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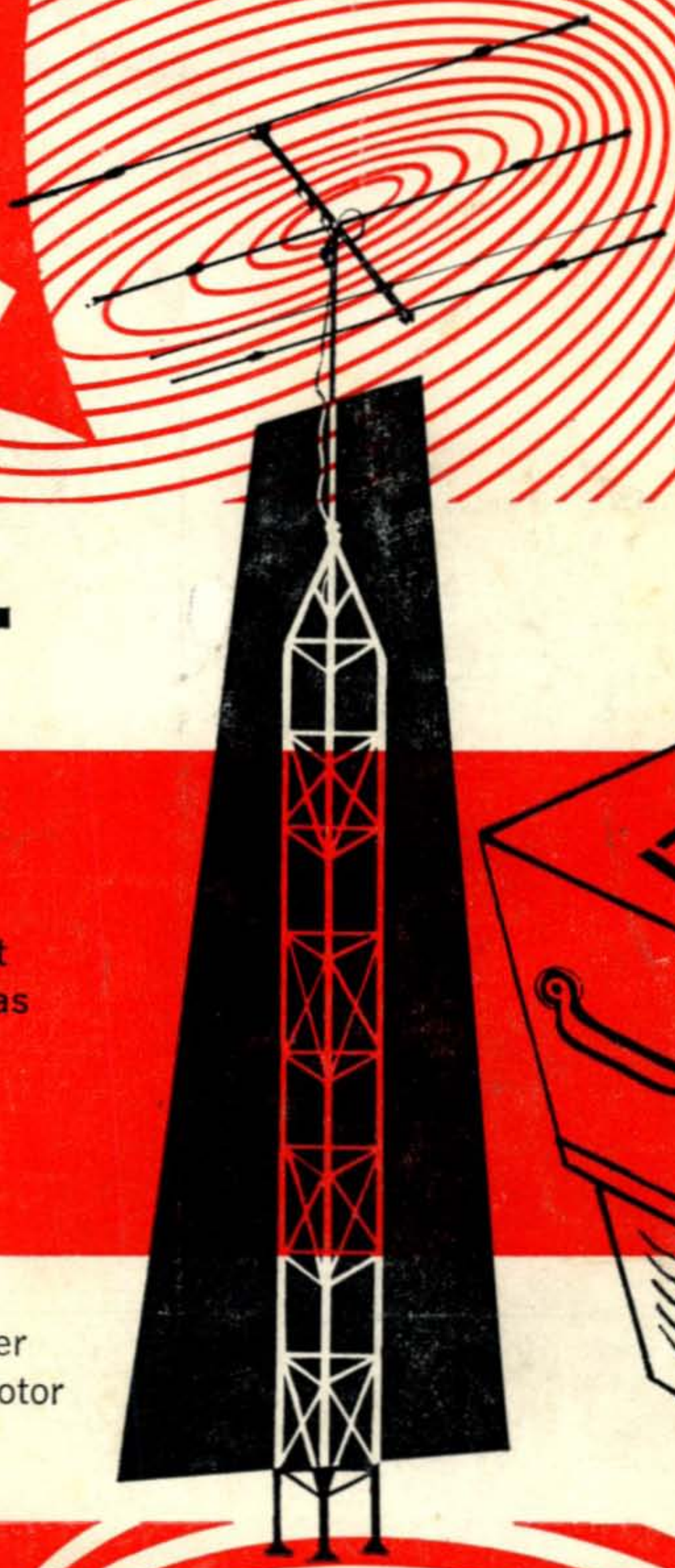

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Designing Multi-Band Quads

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Exciters Using The SCR-274N
A 24G High Frequency Multiplier
Prop Pitch Motor as Antenna Rotor
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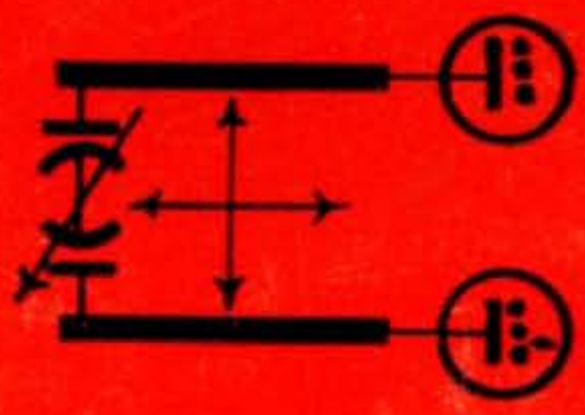
VHF

Transistorized Preamp For 432
CQ Reviews The Heath Pawnee
The Standing Wavemeter
And Starting This Month . . .
The VHF Amateur



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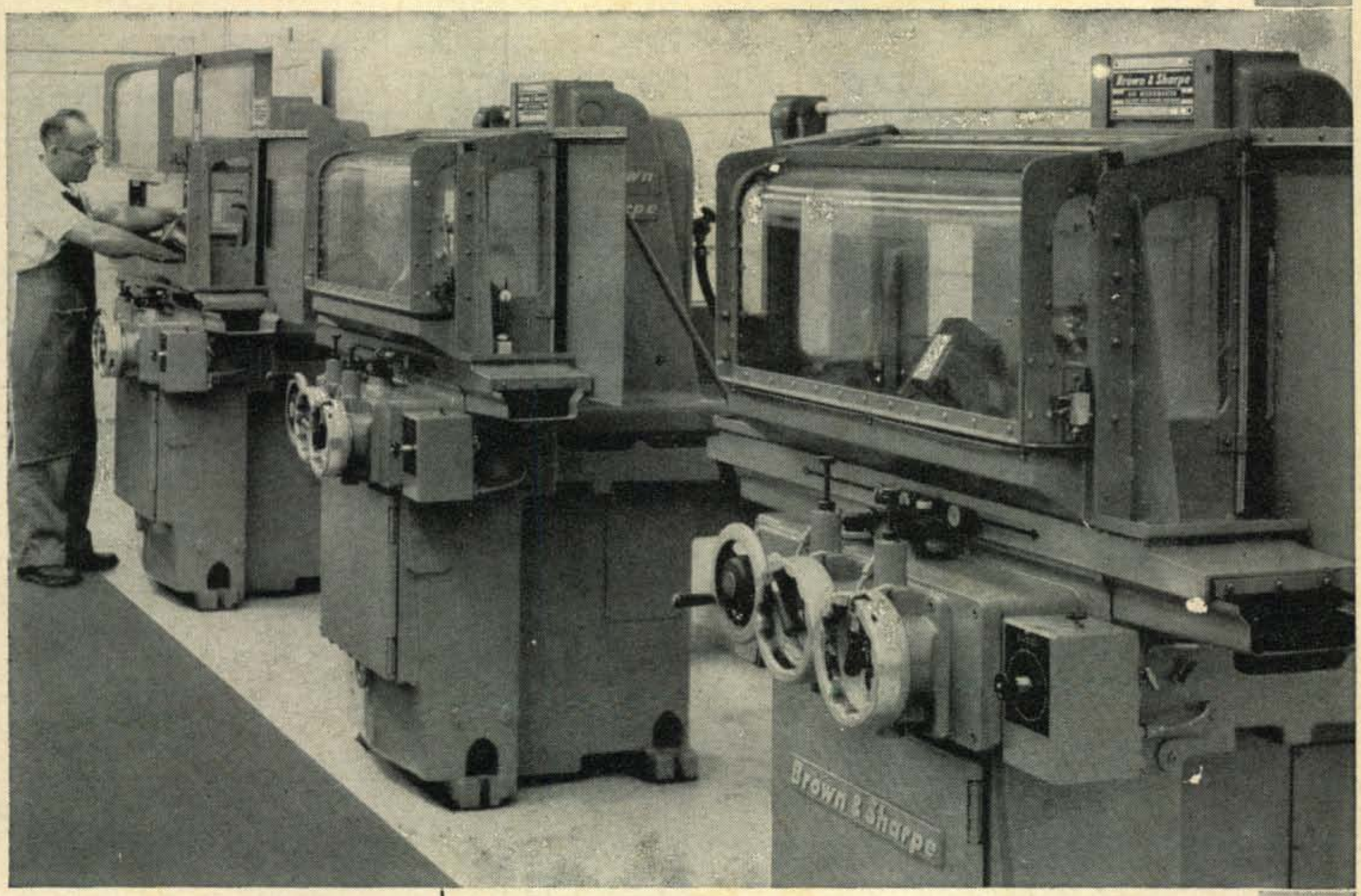

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For further information, check number 2, on page 181

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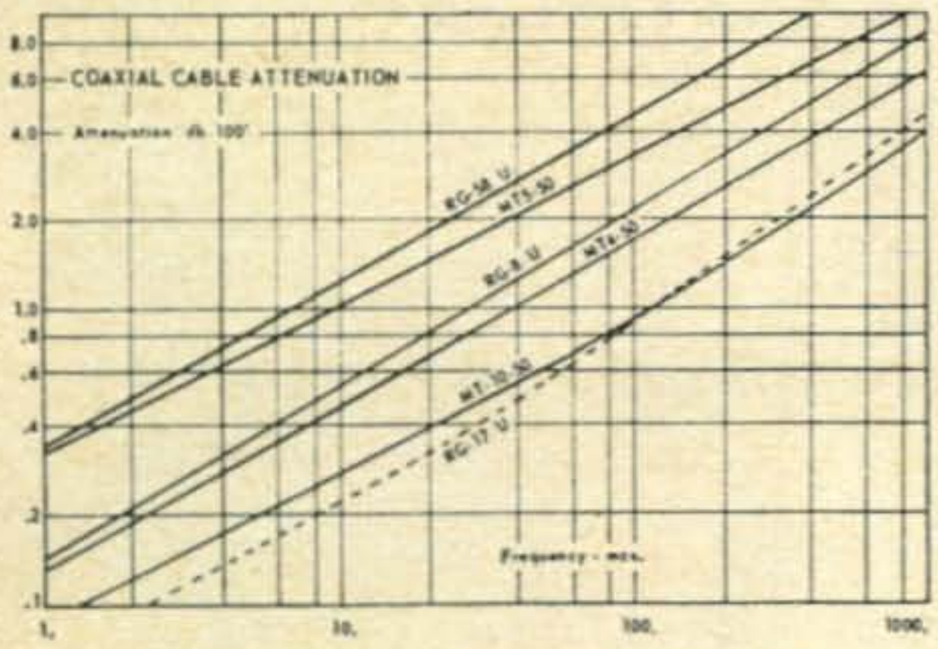
See article by Michael Ferber in April, 1959, Q.S.T.



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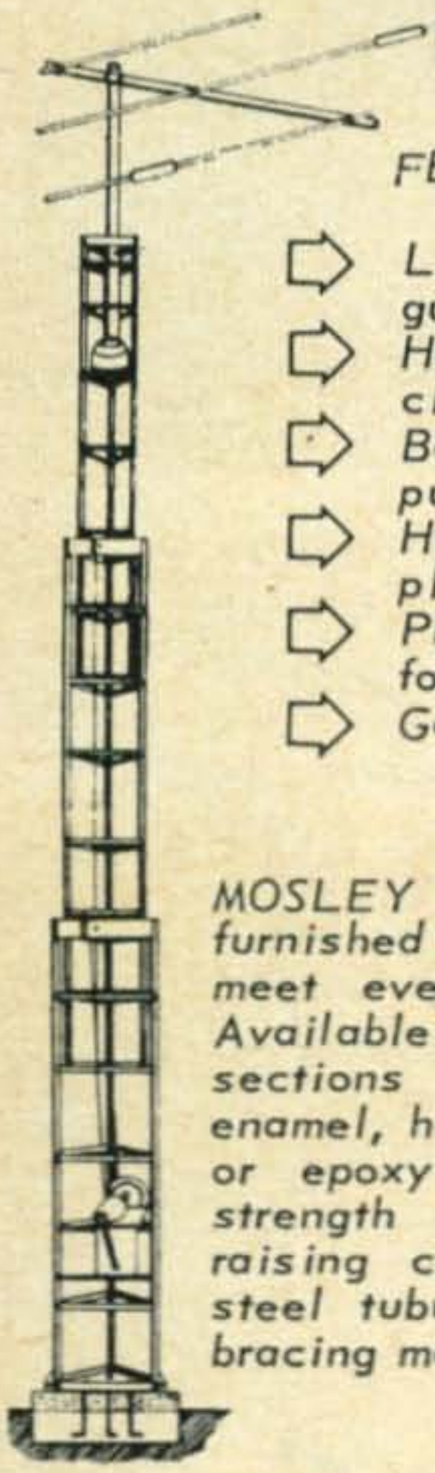

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CQ

The Radio Amateur's Journal

Vol. 18, No. 11 November 1962

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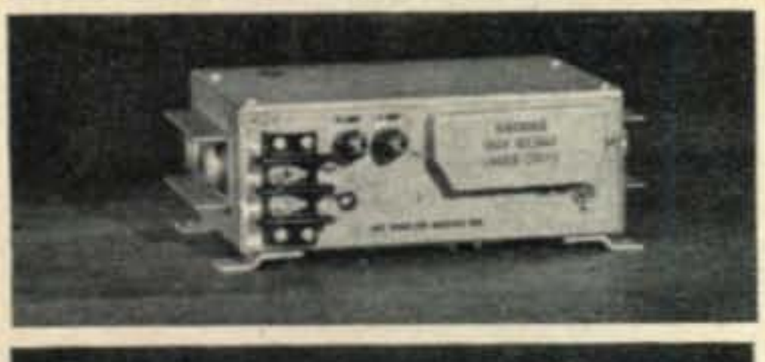

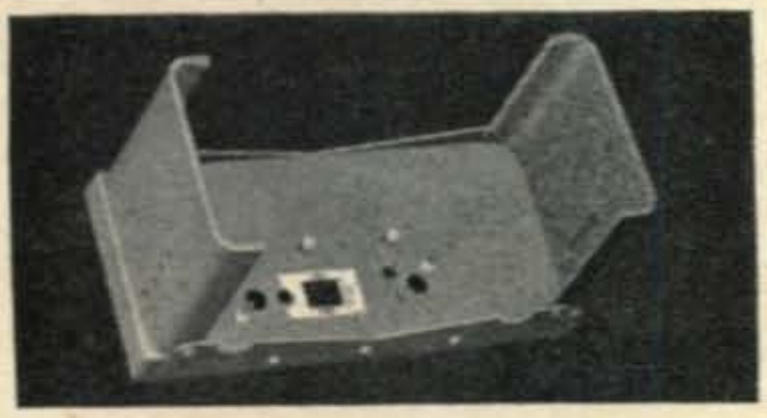

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For further information, check number 18, on page 181

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For further information, check number 59, on page 181

ZERO BIAS

As expected, a great deal of mail was received on the subject of the Technician Class licensee obtaining ten-meter privileges, outlined on this page in August.

It is unfortunate that space does not permit publishing all the letters received; however, a random sampling of both opinions appears, beginning on page 12 of this issue.

The chief reason in the affirmative, given by our readers, is the old cry of spectrum inactivity; many readers calling to our attention the fact that eleven meters was expropriated from the amateur only to be possibly followed by ten if something is not done immediately.

It is our intention to stress here that this is rather unlikely to ever happen. Ten meters is, internationally, a band shared by very few services other than the amateur; citizen's radio is not one of them! An international agreement made at a conference table would be required to ratify a change of this type.

Many amateurs feel that the enormous numbers of CB stations being licensed may bring sufficient pressure on the Congress to allocate more spectrum space. Let us make it very clear that the citizens band is *not* crowded.

Perhaps CB manufacturers and CB operators too would do well to evaluate the extensive use of channels nine and eleven. Most firms supply, as standard items, 27.065 and 27.085 kc crystals, leaving the erroneous impression that eleven meters abounds with activity. We can make the analogy then, that a DX pileup on 20 assumes the entire band is as crowded as the DXer's frequency. Naturally, it is not!

The chances that CBers will ask for additional space is even more remote when one considers that the 23 channels now in existance can easily be doubled with the use of single sideband. Extra channels, too, can be added by reducing the 10 kc spacing now used between channels.

As a summary then, the argument in favor of the Technician receiving operating privileges simply because of 10 meter inactivity doesn't hold too much water, at least for many years to come.

Those against the adoption of ten for the Techs refer time and time again to the original reason for the institution of the license, *i.e.*, v.h.f. and u.h.f. experimentation. The code requirement also appears to be a rather sore point.

Although there are a great many amateurs who for one reason or another cannot prepare themselves for the code requirement, we feel that a major change in amateur regulations will solve no problem.

Very few will argue that our licensing system leaves a lot to be desired. In a country that thrives so well on individual incentive, it appears that the amateur radio ladder-of-success is in sad disrepair, evidenced by the present Amateur Extra regulations.

A great many amateurs in this country seek the elimination of the c.w. requirement and a substantial increase in theory. Besides the obvious need for c.w. in time of emergency, what physiological factor makes c.w. an amateur necessity?

The knowledge that the amateur has presented himself at the FCC, donned the headset, held the twitching pencil in his perspiring hand and copied the "ole' thirteen" is, we feel, sufficient to make this the world-wide equalizer. The fraternalism evidenced in amateur radio does not come from the knowledge of electronic theory. Certainly it is a basic ground on which one can easily converse. We're sure thousands of amateurs have memorized the theoretical part of the exam—but it is impossible to "memorize" 13 w.p.m.

CQ feels the need for a return of incentive; the retention of our code requirement and additional privileges for the Extra Class license.

SOMETHING NEW

This page, along with our regular monthly sections, has received a new look. We hope you like it. Advocates of the very high frequencies will also notice a new face in *CQ*. *The VHF Amateur* will be a regular addition to *CQ* beginning this month on page 89. We hope you like it too.

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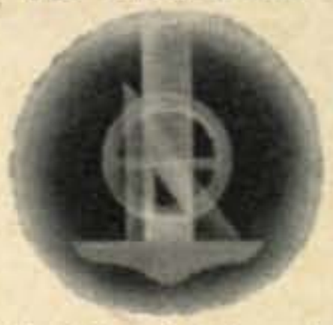

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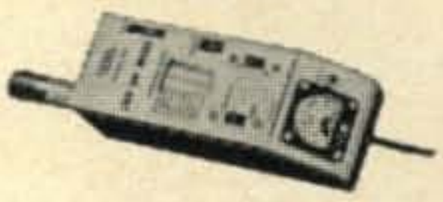

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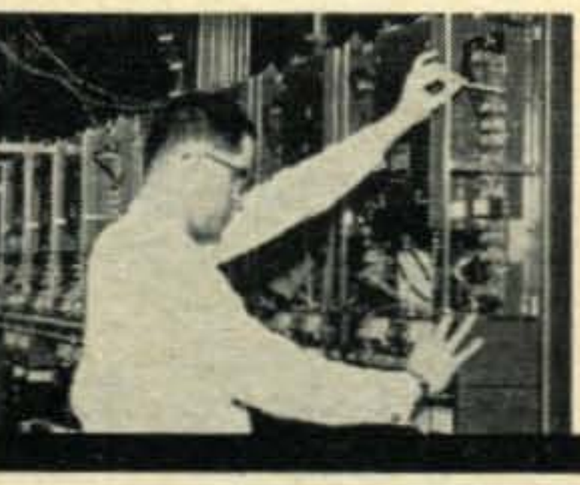

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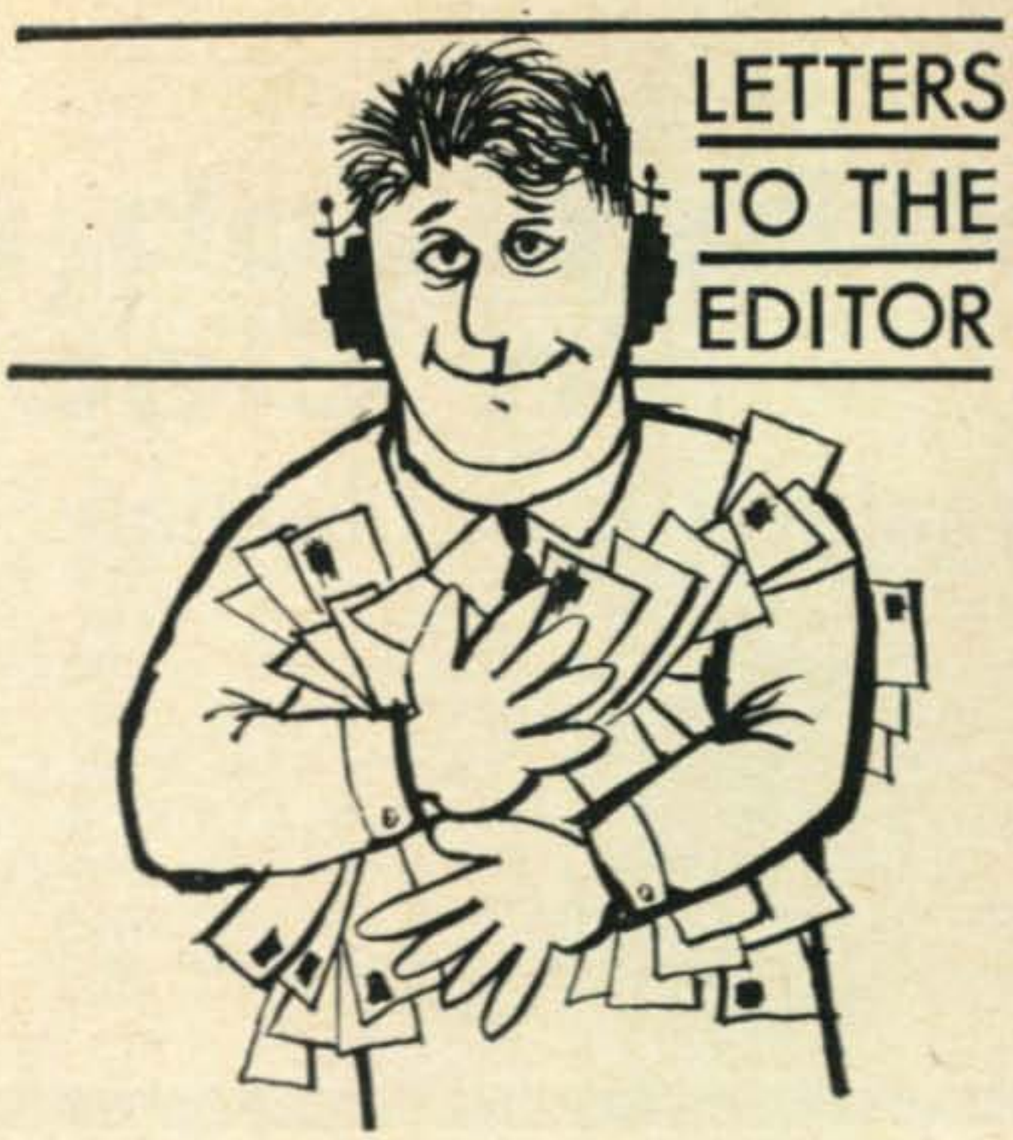

Techs and Ten

Editor, *CQ:*

It was with great interest that I read ZERO BIAS for August and am happy to voice my opinion in the following paragraphs.

It has long been my contention that the code requirement is an unfair restriction to the participation in amateur radio. I believe that the often used excuses for keeping these old laws enforced, *i.e.* for National Defense (so the Armed Services could draw on the amateur ranks to fill their needs) and the "crowded bands" (c.w. takes less of the available spectrum), are quite obsolete.

To the first argument, I offer that the present armed forces are so equipped with modern equipment, even including portable teletype, etc., that the need for "trained" code men is no longer an excuse for requiring amateurs to pass a code exam. The second argument, that of crowded bands, has made an exit with the increased use of s.s.b.

Present day laws, wherein the technical exam is little more than a formality, enables anyone with the ability of attaining a certain code speed to run down to the nearest radio store and buy a kilowatt transmitter.

I personally know of many technically qualified persons who would like to become (real) hams but just can't pass the code requirements.

If the use of the amateur bands have to be more restricted it should, in my opinion, be done by making the exams more difficult to pass. In addition, I believe, it would be to the advantage of amateur radio to eliminate the code requirements completely.

The here-voiced opinion is not based on a selfish desire to gain more benefits for myself or my class of license since I am a general class holder. . . .

Yes, I am in favor of allowing Technicians on the ten meter band.

Walter A. Tilleman, K5IDD
P. O. Box 102
Beatty, Nevada

Editor, *CQ:*

In the 20 some years I have been an amateur I have only twice before settled down to answer an editorial appearing in a magazine. However, after reading ZERO BIAS in the August, *CQ* I feel compelled to get my two cents into the fight.

Reasons are stated that with the lack of activity on 28 mc it will be turned over to the Citizens Radio Service, as was 27 mc. First of all this is impossible unless the FCC decides to break an international treaty to which we are a signatory nation. The 27 mc band was never assigned strictly as an amateur band, while 28.0 to 29.7 is, on a world-wide basis. . . .

After all, as a hobby, ours is the only one regulated by international agreement, where all concerned are

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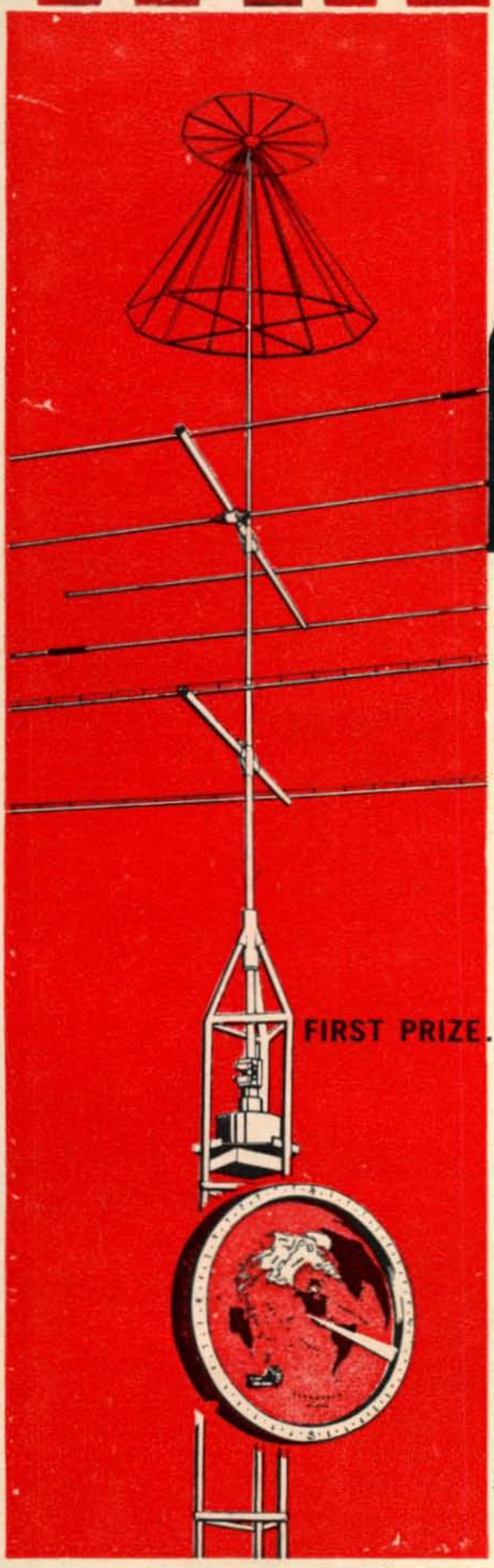

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supposed to have approximately the same minimum technical and manual dexterity background. This one factor has probably brought about more international good-will through a daily interchange of communications between us and foreign countries than all of our foreign aid programs put together.

The Technician Class license was originally adopted to permit serious experimentation on v.h.f. and up; not for normal hamming. Fine, I'm all for that, but in practice it seems to have become a communicator class of license. Where once it took some ability to master the 13 w.p.m. code requirement, now we find people obtaining a license by memorizing 25 consecutive letters sent a couple of seconds apart. They then *demand* the same privileges the others among us got the hard way.

Why not look at it another way? Let's up the code requirement to 20 w.p.m. and clean out all the "dead wood." Once again we will have a wide open spectrum, as all the remaining W/K stations will still be found in the low 50 kc of 3.5, 7, and 14 mc. Sound nasty? Sure, but its as practical a solution as allowing the Techs to go on 28 mc. Besides, it gives the power back where it was (and rightfully belongs), in the hands of the group who built amateur radio, rather than the group who will eventually destroy it.

Maybe I sound bitter, and I guess I am, but it is about time someone stood up and fought back against this dedicated invasion. Any comments to this can be directed to me between 7001 and 7015, or 14001 and 14050 kc, but to conserve time on the frequency please don't call under 35 w.p.m!

Jim Young, W6WAW
1036 N. Stanley Ave.
Los Angeles 46, Calif.

Editor, *CQ:*

Being a Technician with scant chance of ever being able to copy 13 w.p.m. due to my age (82) I am impressed by the comments in ZERO BIAS for August.

I have spent the past 35 years of chief engineer in a manufacturing plant and feel that I have a fair knowledge of the value of ability in the field of electronics. The theory that one must be able to transmit and receive an arbitrary number of words in a given length of time seems to be rather wide of the mark. As a matter of fact, c.w. is rather a throwback to the stone age. As everyone knows, the railroads, steamship and air travel companies have practically abandoned the International Morse Code.

It seems to this writer that the ability to construct and operate short wave radio equipment in accordance with good practice is of more value to the people of our country than the ability to transmit 13 w.p.m.

I trust we may hear more from the Technicians who are, in my opinion, deserving of a little more latitude.

W. W. Warner, K8RSC
432 E. Summit St.
Kent, Ohio

Editor, *CQ:*

In response to your inquiry about Technician licenses, I add my voice to those who oppose any move to permit 10 meter operation by Technicians.

I have been licensed 10 years and made it via the Novice-to-Technician-to-General route. I failed the code test several times and am not ashamed to admit it. But when I finally qualified I felt I had achieved something worth working for and not something that had been handed me. . . .

If it is worth it to a Technician to get on a band where serious DXing goes on, then it's worth it to him to pass his code test. If it is worth it to a Technician to get on a band where there is more long haul radio operation, then it's worth it to him to pass his code test.

Take away an incentive—such as those offered by obtaining a General Class license—and you take away any desire on the part of the Technician to improve himself and his art. Technicians have made an important contribution to amateur radio and are recognized for it. They have opportunities to make additional contributions, but it will require hard work. . . .

Fred Bonavita, W4WUQ/4
51 Altamont Apts
Altamont Circle
Charlottsville, Va.

– For further information, check number 33, on page 181

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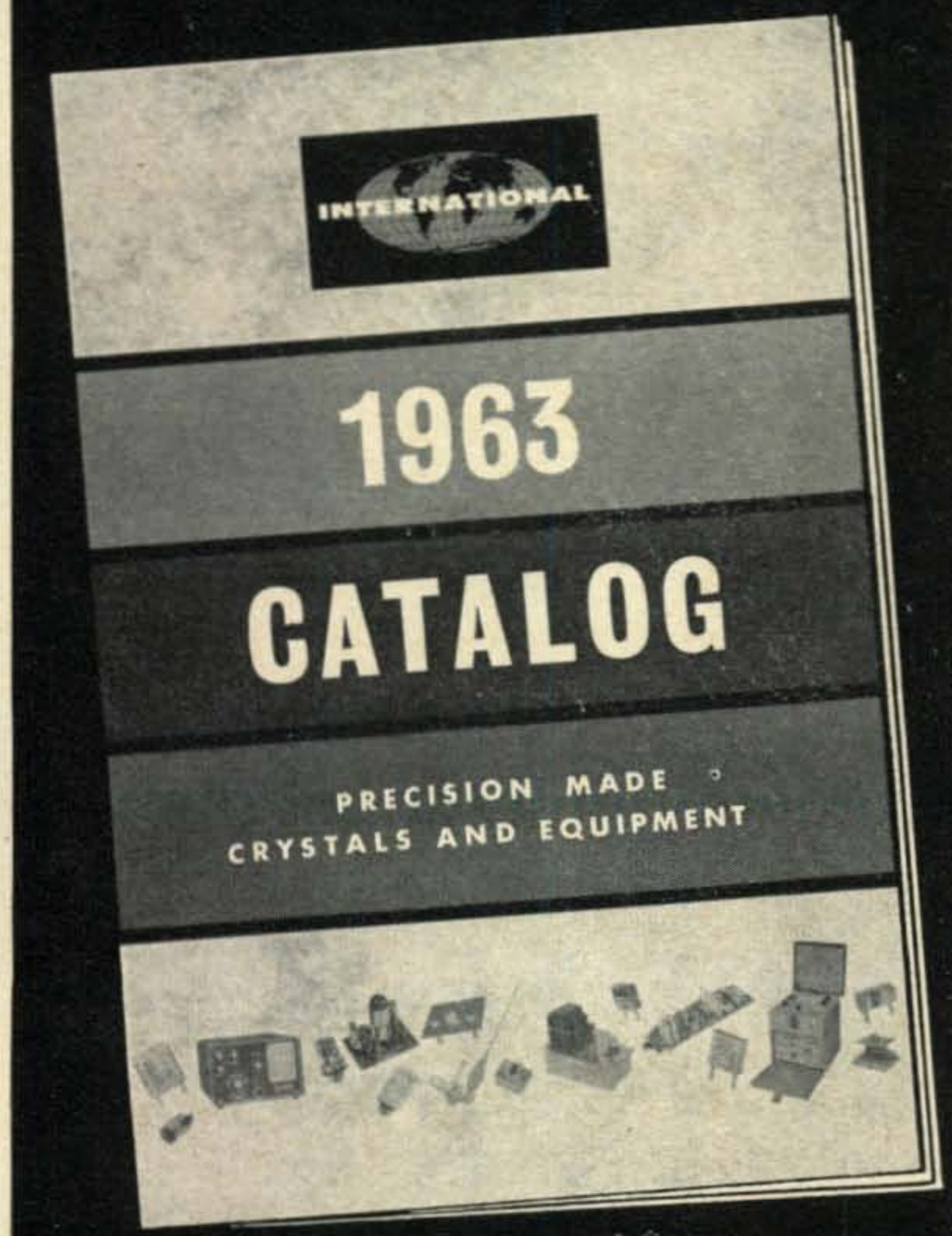

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Random Thoughts From —
the Boys in the Back Room

BY NOW, readers and advertisers alike are certainly well aware that *CQ* is in the process of a major expansion program. By acquiring *The VHF Amateur Magazine* and adding it as a regular feature to *CQ* (this takes place in this month's issue) we are able to enlarge the editorial coverage in *CQ* to provide our readers with more and better material than ever before on all facets of amateur radio.

CQ will now serve more readers than ever before, but there is *no* plan to increase advertising rates. In other words, our expansion can only be completely successful if *CQ*'s sales increase to absorb the expansion costs.

We at *CQ* have never stooped to pleading poverty, and we're not going to start now. It's our single hope to sell *CQ* to amateurs on the magazine's editorial value, and to sell advertising on the basis of a sound financial return for the advertiser's investment.

So, we think we have every right at this time to urge our readers to strengthen their support of *CQ* on *CQ*'s merits. We hope to convert regular and sporadic newsstand buyers to subscribers. This will provide us with additional working capital to further improve and expand *CQ* editorially; it will also make that many more copies of *CQ* available on the stands to the newer group of amateurs who often get to the newsstand after the last copy has been sold.

We also urge readers who buy commercial products from our advertisers to emphasize that the ad was seen in *CQ*. This will encourage the advertiser to sustain his ad program because he'll know his ads are getting results.

CQ is on the move to many bigger and better things for the amateur radio fraternity. Won't you lend us your support so that growth can be accomplished that much faster?

Editor, *CQ:*

I would like to speak out expressing my opinion on the Technicians limited usage of the 28 mc band.

One of the biggest threats to any amateur frequency is inactivity. Because of inactivity, other services can say (perhaps rightly so) that these frequencies are not being used to their best capability.

It is seldom indeed when 10 meters is overcrowded from 28 to 29.7 mc. Limited usage of 10 meters will be an incentive for Tech's, and will precipitate an active 28 mc region. This would not only be to the interest of the Technician, but to all other classes of licensees as well. I say Technician usage of the upper portion of 10 meters will not actually degrade the 10 meter band, but may help.

Kenneth R. Waites, K5RUO
Route 1, Moss, Mississippi

Editor, *CQ:*

Let me say, first of all, that I am not in favor of handing over any band of frequencies below fifty mc to the Technician. We must put a stop to this insidious process of decimating the ham bands just because some license class or group feels they are being crowded, or because some bands appear to be inactive, or because they feel they should be given the bands to insure its continued existence.

None of these is justification in itself for turning over a band to the Technician. If he feels crowded, why doesn't the Technician head for the higher frequencies? Wasn't he licensed under the impression that he wanted the higher freqencies for experimentation instead of just rag-chewing? Suppose the Technician did get the ten meter band; what about the future? This band is relatively quiet at this stage of the sunspot cycle. What happens when the band opens up again? If the Technician is present, he will undoubtedly yell for another band to alleviate the crowded conditions on ten.

I say that if the Technician wants the lower frequencies, let him get out the code practice oscillator and key and earn the lower frequencies by the fail-proof method of learning to send and receive thirteen words per minute.

Let's stop catering to the whims of the few who want everything on a silver tray. This goes for all license classes. Sure, ham radio is only a hobby, but like everything else, the more you put into it, the more enjoyment you get out of it.

Arthur W. Rogerson, W1UXK
RFD 2, Chapel Rd.
Bennington, Vermont

Editor, *CQ:*

I am writing in regards to ZERO BIAS which appeared in August, *CQ*, concerning the expansion of Technician privileges to the 10 meter band.

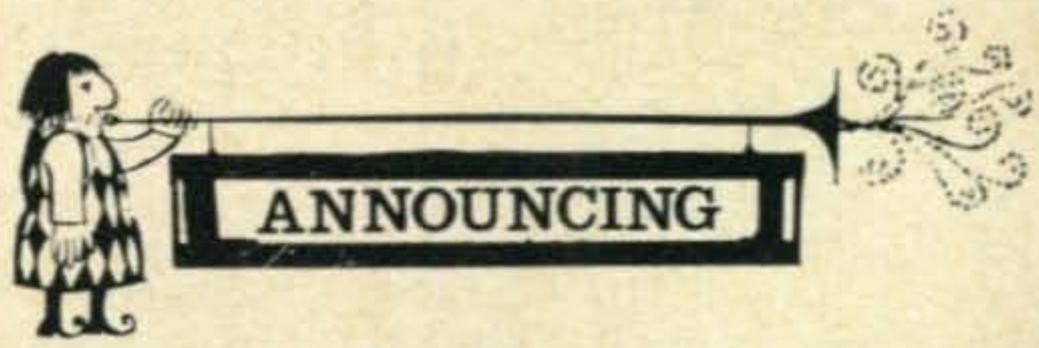
I feel that if Techs were given the 10 meter band to learn more about the "General Class world" then perhaps more Techs would go out for the General. I further feel that the Techs, who are ardent v.h.f. experimenters, probably don't care anyway and will continue to experiment in the high bands, thus continuing to stimulate the purpose for which the Tech ticket was established.

I am sometimes ashamed of the petty jealousy and fighting with other radio services, such as CB, and especially the General vs Tech. Both being hams, sometimes I wonder.

Another reason I would like to see Tech privileges expanded is to help the handicapped. What I'm going to say may be hard to believe but I know of one ham, myself, and I've heard of similar cases over the air, of persons being stricken with forms of paralysis whereby they have poor coordination in their hands. This is a big factor when it comes to code. My friend just barely got by the 5 w.p.m. and felt lucky, although he has the incentive to get his General, he just plain can't knock out the code any faster. This, I feel, is something to think about. Increasing Tech privileges would help these hams in a definite way.

I congratulate you on publishing such a terrific "Ham Manual" each month. Especially for ZERO BIAS

[*Continued on page 170*]



International Communications Fair

November 28th to December 2nd will be the days on which the International Communications Fair will be held at the New York Coliseum. This is a new idea in communications expositions and should prove quite interesting. All phases of communications will be illustrated including amateur radio, citizens band, marine, aircraft, short wave, f.m., hi-fi, closed circuit TV, *etc.* Most of the amateur manufacturers will be in attendance. The Hudson Amateur Radio Council will be operating W2ICF (*I*nternational *C*ommunications *F*air) right on the convention floor. Tickets are $1.00 and 40¢ for children. Special club rates (25 or more) will be honored on club stationary at 60¢ each. ICF headquarters is 310 Madison Avenue, New York 17, N. Y. Telephone MU 7-6290.

Los Angeles

The v.h.f. gang of Los Angeles, California inform us of their impending dinner/dance to be held Sat., Dec. 1st at the Roger Young Auditorium in downtown L.A. Closing date for tickets is Nov. 27th. Info from K6JJN, WA6IZO and WA6KLP.

Terry County, Texas

The Annual Terry County Amateur Radio Club's Swapfest will be held November 11 at the Brownfield, Texas National Guard Armory. There is no admission fee and from last year's turnout this one is expected to be still bigger. W5NFO will fill you in on directions, *etc.*, if you need them.

Home Brew Contest

The Rock Creek A.R.A. (Silver Spring, Md.) is proud to announce the winners of their Home Built Equipment Contest. "Robby" Robinson, W3RE, president of the group presented a $100.00 Savings Bond to Don Campbell, KN3RAZ for his prize winning two-meter converter using four Nuvistors. Larry Rubin, KN3STB, took a second prize of $50.00 with an 80-40 meter transmitter, and a gift certificate of $10.00 went to Jim Henkel, KN3TIV for runner up. The prizes are awarded to those licensed a year or less. *Club Treasurers take notice!*

Dental Net

Matt Eisenman, K3LEC informs us that all Dentists are invited to participate in a net beginning Thanksgiving Day. Be at 14,335 at 1600 GMT and listen in. West Coast net-control will be W6SZU and K3LEC will handle East Coast activities.

Pennsylvania

The Phil-Mont Mobile Radio Club of Philadelphia will hold its annual award dinner at the Llanerch Country Club, Llanerch, Pa. on Nov. 10th. Clint Spencer, W3QQH will fill you in on details. He's at 124 Central Ave., North Hills, Penna.

Correction

Since the August issue, G.E. has announced a new basing scheme for the 7984; "One Tube, 30 Watts," *CQ* Aug., p. 26 Pins 3 and 5 are now also connected to the plate. Please make the correction if you have the August issue handy.

Figs. 2 and 3 of "S.S.B. Reception With A.M. Receivers" were accidentally transposed. Please correct it in *CQ* for last month, pp. 37-38.

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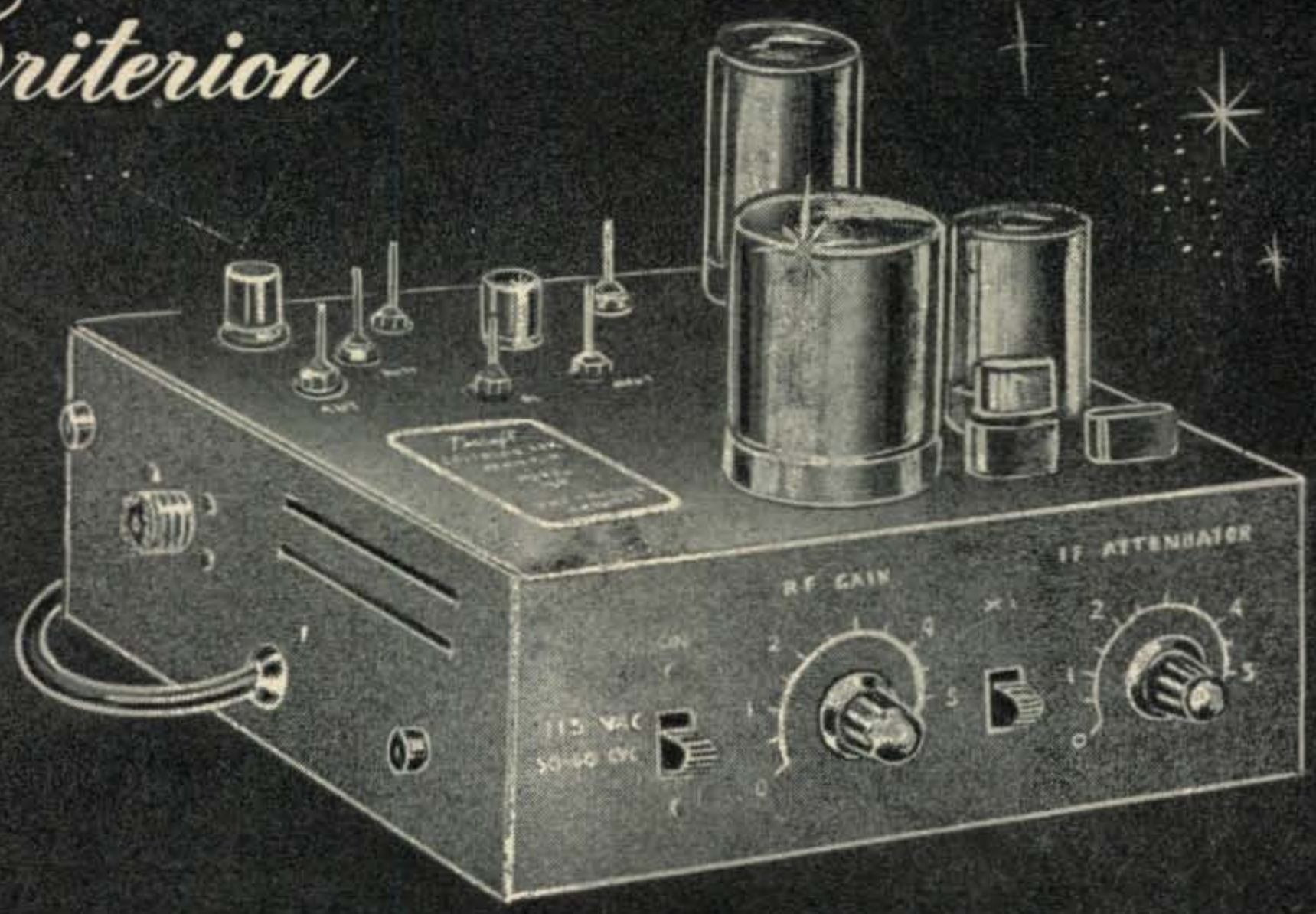

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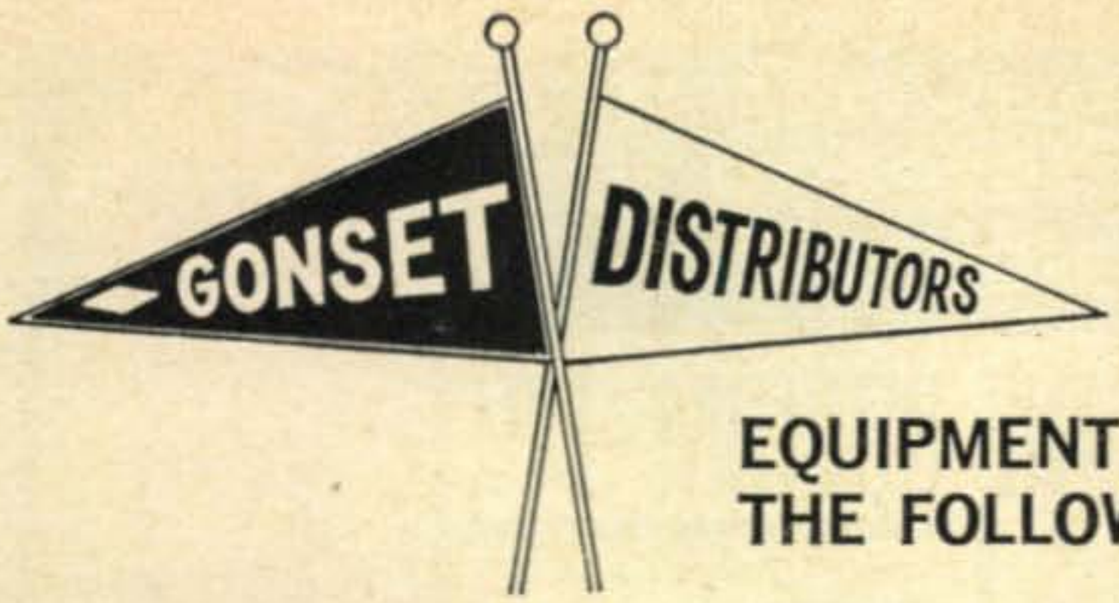

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For further information, check number 40, on page 181

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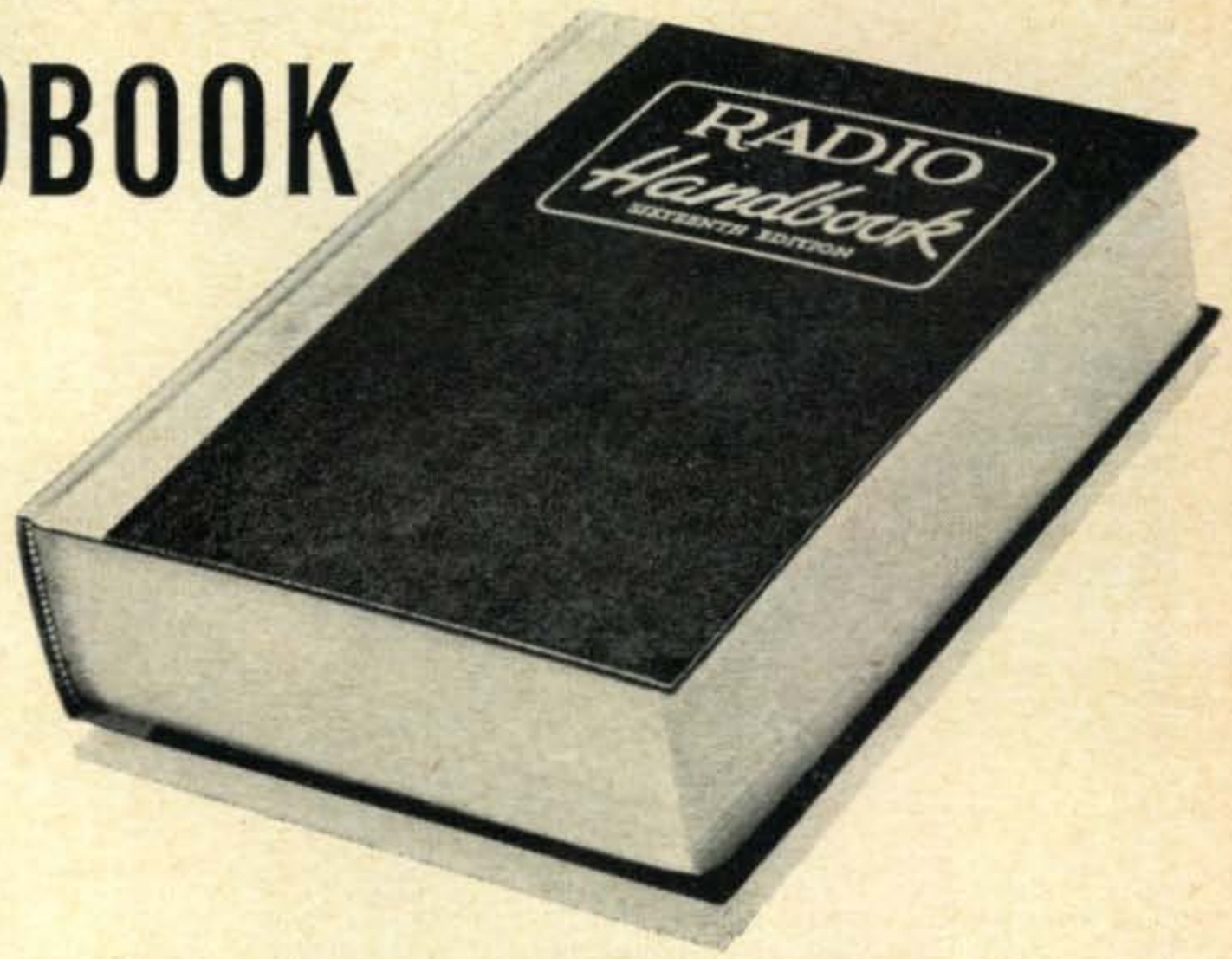

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For further information, check number 19, on page 181

The Standing Wavemeter

BY FREDERICK W. BROWN*, W6HPH

This extremely versatile u.h.f. instrument may be used to measure such things as frequency, impedance, standing wave ratio or even the velocity of light.

DEAR to the heart of every microwave engineer is a device known as the slotted line. At microwave frequencies it is almost indispensable for measuring impedance or s.w.r., and can also be used to measure frequency (wavelength), or phase velocity. In principle the instrument is quite simple, it consists of a detector that can be moved along a section of waveguide and sample the voltage inside by means of a probe inserted through a longitudinal slot. A slotted coaxial line may be used in the same manner. Although simple in principle, construction of a slotted line requires adherence to very exacting mechanical tolerances, and is ordinarily outside the province of amateur construction.

The gadget described here is sort of a parallel wire "slotted line" and performs the same tasks as its microwave counterpart but can be built with much less exacting tolerances. Essentially, it consists of a sampling detector that is movable along a section of parallel wire transmission line; an idea almost as old as radio. Before getting into the construction, let's take a look at some applications.

Standing Wave Ratio

S.w.r. is simply the ratio of maximum to minimum voltage (or current, though the Standing Wavemeter responds to voltage) along the line. Naturally, the ratio, as measured by the sampling detector, will be independent of detector coupling; although the coupling should be as loose as possible to prevent distortion of the standing wave pattern. If the line is terminated in a short or open circuit (or pure reactance), the voltage minimum will be zero; making the s.w.r. infinite. The standing wave pattern will then have exactly the shape of a rectified sine wave with nulls one half wavelength apart.

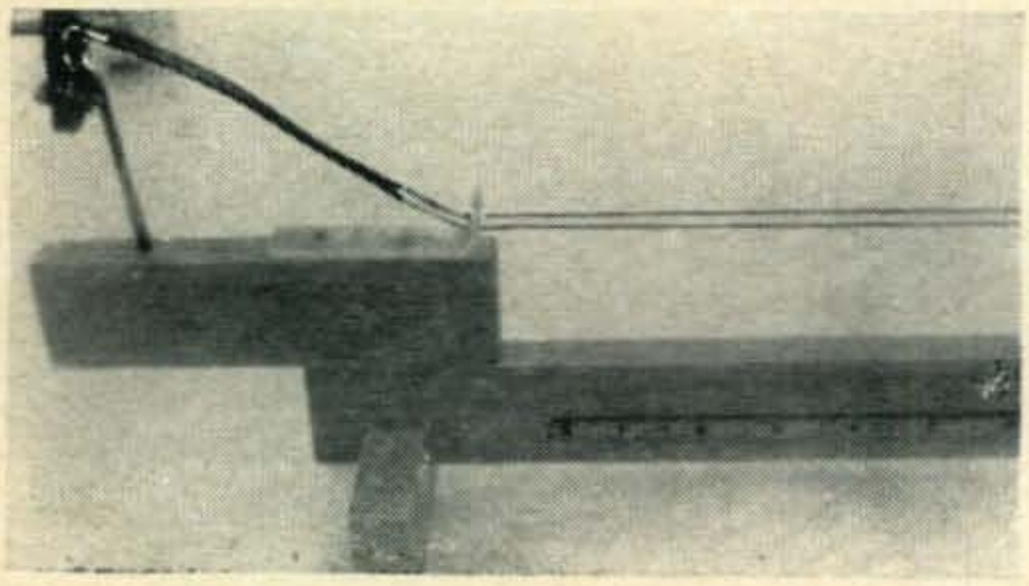
S.w.r. is measured by inserting the Standing Wavemeter in the line and noting the ratio of maximum to minimum detector output voltage. This gives the s.w.r. directly if the Standing Wavemeter has the same characteristic impedance as the transmission line.

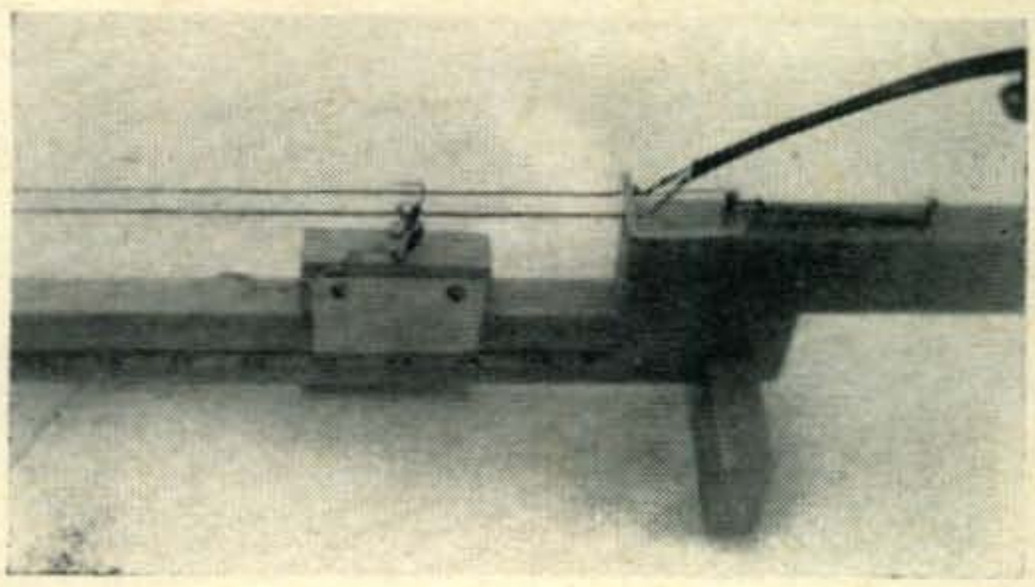
To insure the presence of one minimum and one maximum somewhere along its length, a detector travel of at least one half wavelength is required. This sets the lower frequency limit of operation. The upper frequency limit is not so precisely definable, but may be taken as the point where the wire spacing exceeds 1/10 wavelength. Above that frequency, radiation from the line becomes appreciable.

Wavemeter

The Standing Wavemeter may be used Lecher-wire fashion to measure frequency. It has some decided advantages over the conventional sliding-short type of instrument, however. For one thing, conventional Lecher-wires present an input reactance that depends on the position of the short. If coupled to an oscillator, this changing reactance can affect the oscillator frequency, hardly a desirable situation when frequency is being measured. Moreover, because the short is imperfect (due to its inductance), the line beyond the short

*Star Route, Idyllwild, Calif.





View of the left and right ends of the Standing Wavemeter showing the sliding detector and the general construction method. Tension is maintained on the line by a spring fastened to the right plastic insulator. All wood parts are made from 1" × 2" stock.

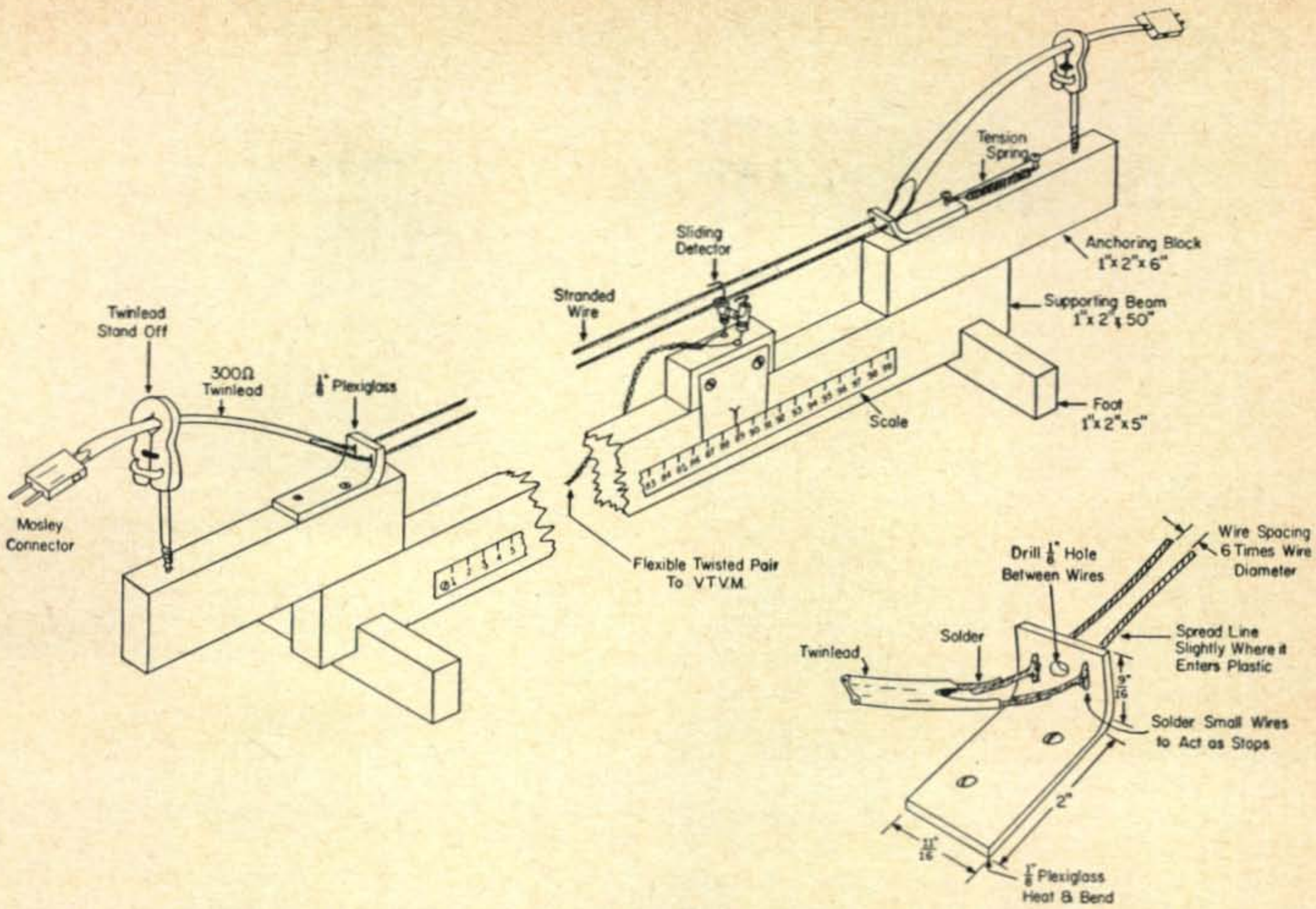


Fig. 1—Construction details for the Standing Wavemeter for use with 300 ohm lines. With a 36 inch scale the unit can function from 164 mc to well above 12,000 mc.

will be coupled to the active part and give rise to a distorted standing wave pattern.

Frequency is determined on the Standing Wavemeter by measuring the distance between nulls. Since the distance is exactly one half wavelength, the frequency in megacycles is given by

$$f = \frac{15000}{d}$$

d being the distance in centimeters between adjacent nulls. If old fashioned inches are used, the formula becomes

$$f = \frac{5906}{d \text{ in inches}}$$

At the higher frequencies slightly better accuracy results if the distance is measured between nulls separated more than one half wavelength. The above formulas must then be multiplied by the number of half wavelengths included.

To insure at least two nulls appearing somewhere on the usable portion, the line will have to be at least one wavelength long. The Standing Wavemeter may be used at lower frequencies, however, if the line is terminated in such a way that a null appears close to the limit of the detector's travel. This can be achieved by terminating in an open circuit at a point slightly less than one quarter wavelength beyond the limiting position of the detector. The wavemeter will then be usable almost down to the frequency where its active length is a half wave. Of course, the distance between a null and its adjacent maximum (¼ wavelength) might also be used to roughly measure even lower frequencies, but is not recommended for precision work because the maximum is relatively broad. Besides, conventional *L-C* wavemeters work well in the lower v.h.f. region.

The precision attainable when measuring frequency depends primarily on the exactness of the distance measurement between nulls. An accuracy of ± ½% is easily achieved.

