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MOBILE CORNER

(from page 38)

publications, but, it's funny that one of our local boys has a QSL from the writer of one of these which does not state it's a mobile contact. Apparently, after a fixed station goes mobile, the importance of this designation becomes apparent.

DX

No one has contested the 75-meter mobile DX contacts given in the January column; neither has anyone contested the 20 countries total of W4PH. W6NAT, however, reports all 48 states, but has not yet confirmed all contacts. He's worked some states twice without a QSL. W8EGN has worked 41 states.

THE YL's FREQUENCY

(from page 40)

3016; W2QGK, 2310; W3CUL, 810; W4HWR, 3161; W5DRA, 3089; W6CIC, 3704; W7HHH, 3781; W8WUT, 1455; W9FZO, 1028; WØTAB, 2471; KH6TI, 3300; KL7RN, 2600; and VE3BTE, 1080. Annette Thompson, W4LKM, who won the Cup in the Ninth Anniversary Party, was unable to enter this contest. Better luck next time, Annette.

New YL Calls

Latest YL calls on the FCC lists include: W6HKU, Ruth Van Zile; W1SLQ, Sylvia Winton; W3PZJ, Barbara Clasen; W4PXC, Rosalie Woodall; W5QPV, Mabel Goldsmith; W6HMD, Letha Johnson; W4PXO, Ellen Peak, and W5QQV, Jean Masingill.

ZERO BIAS

(from page 10)

tion if you help him along. He has a hard task before him, with the Class B deadline looming closer each month, and we've got to do our part. Let's hear no grumbling about "blasted lids," and a lot of mention of "good kids."

CQ has been a leader in urging the creation of the Novice Class, and we're not going to shirk the responsibility we have to the neophytes. If the Novice is to become the good ham we all will try to make him, he must be provided with technical and constructional material keyed both to his presumably limited technical background and to his special frequency problems. There will be at least one technical article in each issue of *CQ*, starting with our April issue, which will be especially prepared with the needs of the Novice in mind. We call upon our authors to keep the Novice in mind when preparing material for our pages. We

shall keep our advertisers informed as to the needs and opinions of the Novices as they develop so as to help the manufacturers and distributors to play their part in our effort. *CQ* will do everything within its power to assist clubs and other amateur groups in perfecting their relationship with possible sources of Novice material—the Boy Scouts and high schools, for example.

When you have a bunch of active hams running a magazine, you can't leave a job like this to someone else. We won't! Will you help?

We invite our readers who are especially interested in the problems which will be faced by the new Novice Class licensees to communicate to us their thoughts on *CQ*'s Novice Program as outlined herein.

DX AND OVERSEAS

(from page 32)

They are all very effective, but the prettiest is the one with upholstered letters. . . .

KP4HX is now living in Chattanooga, and he wants you guys to know that he intends to send out cards from there. . . . VE1EA found himself a bunch of inductance which got him on 1.8 mc. This netted him a QSO with GD3UB on c.w. He also heard G6BQ and G5JU. The BC band is next! VE3AGX also likes the low frequency stuff, and on 3.5 mc., he has worked the following: *F8TM, FA8IH, DL1FF, DL7AH, VP5BF, VP9BN, GD3UB, GW3FWY, OZ2UA, HB9DD, ZL1HM,* and *EK1AO.*

It looks as though 4X4AA will be off the air for a while. Reason? Recently married!

W5LVD passes along the lowdown that *FB8AX* is apparently on shipboard, and ZS6DO told him he was stuck in the ice about 100 miles from his destination. Dan also tells us that VS7EL/ZC2 has been on 7040, and that both *F8QV* and *F8JD* are in Corsica.

DL4VC, who also signed D4OOU for a while, is back home now after 3½ years in Germany. Once again he is W6OOU. For a while, Al operated the station at TA3FAS, and the four days he was on, he says he worked scads of stations. By the way, if any of you fellows worked TA3FAS during any of the times mentioned below, and you didn't get your card, you may write to W6OOU at Rancho Alto Vista, Shandon Star Route, Paso Robles, California. He has the log covering these times.

June 18, 1949	0600–0830 GMT
June 21, 1949	0445–1500 GMT
June 22, 1949	0440–2345 GMT
June 23, 1949	0000–0520 GMT

Galapagos Expedition

HC2JR, who is Prexy of the Guayaquil Radio Club, tells me that the Club is planning an expedition to the Galapagos Islands during the latter part of March. John says they will probably be on 10 and 20 meters and sign *HC8GRC* or, possibly, *HC2GRC/8*. They will be on the air for about 20 days and, of course, will QSL. John didn't say whether they are going to be on phone or c.w., or both, but you can bet they will be on phone anyway. Let's hope they will give the c.w. boys a whack at it too.