Impedance

Two quantities are needed to determine impedance: the s.w.r. and the voltage minimum position on the line. The terminating impedance may then be computed either by formula or, more easily, by means of a Smith Chart. The procedure will not be gone into here; any good transmission line book[1] will give the details.

When measuring impedance or s.w.r., the characteristic impedance of the Standing Wavemeter must be known, and preferably should equal the impedance of the line connecting the load. A wire spacing of six times the wire diameter will give an impedance very near 300 ohms, and ordinary twinlead can then be used to connect the load. When computing the electrical distance from the voltage minimum to the load, remember that the velocity factor of twinlead is 82%. The velocity factor of the air insulated line will, of course, be 100%.

[1]H. H. Skilling, "Electric Transmission Lines," *McGraw Hill.* pp 342-347.

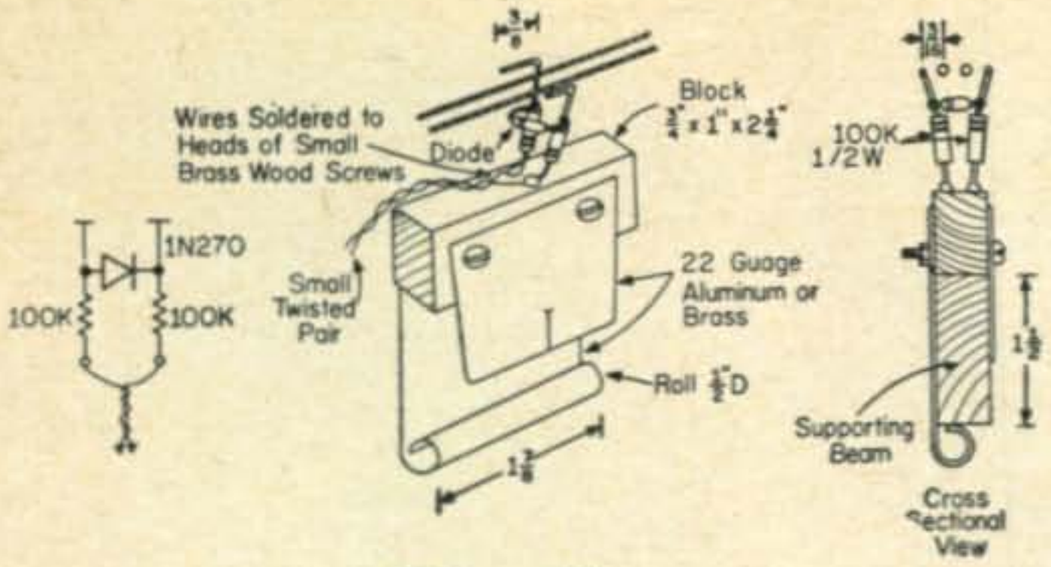


Fig. 2—Construction details of the sliding detector. The spring portion of the rear brass plate should be shaped for a snug fit with the beam.

Other Uses

Other uses for the Standing Wavemeter will suggest themselves to the experimenter. One novel use is as a rough check on harmonic (or subharmonic) output. If no harmonics are present in the transmitter output all of the nulls on the Standing Wavemeter (terminated in a short or open to produce a high s.w.r.) will be nearly zero. If appreciable harmonic output is present, some of the nulls will be deeper than others.

Although of purely academic interest, the Standing Wavemeter may also be used to measure the velocity of light. What is actually measured is the velocity of propagation along the wires. This is equal to the velocity of propagation in air if the wires are perfectly conducting. Wire resistance slows down the wave slightly, but the slowing down is so small it is ordinarily insignificant compared to other measurement errors. Since velocity is the product of frequency and wavelength, measurement of the wavelength will give the velocity if the frequency is known. The wavelength is readily measurable as twice the distance between nulls. Multiplying this by the source frequency should give a product very close to the well known value: $c = 299{,}800$ kilometers per second.

Construction

Most of the construction details will be evident from the drawings and photographs.

The main beam should be as straight and smooth as possible. Hardwood is preferable, although clear straight-grained pine was used for this model. The anchoring blocks at each end are made of the same material and fixed to the supporting beam with ¼ inch dowels and wood glue. As mentioned before, the lower frequency limit of operation is determined by the active length. A detector travel of 41 inches will permit measurements down to 144 mc.

The sliding detector should clamp snugly to the supporting beam but should be free to slide back and forth. A little soap or wax rubbed on the wood will reduce friction.

The detector was designed for use with a v.t.v.m. If a multimeter (preferably 20,000 ohms per volt) is used instead, the 100K resistors should be reduced to 10K or replaced with small r.f. chokes.

Stranded wire is much to be preferred for the line because very little tension is required to maintain its straightness. Wire ripped from old lamp cord is quite suitable.

The tension insulators may be cut from ⅛ inch plexiglass or other suitable plastic. They may be permanently bent by heating gently and holding in the bent position while cooling.

The slight impedance discontinuity at the insulators may be reduced by spreading the wires slightly where they pass through the plastic. (Drill the holes slightly farther apart than the wire spacing). The wires may be stiffened at these points by tinning with solder. Also, a third small hole drilled immediately between the wires will reduce the dielectric at the insulator and thereby improve continuity.

To test the Standing Wavemeter, terminate it in a flat load (a half wave folded dipole makes a fairly flat load for 300 ohm line) and observe the meter reading as the detector is moved throughout its travel. If the load is matched and the source free of harmonics, the detector response should be the same everywhere. A non-uniform response usually indicates non-alignment between the line and supporting beam. ■

Northwest QCWA

These smiling faces are proof that even old timers can have fun. This snap was taken at a recent meeting of the Northwest Chapter of the QCWA and comes to us through the courtesy of W2ZM. Front row, l. to r.; W7ER, W7KL, W7AEA, W7FTR, K7CNE, W2ZM, W7AYO, W7PN, W7AEF. 2nd row; W7HJU, W7TZ, W7AMA, W6NZP, K7RZZ, W7ROL, W7BLX, W7IH, W7AZI, W7JY. 3rd Row; W7OS, W7TV, W7FCK, W7BV, W7LQ, K7IMJ, W7WNH, W7AN, W7NC, W7FON, W7HWD, W7QA, W7BTV, W7AOB, W7HF. Top Row, Paul Hacket, W7KX, W7GRE, W7CVL, W7SO, W7FY, W7BCT, W7MEA, W7BZI, W7DDX and W7AQB.

Hamdom's Top Honors From An Iron Lung

BY CLIF EVANS*, K6BX

CLIFF CORNE, JR., K9EAB, though confined for the past thirteen years in an iron lung, has competed with the best of us to win CHC-200 Top Honors and the Arne Trossman Top Honors Plaque, hamdom's highest honor.

Cliff was stricken with polio in August, 1949, and required use of an iron lung intermittently until about five years ago when it became necessary for him to spend full time in it.

He operates his radio equipment with special devices fitted inside and with special microphone suspended over his head.

Because Cliff was unable to leave his iron lung, the author arranged with the Peoria Amateur Radio Club to hold a surprise meeting at Cliff's home. We asked Cliff Corne, Sr., and Hal Sever, W9FM, to fill us in on the story of awards presentation to Cliff, Jr. Let's let them tell their own story about what happened.

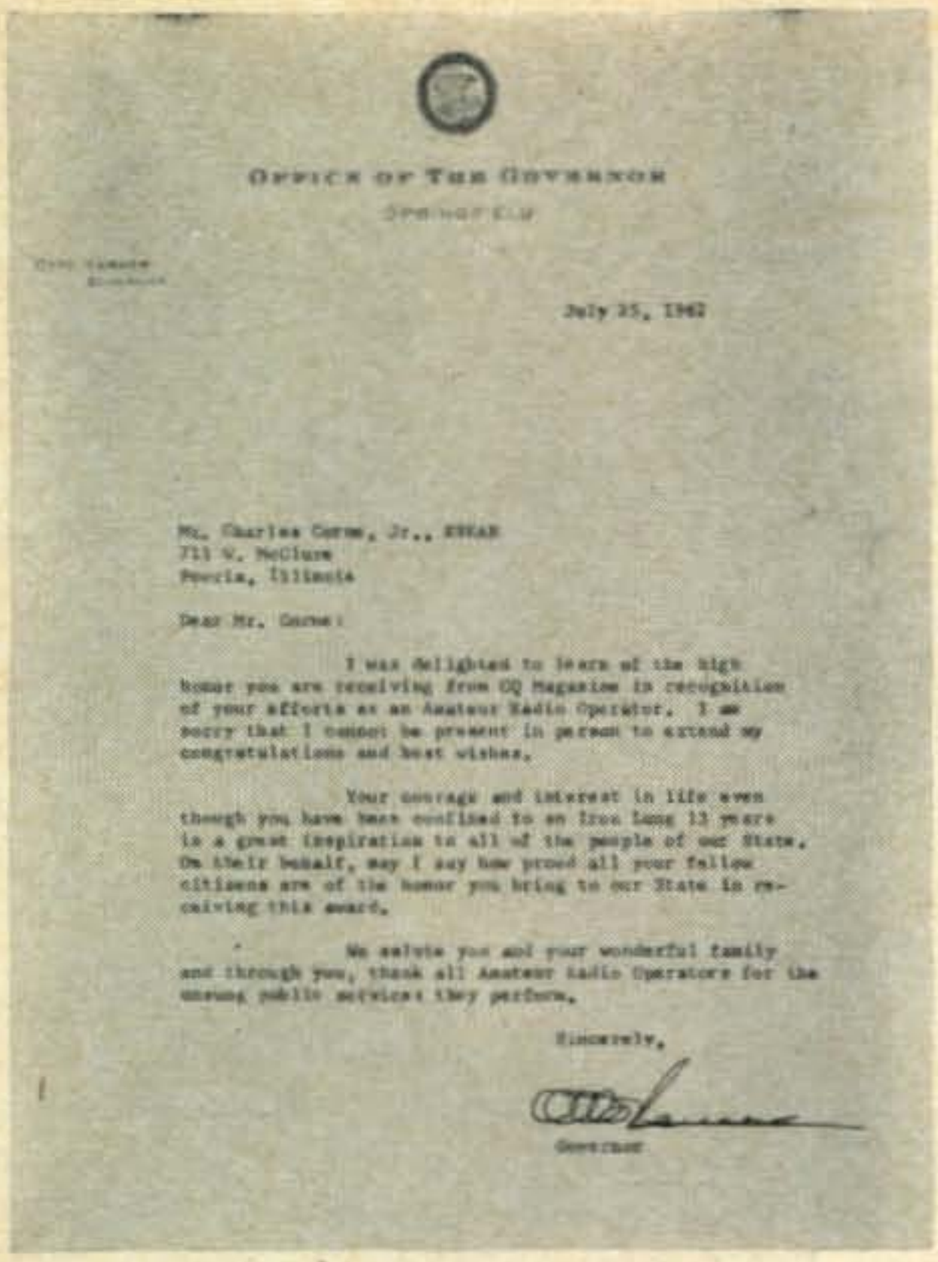
"The Peoria Amateur Radio Club held its regular meeting at the home of Cliff Corne, K9EAB, on Saturday, August 11, 1962. Purpose was three fold. First, although Cliff is a lifetime honorary member, he has never been able to attend a meeting. Secondly, Hal Sevr, W9FM, Cliff's friend and one of the founders of the club was leaving for retirement home in Florida, and third, Cliff had won hamdom's highest honors and it should be Hal's lot to make the presentation.

"As a surprise to Cliff, over 50 club members and their wives and friends, plus reporters from local radio, TV stations and newspaper met at his home. President Ferrell Lytell, W9DHE, opened the meeting with a welcome to all. Woody Barton, W9IOG, reviewed the club's growth from the beginning, culminating with the special event of the day. Woody then turned the meeting over to Hal Sever, W9FM. Hal, an OOTC, got a bit misty-eyed recalling the fond memories of his experiences with local area hams, and then moved to the really big reason for all the fuss . . . fellow member Cliff Corne was to be doubly honored!

"With newsreel cameras clicking, flashlight bulbs popping and amidst the applause of the gathering, Hal presented Cliff with the CHC Top Honors Plaque sponsored by Arne Tross-

*USA-CA Custodian, *CQ*.

Here you see Cliff Corne, Sr., WA9DCQ, reading a Proclamation from the Governor of Illinois honoring Cliff, Jr., K9EAB for winning the Arne Trossman Top Honors Plaque shown held by Cliff's mother. Read the text for full story. (Tnx *Peoria Journal Star)*



OFFICE OF THE GOVERNOR

SPRINGFIELD

July 25, 1962

Mr. Charles Corne, Jr., K9EAB
711 W. McClure
Peoria, Illinois

Dear Mr. Corne:

I was delighted to learn of the high honor you are receiving from CQ Magazine in recognition of your efforts as an Amateur Radio Operator. I am sorry that I cannot be present in person to extend my congratulations and best wishes.

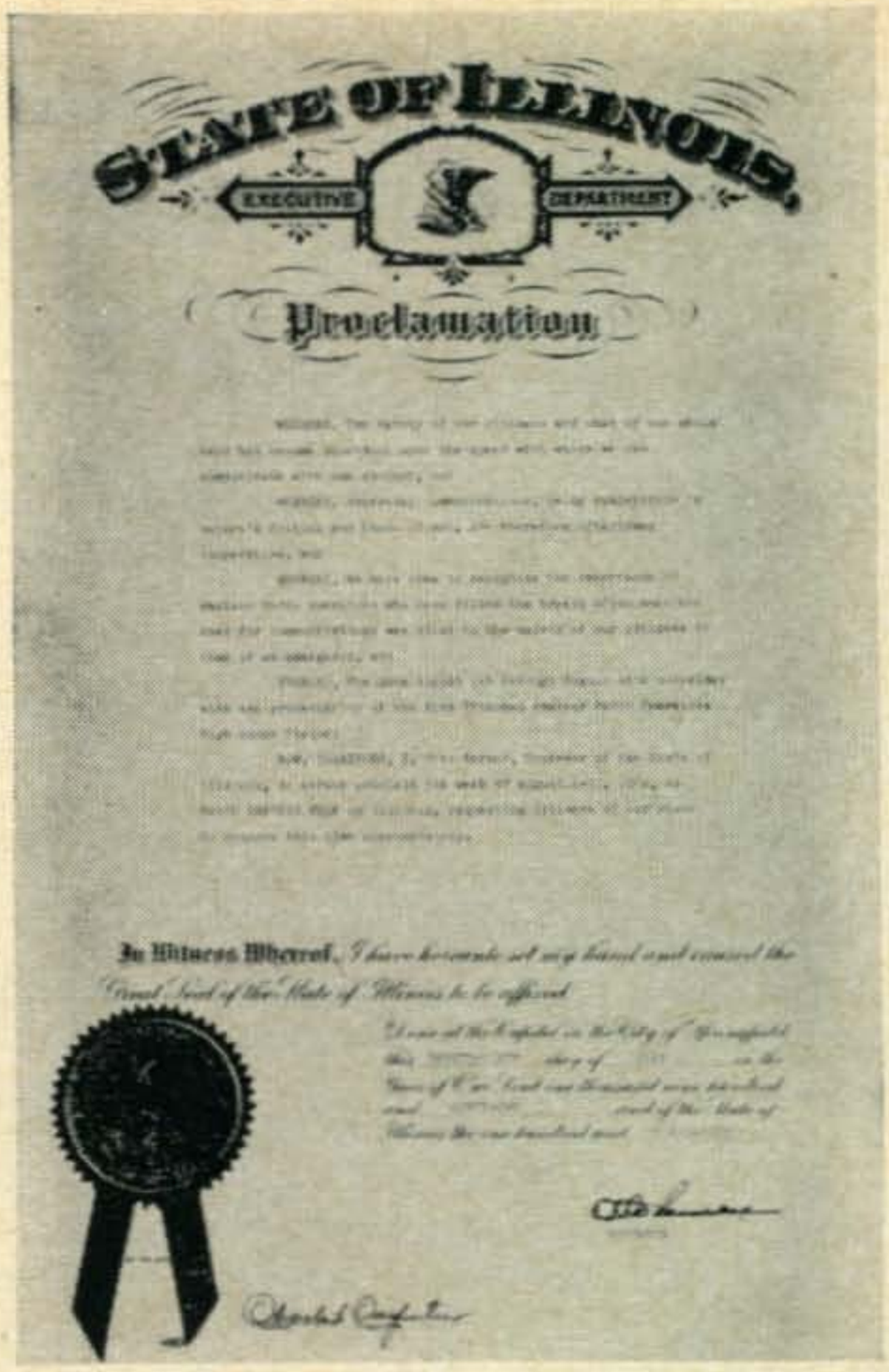
Your courage and interest in life even though you have been confined to an Iron Lung 13 years is a great inspiration to all of the people of our State. On their behalf, may I say how proud all your fellow citizens are of the honor you bring to our State in receiving this award.

We salute you and your wonderful family and through you, thank all Amateur Radio Operators for the unsung public services they perform.

Sincerely,

Governor

Pictured here is a personal letter from Governor of Illinois, Otto Kerner, to Cliff Corne, K9EAB, congratulating Cliff on winning CHC Top Honors and Arne Trossman Top Honors Plaque for holding over 200 amateur radio achievement awards.



STATE OF ILLINOIS,
EXECUTIVE DEPARTMENT

Proclamation

In Witness Whereof, I have hereunto set my hand and caused the Great Seal of the State of Illinois to be affixed

Pictured here is the Proclamation issued by the Governor of Illinois, Otto Kerner, declaring the week August 4th through 11th, 1962, as Amateur Radio Week to coincide with presentation of Arne Trossman Top Honors Plaque to Cliff Corne, K9EAB, holder of over 200 amateur radio achievement awards.

man, Editor, *CQ*. Hal disclosed the inside story of his correspondence and telephone calls with K6BX in setting up the presentation and his worry the Plaque would not arrive on time . . . but it did and all went well.

"Following the Plaque, a personal letter was delivered to Cliff from the Governor of Illinois, Otto Kerner, expressing his regrets he could not be present and offering his personal congratulations to Cliff for winning the high honors. Governor Kerner praised Cliff for his courage and his interest in life, and concluded his letter with: '. . . thank all Amateur Radio Operators for the unsung public service they perform.'

"Cliff Corne, Sr., WA9DCQ, was then called to the dais to read a Proclamation, ordered by the Governor, setting aside the week of August 4 through 11, 1962, as Amateur Radio Week in the State of Illinois with said action and announcement to coincide with the presentation of the Arne Trossman Top Honors Plaque to Cliff Jr. Cliff Sr., was appointed as permanent Trustee of the Proclamation by the PAARC.

"I'll tell you, everybody was mighty proud of the whole affair and it was a lively and exciting party. During the hubbub, Radio Station WIRL dispatched their famous "Big Red" mobile news pickup car to the scene. A direct, live on-the-spot broadcast described the activities and Cliff Sr. was interviewed in the pickup car. All listeners were told just what was taking place and the interview terminated with a reading of the Governor's Proclamation.

"The proceedings were closed with a generous supply of fruit punch and cake, then everyone hurrned home to see himself on TV and to hear the later radio news stories. The next day's Sunday paper carried the story with large picture of the award and K9EAB with father and mother."

Well now folks, aren't we all proud of Cliff, K9EAB. His is a story all hamdom can be proud of. A note from Cliff Sr., said, ". . . one final personal comment from OM Corne . . . who had one of those rare 'happy days.' Thanks to your 'atomic energy' and drive, CHC was founded . . . *CQ* became interested, K9EAB got the fever, Governor Kerner got the message, PAARC got the high-spot-of-the-year program and all Illinois hamdom got a tremendous PR boost! Needless to say . . . we all thank you!"

We could close out the story by again relating that it is part of *CQ's* CHC's, USA-CA's program and policy to generate program which lead to high honors which culminate in the highest level of public relations for hamdom; but we won't. We feel that in Cliff's achievements, there lies a deeper story . . . that of his fiight for life, yet in doing so, his contributions and help to others which should be an inspiration to us all.

Some months back we asked Cliff for his life's background that we might tell others of his experiences. This is another case where the 'quote' is more meaningful. Let's let Cliff tell it in his own words.

"At age 10, in 6th grade on August 19, 1949, I contracted bulbar polio. After 21 days

unconscious, I awakened to find myself inserted in an iron lung . . . and there I have been ever since with total paralysis from the neck down.

"I completed my grade schooling while in the hospital and came home at Christmas time in 1952, after 3½ years. While in the hospital I collected electric trains . . . had 7 full trains with all the fixings. Had bridges, signals, switches, etc. Also spent time supervising and directing the building of model cars, planes, various kits with alcohol engines, number painting, etc. Dad did all the work while I read the plans all day and engineered the work. Also built up a nice collection of firearms: pistols, shotguns, rifles, automobiles, etc.

"When I returned home I continued my education by tutor until I graduated from High School in June, 1955. I was enrolled as a member at Peoria High School from which my father had graduated in 1923. Back at home I got started with tropical fish and had nine aquaria ranging from 5 to 60 gallons, complete with paraphernalia. Next came a big adventure in parakeets. I had outside aviary, inside flights, nesting cages, etc. . . . and in the end had over 400 birds with some real 'exotic rares.'

"I was seeking for the ultimate hobby . . . I found it in amateur radio! My cousin, Bill Sturtevant, K9CDC, now in the Coast Guard at Groton, Conn., lived across the street from me. He became interested in radio through his electrical shop teacher in High School. Together Bill and I studied and practiced. Dad mounted a key on a plywood bridge over my body, and the heretofore useless wiggle in my right thumb was just enough to produce the c.w. signal . . . and at last I was able to do something for myself! I passed my Novice exam in July, 1955 and three months later passed my Conditional. From then on I have enjoyed all the rewards of ham radio with no signs of exhausting the tremendous pleasures and new horizons as I had done with the many previous hobbies. We feel amateur radio is the ultimate of hobbies with unlimited outlets that will live on as long as I do.

"Until 1960, most of my work was DX. Then I heard of the good fellowship generated by CHC and the exciting fun members experienced. CHC has opened unlimited avenues of hobby pleasures with hundreds of new and meaningful friendships. As you say, it is 'fun unlimited.'

[*Continued on page 138*]

A Transistorized Preamp for 420 Mc.

MARTIN L. KAISER*, W2VCG

This one-transistor preamp has a gain of 10 db at 430 mc and a noise figure of 4.5 db. Using inexpensive components, it is constructed on a chassis ½" x 1¼" x 1".

THE overall effectiveness of a system for u.h.f. reception is limited by the noise inherent in the receiver; therefore, it is advantageous that the incoming signal be as large as possible before reaching the receiver. Two approaches for accomplishing this are to build an elaborate high gain antenna array or to construct a high-gain low-noise preamplifier.

Much data is already available for the design and construction of u.h.f. antennas but with the advent of varactor diodes and u.h.f. transistors, a whole new field of u.h.f. amplifier design has been opened. Amplifiers of general interest to amateurs include those utilizing electron tubes, parametric devices and transistors.

Tube types are usually bulky and need special adjustment to get decent results and the problems of construction of parametric amplifiers become discouraging after considering the man hours, cash and the necessary test equipment to effect a good signal to noise ratio.

Low cost u.h.f. transistors such as the Philco

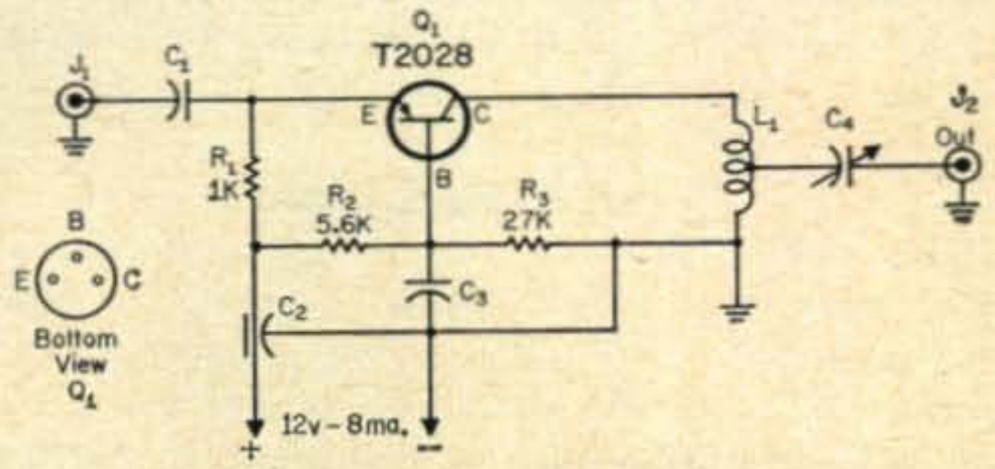
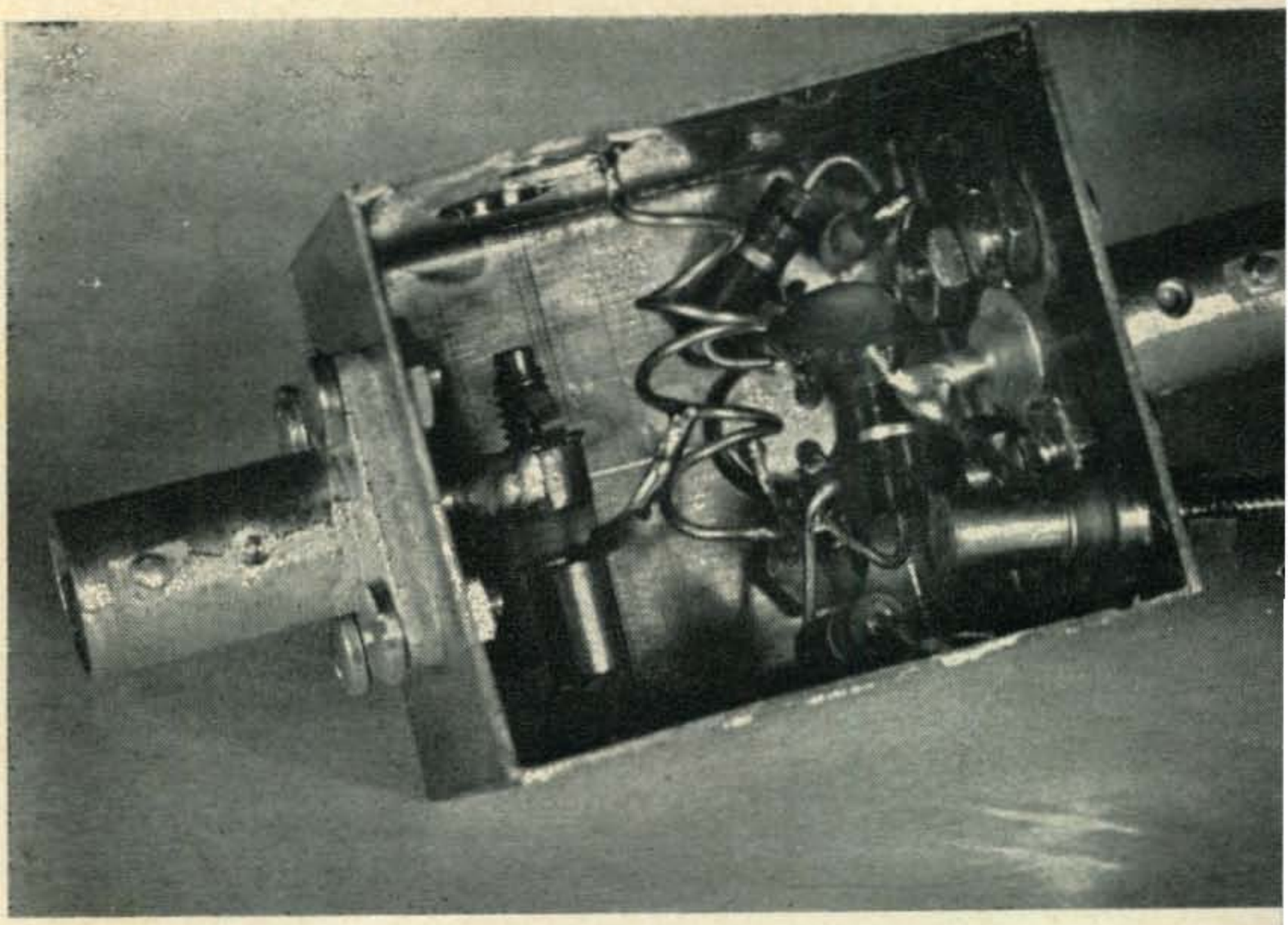


Fig. 1—Circuit of the 420 mc transistorized preamplifier. All resistors are ½ watt.

C_1—470 mmf disc ceramic.
C_2—1500 mmf u.h.f. bypass feedthrough. Erie type 357.
C_3—1000 mmf u.h.f. bypass. Sprague type 507C.
C_4—0.7-3 mmf plastic dielectric piston trimmer. Erie 535C, Part #535-OR7.
L_1—3T #20, ¼" i.d. ¾" long, tapped 1 turn from the transistor end.

*418 Hale Street, Pennington, New Jersey.



Bottom view of the transistorized 420 mc preamp. Resistor R_1 is at the bottom, R_2 in the center and R_3 on the top. Output tuning capacitor, C_4, is on the right. The piston capacitor in the upper left corner was found to be unnecessary and was eliminated. Capacitor C_3 is visible just above the transistor.

T2028 are now being produced. Based on experimental data, these units, when used in simple lumped constant circuits, show gain and a significant improvement in signals up to 800 mc.

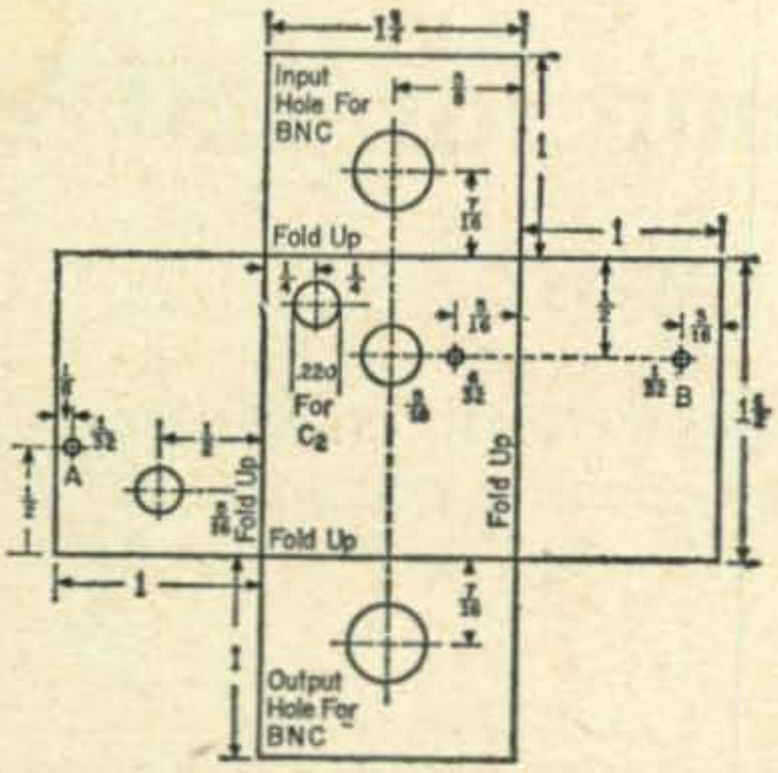


Fig. 2—Chassis layout for the 432 mc preamplifier. Material used should be 1/32" brass or copper. Hole (A) on the left flange is for grounding L_1, and (B) on the right flange is for grounding R_3.

Circuit Description

The circuit is very simple as a glance at fig. 1 will show. It is basically a grounded base configuration and R_1, R_2 and R_3 are the biasing network, C_2 and C_3 are r.f. bypasses while C_1 and C_4 are blocking capacitors. Capacitor C_4 also serves to tune L_1.

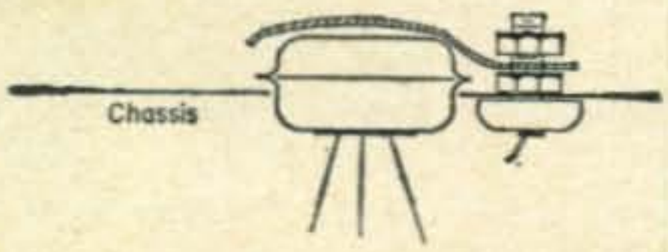


Fig. 3—Details of the transistor mounting. A small copper flange cut from the 1/32" chassis stock mounts on the C_2 stud to hold the transistor down.

Construction

Layout the chassis as shown in fig. 2. Punch, fold and solder the seams closed. Mount the input and output jacks and fasten C_2 and C_3 to the chassis. Solder in R_1, R_2, R_3 and C_1, keeping all the leads short. Position all the parts as shown in the photographs. Now solder in C_4 the output tuning capacitor.

The unit is now ready for the transistor. Cut the leads to a 3/16" length. Slip the transistor through the 5/16" hole and fasten the hold-down clamp into position as shown in fig. 3. Use a good heat sink when soldering the leads. First wire the base, then the emitter and last the collector when the coil is added.

Installation and Adjustment

Adjustment of this amplifier is made by placing the unit in the leadin wire, applying + 12 v.d.c. to C_2, setting the receiver to the center of the 420 mc band and tuning C_4 for a peak in signal level.

This unit lends itself to antenna mounting since C_4 blocks d.c. from L_1. A small 420 mc r.f.c. may be added to the circuit to enable feeding the +12 volts through the coax line. This choke should have zero lead length at the jack end. The simplified circuit for choke wiring is shown in fig. 4. ■

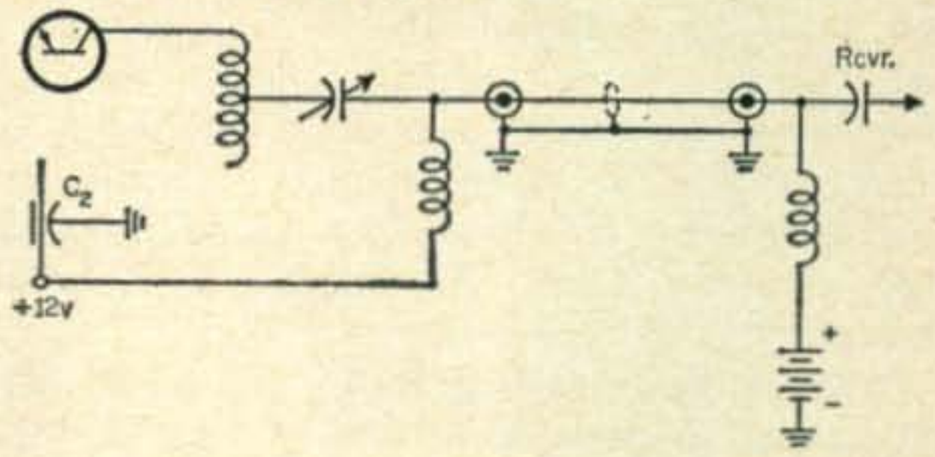


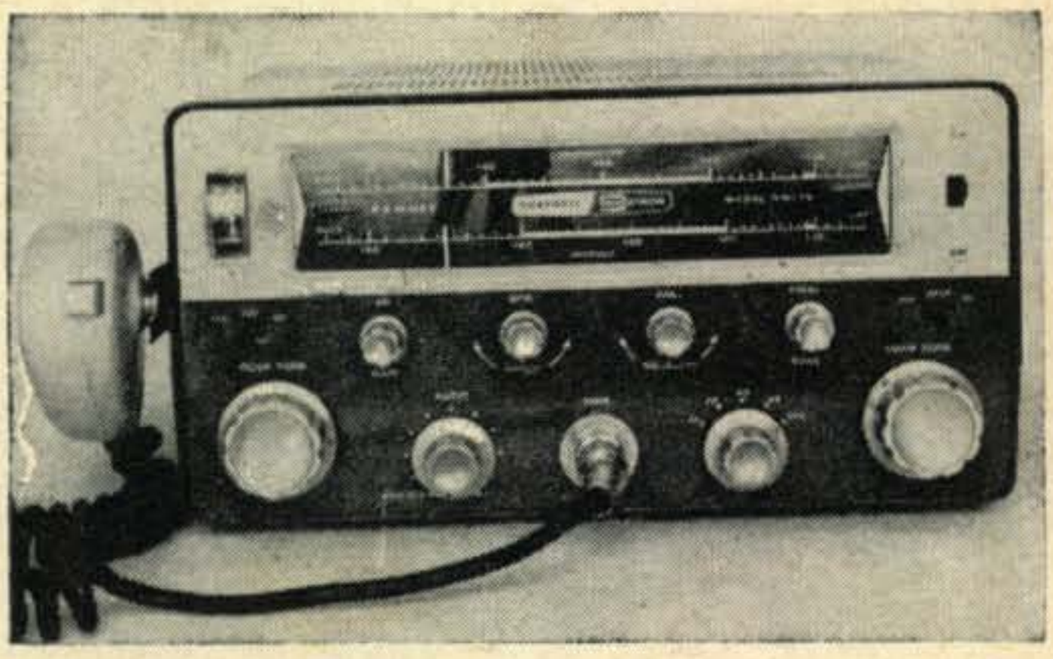
Fig. 4—Circuit used for feeding power when the preamp is mounted at the antenna. The 432 mc chokes are mounted directly at each connector and the d.c. leads run the necessary lengths.

CQ Reviews:

The Heath HW-20 "Pawnee"

DONALD L. STONER, W6TNS
VHF EDITOR, CQ

THE first thing to greet you upon ripping open the HW-20 shipping carton is the jumbo size instruction manual. Glancing through the monumental tome leaves one with the impression that the "Pawnee" is probably the most ambitious kit ever produced by the Heath Company. You could very well be right. Although the manual describes almost 1,000 individual steps and operations, I can honestly say it is definitely *not* difficult to build. This certainly is a credit to the Heath Engineering Department. The manual, incidentally weighs over one pound, is 140 pages long, yet appears to be without error! Let's look at the block diagram (fig. 1) to see what you have when this pile of parts is knit together into a working unit.



Panel view of the Heath "Pawnee" two-meter transceiver. Controls from l. to r. (bottom row) Rcvr. Tune, Audio Gain/Pwr., Mike, Xtal-V.F.O. Switch, Xmtr Tune. In the top row are A.V.C. Switch, R.F. Gain, B.F.O. Pitch, A.N.L./Squelch, Final Tune, and Spot Switch. At the right of the dial scales is the A.M.-C.W. Switch. In addition to the control functions shown, several controls contain push-pull switches to activate still other circuits.

Overall

The "Pawnee" is a 15 tube transceiver for the two meter band, plus CAP and MARS. The receiver is an eight tube double conversion superheterodyne. Four tubes are used in the transmitter and an additional two audio tubes are shared between transmit and receive sections. The 0B2 gas regulator makes the 15th tube. The completed transceiver weighs 30 pounds and is housed in a dark green 6" × 10" × 12" steel cabinet.

The Receiver

The excellent stability and selectivity of the receiver is a direct result of the double conversion design. In essence the receiver consists of a crystal controlled converter ahead of a 22 to 26 megacycle communications receiver. The front end consists of a cascode-connected and neutralized low-noise 6BS8 with the input grid returned to the a.v.c. circuit to provide good overload characteristics. A parallel-tuned trap is connected in the antenna lead and greatly attenuates images from the f.m. band around 98 mc. Neutralization of the r.f. stage and a variable input circuit permits an excellent noise

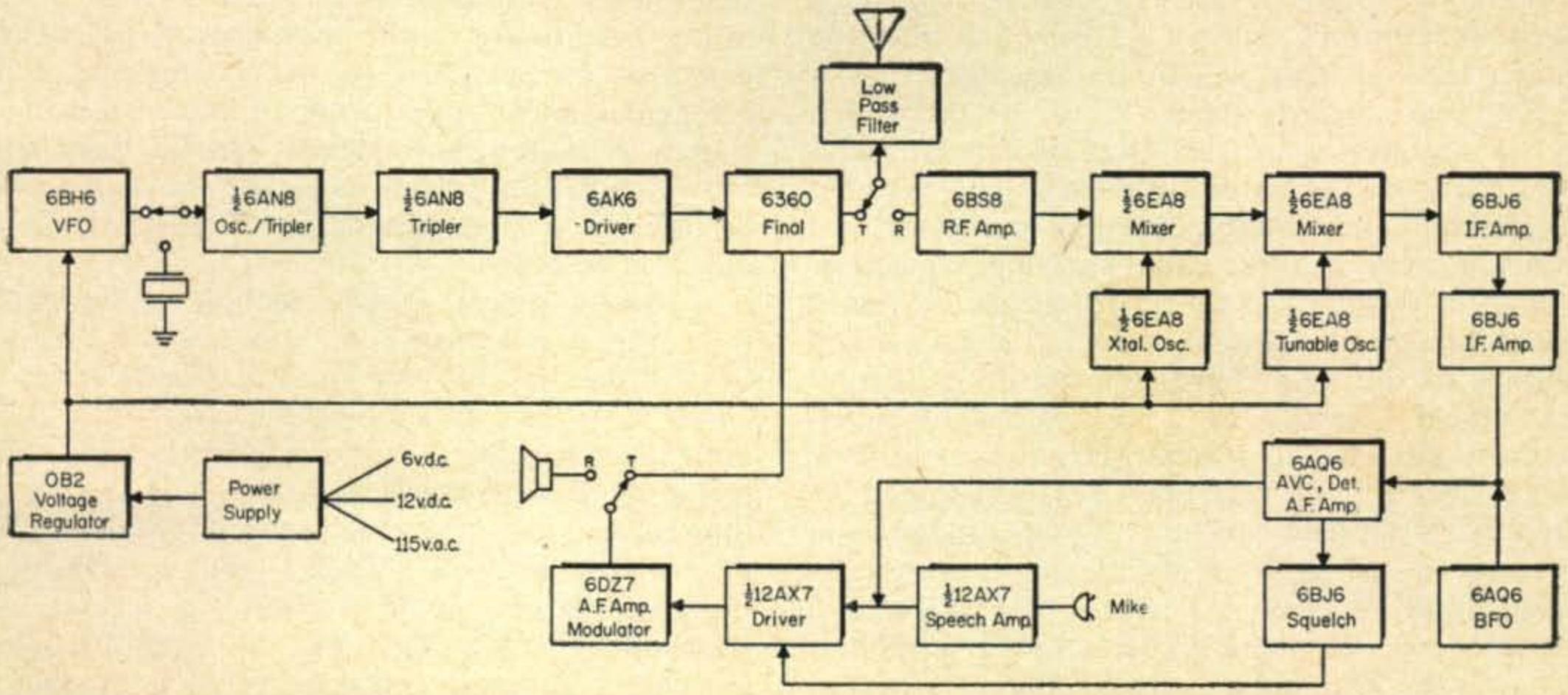
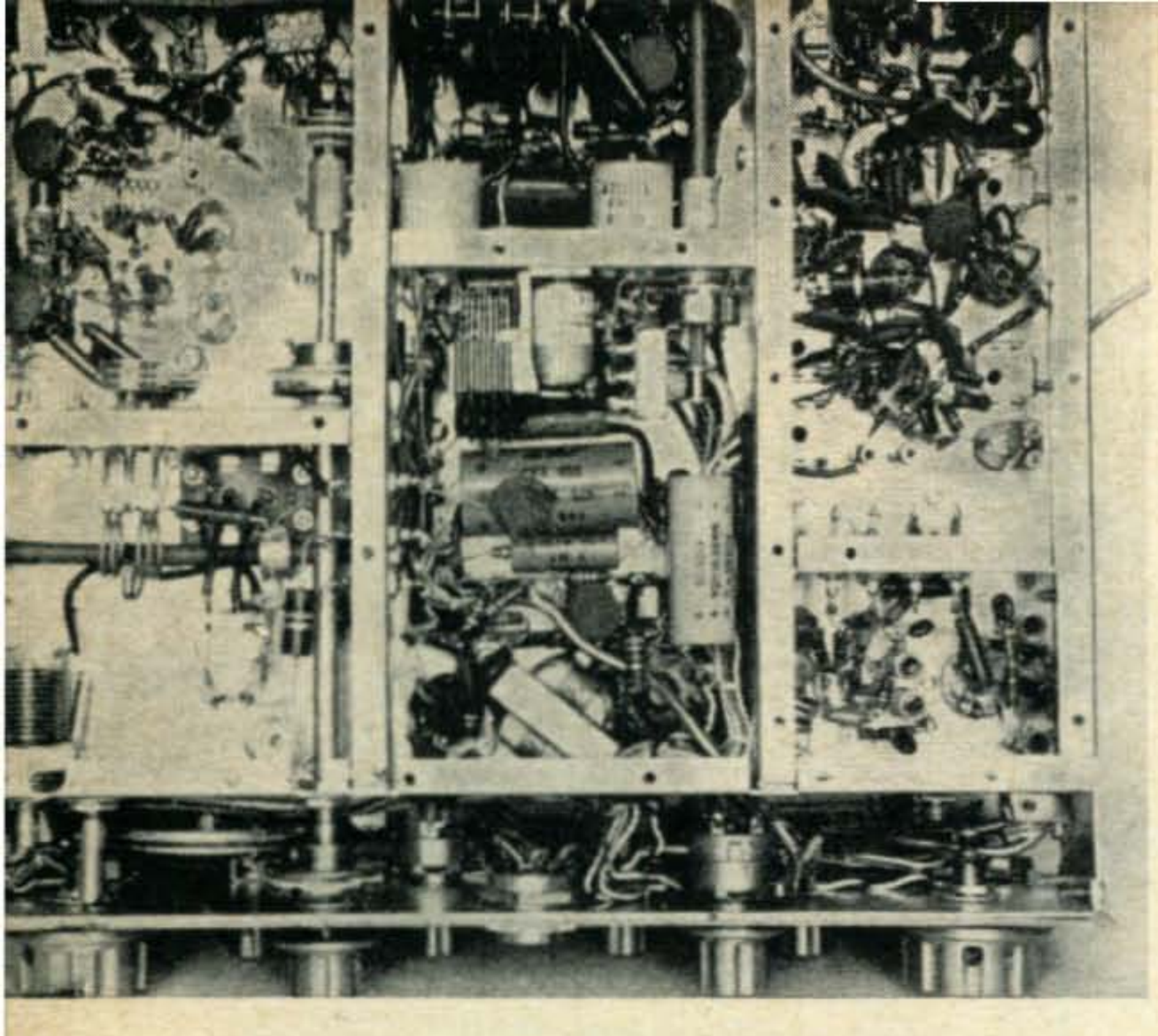


Fig. 1—Block diagram of the Heath HW-20 "Pawnee" two meter transceiver. The six meter version, the "Shawnee," is similar in all respects except for the frequencies involved.



Under-chassis view of the Heath HW-20 showing the tight layout and well shielded construction. The small shielded compartment at the lower right contains a complete two meter crystal controlled converter on a silver plated sub-chassis.

figure when properly adjusted. A bandpass circuit couples the r.f. stage to the mixer and provides a good deal of rejection to unwanted stations outside the regular tuning range.

A 6EA8 triode-pentode is employed as both an oscillator and mixer. The mixer is relatively straight-forward although special care has been taken to insure stability. The 1st i.f. signal from the mixer is fed to the variable i.f. through a low-pass filter.

The pentode section of the 6EA8 is used as the oscillator in an interesting single tube circuit to provide injection voltage at 122 mc. The circuit is shown in fig. 2. A miniature 61 mc third overtone crystal is used and connected between the grid and a capacitance divider feedback network in the screen circuit. This section of the pentode acts as a triode oscillator to sustain oscillations on 61 mc. However, the electron stream also continues through the tube and is attracted by the plate. The plate circuit is resonated at 122 mc by L_6. This second harmonic energy is injected into the mixer through C_{10}, a 1 mmf capacitor.

The variable i.f. tunes 22 to 26 mc which is the difference between the two meter band and the local oscillator frequency. The variable i.f. mixer and tunable second oscillator are tracked with a three-gang variable capacitor. Again, a bandpass coupler is used in the mixer to minimize unwanted spurious signals. The output of the v.i.f. drives the two-stage second i.f. which operates at 2 mc. Sufficient tuned circuits are used to provide excellent selectivity —far more than you may be accustomed to in a portable transceiver. A 6AQ6 diode-triode is used as an audio diode detector, a.v.c. detector and receiver 1st audio. The a.v.c. can be used to actuate a 6BJ6 squelch amplifier, if desired. The a.v.c. voltage also determines the position of a relative reading S-meter. Gain can be manually controlled if desired.

Noise limiting is accomplished by connecting a silicon diode across the detector load. Any signal or noise pulse which exceeds the diode barrier potential initiates conduction and clips the waveform. A second 6AQ6 is employed as a beat frequency oscillator for c.w. reception. The frequency of the b.f.o. is shifted by a variable capacitance diode which is controlled by a front panel potentiometer.

The transceived audio section consists of one-half 12AX7 which drives a dual power pentode (a 6DZ7) as a push-pull class AB1 amplifier.

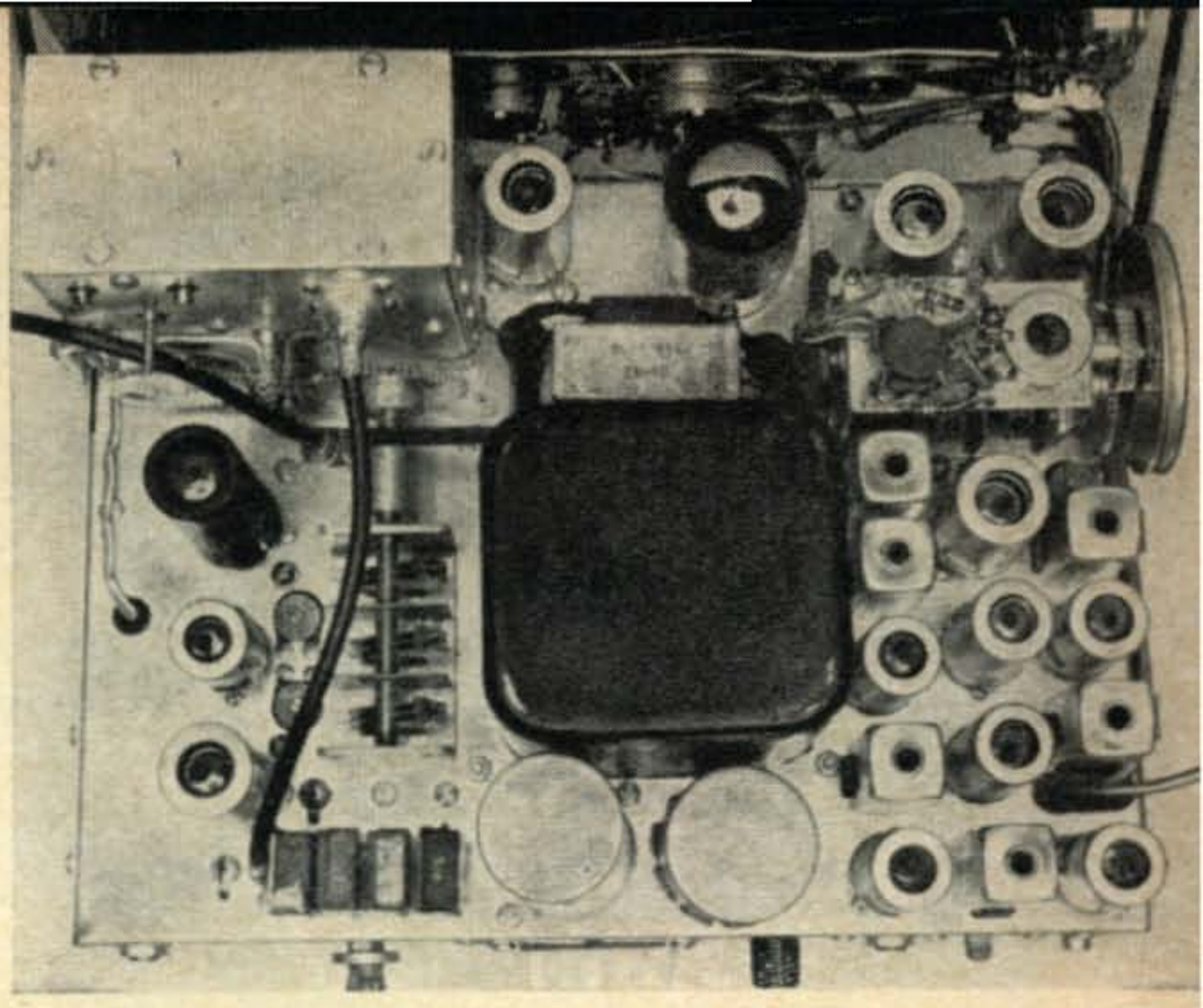
The 125 volt section of the power supply feeds the entire receiver with the exception of the oscillators which are voltage stabilized by an 0B2.

The Transmitter

The signal fundamental frequency is 8.0 to 8.22 mc, which can be generated by either a 6BH6 variable frequency oscillator or the pentode half of a 6AN8, which is used as a third overtone crystal oscillator. A war surplus "rock" oscillates with ease in this circuit. The 24 mc output of the stage is applied to the triode half of the same tube which functions as a tripler to 72 mc. The 144 mc operating frequency signal is obtained from a 6AK6 doubler-amplifier which is driven by the 72 mc energy. Output from the 6AK6 drives the push-pull 6360 power amplifier. All stages in the transmitter are tracked with a three gang variable capacitor which, in turn, is gear driven and tracked to the v.f.o. capacitor. Tracking is good and the drive level is adequate across the entire band.

A high impedance ceramic microphone, which fits the hand well, is supplied with the Pawnee. The mike voltage is amplified by one-half 12AX7 which drives the 6DZ7 modulator. One c.w. all stages except the oscillator are keyed. The keying characteristic is good, with no chirp or click noted. Both oscillators are regulated for maximum stability. A relative reading r.f. voltmeter is included in the transmitter section for tuning purposes. This circuit can also be switched to the headphone jack for actual audio monitoring of the transmitted signal. A switch and external speaker jack are also included to permit using the Pawnee audio section as a p.a. system for ham-fests, field day and so forth.

A husky power supply section is designed into the transceiver. A combination transformer permits vibrator supply operation from either 6 or 12 volt automotive sources or 117 volts a.c. for fixed station operation. Simply changing power cords automatically switches the connections for the proper circuit. The d.c. supply is well shielded and no vibrator hash enters the audio section on receive or transmit. Incidentally, the kit also includes mobile installation components such as heavy duty cables, battery taps, fuse block and power relay.



Top view of the "Pawnee" showing the well thought out parts placement. The stable v.f.o. is at the upper left with the transmitter below it. At the center of the chassis is the three-way power supply with the audio section above it, next to the panel. The receiver section occupies the right hand end of the chassis.

Observations

If you don't qualify as a "hot rod" kit builder, take it slow and easy. It is recommended that the beginner do a page of instructions at a time, then re-check the steps before proceeding. Because of the compact nature of the unit, the parts are tightly packed in places. It could be rough to correct a goof later. Allow plenty of time for stringing the dial cord and do not accept any less than perfect operation. Be sure there are no nicks in the cord which might cause it to break prematurely. Once the unit is assembled, it is quite a chore to restring or change tension.

The time required for completion will vary between 50 hours for the expert and 100 hours for a beginner.

Mechanically the HW-20 is solid as a battleship. There is no sign of any mechanical instability when operating mobile on any type of road. There is not a sign of frequency shift in either the receiver or transmitter. A word of caution, however. If you have a small foreign car, check the dash board strength. One local ham had to mount the rig on the transmission tunnel because the dash could not take the stress of 30 concentrated pounds.

The electrical stability of the Pawnee is excellent. The v.f.o. circuit includes a unique temperature compensating adjustment which permits nulling of drift caused by heating. There is a small amount of receiver drift which disappears after the first 5 minutes of operation.

Calibration is no small job and represents quite a bit of tuning back and forth with the dial to bring in each end. All stages will track perfectly and, amazingly enough for a printed dial scale, the signal frequency tracks very closely with the dial calibration.

The receiver tuning rate is excellent for fine-tuning stations, but because the band is so large, it requires many turns to go from one end to the other. A spinner knob is certainly in order. You can modify the existing knob by drilling it near the rim and tapping the hole. Use a 6-32 screw and spacer about 1 inch long. The measured selectivity is somewhat narrower than the 15 kc specified for the 6 db points. The apparent selectivity when tuning the receiver is excellent. The sensitivity is such that a 0.5 microvolt signal will be 10 times stronger than the internal receiver noise. It was noted that the f.m. trap deteriorated the noise figure somewhat and should be shorted if not required. Adjustment of the cascode r.f. amplifier circuitry with a noise generator will improve the published sensitivity noticeably.

The 6360 appears to run very hot, but a check of the operating conditions shows it to be within ratings. A special heat dissipating tube shield helps cool the tube.

The transmitter output measured 9 watts at the center of the band and slightly over 8 watts at each end (a.m. conditions). No TVI was noted on any Los Angeles channel even with the rig out of the case and the TVI filter disconnected. This extra margin of safety should prevent TVI even in fringe areas. Modulation is sharp and crisp with plenty of reserve "punch."

The only criticism I have is in regard to the layout of the vibrator buffer capacitor. Should replacement ever become necessary, it would prove to be a difficult job requiring breaking the defective component into small pieces to facilitate its removal. However, this is the price one pays for compact equipment.

Several HW-20 owners have reported a strong parasitic oscillation which occurs in the final tank circuit. It results in parasitic "carriers" to appear for several hundred kc either way from the main carrier, and occurs if the final tank is detuned slightly. It *appears* that the plate tank choke (RFC_{11}) is series resonant at 144 mc, making the feed-through bypass (FT-14) relatively ineffective. R.f. energy can get into the modulator through this path and cause a high frequency oscillation. Soldering a .001 disc in parallel with the feedthrough (on the modulator side of the partition) cures the oscillation.

Low drive has also been noted in a few units. If you still have less than the specified grid voltage after rechecking the transmitter tracking, replace RFC_9 and RFC_{10} *with* ohmite Z-144 chokes.

Conclusions

It would be superfluous to tell you that the Heath v.h.f. transceiver represents a good value. It is only necessary to compare the kit price of $199.50 with similar units. If you need a v.h.f. transceiver and feel you would like to save $150 or more in exchange for your time, the HW-20 kit is for you. ■

ANTENNAS

How To Measure Antenna Gain

BY FREDERICK W. BROWN*, W6HPH

Want to know what your antenna gain really is? This article gives the fine points of making an accurate measurement.

ANTENNAS offer an extremely fruitful field for amateur research. Unfortunately there is little standardization of antenna measurements, particularly the parameter of most interest from a communications viewpoint—forward gain. A perusal of the literature will reveal large discrepancies in gain figures of identical antennas and little agreement as to gain of even such common place types as the three element beam.

The one and only sure way to determine antenna gain is by direct measurement. Gain figures published in textbooks and handbooks are not always applicable to practical antennas; and manufacturers claims must be taken with a large grain of salt, to say the least. Most gain figures published in past magazine articles err on the optimistic side because of measurement errors that will be explained in this article.

These remarks will apply largely to measurements in the v.h.f. and u.h.f. region where accurate results are easier. Application of the *scaling principle*, however, makes it possible to indirectly measure the performance of lower frequency antennas. The scaling principle states that if *all* antenna dimensions (including element and boom diameters) are scaled by the same factor as the wavelength, the antenna will perform exactly the same.[1]

The Dishonest Method

Generally one of two methods is commonly used for gain measurement: the honest method or the dishonest method. (The terminology used here may possibly reflect the author's personal bias.) Basically, the dishonest method is one of pattern integration. Use is made of the fact that since gain and directivity go hand in hand, it should be possible to compute the gain from pattern data. Ideally, the pattern should be a 3 dimensional solid pattern, but in practice two orthogonal plane patterns are generally used. Gain is then computed by measuring area under the curve of power vs. angle.

A simplification of the dishonest method (even more dishonest) is to merely measure main lobe half-power beamwidths in perpendicular planes. Assuming a small minor lobe level, the gain may then be computed with questionable accuracy by:

$$\text{Power gain over } \tfrac{1}{2} \text{ wave depole} = \frac{K}{\theta_1 \, \theta_2}$$

where θ_1 and θ_2 are the half-power beamwidths (degrees) in orthogonal planes (usually E and H planes). The value of the constant k depends on which "authority" you put your faith in. It ranges from 18,000 to about 32,000, the lower figure probably being more reliable.

The Honest Method

This technique is actually easier than the dishonest method and is nearly always more accurate. Essentially, it amounts to substituting a reference antenna for the antenna under test and comparing the received signal. Although identical results should be obtainable by switching at the transmitter end and comparing the radiated signal, in practice it is usually easier to make the comparison at the receiving end of the path.

Distance

Whichever method is used, honest or dishonest, certain conditions should be met. One of these is the distance requirement. Antenna measurements ideally should be made with

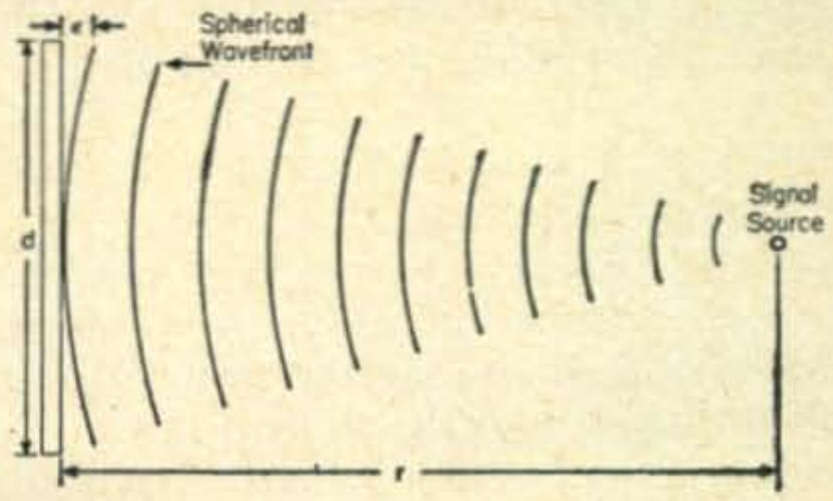


Fig. 1—An illustration showing how an antenna of dimension *d* results in a phase error ε when illuminated from a distance *r*.

*Star Route, Idyllwild, Calif.

[1]One exception is antenna *efficiency* which does not scale and generally decreases with increasing frequency. Efficiency of practical antennas, however, is usually greater than 95%.

a plane wavefront, i.e., illuminated by a source infinitely distant. In practice, of course, the source is located at some finite distance, resulting in a spherical wavefront at the test site. Little error will result if the departure from a plane wavefront is small. Figure 1 shows an antenna of maximum dimension d illuminated by a point source located at a distance r. The maximum phase error ϵ occurs at the array's edge and can be made arbitrarily small by making r sufficiently large. Usually an ϵ of one sixteenth wavelength is regarded as acceptable. For this error, r is given by

$$r = \frac{2\,d^2}{\lambda}$$

where λ is the wavelength measured in the same units as r and d. For example, a 6 foot antenna at 432 mc calls for a distance of 32 feet or greater. At 1296 mc the same size antenna would require a distance of at least 96 feet. The value of d used for the case of a Yagi should be the array length plus one wavelength.

Impedance

If the honest method is used impedances should be reasonably well matched, although the error due to mismatch is not as great as might be expected. For instance, a standing wave ratio of 2.0 represents a mismatch loss of only ½ db. Since the receiver input impedance is usually mismatched to the transmission line, an attenuator pad should be used ahead of the receiver to insure a proper termination. (An attenuator pad of greater than 10 db or so attenuation has the important property of maintaining an input impedance that is approximately independent of its terminating impedance.) The pad also circumvents any r.f. stage gain variation caused by antenna impedance changes. Still another advantage is that the antenna may be matched to the line simply by adjusting the matching arrangement for maximum received signal. This is particularly handy with twinlead where a quick and dirty match can be achieved with a piece of aluminum foil wrapped around the line.

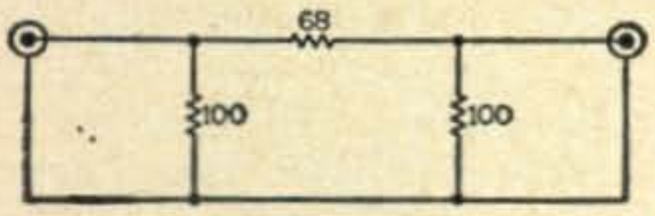


Fig. 2—A 50 ohm 10 db pad to be used ahead of the receiver to insure proper termination. All resistors are ½ watt carbon and should have the shortest possible leads.

The reference antenna should, of course, have the same impedance as the antenna under test. If a folded dipole reference antenna is used, an ordinary half wave balun will convert is 300 ohm impedance to 75 ohms. This is a mismatch to 50 ohm coax (s.w.r. of 1.5). but the mismatch error is only 0.18 db, a trivial value compared to other errors.

Detectors

Ultimately, the gain measurement will depend on a meter reading, and the meter will be connected to a detector of some sort. For the average ham, the most practical method is probably a v.t.v.m. connected to the second detector of the station receiver. The gain difference may then be read directly on the db scale of the v.t.v.m. A phone jack or binding post mounted on the receiver and wired to the second detector makes a convenient connection for the voltmeter.

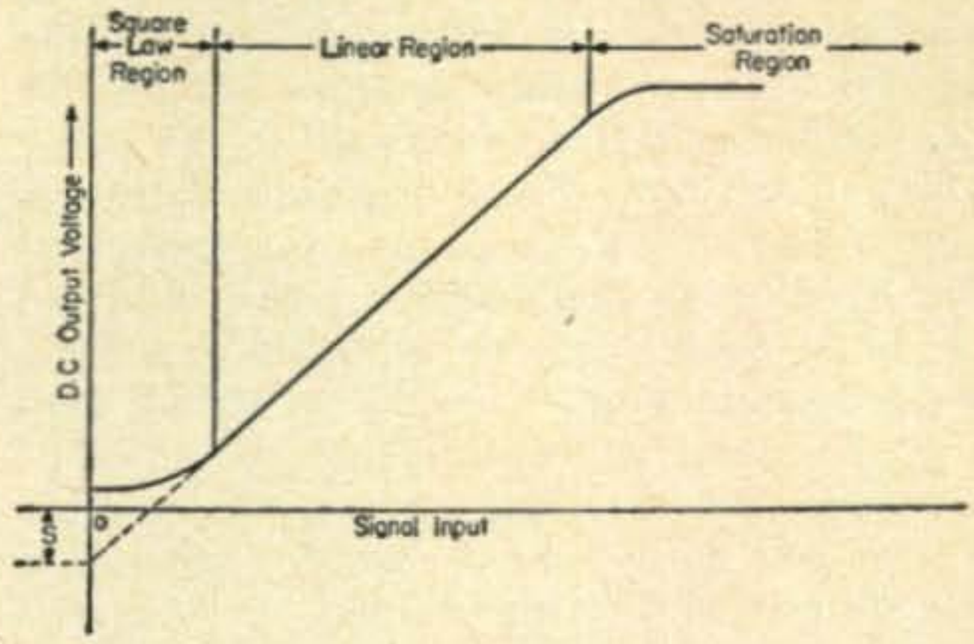


Fig. 3—The three regions of the detector characteristic curve. The individual areas, as they affect antenna measurements, are explained in the text.

A typical detector output vs. input curve is shown in fig. 3.[2] Generally, there are three regions to this curve: the square law region, the linear region, and the saturation region.

The square law region extends from zero up to a few volts (*all* detectors are square law for weak signals). In this region the detector output is proportional to input *power* rather than voltage. The effect is to exactly double db readings, making a 6 db gain difference look like 12 db, etc. This phenomenon explains many of the inflated gain figures quoted in the past. Square law detection also exaggerates gain measured by the dishonest method since it gives the illusion of a narrower main lobe beamwidth.

Notice that the detector output voltage is not zero for no input. This effect is called *emmission bias* or *Edison effect,* and is typically about ¼ volt in magnitude.

It is in the linear region, of course, that we want to operate, and this part of the curve extends from around 4 volts up to the saturation region which is typically around 50 or 60 volts. Saturation occurs not because of the detector, but because of limiting in the last i.f. stage.

Bear in mind that even operation restricted to the linear region does not insure a right

[2]Assuming a conventional thermionic diode second detector. The input scale may be interpreted as either antenna input in, say, microvolts or detector input in volts since everything is linear between the antenna and second detector. Obviously, a.v.c. is turned off.

answer. This comes about because of the difference between proportionality and linearity. Proportionality requires not only linearity, but also that the curve pass through the origin. In order for the linear portion of the curve of fig. 3 (as extended by the dotted line) to pass through the origin, it will be necessary to elevate the entire curve by the amount S as indicated. In practice, this may be accomplished simply by turning the zero adjustment knob on the v.t.v.m. How much, will depend on the particular receiver. For my receiver, the right amount happens to equal the Edison effect bias; so if the meter is zeroed *before* connecting to the receiver, non-proportionality will be compensated. Note that if the detector is not compensated, readings will again err on the optimistic side, probably another reason for the ambitious gain figures claimed in the past.

The extent of the linear region and the required compensation for proportionality is best found by plotting the detector curve with aid of a signal generator, one with an accurately calibrated attenuator. Lacking a signal generator, the meter will usually not be far off if it is zeroed before connecting to the detector and the r.f. gain control set for operation in the vicinity of 15 volts output.

Field strength meters and S-meters are sometimes used for gain measurements, but are so notoriously inaccurate for other than qualitative comparisons they will not be considered here.

Signal Source

The signal source should provide a signal that is at least 20 db above the noise level but should not be so strong as to block the receiver. A battery powered transistor signal source such as the one described in *CQ*[3] is almost indispensable for antenna work.

Reflections

Reflections are the real headache of accurate antenna measurements. Ideally, tests should be carried out in free space, an impossible condition to meet in practice because of the earth's proximity. The ground reflection, however, usually causes less trouble than do reflecting objects above the ground. For this reason, it's very desirable to carry out measurements in an open field, away from all buildings, trees, utility wires, etc. In a metropolitan area it may not always be possible to find a clear field, but there is always one direction to go to avoid reflections, straight up.

Any site can be tested for reflections very easily by waving a dipole around and observing the signal received from a distant source. If the level is not constant within a db or so, it means the site suffers from reflections. The dipole should be on the end of a wooden stick to keep it away from the holder's body, and naturally should be maintained perpendicular to the source direction and constant in polarization.

A number of things can be done about the ground reflection problem. Probably the simplest is to place the signal source on the ground and aim the test antenna at it. Any reflection that occurs will then take place very near the source (assuming a flat ground) and will not produce an interference pattern at the test site.

Antenna directivity may also be utilized to discriminate against reflections. This technique is most effective if both source and reference antennas are directive as well as the array being tested. A directive reference antenna rules out a half wave dipole, of course. The dipole has one great virtue: its gain is accurate known (zero db). Its lack or directivity, however, makes it particularly susceptible to reflected signals. A much better reference antenna is a small Yagi that has been measured under nearly ideal conditions. Use of a directive reference antenna yields another advantage: Its gain will not be greatly different from the antenna under test. This results in improved accuracy since small gain differences can be measured with greater precision.

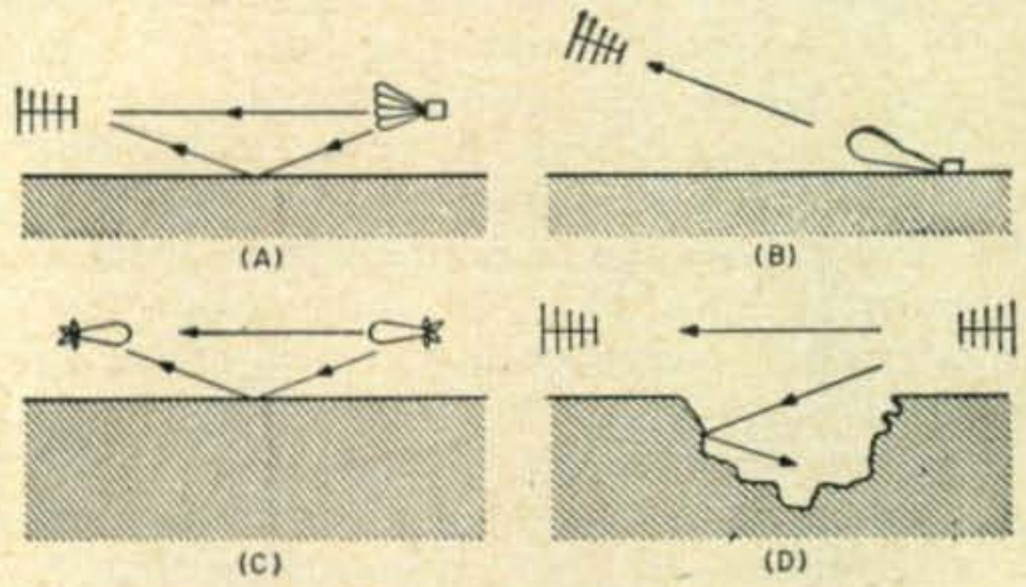


Fig. 4—Various means can be used to avoid the ground reflection. In (A) the ground reflected signal interferes with the direct signal resulting in a very nonuniform field at the test site. The effect is as if the source had the multilobed pattern shown. Placing the source on the ground (B) changes the pattern to a single large lobe, resulting in a uniform field at the test site. Antenna directivity may also be used to discriminate against the ground reflected signal as in (C). Another technique is to carry out the test over a canyon, (D).

Another technique often used to overcome the ground reflection is to carry out the test over a canyon as shown in fig. 4. The reflected signal will then be scattered randomly by the canyon walls and very little will reach the test site.

By employing the above techniques and taking a reasonable amount of care it is possible to measure gain with a precision of about ± ½ db. Greater accuracy than this is not easily achieved with amateur techniques. Remember, though, even a rough measurement is much better than no measurement at all. ■

[3]Brown, F. W., "A Solid State Signal Source For 144, 432, and 1296 Mc." *CQ*, May, 1961, page 32.

Protective Coatings for Antennas

KELTON C. AGRELIUS*, K6SHA

To adequately protect an antenna from moisture and salt spray, two different types of protective coatings are necessary. One is a type of paint which, when applied to the elements, boom and mechanical hardware, will not deteriorate over a long period of time. The second is a type of coating that will effectively seal the r.f. coaxial connectors or connections of the feed line and connections of traps or loading coils. Also any openings in the metal of plastic covers of the traps can be covered to hermetically seal the trap.

A paint of the type mentioned above is available and is called Laminar X-500. This paint has a polyurethane base and when applied properly will outlast an ordinary paint many times. Coating for the r.f. connections and traps is a special adhesive called Pro-Seal no. 501. This coating has a polysulphide base and is easily applied. Both of the coatings are a result of exhaustive tests conducted by the personnel at the Materials Testing Laboratory at the Pacific Missile Range, Point Mugu, California. The coatings are used extensively for improved reliability on all types of antenna systems from small u.h.f. radar antennas to big 64 foot automatic tracking antennas at antenna sites of the Pacific Missile Range. Most of the Instrumentation Vans at remote sites in the Pacific areas are also coated with the Laminar Paint.

Application

Proper application of the Laminar Paint is quite important. The method is simple and includes applying two coats, either by brush or spraying. All metal surfaces of the antenna should be thoroughly cleaned either by sanding or by steel wool. In the case of a new antenna it may only be necessary to clean the metal with a paint thinner or a clean dry rag to remove any oil or greasy contamination. The first coating is the application of a primer and the second is the application of a finish coat. Time of drying between the coats is given by the manufacturer. This paint has a very good dielectric constant and is used with no ill effect on radar antennas at 10 kmc.

The Pro-Seal no. 501 adhesive is a very sticky substance and is non-injurious to the skin. It is easily applied with a paint brush or wooden spatula. Pot life of the coating is approximately one hour after mixing for application. The coating is flexible from —100 degrees to plus 200 degrees *F*, is not affected by sunlight or moisture and is easily removed with a knife if necessary. It is one of few known coatings which will adhere to vinyl and polyethelene. A 200 gram kit is sufficient for coating all r.f. connections and traps on a Tri-Band Beam.

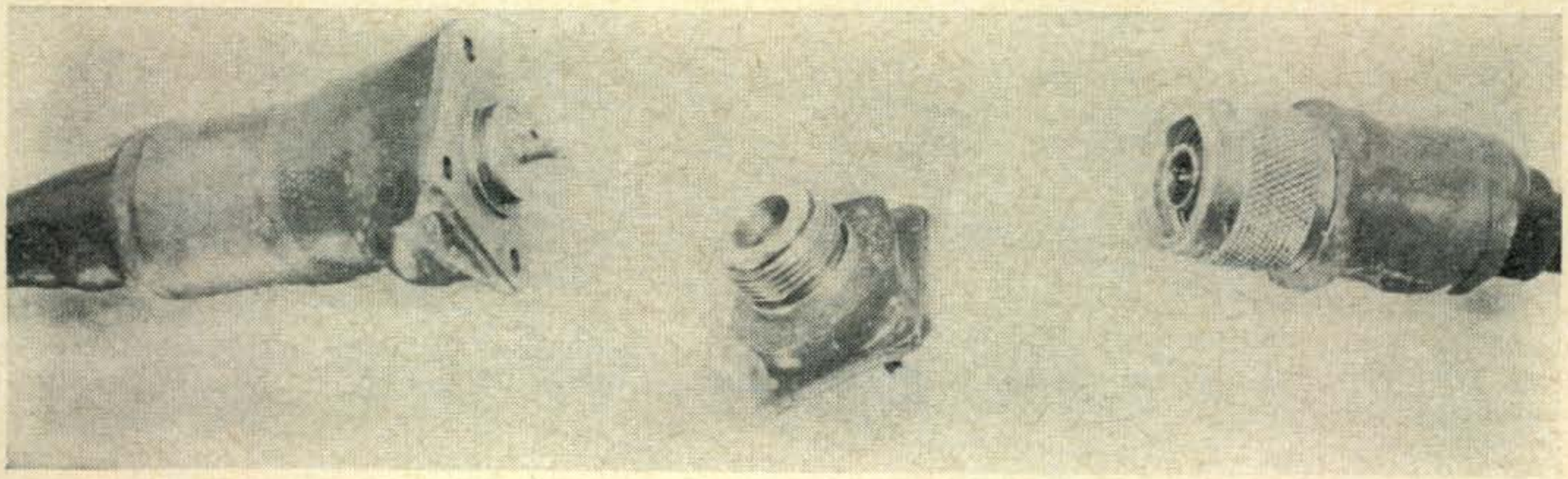
Sources

The Laminar paint is available in either spray or brush type and a quart kit of the primer and a quart kit of the finish coat is more than enough to adequately cover the largest Tri-Band Beam on the market. A number of different colors are available with aluminum or light grey being the most popular for antennas.

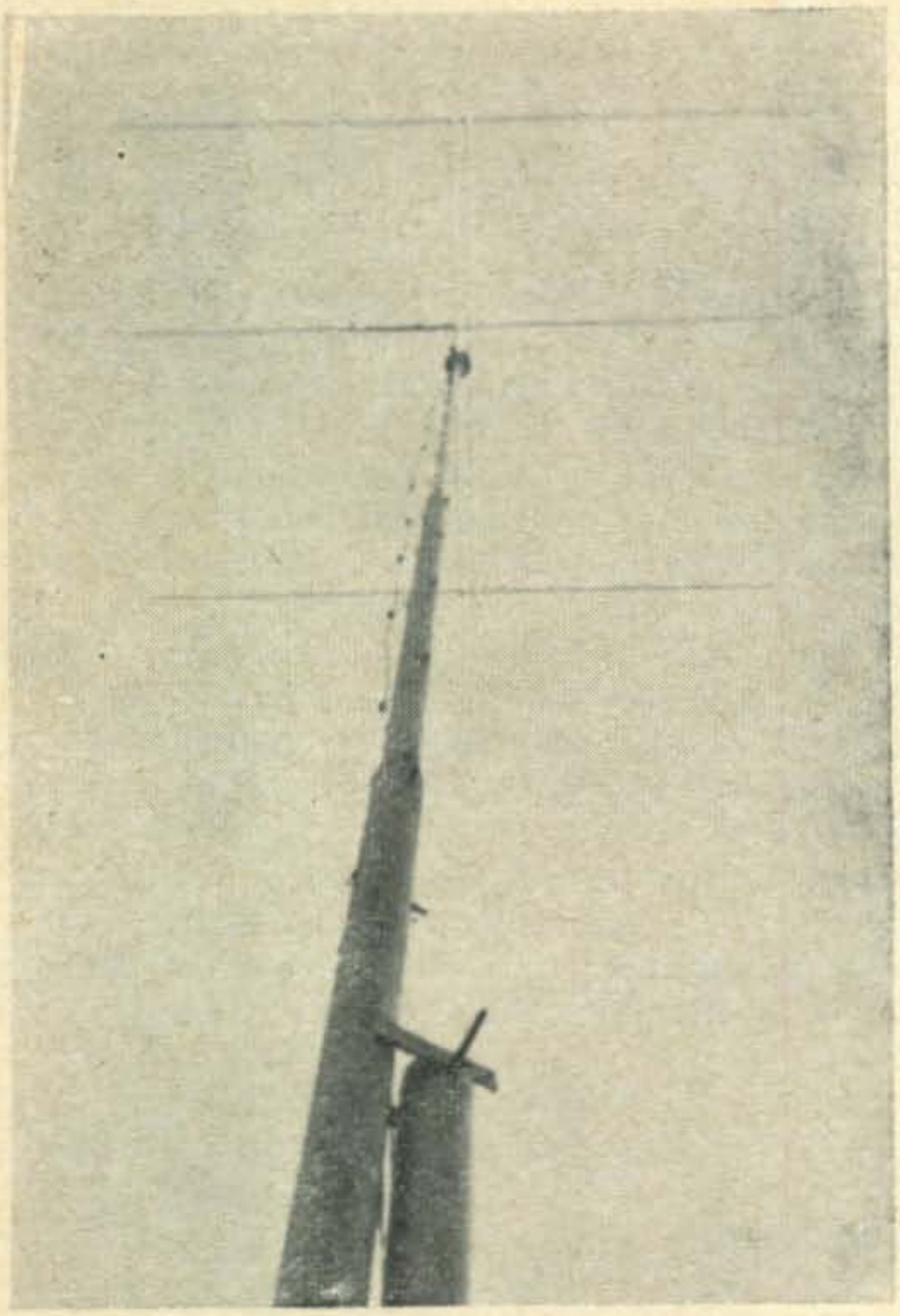
The Laminar paint may be obtained from the Magna Coatings and Chemical Company, 1785 N. Eastern Avenue, Los Angeles 32, California. The approximate cost of the paint is $5.00 a quart for the brush type prime coat and $5.50 a quart for the brush type finish coat. Either type in a spray can is $6.75 a quart.

The Pro-Seal Adhesive No. 501 may be obtained from the Coast Pro-Seal and Mfg. Co., 2235 Beverly Blvd., Los Angeles 57, California. The price of the adhesive is approximately $4.40 for a 200 gram kit. ■

*561 Calle Arroyo, Thousand Oaks, California.



Common variety coaxial fittings shown with a protective coating of Pro-Seal adhesive. This rubber-like substance can be easily removed with a knife, but is not affected by heat or moisture.



A Self Supporting Antenna Mast

BY R. P. HAVILAND*, K3BGX

This self supporting tilt-over mast, made from standard pipe length, is 65 feet high and can support 50 pounds of antenna and rotor.

THE mast described here offers a desirable combination of all the features that are usually needed for amateur antenna support. It is self supporting and so eliminates the need for an extensive guy system. It is designed to fold over, which is a great convenience during erection and also eliminates the usual problems of getting to the top of the tower for antenna changes. It is made of widely available materials and is designed to support up to 50 pounds of antenna and rotator at a height of 65 feet.

The mast is constructed from 21 foot lengths of standard steel pipe with each succeeding section being two pipe sizes smaller so it will nest inside of the next lower unit. The drawing of fig. 1 shows the general layout and the overall dimensions used. Four lengths of pipe fastened together make up the mast. A separate 21 foot pipe, 4" in diameter serves as the mast support and as a gin pole. Hinge pins fasten the mast to the gin pole and allow for fold over. The gin pole is set into the ground in a 6' section of 6-inch pipe which is set in concrete, and which serves as the foundation.

Figure 2 shows the construction of the joints between pipe sections. Except for bolt size, this is the same for all of the joints. The main vertical load is carried by two bolts which pass through the two pipe sections, one near each end of the joint. These two bolts are at right angles. In line with each bolt, the outer pipe is drilled and tapped for a set screw which is used to adjust the position of the inner pipe along the load-carrying bolt. These set screws eliminate side movement and also serve to compensate for small errors in drilling the pipe. The top end of these joints are wrapped with sheet rubber from an old inner tube, held in place by clamps or wire. This keeps water out of the mast.

*72 Ivywood Lane, Radnor, Pa.

Hinge Construction

The hinge construction is shown in fig. 1 and in the photographs. These hinges are made by welding ¼" steel plates to either side of the bottom mast section to form a U. The outer ends of the U are drilled for a pin made of standard ½" steel rod. Washers and cotterpins are used to hold the rod in place. The lower pin is removed whenever it is desired to fold the mast down, and the upper pin is used as the hinge. (Note: the top of the gin pole section should be sealed with a wood disk to keep out rain.)

Counterbalance

The mast is counterbalanced so that raising or lowering the mast can be done quite easily. Counterbalance is obtained by loading the bottom section of the mast with about 150 pounds of scrap steel. Broken truck axles were used here. This gives nearly perfect counterbalance for the mast alone. With the 50 lbs. of rotator and antenna mounted at the top of the mast, the weight at the bottom is less than required

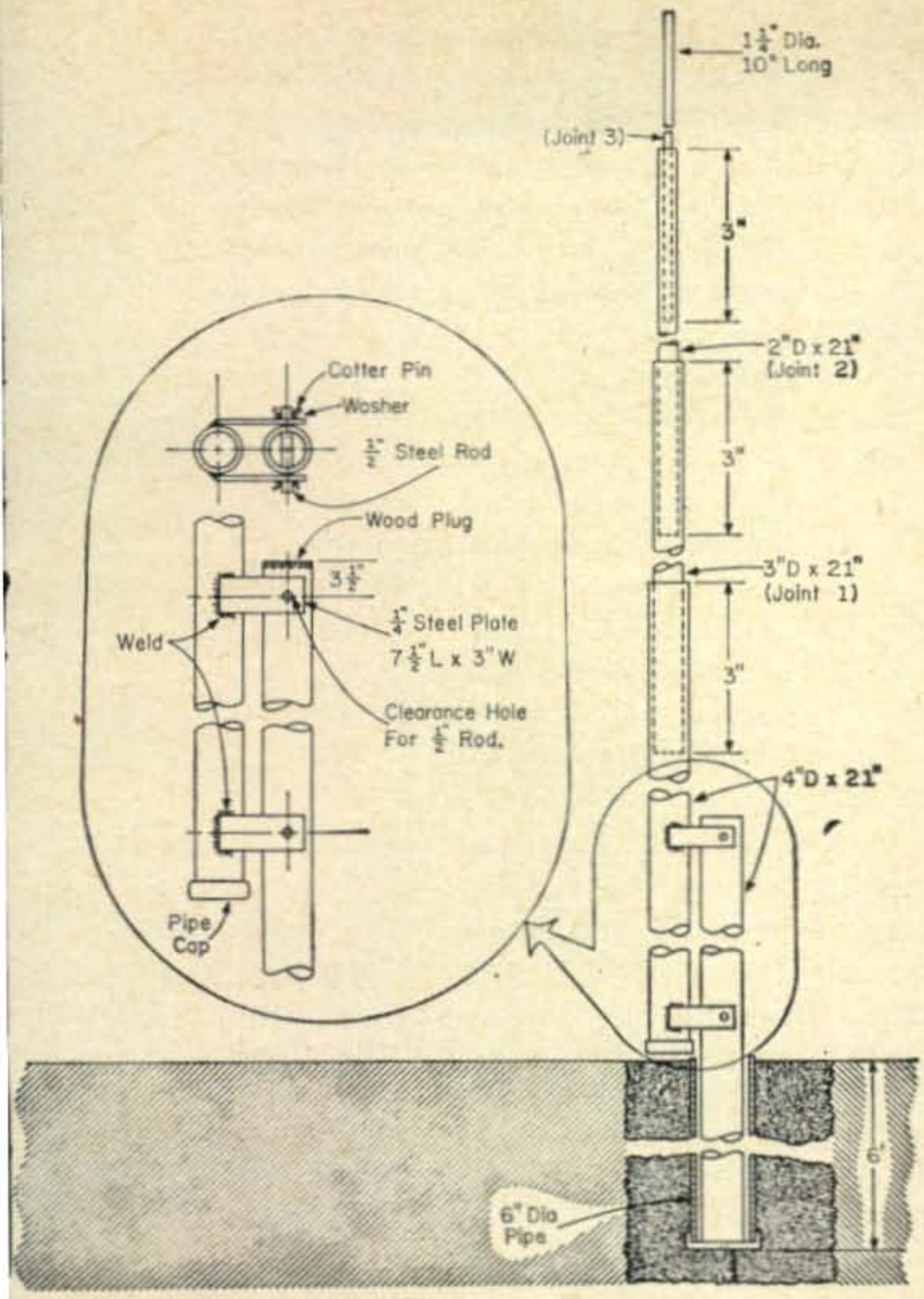


Fig. 1—General layout of the self supporting mast. The 6" diameter pipe is set flush with the ground and, with the concrete mix, provides a foundation suitable for winds up to 75 m.p.h. Details of the hinge construction are shown in the inset. A wooden plug is inserted in the top of the 4" gin pole.

for perfect balance, so a block and tackle must be used to raise or lower the mast as shown in fig. 4.

To eliminate internal rusting, a ¼" hole should be drilled in the center of the 4" pipe cap.

Foundation

At K3BGX, the foundation section of the mast is buried in a shale ledge which starts about a foot below the top of the soil. This is not a normal situation, however, since most masts would be installed in clay or sandy clay. For average soil, the foundation should be a 6 foot section of 6" diameter pipe buried flush with the ground. This should be capped at the lower end with a standard pipe cap, with 2 one-quarter inch holes drilled through it for drainage. The pipe should be centered in a hole 24" square, which is filled to within 6" of the surface with concrete. Scrap iron and large stones may be imbedded in the concrete if available. About 2/3 of a cubic yard of concrete is needed.

The space between the 4" gin pole and the 6" foundation section is filled with sand. This serves two purposes. It holds the mast vertical, and it also serves as a vibration damper to keep the mast from building up a large sway during storms.

Mast Construction

Second-hand pipe is used for the mast, but it should be in good condition. A small amount of rust, scale, etc., at the surface does no harm, but pipe that shows appreciable amount of pitting or corrosion should be rejected. In the mast described, the used pipe came from an oil refinery and both the inside and outside surfaces were in perfect condition. The outside was thoroughly cleaned, then wiped with mineral spirits. Two coats of penetrating aluminum paint (Rustoleum) were applied. A further touch-up coat was given after erection.

There are a number of ways in which the mast may be erected. The one used involves renting four sections of steel scaffolding of the type used by painters. This provided a temporary tower, 20 feet high, which was used for all of the erection operations and for other odd jobs such as touching up the paint and installation of the antenna and rotator leads.

For the actual erection, the scaffold was set up about 6" from the foundation pipe. The gin pole was picked up by block and tackle, and slid into the foundation pipe. The pole was centered in the foundation pipe by small wedges and plumbed to insure that it was vertical. Sand was then poured around the pole and settled by tapping vigorously with a hammer. After the foundation pipe was filled, the wedges were removed. The mast was temporarily separated at the second joint so that only the bottom two sections needed to be raised. The same block and tackle arrangement was used with the attach point to the

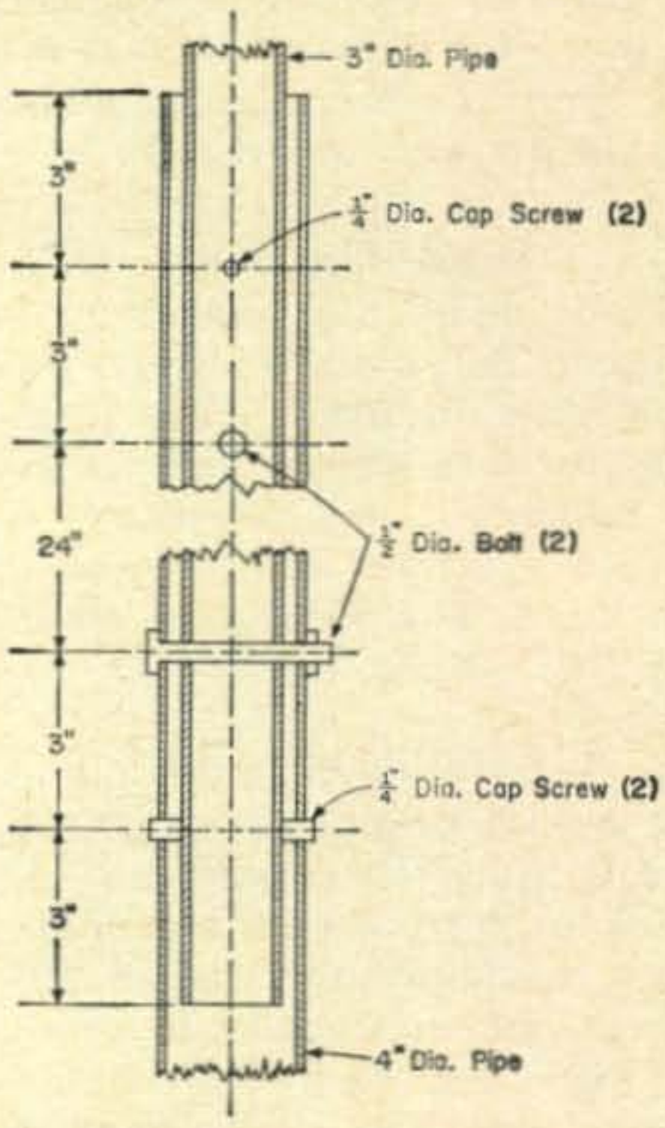


Fig. 2—Details of the joint construction. The joints for coupling the 3" pipe to the 2" length and the 2" to the 1¼" pipe are identical except for reduced diameters and bolt size.

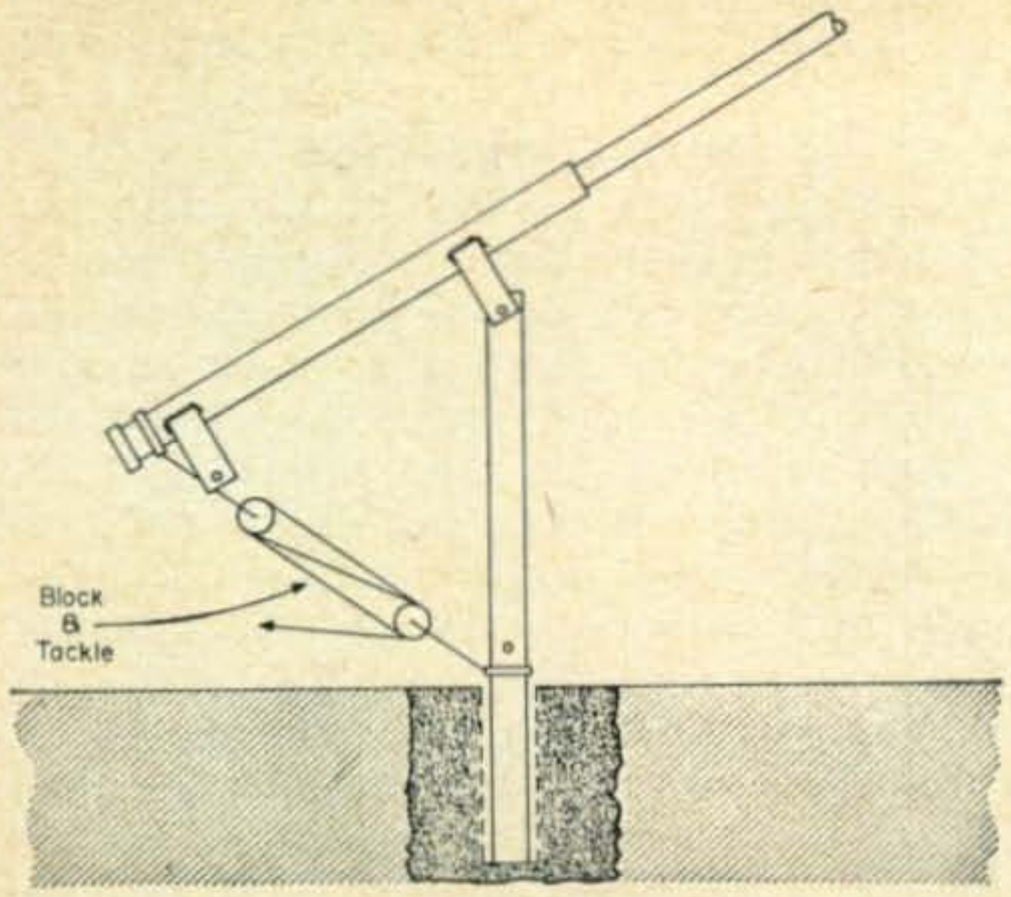


Fig. 3—Set up for the block and tackle to aid in raising and lowering the mast.

mast being just below the top hinge, at the point of balance. The mast was pulled up to the vertical and positioned so that the top hinge pin could be inserted. Thereafter, this pin is not removed. Before erection a pull rope was tied to the upper section, and the tackle block on the lower, as shown in fig. 4.

The scaffolding was then removed and the mast was pulled over by the rope. The upper two sections were then inserted into the lower sections. The attachment bolts were installed and the adjustment screws placed. The scaffold was then used to touch up the paint and to install the antenna leads. Finally, the counter weights were slid into place and the lower pipe cap put on.

An easier method of erection is to use the truck hoist of a company specializing in neon sign work. Most of these have sufficient capacity to lift the completely assembled mast section. Also, with careful rigging it should be possible to do the job with the gin pole alone.

Load Figures

It should be noted that maximum load on the mast occurs when the mast is horizontal, with the antenna in place. This load is less than 20,000 lbs. per square inch, in conformance with building codes. Maximum load on the foundation occurs with the mast vertical, under high wind. The foundation described is satisfactory for winds up to 75 m.p.h. in average soils.

The general construction of this mast is satisfactory for greater heights or larger top loads. However, if it is desired to extend it to heights above 55′ or to carry larger antennas, it will be necessary to change the size of pipe since the loads on the sections will exceed safe values. In this case, each succeeding section should be one pipe size smaller than the next lower section. As can be seen from a table of pipe sizes, these nest easily. It is recommended that any re-design be analyzed carefully for strength and balance. Equations for doing this

List of Materials

1	21′ length 4″ steel pipe, threaded one end
1	21′ length 4″ steel pipe, not threaded
1	21′ length 3″ steel pipe, not threaded
1	21′ length 2″ steel pipe, not threaded
1	10′ length 1¼″ steel pipe, not threaded
1	6′ length 6″ steel pipe, threaded one end
1	6″ pipe cap
1	4″ pipe cap
2	½″ steel rods, 7½″ long
4	½″ bolts, 6″ long, coarse thread
2	¼″ bolts, 4″ long, coarse thread
12	¼″ screws, 1″ long, coarse thread
4	¼″ steel plates, 3″ X 7½″, per drawing
4	½″ washers
4	3/32″ cotter pins
150	lbs. scrap steel (broken truck axles)
2/3	yard ready mix concrete

are given in any standard engineering handbook.

For these higher masts, the foundation becomes increasingly important. Because of the wide variations in local soil condition, no definite rules can be given for the foundation. In average soils, the foundation pipe length should be equal to one-tenth of the height above ground. In case of doubt, it would be well to consult the local power company for their installation method.

In many locations a construction permit will be required for the installation. Before applying for this, the soil at the foundation point should be checked by a test boring, and the type, whether sand, clay, etc., noted. Usually the County Engineer can be consulted for assistance in making these checks and for an opinion as to their adequacy. He will also, of course, have to approve the design before a construction permit can be issued.

General

The cost of the mast will depend on local prices for used pipe, and on the method of erection. The cost of the pipe used, including fabricating the brackets and welding was just over 65 dollars. Small parts, concrete, rental of scaffolding and so on came to about 25 dollars. These costs should be typical.

The mast has been in use for three years. It has been lowered annually for repainting, and check of the antenna rotator. Lowering is easily done by one person, in about 5 minutes. Two or three are needed to raise the mast to vertical, this taking perhaps 10 minutes.

Maximum winds experienced have been gusts to 55 m.p.h. In such winds the antenna moves several feet, but there is no movement of the lower section. The design is calculated to withstand in excess of 75 m.p.h. winds, but if these are forecast, peace of mind indicates that the mast should be lowered.

The general construction of this mast appears to have originated in Oklahoma where it is used for television antennas. ■

A Sterba Curtain for the Low Bands

BY GEORGE COUSINS*, VE1TG/W6

If you have the space available and are interested in DX, here is an antenna to consider. The results on 80 and 40 were terrific.

BEING one of those poor individuals with a fanatic love of DX, closely followed by contests, I became convinced long ago that the antenna was where I should concentrate my efforts. Having a few acres of ground available, and living on the East coast of Canada, where 80 and 40 meter DX is not too hard to work providing one can get through the QRM, I began to take a good hard look at various types of wire arrays.

The most familiar such arrays are the Vee beams, Rhombics, Lazy H's, and assorted varieties of end-fire, broadside and collinear arrays. There are reams of information on these in any antenna handbook, and one by one they were considered, and rejected for one reason or another. There were not too many more to try, but as usually happens, where there's a will there's also a way.

The Sterba Curtain

In every handbook, usually in one or two sentences, on rare occasions in a short paragraph reference is made to another array, the Sterba Curtain. It is a broadside array made up of a combination of parallel and collinear elements giving excellent gain. It is simple to extend to any size, simple to feed and it's used by commercial short wave installations, so it must be good. Let's take a close look at the possibilities.

I have heard of one or two cases of this antenna being used on the high bands by a few amateurs, but when the low bands are concerned, several very important points must be considered: size, height, materials, cost, *etc.* In order to see what could be done, I first decided on a frequency of operation, 7 megacycles, remembering that this was going to be used in a c.w. contest. Glancing at the basic sketch of the antenna, fig. 1, the dimensions work out to be approximately 66 feet for each half wave section and 33 feet for each quarter wave section. For best results (according to the books) the lowest set of elements should be at

Fig. 1—Basic design of the Sterba Curtain.

least a half wavelength above the ground. Since the antenna is normally hung vertically above the ground, this adds up to something rather staggering—a pair of towers about 120 feet high! This thought was almost enough to discourage me. After thinking about it for awhile I went outside and checked the height of a few maple trees I had down in the field. Three of these were around 40 or 50 feet high and a couple of spruce trees were around 30 feet. The more I looked, the more I wondered what would happen if I strung the antenna with the top string of elements stretched between the tops of the tall maples, and the lower string between the shorter trees. The whole affair would end up hung at about a 45 degree angle to the earth with at least a little height on one set of elements. The others would be pretty low, but maybe this would work out anyway. I built the thing, tried it out, and it did all that I wanted it to, and lots more besides. Interested? Well let's see how to build one.

Construction

As can be seen from fig. 1, the Sterba can be extended as far as desired so I checked the distance that I had available between the anchor trees and found that I had about 450 feet in a straight line; enough for a string of 5 half wave elements plus the 2 quarter wave sections at the ends. This also allowed reasonably good clearances at the ends, so that tree brances and wires would not end up in a wild entanglement. Enough room was available to place the second string the proper half wave away, so the design was finalized. With an antenna of this size, fed through 600 ohm feeders and a tuner, I didn't consider that the dimensions would be too critical, so I settled

*38751 Puerta St., Palmdale, California.

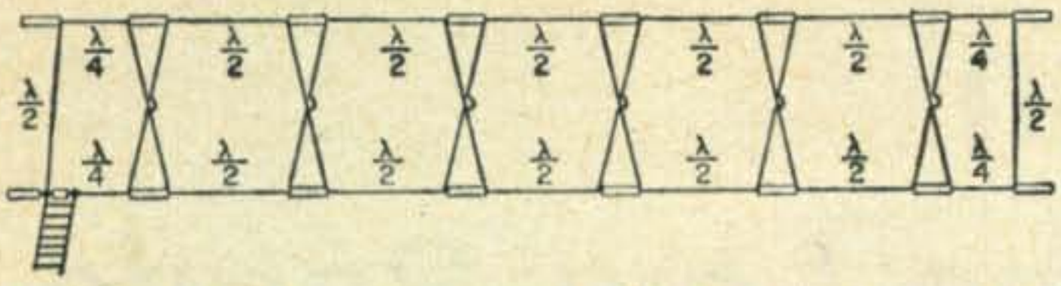


Fig. 2—The final design of the Sterba Curtain at VE1TG. The half wave sections are 66 feet long, the quarter wave sections 33 feet long and the phasing lines 66 feet long.

for those shown in fig. 2, which shows my antenna as it was finally built.

Looks rather immense doesn't it? Well, it is! But remember, you can add or subtract as many of those half wave sections as you wish, depending upon your available space and materials. Figure out the amount of wire you need, and go to it! As can be seen, this one of mine took a total of 1,716 feet of wire, not counting the 600 ohm transmission line, which in my case was 95 feet long.

Materials

Now what about materials? The insulators could be the nice porcelain type, but it's a lot cheaper to buy a few feet of ⅝ inch hardwood dowel, cut it into 6 inch lengths, drill holes in each piece, and then boil them in paraffin wax for about a half hour.

I can hear the next remark, "What nut is going to buy all that expensive wire?" Well now, all you need is wire that is strong enough to support the weight of the antenna itself. This in turn depends upon how many supports the antenna will have and how big you're going to build it. My curtain was supported at 5 main points and it was made entirely of #18 stranded wire with a woven cloth jacket! Not exactly the classic idea of antenna wire, is it? The old idea of #10 or 12 copper wire is fine, if you can get enough of it. But if not, look around for anything else that will do. Check the local utility companies, surplus stores, even junkyards or farm suppliers, for any sort of wire they might have. It's all metal, and it will radiate r.f. Just be sure that all joints are clean and well soldered before you put is up there. Now you have the layout; just put it together as shown in fig. 2. Make very sure that you have only one cross-over in the phasing lines, because if you get one of them mixed up you can see you'll end up with only part of the array in the circuit to the tuner. I used the method shown in fig. 3 for connecting the elements and phasing lines. The lines are looped through a hole in the insulator, wrapped a turn around the insulator, and then soldered to the elements.

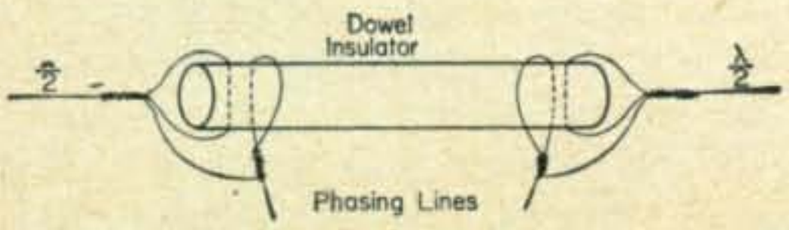


Fig. 3—Method of connecting the phasing time to the elements.

The 600 ohm transmission line is also made up of wood dowel insulators, but of ⅜" diameter stock. The wire I used was #14 copper ground wire with a plastic jacket. A piece of ordinary house wire could be stripped and used. The plastic jacket has no ill effects that I have ever been able to see, and the line is not affected by rain or snow. The rig's loading doesn't seem to change whether the sun is shining or it's pouring rain.

Now about getting the monster assembled—the easiest way (I think) is to build the upper string of elements, attach the phasing lines to this string, and then raise this much up. Incidentally, if you don't like climbing trees, as I don't, attach a light line to a small weight and heave it over the tree and then use this to pull up your main line. A good bet is the use of polypropylene clothes line which won't stretch, rot, or otherwise let you down.

When you get the first set of elements up and secure, assemble the second string and attach the connecting phasing lines (watch that crossover!) and the end sections. Now raise this string as high as you can and attach any side lines in order to keep the sides as nearly a half wave apart as possible. The whole affair will end up hanging at some angle to the ground but this won't matter too much. Just try to get it as high and in the clear as you can. My antenna ended up with some of the bottom elements only about 6 to 10 feet off the ground.

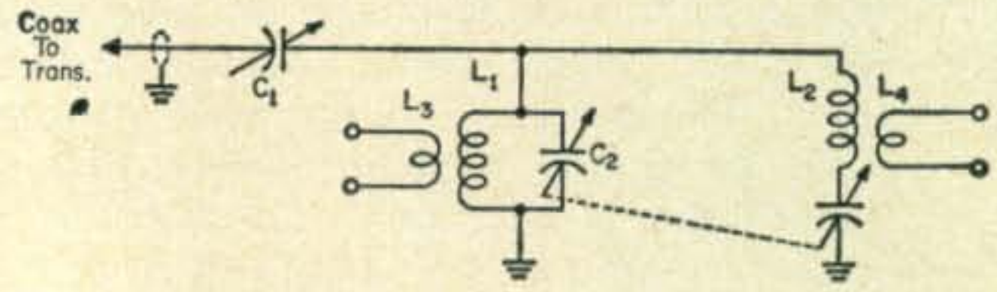


Fig. 4—Circuit of the all-band tuner used with the Sterba Curtain. The circuit was taken from the ARRL Handbook. The coil forms are from a BC-375 tuning unit and wound with #12 plastic covered copper house wire. Capacitor C_1 was scrounged from a TU-12 and is spaced for 150 watts only.

C_1—350 or 450 mmf.
C_2—300-300 mmf.
L_1—11t, 2"d., 2¾" long.
L_2—5½t. 2" d., 1½" long
L_3—6t, 221/2"d., 1¼" long.
L_4—5t, 5½"d., 1¼" long.

Antenna Tuner

Now it's all up, the feedline is attached, so run the line into the shack and hook it onto the tuner. I strongly recommend the all band tuner shown in the ARRL *Antenna Handbook*. The circuit is shown in fig. 4.

If at all possible, reduce the power of the transmitter as low as you can during initial tune up. It doesn't matter what anyone says—it takes time and patience to get the tuner to do the job you want it to do. The entire tuning procedure is aimed at getting as low an s.w.r. on the coax line from the transmitter to the tuner as possible, consistent with proper loading on the final. You should not be satisfied

[*Continued on page 151*]

Optimum Antenna Design for DX

COMMANDER PAUL H. LEE*, W3JHR

In order to work DX effectively the vertical angle of radiation must be as low as possible. The author discusses the effects of antenna types and height upon this angle of radiation.

ONE of the most important factors in the planning of a high frequency communications system is antenna design. For a specific point-to-point circuit, both receiving and transmitting antennas are optimized as to forward gain, front-to-back ratio, vertical angle of radiation, vertical pattern shape, and available space. This process usually results in a large antenna which points in a fixed direction and which has a large number of elements or large aperture area.

For the average amateur, the process of antenna design for the higher frequencies, if it can be so called, usually consists of buying a prefabricated Yagi array, mounting it on a short tower or on his house top, and going on the air. Those who prefer the lower frequency bands, on the other hand, may end up with a random length of wire, loaded up by means of a matching network and at some height above ground which is usually far from optimum. When one considers the lack of thought which is given to such matters, or the surroundings which may consist of trees, other houses, or power lines, it is sometimes amazing that signals get out of the backyard at all.

The field of propagation and antenna design is a most fascinating subject, and one which has so many ramifications that it would be impossible to cover all of them, even in a series of a dozen articles. However, I do wish to direct this article, and one which is to follow in the future, to those who are interested in optimizing an antenna design for amateur DX work. It is here that proper antenna design can really pay off.

Vertical Radiation Angle

Take a long look at fig. 1. This graph shows the relation of vertical angle of radiation to the distance to the first reflection point via F-Layer ionospheric reflection. The height of the F-layer varies between approximate limits of 200 and 350 kilometers, under day-night conditions. Pick out the vertical angle of 20 degrees above the horizon, for example, and you will note that the first reflection zone will be somewhere in the neighborhood of 600 to 900 miles. A vertical angle of 50 degrees will give a first reflection zone of 200 to 300 miles. On the other hand, a vertical angle of 5 degrees will give a first reflection zone between 1400 and 1900 miles. And an even lower angle of 3 degrees, if obtainable, will move the first reflection zone out to 1600 to 2100 miles! Do you want to work DX? Then get that vertical angle down!

The next thought that comes to mind is that for long distances there will be more than one reflection. This is certainly true, for to get from Washington, D.C., to Australia, for example, will require several reflections. Due to the simple geometry of the situation, we are limited to 2500 miles per hop. However, reflection losses run in the neighborhood of 3 to 6 db per reflection, depending on the absorptive and scattering nature of the reflecting surface. When one also adds in the ionospheric absorption which occurs for each ionospheric reflection (and this absorption can be quite variable with sunspot conditions), one can easily arrive at the conclusion that for a good strong signal at an overseas receiver, the fewer the reflections the better. In other words, get that vertical angle down! Vertical angles of 3 to 10 degrees are most desirable. Curtain antenna arrays using 4 × 4 or 4 × 6 arrangements of dipole elements, such as are used

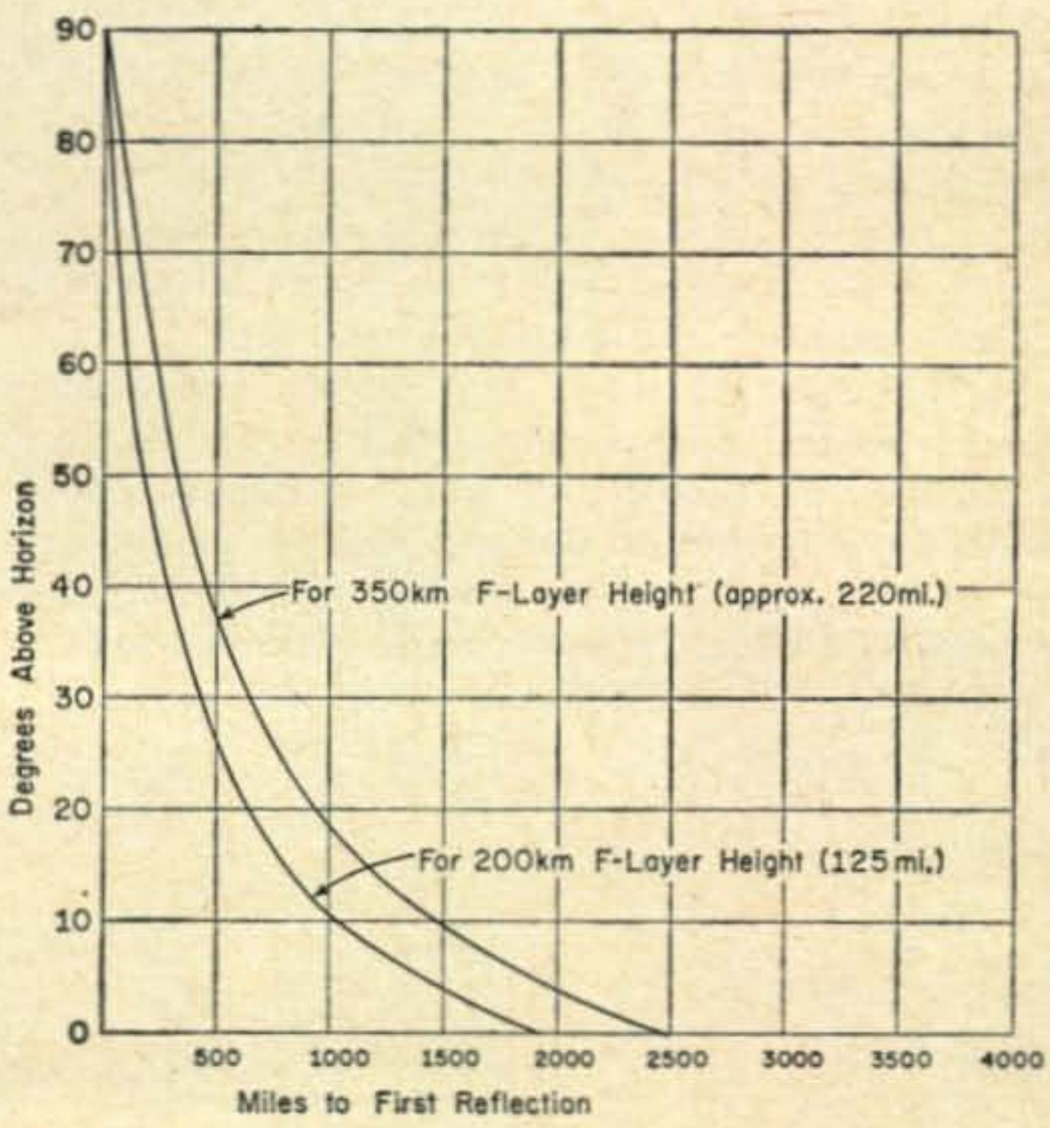


Fig. 1—Vertical radiation angle versus distance to the first reflection.

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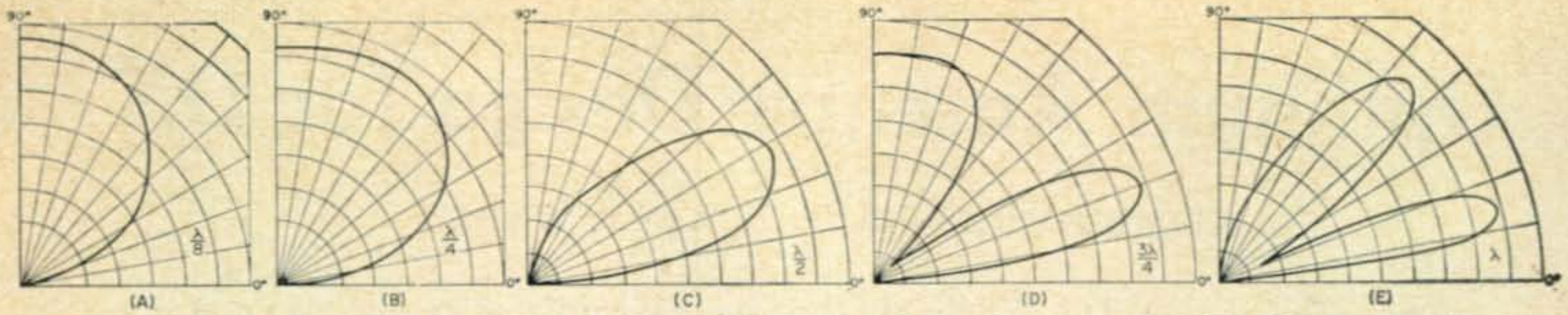

Fig. 2—Vertical radiation patterns for half wavelength dipoles various heights above ground as indicated in each graph.

by the Voice of America or the British Broadcasting Corporation, are optimized for low angles of this kind, in order to place the first reflection point as far out as possible.

How does the antenna used by Mr. Average Amateur compare with these optimum requirements? To answer this question, I have shown in fig. 2, A through E, the vertical radiation patterns of a ½ wave horizontal dipole for several heights above ground of average conductivity. The patterns are in a plane at right angles to the dipole. Let's look at some common backyard cases. Consider the case of a ½ wave dipole ½ wave high, shown in fig. 2C. This corresponds to a 33 foot dipole about 35 feet above ground at 14 mc. Note that the useful lobe is between approximately 15 and 45 degrees. Reference to fig. 1 will show that this lobe will give a first reflection zone of 200 to 1100 miles. Transmitted power is thus being scattered over quite a wide zone. Let's now think of the fellow who has a 3.9 mc dipole, hung between a couple of trees, perhaps, at a height of 30 to 50 feet. Note from figs. 2A and B that dipole heights of ⅛ to ¼ wave give a useful vertical angle of about 30 up to 90 degrees. Did I say "useful?" This type of vertical pattern is useful only for distances out to about 500 to 600 miles, and even so, a lot of power is being wasted at very high angles which penetrate the ionosphere and are not reflected at all! It looks as though we should move our dipole higher, doesn't it? Well, let's take the case of a dipole ¾ wave high. This corresponds to a height of 180 feet at 3.9 mc, or 50 feet at 14 mc. Figure 2D shows that we now have a lobe of radiation from 10 to 30 degrees, which is an improvement, but a high angle lobe of 55 to 90 degrees has appeared, which wastes considerable power at angles which are not useful and which probably penetrate the ionosphere and are lost. If we move the 14 mc dipole up to a wave length height, 66 feet on 14 mc, our low angle lobe sharpens, from about 10 to 20 degrees now, but we still have a large lobe at 38 to 60 degrees which is a waste of power. If we move our 14 mc dipole even higher, the low angle lobe will shrink in size, several high angle lobes will appear, and our vertical pattern becomes quite useless for any DX work.

Yagi Antennas

The next thought that occurs is, "Can't we improve this by using a Yagi array?" The answer to that is that a horizontal Yagil will cut down the size of the undesired high angles lobes somewhat, but that it will do absolutely nothing at all to lower the angle of the desired main lobe. Figures 3A through D show the vertical patterns of a Yagi array at various heights above ground of average conductivity. It will be noted that these figures correspond, case for case, with those pertaining to the single horizontal dipole. With a 14 mc Yagi which is 66 feet high, we are still wasting considerable power at a useless angle of 38 to 60 degrees, and the vertical angle of the main lobe is still from 10 to 20 degrees.

How can we get lower angles than this? There is only one way to do it with horizontal dipoles, and that is by stacking them vertically. One horizontal dipole ½ wave high, with another ½ wave above it and in phase with it, will give a useful lobe from 8 to 28 degrees. Stacking a third in-phase dipole at an additional height of ½ wave, will bring the lobe down to 5 to 15 degrees. Four of them stacked will bring the lobe down to 3 to 12 degrees. Perhaps these statements will inspire some rugged individual to stack two or three 3-element full-size Yagis on 14 mc! This is something which is done quite often by the v.h.f.-u.h.f. fraternity at frequencies where size is reasonable, but personally I don't care to do it at 14 mc!

Verticals

There is another way of getting low angles, and this is by using a vertical antenna. Let's look at figs. 4A through D for awhile. Here are plotted the vertical patterns of vertical

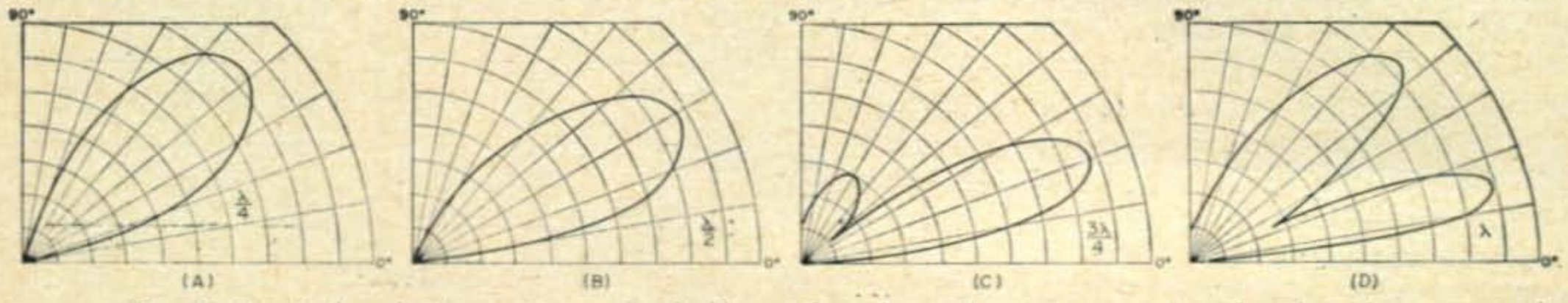

Fig. 3—Vertical radiation patterns for half wavelength yagi antennas various heights above ground as indicated in each graph.

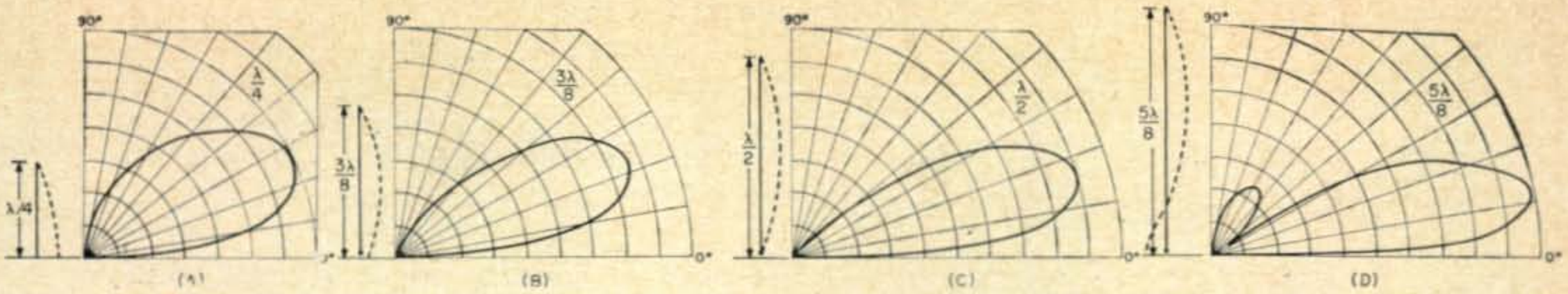

Fig. 4—Vertical radiation patterns for vertical antennas from quarter to five eighths wavelengths long.

antennas of several heights when worked against ground of average conductivity. The ¼ wave vertical gives a useful vertical lobe from about 10 to 55 degrees. A ⅜ wave vertical will drop the lobe somewhat, from 8 to 40 degrees. A ½ wave vertical is quite an improvement, giving a useful lobe from about 5 to 35 degrees. The ⅝ wave vertical, which is the optimum height used by many broadcast stations to get maximum field intensity along the ground, is the best we can do with a single vertical element, giving a useful lobe from about 3 to 27 degrees, ideal for DX work. This height was used in the "Mark II DX Antenna" for optimized performance on 14 mc.[1] A vertical element becomes useless as its height increases above ⅝ wave length, for the low angle lobe shrinks very rapidly, the high angle lobe grows rapidly and splits into several lobes, all of which are at angles too high to be of any value whatever.

Vertical Stacking

The next logical step is vertical stacking of vertical in-phase ½ wave elements, which results in a colinear antenna.[2] In the early days these were known as Franklin antennas. The free space pattern of a two-element antenna is shown in fig. 5A. It has a gain of 1.9 db over a dipole. The two-element colinear in free space is the same as a ½ wave working against ground (consider the mirror image as the other ½ wave element). There is one factor which is often overlooked when considering vertical antennas working against ground, however. It is the fact that when the mirror image is replaced by a ground plane and all the power is put in the remaining upper half of the antenna, an additional theoretical 3 db gain results. The actual amount of gain thus realized will depend on the conductivity of the ground plane, but with ground of average conductivity we will have some gain, perhaps 1 or 2 db. The three-element colinear has a free space pattern shown in fig. 5B. It has a gain of 3.2 db over a dipole. This antenna in free space is the same as a ½ wave element over and in phase with a ¼ wave element, worked against ground, as shown in fig. 5D. In this latter case our vertical pattern is useful from 3 to 20 degrees. If we go further, and use a four element colinear, or two ½ wave elements in phase against ground, the patterns of figs. 5C and 5E apply. The vertical angle in fig. 5E is even lower, from 3 to 15 degrees. The gain of a four element colinear is 4.3 db over a dipole.