G6QX still doesn't think it is possible that he worked a good one in *C8FP*. Even after receiving his card, he was skeptical, but for his benefit (and any others in the same boat), they look plenty good to us and we're allowing credit.

Apologies to OK1WX for leaving him out of the Honor Roll. We shouldn't do that to a guy who holds WAZ certificate No. 121. In fact, we shouldn't do it to anyone who belongs in there. . . . W4AZK got a letter from ST2TC who says ST4JX is probably a pirate.

TF3EA knocked off *XZ2KN* for his 39th Zone and is going hot and heavy after anyone in Zone 23. Einar grabbed his mike to work this one, but other new ones on c.w. for him are *EA8RM, MD7DC, MP4BAD,* and *HP2RO*.

W9AVA had all kinds of things happen to him. In the first place, after hearing Burma for the first time in 18 years, he worked *XZ2EM* two nights in a row at the same time, and right to the second. Buzz logged *UAØKFD* in Zone 19 for his 39th. He, too, is going after Zone 23 and says, "All I need is AC4YN, a hearing aid, and some dexadrene. See you on the 50 yard line in the battle of QRM!"

W7EYS is still waiting for a VQ8 card which will give him all 40. By the way, Bob had to give up the QSL Bureau due to too much work. He says all he needs is a nine-day week. The new custodian of the QSL Bureau is W7FWR, Mary Anne Tatro.

W9RNX upped his phone Zones to 34 when he worked *HZ1AB*. Russ tells me you'll be lucky if you get a card from *ZS9J*, but if you work *ZS9F*, you will get one, because he does a fine job of QSLing. This is on phone, of course.

W6JFJ and W1FH passed along practically the same dope to me which was originally sent from ZS6DO. Apparently, *ZS6GV* and *ZS6DO* are going to Swaziland for a couple of weeks in March. The exact date, at this point, is still unknown. ZS6GV has been assigned ZS7B and will operate 28 mc, while ZS6DO will operate c.w. on 14002. At the time of writing this, he has not been assigned a ZS7 call, but he thinks it might be *ZS7D*. You old timers may not recognize ZS6DO, but when I tell you that for years before the war he was ZS2A, this should ring a bell. You'll also recall how "Pi," which has been his nickname for years, punched out the code as fast as anybody would want to take it.

Now then, most important on this Swaziland expedition is what to do with your QSL cards. *Don't* QSL through the S.A.R.L., but instead, send all cards

for both stations to ZS6DO. . . . And, here's another DON'T . . . don't call either of these guys on their own frequency. If you do, they won't answer. You had better get at least 10 off and be safe.

W8SYC sounds to me like he works in a BC station, since he apparently is tied up from 3:00 p.m. till midnight. You have to give the man credit, as he lives in half of a double house on a small lot right in town. Having good neighbors, however, pays off, as they let him put up a 20-meter beam. . . . I can almost picture half of this beam being draped over his neighbor's house, while the rest of it is over his own. . . . Anyway, Clint is doing all right with 39 Zones worked and confirmed, and all he needs now is that old number 23. His rig winds up with a pair of 35TS with 400 watts in

W4GG feels very good about the job W4AZK is doing, especially since he was responsible for getting FM8AD's card for him.

W3JKO passes along some dope on Poland. Bob says this is the way the hams stack up over there. In Warsaw, there are three active: *SP5AB*, *SP5AC* (who is usually on 10 and 20 c.w.), and *SP1CM* (who uses c.w. on 20, 40, and 80). In Poznan, there is *SP1SJ* (probably on 20 c.w.), *SP1KM* (a new station), and *SP5ZPZ*. (W3JKO says not to be fooled by these call letters, as he is legal but a different class of station. It is some sort of a "collective" station and uses something like six operators.) For a while, they were running with 20 watts on 10 c.w. This station is also on 40 and 80, but as yet, they haven't hit 20.

There are also two more new ones scheduled to be on in Poznan, *SP1BR* and *SP1JF* (incidentally, this call was held by the chap's father before the war). Apparently the boys in Poznan are building a deluxe transmitter for *SP1JF*. It will cover all bands, and they will have the choice of several antennas and a good chance of a rotary on 10 meters. It appears that these same fellows are ganging up to build a high power transmitter for contest work and this will handle between 200 and 1000 watts. It sounds to me like those SPs are really ambitious. . . . As for W3JKO, well, he's been messing around on 80 for quite a while, and some of his stuff includes SVØWH,

SP1CM, TA3GVU, MP4KW, MI3SC, and CT1BV. Bob is also working over 40 meters, having recently logged all continents in about 38 minutes. That sounds like a pretty good deal on 40 meters.