There are several ways of accomplishing the necessary phase reversal between colinear elements—a quarter-wave stub, coaxial sleeve, or tuned circuit—to make a colinear antenna. To sum all this up, it is apparent that stacking in a vertical plane, of either horizontal or vertical in-phase ½ wave elements, is a way by which one can achieve low angles of radiation in the vertical plane. So, what shall it be—horizontal or vertical? Let's draw some quick but accurate comparisons between the two.

Vertical vs Horizontal

1. Low angles are easily obtainable with a simple vertical antenna.

2. The vertical is simpler in construction. Even 50 or 60 foot self-supporting pipe masts are easily erected.

3. The vertical itself requires less space. Ground radials or a ground plane of some sort are required for efficient operation. However, radials can be bent in directions which fit one's available space.

4. The vertical is easy to feed at its base with unbalanced coaxial feed, using a "gamma" type of feed, or a matching network if required.

5. The vertical discriminates *against* TVI, because TV antennas are horizontally polarized. Some claim that it increases BCI. If this should happen, it is not due to its vertical nature, but to its strong, low angle radiation. *Any* antennas which gives strong low angle radiation, such as stacked Yagis, could also cause BCI.

6. The vertical is somewhat more susceptible to rain and snow static, and to noise impulses in the neighborhood when used for receiving.

7. The vertical is non-directional, and thus cannot discriminate against interference from unwanted directions when receiving. However, one can erect three vertical elements and make a very neat switchable directional array to cover 60 degree sectors in azimuth.[3]

8. The vertical is unobtrusive and pleasing to the eye of one's neighbors.

9. The gain of a colinear vertical can approach that of a three-element horizontal Yagi. It is actually greater at the low angles of interest.

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[1] Lee, Paul H., "The Four Band Vertical DX Antenna, Mark II," *CQ*, July 1960, p 28.

[2] Kaspar, H. W., "Added Gain Using Vertical Antennas," *CQ*, December 1960, p 50.

[3] Dixon, Robert S., "A Forty Meter Vertical Beam," *CQ*, July 1962, p 52.

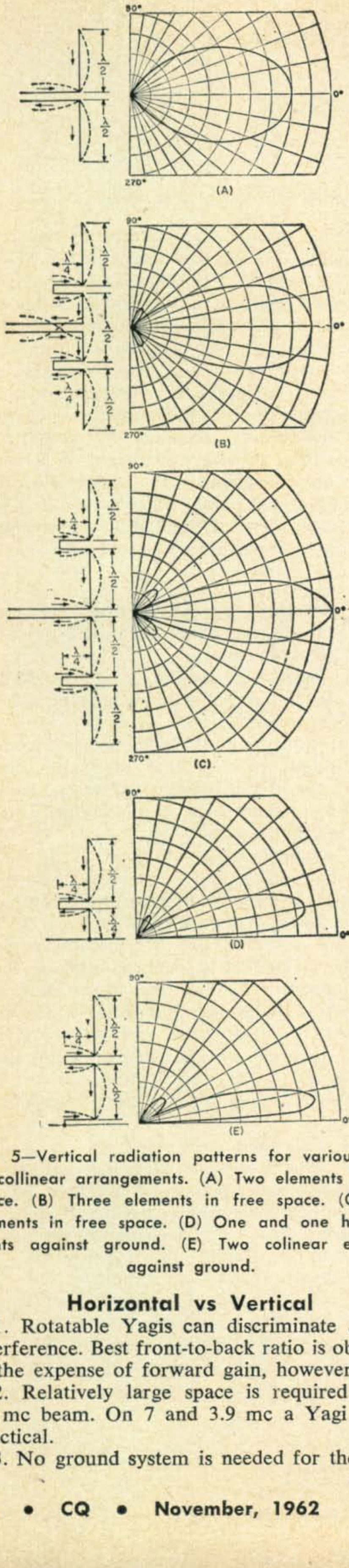

Fig. 5—Vertical radiation patterns for various types of collinear arrangements. (A) Two elements in free space. (B) Three elements in free space. (C) Four elements in free space. (D) One and one half elements against ground. (E) Two colinear elements against ground.

Horizontal vs Vertical

1. Rotatable Yagis can discriminate against interference. Best front-to-back ratio is obtained at the expense of forward gain, however.

2. Relatively large space is required for a 14 mc beam. On 7 and 3.9 mc a Yagi is not practical.

3. No ground system is needed for the horizontal antenna.

4. If a rotatable Yagi is used, there is always the problem of rotators freezing or sticking, and of the feedline becoming tangled or twisted.

5. Elements of a Yagi are subject to breakage due to ice or wind loading.

6. The horizontal antenna can give only higher takeoff angles, which are not optimum at the heights used by most amateurs. Lower takeoff angles can be obtained only with vertical stacking of in-phase horizontal elements, which at the heights and spacings required, becomes impractical.

7. For a single horizontal element or even for a Yagi, a height of one wave length is required to get the takeoff angle down to 10 to 20 degrees. Even then, this is not as low an angle as can be obtained with a vertical, and considerable power is wasted in high angle lobes.

8. Horizontal Yagis come in prepared kits, which require little or no mental design effort on the part of the average amateur. This is fine for the non-technical types who do not wish to design or build something which is optimized but which can be made to work after a fashion by almost anyone.

9. A horizontal Yagi on one's house or on a tower in the backyard can be the cause of much unfavorable concern on the part of neighbors. Horizontal antennas can cause much horizontally polarized TVI.

Exploding a Myth

There is another popular myth which I would like to "explode" right now. On the air one will hear fellows say that the signal from a vertical antenna cannot be received on a horizontal antenna as well as can the signal from another horizontal antenna, or vice versa. This statement is parroted as an argument against verticals, for most amateurs use horizontals. Nothing could be further from the truth than this general statement, I assure you. It *is* true that in the strictly line-of-sight case, as in v.h.f. or u.h.f. (in TV reception, for example), polarization of the antennas at each end makes a big difference. However, research has proven that at high frequencies which experience ionospheric reflection in propagating over long distances, the polarization of the transmitted signal, no matter what it originally was, is caused to turn around by the ionosphere in a random manner, and the signal which reaches the distant receiving antenna is no longer linearly polarized, but is eliptically or even sometimes circularly polarized. It has been quite well-proven that on long distance circuits, fading of a signal received on a linear antenna is not so much caused by a change in path loss or attenuation, but it results from a change in polarization of the signal caused by the ionosphere. This opens up the subject of polarization diversity, which might well be

[*Continued on page 138*]

Multiband Quads

BY L. A. MOXON*, G6XN

The Quad antenna may be used for multiband operation without reverting to individual loops for each band. G6XN presents some practical approaches and the necessary data for the construction of two and three band quads using only one loop and reflector.

THE quad is reputedly a one-band antenna and, whereas dipole-type beam-elements are commonly made to work on several wavebands, the normal "multiband" version of the quad uses separate loops for each band. This seems to be due to a misunderstanding about the properties of loops.

Some years ago the author made a rough theoretical estimate of the gain of a 14 mc quad and got a figure of 6.5 db. For the same beam energized at 21 mc the calculated gain was also about 6.5 db, and this led to the design of a reversible two-band beam with loops 17′ square, open wire stubs 36′ long, and matching on both bands, without retuning, into 100 yards of untuned line. This beam, centered on VK, has given consistently good results over a long period and reports, relative to other phone stations, have been, if anything, better on 21 mc than on 14 mc. Later developments have included several kinds of three-band arrays. The two band system described above turns into a bi-square at 28 mc; the mounting of two quads at right angles on the same pole or tree gives all around coverage by beam switching; and the use of a colinear pair of quads gives increased gain plus electrical beam rotation. We also discovered that loops can be distorted into a wide variety of shapes, such as triangular, without noticeably affecting their radiating properties. Comparisons have been made between three modes of operation, namely with a parasitic reflector, a parasitic director, and both elements driven.

As multiband beam-elements, loops have two main electrical advantages over dipoles. Firstly the radiation resistance is higher which means there is less objection to the use of long resonant feeders or stubs, and secondly if the feeder or stub is made the right length as in fig. 1 its lower end remains a point of low voltage on all bands thereby removing another objection to the use of resonant feeders. This also allows, if required, the connection with acceptable matching on each band, of a long non-resonant feeder.

One of the author's arrangements uses another property of loops to obtain tri-band matching *without* the use of long resonant lines. This enables a 21 mc loop to be resonated at 14 mc with a minimum of loading, thus keeping losses and the inevitable restriction of bandwidth to a minimum.

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Facts About Loops

Figure 1 shows a loop plus a tuning stub, which together resonate at frequencies in the region of 7, 14, 21 and 28 mc with a voltage node at each end of the system. The resonant frequencies depend, to some extent, on how much of the wire is in the loop and how much in the stub, and are not in exact harmonic ratio, but this can be ignored for the moment.

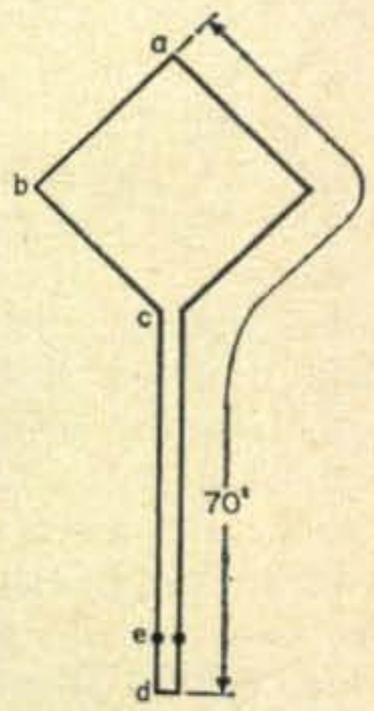

Fig. 1—A loop and stub arrangement that will resonate at 7, 14, 21 and 28 mc. A low impedance feeder may be connected at point *d* and a 600 ohm line may be attached at point e.

Figure 2 shows the current distributions round the loop when this contains ½, ¾, 1, 1½ or 2 wavelengths of wire. For a loop 17′ square this corresponds to excitation at 7, 10.5, 14, 21 and 28 mc respectively. The 1½ wavelength case, fig. 2(d), is a particularly interesting one, being that of a typical 14 mc quad operating at 21 mc or a slightly oversize 21 mc quad at 28 mc. The arrows indicate not only the direction of current flow but also the relative magnitude of field which each segment of the loop is capable of producing, a small arrow being worth only 29 percent of a large

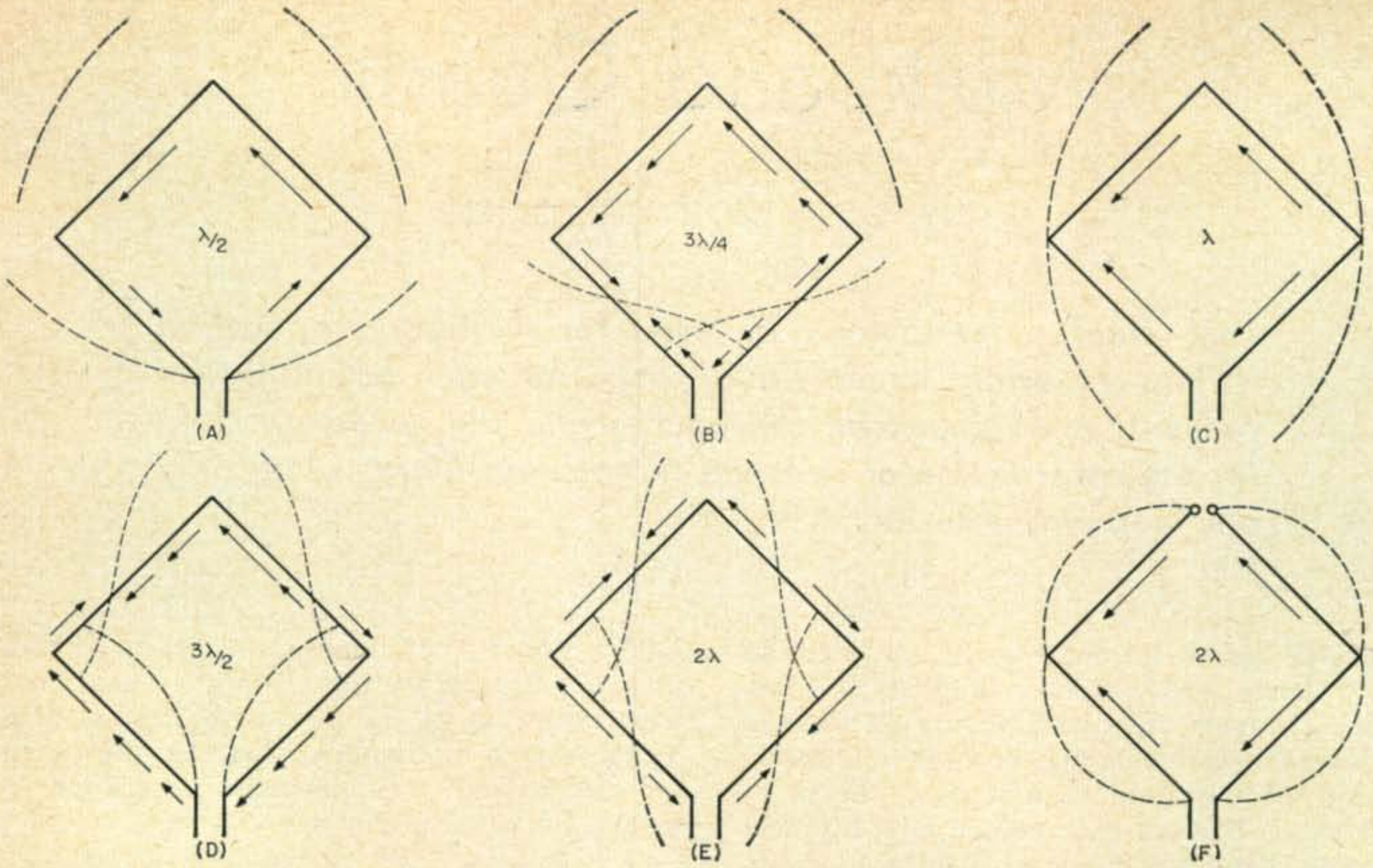

Fig. 2—Current distribution in loops of various sizes at different frequencies. The arrow lengths represent different field strengths, the smallest being 8, the next 29 and the longest 92. Illustrations (a), (c), (d) and (e) represent normal 14 mc quad antennas excited at 7, 14, 21 and 28 mc respectively. Illustrations (b) and (d) represent slightly oversized 21 mc quads at 14 and 28 mc. Illustration (f) has an insulator at the top.

one. Note that although some of the arrows cancel each other, most of them add up to produce radiation in the usual direction for quads, that is to say, at right angles to the plane of the loop. Because the three current-loops which produce most of the radiation are separated by appreciable fractions of a wavelength, the loop has a slight tendency to look like a multi-element array and the gain should be noticeably greater than that of a dipole provided there is no wastage through radiation in other directions. Further inspection shows that although there is some upward radiation, this is less than that of a dipole; in addition there is some vertically polarized radiation "off the ends" and a rough estimate suggests that about 25 per cent of the power may be wasted in this mode. With a two-element beam, however, radiation in these unwanted directions tends to cancel, and in practice the front-to-side ratio has appeared to be well up to normal standards.

Next in order of interest is the case of fig. 2(b) which shows the situation for 14 mc excitation when the loop is reduced in size to 12′ 6″ so that at 28 mc it operates as described above; at 21 mc it is slightly oversize and at 14 mc it is well below normal size. Note that three sizes of arrow have been used, their relative value in terms of field strength being 8, 29, and 92. Most of the radiation takes place from the top part of the loop which should give a useful increase of effective height, but because the dimensions are small fractions of a wavelength, the radiation pattern approximates to that of a doublet or short dipole and the possible gain from a close-spaced pair is about 5 db. The radiation resistance is about 35 ohms for a single loop, or 12-15 ohms when a reflector is added, these figures being about twice those for 21 mc dipoles operating at 14 mc so that, other things being equal, loops provide more bandwidth, easier matching and fewer losses.

Figure 2(a) shows that a 14 mc loop, when used at 7 mc radiates not only in the quad mode, but also as a "small loop" giving vertically-polarized radiation in the plane of the loop. The radiation resistance is very low, in the region of 5 ohms, and it is doubtful whether a pair of loops could be made to give useful gain as a beam. Fed in parallel, however, the two loops should give fairly efficient all-round radiation.

Figure 2(e) shows the unsatisfactory state of affairs when a 14 mc loop is fed at 28 mc. Nearly all the radiation is now in the plane of the loop with a large upwards component which reduces the gain and may also reduce the effective receiver sensitivity by increasing the level of the background noise which, at 28 mc, comes mainly from outer space. Although the two loops of a 14 mc quad can be operated as a broadside array at 28 mc, the gain is relatively small and the radiation is vertically polarized. On the other hand, if the top of the loop can be open-circuited by means of a relay, or tuning stub as in fig. 2(f), a 14 mc loop turns into a bi-square beam at 28 mc. As is well known, this has a gain of 4 db which can be increased by a second loop, acting as reflector, to about 9 db.

For 3 band operation a spacing of 8′ between loops has been found satisfactory. With increase of spacing the gain falls off rapidly at 28 mc, whereas lower spacings may lead to critical operation and reduced efficiency at 14 mc.

Tuning and Matching

Having established that loops can be made to radiate efficiently on two or more bands, there remain the problems of tuning them to resonance, or to act as parasitic elements, and of matching them to the transmitter on each band. There are several ways of doing this, the choice being largely a matter of trading simplicity of initial adjustment for convenience of operation. The beams to be described can all be tuned from ground level but if, as in the author's case, it is necessary to walk 100 yards from the shack to get to the base of the antenna, the operation of retuning when changing bands is ruled out and the job must be tackled the hard way; in other words the antenna must be made to resonate and match to an untuned line simultaneously on all bands. If the beam cannot be rotated, for example, because of tree-branches getting in the way, the next best thing is to make it reversible and this raises further difficulties if remote control is wanted.

The simplest method is to use tuned feeders of any length up to say 40 or 50′ with suitable tuning units. Instead of tuning units, the feeders can be made the "right length" as in fig. 1 which, as already indicated, is a first step towards all-band matching to an untuned feeder. The second step is to bring the resonances into exact harmonic ratio; for two bands this is easy and the method shown in fig. 3 for a 14/21 mc beam has given good service at G6XN over many years. The tuned circuits resonate at about 17 mc and have the effect of increasing the feeder length by 18 inches at 14 mc and decreasing it by 13 inches at 21 mc. The tuned circuit of fig. 3b is used in place of a shorting bar and if adjusted to give maximum gain on either frequency should be found correct for both.

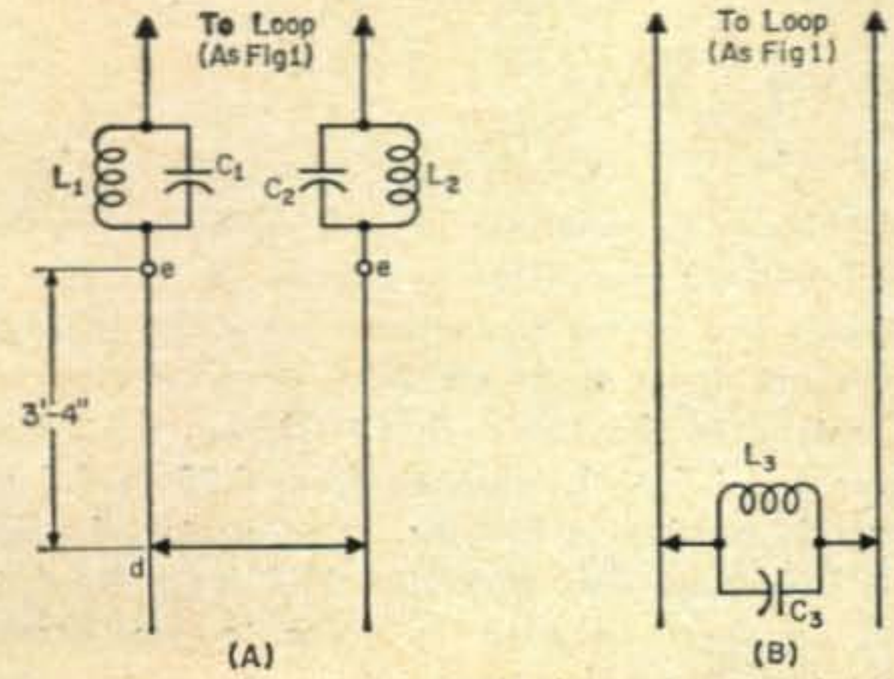

Fig. 3—Compensating circuits for a 14/21 mc version of the antenna shown in fig. 1, assuming 16′8″ loops. In (a), a high impedance feeder may be attached at e with a shorting bar at *d*, or a low impedance feeder may be used at *d*. An alternate arrangement for the reflector is shown in (b).

L_1, L_2—2 turns, 1⅜″ diam., spaced about 1″.
L_3—3 turns, 1¾″ diam., spaced about 1¼″.
C_1, C_2—500 mmf
C_3—250 mmf

It was originally expected that, due to increase of radiation resistance with frequency, the required length of stub *e d* would be the same for both bands but, although a length of 3′ 4″ was found to give tolerable matching in each case, the optimum was about 15 per cent less at 21 mc and correspondingly greater at 14 mc. This implies a radiation resistance of about 70 ohms on both bands so that better matching would be obtained by replacing the open wire feeder with a low impedance line connected at *d*. Moreover, since lower radiation resistance means larger currents in the loops and, other things equal, more gain, it seems likely that the gain at 21 mc has been underestimated. It will be noticed that at 14 mc the above arrangement differs from a normal quad only by the inclusion of half a wavelength of resonant feeder plus the compensating circuits. This increases the losses, but only by a very small fraction of a db, and roughly halves the bandwidth which still remains adequate from the standpoint of gain and radiation efficiency.

Three Band Quad

The author's first attempt at producing a three-band quad was also based on fig. 1, but the loop size was reduced to 12′ 6″ square. The exact length, *abcd*, for 28 mc was found by taking ¾ of the length previously found correct for 21 mc, and then adding half a

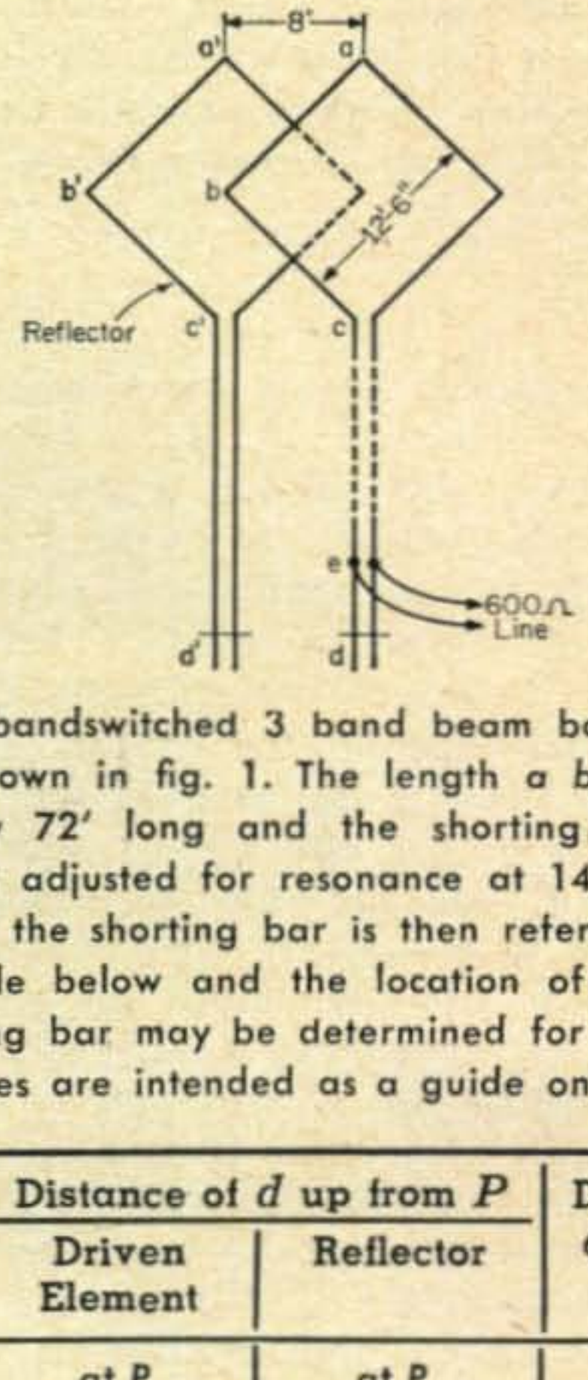

Fig. 4—A bandswitched 3 band beam based on the antenna shown in fig. 1. The length *a b c d* is approximately 72′ long and the shorting bars at *d* and *d′* are adjusted for resonance at 14.12 mc. The location of the shorting bar is then referred to as *P* in the table below and the location of the feeder and shorting bar may be determined for each band. These figures are intended as a guide only.

Band mc	Distance of *d* up from *P*		Distance of *e* from *P*
	Driven Element	Reflector	
14	at *P*	at *P*	3′1″
21	3′3″	2′2″	6′1″
28	3′7″	2′2″	6′1″

wavelength to restore approximate coincidence of the three resonances. Even so, the shorting bar had to be re-adjusted on changing bands, as shown in fig. 4. This was inconvenient, and another drawback was the narrow bandwidth and excessive losses estimated to be about 2 db, at 14 mc. However, even on 14 mc, DX phone reports were mostly flattering and included two of "the only signal from Europe." These experiments proved that, with normal distances between shack and antenna, the use of tuned feeders would be a practical and simple method of obtaining multiband operation.

Triband matching, together with minimum losses and maximum bandwidth at 14 mc, was achieved as shown in fig. 5 which was evolved from fig. 4 by subtracting 34′ of stub and arranging for an open circuit instead of a short

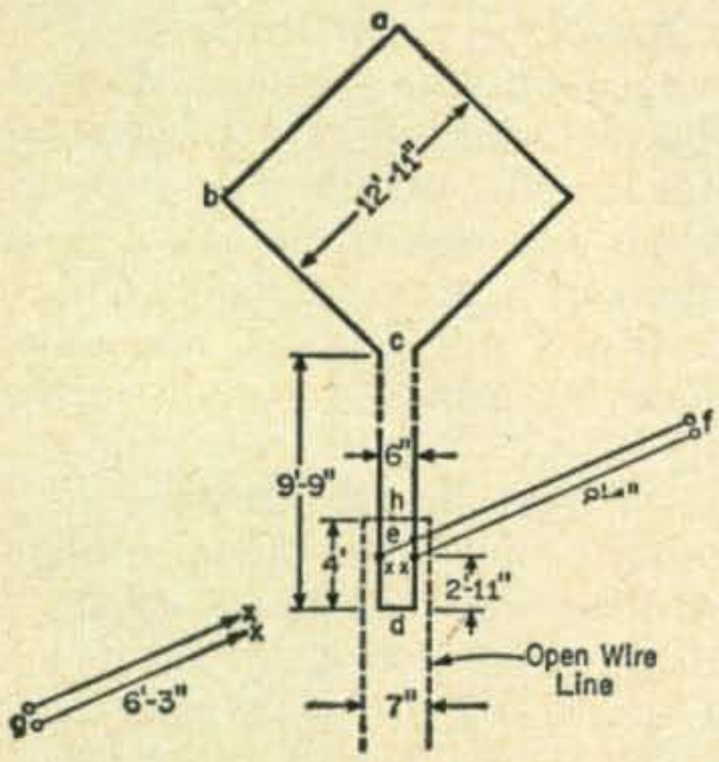

Fig. 5—A 3 band beam with simultaneous tuning and matching on all bands. The main feeder overlaps the 9′9″ stub for a distance of 4′. The 6′3″ stub is connected to the main feeder at xx where the stub of *ef* is connected. Only one element is shown.

circuit at 21 mc. The open circuit is provided by using the 2′ 11″ of excess length *de*, required for 14 mc, as an inductance and tuning it to resonance at 21 mc by a capacitance in the form of the stub, *ef*. By a lucky chance this stub puts a short circuit nearly in the right place for 28 mc whereas at 14 mc it is not long enough to have any appreciable adverse effect. There is no electrical contact between the feeder and the loop, power being transferred to the aerial through the mutual inductance formed by placing the end of the open-wire feeder close to the end of the stub, *cd*. The overlap is 4′ and the spacing roughly ¾ in. To achieve a sufficiently tight coupling it is necessary for the inductance on one side or the other to form part of a fairly high *Q* tuned circuit although the *Q* can and must be low enough to allow adequate coverage of the amateur bands. Due to the comparatively low radiation resistance at 14 mc, the loop has just about the right *Q* for correct matching with a reasonable value of overlap. At 21 mc *f e d* constitutes a high *Q* resonator, appropriately damped by the radiation resistance of the loop which presents a parallel impedance of several thousand ohms at *e*. At 28 mc the *Q* of the aerial is too low to provide efficient coupling, and this is resolved by adding the stub *eg* to the main feeder, *heg* being approximately λ/4 but adjusted to compensate for the slight residual error in the tuning of the loop. The stub *eg* has negligible effect at 21 or 14 mc.

The method of adjustment on 14 and 21 mc was to excite the loops from another aerial and tune each in turn, for maximum current, first at 14 mc using the shorting bar at *d* and then at 21 mc by altering the length of the stub *ef*, finally rechecking at 14 mc. The loop not being adjusted was detuned by a suitable shorting bar so that no measureable current flowed in it. At 28 mc the stub *eg* was adjusted to give the best value of v.s.w.r. Finally, with one element driven, the other was tuned as reflector by means of a feeder extension at a convenient height with a shorting bar being moved along this extension to give maximum field strength in the desired direction.

From the positions of the shorting bar it was possible to calculate a compact three band termination for the feeder going to the reflector as shown in fig. 6. Beam reversal was obtained by a 2 pole changeover relay as shown, and the v.s.w.r. improved rather than deteriorated by leaving the reflector termination attached to the driven element.

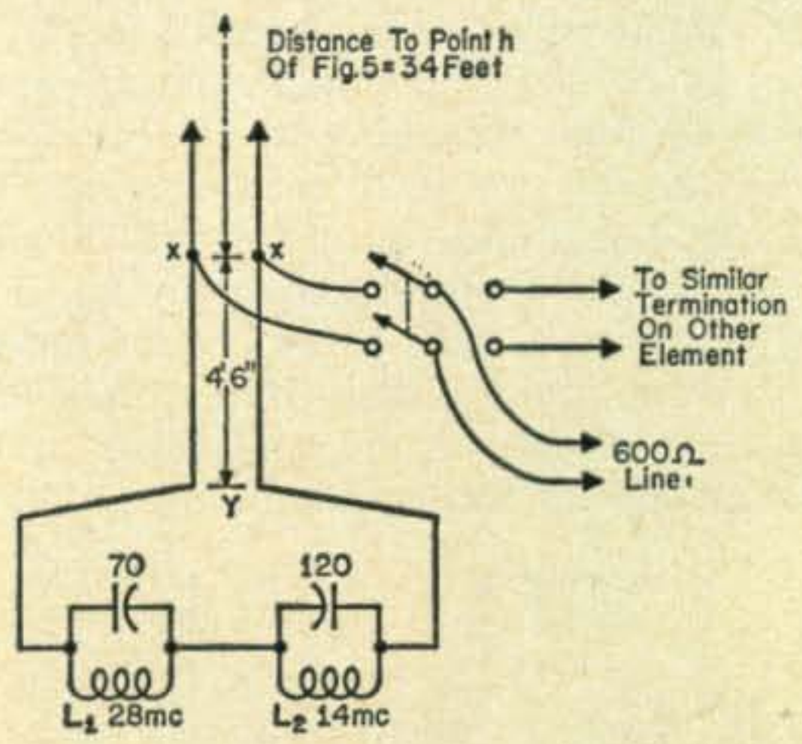

Fig. 6—Feeder terminations for a 2 element reversible beam based on the antenna showin fig. 5. The requirements are for an open circuit at y on 14/28 mc and a short circuit on 21 mc. If switches or relays are used instead of the tuned circuits shown, the 28 mc reflector bandwidth is widened from 0.25 to 0.5 mc. Inductor L_1 consists of 5 turns, 1″ diameter, 1″ long and L_2 is 6 turns, 1¾″ diameter, 1¾″ long. Points xx should be short circuited in order to use another beam mounted on the same pole.

Cautions

Now for some words of warning. To obtain optimum gain and a v.s.w.r. better than 3, simultaneously on all three bands for both directions, required a lot of time and patience. The job would have been easier if more care had been taken to make the two loops and their stubs exactly the same. Small variations in the tuning of the loops make large differ-

ences in the reflector terminations and there is no certainty that the author's values would be optimum in another installation. These terminations operate via the mutual couplings to give vernier adjustment of loop tuning and will not compensate for large errors in the adjustment of the loops. A suggested alternative alignment procedure is to tune the loops for maximum gain as reflectors with the tuned circuits of fig. 6 replaced by a short circuit at 21 mc and open circuits at 14 and 28 mc. The circuits can then be adjusted to produce equivalent results without switching and the v.s.w.r. checked. Comparing the fig. 5 scheme with that of fig. 4, improved performance at 14 mc has been obtained at the expense of increased losses and narrower bandwidth on 21 and 28 mc. For these losses to be negligible, thick wire must be used for the stub *fed* and all joints must be soldered and taped. A calculated figure for the stub-loss at 21 mc is 0.5 db for 12 S.W.G. wire, and the adverse effect of using 16 S.W.G. in the first experimental hook-up was very noticeable, particularly in terms of back-to-front ratio.

As compared with a full sized quad at 14 mc, voltages are much higher, and to avoid deterioration in wet weather it is advisable to use good insulation and keep tree branches, etc., well away from high voltage points in the system. Bandwidth on 14 and 21 mc is only just adequate and is not symmetrical. To cover the whole of each band it is recommended that adjustments be made at about 14.12 and 21.15 mc. Coverage on 28 mc is somewhat restricted unless the reflector is retuned, which can be done, however, at ground level by adjusting the termination shown in fig. 6.

Rotary Quad

Some thought has been given to a rotary version of the above beam. With 360° rotation, one feeder can be discarded but disposal of the stubs remains a problem. For the driven element the stub *eg* (fig. 5) can be replaced by a fixed capacitance. Similar replacement of *ef* is a possibility but increases the circulatory current in *ed* at 14 mc and may cause appreciable losses. Possibilities for the reflector, if disposal of stubs proves difficult, include separate loops for each band, or a two band loop plus a one band loop, and an experiment has shown that loops resonating at 14 and 21 mc can be spaced a few inches apart without serious interaction.

Three Band Compensating Circuit

Figure 7 shows the 3 band version of fig. 3. The shorting bar at *d* is first adjusted for resonance at 21 mc with the stub *eg* disconnected. The stub is then connected and its length adjusted for resonance at 28 mc. On 14 mc the stub *eg* acts as a capacitance, thereby increasing the effective length of *ed* by about the right amount. The larger the *LC* ratio of the 21 mc trap-circuits the greater the lengthening effect on 14 mc so that the design can be rectified, if, as might happen with a different installation, the best positions of the shorting bar at *d* for 14 and 21 mc fail to coincide. This matching arrangement can also be used for a two-band system in place of the one previously described (fig. 3) and has the advantage that the system can be tuned to resonance on 14 mc by adjusting the length of *eg* (or an equivalent lumped capacitance) without affecting the 21 mc adjustment which must, however, be carried out first.

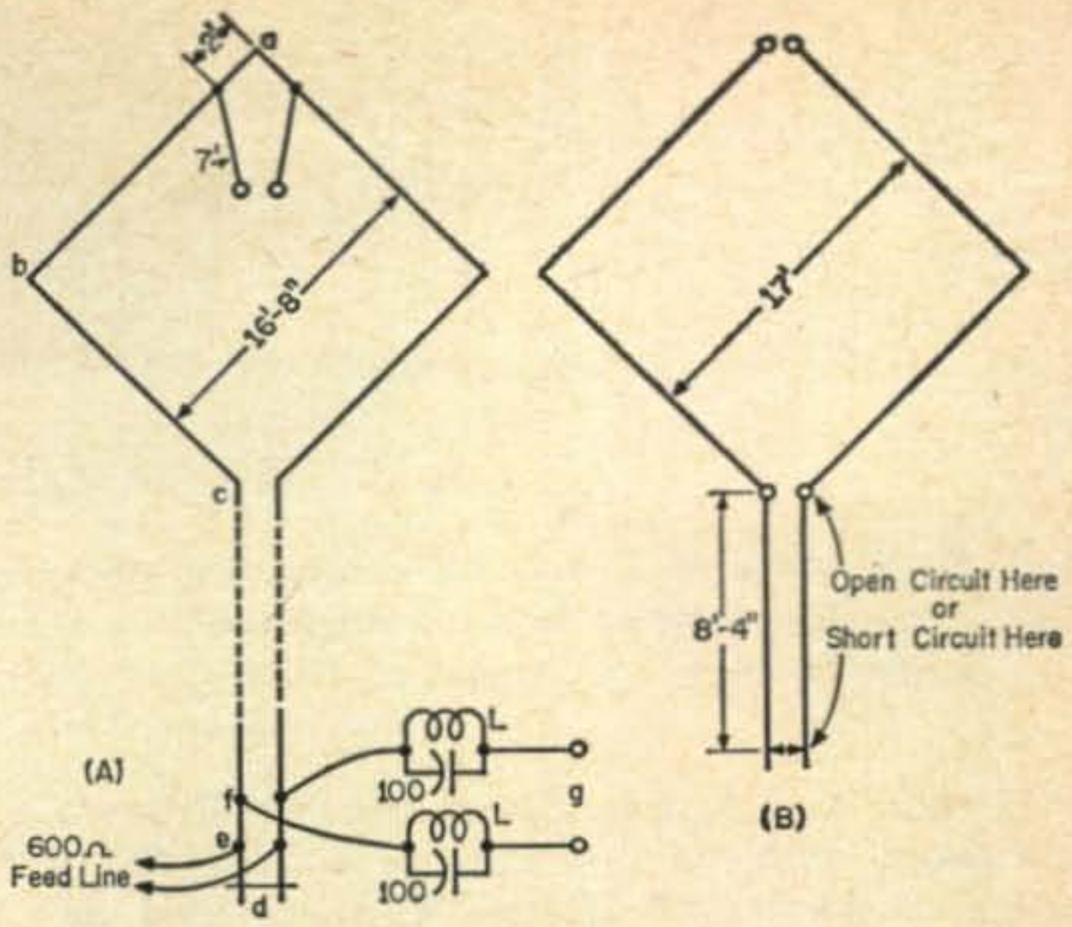

Fig. 7—Compensating circuits for a 3 band beam using 14 mc loops. A recommended design is the use of 2 loops, as in (a), spaced 8′ to 10′ as a reversible 14/21 mc beam with a separate 28 mc reflector, shown in (B), spaced midway between the two main loops. The lengths are as follows: *cd*, 36′; *ed*, 34′; *ef*, 22″; *fg*, 5′6″. The inductors are each 6 turns, 1″ diameter, 1″ long, resonated at 21 mc.

A useful feature of all these beams has been the ability to reverse them merely by changing over the main feeder from one element to the other without retuning, the elements having been first tuned up for maximum gain as reflectors. Optimum adjustments for reflectors and radiators do not always coincide exactly but it has usually been possible to reverse the beam in the above manner without losing gain or making the v.s.w.r. worse than about 2 or 3. The capacity of the reversing switch or relay with its leads tends to have a lengthening effect on the reflector stub and the tendency for the optimum adjustments to coincide can usually be improved by altering the lead lengths.

Practical Results

The arrangement of fig. 3 was the first to be tried and was fixed in an East-West direction. The mean height was 45′ and the spacing about 12′. The array was mounted at the top of a tree with its lower half partly buried in the branches. Tested on 14 mc using another local station as a yardstick, performance was roughly equal to that of an earlier 4-element array which used two half-waves in phase with reflectors. Phone reports over the

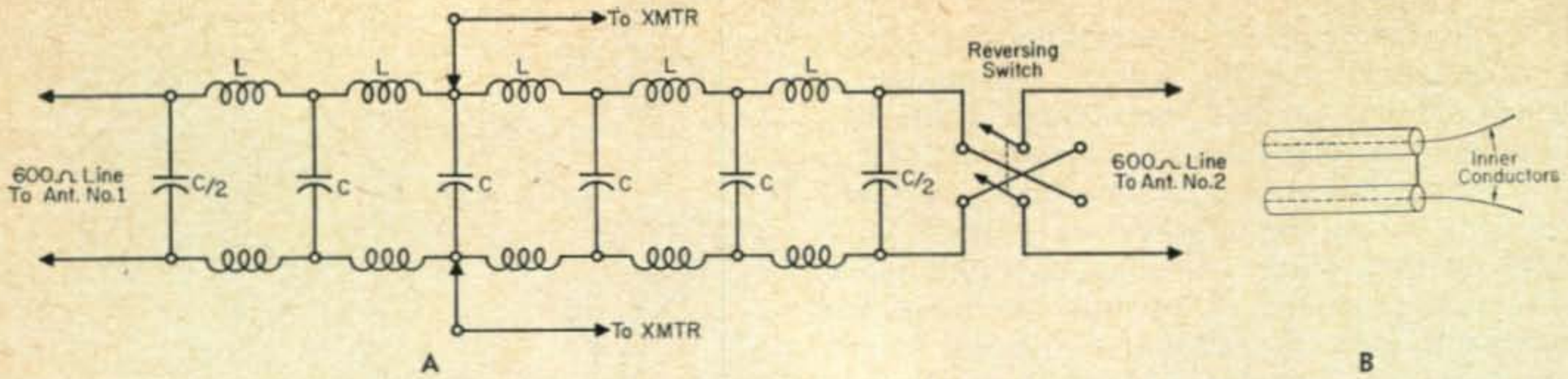

Fig. 8—An artificial line for phasing two antennas is shown above. The line is wrapped around a 2 pole 6 position switch. Each inductor is 6 turns, ⅜" diameter 1¼" long. The capacitors are formed from two 5" lengths of 72 ohm, ½" diameter coax wired as shown in B, except for the first and last. These two are 2½" each.

long route to VK were about one S-unit down compared with results from a former QTH where a steep ground-slope had provided an assisted take-off. Reports of "the best G signal" were received occasionally on 14 mc and more frequently on 21 mc. At this stage the method of beam reversal consisted of retuning the reflector to act as a director, which proved very inefficient. The current in a director was found to be less than half that in a reflector, and the gain appeared to be at least 3 db less, although this was offset by the advantage of having a slight ground slope in the reverse direction. The reason for the loss is that the mutual coupling between loops is more inductive than that between dipoles. Parasitic directors and reflectors only give equal performance if the mutual coupling is non-reactive as in the case of dipoles spaced about $\lambda/8$. Inductive coupling increases the current in a reflector making it more nearly equal to that in the driven element, thus increasing the gain slightly, and front-to-back ratio considerably. Similarly a capacitive mutual impedance favors directors at the expense of reflectors.

The next development was the erection of a second similar array, the two being used as a collinear pair spaced 35′ giving an additional gain of about 3 db. The two were phased by connecting the feeders to opposite ends of an artificial line wrapped round a 2 pole, 6 circuit wafer switch as shown in fig. 8. This arrangement allowed the beam to be swung $\pm 45°$ for a loss of up to 3 db, adjustment being made for *minimum* signal strength on reception followed by operation of the reversing switch. Theory requires unity v.s.w.r. in the feeders and predicts insufficient phase-shift on 14 mc and too coarse an adjustment of phase on 28 mc. In practice, however, the arrangement has been successfully used over many years with different antennas, v.s.w.r.'s of up to 3, and differences in performance between the two antennas of up to 1 S-unit. It has usually been possible to obtain a gain of ½ to 1 S-unit from the pair.

The author is well aware that the gain should only have been 2-3 db and that an S unit is supposed to be 6 db; in the course of long experience, however, it has been found that 3, or at most 4, genuine db are equal to one S-unit in average signal report, or anywhere between 6 and 20 db if signals are "over S9". Perhaps someone can explain this! Either way, we do not know how to improve much on this result short of buying a few more acres of land and erecting a great number of large rhombics. Results should, of course, improve over the years as the trees get taller, so perhaps by the year 1980 or thereabouts we may get around to winning that DX contest!

To improve performance on the short route to VK, the beams were altered so that both elements were driven, using a pet scheme which we wrote up some years ago[1].

The two elements were tuned to resonance, connected in antiphase 8JK fashion, and fed about 2′ off center in the desired line-of-shoot. This worked quite well and gave a very large front-to-back ratio on both hands. Unfortunately, the optimum off center displacement was not the same on both bands and the strain of having to decide whether to accept a 1 db loss or walk 100 yards to shift the feed-point proved too great. It was decided that a large back-to-front ratio is of little use anyway, because its holds over such a small angle that the chance of an interfering signal being in that direction is just about nil. Eventually, a parasitic reflector was used for both directions with plug and socket connections for beam reversal.

Tests with the smaller beams have been mainly in a North-South direction, i.e. at right angles to the larger ones, but for a short time one of the latter was replaced by the beam shown in fig. 5. Results were comparable except for a drop of about half an S-point on 14 mc. It had been hoped that the extra effective height would make up for the theoretical drop of 1 or 2 db in gain, but this just didn't work out.

The beam of fig. 5 was first tried out using triangular loops, the idea being to mount it on spreaders between two trees. During adjustments at ground level a number of phone contacts were made including ZS on 21 mc (QSA5 S7) and CN8 on 14 mc. After adjusting the stubs the loops were altered to a square shape with the diagonal vertical. The

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[1]Moxon, L. A., "Two Element Driven Arrays," *QST*, July, 1952, page 28.

effect of this on the adjustments, and on the radiation resistance, was very small.

With a fig. 3 beam and a fig. 4 beam mounted at right angles on the same tree some very serious interaction was found at 14 mc, but was removed by placing shorting bars on the unused feeders some 3 or 4′ up from the normal position. The same trouble was found on replacing the fig. 4 by the fig. 5 beam, but on this the position for the shorting bars was much more critical and exactly $\lambda/2$ at 14 mc from the antenna end of the feeder. The same position was satisfactory for all bands, the interaction on 21 and 28 mc being in any case small.

The most recent development has been the conversion of one of the original 14/21 mc beams to a three-band beam in accordance with fig. 7, and the mounting of another similar beam at right angles to it on the same tree. These modifications have had no perceptible effect on the 14/21 mc performance, subject to de-tuning of whichever beam is not in use. Without this precaution, interaction was so bad at 14 mc that the reflector appeared completely dead, having no measurable current and no effect on field strength readings! Checks on 28 mc have included good reports from VK, VQ and ZS and confirm that the beam is operating in the intended mode, although the gain from the reflector is rather poor, being in the region of 3 db only. This is not surprising in view of gale damage which has caused uneven and excessive spacing.

Other Experiments

As is well known, a Quad can be mounted with either a diagonal vertical or the sides vertical, results being identical for the same mean height. This does not necessarily apply to multiband operation and rough calculations indicated that a 14 mc Quad might be about 1 db worse at 21 mc with the sides vertical. This arrangement has been tried and gave good results, but it was not possible either to prove or disprove the suspected loss.

From the fact that a square loop can be distorted into a triangular shape without upsetting it, one might argue, why stop at a triangle? How about squashing it completely flat? It then turns into a folded dipole which is also reputed to be a single-band antenna and like the quad, can also be used as a two or three band antenna. A 14 mc folded dipole was tried on 21 mc and found to work equally well, the v.s.w.r. in a 600-ohm feeder being rougly 3 on both bands, although it was more difficult to support and down slightly in gain compared with a loop. A 28 mc folded dipole, tuned and matched with a stub at 21 mc and only 24′ high, produced a report of Q5 S8 from VS1.

A brief trial was made of a single loop at 7 mc. Although c.w. DX was worked, results were poor and the loop was later found to have excessive resistance. This would, of course, have been much more harmful at the lower frequency.

Recommendations

The resonant-feeder method can be applied to two or three-band quads having between 45 and 70′ of wire in each loop, the efficiency of the larger loops at 28 mc being greatly increased by adding a stub or other form of open circuit at the top to turn them into a bi-square, as discussed above. This is a good scheme for anyone who wants to try out the idea with a minimum of trouble, or who doubts his ability to tackle the more complex multiband matching devices.

The small three band beam (fig. 5) is advised only for use when space or pole-height is restricted, and may prove tricky for the novice. The beam of fig. 7 is comparatively simple, and adjustment is less critical on all bands. With either of these beams two can be mounted at right angles on the same pole or tree, one of them two or three feet below the other, and used to give all round coverage by beam-switching. An obvious improvement not yet tried out is to connect the two beams in parallel for the 45° directions to prevent the performance drop which would otherwise occur. Elements of either of these types can be assembled to form multi-element arrays in any of the usual ways. Another obvious but untried improvement is to mount a "28 mc only" reflector element midway between the two tri-band elements; this gets over the difficulty that the minimum acceptable spacing for 14 mc is a little wide for 28 mc and may simplify beam reversal since the element not being driven no longer has to turn into a reflector on all three bands.

Finally, one of the main objects of this article is to stimulate further experiments from which it is hoped that new and better designs will emerge. While on the subject of progress, a few words of warning may be in order. Accurate measurement of antenna performance is difficult and even a bad beam may work well in a good location. Some standard of comparison is necessary such as another antenna, at the same height if possible, or another station willing to take part in three-way QSO's and act as a yardstick, but findings should anyway be checked against theoretical expectations and regarded with suspicion if they do not fit. "Theory" does not mean pages of mathematical formulae, just a few simple rules and common sense, as I have tried to show in another article, "Evaluating Aerial Performance," *Wireless World*, February and March 1958 which provides most of the theoretical background for the Quad experiments described above[2]. The author's gain figure (6.5 db for the Quad is less than is usually quoted, but is supported by his own and other measurements, *e.g.* as reported by G3HRH/G3GOZ in the *R.S.G.B. Bulletin* for April 1959. ■

[2]See also, p. 50, *CQ*, this issue—*Ed.*).

CQ Awards Honor Roll

Worked All Zones. **The following is a list of the call-letters of top DXers throughout the world who have qualified for the Worked All Zones Award as of September 15, 1962. Calls are listed in alphabetical order by call area and country.**

RADIOTELEGRAPH

W1AB
W1ACB
W1AJG
W1AZY
W1BFT
W1BGA
W1BGW
W1BIH
W1BIL
W1BLO
W1CKA
W1CKU
W1CTW
W1CV
W1DGT
W1DHO
W1DMG
W1DQH
W1EIO
W1EOB
W1EQ
W1FFO
W1FH
W1FQA
W1FZ
W1GKK
W1GVZ
W1GYE
W1HGT
W1HX
W1HZ
W1ICP
W1IJB
K1JDN
W1JYH
W1KQF
W1KXU
W1LHZ
W1LQ
W1LZE
K1MLI
W1MV
W1NHJ
W1NLM
W1ODW
W1OJR
W1OOA
W1OOS
W1ORV
W1OTX
W1PFA
W1QJR
W1QNC
W1TSL
W1TYQ
W1WDD
W1WLW
W1WY
W1ZD
W1ZW
W1ZZK

W2AEB
W2AGW
W2AQW
W2AYJ
W2AYU
W2AZS
W2BAC
W2BBS
W2BHM
W2BHU
W2BOK
W2BRR
W2BRV
K2BU
W2BVN
W2BXA
W2BYP
K2CD
W2CNT
K2CPR
W2CWK
W2CZO
K2DCA
W2DEC
W2DEO
W2DGW
W2DOD
W2DS
W2DSU
K2DSW
W2EHN
W2EQS
W2ESO
W2FBS
K2FC
W2FCQ
W2FSN
W2FXA
W2FXN
W2FZY
W2GDX
K2GFQ
K2GMO
W2GNQ
W2GT
W2GVZ
W2HMJ
W2HO
W2HSZ
W2HTI
W2HQL
K2HXL
W2HZY
W2ICO
W2IOP
W2IRV
W2IWC
W2JAE
K2JGG
W2JT
W2JVU
W2KCE
W2KED
W2KJZ
W2KUW
W2LAX
W2LNB
W2LPE
W2LSX
W2LV
K2LWR
W2MES
W2MUM
W2NOY
W2NUT
W2OBX
W2OCL
K2OEA
W2OGE
W2OKM
K2OLS
W2OTC
W2PCJ
W2PEO
K2PFC
K2PIC
K2PKT
W2PTD
W2PTI
W2PZI
W2QHH
K2QHL
W2QJM
K2QXG
W2RA
W2RDD
W2REF
W2SAW
W2SHZ
W2SSC
W2SUC
W2TP
W2TQR
W2TVR
W2TWC
W2TXB
W2UFT
K2UKQ
K2UPD
W2UTH
W2UVE
W2UZF
W2VCZ
W2VND
K2VUI
W2VYX
W2WS
W2YTH
W2ZGB
W2ZVS
W2ZXL
W2ZY

W3AEL
W3ALB
W3AOH
W3ARK
W3AS
W3AXT
W3AYD
W3AYS
W3BCY
W3BES
W3BHV
W3BQA
W3CA
W3CGS
W3CPV
W3DBX
W3DRD
W3DWY
W3ECR
W3EFZ
W3EOB
W3EPR
W3EPV
W3EVW
W3FYS
W3GAU
W3GEN
W3GHD
W3GRS
W3IMV
W3IPO
W3IXN
W3IYE
W3JKO
W3JNN
W3JTC
W3JTK
W3JW
W3JZY
W3KA
W3KDP
W3KFQ
W3KPI
W3KT
W3KVQ
W3KZQ
W3LE
W3LMA
W3LMM
W3LMO
W3LOE
W3LUD
W3MFJ
W3MFW
W3MJF
W3MSR
W3MVQ
W3MWC
W3NCF
W3NKM
W3OCU
W3OP
W3PGB
W3PN
W3RBF
W3RBW
W3RPG
W3RSR
W3RUT
W3RZL
W3SOH
W3SWV
W3TMZ
W3UXX
W3VKD
W3WGH
W3WU
W3WV
W3ZAO

W4AAU
W4AH
W4AIS
W4AIT
W4AIX
K4AW
W4AZK
W4BFR
W4BJ
W4BPD
W4BQY
K4BVQ
W4BYU
W4CKB
K4CLT
W4COC
K4CTU
W4CXA
W4CYR
W4CYU
W4CYY
W4DHZ
W4DKP
W4DQH
W4DQS
W4EEE
W4EO
W4EPA
W4FFV
W4GD
W4GRP
K4GSS
K4GSU
W4GXB
W4HA
K4HFS
K4ICK
W4IFN
K4IIC
W4IMI
W4IUO
W4JAT
K4JEY
W4JII
W4JJL
W4NE
W4JV
K4JVE
W4KFC
K4KOY
W4KWC
K4LNM
K4LPW
W4LRN
W4LVV
W4LYV
W4LZF
W4MCM
W4ML
W4MR
W4NBV
W4NYF
W4OM
K4OMR
W4OPM
K4PDV
W4PLL
W4QCW
K4QIJ
W4QT
K4RID
K4RPK
W4SHX
W4SSU
W4SXE
K4SXR
W4TM
W4UXI
W4VPD
W4VYP
W4WDI
W4YGZ
W4YWX

K5ABW
W5ABY
K5ADQ
W5ADZ
W5AFX
W5AWT
K5BGB
K5BGT
W5BRR
W5BUK
W5BZT
W5CE
W5CEW
W5CK
W5CKY
W5DA
W5DML
W5DRU
W5EGK
W5FFW
W5FNA
W5FXN
W5GEL
W5GNG
W5HDS
W5HJA
W5IAH
W5JUF
K5JZY
K5KBH
W5KC
W5KES
W5KF
W5KLB
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RADIOTELEPHONE

W1BAN W1BHP W1BIH K1IXG W1ORV W1UOP W2APF W2BOK W2BXA K2DCA W2DEC W2FXN W2HTI W2JT W2OKM W2UTH W2UZF
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W9JJF W9NDA W9RBI W9WHM W9YSQ W9YSX W0AIW W0BFB W0MLY W0QVZ CN8MM CX2AX CX2CO
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HB9J HB9MX I1AOF I1RIF I1SM I1UA JA1ACB JA1BK JA6CY KH6DLF KH6OR LA5HE LA5LG
LU1DAB LU6AJ MP4BBW MP4BCC OE1FF OE2YL OK1MB OK2AG ON4DM ON4RC OZ7FG PA0FX
PA0HBO PA0WWP PY2CK PY2JU PY4CB PZ1AX SM3AZI SM3BIZ SM3EP SM5CO SM5LL SM5RY SM5TR SP7HX
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VQ4ERR XE1CV XZ2SY ZL1ACI ZL1HY ZL1KG ZL2GX ZL4BO ZS6Q 4X4DX 9K2AZ

ALL SINGLE SIDEBAND

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VE7ZM VK3AHO VQ2AT VQ4ERR XE1CV YO3GK ZL2GX ZL3AB ZL3IA ZS5DW ZS5JM 4X4DK

WPX The following list indicates the amateurs who have qualified for the Worked Prefix award as of September 16, 1962 and their relative standing. A prefix is defined as the first one-or two-letters of the call sign and its accompanying numeral; *i.e.*, W1, K1, WA1, WN1, WV1, KN1; G2, G3; etc. Amateurs are encouraged to work as many different prefixes as possible and apply for the award directly to the WPX Certificate Committee, 300 West 43rd Street, New York 36, N.Y. Application forms may be obtained from the above address or from the DX Editor, W2DEC. See the DX section in this issue for more information.

C.W. WPX

W2HMJ	668	G3EYN	503	K9EAB	451	K5LZO	411	SM3AGD	384
W5KC	618	YU1AG	503	PA0L0U	451	W2PTD	411	IS1FIC	383
W8KPL	610	W2NUT	502	W3PGB	450	W4DKP	410	SP2AP	383
W2EQS	572	W5LGG	502	DL1YA	450	W1CKU	408	F9MS	382
K6CQM	565	W6YY	502	W8JIN	449	K4JVE	407	W4BFR	379
W5OLG	564	IT1AGA	502	W8RQ	445	W5AFX	407	W4BJ	377
W9YSX	544	K2CPR	501	OE1FF	442	W9UZS	406	W0QYE	377
W6KG	542	W9SFR	501	W3BQA	437	W4YWX	404	SP7HX	370
W9UXO	542	K2ZKU	500	LA5HE	437	W9IHN	403	W5BUK	369
K2UKQ	535	W2MUM	495	W8UMR	429	DL3RK	403	W7AB0	367
W4OPM	531	G2GM	494	W0AUB	429	JA2JW	403	W9DYG	367
W2HO	526	SM5CCE	488	K5LIA	428	VE6VK	403	W1DGT	366
K9AGB	515	W4BYU	487	OK1MB	428	G3HIW	402	DL6MK	366
W1IJB	513	W8PQQ	481	W3CGS	426	K2PFC	401	VU2MD	366
W1EQ	512	W4HYW	478	W1EIO	425	W0VBQ	401	W2FLD	365
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W8LY	506	W2KIR	463	W8IBX	416	VE4OX	400	MP4BBE	364
W9DWQ	506	PY4OD	462	W0MCX	416	VK3KB	400	W1WLW	362
W9GFF	503	W9WCE	458	W5AWT	412	VK3XB	387	DJ2KS	462
		W3BCY	457	W5DA	412	ZL2GS	385	W9QGR	361

W9WIO	360	W6UNP	350	W0SNL	327				
W0MLY	360	W9MQZ	350	SM7CNA	327				
W0CDP	359	SP6FZ	350	VK5NO	327				
SM5AJU	359	W3GAU	349	LU8EN	326				
W2GNQ	358	W6ID	349	W20WX	325				
G8KS	357	W90VF	346	VK3CX	325				
0E3WB	357	VK2APK	346	W1BGA	325				
UC2AA	357	KP4A00	345	W6RLN	324				
VE3DIF	357	W9IU	344	DJ3HW	324				
DL7CS	356	PA0W0R	340	W2HUG	323				
DL7MF	356	0H9NC	339	HA5BU	323				
W2GVZ	355	SM7ID	339	PA0VER	323				
W9IRH	355	DL1IA	337	F9IL	322				
G2FF0	354	W6BZ	336	W9KA	320				
HA5AM	354	UR2BU	335	KP4CC	320				
K4GSS	353	W0RJV	334	SL5AB	320				
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F3DM	351	W2B0K	332	G8DI	319				
K2PKT	350	LU5ABL	332	UC2AR	319				
K6VVA	350	W0VFE	330	EA4CR	318				
WA2CBB	350	DL1QT	328	F2MA	318				
W6UDR	350	K2QXG	327	LA6CF	318				

OK3UI	318	W3NCF	313	SVØWZ	310	OK3DG	306	W6RLP	304	WØDMA	302	W1BPW	300	W7TPE	300				
SM7EH	318	W6YC	313	UA3BN	310	PY5FO	306	OK1AEH	304	OK1KKJ	302	W1CV	300	W7VIU	300				
ZB2I	318	UA6UI	313	VK3RJ	310	UA9DN	306	OK2QR	304	SM3BEI	302	W1HWH	300	W8BQV	300				
DJ4OD	317	K2ZRO	312	W3AYD	309	VK4SS	306	ZL2PM	304	SM5CXF	302	W1IJO	300	W8GMK	300				
EA2CR	317	G3FPK	312	ZS1ACD	309	K4HXF	305	K2OUS	303	VE3IR	302	W1YPH	300	WØDVZ	300				
G3LPS	317	G3GSZ	312	DJ4HR	309	W5TP	305	K2YMO	303	K4OMR	301	W2DEO	300	WØOVQ	300				
HA5KDQ	317	SM5AJR	312	G2BUL	309	WA2DIG	305	K6HOR	303	K8CVQ	301	W2FXA	300	DL1PM	300				
LA3UF	317	SM5WI	312	K1SHN	308	W4LRN	305	K8IKB	303	W2DGW	301	W2QHH	300	DL9KP	300				
VK5NQ	317	W3RZL	311	DJ3BB	308	W4SHX	305	W2ECU	303	W2ZXL	301	W3DKT	300	DL9PF	300				
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DJ1VS	316	EA5BD	311	SM5AHJ	308	W8ONA	305	W9VIN	303	W8TTN	301	W4BHG	300	OK1MP	300				
GI3OQR	316	SM5AHK	311	SM5BCE	308	WØGUV	305	DL1ES	303	JA3FT	301	W4GXB	300	PAØZL	300				
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W2HOL	315	K9GTK	310	DU7SV	307	ZL1AV	305	SM4BZH	303	ZL4CK	301	W5ARJ	300	SM7BHF	300				
PAØVB	315	W3GHD	310	SM5BBC	307	K4BVD	304	VE3HB	303	K2HIY	300	W6BIL	300	SM5BPJ	300				
PAØVO	315	W4OMW	310	SP6AAT	307	K4DRO	304	K8KTZ	302	K4KOY	300	W6DIX	300	ST2AR	300				
DL3ZA	315	W7STC	310	SP9RF	307	K5JZY	304	K9CLO	302	K2QHL	300	W6FLT	300	VE3CIO	300				
K9GVE	314	W9BPW	310	K4IEX	306	K6RTK	304	W1HGT	302	K3ERC	300	W6JNX	300	VE5JV	300				
W1NHJ	314	W9UX	310	W2SAW	306	K8GHG	304	W3DBX	302	K4TEA	300	W6MDK	300	VE7SB	300				
DJ5IM	314	WØEWH	310	W8NAN	306	W1BFT	304	W5LEF	302	K5ESW	300	W6NUQ	300	YO2NA	300				
SM8TV	314	OH3TH	310	W8RSW	306	W1FZ	304	W8YAH	302	K9DKI	300	W6WWQ	300	YO3FD	300				
W1IUU	313	PAØLY	310	G5GH	306	W6NWI	304	W9MZP	302	W1BGW	300	W7LZF	300	ZS1RM	300				

Phone WPX		VK6RU	421	SP7IHX	381	PY2CK	354	CX2CN	325	LU9DM	311	W3HUG	304	K5MDX	300				
		W9UZC	418	TG9AD	381	5A5TO	353	HB9MX	325	XE1CV	311	SM3BIZ	304	W1FAB	300				
CT1PK	587	F8PI	418	DL6VM	376	W1ORV	351	VE1ADE	325	YU1AG	311	W5JCY	303	DJ3CP	300				
G3DO	559	PZ1AX	413	PAØSNG	369	LA5HE	351	TG9AZ	319	W9SFR	310	VE2AFC	303	DJ3OJ	300				
W8WT	557	K2CJN	409	K9EAB	366	W8PQQ	347	W3CGS	317	GM3BCL	308	VE6TF	303	EA2EL	300				
W9WHM	554	G8KS	408	G3FKM	366	W5PQA	344	F9MD	315	I1PDN	307	VK6KW	303	EA2FE	300				
W9YSQ	471	DL3TJ	404	W8UMR	363	SM3AZI	335	W3AYD	314	K3COW	306	PY1NC	302	VE3BQP	300				
MP4BBW	454	W1UOP	402	SM3EP	361	UR2BU	333	G2AFQ	312	W3DJZ	306	EI3R	302	XE1AE	300				
PAØHBO	453	G3NUG	400	W5ERY	358	WØMLY	332	G3BID	312	ZP5CF	306	K8CFU	301	ZS1AB	300				
W6YY	448	OE1FF	382	W8JIN	356	KP4WD	328	I1CBZ	312	IT1SMO	305	W9PQA	301						

S.S.B. WPX		K9EAB	350	K1IXG	303	DJ3CP	260	W1GR	246	HB9TL	221	DL4AS	208	WA2EOQ	201				
		G3DO	348	KØRDP	300	VE3BKL	259	W2HMJ	240	W3CGS	217	SM3BIZ	208	W9EXY	201				
HB9TL	423	PZ1AX	345	W6YMV	293	W2YBO	257	W6EKZ	233	OY7ML	216	K2JXY	206	DL4NQ	201				
W4OPM	400	G8KS	341	W1UOP	273	W3VSU	256	K8PUU	230	W1AOL	215	W5DA	204	K2ZKU	200				
MP4BBW	392	W2HXG	324	WØCVU	271	XE1CV	256	EP2AG	229	W6YY	213	W5RHW	203	K5OGP	200				
W3NKM	380	W2VCZ	320	K2JFV	266	G3FKM	255	W4NJF	225	VE6VK	213	DL1PM	203	KP4AQQ	200				
G3NUG	356	W8PQQ	315	K2TDI	264	UR2AR	255	W1EO	224	K2CJN	212	K1GHT	202	UA3FG	200				
TI2HP	356	W1ORV	307	K2MGE	263	TG9AD	252	VE3BQP	223	W9YHE	211	W6USG	202	VQ2AT	200				
W3MAC	354	K4PUS	305	W3AYD	262	W4RLS	251	W1WDD	221	W9SFR	210								

Mixed WPX		W8WT	583	W2GT	528	LA5HE	500	DL1YA	456	W5PQA	417	W9KA	405	W4NNH	401				
		W6YY	570	W5LGG	509	WØMCX	476	WØVBO	452	G6VQ	413	W8TTN	404	W9EXY	401				
W8JIN	605	W4BYU	557	K2ZKU	508	W3CGS	475	PAØLOU	452	K4RID	410	K3COW	403	W1UOP	400				
W4OPM	595	K9EAB	553	W9DWQ	508	G8KS	471	W2GNQ	442	W1ORV	409	W4BFR	403	DJ5VQ	400				
G3DO	590	HB9EU	551	W3KDP	501	G3FKM	463	W1EIO	432	VE7CE	409	K4BAI	402	SM5AJR	400				
W3OCU	588	YU1AG	533	W8UMR	500	W4BQY	459	SM5BPJ	425										

SSB DX HONOR ROLL

272	W2JXH	K4PUS	WA6HOH	174	K2ZKU	128	W1MZB	OH2NB	DL1PM	W5KC									
TI2HP	W6BAF	214	WØPGI	W3FWD	W4RLS	XE1CV	W9EYC	105	DL4FC	K6CWS									
271	234	W1WDD	196	XE1AE	W6USG	127	118	W2FGZ	G3KZI	W6DLY									
VQ4ERR	W1OOS	W2YBO	W1UOP	171	K9PPX	K4OEI	W7EOI	K3PQO	G5BJ	WA6HOH									
269	233	210	194	W9EXY	WØQLX	KØTJW	117	W4VCB/	GI3CDF	WA6MAZ									
W8EAP	W3MAC	K6MLS	WA6EYP	168	XE1SN	VP6WD	W6ZJY	KL7	JA2JW	K6QDD									
W8PQQ	232	W6VEU	187	K4ASU	G3CCN	126	116	W6NJU	LA3SG	K6ZKH									
267	W5IYU	208	W6YMV	167	KP4AQQ	W3HQO	DL6EQ	DL6VM	OE1FF	W7EUD									
W2ZX	231	K6LGF	W7DLR	G3AIZ	OE1RZ	W6DLY	115	EI8P	SM2DW	K8CFU									
261	G8KS	YV5AFF	186	165	UA3FG	W7BPS	ZS7P	LA5HE	YN1CK	W8CIQ									
HB9TL	230	205	ZL3IA	K2HEA	VE3BKL	W8WT	113	SM5BPJ	101	K8LSG									
260	W6RKP	W3KT	185	163	149	W9CLY	W9YMZ	ZS6AMV	W2SKE	W8QNW									
W2FXN	W6WNE	204	K2JFV	G3NUY	W6VUW	VK4RQ	112	104	K6CQM	W9CMC									
259	ON4DM	K4AJ	DJ3CP	161	141	125	W4PAA	W2OWL	K6HZP	K9CRS									
PY4TK	PZ1AX	PJ2AA	183	4X4DK	K9WUR	W1JSS	K6EXO	W5PSB	W6WWQ	K9HOL									
258	227	203	K4JEY	157	140	W2ATJ	OE3ME	HZ1AB	K8JGM	K9KHG									
W6UOU	W2TP	W2LV	182	K1JMV	WØKFA	W3KPP	OZ7FG	VE3BQP	K9IUI	W9SFR									
253	DL1IN	G3DO	K2FW	W3CGS	138	W4UWE	111	ZE4JN	CR6CA	WØBSK									
K8RTW	226	202	WA2IZS	W5DA	W9YHE	W5KC	VK4FJ	103	DL4FX	WØQGI									
250	K1EJO	WØBMQ	181	155	135	K5OGP	110	W2HTO	DL4ZW	EA8CT									
W3NKM	K1IXG	201	W6EKZ	W2BQM	DL4NQ	K6HFZ	K5AWR	W3BVL	EP2AG	G3FKM									
W4OPM	K6ZXW	W2VZV	180	KØRDP	134	K6VVA	LA5LG	W4ERZ/1	GW3AHW	G3OGE									
K4TJL	WØUUV	W5KFT	W5RHW	154	OD5CT	W8AET	109	W4WDI	SM6BIZ	G3WW									
K9EAB	225	K5MDX	WA6AMZ	W3COG	133	K9MGF	K3COW	K6VNU	UR2AO	KH6DLF									
WØQVZ	W2VCZ	G3FKM	178	UA2AR	W3ICQ	DJ3CP	UA3CG	W8JIN	100	KP4CL									
G3AWZ	WØCVU	UA3CR	G2PL	153	132	HB9JV	YN1TAT	K8NZD	K1EJO	KP4GN									
MP4BBW	G2BVN	200	177	W2MAF	G6UT	123	108	GI6TK	K1GHT	LA6UC									
249	G3NUG	W1ORV	K2CIN	G3KHE	131	W5PQA	DL7AP	SM5UF	W1FZ	PJ2AF									
W5AFX	220	W2NUT	176	152	K8ONV	122	107	UB5WF	WA2SFP	SM5AQV									
242	VE3AHO	W3VSU	W2PTM	K1IDW	KG6AJB	W6UPP	W4SSU	UC2AA	W2WJS	SM5LL									
K2MGE	221	W8YBZ	G6LX	151	130	GM3JDR	OH2HN	UQ2AN	K2YIY	VE3CIO									
W3LMA	W1LLF	KØCTL	175	W4NJF	W4OM	121	106	ZS6ATA	W3ATV	VE6EN									
239	218	I1AMU	W2HXG	150	129	DL3DW	W2MOF	102	W3KPP										
W6PXH	W1AOL	TC9AD	K2TDI	WA2EOQ	W9JJF	120	W5DVV	K1IDW	W4IFN										
237	215	197	W4UWC	W2QKJ	ZL3AB	K1JDN	K5QWZ	K4HYL	W4WDI										

BE APPRECIATED!

YOU probably have several very near and dear friends who are Hams, for whom expensive and elaborate Christmas gifts this year are out of the question.

IF SO, you're not alone! Thousands of Christmas shoppers face the problem of what to get these friends . . . while holding expenses within their budgets.

A SUBSCRIPTION to *CQ* and any of the fine books listed will be appreciated by those who receive it and will be a reminder of your thoughtfulness throughout the year.

SAVE MONEY on your subscription as well as your gifts.

CHECK our Subscription envelope and rates on the opposite page.

DX DX DX DX DX DX

URBAN LE JEUNE, JR.*, W2DEC

The following certificates were issued between the period from August 5th, 1962 to and including September 5th, 1962:

CW-PHONE WAZ

1719	ZS6IW	M. Sherman
1720	W4DQS	H. Dale Strieter
1721	VK5NQ	Jeff Vale
1722	JA1BWA	Toshio Takahashi
1723	OK2QR	Rudolf Stajgl
1724	OK2OV	Drozd Vilem
1725	G2BOZ	J. E. Bazley
1726	JA8AQ	Sashiya Mitsumata

ALL-PHONE WAZ

168	W1BIH	John H. Thompson
169	VE6VK	R. A. Wilson
170	K8CFU	Archibald C. Doty

TWO-WAY SSB WAZ

121	W1BIH	John H. Thompson
122	W2JXH	Harry L. Whiting
123	VE6VK	R. A. Wilson
124	DL1UX	Rolf Netzband
125	K8CFU	Archibald C. Doty

CW WPX

358	VK4SS	Alan Shawsmith
359	DJ3HW	Bernd Kaiser
360	WØEWH	H. A. Miller, Jr.
361	HA5AM	J. Emmer
362	K1SHN	George C. Banta
363	K3ERC	James B. Anderson
364	UA3FT	Ivan Kazansky
365	W5LEF	Willie E. Petty
366	W9UZS	Walter W. Johler
367	W1BGW	Jack Berman
368	W7LZF	Arthur E. Olson
369	WØVBQ	Oscar H. Baker

SSB WPX

113	DL1PM	Ernst Manske
114	W1WDD	Peter C. Card

MIXED WPX

41	W1ORV	Leonard C. Pray
42	DJ5VQ	Karl Kaul
43	W4BYU	Ed H. Mau

Here, There and Everywhere

AC?: The Indian Government is in the process of forming a new and independent state in Eastern India. It will be called Nagaland and will be similar to AC3 and AC5. *(Tnx NEDXA)*

*Box 35, Hazlet, New Jersey.

CR8 Portuguese Timor: CR9AH is sending an HT-37 to CR8AB who will again be active in December. The last rig was a 40 watter and this new one should make plenty of noise. CR8AB is in the Portuguese Navy and visits CR7, CR9 as well as CR8 periodically. He is an old timer to radio but a newcomer to amateur activities. *(Tnx LIDXA)*

FB8ZZ Amsterdam Island: Louis, ex-TT8AG, has recently informed Ed, W3KVQ, that he will depart from Nice, France in November to begin a one-year tour at FB8ZZ. This will be followed by a two-year tour in 5R8-land. *(Tnx WGDXA)*

JT1 Mongolia: UA3CR will shortly be making an s.s.b. DXpedition to Mongolia. *(Tnx WGDXA)*

SU Egypt: VE3BQL/SU has returned to Canada. While in Egypt, all stations QSO'd were QSL'd. However, if any cards went astray, a new one will be sent if all the QSO information is supplied to VE3BQL at his present QTH. See QTH section.

TU2 Ivory Coast: Lloyd, TU2AL, is again in a good state of health but he will not operate TU2AL again as he is returning stateside on leave. His next assignment will be Lyon, France although while on leave in Washington he will attempt to have that changed in favor of another rare DX spot. *(Tnx W3KVQ, via WGDXA)*

VK9 Christmas Island: VK9OI has been worked recently on 14 mc s.s.b. He claims he is located on Christmas Island (ex-ZC3). No one has received a card as of yet to my knowledge. Frank, VS1FJ, is scheduled to be active from Christmas Island early next year. *(Tnx WGDXA)*

VP2S St. Vincent: Dock Samson, VP2SQ, is now QRT and returning to Europe.

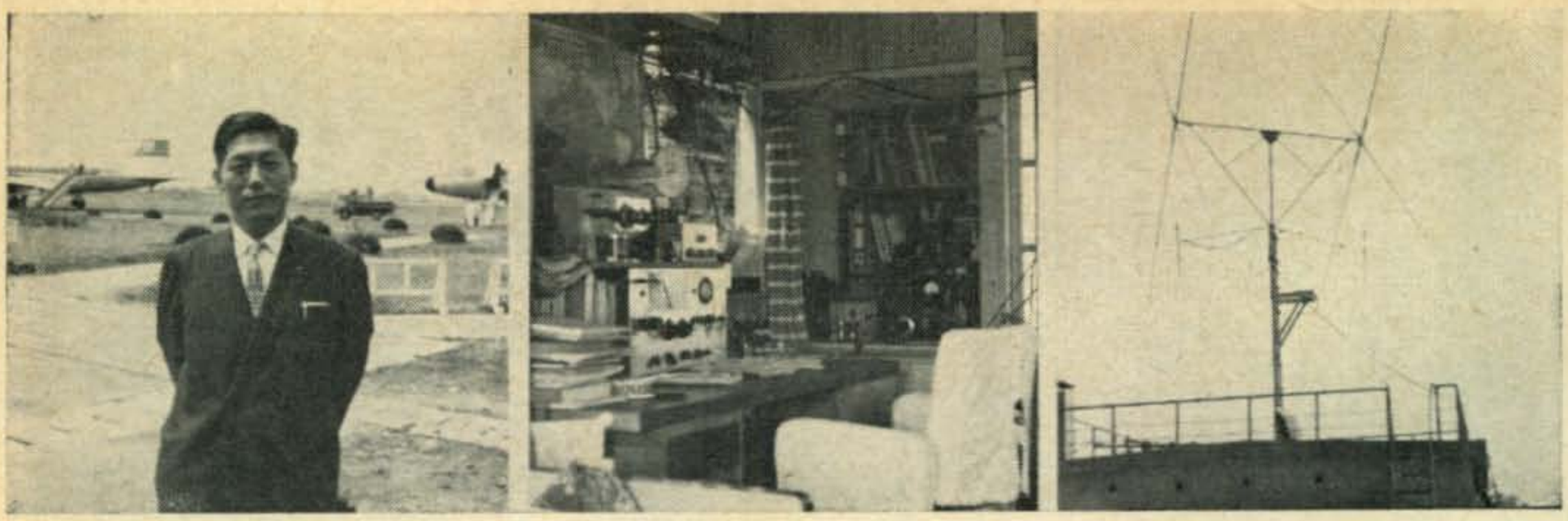
VR6 Pitcairn Island: Received a note from Bob, W5OLG, mentioning that anyone desiring a c.w. sked with VR6TC will be accommodated as time and conditions permit. Anyone desiring to be placed on the list should send a s.a.s.e. and a date will be set.

ZL1ABZ Kermadec Island: Ian, ex-ZL4JF, will

WAZ and WPX

THE WAZ and WPX certificates are awarded by the *CQ* DX department. WAZ is issued for proof of contact with the 40 Zones of the world as shown on the official WAZ Zone Map. WAZ is issued in three classes, *i.e.* Any mode, all phone and all s.s.b. For complete rules, see the January, 1962 *CQ*, page 50.

WPX is issued in four classes, *i.e.*, all c.w., all phone, all s.s.b. and Mixed. The number of prefixes required are: C.w.-300; Phone-300; s.s.b.-200; Mixed-400. For complete rules, see January, 1962 *CQ*, page 52. WAZ applications, Zone Maps and WPX applications may be obtained from the DX Editor at the address shown at the head of this column. Please send a self-addressed, stamped envelope or a self-addressed envelope and an IRC. All applications should be sent directly to the DX Editor.



There is no question that Ben, JA5AI, has one of the best signals coming from Asia. Shown here is the man, the rig, and the antenna which does such a wonderful job on 14 and 21 mc. *(Tnx KR6LJ).*

begin operation as ZL1ABZ on Kermadec Island about mid November. He will operate for approximately 10 months using a Collins S-Line. QSL via ZL2GX. *(Tnx ZL2GX)*

4W1 Yemen: 4W1AA has been appearing periodically on 14 mc c.w. It would appear that this station is not a legitimate operation for several reasons. Central European stations cannot hear him, although they hear other stations in his supposed area at the same time. He also gives a post office box in Yemen and MP4QBB reports that there is no such thing as a post office box in Yemen. SM5OY, who is presently QRV as ET3Y, is trying for a 4W license so let us keep our fingers crossed and hope that he is successful in the near future.

9N Nepal: W6RTK has been active on Tuesday and Thursday on 14.230 s.s.b. signing 9NT5O, that's right, no misprint. (Tnx DX Press)

Approximately every two months the YN-QSL Bureau (Nicaragua) sends W6OJW a batch of QSL cards for W/K/WA/WB/KH and VE areas. A s.a.s.e. will bring any cards to those awaiting confirmations. Cards are held one week after arrival for s.a.s.e. and then cleared to QSL Bureaus of ARRL.

Certificates

WA-AP—Worked All Pakistan

The Tigers Amateur Radio Club (TARC) is pleased to announce its certificate "Worked All Pakistan" (WA-AP) to radio amateur operators all over the World who will work nine AP stations spread in both wings of Pakistan separated by a distance of 1500 miles. WA-AP is designed to encourage friendly contacts and develop interest in Pakistan by radio communication.

WA-AP will be issued to those radio amateurs who can show confirmation of two-way communication after August 14, 1962 with:

a. Five AP stations in West Pakistan (Zone 21)
b. Four AP stations in East Pakistan (Zone 22)

WA-AP is issued for phone or c.w. or mixed operation on 7 or 14 mc or both. Minimum signal report considered is RST 338 for c.w. and 33 for phone.

All stations must be contacted from the same call area or from same country, where no call areas exist, except where a station has moved from one call area to another within a radius of 150 miles of initial location.

WA-AP will be awarded to those radio amateurs who will submit:

a. A letter, dated and signed, containing detailed list of stations worked, date, time, band and mode.
b. The QSL cards.
c. One USA Dollar or its equivalent in IRC for mailing purposes.

All confirmations must be submitted exactly as received from stations worked. Any altered or forged QSL submitted for WA-AP will result in the disqualification of the applicant.

All decisions of TARC will be final and irrevocable. All certificates will be numbered and an Honor Roll, showing all those issued the award, will be kept by the Award Manager, Mohd, AP5CP. Lists, QSLs, *etc.* are to be forwarded to: Mr. Mohd, AP5CP, Award Manager, Tigers Amateur Radio Club, Dacca Signals, Dacca 6, East Pakistan, Asia.

Angus, 5N2AMS, who is also well known as TY2AA and 5N2AMS/TR8/FD8 at a dinner which was held in his honor and given by the NJDXA. Sitting at his side is his charming wife, Doris, 5N2DMS. *(Tnx WA2DIG).*

WAT Worked All Tigers

The Muslim State of Pakistan was created on August 14, 1947. In order to celebrate the anniversary of the Independence Day, Tigers Amateur Radio Club hereby created a "WAT" certificate for working with its members on/after August 14, 1962.

"WAT" will be granted to all other stations that present proof of contact with AP stations who are members of the TARC. Present members are: AP5CP, AP5AH, AP5JA, AP5SS. All Amateur bands may be used. "WAT" will be granted for CW or Phone or Mixed. Minimum signal is 339 (c.w.) and 33 (phone). QSL's accompanied by 12 IRC should be sent to: Mr. Mohd, AP5CP, Award Manager, Tiger's Amateur Radio Club, Dacca Signals, Dacca 6, East Pakistan, Asia.

The Okinawa Award

The Okinawa award is issued to:

a. KR stations when proof of 25 QSL cards on hand is submitted.
b. W, WA, WV, WN, K, KN, KA through KZ, and JA stations when proof of 10 QSL cards on hand is submitted.
c. All other stations in the world when proof of 5 QSL cards on hand is submitted.

There is no fee or handling charge as all expenses are borne by the Okinawa Amateur Radio Club.

Address all applications to: Awards and QSL Manager, Okinawa Amateur Radio Club, APO 331, San Francisco, California. *(Tnx KR6LJ)*

This is the first picture from a few members of the Radio Club of Cuba in exile. They are from l.to r. (standing) Agustin Mederos, former owner of a broadcasting station, Juan Calve, CO2DD (Secretary), Miguel Alonso, CO2UP (President), Rafael M. Estevez, Activities Manager CO2ZQ, Marie Arben CO2AN, Manuel Alvarez, s.w.l., Rosa Pujadas CO2RB, Salvador Hernandez CO2HC, Jose Garcia CO2GU and Tomas Munoz CO5TM. Kneeling Vicente Monte CO2FK, Pable Avila (Treasury) CO2OA, Angel Castillo CO2ZT, Angel Gonzalez CO2UA and Luis Leon CO2HR. *(Tnx CO2ZQ)*

Worked High Speed Club Award

The German High Speed Club offers this special c.w. award to all licensed radio Amateurs everywhere in the world.

WHSC is available in 3 different classes:

Class 1: 100 confirmed c.w. contacts with HSC members located in 10 countries.

Class 2: 50 confirmed c.w. contacts with HSC members in 5 countries.

Class 3: 25 confirmed c.w. contacts with HSC members in 3 countries.

A tone report of T9 is strictly required for all contacts. All contacts starting on January 1, 1961 are valid for WHSC. Applicants in Europe have to work half of required contacts on 80 meters and/or 40 meters. (Class 3: 12 contacts, Class 2: 25 and Class 1: 50 contacts.)

Radio Amateurs in Europe apply with original QSL cards, list with calls, day, time, band and received RST. Others send only list with same data, certified by two other hams, or one club officer that all QSL cards are in possession of the applicant and listed datas are equivalent with the original QSL cards. Also 1 HSC member may certify the list. Include 10 IRC coupons or 1 U.S. dollar for fee, postage, etc.

Apply to: DL6MK, Edgar H. Schnell, Grohenritte bei Kassel, Im Bruchhof 6. HSC now has about 350 members in 35 countries. Send 2 IRC's to same address for membership list. Interested high-speed c.w. amateurs ask DJ4KW for membership in HSC.

7HK7 Award

The Radio Club Santander issues the certificate 7HK7 to every licensed radio amateur who has worked seven different ham stations on voice (A3) or seven different ham stations on c.w. (A1) within district 7 of Colombia.

To obtain this certificate, the contacts have to be made after January 1st, 1962.

Claims for above mentioned certificate must be accompanied by QSL cards confirming to the HK7's the QSO's and addressed to Radio Club Santander, POB 222, Bucaramanga, Colombia.

Diploma Ribatejo

Conditions for obtaining this certificate which is to be known as the "DR" are as follows:

The DR will be granted to all stations that present proof of contacts with 5 CT1 of Ribatejo, to foreign stations.

All amateur bands may be used, c.w. or phone, and all contacts after January 1st, 1962 are valid.

QSL's to CT1 Ribatejo stations worked, accompanied by 1 dollar USA or their equivalent in any money, shall be sent to: CT1PK, Cartaxo, Portugal.

For Continental portuguese stations is necessary work 8 Ribatejo stations, but the award is free.

The Ribatejo stations are, at present: CT1AP, DT, HL, IS, KJ, KK, LI, PK, TT, FL.

VEØMO is the call letter of H. M. S. *Bounty*, the three masted sailing vessel built expressly for the film, *Mutiny on the Bounty*, as the ship sails on her present voyage to a number of the leading ports of the world.

The *Bounty* began her tour in Vancouver, British Columbia, then went to Victoria, then to Seattle, then to San Francisco. She left the latter city on July 9th and is sailing to the east coast via the Panama Canal. After stops in New Orleans, Miami and possibly W h-ington, D. C., she will proceed across the Atlantic Ocean, stopping in London and paying visits to several English Channel ports. She will return to New York in November just prior to opening of the new film.

Of special interest to radio amateurs, is the ship's radio operator, "Spud" Roscoe, who is operating the KWM-1 on board. QSL cards will be issued to all amateurs making contact with the *Bounty*. Roscoe will be on the air at various times, on 20, 15 and 10 meters, sideband only.

Those making contact are to send their cards to Metro-Goldwyn-Mayer Studios Amateur Radio Club, Culver City, California, from where they will be forwarded directly to H. M. S. *Bounty* in whatever part of the world she happens to be.

DX Log

GE Ham News have come out with their 1962 edition of the DX Log edition. It is larger and better

[*Continued on page 172*]

PROPAGATION

GEORGE JACOBS*, W3ASK

LAST MINUTE FORECAST

The following is a forecast of day-to-day propagation conditions expected during November, 1962. This forecast attempts to predict *specific* days upon which openings shown in the Propagation Charts in this column are most likely to occur, and the expected quality of the openings. For example, the following forecast shows that circuits rated (2) in the Propagation Charts are most likely to open with "fair" to "good" quality (B-C) when conditions are above normal (Nov. 12-13) and with "fair-to-poor" quality (C-D) when conditions are expected to be normal. Circuits rated (2) are not expected to open on those days forecast to be "disturbed," etc.

PREDICTED PROPAGATION CONDITIONS & CIRCUIT QUALITY

Prop. Chart Forecast Rating	*Above Normal Days (WWV rating 7 or higher)* Nov. 12-13	*Normal Days (WWV rating 5-6)* Nov. 5, 7, 10-11, 14, 16-17, 19-23	*Below Normal Days (WWV rating 4)* Nov. 3-4, 6, 8-9, 15, 18, 24-25, 28	*Disturbed Days (WWV rating 3 or less)* Nov. 1-2, 26-27, 29-30
(1)	C	D-E	E	E
(2)	B-C	C-D	D	E
(3)	A-B	B-C	C-D	D-E
(4)	A	A-B	C	D

Where:

A—An excellent opening, with strong steady signals.

B—A good opening, moderately strong signals, with little fading and noise.

C—A fair opening, signals fluctuating between moderately strong and weak, with moderate fading and noise.

D—A poor opening, signals generally weak, with considerable fading and high noise level.

E—A very poor opening, or none at all.

THE c.w. section of the 1962 *CQ* World-Wide DX Contest will be held from 1900 (7 P.M.) EST Friday, November 23 to 1900(7 P.M.) EST Sunday, November 25. Special DX Propagation Charts for use during the Contest appeared in last month's column. Be sure to check these Charts for a prediction of band openings and for other propagation data which should be useful during the c.w. section of the Contest.

For a day-to-day forecast of general propagation conditions expected during the month of November, including the Contest period, see the "Last Minute Forecast" appearing at the beginning of this column.

*11303 Clara St., Silver Spring, Md.

Short—Skip Charts

This month's column contains a Short-Skip Propagation Chart for use in the continental United States for distances between approximately 50 and 2300 miles. Special propagation charts centered on Hawaii and Alaska are also included. The following are two typical examples for use of the Short-Skip Propagation Chart:

1. What is the best *time* to work between New York City and Denver on 40 meters?

a. Measure the distance between both points on a map or globe. The distance is approximately 1600 miles.

b. Enter the Short-Skip Propagation Chart for 40 meters, and look under the column headed "1300-2300 miles." The highest quality rating (4 in this case) is found between 18-22 local standard time at the path mid-point.

c. New York City is in the Eastern Time Zone, Denver is in the Mountain Time Zone. The mid-point of the path would be in the Central Time Zone. The optimum time found in "b" is, therefore, 18—22 CST. This corresponds to 7—11 P.M. EST in New York City, or 5—9 P.M. MST in Denver.

2. What is the best *band* for working between Seattle and Los Angeles at 3 P.M. Seattle time?

a. Measure the distance between both points on a map or globe. The distance is approximately 1,100 miles.

b. Enter the Chart under the column headed "750—1300 miles." Since the distance between Seattle and Los Angeles is closer to the upper range than the lower range, check the second quality figure appearing in parenthesis for each band, at 1500. (Since both Seattle and Los Angeles are in the same time zone, the time at the path mid-point is also PST, and no further correction is necessary).

c. A quality figure of (1) is found for 10 meters; (1) for 15 meters; (4) for 20 meters; (2) for 40 meters; (0) for 80 meters. Twenty meters is, therefore, the best band between Seattle and Los Angeles at 3 P.M. PST.

Sunspot Cycle

According to daily observations made by the Swiss Federal Observatory, the monthly average sunspot number for August 1962 was 21. This results in a 12-month running smoothed sunspot number of 41 centered on February, 1962. A smoothed sunspot number of approximately 30 is predicted for November 1962. This is approximately the same level of solar activity that occurred last during the fall of 1952.

V.H.F. Openings

The *Leonids* meteor shower is expected to occur between November 14 and 18.

This should result in some meteor-type ionospheric openings on 10 meters and the v.h.f. bands during this period. Some v.h.f. openings also are expected to occur as a result of auroral ionization during periods of ionospheric storminess. Check the "Last Minute Forecast" for periods that are likely to be disturbed or below normal during November. 73, George, W3ASK

[*See page 164 for Short-Skip Charts*]

SPACE COMMUNICATIONS

GEORGE JACOBS*, W3ASK

DUE to a shortage of space in last month's column, the following information concerning Project OSCAR I's final report was omitted.

OSCAR I Statistics

(Compiled from Project OSCAR Association Report)

Launched: From Vandenberg, California, 2042 GMT, December 12, 1961.
Orbit: North-South, 81.2 degree inclination to equator.
Beacon Transmitter First Heard: KC4USB, Antarctica, 2108 GMT, December 12, 1961.
Beacon Transmitter Last Heard: G2DQ, England, 0924 GMT, January 3, 1962.
Re-entered Earth's Atmosphere: Between 0400 and 1000 GMT, January 31, 1962.
Number of Tracking and Reception Reports Received: 5200 from 570 radio amateurs and other observers in 25 countries.
Frequency: Approximately 144.983 kc.
Power Output: 100 milliwatts.
Antenna: ¼ wave monopole, 19 inches long.
Modulation: C.W., keyed with series of HIs in Morse Code. Number of seconds for 10 HIs indicating temperature within the satellite.
Call Sign: None for satellite. Project OSCAR ground station control assigned W6EE.
Apogee of orbit (point farthest from earth): Approximately 268 miles.
Perigee of orbit (point closest to earth): Approximately 153 miles.
Orbital Period: Began at 92 minutes, ended at 89 minutes.
Maximum Doppler shift: 7.5 kilocycles.
Distance traveled while in orbit: Over 20 million miles.
Range of signal to radio horizon: Approximately 1400 miles on overhead passes.
Internal Temperature: Average temperature within satellite was 127 degrees F, corresponding to a HI rate of 10 in 6.5 seconds.
Power Supply: Three 18-volt mercury cells in parallel, with estimated life period of three weeks.
Dimensions: Cylindrical canister, 12" × 10" × 8".
Weight: 10 pounds, canister made of low-weight magnesium alloy.
Launching Vehicle: Launched as ballast in an Agena Satellite, boosted into orbit by a Thor vehicle.
Transmitter: Transistor crystal oscillator on 72.5 mc, transistor amplifier and "Vari-cap" diode doubler on 145 mc. Keyer consists of transistor multivibrator and counters with diode logic. Oscillator is keyed in base circuit.
The entire internal structure of the OSCAR I satellite was encapsulated in epoxy foam to serve as thermal insulation.

*11307 Clara St., Silver Spring, Md.

OSCAR I Honor Roll

More than 5200 individual tracking and reception reports of OSCAR I's 2 meter beacon transmitter were received by the OSCAR Data Reduction Center (Box 183, Sunnyvale, California). These reports were submitted by 570 radio amateurs and other observers representing 25 different countries in all corners of the world. The number of observers in each of the participating countries is shown in the following Honor Roll.

OSCAR I Honor Roll

(Total contributors of reports by countries)

USA	427	USSR	3
Germany (F.R.)	39	Belgium	2
U.K.	31	New Zealand	2
Canada	11	Norway	2
Netherlands	7	Argentina	2
Italy	6	Philippines	2
Sweden	6	Japan	1
Spain	5	Puerto Rico	1
Switzerland	5	Denmark	1
Australia	4	Germany (D.R.)	1
South Africa	4	Finland	1
France	3	Antarctica	1
Austria	3		

Total countries contributing reports 25
Total observers in all countries 570

The Project OSCAR Association's report on the OSCAR I satellite records the accomplishments of amateur radio's first venture into space. But perhaps the greatest accomplishment of all is the fact that OSCAR I brought together radio amateurs of many nations and of differing political beliefs in an international undertaking of a peaceful scientific nature in space. This is truly the spirit that makes amateur radio great. *CQ* again salutes all those who helped make OSCAR I one of the most important accomplishments in the long history of amateur radio communications.

Communications Satellite Act

On Friday, August 31, an event of "historic importance" in the field of communications took place. On that day, surrounded by high ranking officials, President Kennedy signed into

[*Continued on page 171*]

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

CONTEST CALENDAR

FRANK ANZALONE*, W1WY

CALENDAR of EVENTS

October	27-28	*CQ* WW DX Phone
October	27-28	RSGB 7 mc Phone
November	3-4	RSGB 7 mc c.w.
November	7-8	YLRL Phone Party
November	10-11	ARRL SS
November	17-18	ARRL SS
November	24-25	*CQ* WW DX c.w.
December	1-2	RSGB 21/28 mc Phone
December	9	OK DX c.w.

CQ WW DX

If the requests for log sheets is any indication, we should have a real turn-out for this year's Contest.

As for condition you will have to check George Jacob's department. Maybe he will surprise us with another excellent week-end, like the one we had for the c.w. contest last year. However, don't expect too much, we're just about at rock bottom.

Once again I am making a pitch to please send us your log regardless of the size of your score. So many times I get the stock excuse, "I know my score is too small to be a winner, so why bother to send it in." But we want you to send it in; it can be very valuable and useful to us in our checking. And since our published results are very complete you will always get credit for your efforts.

That's about it. You fellows with impressive scores can AIR MAIL them to me immediately after the Contest and I'll run it in the "Claimed Scores" in an early issue.

RSGB 7 mc

Phone

Starts: 0600 GMT Saturday, October 27th.
Ends: 2400 GMT Sunday, October 28th.

C.W.

Starts: 0600 GMT Saturday, November 3rd.
Ends: 2400 GMT Sunday, November 4th.

The RSGB is trying a new one this year and we told you all about it in last month's CALENDAR. I doubt if you found the phone week-end very productive but the coming c.w. week-end should be interesting. A good tune-up for our WW Contest at the end of the month.

Rules appear to be the same as the RSGB 21/28 contest below.

*14 Sherwood Road, Stamford, Conn.

1962 CQ World Wide DX Contest

Phone

Starts: 0000 GMT Saturday, October 27th.
7:00 P.M. EST Friday, October 26th.
4:00 P.M. PST Friday, October 26th.
Ends: 2400 GMT Sunday, October 28th
7:00 P.M. EST Sunday, October 28th.
4:00 P.M. PST Sunday, October 28th.

C. W.

Starts: 0000 GMT Sat., November 24th.
7:00 P.M. EST Fri., November 23rd.
4:00 P.M. PST Fri., November 23rd.
Ends: 2400 GMT Sun., November 25th.
7:00 P.M. EST Sun., November 25th.
4:00 P.M. PST Sun., November 25th.

YLRL Party

Phone

Starts: 1700 GMT Wednesday, November 7th.
Ends: 2300 GMT Thursday, November 8th.

Check Louisa's Column last month.

ARRL SS

Starts at 2300 GMT Saturday and ends at 0801 GMT Monday on both week-end, November 10/12 and November 17/19.

RSGB 21/28

Starts: 0700 GMT Saturday, December 1st.
Ends: 1900 GMT Sunday, December 2nd.

This is a phone contest only and operation of course is confined to the 21 and 28 mc bands. It's the world working the British Isles. (G, GB, GC, GD, GI, GM and GW)

1. The usual five figure serial number, RS report plus a progressive 3 digit number starting with 001.
2. Each contact is worth 5 points.
3. An additional bonus of 50 points may be claimed for the first contact with each British Isle country/numeral prefix on each band. G2, GC2, GB, GM6, *etc.* A possible 37 on each band.
4. A further 50 bonus points is available for each additional 10 stations worked in each country/

[*Continued on page 172*]

HAM CLINIC

CHARLES J. SCHAUERS*, W4VZO

THE best ham equipment troubleshooters are those who build or who have built ham gear. These hams generally have sufficient test equipment and the technical know-how to enable them to quickly isolate and correct ham equipment troubles . . . they do very little guessing.

With the set connected for operation he will note meter readings and other operating pecularities.

Transmitter troubleshooting can be very difficult and frustrating if an intermittent trouble crops up; but with a little patience and circuit know-how it can be found—as can any other trouble.

A v.t.v.m. is a *must* in any ham shack, and so is the multi-meter. One can always take their tubes to a radio-electronic sales outlet for testing.

If an oscilloscope or some other instrument is needed, your TV serviceman may allow you to borrow them if you can prove to his satisfaction that you know how to use them. But do not feel badly if you are told by your "friendly" TV serviceman that he regards his equipment as he does his pipe—for his personal use only, and not to be borrowed.

As in radio receivers, the greatest cause of transmitter mal-functioning can usually be attributed to defective tubes. So before taking the set out of its case, do check the tubes. If your final is neutralized, be sure to replace the final tubes in their original positions.

Transmitter Troubles

Some of the transmitter troubles encountered by hams at one time or other are: fuses blow; parasitics; antenna does not load up; keying is erratic; modulation is low or "mushy"; no r.f. drive (or it is erratic or low); operates on one band only; the final plate current cannot be dipped; hum on the carrier; microphone is hot with r.f.; final plate current varies on a.m. or c.w. without modulation or being keyed; heavy key clicks; chirpy c.w. signals; f.m.-like signals on a.m.; arcing in the final tank circuit; tube or tubes running too hot; large v.f.o. drift; antenna seems to load but signals are reported weak by nearby stations; high second harmonic output reported; heavy TVI; need for frequent replacement of a tube or tubes; noise in the receiver from the transmitter when the latter is on standby; and reports that your a.m. signals are splattering.

In s.s.b. transmitters: poor or no carrier suppression; splatter; speech distortion; final grid current too high (in some linears); final hard to load; low s.s.b. drive; noisey final in standby; frequent fuse blowing; some tubes running too hot; too much a.f. gain needed and symptoms of frequency drift.

One Band Operation

If an all-band transmitter operates well on only one band, first suspect the inter-stage and final stage band-switching components. Next, check the multiplier action of stages that follow the oscillator. Look for shorted r.f. chokes and r.f. by-pass capacitors.

No Final Current Dip

This is a common trouble in the smaller transmitters and is usually due to no r.f. drive to the final.

Carrier Hum

When a transmitter emits a signal full of hum you can safely bet that there is a filter capacitor failure in the power supply, a poor mike connection or a bad ground connection. Too, a defective tube (with grid to cathode leakage) will cause the trouble.

Hot Mike

A common trouble is the microphone that burns one's lips with r.f. Sometimes this becomes a sticky problem and is not always easy of solution. A transmitter operating into an antenna with a high s.w.r., a poor ground or a resonant mike cord can cause the trouble. Sometimes an r.f. choke (2.5 mh) inserted in the hot center lead of the mike and by-passed to ground with a .001 mf ceramic capacitor will lift the r.f. from the mike.

Final Plate Current Variation

Nine times out of ten when a final plate current meter indicates a varying current without modulation or keying you can usually point your finger at poor connections. A variation of current on a.m. without modulation could also mean a resistor changing value or an r.f. coupling capacitor that is bad.

Key Clicks

If a transmitter suddenly develops key clicks check all keying filtering components and make certain that your ground connection is still solid. If your set is crystal controlled, then check your crystals.

Fuses Blow

Fuses blow because their current carrying capacity has been exceeded. This usually means that a short exists either in low or high voltage supply circuits.

With the set out of the cabinet and filter capacitors drained by shorting them to ground with a screw-driver, a quick resistance check at each tube socket plate and/or screen pin will generally show up shorted filter or by-pass capacitors. Shorted switch sections, transformer, choke (a.f.) *etc.*, can be easily determined with resistance checks.

Low or "Mushy" Modulation

Low modulation is generally due to bad tubes in any of the speech stages or the final modulator, but it can also be due to low voltages or bad inter-stage coupling capacitors. Again, resistance and voltage checks will usually pin-point the trouble.

Mushy modulation can be due to a defective microphone, over-driving modulator stages or improper final tank loading . . . especially in screen modulated rigs.

No Antenna Loading

When an antenna cannot be loaded properly, the first thing to suspect is a defective antenna relay or defective final switching. Next in line is the non-resonant antenna, defective coaxial cable or bad connections at the relay and transmitter.

Erratic Keying

Erratic keying can be due to poor plug contacts, dirty or corroded key contacts, defective stage components or an intermittent ground. Anytime you find an NE-2 neon bulb in a keying circuit suspect this troublemaker first. Those who own Apache TX-1's should replace this neon when keying becomes erratic.

Questions

Blown Line Filter Components—HAM CLINIC has received six letters from readers who have had to replace the ceramic line filter capacitors (across the 110 v.a.c. line) in their transmitters along with the line filter chokes. In one instance, the v.f.o. filament transformer was burned up. These replacements were made after an *electrical storm*. However, one of the readers queried his power company who told him that "his ground loop was different from theirs and could have caused the blow-out."

In all six instances, coaxial cable was used as the antenna feeder.

My opinion? The troubles were caused by lightning and/or static discharge. I recommend using a Cushcraft Blitzbug.

On the Adapt-O-Citer—We have received a number of letters from readers who have built up the "SSB Adapt-O-Citer" described in the June 1962 *CQ*. Some were happy and some were not.

Those who were not happy used vacuum tube diodes instead of the silicon diodes recommended. The additional wiring using 6AL5s and the difficulty of shielding made for poor carrier suppression. I recommend that you stick to silicon diodes.

In the diagram, PC_1 (the parasitic choke in the EL-84 output circuit) should be 6 turns and *not* 25 turns.

On page 29: "when used as an adaptor, r.f. excitation is furnished by the transmitter final driver stage and is fed into L_1" (*not* L_3). Shield, shield & shield!

Invader and Invader 2000 Up-dating—"Any changes in Invader circuitry which might improve performance?"

Yes. Write the E. F. Johnson Co., Waseca, Minn. and ask for their bulletin on the subject. It will be worth the trouble.

Heath GW-21 to 10 Meters—"What is the best way to convert the Heath GW-21 to 10 meters?"

Change crystals, trim coil L_4 for 10 meter resonance and peak up all tuned circuits. For more power out, adjust R_{35} for maximum power input to the final stage. When so modified they are "hotter than hot." Crystals specifically for these sets are obtainable from Midland Manufacturing Co., 3155 Fiberglass Rd., Kansas City, Kansas, however, other crystals will work well too.

Free DX-40!—We have a slightly used DX-40 transmitter which we are going to give away to some lucky ham as a first prize in a little writing competition. A second prize of $25.00 will be awarded.

This contest will close February 1, 1963 and entries must be post-marked before that date.

Anyone who reads HAM CLINIC is eligible, and this means everybody in the United States *and* Overseas.

Entries may be in the following languages: English, German, French, Russian, Chinese, Spanish and Italian.

To participate, write in 500 words or less, on the subject: "Amateur Radio, A Bridge To International Friendship."

Mail your entries to: HAM CLINIC Contest, 300 W. 43rd St., N. Y. 36, N. Y. Entries will not be returned nor will we engage in correspondence concerning them. Enter now!

RDF Fixes—"How many radio direction finding stations does it take to get a fix (obtain position) of a radio station?"

One, if it is mobile, for it can take bearings from a number of points and plot these on a map. When 3 or more bearings have been taken from different positions the radio station will be in the area as indicated by the crossed bearing lines. The more bearings taken (by one or more stations at different positions) the more accurate will be the fix.

WRL Vertical Test—"One of my friends told me on the air that you are testing out some vertical antennas. What's cooking?"

Right now I am testing out the WRL WVG model which sells for $14.95 and covers the 10 through 80 meter bands. So far, this easy-to-install antenna really works FB. It took me all of 20 minutes to install it *without* radials. Fed with 60 watts it does a nice job on locals as well as distance stations. The s.w.r., although not as good as with a single band antenna is low enough to suit me. The one I purchased is mounted near the house (about 3 feet away from a corner) and fed with RG-59/U. To show you how easy it is to mount see the photo.

I am now trying to figure out a way to operate the coil electrically from the shack. It is necessary to change the tap for each band, but this only takes a few seconds *after* you have marked the correct tap for the band in use with a different colored paint. A rotary coil, electrically tuned.

[*Continued on page 139*]

VHF

DONALD L. STONER*, W6TNS

RADIO amateurs have discovered many phenomena associated with radio wave propagation. By virtue of numbers there is usually a ham at the right place and at the right time. Most of their accomplishments have been on the very high frequencies.

Bill McNanny, W3MIQ, was at the right place, namely six meters, to hear an unusual event recently. He wonders if anyone else has observed a similar situation. After a severe lightning storm passed over and continued to cause static on the receiver, he pointed his beam toward the storm. With that heading he noticed a pronounced increase in the signal strength of six meter stations located in the direction of the rear of the antenna. These stations were 50 to 60 miles away and copy was Q2. A lightning stroke caused their signals to jump up to Q4 or Q5. Bill figures this was due to ionization which caused a reflection to exist. If you want to "chin" more with him on this, drop a line to P. O. Box 197, Homer City, Pa. Too bad we never have any of these storms in Southern California.

Another unusual effect which the writer has heard might be termed *reverse* tropo. Did you ever want to get your antenna as high as possible in order to "bomb" in a signal on two meters? Did you ever wonder if there was such a thing as getting it too high? Ken Woodward, WA4BVW, has investigated this reverse tropospheric effect both in amateur and commercial operations. As an engineer at WMT, Mt. Mitchell, North Carolina, he has had the opportunity to observe the phenomena over an extended period of time.

What is Reverse Tropo?

Everyone who has operated two meters has heard the tremendous signal increases caused by temperature inversion or ducting. The phenomena can be observed anywhere in the world, however, it is more noticeable near sea coasts where different air mass temperatures exist. The inversion is a condition where one mass of still air will hold down another. As a result temperature ducts are formed which are capable of propagating v.h.f. signals along the earth's surface much like a gigantic waveguide which follows the curve of the earth.

The height of this duct generally reaches no more than 4,000 feet. The phenomena is quite common in the Los Angeles area and accounts for the heavy concentration of air pollution in the basin.

Consider now what happens when a station is *above* the inversion. Station A is located at sea level approximately 120 miles from station B, who has about 1200 feet elevation. Station C is a few miles beyond B but on a mountain top with an elevation of 6,000 feet. Under normal conditions A and B exchange signals which are 1 microvolt or less. Station A and C enjoy signals as high as 50 microvolts since a line-of-sight path exists. When the temperature inversion is in evidence, the A to B path signals may increase by as much as 20 db. However, because C is above the inversion, no signals can be exchanged between A and C resulting in an unmeasurable and for all practical purposes, an infinite path loss. Essentially this is the reverse tropo or Woodward effect. Much remains to be done in the way of charting this phenomena in a more scientific manner. Those wishing to investigate the effect further should contact WA4BVW.

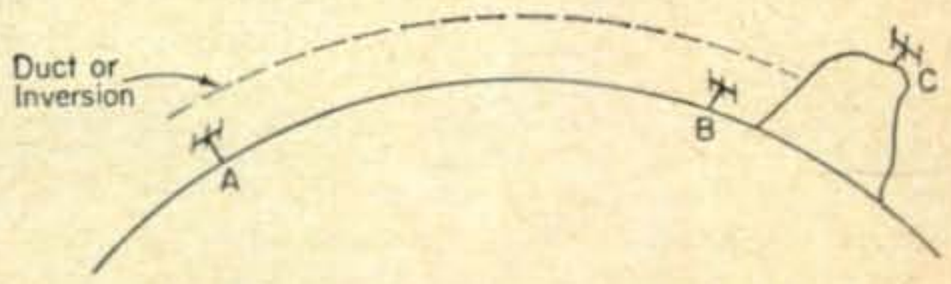


Fig. 1—Example of "Reverse Tropo" in which A and B experience the favorable effects of the duct (shown dotted) with very strong signals. Station C, however, is unable to even copy either A or B because C is above and outside the duct.

Funny Modulation (FM)

The latest issue of the *FM Nets Directory* (issue 4, July 1962) is now available and carries literally hundreds of f.m. net listings. Single copies may be obtained from T. A. McKee, K4ZAD, 1306 Grove Rd., Lynchburg, Va., by sending him a self addressed stamped envelope. K4FSU is planning to publish a bimonthly f.m. newsletter to serve as a means of exchanging technical and nontechnical information on hamband f.m. The subscription rate is 25¢ for the first six issues from Seymour Paul Jr., K4FSU, Rt. 2, Waterlick Rd., Lynchburg, Va. Also mentioned in the *FM Nets Directory* is a conversion book on Motorola 2 meter gear written by K9OJV and K9YHQ. It is priced at $1.75 and may be obtained by writing to J. S. Aagaard, c/o Electrical Engineering Dept., 2145 Sheridan Rd., Evanston, Illinois.

Let's Get Technical

Now that you have that shiny new converter finished, let's put it on the noise generator and see just how good it is. What? You don't have a noise generator? What kind of a v.h.f.'er are you?

About the easiest noise generator to build and use is shown in the accompanying photographs and in fig. 2. It is built in a small LMB box but any similar

*Alta Loma, California.

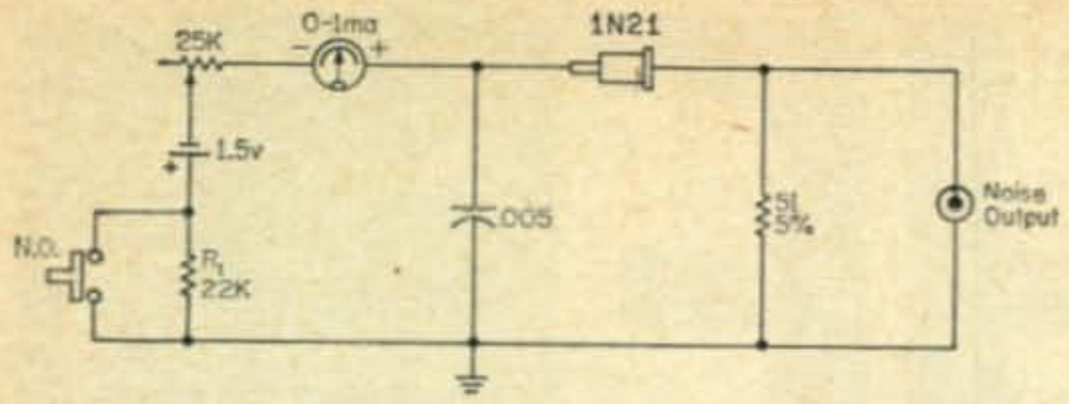


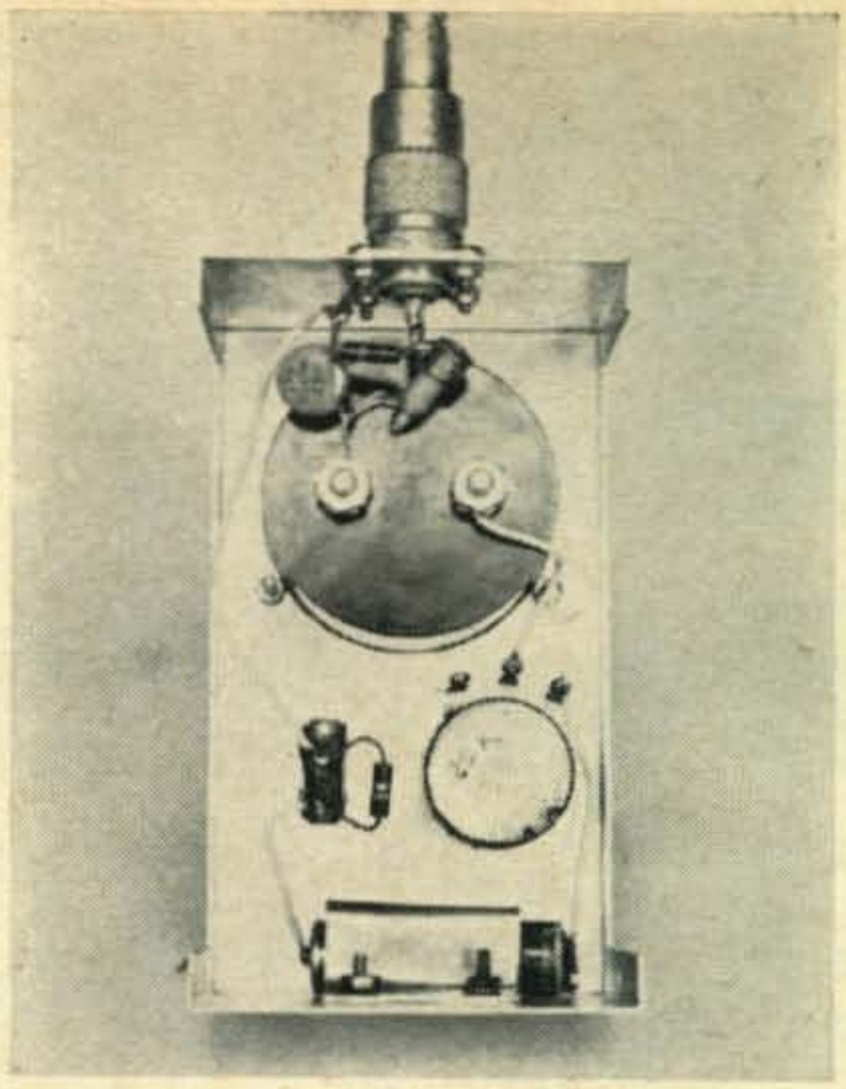
Fig. 2—A simple noise generator for accurate peaking of v.h.f. receiving gear. Resistor R_1 should be disconnected if the generator is to be idle for long periods to prevent unnecessary battery drain.

case can be used. The location of components is quite flexible. The 1N21 radar diode is connected in such a manner that current flows through the junction in the direction of highest resistance. When this is done the diode will generate profuse amounts of noise, the exact amount can be controlled by the setting of the potentiometer.

Normally the noise generator is used in this manner: .. voltmeter is connected to measure the noise content generated by the receiver. Then the noise generator is turned on and adjusted to just double this figure. The lowest meter indication which doubles the noise correspondence to the lowest noise figure. The exact noise figure cannot be measured or calculated unless you have an elaborate tube generator which indicates filament temperature. I use the generator shown in the photographs in a somewhat different manner but find the results are every bit as good as the above system. Further it is not necessary to disassemble the receiver to connect a meter. Connect the noise generator to the converter through a short length of coax. Turn the potentiometer all the way to the left for the lowest meter reading. Slowly advance the knob while alternately pressing and releasing the pushbutton switch. At the first point where you can *just* hear the noise increase note the reading of the meter. Then readjust the converter input coil and try it again. When the converter is properly adjusted you will be able to hear a perceptible increase in noise with a meter reading as low as 200 microamperes (0.2 ma). The lower the meter reading, the better the converter noise figure. Any 0-1 ma meter may be used as long as the divisions are large enough to read. If you have an accurate noise generator available, conceivably it is possible to calibrate the meter to indicate noise figure directly.

Two Meter Sideband

Once you have a low power source of 14 mc sideband energy, it is a relatively simple matter to heterodyne this signal to either six or two meters. The K6BUK converter, featured in this column recently, is a good example. This same circuit can be installed in the Barry Electronics 243 mc beacon transmitter in the



Rear view of a simple noise generator showing layout of the components. The resistor across the pushbutton switch is to eliminate a "thump" when the switch is depressed. This "thump" is difficult to separate from the noise when you are scratching for that last db. Note that it causes a small residual current to flow but does not seem to run down the battery since it only amounts to 40 microamperes or so.

following manner:

1. Remove the code wheel at the rear of the chassis. Incidentally, by etching a new code disc for this mechanism you can make a slick wheel to send "CQ SS DE W6TNS" or any other information you wish to repeat over and over. It runs on six volts too!
2. Rewire the oscillator section to correspond to the K6BUK circuit. Insert a powdered iron slug in the oscillator coil to resonate it at 43 mc.
3. Disconnect the second 12AT7 socket and rewire for a 12BY7. If you want to replace the chassis in its cabinet, it will be necessary to submount the socket.
4. Replace the 6360 grid and plate coils with the values shown in the K6BUK circuit. Replace the plate choke with a Z-144 Ohmite.
5. Install a new power socket, antenna connector and s.s.b. input jack on the front panel. If you are real sharp you can install a silicon voltage doubler power supply in the space formerly occupied by the code wheel.
6. The same tune-up procedures apply as for the K6BUK circuit.

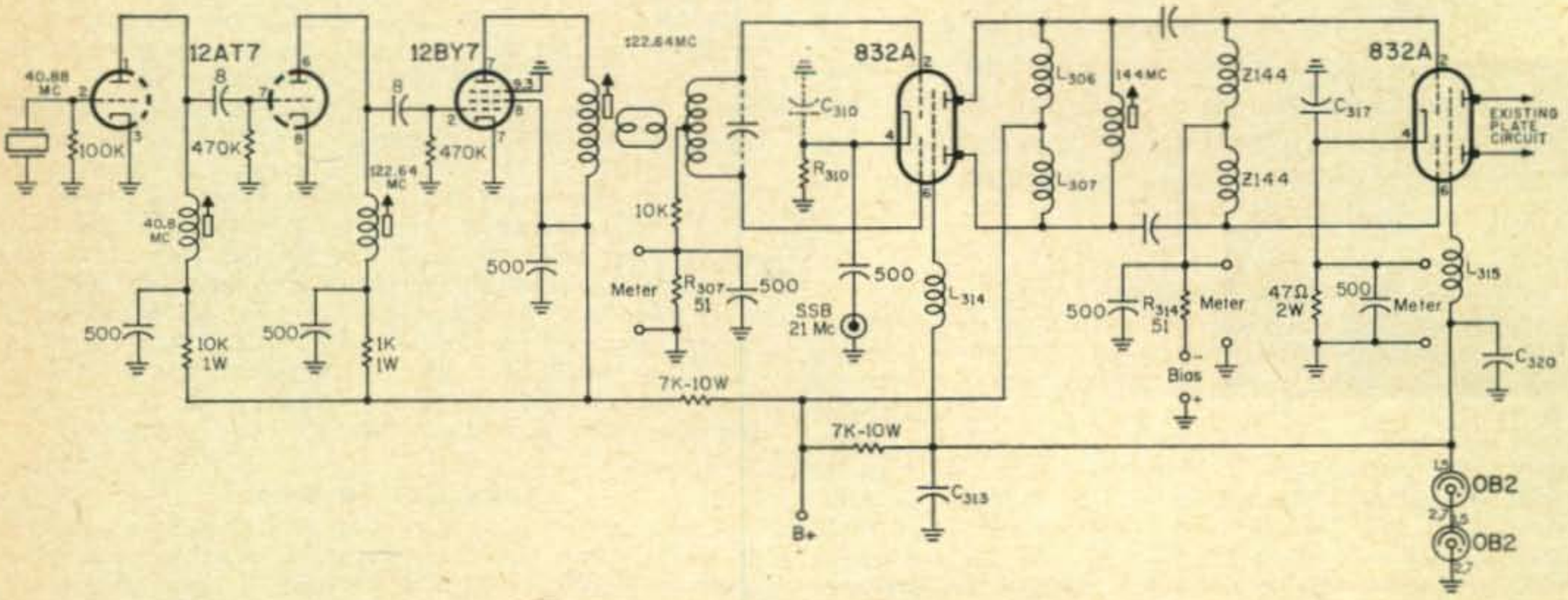


Fig. 3—Necessary changes to convert the T-23/ARC-5 to a two meter s.s.b. mixer and amplifier. Note that the 1625 xtal. oscillator and multiplier string are replaced by a 12AT7 and 12BY7. Adjust bias for resting plate current of 10 ma on 832A linear amplifier.

If you were not lucky enough to get one of the Barry beacon transmitters, or if you have a T-23 ARC-5 surplus transmitter, these can be converted to operate as a two meter s.s.b. converter and amplifier. For this conversion information our sincere thanks go to my friend Pete, AF5AJG, who is the director of the sharpest Air Force technical net in the country and to his cohort AF5QOA.

The necessary changes are illustrated in figure 3. This modification consists essentially of rewiring the 832 section and replacing the driving source. When converted this unit will have sufficient s.s.b. output to drive an amplifier to 1 kw on two meters. It can also be used as a transmitter itself with an output of approximately 50 watts p.e.p. With inserted carrier the average power output will be at least 25 watts. This figure is with a supply of 400 volts on the plates of the 832A's. More output is possible using higher voltage. It is possible to go as high as 750 volts on the last 832A when used in linear fashion. The above power output figures were measured on a commercial 52 ohm dummy load.

Several other methods could be used to convert the T23. If only very low output on s.s.b. is required, the last 832 stage could be made to operate as a mixer. The power output would drive a tetrode to several hundred watts. However, spurious responses should be closely checked as no tuned circuits would be between the T23 and the amplifier other than the plate and grid circuit. This is a simple modification but is not recommended unless a high *Q* tuned circuit of some type is used on the output between the unit and the final it is driving.

The preferable system is shown, that is, wiring the first 832 as the mixer and operating the second 832 as the linear amplifier. A source of 21 mc s.s.b. energy is used. Other frequencies could be substituted if the crystal string is adjusted accordingly. However, 21 mc seems to be a good compromise and allows the tuned circuits to better attenuate spurious mixer products. A crystal around 41 mc was used. With a 10B or 20A exciter set for 15 meters, the combination will produce output on two meters. Approximately three watts of s.s.b. energy is all that is required for proper mixing.

No details are given on filament voltage, turret voltages, *etc.*, as it is assumed these details have been taken care of already. Only the changed circuits are shown in fig. 3. A variable bias supply could be incorporated easily by using a filament transformer and small rectifier. This will provide best linearity by adjusting the resting current of the 832 linear amplifier. The bias will be approximately 15 volts and should be adjusted for approximately 10 to 15 ma of resting plate current.

Injection of the s.s.b. energy was tried in the control grid, screen grid and cathode circuit of the mixer tube. Very little difference could be noted and cathode injection was decided upon since it was the easiest to install. You should remove C_{310} with cathode injection.

Who's News?