VE3BQP has been using FM phone for quite sometime. One thing that sold him on it was the lack of complaints in his neighborhood where each house has at least one a.c.-d.c. receiver. Bill would like to exchange notes and ideas with other DXmen who are exponents of FM. If there are any takers, write direct to VE3BQP.

G6ZO is up to 218 with *FY8AC, FN8AD, VP5BF,* and *KM6AH.* . . . VE3IJ now has 39 Zones, thanks to HS1SS. He says he is going to do his best to correct the WAZ list which seems to be top heavy with W6s. Although this probably gave him the honor of being the first VE3 to work 39 Zones, a week or so later, *XZ2EM* popped through, which he worked, as did VE3QD, VE3TB, and VE3AAO. Come on you fellows . . . get that Zone 23!

If any of you boys overseas need Montana, you might take a look on 10 phone for W7NFA. He runs half a kilowatt to a pair of 813s, and is using a four element wide-spaced beam. At present, Al is a freshman at Montana State and is slowly, but surely, getting the DX disease. Is that good??

W7GUI wants to know how in the dickens he can get a card out of Zone 18. You see, he has worked all 40 of them on phone, but he still seems to need this one. He wonders if a bottle of Vodka would be an incentive. For whom??

WØBBS is going after WAZ too. It seems as though he is using a square rhombic 408-feet long on each leg. He operates the four directions with the use of relays for switching. BBS is using four separate final amplifiers and runs a kw on each band.

Doc, W4VE still works them, his latest being *ZB2I.* He also tells me he is using a quarter-wave vertical against ground on 40, and gets out very well into all continents.

W9BZB, another 10-meter phone man, worked *CT2AE* in the Azores, who was only there for a few days and is now back in Portugal. His call there is *CT1RX.* . . . W9TQL hooked *ZD2FAR,* the other day. He also reminds me that he was G5FA in 1930, VQ3FAR in 1937, and was last on the air in 1939. . . . If you hear F3AT, he is none other than FE8AB who is supposed to return to France sometime in February. W9TQL is another one looking for Zone 23, so I guess everybody isn't WAZ yet.

Well, just look at this! W1MCW worked *HV1A* in December for a new one; this is a good one too. She also logged KM6AO and UQ2AB. . . . Another W1, this one being BIH, hooked up with VS9AL and UL7BS for two new ones. While in the first district. . . . I understand strange noises have been coming out of W1KKP of late. My operatives tell me it resembles code. This Coakley is a strange man—pulling a switch like that after selling everyone, for years, on the good points of phone. Being a salesman, I'd think he would be more at home gasping into a mike. Oh, well, maybe he is about ready to retire. . . . We can't overlook W1FH who is still on top of the heap, having made WAZ last month. Charlie still intends to keep his receiver warmed up so nothing will escape him. Not much does either! . . . Wonder what has happened to W1HKK? I know what has happened to W1SZ, but I won't mention it here. Hey! Let's get out of this district.

W2BXA is up to 227 with *FN8AD* being it. On phone, VP8AK was Ben's 174th country.

A lot of you will probably be reading this stuff in between the two halves of the A.R.R.L. DX Contest. I wonder how many of you fellows were put off the air the first night of the contest by your neighbors due to TVI?? As the boys around Los Angeles say, "Don't you dare mention that nasty word!" Speaking of TVI, however, a lot of the boys tell me that the "Harmoniker," as shown in the November issue of the *G.E. Ham News,* really does a swell job on taking out the harmonics. As soon as I get a chance to build a couple, and put them in my feed lines, I am hoping it will reduce the number of phone calls each evening. . . . And, by the way, how are your neighbors? 73.

QTHs

CR4AF	Antonio A.M. De Macedo, Box 15, Cabo Verde
CR4AB	Radio Club de S. Vicente, Mindelo
CR4AC	Manoel Tomas Dias, Praia
CR4AD	Hilario Brito, Praia
CR4AE	Flavio Cunha, St. Vincent
EA6AF	Bartolome Pina, Box 135, Palma de Mallorca, Balearic Islands, Spain
FF3CN	George Guerineau, P.O. Box 566, Dakar
FF8AH	Box 566, Dakar, F. W. A.
IS1RPA	Mercello 67, Cagliari, Sardinia
G3HCL	F/Lt. D. Lockyeb, Officers' Mess, R.A.F. Station, Henlow, Beds, England
KP4HX/W4	F. F. Lambertson, 210 S. Moore Drive, Chattanooga, Tennessee
MI3DX	Box 880, Asmara
OQ5NK	P.O. Box 86, Leopoldville
ON4UN	P.O. Box 38, Bruges, Belgium
OQ5EB	Lachlan Vass, American Presbyterian Congo Mission
OQ5EC	Sandy Mark, American Presbyterian Congo Mission, Lubonai, Tshimbulu
PK4KS	Tan Koon San, Pangkalpinang, Banka Island, Indonesia
ST2TC	Box 25, Malakal, Sudan Africa
VO6VB	Bob Morrison, c/o Dept. of Transport, Goose Airport, Goosebay, Labrador
VS6 QSL Bureau	Box 541, Hong Kong, China
YO QSL Bureau	Box 95, Bucharest, Roumania
ZC6UNR	P. E. Lindahl, UNHQ, Galei Kinnereth Hotel, Tiberias, Israel
ZD2FAR	c/o P. & T. Dept., Lagos, Nigeria

SURPLUS METERS

(from page 25)

in this case

$$R_{sh} = \frac{2 \times 1}{48} = \frac{2}{48} = .0416\ \Omega$$

a simpler form is shown below where N is the factor by which we multiply the full scale reading of the meter to get the desired reading.

$$R_{sh} = \frac{R_M}{N-1} = \frac{1}{25-1} = \frac{1}{24} = .0416\ \Omega$$

To obtain a resistor of the exact low value required means cut and try, since these values cannot be purchased. If we use No. 30 enameled wire, we shall have to use about 2/3 of a foot, since one foot has a resistance of about .066 ohms. The resistance of copper wire is given in a wire table for lengths of 1000 feet. (Divide by 1000 to get the resistance of one foot.) Since manufacturing tolerances are quite close, fairly good accuracy may be obtained in low values of resistance by this method. The shunt thus obtained will probably have to be pruned to exact value by placing a milliammeter of known accuracy or a multi-meter in series, as in *Fig. 1.* QSY to p. 66

When the internal resistance of the meter is unknown, about the only way to arrive at a correct value of shunt resistance is to make a wild guess at what the meter is and then place almost any length of No. 30 wire across its terminals, using the set-up shown in *Fig. 1*. For instance, assume a meter of unknown internal resistance is in a circuit (*Fig. 1*) with a random length of wire across the terminals for a shunt. With the standard meter reading full scale, say 100 ma, the unknown meter might read 6/10ths of full scale. This would indicate that the unknown meter is not carrying enough current (the shunt is passing too much current, in other words). Obviously, the better way to arrive at the correct value desired is to have too high a resistance to start with so that the length of wire may be pruned until the correct value is obtained.

It would be beyond the scope of this article to cover specifically even the most representative cases of surplus meters and their modification for amateur use. A little common sense, a considerable amount of care, and perhaps some reading in the handbooks would enable the average amateur to put these meters to good use. By using the principles outlined herein, you should be able to have better meters on your transmitter and at the same time save a dollar for the purchase of some other needed part.

THE TWIN FIVE

(from page 14)

metal element-support boom is employed, the element lengths should be increased by about ¾ of the diameter of the metal mounting tube.[4] In order to achieve even approximately the same feed impedance as was realized in the original design, the ratio of conductor diameters of the folded dipoles should be preserved.

Our wooden frame was made of 1″ × 2″ selected red cedar, and the two Yagi "booms" were made of the same material, tapered to 1″ × 1″ at the ends to cut down weight and wind resistance. The clothes-wire elements were force-fit into holes drilled into the wooden booms, and were secured by the use of wood screws as set screws. The tips of these screws biting into the aluminum wire insure that the wire cannot slip out of place. The large-diameter conductors of the folded radiators were attached to the outside edges of the wooden boom by small metal cable clamps, which were screwed to the booms with wood screws. The small amount of mis-alignment caused by mounting the dipole section on the side of the boom apparently produces no deleterious effects. A few coats of spar varnish over the wooden frame will protect it against the ravages of weather.

The main mounting plate (*Fig. 5*) may be

[4] R. M. Fishenden and E. R. Wiblin "Design of Yagi Aerials" *Proc. I. E. E.* (London), January, 1949, Part III Vol. 96, pp. 5–12.