Jeff Krauss, WA2GFP, kicks it off this month with some excellent comments on the Century Club awards. His comments; "In inaugurating this program, *CQ* has given the serious v.h.f. man a relatively good award. However the original program seems to have missed one or two good categories. The first of this is 420 mc TV. While 25 432 mc QSO's may be fine for the award on Phone it is impossible to gather 25 TV QSO's in one year, even in New York. I would like to suggest that serious consideration be given to either 10 or 15 TV QSO's/QSL's for a new award. Why must 1215 be left out, secondly. Comments and news concerning 1296 mc has been both helpful and enjoyable reading. Why not include this band into the Century Club program? The number of OSO's must be high enough so that it is a decent challenge and low enough so that it is not impossible, even for those in a high density 1215 mc area. (I suggest 10 QSO's—any comments? *ed.*) Lastly, some news for the column. The Sunburst VHF Society is a small group now meeting and planning for the coming season. Anyone interested in the group may contact me."

Always lots of news from the Carolinas. W4OAB reports a new MARS net is operating on 49.980 and meets Tues. and Thurs. at 8:00 to 9:00 local time. W4URS and W4OAB have been working six meter duplex with 1 mc separation. Brian reports that it works better than vox but must be above 51 mc. WA4BVW Mt. Mitchel, monitors 52.25 mc f.m. and reports much activity in the area. From Tenn. K4KYL was worked and reported some activity around Knoxville. They may kick off a Tennessee VHF Society soon. Jim, K4YYJ, reports that 145.35 is the calling frequency in Salisbury, Winston and Greensboro. It is monitored whenever possible. Ted, W4FJ, Richmond, Va., (144.01) reports daily schedule as follows: 2130 E.S.T. with W2ESX, 2145 E.S.T. with W8BKI (144.257) and 2215 E.S.T. with W8KAY. Ted calls for first two minutes. He is hearing lots of pings and letters from K9UIF, Chicago, on 144.186 during his skeds.

Up north, Walt, K1RTS, sends along a Brownie of his new beams. The high one is commercial and the other is home brew (I couldn't tell, Walt). The QTH is located on a hill above Waterbury which has an elevation of 250 feet. Walt has a Mark II surplus rig and would like to get a schematic of it so he can get the transmitter going. Also needs one for the ARC-4. Drop him one at 38 Wildwood Ave., Waterbury 10, Conn. Walt continues "August saw quite a bit of two meter openings. We picked up two more states namely Vermont and Virginia. The first state was the DX-pedition of WA2AJG, WA2AKW, WN2ONO and WN2PZE on Mt. Equanox. Sounded like they were having a great time. Now all we need are R.I., Mass., and Maine. Speaking of DXpeditions, The New England "Mobileers" sent out four "Mountaineers" on Sept. 2nd (K1ILQ, K1GTZ and K1RBS were on a hill top in Conn. while K1OTQ operated a mt. in Mass.). Any station contacting all four will get a certificate.

Speaking of goodies, the Cleveland 50 mc DX Club is awarding a trophy. Six members of the 15 club members must be worked after Jan. 1962 and exhibit QSL's for the contacts. They must be 75 miles from Cleveland or outside the state. For more information, drop a line to Don Hasek, K8NUE, 3318 Ralph Avenue, Cleveland 9, Ohio.

Bob Piechaty, K9CGD, 2427 Westover Ave., No. Riverside, Ill., is a recent VHF Century Club recipient and also writes an interesting letter. He operates an SX-101A but the remainder of his gear (other than the antenna) is home brew and includes a 5894 linear operating class B, Nuvistor pre-amp and converter and a 6360 transmitter with controlled carrier modulation. Bob mentions he is 22 years old and left the d.c. frequencies in March '62 after getting a taste of two meters.

By way of the Evergreen 50 and Up Society we learn of the Puget Sound Emergency Net which meets every Monday evening at 8:00 P.M. local time on 50.85 mc. Everyone is invited to check in.

That polarizes us for another 30. For now,

73, de Don, W6TNS

CQ Century Club Awards

50 Mc

Pat Dennis, K8VMY
Geo. Oliva Jr., WA2UOA
Richard M. Farage, WA2OYC
Henry C. Stout, K8CKO
Walton L. Hall, WA2TGC
LeRoy Fergusen, WA2RQH
Phil Schenck Jr., K1JQT
Henry Hickman, K3MMR
John Bruner, Jr., K3KEK
G. H. Krauss, WA2GFP
Lawrence Blaybough, VK4ZGL
George Buza, W8FKV
Ken Birman, K8YYC
Charles R. Robinson, Jr., W5GKP
Bud Crawford, W8CZD
Keiji Ito, JA1GYQ
Nancy M. Gunstream, K5VXP
Julio Garcia Moll, XE1CZ
Daniel R. Stock, KØSBJ

144 Mc

Robt. Davison, WA2LPJ
Sheldon Pivnik, WA2QPF
Michael Zakin, WA2SZM
Bob Piechaty, K9CGD

sideband sideband sideband

SIDEBAND

IRV & DOROTHY STRAUBER*, K2HEA/K2MGE

You will notice, elsewhere in this issue, a listing of the most active sidebanders in the world as indicated by the certificates and stickers they have been issued during the past year. Everyone using single sideband is eligible for and encouraged to work toward achieving the attractive awards issued by *CQ*. The rules governing these awards and an official form for listing your confirmations are available, upon receipt of a stamped, self addressed envelope from the SIDEBAND Editors at the above address. There is no charge for the certificates or stickers; however, sufficient postage for the certified, first class mailing return of your cards is obligatory.

You may send listings of your additional confirmations as often as you like in order to keep your standing on the Honor Roll current. In order to hasten the process of receiving an acknowledgement slip from the Editors for your listings and your stickers, it is strongly recommended that you include a stamped, self-addressed envelope. When submitting your listings, be sure that your confirmations are numbered and listed in alphabetical order according to prefix. All confirmation listings are carefully kept on file so it is necessary to submit only additional listings to the Editors.

*12 Elm St., Lynbrook, New York.

Another of sideband's very popular couples is the Springers, Audrey, W3GEN and Stan, W3NKM of Pittsburgh, Pa. Stan is high up on the Honor Roll and though we haven't heard from Audrey lately, she used to be very active several years back garnering all the rare DX that was available.

RSGB Handbook

We are grateful to Steve, G2BVN, Editor of "This Month on The Air" column in the *RSGB Bulletin,* for a copy of the *Amateur Radio Handbook* published by the Radio Society of Great Britain. We are all familiar with the ARRL's *Handbook* and appreciate the help and guidance it has furnished the thousands of hams in this country. We are certain that the RSGB publication is likewise doing its bit for English speaking hams around the world.

Following the format we are all familiar with in our own Handbook, there are chapters on Fundamentals, Receivers and Transmitters, Transmission modes, Antennae, Mobile equipment and General Data among others.

The accent, of course, in on home-brew and many interesting circuits are found in various sections. Helpful, and we hope a soon to be copied, feature of the construction parts of the various sections, is the inclusion of both parts placement drawings and parts layout measurements. All too often we are left high and dry when constructing some piece of equipment as to the physical placement of a component or the exact measurements to be used in laying out the various pieces on the chassis. We suggest to the editors of our *Handbook* and to our own Technical Editor that the inclusion of these helpful aids would do much to assist in construction.

A highly informative and well written book, it has provided us with many an interesting evenings' reading.

Fine Print

You fine print readers noted in our August column a suggestion advanced by Kermit, W9YMZ, to the ARRL Directors that the ARRL petition the FCC for a new Rule to the effect that in fifteen years all amateur phone below 25 mc be limited to single sideband.

You can imagine we would receive a few comments! We did!!

Covering the case for the opposition (friendly), we present the comments of Vince, VE1AGT, which ably speak for the others who wrote to us.

"Browsing through your August issue and I come up with a statement that has me "up in arms"—namely the suggestion to add yet another stupid legislation to amateur radio and have it all s.s.b.

"S.s.b. has its advantages (before I get lynched by

the rabid enthusiasts) and for fixed frequency clear channel high power commercial point-to-point service it has no peers. *But* for all but the DX hunting, certificate collecting *etc.*, it has some distinct shortcomings. Consider for example, the short haul rag chewer (who comprises probably most of the active amateurs). He works away at his latest project meanwhile monitoring the favorite frequency of the group he habitually talks to—this will normally be the local 75 meter net but could be anything. On a.m. he can cover a lot of conversations ignoring those of little interest until something comes along that perks him up. Voices are instantly recognizable even when far off frequency. But on s.s.b.—what a hope!

"The big feature is let's not have any more legislating for the ham bands. There should be a *minimum* of restrictions. It is (on our Canadian licenses anyway) designated as an Amateur Experimental Service and as such it should not be restricted except in so far as is absolutely necessary to prevent monopoly by a minority (which is what our s.s.b. 'friend' is advocating). Instead of his banning everything but s.s.b. let us remove all present restrictions as to mode but introduce as the only restriction that the radiated power be a maximum of 1000 watts (although I would prefer it personally to be 100 watts!) with no radiations over a –70 db level (or 250 milliwatts, whichever is the lesser) measured not closer than plus or minus 5 kc to the center of the radiated signal. In other words, you can use any mode you want provided it does not occupy more than 10 kc of the spectrum.

"Rather than saying that s.s.b. is the only mode to use, amateurs should be trying any and all methods of communication. For example, I have never been persuaded that n.b.f.m., using modern techniques for reception, hasn't many advantages expecially for local net type operation. Also where would c.w. and RTTY fit into this?

"It could be the item was intended for humor. If so, let's have less of this and a return to the wide open experimental service. Let's get those empty 'c.w.-only' portions of the spectrum filled with amateur experimenters and less of a 'one-type-only' and that mostly 'commercial' type of deal."

"Vince", VE1AGT
RCAF Station, Sydney, N.S.

Our opinion? If every a.m. station switching over to s.s.b. would continue to operate on the same frequency used before the switch we'll bet that it won't take fifteen years!

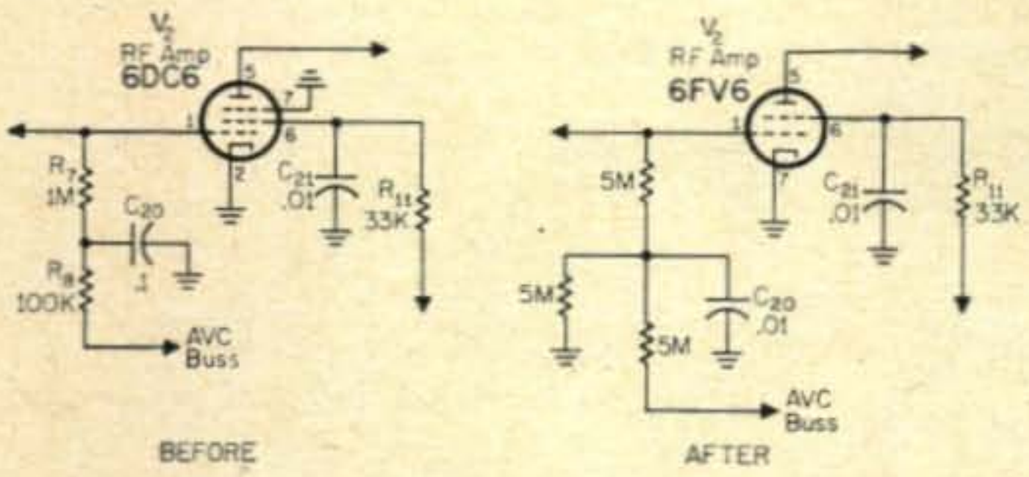
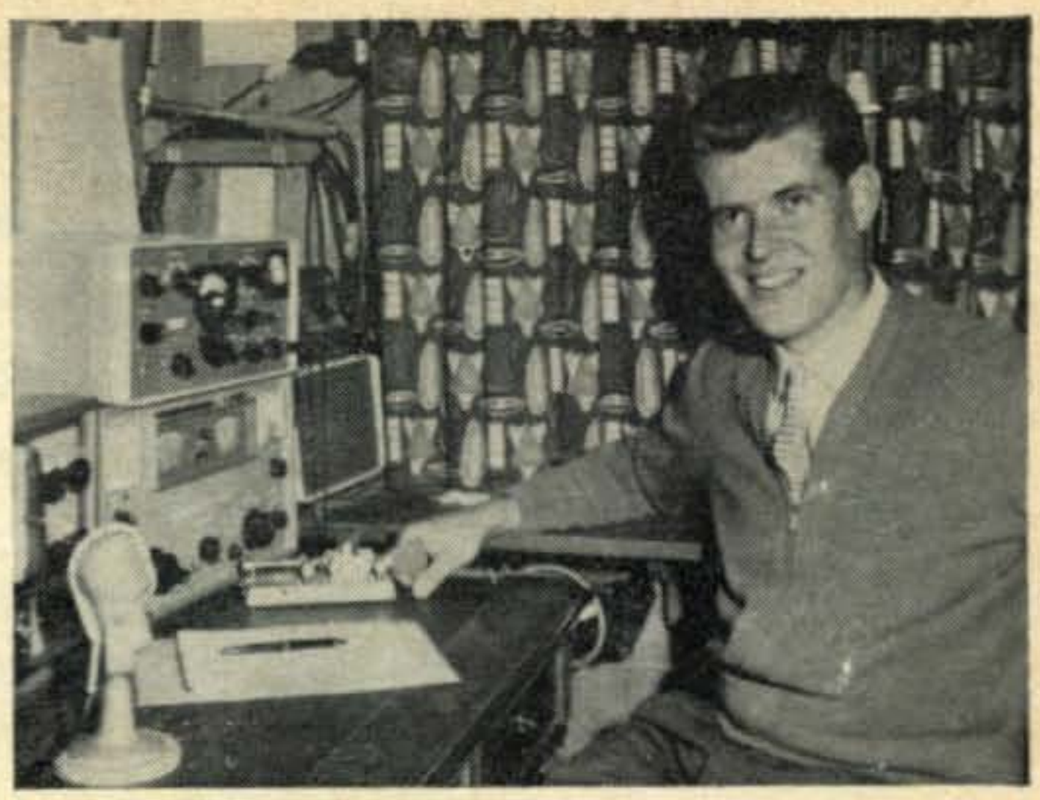


Fig. 1—Modifications to the r.f. amplifier of the 75A-4. Change the 6DC6 to a 6FV6 and make the grid grid circuit changes shown.



Meet Gody Stalder, HB9ZY, of Meggen-Lu, Switzerland, whose compact station fills a neat little corner in his home.

Up date the 75A-4

Every now and again the venerable 75A-4 pops back into the news with a modfication to improve it's operating abilities.

Earl Lucas, W2JT, much respected for his ability to improve ham gear, has come up with several changes in the circuitry of the 75A-4 which we are happy to pass along. Earl is the type of fella' who cannot accept any circuit as being the final and best way of doing a job. If he can squeeze a fraction of a db more out of a received signal, Earl is there with the soldering iron.

One department in which the 75A-4 has been in need of some help is the audio section. Although quite adequate for communication purposes, it leaves something to be desired in the quality department. Modifications needed to improve the audio are quite simple. Remove R_{71}, 33K from V_{13} and replace R_{109}, 390K with 750K.

For greater i.f. gain, remove R_{40}, 22K from across L_{27} and remove R_{29} from across L_{24}. These changes are not new and have been tried previously with inconclusive results.

The change of the second mixer from a 6BA7 to a 6U8A as outlined in our column in June 1960 is worthwhile and we can recommend this modification from our own experience. If the mixer changes are not contemplated, check screen voltages on the 6BA7 mixers. They will probably show 150 to 170 volts. Tube manufacturers maximum ratings are 100 volts. Increase the values of the screen dropping resistors to get 100 volts. As for the other suggestions, we have not as yet had the opportunity to try them and we must reserve comment until such time as we have. A number of technically well-versed hams have, however, made these changes and their experiences suggest that they have improved the receiver as anticipated.

Sideband To The Rescue Again

On August 14, 1962, the son of the Honduran Ambassador to San Salvador was critically injured by an

[*Continued on page 174*]

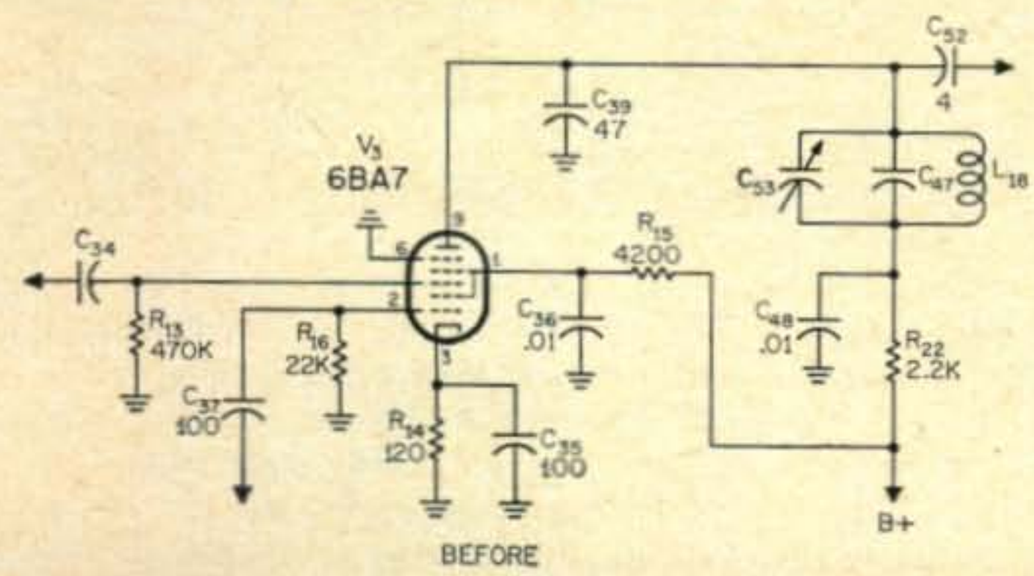


Fig. 2—Improved first mixer circuit for the 75A-4. First mixer is changed from a 6BA7 to a 12AT7 with the circuit changes shown. Resistor R_A is adjusted for 150 volts on pin 1 of the 12AX7. Resistor R_B can be between 100 and 1000 ohms with varying results

the USA-CA PROGRAM

CLIF EVANS*, K6BX

SEVEN lucky USA-CA winners since last issue. Six were USA-CA-500 winners and Lloyd Colvin of WPX fame came in for USA-CA-1000.

USA-CA-500

W5OCX	112
W4EJQ	113
K8BHG	114
W6OJW	115
W8RSW	116
K9GDF	117

USA-CA-1000

W6KG	7

All were for mixed operations except W8RSW and K9GDF for all c.w.

Winner of USA-CA-500 #30, W8CXS, originally endorsed for mixed operations, now has qualified for USA-CA-500 endorsed all 7 mc and all c.w.

We would like to re-emphasize there are no date limitations on USA-CA. USA-CA is to the individual regardless of calls held or changes of QTH. QSLs earned by the individual throughout his lifetime count toward USA-CA. USA-CA encompasses all U.S. awards within its scope and rather than being just an award as such, is a tremendous program of unlimited fun. Clubs and organizations as well as individuals may work for USA-CA. USA-CA is available to s.w.l.s. USA-CA is the most beautiful and significant award in the world.

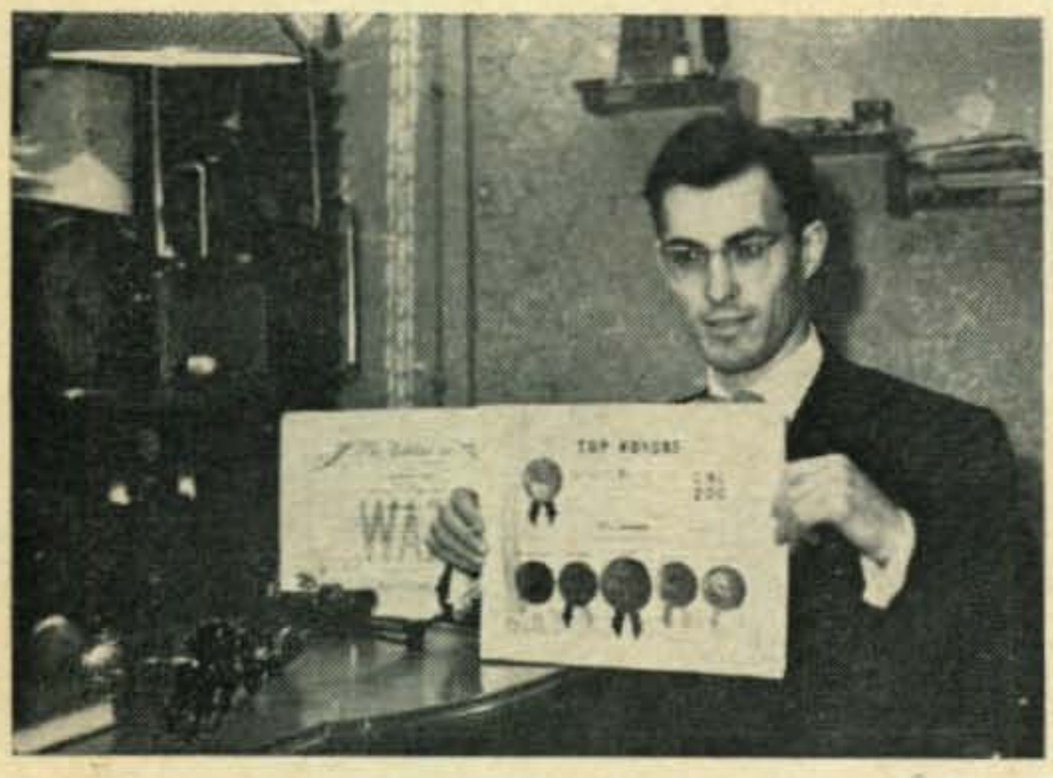
Might we also interpose at this time that USA-CA is a tremendous U.S. Public Relations program which also includes a painless education program. USA-CA is unique in that rather than promoting just its own qualities, seeks to promote all U.S. awards in order that U.S. hamdom might benefit from more healthy mutual and mass PR.

We Get Letters and Questions

The OLD MAN gets so many interesting letters, we feel we should share some of them with you. It is one man's opinion when we editorialize; however, letters we get give a good sampling of what other folks think. **K1HKI, Father Bob:** "Let me congratulate you on the outstanding USA-CA Program. I am indeed thankful that finally a worthwhile award is available for those of us who do not maintain the same QTH for a long period of time." OLD MAN's comments: It is our valid conviction that 'achievements' are won by individuals and that achievements, once won, be it a QSL card or an award, cannot validly be stripped from the individual because nature of his work or military service demands he frequently change QTH. We are glad USA-CA is not discriminatory.

W1YPH, Leona: "Congratulations on your outstanding column in *CQ*. Loads of interesting info there . . .

*United States of America Counties Award Custodian, Box 385, Bonita, California.



Pictured above is a very proud Russian ham, Valentin, UC2AA, holding up his CHC-200 Top Honors Award. Valentin, by virtue of winning the CHC Top Honors Award, also wins the Arne Trossman Top Honors Plaque which will be sent to him. UC2AA is the second Russian ham to win Top Honors; first was UR2BU. Valentin became a ham in 1955. In Russia it is necessary that one first be a s.w.l. before obtaining a transmitting license. Val has logged 30,000 QSO's and has QSL return of 18,000. He QSLs 100%.

Here is Valentin, UC2AA, winner of CHC-200 and Arne Trossman Top Honors Awards with his family. Val is 26 years old, married, and has two boys, Alex, 4½ years old and Andy, just 1 year old. Val says his major hobbies are first his family and then Certificate Hunters Club activities followed by music (jazz). Val is truly a ham's ham and the 30,000 QSLs he has sent out has made that many other hams happy . . . to Val and his 'growing family' (Val hints more) we say, *"a well done."*

really like your straight-forward mode of expression . . . reminds me of my own OM."

ZL1TB, Mark: "My compliments to you on excellent work you are producing in *CQ* . . . it makes great reading. I have P.O. Directory #26 and will be more than glad to help all "down under" to identify U.S. counties for USA-CA." OLD MAN's comment: note on USA-CA Good Will Club membership, this issue, that many DXers and s.w.l.ers are joining the club.

K5VXP, Nancy: "Just love your column in *CQ* . . . first thing I read . . . before long that beautiful USA-CA shall adorn the walls of my shack."

G3DO, Douglas: "The USA-CA is the most beautiful award certificate I have ever seen and I am most proud to be first G-land winner." OLD MAN's comments: got surprise for you Douglas, a duplicate of your USA-CA award will be displayed at R.S.G.B. International Radio Communications Exhibition, London, this month. Contact Steve, G2BVN, RSGB *Bulletin* staff for details.

WPE4EOI, Norman: "I subscribe to *CQ* because of your column. You are doing a great job with the wisdom of your reasoning. Sign me up to help DXers identify U.S. counties for the USA-CA Program."

VP9AK, Clarence: "Cliff, only need 70 more U.S. counties for USA-CA-500. I have copy P.O.D. #26 so put me down for the USA-CA Good Will Club. Thanks for such an interesting and educational awards program."

K5VXP, Nancy: "I think your *CQ* column is tops. I'm hunting hunters, counties, states, countries, and having a ball . . . keep up the good work and count on me for the USA-CA Good Will Club."

K9RNQ, Tava: "Thanks so much for the highly interesting information you put in your *CQ* column . . . excellent reading . . . as a newly licensed amateur I am looking forward eagerly to winning some of the wall paper you so aptly describe."

K1UAA, Jeff: "USA-CA is the best thing that ever happened to acquaint all amateurs about the U.S.A. Because of USA-CA, hams the world over now seek to work new U.S. counties. As a result, all U.S. hams now are much sought after and many enjoy the experience of rare station pileups. In appreciation I couldn't do less than join USA-CA Good Will Club and, as you say, fun unlimited." OLD MAN's comment; many, many letters express Jeff's realization that USA-CA has brought high DXer interest in working U.S. hams, and likewise created greater purpose for contacts between U.S. hams. One soon learns after joining USA-CA fun that USA-CA adapts itself to any and all contests, QSL Parties and Field Days regardless by whom sponsored.

We have received such a flood of letters commenting on various aspects of the USA-CA Program and the OLD MAN's editorial subjects, along with a mass of questions, we now realize much of same is of common interest to many readers. In consequence we will continue the "We Get Letters" and add to it "and Questions." While we cannot answer all questions in this column, we will make a compilation or select those which are typical for answer.

Just remember, we have to fight those Editor and Publisher swabs in New York for every inch of space in their so-called technical rag; however, you good folks just keep the letters coming and we'll do our part.

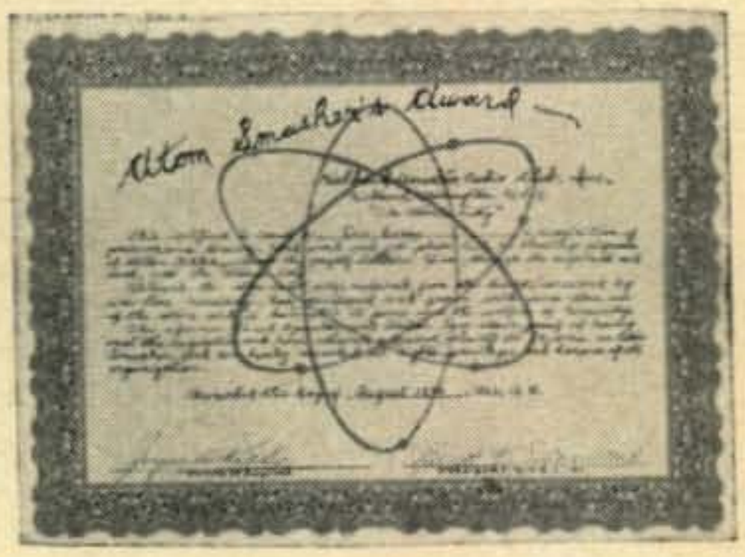
USA-CA Good Will Club

Some months back, as you good folks know, we created the USA-CA-Good-Will Club whose members are willing to help DXers identify U.S. counties. The need for such a club was and is in fact due to too many U.S. hams who fail to name their counties on QSL cards even though their own states (clubs) sponsor awards for working their state's counties. You will have to admit that it is a sad-sack situation which will take a bit of education to remedy.

Maybe we should put the sad-sack in past tense because, today, there is much evidence of a revolutionary turn for the better. Most cards we receive today either have county name printed or written on cards. In any event, we feel another year or so of education is needed and the Good Will Club can provide an invaluable service to DXers the world over.

Above is pictured the attractive Confederate Signal Corps Colonel's Award sponsored by the Confederate Signal Corps, Inc., Radio Club of Georgia. Requirements for obtaining award are: Fourth Area stations contact 20 members of the club; other U.S. stations contact 10, and DX stations contact 5. All contacts must be after January 1, 1962. QSLs must be exchanged. Apply with GCR list (certified by two other hams or radio club official that cards sighted). Award is free to DX stations. U.S. stations send 50¢ handling fee. Send applications to club c/o General Ron Bacon, K4NTS, P.O. Box 267, East Point, Georgia.

Work five members of the Apple Pie Hill Amateur Radio Club and get the above award. To get the award send list with full log data to Club c/o Custodian, Jack Hilton, WA2DPR, Mill Street, West Creek, New Jersey. Certificate has gold scroll and background.



Pictured above is number one Atomic Smasher's Award issued to K6BX for working five members of the Richland Amateur Radio Club, Richland, Wash. To get this award, W/VE stations contact five members after June 1, 1962, and DX stations contact two. Send GCR list (certified list) to club, P.O. Box 73, Richland, Washington, c/o Custodian, Robert H. Ver Steeg, W7YFO; free to DX; U.S. stations send 50¢ handling fee. Award is available to s.w.l.s. The award is red print on orange frame and background which are the official "RADIOACTIVE" colors. Among other things inscribed upon the certificate is, "Richland, the atom-built city, reclaimed from the desert, conceived by war-time necessity, has developed and grown with peace-time use of the atom and is dedicated to peace and the welfare of humanity."

The following is a list of 146 USA-CA Good Will Club members. DXers the world over may feel free to write them for county information. We suggest when county identity is requested, both call and city/state as shown on QSL cards be sent as otherwise club members are forced to look up calls in Call Book as well as P.O.D. #26.

K1 BUR, KSG, IDK, MBM, MEM, PMJ, QCJ, THG, UAA, UAB; **W1** DMD, EIO, GKJ, LXF, YPH; **K2** GTF, PFC, TCS, UFT, VGR, ZKU; **W2** EMW, JMF, JQU, KAT, QHQ; **WA2** EFN, KQG, IKW, NFN, ONO, TCW, WLN; **K3** CNN, DFU, JGJ, MNW, NAS, PQO; **W3** MGP, MNW, NCF, OUA; **K4** CDY, DWU, JIG, LWL, MPE, NUW, OAF, VRI, ZRA; **W4** EJP, EJQ, FNQ, UF, VWW; **WA4** BMC; **WN4** CMV; **K5** BQS, BTM, JBC, SBN, HHO, MEH, UYF, USE, UTH, VXP, WWL; **W5** AWT, KPO, VSQ, VZU; **K6** BX, JBP; **W6** DIX, MDK, OJW, YC; **WA6** AJF, ATY, DWH, MWG, OET, OZL, PDE, PQI; **K7** CHA, IMP, JRE, LDK, LTV, NHV, MRX, OXB, SQD; **W7** KOI, NNF, RZY; **K8** IQB, IUZ, MMO; **W8** CSK, KPL, WUT; **WN8** DOF; **K9** DWG, HXX, QGR, TZH, UCR, YND, ZQW, ZXG; **W9** CLH, GFF, IRH, QQG, QWM, UX; **WA9** AYD; **KØ** BQI, DEQ, PFF, RGU, **WØ** ARO, ITO, PLN, VBQ; **WAØ** AQN; **DX** F9BB, G5GH, 3A8PL, VP9AK, ZL1TB; **SWLers** Richard Haden, Belleville, **Wisc;** Bob Savoy, 7801 Hasbrook St., Philadelphia 11, **Pa.;** Andy Rugg, 16 Lake Breeze, Point Claire, **Que.;** Roger Williams, Rte 2, Box 78-B, Snohomish, **Wash.;** Clif Hoobler, 8134 Baird Ave., Reseda, **Calif.;** Gary Perlstein, YMCA, 10th & Faraon St., St. Joseph, **Mo.;** Steve Cline, Tazewell, **Va.;** Terry Drott, P.O. Box 161, Smithville, **Tenn.;** Norman Atnip, 406 W. Broad St., Smithville, **Tenn.**

We suggest that in addition to list sent to any of above club members, an s.a.s.e. or 1 IRC be sent in return courtesy.

We're a mite proud of the 146 folks above who have stepped forward and offered to pull a Good Will oar . . . they alone insure no DXer need have too much difficulty identifying U.S. counties. But, gosh . . . we just can't be satisfied until *everybody* joins the Good Will club; only then we'll be sure *everybody* is naming counties on their QSLs. Send in a postcard and join the Good Will Club . . . no dues, *just* good will.

Alabama To Join USA-CA Program

Have advance flash info the Montgomery Amateur Radio Club has decided to go ahead with plans for sponsoring an Alabama counties award program early in 1963 and joining the USA-CA Program.

Preliminary plans are to create the award in five classes with band/mode endorsements; Class A is 67/67, Class B is 60/55, Class C is 50/45, Class D is 40/35, Class E is 30/25 counties with last figure being requirements for stations outside the North American Continent. The above is only tentative so folks can start hunting Alabama counties toward day of award availability.

We are in close contact with Betty, K4ZNK, the club's 'live wire,' and will bring you full details as they develop. You can be sure the Alabama award will be a credit to Alabama, the U.S. and all hamdom. It will follow usual USA-CA rules and concepts.

South Dakota To Join USA-CA Program

As we flashed earlier, South Dakota soon will join the USA-CA Program with a beautiful counties award. When OM KØWEM and his XYL KØWEN, were by a couple of weeks ago visiting K6BX, they headed back to South Dakota to put finishing touches on the awards program. Plans are it will picture the Shrine of Democracy, Mt. Rushmore.

You can be sure this award will be of high-level Public Relations quality at state and national level and a credit to South Dakota hams. We will keep you informed and bring you full pic story as soon as details are worked out on award's design and format.

Like the OLD MAN keeps telling you good folks, there is no better PR instrument than a high-level awards program promoting the society that makes amateur radio possible. Amateur radio is not just a selfish hobby to indulge in ego abuses; amateur radio is an integral function within our free society and a valuable asset both to the Public Interest and to National Security. The sooner we get about creating better local, national and international PR to this end, the sooner our valuable contributions will be appreciated by the public, the politicians and the government administrators who control our destiny. We also wish to project for the more intelligent and profound thinking reader that many programs being disclosed in these columns are products generated and promoted by a free press which is in support of all elements of our society and all of U.S. hamdom's diversified but common interests.

Pictured above is the DXYZ-7 Award sponsored by the engineering staff of Broadcasting Station WXYZ and TV Channel-7. See text for full details about the award and club.

Unique DXYZ-7 Club and Award

Don't be confused by all the alphabet . . . up in Detroit, Michigan, sixteen hams work under the same roof on the engineering staff of Broadcasting Station WXYZ . . . and with TV channel on 7, we end up with DXYZ-7 Award. See picture of award.

The DXYZ-7 Club was formed in 1962 to stimulate interest with others engaged in same radio and TV activities, and to promote non-commercial and hamdom interests, and to make new friendships world-wide.

To get the attractive DXYZ-7 award, stations within 50 miles radius Detroit contact seven members after January 1957; all others contact four. Send list with full log data and 50¢ handling fee to Secretary, W8QNW, John Govier, 18670 Gilchrist, Detroit 35, Michigan. Current hams on WXYZ staff are: W8AM, CAT, IYT, GA, JOP, LZV, MMZ, NEC, OCF, PDK, QNW, VBJ, YFE, K8YFE, K8BGB, & K8BTY. President is W8CAT, Vice Presidents are W8LZV & W8PDK. Secretary and Awards Custodian is W8QNW.

QSL Card Economy

In September issue we told you about the "Continental QSL Club, Inc.," (see their ad in same issue) and program by which this club, for a membership fee of $3 per year, will provide free distribution of QSLs among members throughout the entire U.S. and Canada. As you know, our League has refused to provide this service within the continent, and even refused to handle QSL cards for SWLs under any conditions.

The services of the "Continental QSL Club, Inc.," are available to hams and s.w.l.s alike. For the club's service to be wholly successful, it will require thousands to become members. The OLD MAN already is a member and highly recommends the club and its services as worthy of your support. Once the club gets really going as it will . . . you will find you can save your membership fees in short order through postage saved.

As you know, the OLD MAN has been dickering with several promising sponsors of stock, economy QSL cards suitable for normal mass needs especially for contests and QSL Managers. First, let me congratulate Editor Joe Martin, the *Monitor* magazine, for his prior willingness to be sponsor in providing mass economy QSLs, and his later agreement that best hamdom interests would be served by the "Continental QSL Club, Inc.," providing such cards. Yep, there you have it. The club will make such cards available just as soon as all details and suitable formats can be worked out. Just be patient and we will bring you the whole story at later date. In the meantime, send in your $3 membership dues and let's give wholehearted

support to this club so the show can get on the road with best success for future. Don't forget, clubs may collect from members and remit only $2.75 each, thus putting the extra 25¢ in club treasury.

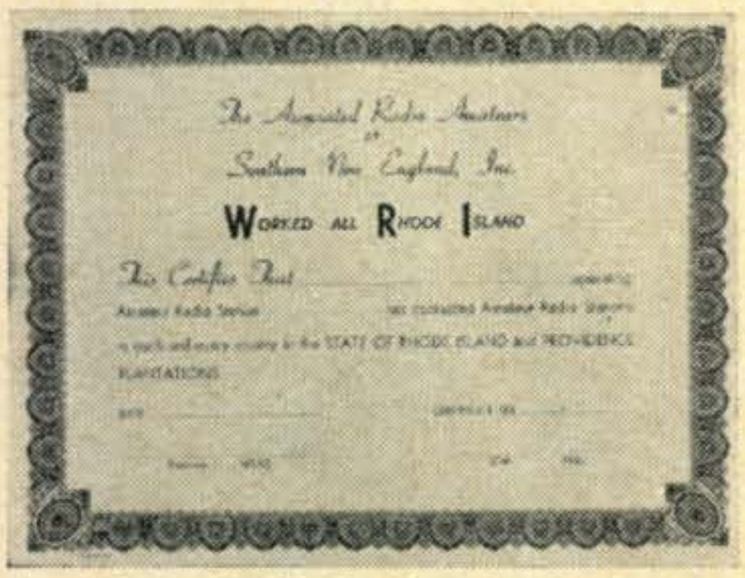
SWL DX QSL Bureau

Possibly clarification should be made for handling s.w.l. cards within and to the U.S. As stated elsewhere, s.w.l. QSL cards within and between s.w.l.s of the U.S. and Canada may be handled through the resources of the "Continental QSL Club, Inc."

As you know, the regular system of QSL Bureaus which accept only DX QSL cards for delivery to licensed amateurs within the U.S. refuses handling of SWL QSLs from DX stations.

So far as we can ascertain, as of today, the only QSL Bureau services available to U.S. s.w.l.s in receiving DX QSLs is through Leroy Waite, Editor, Amateur Section, Newark News Radio Club, 39 Hannum Street, Ballston Spa, New York.

A recent letter from LeRoy states, "please emphasize the s.w.l. QSL Bureau serves as a clearing house for QSLs sent direct in packets, or via DX QSL Bureaus, or by DX hams and s.w.l.s to W/K/VE s.w.l.s. While



Here is the Worked All Rhode Island award for working Rhode Island counties, sponsored by The Associated Radio Amateurs of Southern New England, Inc. W/K and VE/VO stations work two stations in each Rhode Island county; DX stations including KH6 and KL7 contact only one each county. Endorsements for all one band or mode or mixed. To get award, send QSLs, s.a.s.e. for their return, and list to Custodian, ARASNE, Inc., c/o Ed Radlo, K1LDX, 54 Kelly Ave., East Providence 16, R.I.

we have no affiliation with ARRL, they do cooperate by forwarding to us any DX QSLs for s.w.l.s which arrive by mistake at ARRL. Please also tell W/K/VE s.w.l.s that in order to obtain the s.w.l./QSL Bureau DX services they must file an s.a.s.e. with full return address plus s.w.l. call in upper left hand corner."

Commenting on U.S. s.w.l.s past plight, LeRoy had this to say, "Your continued efforts to have the ARRL take the many thousands of s.w.l.s under its wing is greatly appreciated. It does seem strange that in the U.S. with the largest number of amateurs in the world, the U.S. s.w.l. fails to receive any recognition whatever."

U.S. *Call Book* Good Will Program

Seems good will is the theme of this issue. It is about time the OLD MAN reminded you generous folks that we are sponsors of the *Call Book* Good Will Program. It works like this; publications the world over publicize fact that DXers may feel free to write K6BX to arrange gift of a replaced *Call Book* not over two-years old. Likewise, U.S. hams then write to K6BX asking for name of a DXer who has written for such a gift.

U.S. hams are much too smug and complacent in their high standards of living. They too often fail to realize that possibly 50% of all DXers cannot afford to purchase a *Call Book*. Have you ever stopped to think what your own predicament would be without a *Call Book?* Did you know that in many European cities and elsewhere, the only *Call Book* for many miles distant is in some public library?

Remember also that in most other countries *except* the U.S., one must be an s.w.l. before one can become a ham. Our files are full of DX s.w.l.s pleading for a *Call Book*.

We get many requests for about everything under the sun; however, our time and facilities are limited and we try to hold requests to *Call Books*. Every so often we get letters from folks that really deserve our help. Here is one from VU2GV, Sect'y Amateur Radio Club, VU2TT, QTH: B-139, B.E.L. Estate, Bangalore-13, India: "We have read about your *Call Book* good will program in *CQ*. You are so kind. Ours is a small club formed a year ago with 25 members of which only 10 now have their licenses. Financial resources of our club and members are very meagre. We cannot afford *Call Books* so please help us. We are also desirous of accumulating a ham library of old books and literature donated by well wishers . . . if you have any friends who would be willing to help us, please pass our QTH along."

We are taking care of their *Call Book* needs folks but how about a few appropriate books and literature for these Indian lads? How about those books you haven't cracked a page in . . . in ages . . . send them along and you'll sleep better tonite. . . . Okey!

What's Cooking Department

Got so many goodies stacked up in the pantry these days just don't know what we should brew up next. Maybe we'd better whet your appetite and let you enjoy pot luck.

We appreciate all the letters you good folks have been sending along . . . even a few pot shots at the OLD MAN. Files are bulging at sides and we had to make more room. Been doing all our work, publications, printing and whatnot in our small 12 × 14-foot ham shack. By time you read this we will have added an office room to the shack getting ready toward time we'll be forced to hiring a full-time secretary to help with the mountains of mail and heavy administrative work load.

While we were overhauling files, we were saddened by fact about half of sponsors for U.S. and Canadian awards have so little on the PR ball they haven't sent along samples of their certificates together with interesting news materials about locality or city. We like to keep this back-ground material on file because as other events break, it frequently is pertinent and good timing to introduce supporting material. Those of you who might have fretted because we don't seem to ever get around to picturing your club's award, might collar your secretary to find out if he ever sent materials to us. It is a 50-50 chance he hasn't. Public Relations is something one has to work at constantly . . . it just doesn't fall in one's lap by chance. We continually suggest the most important officer in any ham club *could be* a club's PR representative.

You've seen a few examples of PR job the OLD MAN can do for you if you provide basic news and picture materials. So keep us informed about "What's Cooking" so we can help you get better publicity for hamdom activities.

Thanks for listening . . . be back next month to help you good folks wind up another highly eventful hamdom year . . . 'til then,

73, The OLD MAN, K6BX

Above is pictured the *Mark Twain* Award sponsored by the Northeast Missouri Radio Amateur Club, 212 Bird Street, Hannibal, Missouri, for working five members. Apply with list only (no QSLs) showing full log data and handling fee of 50¢.

NOVICE

WALTER G. BURDINE*, W8ZCV

DID you ever count the reasons that persons interested in amateur radio gave for not getting a license? And how did they come by that reasoning? Did you fall for their line of reasoning? A lot of future amateurs are missing the pleasure of being on the air because someone that knew absolutely nothing about amateur radio told them that it cost a lot of money, took a lot of space, and that you had to have a farm to put up an efficient antenna system or that you had to be either a nut or a brain to be a good ham. A lot of us take anything we are told as the Gospel truth regardless of the veracity of the informer, but sometimes we should check to see what we are being sold. Do your own investigation; see what you are missing and why are you missing it.

Nets

The Minnesota Novices and some Generals have started the Minnesota Novice Net (MNN) and it has been going strong for about five months. The net meets at 1930 Minnesota Time on 3725 kc and welcomes all Novices interested in traffic handling and gaining c.w. experience. The net is registered with ARRL and information about the net can be obtained on the air or by writing direct to Nick Alex, KØJFJ, Net Control, MNN, 712 Third Street N.W., Rochester, Minnesota.

I will list any Novice nets in our column if you will send the information to Walter G. Burdine, W8ZCV, Waynesville, Ohio. This is a service of your column and will help those needing code practice to get the General.

Antennas For Crowded Locations

Joseph A. Smith, W9ZDN, Jacksonville, Illinois sends in this idea and I hope it helps some one to get on the air. Joe says necessity is often the mother of invention, so when a new neighbor moved in next door and wouldn't let him use the lot next door, Joe solved his problem this way:

"The simple Windom attic antenna described is identical to the out-door version which has been successfully used here for over two years. Indoors it seems to load up equally well and is working out, so we are not losing sleep over the possible removal of the outdoor antenna.

"The house has an attic window almost directly above a basement window. Therefore, the off-center antenna feed point will fall above and as near this attic window as possible permitting the single wire feedline to pass out the window. It then travels downward into the shack through the basement window. Feedthrough strips or a window feedthrough panel can be used to bring the antenna into the basement.

"Since our 75 meter phone band Windom here is 120 feet long overall and is fed off-center at a point exactly 40 feet from one end with its single wire, one end requires twice as much length in the attic as the other. See fig. 1.

"In our case, about 15 feet of the longer end had to be folded back on the wall at the far end, but since radiation is so small at this point this seemed to make very little difference.

"The feed-line is a suitable length of 600 volt insulated single conductor type line such as is sometimes used in house wiring. The feedline is tightly connected to the antenna at the feed-point and well soldered and runs out the window to the basement and a parallel type antenna tuner.

"Does it work? *Yes!* It may not be the DXer of the outdoor version, but it will keep you on the air with a respectable signal. Your antenna can be made of copper coated fence wire or any type of copper wire that you have because it is indoors and protected from the weather.

"While we do not use a ground with our antenna system and tuner, it is still a necessity with the receiver and rig of course. Our ground wire is only 15 feet long. 73, Joe, W9ZDN."

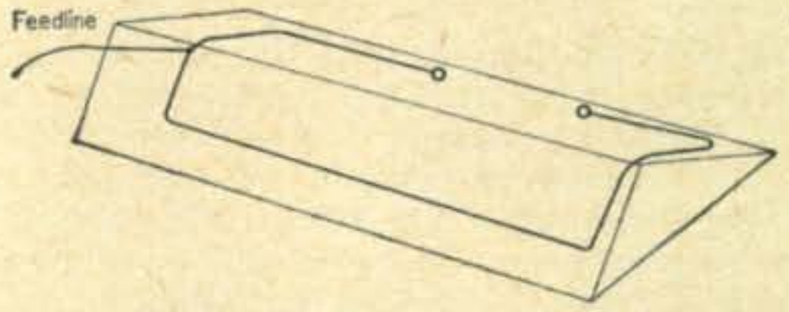


Fig. 1—A simple 80 meter indoor antenna system that will fit inside a 40 foot long attic. The single wire feedline is coupled to the transmitter through an antenna tuner and may be of any length.

Letters

Darcy Vieira Mayer, PY1BRL, Rua Alan Kardec, 50 casa 26 Engenho Novo, Rio de Janeiro, Brasil writes: "Dear Friend Walter: I have in my hand the copy of *CQ* for April 1962 where I find a very interesting article about converters. But in winding the coils I find that this resonant frequency is too high. I am using the National XR-50 coil forms. Can you give me the correct resonant frequency (maximum and minimum) of the coils?

"Is it possible to use the converter on other bands, if so how about information on coils and the resonant frequencies?

"My grid-dip oscillator is a home made one as I built from the article by Clayton, W6WB, in the CQ *Anthology*. Here, at Brasil, all the instruments are very expensive.

"As I am an amateur, I am always waiting for news, especially that from American amateurs, for whom we have a great deal of admiration.

"You may be sure that your first effort as Novice

*R.F.D. 3, Waynesville, Ohio.

editor is very much appreciated amongst the Brasilian hams and we are waiting for articles in the near future, most especially in the field of s.s.b.

"Thanks in advance and good luck Walter. 73 from your Brasilian friend. Darcy Vieira Mayer, PY1BRL."

Thanks Darcy for the letter and I wish you the best of DX with the converter.

It has been said that variety is the spice of life, here is our spice. An Aerogramme from S. Javad Mesbahi, P.O. Box 153, Shiraz, Iran was delivered in 6 days from postmark and give some of us a way to help prove that hams are the nicest folks in the world.

"Dear Mr. Burdine: Perhaps a letter from EP-land, Iran, will come as a surprise to you. I will tell you now what it is all about.

"I am a student at Shiraz University and am greatly interested in electronics and amateur radio. I have been interested in these subjects for more than 10 years. I know a great deal about amateur radio and know the code, too. My speed is about 15 words per minute in English and 25 w.p.m. in Persian. I have been a radio-electronics experimenter and an s.w.l. for a long time. It is much to be regretted that P.T.T. has not issued my license up to now. It needs some push, I believe. Won't you ask those few Iranian Amateurs to help me in getting my license?

"Another problem is that I cannot get any ham equipment, parts, books, magazines, *etc.*, I need a call-book too, but cannot get it. Won't you please pass this note on to anybody who might help me with these and in return I can send some pictures, stamps, books, magazines, *etc.*

"I am very much interested in corresponding with American hams or anybody that might be interested in Iran.

"Well, that is all for now and I had better close and say good luck and 73 to you. Sincerely yours, Javad Mesbahi, who sends you many good wishes."

I hope that some of the fellows that have too much radio gear can help Javad with his problem and I will write and ask what is the best method of delivery for parts to foreign amateurs.

A letter marked ON ALERT, Lincoln AFB, Nebraska proves that *CQ* is being read by many people and under all kinds of circumstances, and that it is helping a lot of people in many ways. I'm thankful for that, and wish that we could help more, but I guess every little bit helps.

1st/Lt. T. H. Latham, 2928 North Cotner Blvd., Lincoln 7, Nebraska says: "Dear Walt: I just picked up a copy of *CQ* to while away a couple of hours here at the alert shack.

"Since I'm embarking on my Novice studies I thought I'd pay particular attention to your column. I must say that in terms of chronological age, my 27 plus years makes me feel sort of old after reading about kids like Ann Partridge and Alan Kellogg. However, believing that you *can* teach an old dog new tricks I will venture to say you'll be hearing me on 20 in about a year.

"We have quite a few crew members here at Lincoln who are amateurs and always willing to help an interested Novice.

"I will be looking forward to reading more of your comments to aspiring hams in *CQ*. 73, T. H. Latham."

Good luck, keep us informed and I'll be looking for that 20 meter QSO, just don't let me down and I'll keep going as long as *CQ* will print our material and as long as you keep reading and writing.

Alec A. Hugh, 38 Brentford Road, Kingston 5, Jamaica, West Indies writes. "Dear Walt: Long before I started a subscription to *CQ* I read the Novice column with great interest. I have been in this great hobby for about four years with no particular interest in awards, in the past year I have been digging into the various activities of amateur radio and have decided to try for a few awards. I think I should like to get WAS and some of the other awards. I have worked 40 countries and 38 states. I need Arizona, New Mexico, Delaware, North and South Dakota, Nevada, Idaho, Wyoming, Alaska, Hawaii and Montana. I would like to sked anyone needing Jamaica, West Indies for a new country.

Gary Leff, WA2RUH, 2336 Batchelder Street, Brooklyn 29, New York must run low power and use an indoor antenna but is having a wonderful time talking to locals. His dad is also a ham. Gary uses a 5763 in the final and has worked about 100 hams since May 16.

"Keep up the good work in *CQ*, we need it. 73, Alec."

Alec you forgot your call, dog-gone-it-any-way. I guess if you want to work Jamaica you can write to Alec and arrange a sked for a new country.

Carl Jones, 814 North Stevens Street, Thomasville, Georgia writes, in part: "Dear Walt: Some time ago I wrote you a letter inquiring about a code machine, well I finally rented one for a month and two weeks ago I took the Technician exam and I am now waiting for my license. I passed the test at ten words a minute. I am still working for the General test and that 13 w.p.m. plateau.

"When I do get my ticket, I will be on 6 meters operating a Globe Scout, a Hallicrafters S-53-A with a converter. I have a straight key and a very good set of headphones. I would like to purchase a vertical antenna (Gotham V-80).

"I have just finished college and I am very much interested in ham radio. I hope to see you on 6. 73, Carl."

Carl, your station will do a good job of working out if it is operated as I know that you will operate and I wish you the very best of everything and many operating awards.

Help Wanted

If you are in need of help with some problem in getting your license, just write to me and I will include your problems in the help wanted section of NOVICE and undoubtedly you will get some offers of help. I want to thank those amateurs who have come forward to offer help and to the countless hams that have taught code classes in the Y, the local radio clubrooms and those that have helped other aspiring hams in their own home. I think that this is one reason that makes America big, we are always willing to help those less fortunate than we. Well, maybe not *always*, but *almost* always. Anyway, thanks fellows and gals. Those needing help this month are:

Don Ardrey (Forgot his call) R.R. 3, Dundee, New York. Don needs help in getting his general license.

Thomas Monahan, WV2ZWE, 201 Chatham Avenue, Paterson 2, New Jersey can use some help or information on converting his DX-20 to six meters.

J. A. Triplett, 114 Elm Street, Marblehead, Massachusetts would like to know if there is a club or organization near-by that holds code and theory classes for the beginner.

A *real* ham, Bill Ham, WAØACI, Box 396, Sherburn, Minnesota would like to know if there are any Novice nets operating within his neck of the woods.

Jeff Angelo, 135 Columbus Place, Roselle Park, New Jersey needs help from a local ham to prepare for the exam. He is 13.

[*Continued on page 174*]

RTTY

BYRON H. KRETZMAN*, W2JTP

RTTY Operating Frequencies

Nets centered on frequencies given; operation usually ± 10 kc.

80 meters	3620 kc
40 meters	7040 kc
20 meters	14,090 kc
15 meters	21,090 kc
6 meters	52.6 mc

POLAR relays for radioteletype are very useful devices if they have been properly adjusted. Much has been written in the *New RTTY Handbook* and in this RTTY COLUMN on how to adjust them, but we still hear RTTYers sending with large amounts of telegraph bias (making them difficult to copy) simply because a polar relay is out of adjustment. Other fellows have had trouble trying to use them in a receiving converter or terminal unit (TD). Contact noise, which can be eliminated by proper filtering, has been another problem when a polar relay is used for receiving.

*431 Woodbury Road Huntington, New York.

It has been our experience that most electronic keyer circuits in TU's have been complex and hard to adjust for minimum telegraph bias when compared to the polar relay. That is, up until we saw Phil Catona's little black (actually grey) box, designed to key the receiving selector magnets of a Teletype machine set up for either 20 or 60 ma.

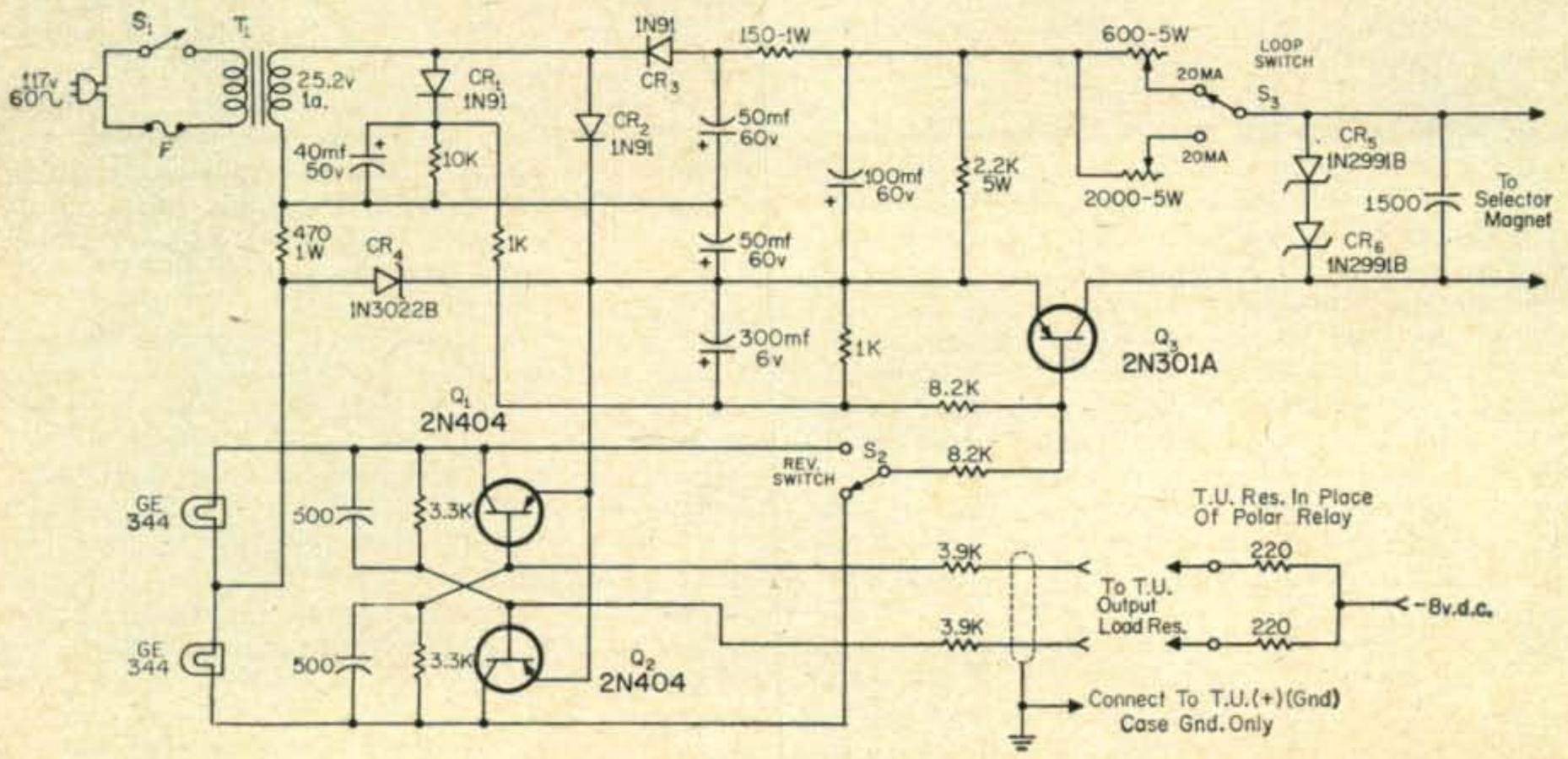
W2JAV Selector Magnet Driver

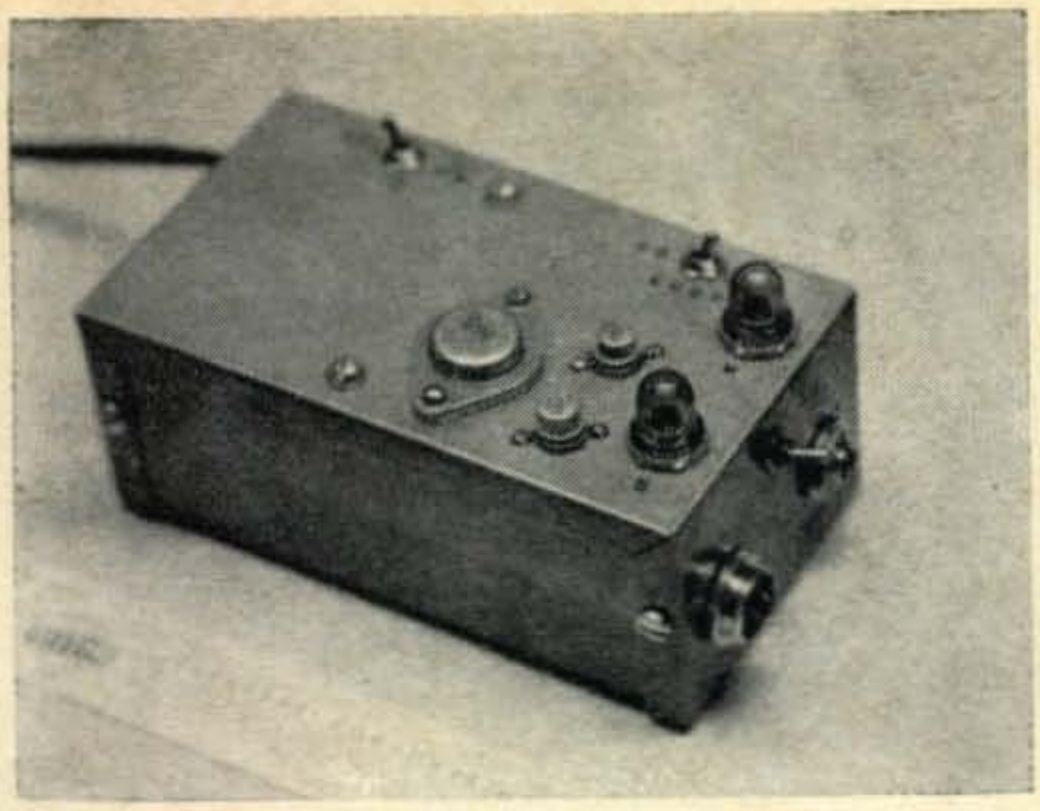
Phil's electronic keyer was designed to operate from the W2JAV Transistorized Polar Terminal Unit which was described in the February 1962 RTTY COLUMN in *CQ* and on page 107 of the *New RTTY Handbook*. A pair of 220 ohm resistors is substituted for the polar relay coils usually connected to the TU. The electronic keyer, or to be more accurate, the selector magnet driver, is powered from the 115 volt a.c. line. No 120 volt d.c. local loop supply is required; the driver directly operates the selector magnets. In other words, the receiving red plug from the machine plugs right into the driver unit.

The Circuit

Figure 1 is the diagram of Phil's transistorized selector magnet driver. Two RCA type 2N404 p.n.p. transistors, Q_1 and Q_2, are connected in a "flip-flop" circuit. This circuit is "flipped" from the *IR* drop across the TU 220 ohm dummy load resistors that replace the polar relay. Output from Q_1 or Q_2, depending upon the position of the reversing switch S_2 controls the keyer or actual "driver" transistor Q_3, an RCA 2N301A, which has the selector magnet coils in its collector circuit. Notice the two Zener diodes, CR_5 and CR_6, type 1N2991B, connected back-to-back across the selector magnets. These can be almost any 35 to 40 volt Zener diodes. They really square-off the pulses going to the driver. The 1500 mmf capacitor

Fig. 1—W2JAV Selector Magnet Driver





Phil Catona's Transistorized Selector Magnet Driver. This is designed to replace the polar relay used with the W2JAV Transistorized Terminal Unit described in CQ for Feb., Page 85.

eliminates any possible r.f. radiation from the steep wave-front of the pulses. Loop current is adjusted to the desired value by separate pots for 20 or 60 ma, depending upon the position of the loop switch S_3.