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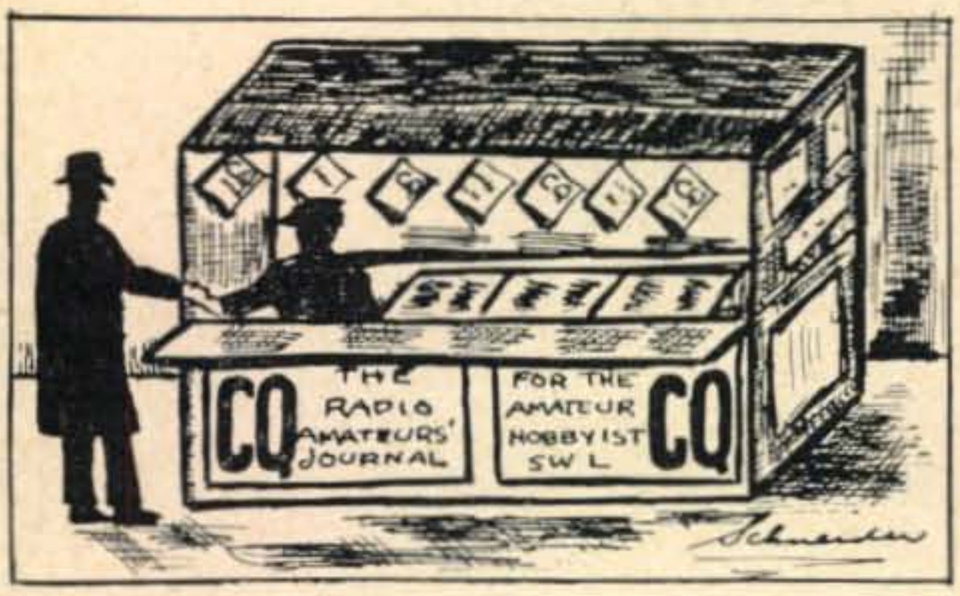

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constructed of wood or metal. It can serve as a mounting point for a bearing or flange. If "flip-flop" operation is desired, a sturdy hinge may be attached to this plate to provide a tilt-top mounting at the mast head. It is possible to locate the balance point of the beam assembly so that very little force is required to tilt the entire array through ninety degrees, and it can be made to rest stably in either position without the use of springs or counter-weights. The details of the polarization-changing mechanism will be left to the individual choice of the builder. We have seen everything from spring-return screen-door hinges to elaborate motor-driven systems employed for this purpose. At W2PAU we use two ropes which run all the way up to the masthead from the first-floor operating position, and, despite the fact that these ropes wind around the mast guy system as the beam turns, we have not experienced any trouble due to fouling, mainly because the force required to tilt the beam is so small.

The purist would probably prefer to use a wooden mast, or at least a wooden top section, if vertical polarization is to be extensively employed. Unless the feeders are supported out in back of the beam structure and brought down away from the mast until they are well below the ends of the elements, there is nothing to be gained through such a refinement. We have checked the performance of one of these beams mounted on a metal mast, and the effect of the mast seems to be negligible. The wide spacing between the Yagi sections pays a dividend in this case because the elements are at least a one-half wave from the vertical run of feeders and from the supporting mast; thus, the mutual coupling between these members is less than in the conventional close-spaced configuration.

Matching the Array

The antenna was designed to be fed with 300-ohm twin line. The model described above was checked experimentally, and the standing wave ratio was found to be approximately 2 to 1 at the low-frequency end of the two-meter band. The beam feed impedance was lower than desired and measured about 120 ohms, essentially resistive. Here we were faced with a problem. Should we re-design the entire array in the hopes that the next attempt would yield a feed impedance closer to the desired goal, or should we simply provide a matching system to transform the measured impedance up to the correct value? It was finally decided that the basic design was almost satisfactory for many applications without change. For example, if 75-ohm coaxial cable were used with a "bazooka" type of balancing device, the beam impedance was only a little too high. If 50-ohm coaxial cable were used with a "trombone" type of balancing transformer, the beam impedance should be 200 ohms.[5] In

[5] W. M. Scherer, "Balanced Feed Systems with Coax," *CQ*, July, 1949, page 29.

short, any effort expended to make the design specifically suitable for the 300-ohm twin line would only serve to make it worse for the other types of feeders.

Any of the common methods of matching a beam could have been used, but we decided to use the single-stub matching system. By using a stub of adjustable length, tapped across the feedline at an adjustable distance from the load, practically any type of line can be matched to any impedance load. Our stub was constructed of the same type of 300-ohm twin line as was used for the feeders. The adjustment which produced optimum results consisted of a 10″ shorted stub connected across the feedline 22″ from the antenna feed point. The shorted end of this stub may be grounded if desired, it can be tied to the mast, or attached to the beam structure at any convenient point; thus, it does not represent a very formidable mechanical problem. This matching system produced practically a perfect match over the major part of the two-meter band.

Bandwidth Considerations

Parasitic arrays have generally had the bad reputation of being acutely frequency-conscious. We were quite surprised to discover that this antenna, with the simple matching system described above, showed very little change in feed impedance over the entire lower three megacycles of the two-meter band. As is shown by *Fig. 6*, the v.s.w.r. was better than 1.5 to 1 over this range. The obvious implication is that the antenna will accept full power and presumably radiate essentially all of same at any frequency within this band. The only other consideration which might affect the utility of the array over a wide frequency band would be a degradation of the field pattern as the frequency is shifted. In practice, very little change of the major features of the field pattern can be noted, even at the extremes of the band. Although the front-to-back ratio may change slightly as the frequency is shifted, the percentage of the total radiated *power* that leaks out in undesired directions is still very small. In short, the specification performance of this array should be maintained over the lower three megacycles of the band, and only the most precise measuring techniques would detect the dropping-off of performance in the remaining megacycle.

The Field Pattern

A few words of explanation about the directivity pattern of this array might be in order, as we have heard several questions from users of the design who wonder why the beam seems to respond better to signals coming in from undesired directions than their old beams did. This complaint is probably justified. A re-examination of the pattern of *Fig. 3* will disclose the fact that the minor lobes are only about ¼ as large as the main lobe on the basis of relative field strength. When expressed in terms of power ratio, this is equivalent to 16 to 1, so the actual amount

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WANTED: AN/ART-13, BC-348, RTA-1B, AN/APN-9, R5A/ARN-7, AN/ARC-1, AN/ARC-3, BC-788-C, I-152, MN-26, test sets with TS- or I- prefix, dynamotors, control boxes, transmitters, receivers, power supplies, etc. State quantity, condition and best price first letter. HI-MU Electronics, Box 105, New Haven, Conn.

QSLs! G. L. Taylor, Sumrall, Mississippi.

WILL SWAP DeForest's radio training course, minus experimental equipment, radio technical books, various transmitter parts, for tools suitable for home workshop use. Gene Taylor, Norden Route, Johnstown, Nebraska.

QSLs, HIGH QUALITY, fair prices, samples? W7GPP, 1380 F. The Dalles, Oregon.

BARGAINS—NEW AND USED TRANSMITTERS—RECEIVERS—PARTS: Globe King $299.00; Meissner 150B $295.00; Hallicrafters HT9 $295.00; Sonar SRT-75 $149.00; New 150 watt phone $199.00; 60 watt phone $99.00; Globe Trotter $57.50; MB-611 $29.50; HT-17 $39.50; New Meissner signal calibrator $29.95; HRO-5TA1 $199.00; HRO complete $149.00; SX43, NC173, HQ129X $139.00; RME-45, SX25 $99.00; S38 $29.95; S41 $22.50; latest signal shifter $59.50; DB22A $49.00; BC610's, AF100, and many others. Large stock, trade-ins. Free trial. Terms financed by Leo, WØGFQ. Write for catalog and best deal to World Radio Labs., Council Bluffs, Iowa.

FOR SALE: Pair BC-222 walkie talkies complete with handsets and whips. Cover 10 and 6 meters. Like new, $30. Harold Tatar, 36 East Boulevard, Gloversville, N. Y.

SELL OR TRADE for anything of equal value, National NC-24OD receiver with matching speaker—perfect—used very little—make offer. Don Savin, WØZFK, 202 W. 11 St., McCook, Nebr.

FOR SALE: COLLINS 75-A RECEIVER. Excellent condition and A-1 shape. Express prepaid, $300.00. J. A. Selvidge, WØOMG, Poplar Bluff, Mo.

BC-610 BOUGHT NEW, factory converted for 10, $500.00. BC-654 with army stand, generator, telephone box, hand generator and extra BC-654 for spare parts, $50.00. HRO5TA1, spkr, power pack, coils from 550 kc to 30 mc. $235.00. VHF152, used very little, $75.00. ARC-5 transmitters and receivers BC-655, 459, 696, 453, 454, 455 all good condition, $45.00 takes lot. SCR522 xmtr. and rcvr. working condition, $15.00. f.o.b. Ithaca, no charge for crating. R. R. Sprole, W2QJT, 101 Homestead Road, Ithaca, N. Y.

PANORAMIC ADAPTER and oscilloscope Model AN/APA-10 converted to 115 v 60 cycle with 19 inch relay rack mounting including instruction book. Will ship prepaid for best offer. W9CUE, 1467 N. Colorado, Indianapolis, Indiana.

VHF-152A, DB-22A. Slightly used. W8QJC, Box 218, Holland Mich.

SELL–TELETYPE MACHINE, Model 12 complete with table, typing unit, keyboard, polar relay, etc. converted for ham use. Also tape equipment consisting tape transmitter, distributor, and reperforator. All in working condition. Best offer, W2SHE, 111–55 77 Ave. Forest Hills, N. Y.

WANTED: Bakelite, fibre, sheets, rods. Large, small surplus lots. Hubstampco, 355 Congress, Boston, Mass.

MULTI–MATCH modulation transformers, 300-watts—$17.95 and 500 watts—$34.95. Plate transformers 3000–2500–2000 each side, 500 ma., primary 115/230—$39.95. Fully cased, hermetically sealed, no surplus. List. Frampton Transformer Shop, Box 109, Blackwell, Oklahoma.