Power for the transistors, and incidentally for the selector magnets, is provided from the transformer T_1. This is a Stancor P-6469 rated at 25.2 volts and 1.0 amp. Suitable surplus transformers giving around 24 volts can also be used. 1N91 diodes CR_2 and CR_3 are connected in a voltage doubler circuit that provides almost 60 volts for the collector of Q_3 through the selector magnets. Another 1N91, CR_1, with its own filter circuit, is used to supply a positive bias to the base of Q_3. Half of the voltage doubler circuit in conjunction with Zener diode CR_4 is used to provide regulated 12 volts d.c. for the flip-flop, Q_1 and Q_2. CR_4 can be any 12 volt Zener with a minimum rating of 1 watt, such as the 1N3022B.

Construction

The complete transistorized selector magnet driver is built into a Mini-box about 5¼ × 3 × 2⅛". The front end has the jack for the red plug of the machine, a connector for the circuit to the TU, and the miniature reversing switch. The top of the box mounts the 2N301A power transistor, insulated from the box by a thin mica or mylar sheet; sockets for the other two transistors; the on-off and miniature loop toggle switches, and the two pilot lamp holders. It isn't necessary, of course, to use these fancy holders for the GE344 lamps. Rubber grommets just big enough to tightly grip the lamps can be used, and connection can be made by soldering right to the lamps.

Adjustment and Operation

The nice part of Phil's design is that the initial adjustment consists only of setting the selector magnet current to the proper value. This is a "screwdriver" adjustment and need be made only once for the machine you are using. To set up, a *mark* signal of 2125 cycles should be fed to the TU. The reversing switch S_2 is then thrown to the position that causes the loop current to flow. Set the loop current. A *space* signal of 2975 cycles then should cut off the current to the machine. That's all. Simple, isn't it?

With an RTTY signal properly tuned in, the two GE lamps should merrily flash back and forth, one indicating *mark* and the other *space*. It takes only a little practice to use these flashing lamps as a tuning indicator.

The Technician and 6-Meter RTTY

A recent blast from W1UHE of Tiverton, Rhode Island, informs us that he has been working f.s.k. between 50.1 and 52.5 mc, and that it is quite legal. Our listing on page 144 of the *RTTY Handbook* is therefore in error as only A2 is listed. Section 12.111 of the FCC Rules & Regulations, papagraph (h) reads, ". . . 50.1 to 54.0 mc, using types A2, A3, A4, and narrow band FØ, F1, F2, and F3 emissions." The phrase "narrow-band F1, F2, and F3" is defined in Section 12.114, paragraph (c), "The use of narrow band frequency or phase modulation is subject to the conditions that the bandwidth of the modulated carrier shall not exceed the bandwidth occupied by an amplitude-modulated carrier of the same audio characteristics . . ."

Norm tells us that there are hundreds of good machines in the hands of technicians and that many are not aware that they can use f.s.k. from 50.1 mc and up. W1UHE frequency-shifts a crystal oscillator into a Seneca and has copied Arkansas and Boston (low-power) on f.s.k. Norm also suggests that an f.s.k. "national" frequency be established between 50.1 and 51.0 mc. Any suggestions? Drop us a card, will you?

On the Bauds

W1OHF in Norwalk, Conn., is on 80. K1NNC, Unionville, Conn., sends East Coast bulletins every Friday night on 3620 kc at 8 P.M. W2EW, traffic man of Brooklyn, N.Y., gave a talk on handling traffic by RTTY. W2LNP, pioneer amateur TVer of Brookville, Long Island, is on 20, RTTY with a model 15. W2GHR of Manhasset, L.I., is readying his f.m. 6 and 2 meter automatic repeater system for 52.6 mc RTTY.

W3MUA of Damascus, Maryland, is on 80 with a Model 15 and a 3-transistor TU. W4-MGT of Lexington, Kentucky, is doing lots of experimenting with 170 cycle shift. W4QVL of Lynchburg, Va., is on 80. W4FGE of Chattanooga, is building the W2JAV a f.s.k. oscillator. K5CHC of New Orleans, has a Model 15 and an FRA converter. K6ZBL of Oakland, Calif., is the new Secretary-Treasurer of NCARTS, Inc. They will soon have some Model 26's available. K6ESZ is transmitting NCARTS bulletins the first and third Thursdays on 3620 kc and 146.475 mc at 7:08 P.M.

W7TVM of Toledo, Oregon, is building the W2JAV tube TU. W7DQT of Lebanon, Oregon, has a Model 26 for sale for $65 and a Model 15 for $85. K8JTT of Grosse Pointe Woods, Mich., is on with a Model 15 and an HX-10 Marauder. K9BFU of Addison, Ill., has built the transistorized TU and a f.s.k. oscillator of W2JAV to work with his Model 15 and VF-1. KØLIX of Red Wing, Minn., is on 20 with tape for traffic. WØRX is also operating on 20 from Grand Junction, Colorado.

KL7CAT is leaving Anchorage, and is driving to Texas to relocate there. XE1YJ was heard on 20 working K4PJJ. I1RIF was heard September 3rd testing on 20 using a ground plane antenna on top of a 34 story building in downtown Milan. VK3KF made WAC on RTTY. (Certifications for WAC-RTTY issued by RTTY, Inc., the RTTY Society of Southern California via W6CG.)

Comments

Just one short, quick, question: How come we (here in the east) never hear any RTTY on or near 7040 kc on forty meters?

73, Byron, W2JTP

YL

LOUISA B. SANDO*, W5RZJ

CONGRATULATIONS to the newly elected officers of the Young Ladies Radio League who will serve during 1963. The president, K6OQD, Jean Kincheloe, is known to all, for during the past 3 years she has been YLRL's treasurer, she compiled the 1961 YLRL *Directory*, and has been YL editor for *Western Radio Amateur* magazine. Licensed in 1955, Jean operates 2, 6 and 10 through 80 meters. She has several Public Service Awards, BPL medallion, Grand Master Traffic Handler's certificate, CHC (1st YL) and many other certificates and appointments. Jean and her OM, K6OQC, share the hobby of radio controlled model planes, but their latest and biggest interest is their jr. YL, Kathryn Jean, born in July.

Vice president K1IZT, Blanche Randles, also is no newcomer for during 1961-62 she served as secretary of YLRL. For the past year Blanche has been treasurer of the Framingham (Mass.) R.C., and she is certificate custodian for WRONE. She holds WAS/YL and YLCC with 5 stickers and many other certificates. She operates all bands 80 through 2 at home QTH and summer camp in N.H. Her OM is K1HTK and they have one jr. YL aged 16.

Newly elected secretary is K7MRX, Fran Bailey, of Moscow, Idaho. Fran and her OM, K7LDK, got their licenses in 1960, some 25 years after they originally became interested and started to learn code after receiving as a wedding gift a Zenith receiver which included the short waves. Again in '46 the bug bit but they became too busy with Doc's veterinary practice. In 1959 when they became interested they knew they'd stick with it. They operate all bands, 75 through 10. The main rig is an HT-37 with Viking Thunderbolt and an HQ-170 receiver. In her kitchen Fran operates a Viking Ranger and an HQ-100. She enjoys contests (top 7th district score in both the YLAP and YL-OM contests in '61) and just plain ragchewing. She also handles traffic on the Treasure State net, and holds CHC. Fran and Doc have two jr. ops—a YL aged 17 and a boy 16, who is now a Novice. Fran also is national secretary of the American Veterinary Medical Assn. Auxiliary, secretary in DeMolay Mothers' Club, on executive council Jobs Daughters, secretary for Daughters of the Nile, active in church work and does professional typing.

Treasurer Shirley Rex, K8MZT, was written up in this column in *CQ* for Jan. '62, p. 86. She was licensed in 1960; OM is K8MZS. Shirley is a member of Chix-on-Six, the Canton (Ohio) ARC, the Buckeye Belles, and is chairman for the 1964 YLRL International Convention. She now has a KWM-2 mobile and a new 15 ft. trailer and about the time you read this will be mobiling in New England and looking for a high spot to operate during the YLRL A.P.

District Chairman serving YLRL during 1963 will be: K1GSF, Peggy; W2IQP, Lillian; W3AAU, Edith; K4RNS, Marge; W6QYL, Martha; K7JPI, Betty; K8-MQB, Alice; K9JJS, Marion; KØMAS, Elizabeth; KH6AFN, Jeanette; VE5DZ, Ebbe.

Effective January 1, K1EKO, Edie, will be editor of *YL Harmonics*. Send news to her for the Jan.-Feb. issue.

*4417 Eleventh St., N.W., Albuquerque, N.M.

K6OQD, Jean Kincheloe, YLRL president for 1963, with 9-day old Kathryn Jean.

YLRL A.P.

Still time to get into *the* YL contest of the year. Phone section of the YLRL Anniversary Party will be held Nov. 7-8 (c.w. section was Oct. 24-25). Check rules in October *CQ*.

YLRL Convention

In 1964 the Young Ladies Radio League will celebrate its 25th anniversary! This momentous occasion will be marked by another International YLRL Convention, the 4th to be held since 1955. The Buckeye Belles of Ohio will be hostess, and K8MZT, Shirley Rex, is convention chairman. Definite date and place are still to be decided, but in the meantime start saving your dimes and dollars for a trip to Ohio in June, 1964!

All-Ham Family

Hamdom can well be proud to number in its ranks the all-ham Ryden family of Birmingham, Mich. Ken is K8OHG, Mary is K8ONV, and their jr. YLs are Sally, K8ONW, and Alicia, K8RBB. Ken and Mary had never met a Ham when in '59 they decided they needed a new interest and put together an AR-3 receiver kit. While listening to this they biult a DX-40, and after a couple of weeks with the *License Manual, etc.*, Ken, Mary and Sally passed their Novice exams. In July, Mary and Sally passed General and they




The all-Ham Ryden family of Birmingham, Mich. L. to r., Ken, K8OHG; Mary, K8ONV; Sally, K8ONW, and Alicia, K8RBB.

invested in the Collins S-line. In Aug. while Ken and Mary were on a week's business trip Sally taught Alicia (then 11) the Novice theory and code up to 12 w.p.m. In March '60 both Ken and Alicia got their Generals.

Sally, age 18, is now in her second year at the U. of Michigan Honors College in pre-med. She graduated first in her HS senior class of 665, is a National Merit Scholar, and a member of Alpha Lambda Delta, honorary freshman sorority. She keeps twice weekly skeds with her family from the dorm via 75 s.s.b. Alicia, now 14, is in the 9th grade. Last year she was an A student in a special honors eighth grade class taking Algebra, Latin, *etc.*, with which she is continuing. She still finds time for Hamming and received DXCC last spring.

Mary says Ken is wonderful to help and encourage all his YLs, giving them special Ham gear for birthdays, *etc.* Last March he was chief c.w. op on the VP1WS DXpedition, and now is interested in RTTY. Mary loves to chase DX, on c.w. and s.s.b., and has well over 200 countries for DXCC; 150 on s.s.b. She has been QSL manager for HKØHCA, YNØNZ and VP1WS DXpedition. They use a 32S-1 and a 75S-3, a Mosely TA-33 and VP-40 on 40 m. and an inverted V on 80. They also built a "Twoer."

WRONE Luncheon

The annual WRONE fall luncheon will be held this year on November 3 at the New Hampshire Highway Hotel in Concord. For the first time OMs of members are invited. Co-chairmen are K1NZK and K1OGU, and serving with them are K1's PCZ, JFQ, SLS.

Now is the Time . . .

For all good Hams to come to the aid of their MYLs, and order the SW (Sweet Wife) a copy of *CQ YL* in time for Christmas (or vice versa). The one and only book devoted to telling the story of YLs in Ham radio, it contains 18 chapters, over 500 photographs. Order from W5RZJ (QTH at head of column); cost $3, postpaid.

33, W5RZJ

K1IZT, Blanche Randles, YLRL V.P. for 1963.

YL NETS

Day	*Time (EST)*	*Freq. (mc)*	*Name*	*NCS or Mgr.*
Mon.	0830	3.900	Buckeye Belles, phone	K8MZT
	0900	7.225	Floridora	K4JZX
	0900	3.920	U.P. Mich. YL	Rotates
	1100	7.235	Loaded Clothesline	KØGAS
	1300	50.4	Ind. Mich. Petticoat Sisters	K9YIC
	1430	3.738 & 3.744	Buckeye Belles, c.w.	WN8AOK
	1800	3.890	Oregon YLs	W7HHH
	2300	50.56	BAYLARC (6m)	K6SZT
Tues.	0830	3.900	Blue Ridge	K4CZP
	0830	3.940	Jayhawker	KØHEU
	0900	7.215	Floridora Lower SSB	W4UF
	0930	145.26	Buckeye Belles	K8NQK/ K8WDZ
	1000	50.33	Floridora, Southern	K4ACF
	1300	50.4	IMPS	K9YIC
	1400	3.910	Hawk Roost	K9ILK
	1000	3.820	No. Star YLs, a.m. or s.s.b.	Rotates
Wed.	0830	3.900	WRONE, Yankee Lassies	K1LCI
	0900	3.900	YL Welcome	W8ATB
	1000	7.278	Buckeye Belles, c.w.	K8TFG
	1100	7.123	So. African Women's Radio Club, Housewives	ZS5BP
	1130	7.100	Loaded Clothesline, c.w.	KØGAS
	1300	7.260	Buckeye Belles, Phone	K8ITF/ W8HWX
	1300	50.4	IMPS	K9YIC
	1400	50.65	WRONE (6m)	W1HOY
	1400	14.280	YLSSB	Rotates
	1400	50.7	Chix on Six, Phone, Akron Area	Rotates
	1600	3.950	G.P. Roundup	K4RHU
	2200	146.1	LAYLRC	K6BUS
Thurs.	0900	7.270	Friendly Forty	W3UUG
	0900	7.260	Georgia Peach	K4KIH
	0900	3.880	TYLRUN	K5BNH
	1130	7.235	TYLRUN	K5BNH
	1300	14.277	Floridora Int'l	K4ICA/
	1400	14.240	DX, Upper s.b.	KP4CL
	1900	50.64	Tangle Net	KØEPE
	2000	50.7	Buckeye Belles, Columbus Area	W8LGY/ K8CEN
			Buckeye Belles,	K8SOU
Fri.	0830	3.600	Cleveland	
	1300	50.4	WRONE YL c.w.	K1IJV
Sat.	1300	3.845	IMPS	K9YIC
Sun.	0900	7.225	BAYLARC	W6BDE
			Floridora Business Girls	K4UIZ
	1700	3.940	Jayhawker	KØHEU

The above list of nets was compiled by the YLRL vice president's committee. If there are any additions or corrections, please send net information to YLRL V.P. K2JYZ, Lillian Byrne.

Here's the rig you've been waiting for — Clegg's new THOR VI Transceiver for 6 Meters. Astonishing performance... Priced right!

Fixed station or mobile, this little power package reflects all the advanced engineering and design features that have made CLEGG the "most wanted" gear in the VHF field.

Talk about performance . . . listen to this: **Fifty solid watts** on both AM and CW; high level modulation with full speech clipping to give you famous CLEGG "Talk Power"; true transceiver operation with tuneable oscillator in the receiver serving as the VFO in the transmitter; provision for keying the transmitter.

A low noise double conversion super-heterodyne receiver complete with BFO and ANL provides maximum selectivity and sensitivity with stability equal to the exacting requirements of SSB and CW; separate power supply/modulator for 115V AC operation. A fully transistorized power supply/modulator for 12V DC available soon.

And best of all, this rig is priced at a level that every ham can afford. Place your order with your distributor today. Deliveries start late in November.

And here's one for you VHF sidebanders!

It's the new CLEGG VENUS six meter transceiver for SSB, AM or CW! Once you've used or heard this rig you'll appreciate the engineering and design "Know-how" that made it possible.

Here's what you can expect: A superbly engineered crystal lattice filter, SSB transmitter of greater than 120 watts PEP input; amazing frequency stability, VFO controlled by the receivers tuneable oscillator; full power input on CW and a substantial signal on AM phone. There is also output provision to drive a KW linear final.

In the receiver section a double conversion, low noise super-het of extreme sensitivity and selectivity, with crystal lattice filter and product detector provides flawless reception of sideband, AM phone or CW. A 115V AC power supply of adequate capacity is a separately mounted unit which can be installed at any convenient distance from the transmitter.

This rig, too, is priced within reach of every ham. Watch for it at your distributors late in January. Place your order now to be sure of early delivery.

And here's a winner and STILL champion in it's class! The famous Clegg 99'er, six meter transceiver favorite of thousands of VHF hams is small in size, low in price and tops in performance.

The 99'er offers operating features unequalled in far more costly gear. The double conversion super-het receiver provides extreme selectivity, sensitivity and freedom from images and cross modulation. The transmitter section employs an ultra-stable crystal oscillator which may also be controlled by an external VFO. An efficient high level modulated 8 watt final works into a flexible PI network tank circuit. A large S meter also serves for transmitter tune-up procedure.

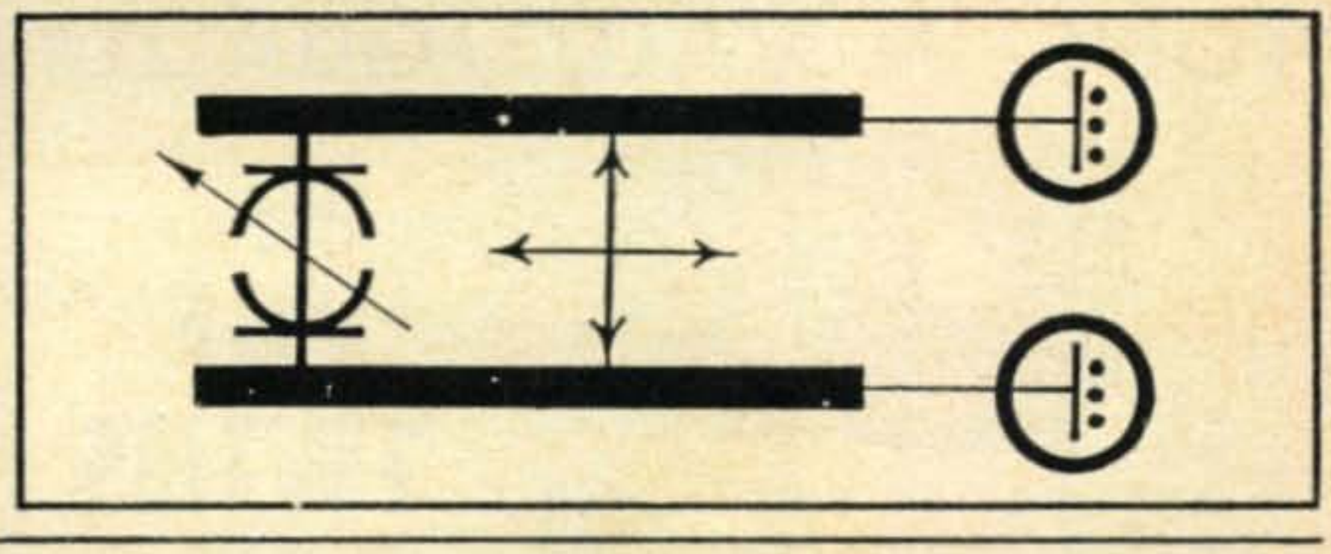
Clegg LABORATORIES

OAkwood 7-6800

506 Route 53, Mt. Tabor, New Jersey

Vol. 4, No. 11—November 1962

VHF AMATEUR



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DEPARTMENTS

STAFF

Address all correspondence to: The VHF Amateur, 300 West 43rd Street, New York 36, New York. Telephone: JUdson 2-4460, extension 8.

For further information, check number 8, on page 181

Editorial . . .

WE ARE pleased to present this month our first joint effort with *CQ* toward presenting the best in v.h.f. to the fraternity. For many readers this will be the same publication they have enjoyed for years, but incorporating a new format and presentation.

Introduction

To those of you who are new to our readership and possibly not acquainted with our purposes, let us delve for a minute into what might be expected on these pages in the future. Our basic concern is with the very high frequencies in our amateur spectrum. These bands contain, we feel, a select group of radio amateurs with a common interest; that of attaining the utmost enjoyment out of their hobby. For the most part, these are people like you and I who seldom stray from their beloved group, be it on 6 meters, 2 meters, or what have you. This is where the most informal, pleasant ragchews occur; the making and meeting of new friends, and a certain relationship with one another that can never quite be put into words. It is, perhaps, an indescribable feeling of kinship, the same fraternalness that results in massive gatherings whenever word leaks out that a hamfest has been planned. If you have ever operated one of these bands, you know what I'm talking about. Here is a place where most everyone finds his home: DX men, experimenters, sidebanders, contest enthusiasts and just plain talkers. Here are found the old timers who have tried all that the sometimes hectic world of amateur radio has to offer and wound up on the more peaceful very high frequencies. Here are found newcomers to the art, men and boys spending their first long-awaited moments on the air. Here is a group almost completely without class distinction where all are one and one is all. Here are a happy lot; people from all phases of life, many with specialized interests . . . Here is the heart of v.h.f. . . . Here also are the people that provide the pulse and tempo of *The VHF Amateur*.

We believe that contributions from our readers constitute a fair cross section of this vibrant group. Just as the essence of v.h.f. is free thought and comment, we receive letters and articles written much like one side of a typical Friday night QSO, with perhaps a bit of the other side thrown in for spice. Just as many operators are heard relating their latest DX accomplishments, so goes our DX REPORT, and, generally speaking, the rest of the magazine. What we publish is what v.h.f. "bugs" seem to enjoy. We have tried to tap just a bit of this pulsing enthusiasm we find when tuning the band. Presented on these pages you can expect articles on construction, propagation, theory, c.w., s.s.b., DX, activities, u.h.f., commentaries and good old fashioned sound offs. The next time you seat yourself in that familiar chair and turn on the receiver, pay particular attention to the subjects under discussion as you tune. Not much similarity between them, is there? Undoubtedly you will find these amateurs talking about the topic that interests them the most, probably one of the fields just mentioned.

Participation

If you don't find here what interests you, we want to know. We aim to please even though we sometimes fall far from the proverbial bullseye. Our contact with you is what shapes these pages; if you don't like it, it is remolded. A number of old-time *VHF Amateur* readers know what I mean; our face has changed much since the original institution of the publication a little over four years ago. The book had one period, for example, when a reader who neglected buying his copy for two months commented that he didn't even recognize the magazine when he later visited the local radio store. (He did mention, however, that he thought the change was all for the good). Such is the history of this small publication. It is specialized only in its major concern, the very high frequencies.

Staff

Our editorial content will remain much the same as it has in the past with the possible exception of the VHF SSB and DX REPORT columns. With this edition we proudly introduce Bob Heil, K9EID, s.s.b. enthusiast extrodinair, to take the helm of our much expanded column. Let's extend a cordial welcome to Bob, and give him the cooperation he deserves. In the months ahead you will notice two names on the masthead of the DX REPORT column; that of Daniel Parnes, WA2DMQ, and myself. Due to our now expanded circulation and the many long hours of compiling reports and answering correspondence involved, the two-man team appears to offer the best possibilities.

We welcome your comments on this our first combined issue with *CQ*. Our foremost interest is you, the reader. We invite criticism—also cures. One letter can noticeably change next month's edition. Feel free also to present your views and comments on anything you feel concerns v.h.f., whether it take the form of a commentary, a technical discussion, or a construction article. It would be fair to say that *The VHF Amateur* as such is a gathering place where all those interested can meet. Your support would be greatly appreciated.

Bob Brown, K2ZSQ, EDITOR

THE SB-62

BY BOB HEIL*, K9EID

Construction of a bandswitching 6 and 2 meter SSB mixer.

With the ever increasing s.s.b. activity in the v.h.f. spectrum, many new pieces of gear for 50 mc are being introduced on the market. Not as yet, however, is there any complete 6 and 2 meter s.s.b. converter for your low frequency transmitter.

The unit presented here, with which I have been experimenting for quite some time, is a bandswitching 6 and 2 meter mixer driving separate linear amplifiers that run 100 and 60 watts respectively. This consists of two mixers driven by a 14 mc low frequency transmitter which is mixed with a 36 mc signal to produce the 50 mc. This is then switched to either the 5894 or the two meter mixer where the signal is mixed with a 95 mc signal to produce the 145 mc that drives the 6146 final.

The 6 meter mixer uses a 6U8A oscillator and buffer, 12BY7 mixer and a 6360 amplifier. The 14 mc is injected in the cathode of the 12BY7 while injecting the 36 mc from the 6U8 to the control grid, and tuning the plate to 50 mc. This is then coupled to the 6360 through L_3 and L_4.

A wafer switch is used to switch V_3 (6360) to either the 5894 or the two meter mixer cathode (V_5), via J_2-3, where the 50 mc is mixed with the 95 mc being produced in the 12AT7 (V_4) oscillator-doubler. A 47.5 mc crystal is used in this circuit and doubled to 95 mc. The plate of V_5 is tuned to 145 mc and drives the 6360 (V_7). This is coupled to the 6146 linear.

This is a completely different approach to getting on 144 mc s.s.b. Since the 6 meter mixer is already built and can be on the same chassis, I figured it ridiculous to start back down at 14 mc again to get back up to 144 mc. I used the 50 mc signal to mix with the 95 mc oscillator to obtain a 145 mc signal and was quite satisfied with the results.

Each unit is built on fiberglass epoxy boards with copper laminated to the underside. This is a real dream to build on. It can be punched with a chassis punch and the sockets, tie strips, and other parts are not bolted into position but are soldered right to the copper. No ground lugs are needed with this as ground connections are made to the copper. I have a supply of these boards for the 6 and 2 meter mixers with all the holes punched, tube sockets, crystal socket, coax connectors mounted and all the filaments wired and bypassed. They are available for $10.00 per board. This simplifies construction very much as all that remains is to insert the resistors and coils to finish the mixers.

If less than 10 or 20 watts of 14 mc signal is used to drive the 6 meter mixer, omit the two 53 ohm, two watt resistors in the cathode circuit of the 12BY7 (V_2). This puts J_1 directly to the 0.01 capacitor. No swamping was needed in the two meter mixer as the output of the 6 meter unit is approximately 6 watts, which gives the proper drive to V_5.

Tune Up and Alignment

Alignment is very easy using these mixing frequencies. Since they are not close together this makes it almost impossible to get some undesirable output on any other frequency than 50 or 145 mc. After the units are constructed, go through each tuned circuit with the grid dip oscillator and get the coils to their proper frequencies before applying power. The proper frequency is shown on the schematic above

*402 Border Street, Marissa, Illinois.

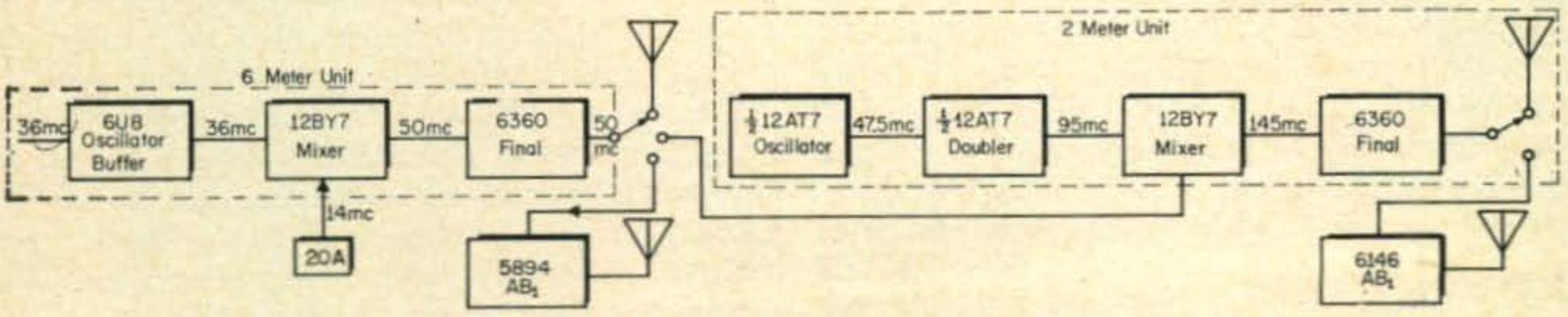


Fig. 1—Block diagram of K9EID's SB-62 with separate linear amplifiers.

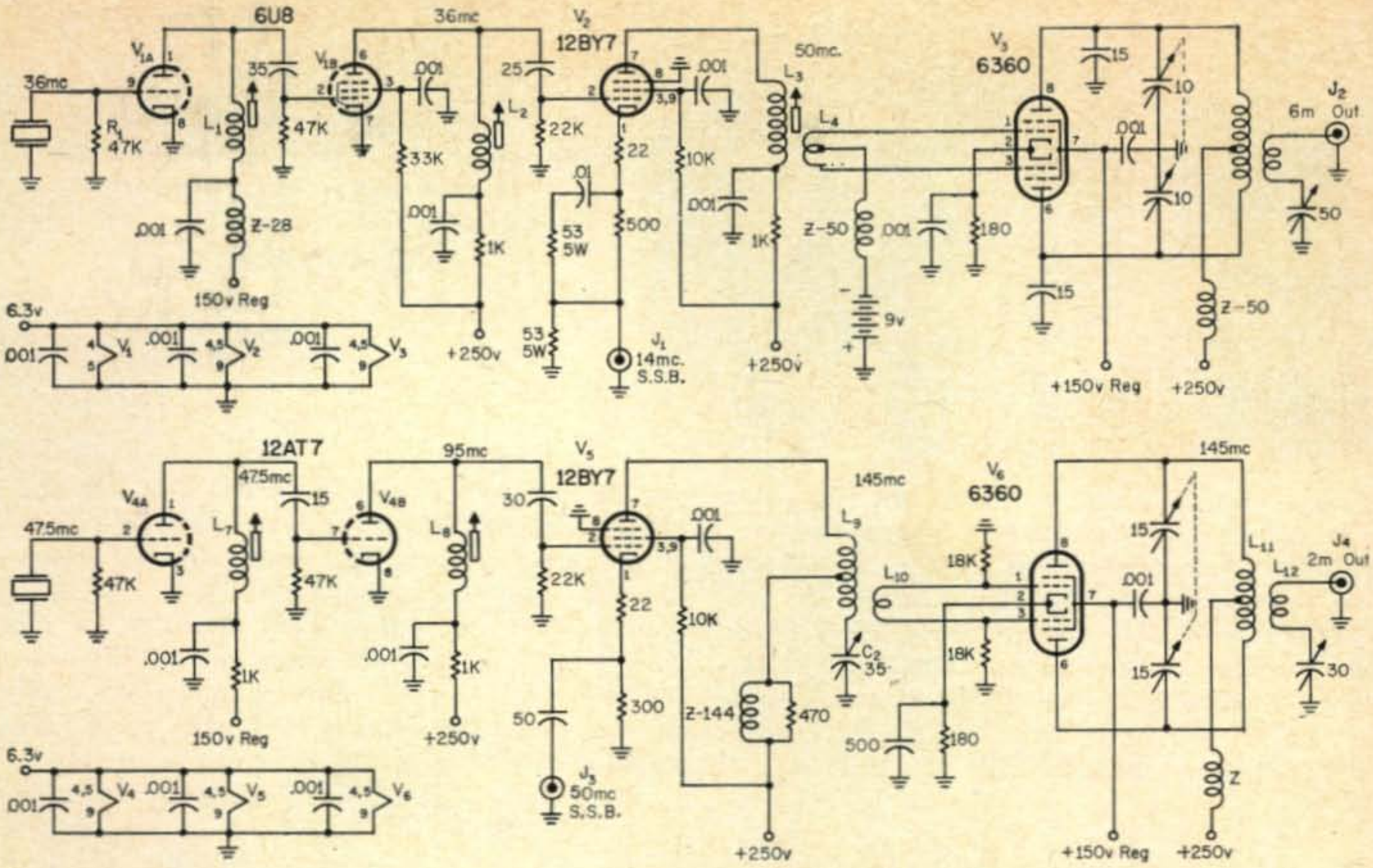


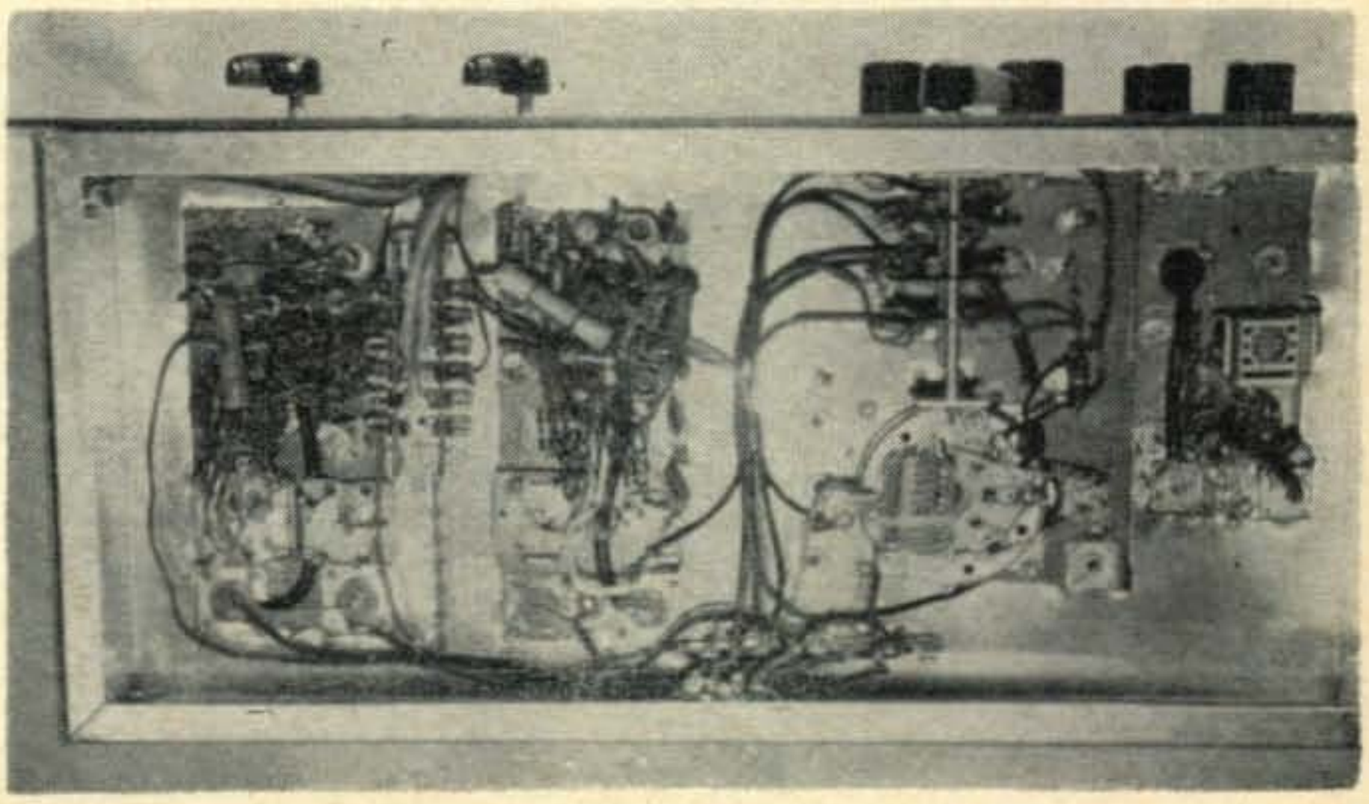
Fig. 2—Schematic diagram of the SB-62 with the top section the 50 mc s.s.b. mixer, lower, the 145 mc s.s.b. mixer.

C_1—2-7-10.8 mmf miniature butterfly. Johnson type 11MB11.
C_2—3-32 mmf miniature variable. Johnson type 30MB.
L_1, L_2—16 t. #26 e. closewound on 3/8" ceramic form.
L_3—9 t. 18 e. closewound on 3/8" ceramic form.
L_4—3 t. hookup wire wound around cold end of L_3.
L_5—8 t. #20 e. 3/4" dia. 1 1/4" long.
L_6—2 t. link hookup wire inserted in center of L_5.
L_7—13 t. #24 e. closewound on 3/8" ceramic form.
L_8—5 t. #18 e. closewound on 1/4" ceramic form.
L_9—5 t. #18 e. 1/4" dia. 1" long, center tapped.
L_{10}—3 t. hookup wire inserted in center of L_9.
L_{11}—3 t. #16, 1" dia. 1" long, c.t.
L_{12}—2 t. hookup wire inserted in center of L_{11}.

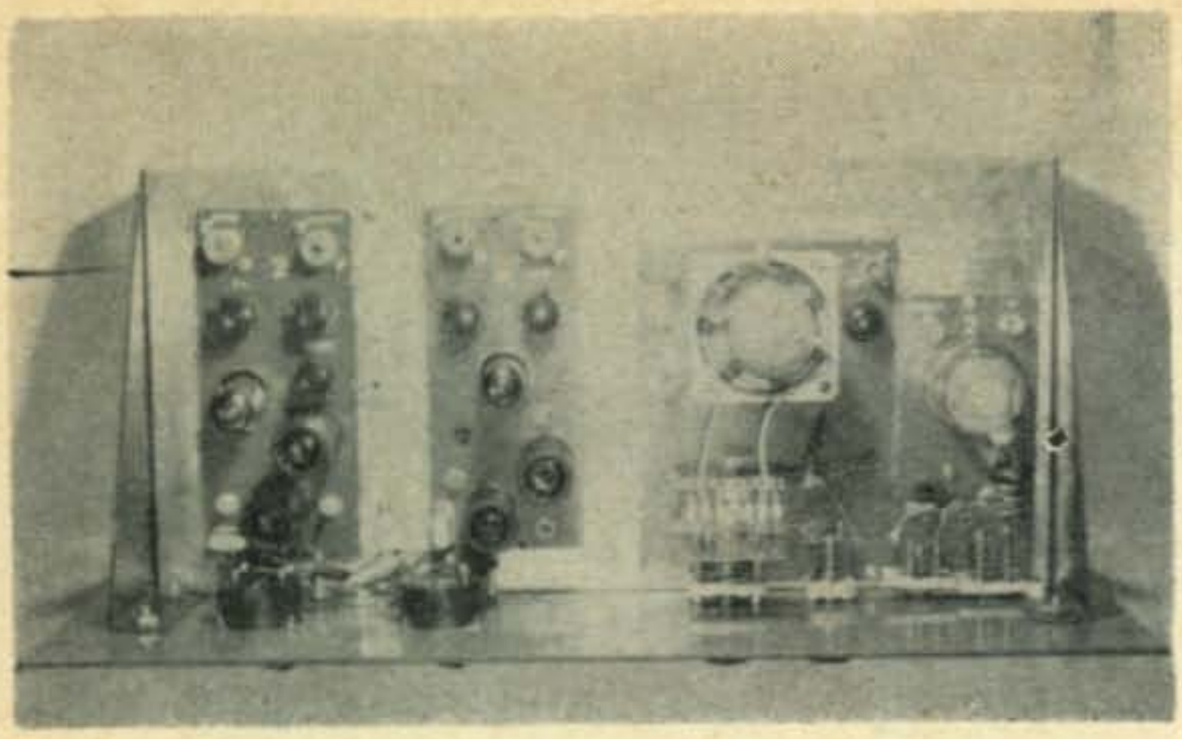
each coil. Make sure that the oscillators (V_{1A} and V_{4A}) do not oscillate on their fundamental frequency. They will still have output on their overtone, but if it oscillates on the fundamental as well, many spurious frequencies can be generated. The oscillators should also be adjusted so that they will not break out of oscillation when the B+ is turned on and off.

After the 50 mc mixer is operating, connect J_2 to J_3 and align the 144 mc mixer. Be certain the oscillator is operating on 47.5 mc and that it is doubled to 95 mc in the 12AT7 (V_4A and V_4B). Adjust the 12BY7 plate for 145 mc output and 6360 final for output into the dummy load.

Both of these units have an output of 6 watts and are sufficient to make many contacts on 6 and 2 meter s.s.b. If more power is desired, however, separate finals can be used with excellent results. I use a Johnson 6N2 Thunderbolt, but there are many times when I don't need all this power (working locals, for example), so I built the 5894 for 50 mc and the 6146 for 2 meters (not de-



Underside view of the completed installation at K9EID. The two copper laminated chassis on the left are the 2 and 6 meter s.s.b. mixers respectively. Two units on the right are the 6 and 2 meter finals, not described here.



Top view of the installation. On the left, the 2 and 6 meter s.s.b. mixers, respectively. Final amplifiers for these mixers are on the right, (not described here).

scribed here). These are built on the same type copper clad board which simplifies construction. A bandswitch is used to switch the two mixers from the Thunderbolt to the smaller finals. This also switches the 6 meter unit into the two meter unit while the output of V_7 is routed to one of the finals. This is left up to you and it can be altered to suit your individual needs.

Power Supply

The power supply for the mixers and finals is built on a separate chassis 17 x 12 x 3", and provides 150 volts regulated, 250v, 500v, 700v, and –100v bias plus the 6.3 v.a.c. using transformers that were acquired from the Collins surplus store in Cedar Rapids. The plate and a.c. supply switches are on the power supply chassis and the ten conductor shielded cable from the supply to the mixers carries only the supply voltages. The B+ can be left on without any trouble and all that is done to put the signal on the air is to key the 14 mc driver. Everything is biased off properly in the mixers and finals, thereby making it real easy for the control circuits.

Once again, get out the honorable soldering iron and let the XYL out for a few nights while you get your SB-62 on the air. Be sure and remember that this little jewel can also be used to put any 14 mc s.s.b. or a.m. transmitter on 2 or 6 meters as well as putting a 6 meter transmitter (Sixer, Communicator, etc.) on two meters very easily. Let me hear from you on your "SB-62" construction. ■

QRS!

Marvin Sarafan*, WA2NZE

A BASIC difference between hams, be they General, Technician or Novice, can be summed up principly by the rate and quality by which they send and receive a strange and mysterious phenomena infecting the etherial environs.

This unique and almost extinct form of communication is commonly referred to as interupted continuous wave radio transmission. The General class amateur calls this hyrogliphia "code," the Technician, "c.w.," and the Novice, "QRS please."

Fortunately, the v.h.f. bands have all but eliminated this unnecessary burden from the basic curriculum of amateur radio and needless to say s.s.b. will alienate it even more. However, as a lover of antiques (I still own an American transistor radio) I thought I would like to try my hand at c.w. and see if I could carry on a QSO on 50 mc using A1.

For three days I tried vigorously to raise another brave soul below 50.1 mc, but to no avail. Finally, at a point of utter despair I heard *a* station returning my call. This fellow, a sturdy lad, was pounding out my call using m.c.w. on the freeway. (For those readers not familiar with the New York area, the freeway is 50.200 mc or the 6 meter answer to the 80 meter Novice band during a contest.) Again, to my chagrin, I found that after two years in front of the D-104 my code copying ability had degenerated to a mere 8 to 10 words per. Nevertheless, my contact belted back at 18 w.p.m. and I was stuck.

About half of the QSO went west but, unwilling to display ineptness at this simple task, I returned to this chap at his given rate of speed. We bantered back and forth for one hour and fifteen minutes, during which time I hadn't the vaguest idea what he had said. It was then I dedicated my future life to increasing my code speed and of propagating a new race of amateur: a man who has the courage to go on c.w. at least once during his license term.

Not to digress, however, I returned to key and belted out as fast as I could the following message: "FB Larry. Wy nt sgn by fone?" The next thing I knew a voice with pearly tones came back with, "Thank God! What in the world have you been saying for the past hour?"

"Why," said I, "Couldn't you copy that slow speed stuff?"

Moral: Let he who is without speed cast the first dit. ■

*42 Crambrook Drive, New City, New York.

Introduction to V.H.F.

David L. Heller*, K3HNP

To adequately cover a subject of this size would require many more pages than a Manhatten telephone directory. K3HNP presents here, however, in short form, some of the answers to questions faced every day by newcomers to the region above 50 mc.

Since this is my first appearance in our new form as part of CQ it's a propitious time to warn my new readers what to expect regularly under this heading. I regard amateur radio as a unique hobby, a marvelous pastime which combines pleasure with knowledge—electronic, obviously, but geographic and cultural also—and, quite regularly, the opportunity to make original contributions to the science of communications. Ham radio is automatically international. Each of us is governed not only by Federal law but also by world-wide treaty, and as a group we have almost exclusive domain over a large portion of one of Earth's most valuable resources, the radio spectrum.

We aren't all expected to make major contributions to the electronic art, but we are expected to remain strictly within the law as defined by FCC and to accomplish whatever purpose we have on the air with the minimum possible effect on other users of the adjacent frequencies.

Not all of us can introduce technical advancement to electronic science. But we all can become good radio operators. What is a good operator? The one who achieves his desired communication in the simplest, easiest manner with the least possible use of the radio spectrum. Most commentaries will be candid discussions of operating practices which I think are degrading to amateur radio. I am inherently controversial and I welcome comments from readers. I admit that in trying to please no one it's so easy to be wrong.

I'm seldom trying to reach any particular class of operator. If I seem to be talking to Novices or Technicians in particular just remember that some Extras can be heard making like untamed Novices, and conversely Novices as a group are consistently excellent operators, slow as they may be. I am concerned primarily with the Novice and VHF bands—but Generals have been known to be found in such places!

Enough of that before I scare off some likely prospects for some interesting letters.

—K3HNP

So you are going v.h.f.? Before you drive headlong into this strange territory, however, why not do a little investigating? Selection of band is the first thing to decide. Choose between 6 and 2 meters for a start. 220 and 432 mc are still mostly experimental and populated by experienced technicians of u.h.f. communications. One can get on either 50 or 144 mc with relatively simple equipment; both bands are well populated and have reasonable DX potential.

Two meters offers very good groundwave; conditions often permit contacts with stations hundreds of miles away. Six meters, on the other hand, offers almost unlimited propagational advantages, in that almost every known form of reflecting a signal is present at one time or another. Fifty mc Sporadic-E openings occur at frequent intervals, permitting contacts with other stations well over a thousand miles away. Six meters usually has more local activity than two.

To Buy Or Build?

About the only thing that's invariably commercially made is the receiver. Transmitters, converters, and antennas are homebrew as often as not, and their builders just as frequently have never built anything electronic before. The ARRL *Handbook* has construction details for anything the beginner could want—and it's written for beginners.

Equipment

Six and two meter transmitters are becoming available commercially in almost all sizes and prices. At the lower edge of the price scale are such rigs as the Heathkit Sixer, and the various Lafayette transceivers, while more money can buy 100-watt-plus rigs like the Johnson 6N2 or the Clegg Zeus.

I strongly recommend the beginner use a small transmitter. Learning to operate comes only by being at the bottom of the pile (not that there aren't many 5 watt rigs in use by old timers). Only when the details and specifications of the more expensive and higher power equipment can be interpreted properly (and this comes only by listening and learning) is it time to graduate.

*14 Darkleaf Lane, Levittown, Pennsylvania

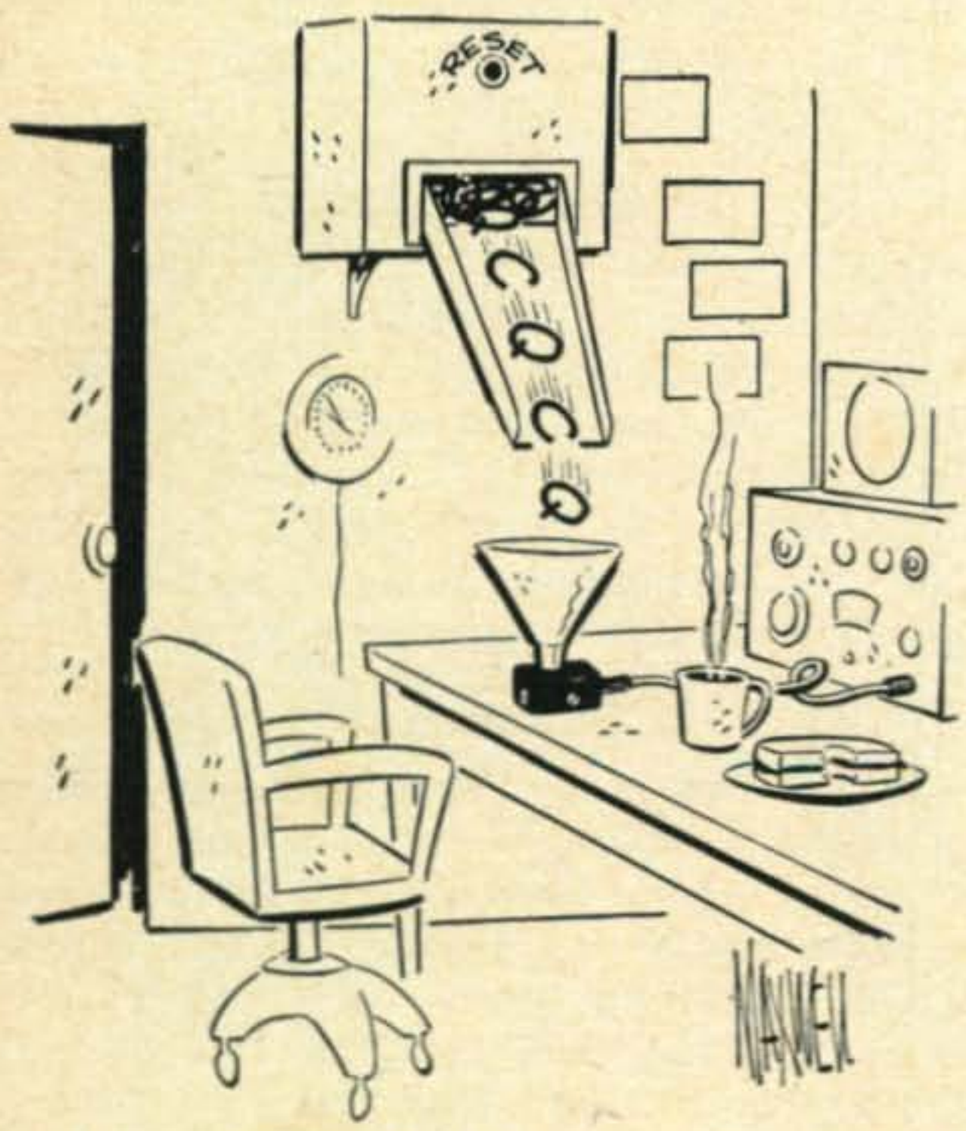
V.f.o.? No! Stay crystal control led to start. You'll not be alone, and there are things you'd never learn if you started out with a v.f.o.

The receiver is more important than the transmitter. Here again, start small. A smaller communications receiver, or even an old *good* shortwave set will suffice until you know better what's what. Catalogs can never tell you what you can learn on the air. Sure, a 75A4 is fine . . . but is it what you want? An a.c.-d.c. broadcast set is definitely not good enough. In between? Borrow, beg or steal some sort of used ham receiver until you can decide intelligently.

Converter? You need one for v.h.f. Some receivers tune six meters . . . few do it well. None in the low price range tune two meters (of course the popular transceivers are self-contained for transmitting and receiving). Here again, the catalogs tell only the price. Ask those on the air what they're using and why. In the meantime get a cheap converter, new, used, or homebrew.

Antenna

The antenna is, without a doubt, the most important part of any ham installation. Unless you have truly reliable advice, start with a halo or a homebrew dipole. It will work, and you'll rapidly learn what make and configuration beam you want. You will also need coaxial cable, and for a beam, a rotator.



"Avoid long strings of CQ's . . . Someone might listen just to learn whom *not* to call.

Calling CQ

If you can't find anyone looking for a contact, find a clear frequency for which you have a crystal and give your own CQ. Call CQ four or five times, give your call a couple times, and repeat. The entire procedure shouldn't be longer than 30 seconds; if there's much activity, 15 seconds is ample. Tune your own frequency first, then the band. Avoid making a two minute string of CQ's before giving your call. You'll most likely be heard and some one might listen to you just to learn whom *not* to call.

On Phonetics

Never use phonetics for the station you're calling. He probably knows and can recognize his own call letters by now—if he doesn't, you won't want to talk to him anyway. Use phonetics on your own call once, if you must. If the other station isn't sure of your call, he'll ask for a repeat. *Forget the "cute" phonetics* . . . they'll rubber-stamp you as a lid before you even get your foot in the door.

Don't omit prefixes (FCC doesn't like it) but don't bother with the phonetics for K, W, WA, etc., when you're working within the country. These are the only possibilities (plus the KN, WN, WV, and WB's) in the USA and are difficult to confuse. "This is Whiskey Alpha the Figure Two . . ." is a sure-fire way to lose prospective contacts.

Always give the call of the other station first, then your call last. This too, will keep the FCC happy. Remember that transgression of FCC rules is never "smart."

Junk Box

The frequent problem of a beginner wanting to build is "parts." Purchased new it would seem just as cheap to buy a commercial rig. You are starting fresh—you lack the proverbial junk box. No problem. Find a junk TV set . . . the older and heavier, the better. Remount some parts and you have a 100 watt power supply. The chassis will supply almost all your resistors and capacitors, coil forms, tube sockets and tubes. A TV set is an instant junk box. Later on, the collection will grow; before long you'll be begging the fresh crop of beginners to take some of it off your hands.

TVI

V.h.f. TVI is a subject in itself; in months to come I'll cover it thoroughly. For now I'll limit myself to the most important fact of all: "If you are clean on your own TV you can do no more." The rig's all right.

Conclusion

I hope that this article and ones to follow will be of value to my readers. Several of the subjects covered here in a single paragraph will be greatly expanded in Commentaries to come. But reading articles will never make a perfect operator. Before you throw that switch, listen. That's the best way I know to learn anything. ■

Results of the July 1962 *VHF Amateur* VHF Contest

COMPILED BY ROBERT M. BROWN, K2ZSQ, EDITOR

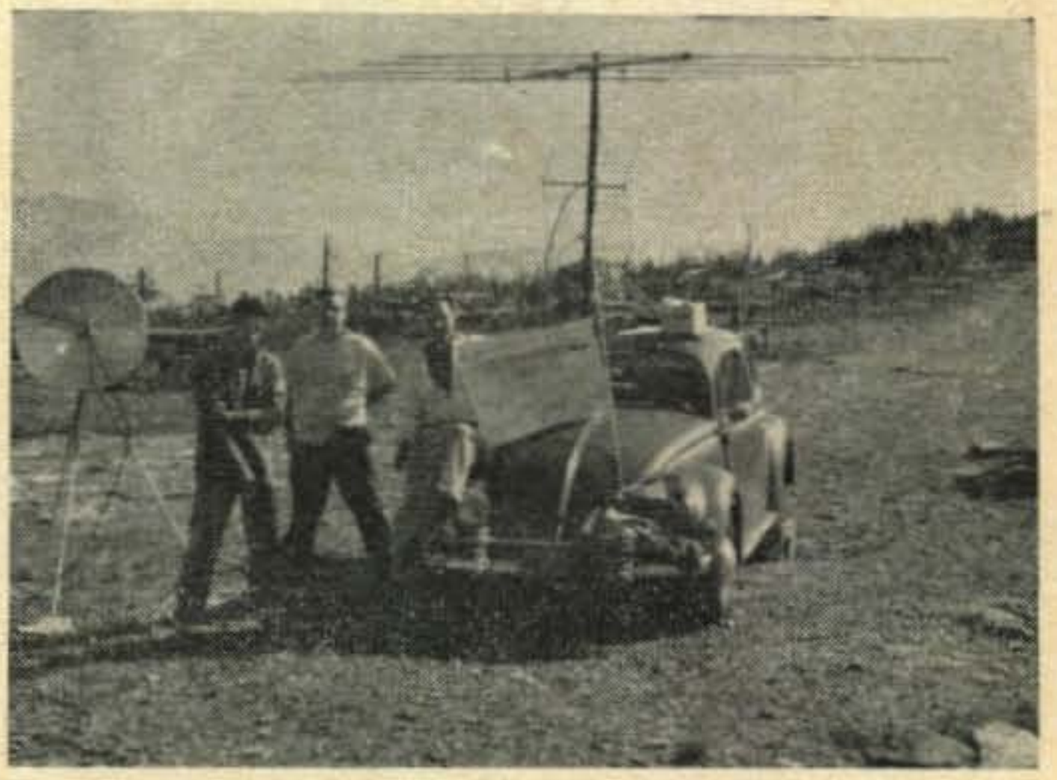
Good Weather, Rare Area Hilltoppers, and Sporadic-E Skip

HIGH SCORES

Multiband	K1UGZ/1	2,957,760
50 mc	W8HBI/8	3,639,600
144 mc	WA2FVR	182,400

IT WOULD be fair to say, we think, that *The VHF Amateur's* first annual VHF contest was quite successful. Competition was severe in the East with varying amounts of activity throughout the rest of the country. The contest, though not very widely publicized, was well received by contest enthusiasts who seemed in some instances to go all out to hit the top. For those who were not among our readership when the rules were printed, here's a run-down in capsule form of the rules as originally presented: The contest was aimed at the low powered v.h.f. stations who were possibly not equipped for multiband operation with sixteen operators. Accent was placed on this low power division by a staggered power multiplier. Under 10 watts input was awarded a multiplier of 20, while all those over 200 watts received a multiplier of 1. Special attention was given to v.h.f. s.s.b. operators, who were awarded a multiplier of 15 regardless of power p.e.p. The contest ran from 12 noon on Saturday, July 28, and ended at 6 PM Sunday. ARRL sections were used as divisions. The three major categories were 50 mc, 144 mc, and multiband.

Members of the Cleveland 50 mc DX Club (W8HBI/8): Standing, left to right, K8UQA, W8HBI, WA8EHI, K8MMM. Kneeling, K8JCG, K8TOL and K8NUE.



Here's the gang at K2UYH/1 at Mt. Equinox, Vermont. These boys worked up to 2nd position in the Multiband category.

Our highest scoring participant was W8HBI/8, who amassed 3,639,600 points in the alotted thirty hours. An all time record of 337 contacts were made in 18 different ARRL sections. W8HBI, manned by members of the Cleveland, Ohio, 50 mc DX Club, succeeded in working into the East Coast and to the South, thereby collecting an untold wealth of points. You fellows who frown at transceiver type power levels behold: Our nationwide contest winner ran 10 watts input!

Those who remember the February '61 *CQ* W.W. V.H.F. Contest, are bound to recall Bert Simon, W2UUN, who walked away with the honors then. Well, Bert was in there strong once again, but couldn't quite make the competition from W8HBI/8. He did succeed, however, in holding that second place post position on 50 mc. Bert racked up 187 contacts in 20 ARRL sections for a final score of 2,444,000.

Moving over now to two meters, we find Walt Gibbons, WA2FVR, of Colonia, New Jersey, right there on top with his 16,200 points. Walt is no newcomer to v.h.f., or to v.h.f. contests, for that matter, but he did

Meet Ned Soseman, Jr., WNØBDU, of the Kansas City area. Rig used during the contest was a Communicator II into a 5 element beam up 30 feet.

himself proud with this one. As a personal side-note, we might mention that both Walt and his brother Jim, WA2FVQ, are totally blind. Yet even with this handicap, Walt manages to continually work stations others aren't even hearing, and receives comments like, "You're the only station we hear from the NYC area." Our congratulations to WA2FVR for a job well done.

Notes and Comments

W4IMX—Sure enjoyed operating in the contest! . . . *K3MOY*—Found the contest a fine idea . . . *K3KST*—Family competion kept us interested during the wee hours (brother of K3MOY.) . . . *WA2GWM*—"Tops" in my book! . . . *K1PAM*—Why don't you award extra points for c.w. instead of s.s.b.? Then maybe some of the lazy Technicians might be forced to work for their points . . . *K1RTS*—Had a lot of fun and had the pleasure of working W1HDQ of ARRL. Only complaint was that since I work Saturdays, I wasn't able to get on until 7:30 Saturday evening . . . *K1UGZ/1*—Hope to make it again next year . . . *K4SHI*—First contest for me and I enjoyed it thoroughly . . . *K2ZSQ*—Oh for a v.f.o.! *WA2VPI*—It was a real gasser! . . . *KØITF*—It was good fun and a pleasant contest . . . *WV6UAP/6*—Not many stations on out here. Hope the contest was a success nationwide . . . *K3JNZ/3*—Would like to have heard a little more activity from New York and further to the northeast. Did hear W. Mass. and W. Va., but no contacts . . . *W1HDQ/1*—Entire works set up and operated by one (old) man! Some fun! . . . *W9SLM*—Didn't run up a very big score but had lots of fun and worked my first DX outside of continental U.S.A.—CO2XA in Havana, Cuba . . . *WA2FVL*—Band was in good shape . . . *K9DTB*—Local stations had trouble with my s.s.b. Told me I was "overmodulating!" . . . *WØFMS*—Many thanks for a most enjoyable contest . . . *K8QDZ*—Had lots of fun operating the contest . . . *K8IXU*—Thought the contest lasted until 10 o'clock and lost six ARRL sections (sigh!) . . . *W4DNU/6*—Contest was complicated by a neighborhood do-it-yourselfer who insisted on injecting an S8 noise level for the last ten hours . . . *K5IPL*—Think the power multipliers help the city fellers, not us country boys . . . *K7EZP*—will do better next time; been just too hot here in Oregon for hamming! . . . *WA2KLF's XYL*—The operators slept on everything from air mattresses to crib mattresses and survived on coffee, hot dogs and mashed french fries . . . *WNØBDU*—Am 13 years old and heard about the contest through KØITF, who got me on in the 2 meter category. Thoroughly enjoyed it . . . ■

50 mc Results

The first column shows the power multiplier awarded, the number of ARRL sections worked, the number of contacts made, hours, and final score.

W8HBI/8	20	18	337	30	3,639,600
W2UUN	20	20	187	30	2,444,000
K2BBR	20	17	150	30	1,530,000
K3JNZ/3	10	17	172	29	847,960
WØFMS	20	11	121	28	745,360
WA2GWM	10	17	162	25	688,500
W4LFX	20	15	92	19	524,400
K4SHI	10	18	87	24	375,840
W4IMX	15	11	68	21	235,620
K8LCC	15	4	122	29	212,280
WA4EBN	10	14	74	20	207,200
K3HNP	5	18	112	20	201,600
K4DNE	10	11	61	25	167,750
WA2IMG	10	12	72	19	164,160
KØYEQ	20	5	60	22	132,000
WA4AWH	10	15	46	19	131,100
WA4AJC	10	11	55	18	108,900
WA9BGU	5	8	93	29	107,880
K3KFD/2	10	5	112	19	106,400
W3ZOR	10	11	53	14	81,620
K1PAM	20	4	32	25	64,000
K3MOY	10	7	38	21	55,860
K8IXU	10	13	34	11	48,620
K3KST	10	9	37	12	39,960
WA2UPN	10	4	34	17	23,120
W9SLM	15	9	28	15	16,200
WA2PMW	10	6	50	5	15,000
K9DTB	15	4	22	10	13,200
WA4BAW	15	8	16	6	11,520
K3EJG	15	3	21	10	9,450
K4YZE	15	2	15	16	7,200
K1TSH	10	2	10	7	1,400
K5WIZ	10	2	11	6	1,320
K4FLR	15	1	2	2	60

144 mc Results

The first column shows the power multiplier awarded, the number of ARRL sections worked, the number of contacts made, hours, and final score.

WA2FVR	20	5	76	24	182,400
K2LOK	10	5	123	23	141,450
WA2FVL	15	5	70	24	126,000
K8CZZ	5	6	61	25	45,750
W4DNU/6	10	3	68	21	42,840
K3RVS	20	4	27	18	38,880
W2TND	20	2	48	18	34,560
K1RTS	15	3	32	15	21,600
WA2UDT	20	3	26	13	20,280
WV6UAP/6	15	5	24	7	12,600
K8QDZ	20	3	7	5	2,100
WA2IDH	20	2	8	6	1,920
WNØBDU	20	2	8	4	1,280
WA2PTS	15	2	11	2	660
K8UZE	15	1	8	5	600
K5IPL	5	5	9	4	180

Multiband Results

Call	Score
K1UGZ/1	2,957,760
K2UYH/1*	1,066,760
WA2VLR	1,010,600
K2ZSQ/2*	844,200
KØITF	729,660
WA2JMF/2	103,680
K2RGF	87,360
W1HDQ/1	15,120
K7EZP	4,480
K8IVW	940

*Staff

Modulation "PUNCH!"