BEST OFFER takes 500-watt phone transmitter, pair 8005 in final, modulators 811s. Has 900-ma. power supply. Rack mounted in cabinet with ECO, ready to operate. Also 200-watt, 10-meter phone, complete, 3C24G final and modulators. W5HXC, Box 109, Blackwell, Okla.

MUST SELL—commercial looking 600-watt plate modulated 10 & 20 meter phone transmitter in 4 ft. deluxe Par Metal cabinet. Highest quality parts. Priced at $350, f.o.b. San Francisco. This is far below net cost. T. R. Peixotto, W6MXW, 201 Noe St., San Francisco.

COLLINS EQUIPMENT represents the best value for the radio amateur. All units stocked. We trade and offer terms. Evans Radio, Concord, N. H.

10 AND 20-meter beams—$19.25, up. Aluminum tubing, etc. Willard Radcliff, Fostoria, Ohio.

BC459 VFO (7–9 mc) transmitters, excellent, used, with power plug, circuit diagram, tested for output and frequency—$8.75. ATC1 (ART13) xmtr, excellent, used (wiring untouched) $97.50. Al Williams, W7HYA, 12015 75th Ave. S., Seattle 88, Wash.

HOORAY—a 2 tube 28D7-6SL7 preamplifier—in easy to adapt metal case—oodles of parts, new with original instructions—fine for many uses—$3.50 postpaid. The Overbrook Company, Overbrook 81, Mass.

NEW HT18, $70. Transtat 15A $30. Black crackle cabinet door, std. panel, 42″ x 22″ x 17″, original packing, $22. Complete station in suitcase AN/PRC1. Suitcase transceiver 2-12 mc. c.w. Input 115–250 v.a.c. 5 steps. Xmtr. 60 w. xtal, monitor, meter, Pi-network. Rcvr. hot superhet. Spares. New condition, $200. 400 ma. chokes $4. A. Worsnop, W2WBH, Pine St., Ardsley, N. Y.

FOR SALE: HQ-129X receiver. Excellent condition. $120. All inquiries answered. Lorence Weaver, WØSIL, 1921 Garland, Wichita 3, Kansas.

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HALLICRAFTERS HT18. Guaranteed like new. $75 f.o.b. C. Reber, W4OIT, 201 North Trenton, Arlington, Virginia.

FOR SALE: NC100X complete. Good condition. First offer over $45.00 takes it. W4KMB, 456 Pocahontas Street, Naval Base, Norfolk, Va.

FOR SALE: BC654. Good condition. Complete. Best offer. J. Anderson, W9IDA.

QSLs—still at our low prices. VYS Print, 1704 Hale Ave., Ft. Wayne, Indiana.

SELL: BC-610 transmitter, complete; factory converted for 10; operating on 10 through 80 meters; 700 watts fone & c.w.; $500. W5OFQ, C. H. Boyd, 1522 West Fourth St., Freeport, Texas.

UNITED STATES NAVY SYNCHROS—unusual opportunity to obtain a superb 166 page textbook giving complete and thorough instructions on operation, maintenance, and trouble-shooting of Selsyns—brand new. $1.75 postpaid. Army technical manual on SCR211 (BC221) frequency meter. Has complete specifications, schematics, instructions for maintenance and repair for all models. $2.00 postpaid. Frank Dunan, W3NB, 1717 Lang Place, N.E., Washington 2, D. C.

WANT TO SWAP my Conn Copron bell trumpet in new case—just factory reconditioned for any first class receiver in new or near new condition. James Lark, 2223 N. Quincy, Tulsa, Oklahoma.

CQ Ad Index

of power radiated in the minor lobes is small, in the order of 10 or 15 percent of the total power. However, expressed in terms of db, which is the scale usually used on receiver "S" meters, each minor lobe is only down about 12 db or two S-units. The rear and sides of the beam are not entirely "dead," but may have minor responses up to about 20 db below the main lobe. The presence of such appreciable pickup in undesired directions might make this beam appear, at first glance, to be inferior to other popular arrays, but, in every respect except ability to suppress QRM, it can out-perform any other simple antenna of comparable size which we have checked. It has filled a real need for us and for many other of the 144-mc operators who have investigated its possibilities.

SCRATCHI

(from page 4)

ceiver is turned on. Also, the louder I have the receiver volume, the better the car runs.

Things are going fine after I discover the key to the mystery, except that as I got farther and farther from town on my way to the ranch, the noise level on the receiver is getting lower and lower, and the car is getting to run no better faster and faster. About one mile from home, the car is sputtering to a stop and this time I can not get it started again.

Scratchi is now in 1/c predicament. The old sun is making the car hot, Scratchi hot, and the pavement hotter. I are not relishing idea of walking home, so I are putting Hon. Brain in high gear. If the car runs when the receiver is turned on with high volume, and receiver not not putting out high volume because there is no ignition noise around, why not make ignition noise in the car? Sounding like peechy idea, so I quick-like take off the spark plug suppressors, jump in the car, and step on the starter. Hot Diggedity, everything working FB.

With motor running the spark plugs are making noise like fury in the receiver, which are making loud volume outputs so motor are running. Scratchi is now getting home in jigs time and soon explaining master stroke of genius to Brother Itchi. He is quite impressed with my ability, but he is wondering how come the car not working in the first place. So, he is taking look at what might be wrong.

First thing Itchi is finding is a short in regular ignition circuit. Next he find that the speaker leads from the ten meter receiver are mixed up with the spark coil. It seems that when the receiver is on the output voltage going to the speaker is also into the spark coil, which are energizing spark plugs and motor is running. Scratchi like this system so much that I ask Brother Itchi to leave it that way, but he say that he went to fix the car properly.

After getting leads straightened out the car is still non compis mentis, and I are about to give Itchi big horsey laugh when he going to the gas tank. Yes, Hon. Ed., you are guessing it. No gas. Your for bigger and better quarter-wave vertical 75 meter mobile antennas.

Respectively yours,
Hashafisti Scratchi

THE NEW HRO-50

"CHARACTERISTICALLY" SUPERB!

Compare the characteristics of the new HRO-50 and see why, once again, the HRO sets the standard of receiver performance! You'll appreciate the convenience of the new HRO-50, too — the new edge-lighted, direct reading dial and the insulated, heavy-duty, built-in power supply. For thrilling performance, be sure to see and try the new HRO-50 — the receiver of the year!

National

NATIONAL COMPANY, Inc.
MALDEN, MASSACHUSETTS

SUMMARY OF CHARACTERISTICS

Freq. Range: 50-430 kc., 480 kc. — 35 mc.
Tube Complement: 6BA6, 1st r.f.; 6BA6, 2nd r.f.; 6BE6, mixer; 6C4 h.f. oscillator; 6K7, 1st i.f.; 6K7, 2nd i.f.; 6H6 det. & a.v.c.; 6H6, a.n.l.; 6SJ7, 1st audio; 6SN7, phase splitter and S-meter amp.; 6V6 (2) p.p. audio; 5V4G, rect.; 6J7, b.f.o.; OBZ, volt. reg. *Accessories:* Crystal Calibrator, 6AQ5; NFM Adaptor, 6SK7, i.f. amp., 6H6, ratio det.; Select-o-ject, 12AT7 (2).
Power Output: 8 watts undistorted, push-pull amplifier fidelity ± 1 db 50-15,000 cycles.
Sensitivity: 1 microvolt or better at 6 db sig./noise.
Selectivity: Variable from 15 kc. overall to about 400 cycles at 40 db.
Drift: Negligible after warm-up.
Calibration: Direct frequency reading.
Shipping Weight: 100 lbs. incl. spkr. and 4 coils.
Dimensions: 16½" deep x 19¾" wide x 10⅛" high.
Price: $335.00 (less speaker).
Accessories: 100/1000 kc. calibrator, $19.95; NFM adaptor $16.95; SOJ-3, $24.95.

The Big Three

YOUR SELECTION OF RCA POWER RECTIFIERS

Tube Type	Rectifier	Max. DC Input to Filters	
		Volts	Ma.
RCA-5R4GY	single-tube	750	250
RCA-816		950	150
RCA-866-A	two-tube	2390	250
	two-tube	3180	500

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RCA 866-A half-wave mercury-vapor rectifier has an edgewise wound filament with an enormous emission reserve—hence, longer life. This tube has the ability to withstand a peak inverse voltage of 10,000 volts at 1000 ma. peak plate current. A pair will deliver a kilowatt of dc at 3000 volts . . . with plenty of power to spare.

RCA-816 half-wave mercury-vapor rectifier is also double-ended; therefore its internal high-voltage qualities are not limited by glass electrolysis or by base and socket insulation. A smaller version of the RCA 866-A, this tube also has an edgewise wou filament and will handle high peak voltages and em sion currents. A pair will deliver *550 watts* of dc 2200 volts!

RCA 5R4GY is a full-wave, high-vacuum rectifi with a heavy-duty coated filament. Fitted with a lo leakage Micanol base, this tube can handle peak i verse voltages up to 2800 volts at 650 ma. pe current per plate. A single tube will supply a output of over 150 watts at 250 ma.

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