Jerry Ginsberg, WA6NFI
9632 Ball Road, Apt. 17
Anaheim, California

ARE you getting enough modulation with your present rig? If not, and you are running low power, why not try this inexpensive single tube modulation system which will provide more "talk power." The overall cost of this modulator using all new parts was under $5.00. With aid from that ever valuable junkbox, this cost can be reduced to practically pennies.

I built my modulator in a 3 × 3 × 5" minibox and had enough room to add a pre-amplifier stage at the time, if one was desired. It was found in my case that I could very easily overmodulate causing splatter and distortion if I opened the gain too far. The characteristic of this system is carrier controlled modulation, or more simply, power output on modulation peaks.

It might be noted at this time that the system halves the input to the final, and, if difficulty arises, try reversing the lead to the high voltage, to the screen grid, and vice versa.

You might notice that the schematic is similar to that of a Heathkit Seneca, only greatly modified. It is straight screen grid modulation, but provides the necessary "punch" to work DX. Hope it works as well for you as it has for me and my homebrew 5 watt 6CL6 rig. ■

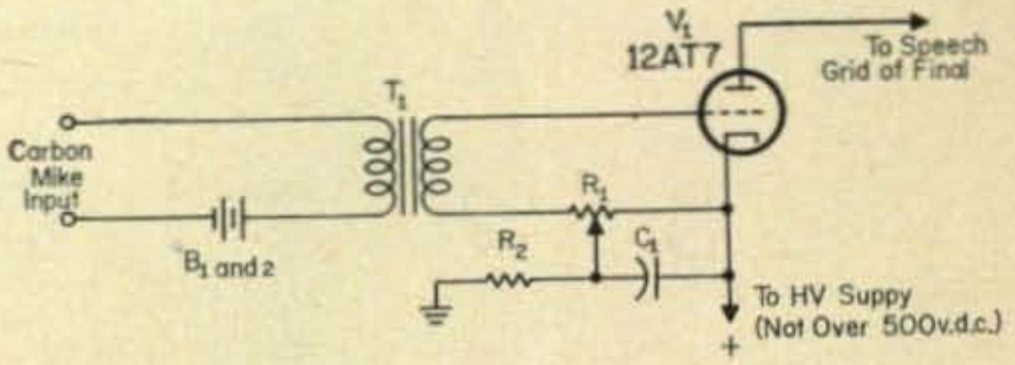


Figure 1—Schematic diagram of WA6NFI's little modulator. This device provides more than adequate "punch" for the average v.h.f. transceiver or low powered transmitter.

$B_{1, 2}$—1½ v. penlite batteries.
C_1—.01 mfd 1000 v. disc ceramic.
R_1—20K, 1 w. potentiometer.
R_2—100K, ½ w.
T_1—Standard carbon mic. transformer.
V_1—12AT7.

Portable 6 Meter Antenna

David L. Heller, K3HNP
14 Darkleaf Lane
Levittown, Pennsylvania

AN OUTSTANDING feature of the small six meter transceivers like the Heathkit Sixer and Clegg 99'er is their portability. Take them anywhere—they're no problem; just plug in and you're in business in your hotel room. The problem is the antenna. Occasionally a "hill-top" 3-element beam is practical, but the usual need is for a pocket antenna.

I've had excellent results with this folded dipole. In theory it's badly mismatched. In practice it gives a presentable s.w.r. satisfactory pattern, and many excellent reports. My practice is to hang the antenna over any two convenient nails and "adjust" with clothes pins until the s.w.r. is satisfactory. Adjustment can be made by peaking a received signal; on the Clegg 99'er the output meter serves to indicate s.w.r. very conveniently, so I simply tune the antenna for minimum meter readings when the rig is tuned for peak. A little field strength meter will work well, too—the standard untuned combination of meter, diode and short antenna. ■

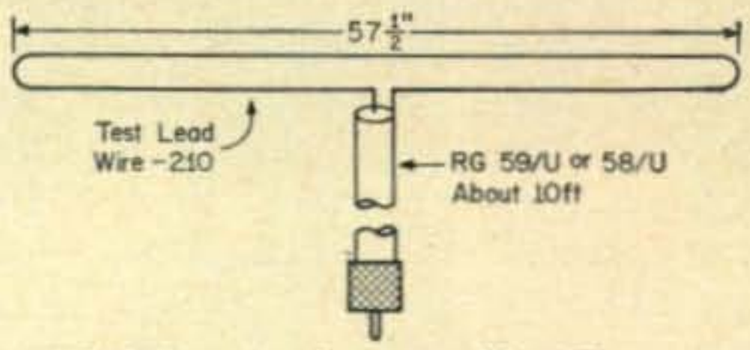
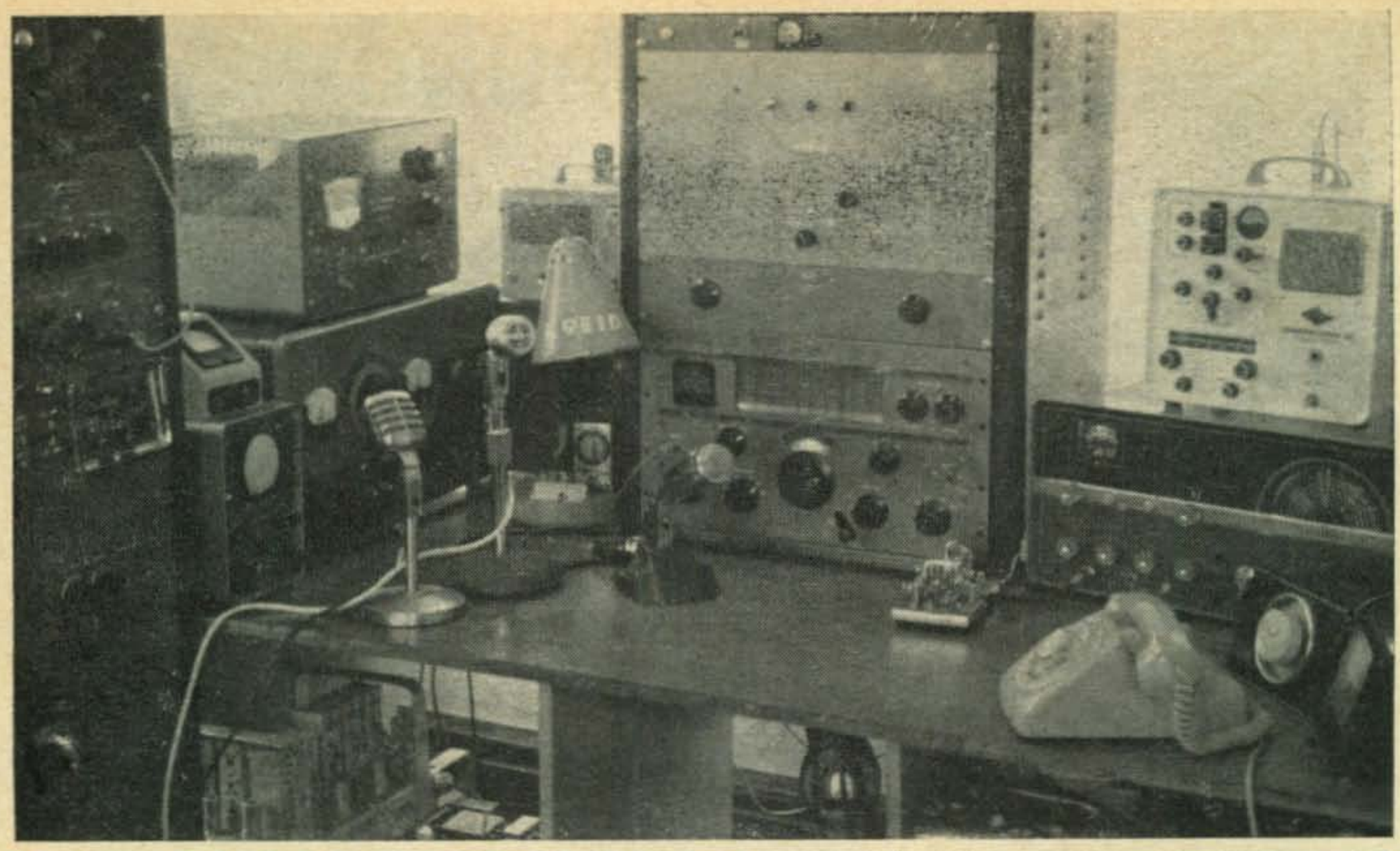
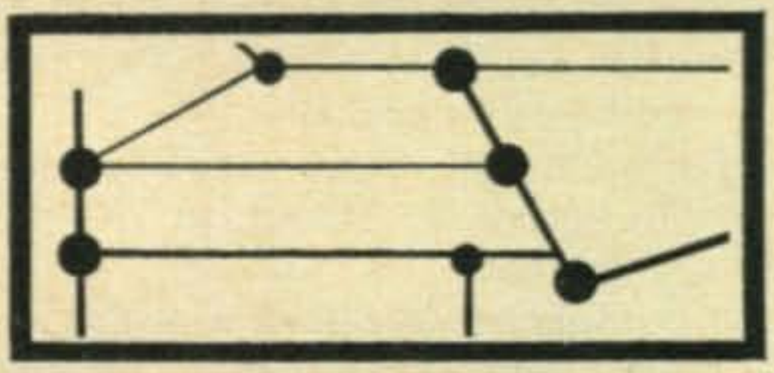


Fig. 1—K3HNP's simple portable 50 mc antenna.

How about a little more consistency on "end of transmission" codes? According to the most publications, K means "go ahead, anyone:" KN means "go ahead, station I'm in contact with only," and AR means "go ahead, station called (before contact is established)" "SK" means "I'm clear with you, not coming back again;" CL means "I'm closing station." But to listen around you wouldn't know what's going on.—*WA6PU*. ■



VHF SSB



ROBERT HEIL*, K9EID

As ANYONE can plainly see from above, this is to be the VHF SSB COLUMN in the new "combine" *CQ-VHF Amateur*. If you also have been following your magazines, you'll note that the conductor of this column is also new to the amateur radio reader. I will be the very first to admit that I am a professional organist, not a professional writer, so if everyone can stand pat and hold on for awhile until I get into the swing of things, perhaps we can make this a column of interest instead of an automatic log book repeater. I hope that you noted the "we" in the last sentence as this is a column which is for you and the only way it can survive is for us to hear from each and every one of you.

Just about every book printed about amateur communications today contains the old familiar tug of war: s.s.b. vs. a.m. I really do not believe the subject should be taken up in this part of the magazine. Let's look at it this way: if we didn't have the evidence to prove which is superior, perhaps the heading would be changed to v.h.f. a.m.! Enough said.

Introduction

I have operated on the v.h.f. frequencies since 1956—only the first year was on a.m. Ever since the s.s.b. bug originally got me, I have been enjoying the mode with great pleasure. Tuning across 50 or 144 mc. one can hear the old familiar QSO which takes 45 minutes and where the same contact could have been made in 15 minutes on s.s.b. To me this is one of the foremost advantages of s.s.b. Round tables are, of course, made much simpler and twice as many stations are able to participate. This to me is well worth the effort because radio communications as you and I know is a relaxing hobby and not a business—as so many are trying to make of the amateur frequencies today.

*402 Border Street, Marissa, Illinois.

News and Activities

Practically every day more and more new v.h.f. s.s.b. stations are appearing here in the Midwest. Many of the 75 meter s.s.b. operators are getting their HT-37's and 32S-1 transmitters switched into the new (and real f.b.) P&H two meter mixer or the Hallicrafters HA-2. Several of the local fellows are patiently awaiting the Collins 62S1, but it may be awhile until the unit is on the radio distributors shelves.

For those who desire the store bought gear, P&H sure has the answer at a choice price tag. W9IBI, Shorty, in Matoon, Illinois, has one of the P&M 2-150 transmitting converters be-

hind his HT-37. This sure produces a nice s.s.b. signal. The quality is perfect.

K9VEN at Jacksonville, Illinois, has done a lot to get the two meter s.s.b. stations started. He has built several mixers using 3 or 4 tubes that deliver about 6 watts of s.s.b. Ed, WØLFE, at Bowling Green, Missouri, has one of these little units in between a 200V and a Johnson Thunderbolt. This feeds a new 16 element "J" Beam by Gain, Inc. This gives Ed quite a respectable 2 meter s.s.b. signal. Ed needs no introduction to the 144 mcs. operators. He is one of the finest operators in these parts.

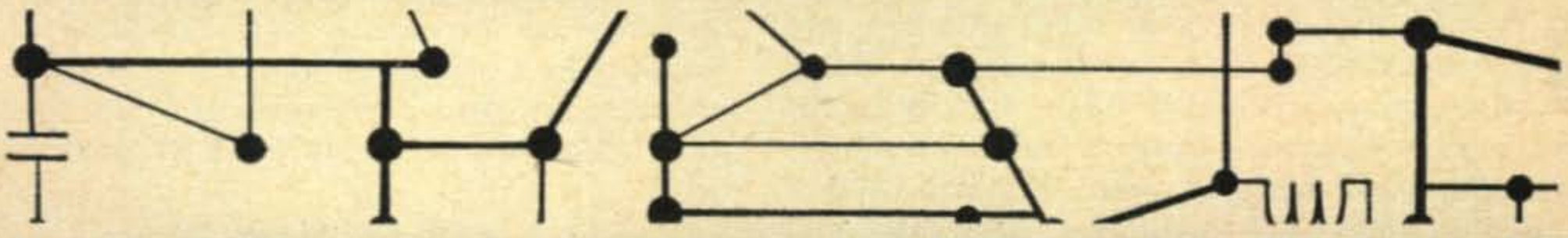
If any of you are wondering why you haven't heard Jack, KL7AUV, lately, it's because he has been putting the finishing touches on his new house! Jack had some difficulty with the wind and his antenna system but has this problem under control. He usually does most of his operating about 0400 GMT—0435 GMT to the East, then North & South every day. This netted him VE8BY in December and Bob Brown, KL7DJY in Nenana in March. Jack mentioned that KL7AUG is completing a new final for s.s.b. while the 4CX250B final of KL7AUV has been held up for four months trying to get a blower. As soon as Jack gets this going it should be very interesting to see if we will be able to catch him. Jack passes his kindest regards to all the 6 meter stations that he used to work and hopes to get some openings before too long.

V.H.F. S.S.B. Directory

We've wanted to publish a directory of s.s.b. enthusiasts on v.h.f. for some time. If you'll send along a postcard with information on your gear, QTH, possible operating time, frequency, etc., we can get started. This could be a very valuable item in your shack for reference. While you're at it, how about dropping a note on s.b. activities in your area? You're going to get awfully tired of hearing about W9's if you don't.

That about unwinds me for this time fellows. 73, Bob, K9EID

the answerman



KEN PHILLIPS*, K8CHE

JOHN T. KERR, WN4CAK, down in Durham, N.C., wants plans for making a 6 and 2 meter v.f.o from an ARC-5 Xmtr, 7-9.1 mc model. See the September 1961 edition of *The VHF Amateur* for a fine conversion by K3HNP. Available for 25¢ from Bob Brown, K2ZSQ.

When one trys to answer any and all questions (the little old quack doctor, me), someone comes around with some problems that we can't seem to find the right answers for. Here is a sample or two.

"I have a pair of Communicators (both model IV's), one on 144 mc and the other on 220. Both are lacking in modulation capabilities. Do you have a solution?" —"Pop," Kent, Ohio.

This is one of the questions that I would like to answer with a simple "no" and go on to the next one. But I can't. You see I know this feller pretty well. Pop, (that's what they call him around here) calls himself "The Old Greyhead." I think that's because he decided he had better buckle down and get a ham ticket before he was 80 years old. So Pop got a ticket when he was 79 . . . and this isn't bad when you take into consideration that he didn't start till he was 79! Now if my memory serves me right he's about 82 now. If any of you young fellers out there have an answer to Pop's problem, let me know.

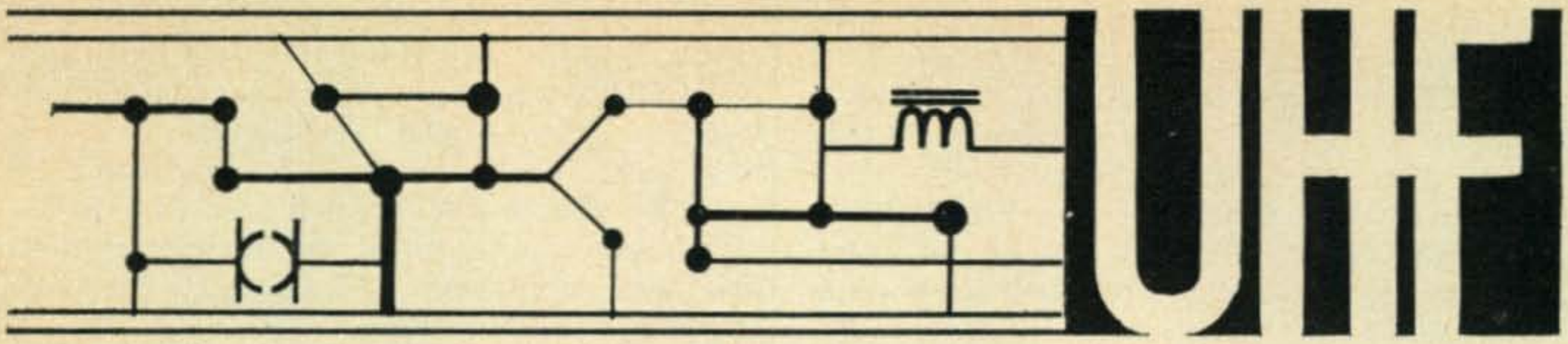
We are both glad and remorseful when we finally arrive at the point where we say, "Well fellows, that winds us up for this month," and switch off the typewriter and airmail the stuff to the Editor. Seems like a little part of our much too short earthly visit has been mailed away. But perhaps that isn't the whole truth. Instead of being "wound-up" we're "run-down." And then the letters from the readers arrive, and like a shot of adrenalin were off again.

In the Works

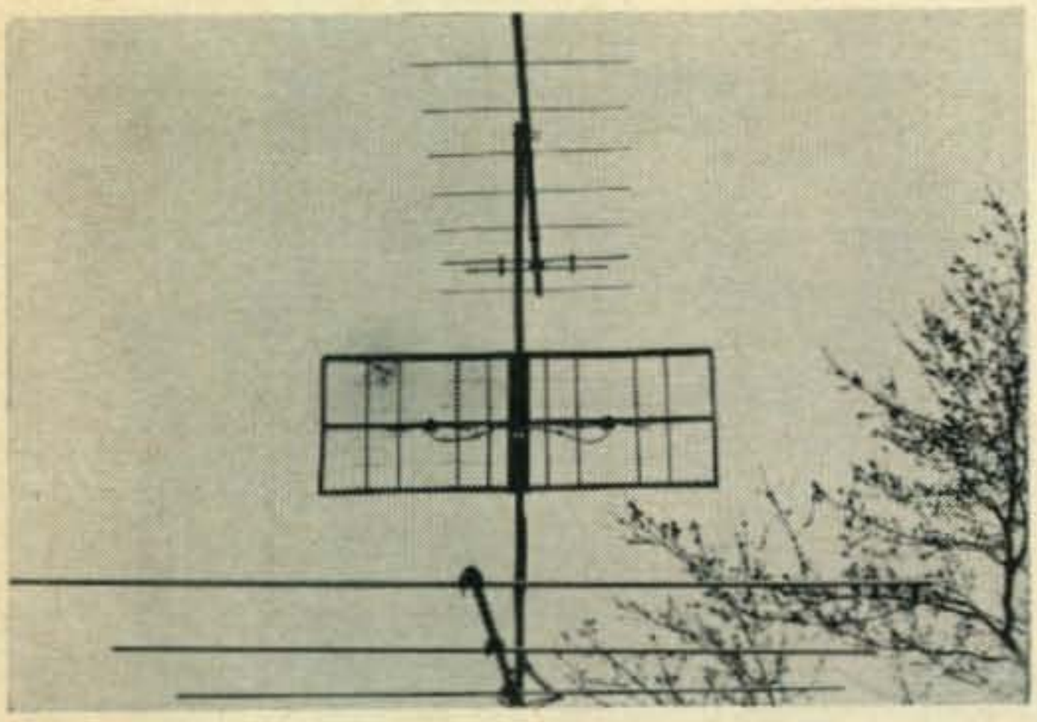
After having tried to concoct a 6 meter converter (mobile type) using 12AD6 tubes and having difficulty in making it breathe, we retired to our operating room and carved out a sure fire job. Hope to have the circuit and some pictures next month.

There are so many circuits that operate so close to the margin of "maybe it will or maybe it won't," and so many articles that have requirements for special parts . . . Oh, well . . . that's the reason for the converter. Read all about it next month. —73, Ken, K8CHE

*351 Hillman Road, Akron, Ohio.



ALLEN KATZ*, K2UYH



WA2EWG's 1220 mc 32 element collinear screen antenna.

EVERY day more and more amateurs are flocking to the u.h.f. frequencies. Some are newcomers to ham radio attracted by u.h.f.'s romance, others are old timers reminiscent of the good times they had on 2½ and 5 meters with modulated oscillators and super regenerative receivers. Their ideas of u.h.f. operation differ widely. Some dream of bouncing radio signals off the moon the first day on, while others picture mountain top to mountain top contacts using dishpan antennas aimed with telescope accuracy. Neither is wrong; u.h.f. offers both forms of operation and more.

Activities

1296 mc: W2PEZ operating in the June ARRL V.H.F. contest near High Point State Park, New Jersey, really had a time. Using a converted APX-6 with a 2C39 amplifier similar to the one designed by K2CSM and a fairly large parabolic antenna, he worked K2UUR in Parlin, New Jersey, operating on 1296.010 mc with crystal controlled receiver and transmitter, and corner reflector antenna with 5-9 signals both waves.

K2BJP, The Central New Jersey V.H.F. Society, located itself near Washington Rock in New Jersey during the June VHF contest and operated on 1220 mc with an APX-6 and a 3 foot dish and worked K2RGF in Edison, New Jersey, another APX-6 owner with a corner reflector for an antenna. K2BJP, operated by K2RMD, also heard W2PEZ, but could not make a two way QSO. Skeds with K2SLI on Long Island proved a similar disappointment. They also had equipment for 3.5 kmc on the air, but the scheduled station ran into difficulties and no contact was made here either.

The Microwave Society of Long Beach, California, sends word of a great deal of activity on 1296 mc band with 20 stations active. *How about some particulars, fellows?*

There is activity in Oak Ridge, Tennessee, on 1215 mc, mainly due to the efforts of Ed, W4VSN, and Gene, W4SGI, who are supporting the band with their use of helical antennas. In fact, W4SGI has three ten-turn helix beams stacked.

W4VTJ, of Lantanna, Florida, is working on a large cross yagi antenna, along with a KW c.w. transmitter for 144 mc moonbounce.

W1QKA, of Nashua, New Hampshire, provided 1296 mc signals during the July *VHF Amateur* contest which were copyable at Mt. Equinox in Vermont on an APX-6. Roland uses crystal controlled equipment and did work up to Mt. Equinox in the July ARRL contest.

432 mc Ham TV

Al, W4LSA, in Florida is now ready for two way Ham TV contacts. He has a 12AT7 modulated oscillator and yagi antenna on the roof. He also mentioned that WA4BGL and K4DQO may also soon be on Ham TV from the area. In New Jersey, Ray, K2ULR, is converting a surplus TV camera and AXT-2 surplus TV transmitter for 432 mc operation.

Moon Bounce and Satellite Bounce

Jóse, CT3AE, writes to say that he is just about ready for two meter moon bounce. He has completed his 104 element cross yagi antenna, and his receiver and exciter is OK and and ready to go. His only problem is the final. He did not have both final tubes, however, they are on the way. Bill, WA2EMA sent them a month ago. *Good luck, Jóse! The boys here will be looking for you on two meters.*

In case you are wondering what happened to K1HMU who nearly made it to California via two meter moon bounce last summer (one way), we have word that he is working on a 362 element cross yagi antenna—calculated gain, 28.3 db. This one sure beats the 140 elements he was using last summer!

W3DD may soon be trying 1296 mc moon bounce operations. He has a 12 foot dish and paramp working on the band.

73, Allen, K2UYH

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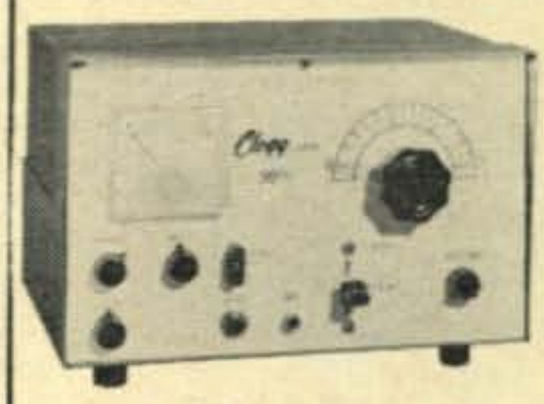

HAM NET 169

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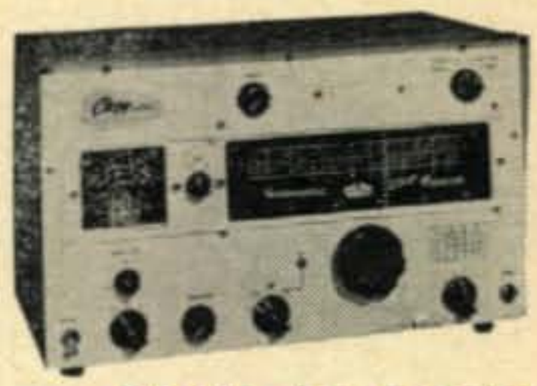
6 & 2 Receiver



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Clegg ZEUS	$695.00	$63.25	$34.50	$24.91
Clegg 99'r	169.00	15.03	6.95	5.72
Clegg Interceptor rcvr	473.00	42.83	23.33	17.91

Above are shown for a 3 year contract. Minimum order that can be financed for one year is $60, two years $120, three years $180. Persons signing time pay contracts must be 21 or over and employed.

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DX report

ROBERT M. BROWN*, K2ZSQ

SINCE many are reading this column for the first time, perhaps a bit of history is due. The DX REPORT is one year old this month and has been edited in the past by Dan Parnes, WA2DMQ. Dan has been on vacation for the past few months, so I'll be doing the column until he returns. When he does, the column will become a two-man venture with both of us working together. The "DX Report" is essentially a news-activities column, presenting as comprehensively as possible the month's goings on.

50 Mc Activities

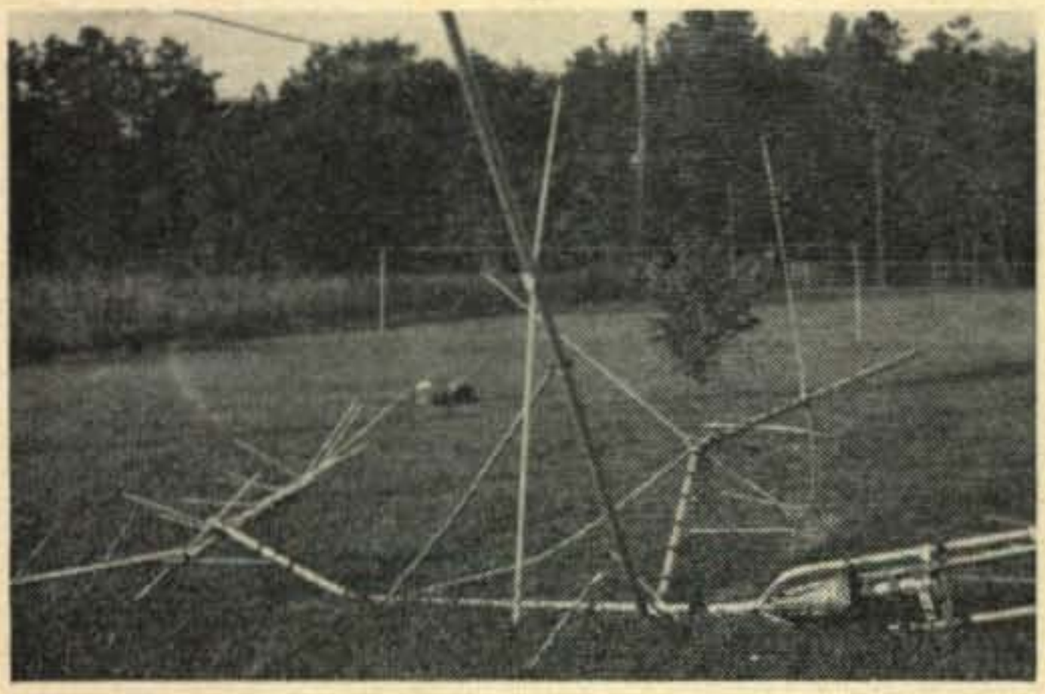
W1: K1GPJ, of Lewiston, Maine, worked XE1OE, and VO1DW this summer. Clem heard (but didn't work) Wyoming back on July 9. That state is a tough one from anywhere, especially Maine. Another Maine station, K1NTC, of South Berwick, reports "lots of double hop to CO2, XE, and the West Coast." Curt snagged two Wyoming stations in the early part of July, W7UFB and W7UDZ, with his 6 watter. *Nice going!* Dave Heifetz, K1PDA, of Manchester, New Hampshire, worked out well into the Midwest during Sporadic-E sessions this summer, what with snagging K#WLB and all . . . Russ Brown, K1TSH, of Walthem, Massachusetts, enjoys groundwave operation as well as skip. Russ QSO'd WA2HIK, of Lower Bank, S.N.J., on July 7 with good signals. K4BHH, and VO1DW were also worked, but on skip.

W2: "Just a little note to let you know of a surprise opening on July 1st. About 0400 GMT this station worked KL7EBM with signal reports of 53-4 on both ends. The OM's name is Louis, and was running 500

Here's the neat shack of Tom Halwachs, WA2UPN. This Scotia, New York station did quite well in the recent *VHF Amateur* contest with his HT-40 and three element beam.

watts into eight elements," says Lou, WA2PMW, of Flushing, New York, "and at this end a G-50 with 5 elements. I'm still not believing this, but the postmark is Kodiak, Alaska!" *How's that for you boys who cried about the decline of sunspots?* KL7EBM, by the way, is on every Saturday and Sunday from 0400 to 0600 GMT. Donn Baker, WA2VOI, of Salamanca, New York, reports working W3OMY in Pittsburgh, Pennsylvania, for a nice 140 miler. Appreciated more fully, I am sure, when you realize that Donn has only a dipole on the roof! WB2AAI, of New York, worked K9HBT, W4LIX, and K4OTS, for three new states with just a halo antenna and an SR-34 (6 watts)! Tom just moved to the N.Y.C. area from Oklahoma. A well-known New Jerseyite, WA2GWM, of East Paterson, worked CO3NR in Havana, at 1300 EDST on July 16, for a new country. Frank also snagged WA5CWD and W5KRQ on skip that day. W3CAJ of Lewisbury, Pennsylvania, was contacted by WA2GWM also on the 16th for a nice 160 mile tropo QSO. Carl Schultz, WA2IMG, (familiar to many of you through his writings in *The Monitor*) reports a startling contact . . . "Worked YV5AGM on 50.324 mc on July 3rd at 1917 EST."

W3: Gary Citrenbaum, K3KST, of Baltimore, heard an unidentified CE3 (Chile) on July 30. Gary has worked CO3NR and CO5CN, both in Cuba, also, in addition to the usual string of summertime Sporadic-E contacts. K3KST also reports hearing KP4, HK1, KZ5,



"QRX just a moment OM . . . I think the antenna . . . oh . . ." 90 m.p.h. winds hit W4OAB's tower in Charlotte, N.C., leaving the sad story depicted above.

KH6, and KL7, but no contacts "unfortunately." CO2CT has been known to break through to Maryland. Brother Ron Citrenbaum, K3MOY, finally got South Dakota with KØGRP. Long groundwave made possible a fine QSO with K2CQG/2 in the Catskills of New York state for a real nice 300 mile contact.

W4: Things have really been popping down South! W4NUT reports hearing K8MMM working PJ2AA on July 16th at 1900 GMT. "Tom, K8MMM, was the first 6 meter contact that George, PJ2AA, had ever made. I was the second. W4TKU, K4JGU and 26 others worked PJ2AA the same day," comments George, W4NUT. Seems the Netherlands West Indies station was only running 10 watts at the time! *Think we'll move to Florida* . . . Ed Lankford, W4HHY, of Nashville, Tennessee, reports working a *CQ* staffer, WA2LRO, as well as a long list of other skip stations from New York to Washington state. Mike Eggert, WA4BMC, made a nice long hauler into California and WA6YAN back on June 9. *Shades of 1958!*

W5: A real "mobileer" in its truest form is Frank Tackett, K5WIZ, of Dallas, Texas. Frank seems to work more from his car than I even hear at home with eleven elements. Among his credits: W5FKW, K4SYN, K4NGD, K4AKW, K8TOH, KØTSB, and many "locals." K5WIZ's report is our only one from W5-land this month. Doesn't anyone else operate 50 mc besides K5WIZ?

W7: Moving further West, K7NKC of Arizona reports working XE1OE, VE3CJN, K4JQY, and K4WVP in early June. Jim Bingham, on the other hand, undermines K7IMH, and manages to snag KØ's and such.

SKED BOX

Policy: Although the Sked Box will appear every month, your listing must be re-submitted to be repeated. No listings are held over. *Deadline for sked Box listings is the 20th of the month.* All data received after that date will be run the following month. Listings must be submitted on a postcard or the Reader's Reporting Form. Give as complete information as possible. Listings are compiled first by frequency, then by call area. Adress all requests to: "Sked Box," *The VHF Amateur*, 300 West 43rd Street, New York 36, New York.

Schedules Desired—50 Mc

K1PDA (N.H.) needs skip skeds to N.D., S.D., W5 area, and tropo work to Pa. and N.J.
K1GPJ (Me.) needs skip skeds to S D., Colo., Wyo., Utah, Mont., Idaho, Hawaii and Alaska.
WA2GWM (N.J.) wants groundwave skeds to Md., Del.
WA2OCK (N.J.) would like to sked Del.
WA2VCM (N.Y.) desires groundwave skeds to N.J. and Md.
WA2VOI (' J.) needs skip contacts to the Mid-west.
K3KST (Md.) would like Nevada, N.M., CO and KP4.
K3MOY (Md.) wants Arizona, N.M.
WA4AWH (Tenn.) would like a sked to S.C.
WA4BMC (Fla.) wants skeds into N.D., Utah, Alaska on c.w.
WA4BXU (Ala.) needs Ky.
WA4DKG (Fla.) wants a sked to Macon, Ga.
WA4GDC (Fla.) wants Amarillo, Tex. Also WA2PMW.
W4HHY (Tenn.) wants skeds into La. and S.C.
W5UKQ (La.) looking for s.s.b. or c.w. to Austin or Dallas.
W6FZA (Calif.) desires scatter skeds on 50.001 mc. Available time: 0900 PST Sat. and Sun.
K6HCP (Calif.) desires scatter skeds on 50.110 s.s.b. Available: 0800-0900 PST Sat. and Sun.
W6NLZ (Calif.) would like scatter skeds on 50.009 mc c.w. Available: 0800-0830 PST Sat. and Sun.
W6OKR (Calif.) wants scatter skeds, 50.006. Available: 0800-0900 PST Sat. and Sun.
W6SSN (Calif.) desires scatter skeds, 50.028. Available: 0800-0900 PST, Sat. and Sun.
K7IMH (Ore.) wants s.s.b. skeds for Sat. and Sun. AM, 50.120.
W7RWS (Ariz.) needs skip to N.Y. or R.I.
K8REG (Ohio) wants Mass., Utah, and Idaho.
K9EID (Ill.) would like skeds to Kansas City and Ark.
W5RCG/Ø (Nebr.) needs Neosho, Mo., and Amarillo, Tex.
KØEIC (S.D.) looking for N.D.
WØDLL (Nebr.) wants Wash. and Oreg.
K4PGL/VP9 (Bermuda) hears W1's and W2's all the time. No contacts yet. Would like skeds.

Schedules Desired—144 Mc and Up

K1RTS (Conn.) wants groundwave skeds to N.Y.
WN2AOG (N.J.) desires New England skeds. 145.240.
WA2VEX (N.Y.) would like to sked Mass.
W5HPT (Tex.) 432 mc skeds at 0700 local time. would like more.
W4DNU/6 (Calif.) open for 144 mc several-hundred-milers.
K8AQA (Mich.) wants Me., Idaho, Ariz., and N.M.
K9CGD (Ill.) needs Wisc., Iowa, Mich., So. Ill., and Mo.
WØRVA (Mo.) wants early morning c.w. or a.m. skeds.
VE2BBY (Quebec) wants skeds south, 200-2200 EST.

Meet Emil Carver, K3MZO, of Plymouth, Pa. Gear in the picture is for six meters, however Emil is also quite active on 144 mc with homebrew equipment not shown here.

W8: Gordon Bean, K8MRS, of Saginaw, Michigan, has had his share of DX also . . . from W1's to WØ's. W7PSO proved to be Gordon's first Wyoming. W8GZF, of Tawas City, Michigan, works his skip with a Heath Sixer and a 54" coaxial whip.
W9: Al Ruoff, W9VPP, of La Crosse, Wisconsin, has heard Casper, Wyoming, Idaho, and Montana, but "no QSO's yet." Staffer Bob Heil, K9EID, of Marissa, Illinois, reports such choice contacts as: K6KFY, WA6PXW, WØKMY, CO3NR, KP4AXC, VE1CL, VE2AIO, not to mention 250-300 mile trop work with W4HJQ, K4GOF, WØYWP, K9HAE, K9YIA, and WA9CXL. Phil Caruso, K9DTB, of Villa Park, Illinois, was another well heard call during this summer's sessions.
WØ: WØRVA of St. Louis, Mo., reports "Everyone's doing it!" (CO3XA, that is). Our rare state contributor, Roy Labelle, KØEIC, of Rapid City, South Dakota, is another of XE1OE's regulars. "Worked W7BNJ/7 in Pocatello, Idaho *(oh . . . for that state)* who was running only 1 watt. Was hoping for a mobile in Yellowstone Park so I could get Wyoming, but no such luck," comments Roy. Richard Sullivan, KØDQG, of Boone, Iowa, is another real "mobileer." Dick's worked many long haul groundwave stations from Rocky Mountain Park. WØDLL of Grand Island, Nebraska, notes, "Very rapid QSB with flutter noticed during July. Best month by far was June." Bob's worked K4IEA, WA2MZL, WA5BPQ, and such on skip . . .

144 Mc and Up Activities

W1: Walt Belsito, K1RTS, of Waterbury, Connecticut, sends along his list of two meter "regulars" in the area: K1IPT, K1RJH, K1HJV and sons KN1TOG and KN1TOH, K1CMF, K1RTS, K1PKQ, K1PUG, K1SSB, K1SBM, K1DDY, W1VTU, W1JZA, W1HJG, W1BBU and W1HCU. *Who said there's no activity in Connecticut?*
W2: WA2VBX of Rocky Point, New York, snagged W1YQI and W1BU with his Heathkit Two'er! Dave Mackey, W2TND, of Elizabeth, New Jersey, recently worked W1RJA in Milford, Connecticut. Got a nice report from Bill, WA2EMA: "August 3, 4, 5 and 6th good tropospheric conditions along the East Coast. Heard Mass., Conn., R.I., N.Y., N.J., Pa., Md., Del., Va., and N.C."
W3: Richard Moore, K3MBR, of East Lansdowne, Pennsylvania, spends his time working K1OAN (Conn.) and W1ECI (Conn.) not to mention numerous local contacts. "TV" Fabian, W3RUE, of Belle Vernon, Pennsylvania, presents a nice list of early summer contacts: WA2STS, WA2RDE, W2RPO, VE3EYX, VE3BTD, W8SDJ, K9UIF, WØYMG and more. *Sound like 6 meter DX?—no misprint—that's 2!*
W4: Larry Barker, W4GIS, of East Point, Georgia, reports the following are active on 144 mc: W4FWH (Doraville, Ga.), K4MDF (Dahlonega, Ga.), K4KLD (Horshton, Ga.), K4UJL (Cummings, Ga.), and W4-

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Reader Reporting Form

Month of October, 1962

This form serves as the basis for our DX REPORT column in *The VHF Amateur*. Your participation in this program is of utmost importance, for without news-activities reports from you, we cannot provide a truly comprehensive column. *Deadline:* November 20, 1962. Return this form to: DX REPORT, *The VHF Amateur*, 300 West 43rd Street, New York 36, N.Y.

Your name ..... Call .....

Address ..... City ..... State .....

This report covers my 6 2 220 432 (circle one) activities for the period. Enter only one band's activities on this form. Extra forms free upon request. (S.A.S.E. please.)

Antenna (number of elements and type) .....

Best DX During October

Date	Time	Call	Location	Sig. Rpt.

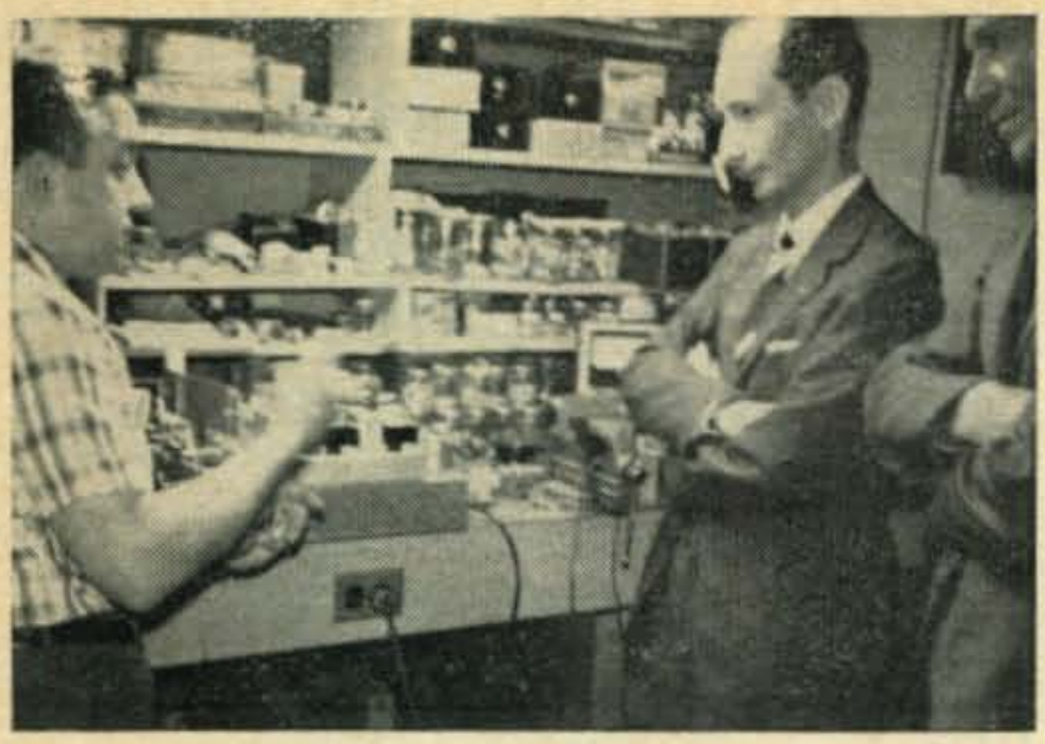
Sked Box Listing: Do you desire schedules to a particular area? (Give state, frequency, days and available times) .....

.....

Do you presently hold skeds? (List calls, times, days and frequencies) .....

.....

Approximate distance of longest contact made this month (give details: call, number of miles, day, *etc.*) .....



Learned trio these: Mike Medwig, K2DZM, on the left pointing out some s.s.b. techniques in v.h.f. construction to Michael Czysch, LU3DCA, and "Red" Brown, K2ZSP, far right. Michael recently visited this country on his honeymoon.

DX Report *[from page 106]*

GJZ (Cartersvills, Ga.).

W5: W5HPT of Bedford, Texas, worked W9OII in Sharon, Wisconsin, for a distance of 800 miles-plus on June 17 at 0745 CST. Vic also presents his list of best DX this year: W5PEP, K5SZH, W5POG, K5TYP, W5FYZ, W5UKQ, W5ML, W5ZYA, W5JWL, W5RCI, K5JHD, W4TDO, K4DY, W4GJO, W4NTD, and W5GIX.

W8: Bob Merdler, K8AQA, of Saginaw, Michigan, recently worked W8AIB, Detroit, W8ARF, Toledo. "Extended groundwave from June 27th until July 3rd. Almost every evening we heard Michigan, Ohio, Ontario and New York."

Jack Woodruff, W8PT, of Benton Harbor, Michigan, submits a very informative letter. "Another Perseids has come and just about gone. I think this one was about normal. The peak seemed to be Saturday morning, August 11th, but the signals were just as good Sunday, except the bursts were further apart. I had skeds with W6WSQ, W4TLC, K7IDD and W5KFU. I worked W4TLC in South Carolina, for state number 39—*Congratulations, Jack!*—and W5KFU, Texas, which I already had worked. I heard a couple of good pings from K7IDD in Utah, but that's all, and nothing at all from W6WSQ. Also heard very f.b. signals from W7JRG, K7HKD and WØENC, but had already worked them. Got a couple of good bursts from W7FGG, Arizona, which makes me think he might be workable. No known activity in Maine or New Mexico, the closest states I need. I don't know what its going to take to get a good station on in Maine. K5TQP will be going from his mountain QTH in New Mexico next year and maybe we can get W5VWU out of the mothballs, although my mail to him went unanswered this year.

"Well, that's the news. How about getting someone in Maine lined up for me? I need help there." *OK, fellows, you have the word. Drop Jack a line in time for the November showers.*

W9: Bob Plechaty, K9CGD, of North Riverside, Illinois, has worked his share of DX also. K9VTT, Hammond, Indiana (July 3, 1962) at 2130 CDST, and W9OVL same time, but on July 7th. Bob reports good inversion on the 7th and early morning on the 8th.

Portugal: CT1CO reports, "It may interest you to know that I am trying to QSO Spain and England on 144 mc. I have been calling EA and G regularly, but so far the results have been negative."

Here we are at long last down to the bottom of the stack. Now turn to the Reader Reporting Form, fill it out, and return to us today while you're thinking about it. See you again next month.

73, Bob, K2ZSQ

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Clegg's all new INTERCEPTOR VHF Receiver, designed for the serious operator on these bands offers performance features unmatched by presently available equipment for these frequencies. Exactly matching the famous Zeus Transmitter, the Interceptor offers reception with virtually no cross modulation. Nuvistor RF stages provide an extremely low noise figure with high sensitivity. Stability is ideal for the exacting requirements of SSB and CW.

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INTERCEPTOR, $473.

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SURPLUS

WHEN World War II ended in 1945 the U.S. Government released great quantities of radio equipment as "surplus" because it was either obsolete by then existing standards, or was excess in view of then foreseen military needs. Amateurs rushed in and bought great quantities of components, tubes, complete assemblies, etc., usually with no immediate use in sight but with the intention of "some day" salvaging components from the assemblies. Much of this material has lain dormant on shelves and it is the purpose of this series of articles to show how some of this may be converted into reliable amateur transmitting equipment. The units described on the following pages, v.f.o.s to a kilowatt final, have been proven by several to many years of consistent reliable performance.

V.F.O. Conversion of the ARC-5/SCR-274-N

D. C. McCOY*, W8DG

The SCR-274-N, ARC-5 series make excellent v.f.o. units (or low powered transmitters) when properly converted. Conversion of the units described provides coverage from 160 to 10 meters. Also described is a suitable power supply and switching circuit for the combined units.

THE SCR-274-N/ARC-5 series of aircraft transmitters is one example of an excellent series of surplus equipment which can be converted to amateur use with a minimum of effort. These units provide variable frequency oscillators or low power transmitters of excellent stability with excellent performance for amateur use. The final decision as to what to do with these units will depend on whether they are to be used as a frequency control unit followed by additional stages or as a low power transmitter. In the latter case it is not good practice to modulate a stage immediately following an oscillator, so if the unit is to be used for low power phone work an additional stage should be inserted between the oscillator and the parallel 1625s. Most of the experimental work described here has concentrated on the use of these units for frequency control followed by additional multiplier stages. Only variable frequency operation will be discussed herein.

For v.f.o. service first remove such parts as are not required. Figure 1 shows the original circuit and fig. 2 the modified circuit. Before starting to rewire note that *all wiring carrying r.f. currents should be as short and direct as possible.*

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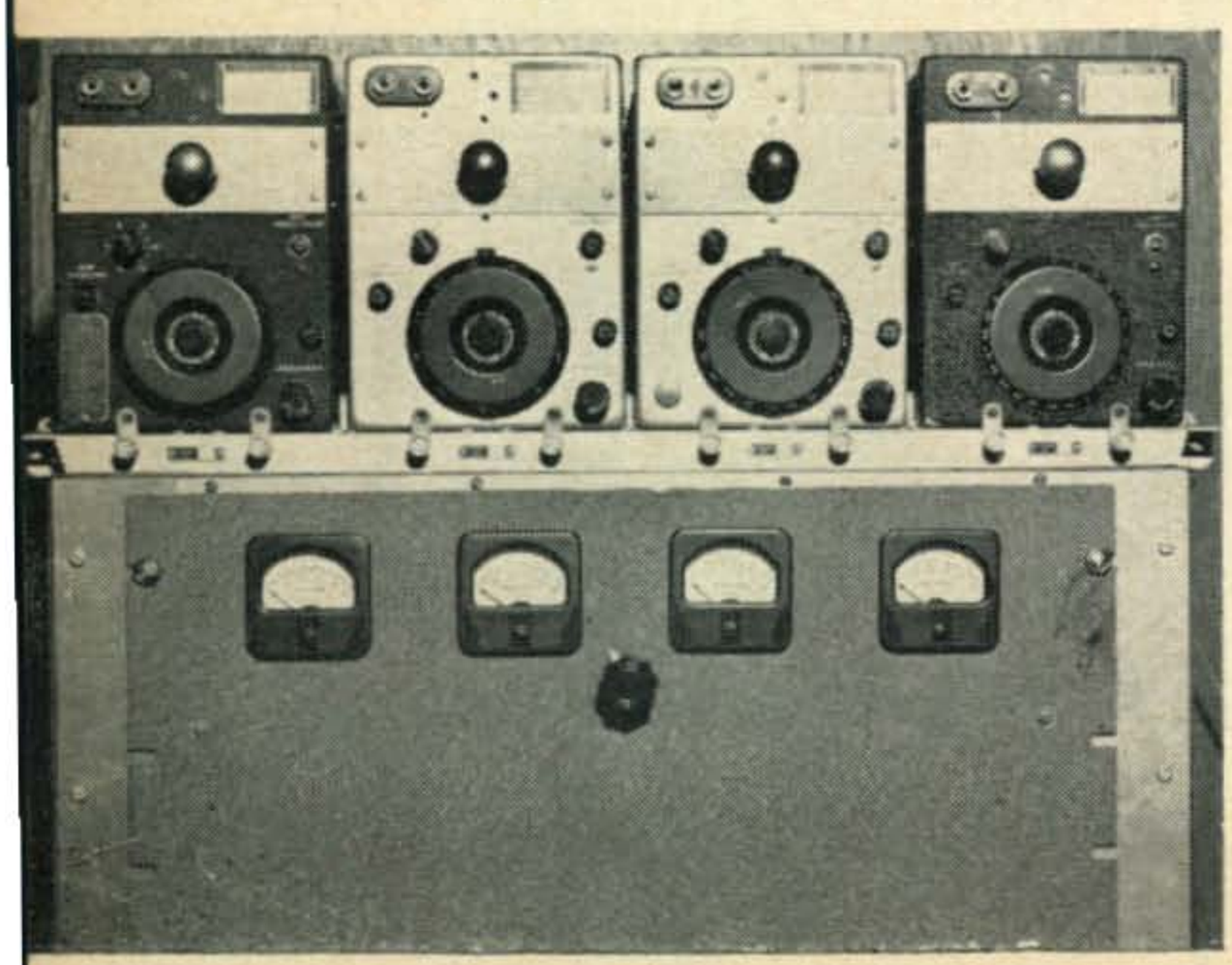


The SCR-274-N v.f.o.s. is a 4 unit rack, mounted above the power supply. The units are, from l. to r., 1.8 mc, 3.5 mc, 5.25 mc and 7 mc. The upper switch on the power supply panel is S_4 for controlling the screen voltage of the amplifier. The controls in the lower row are, from l. to r., A.C.-On-Off, Standby-High Voltage, Unit Selector Switch, Amplifier High Voltage and Key Jack.

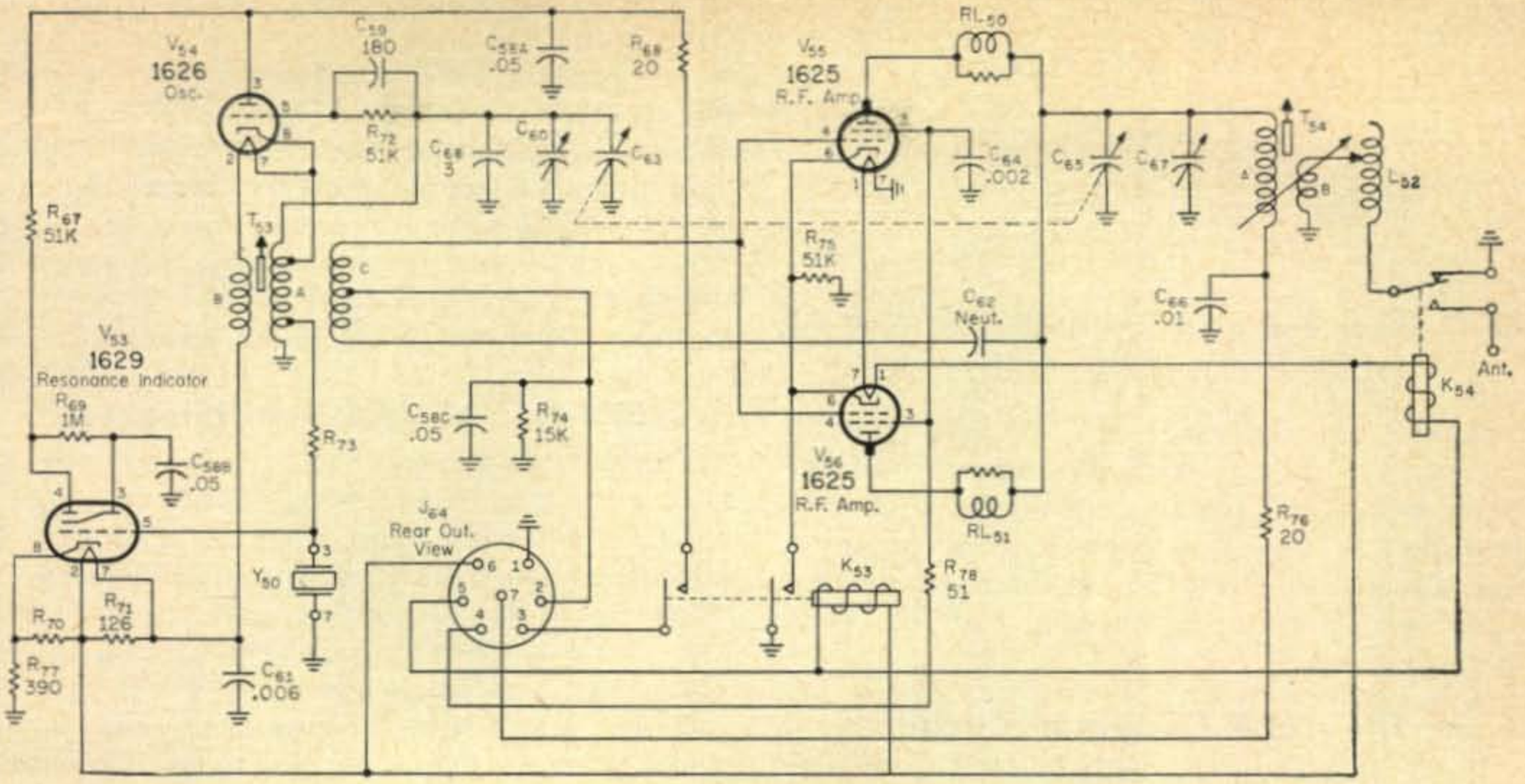


Fig. 1—Circuit of the unmodified SCR-274N.

Power Amplifier and Output Circuit

Remove one of the 1625 tubes, (V_{56}) the antenna tuning coil L_{52}, the antenna relay K_{54}, and the antenna binding post in the upper left hand corner on the front panel. The latter should be replaced with a coax connector if you prefer to use coax to connect the v.f.o. to the following stage. I have been using 72 ohm small twin lead to interconnect stages. For this use a National-type "FWJ" R-39 terminal. Disconnect the grounded end of T_{54_B} and connect it to the "FWJ" terminal or leave it grounded for use with a coax connector. I have used the small 72 ohm twin lead in the past to connect the v.f.o. to a remote transmitter, a distance of over 100 feet, with excellent success.

Remove R_{74} which will be replaced in the power supply in the 1625 grid metering circuit. Remove relay K_{53} (7252) but save it for future use. Rewire the filament circuit for 12.6 volts. Remove R_{75} and connect pin 6 of the remaining 1625 (V_{55}) direct to the grounded filament pin, 7. Connect pin 7 to the grounded end of C_{66} between the two 1625 sockets with a short wire for a good r.f. connection. Install a .01 mf bypass capacitor between pin 1 and pin 7 of V_{55}. Disconnect the control grid, pin 4, and the screen grid, pin 3, of V_{56} by clipping the interconnecting wires at the socket of V_{55}, the 1625 to be used. Remove the neutralizing capacitor, C_{62}, disconnecting it from the junction of C_{65} and C_{67} and from pin 6 of the oscillator coil shown in fig. 3. Since a single 1625 is to be used, leave the grid return on pin 4 of fig. 3. This will give ample drive for a single 1625. If an 837 or two 1625's are to be used, moving the grid return connection from pin 4 to pin 6, will increase the grid drive and be better suited for this combination of tubes. With the power supply suggested, pin 4 will give about 3 ma of grid drive with a single 1625 while pin 6 will give about 8 mils, which will be overdriving a single 1625.

Resonance Indicating Circuit

For amateur use there will be no need of this circuit. Therefore, remove it completely,

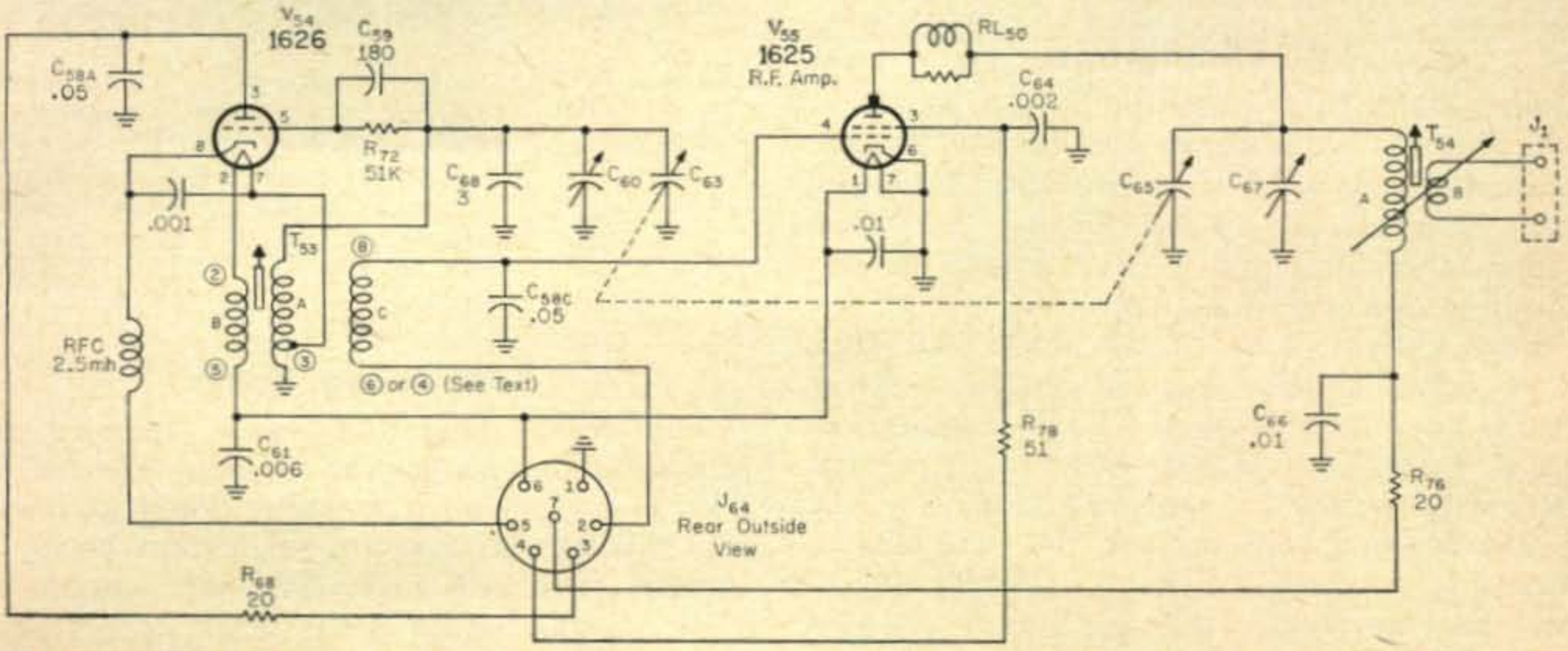


Fig. 2—Modified circuit of the SCR-274N. The circled numbers on the oscillator coil are identified in fig. 3.

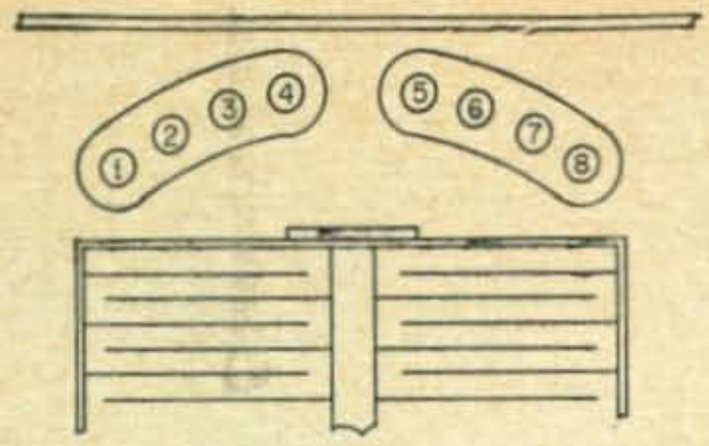


Fig. 3—Basing diagram for the modified oscillator coil wiring. Pins 1 and 7 have no connections.

including the 1629, crystal, sockets and all components starting with R_{67} at pin 3 of the 1626 socket and winding up at pin 1 of T_{53}, (see fig. 3) and C_{61}. Connect this point on C_{61} directly to pin 6 on J_{64} forming the hot 12.6 volt filament connection for the 1626 through T_{53_B}.

The 1626 Oscillator Circuit

First, check all 3 sections of the bypass capacitor C_{58} to be sure they are not leakers. If leaky, replace C_{58_A} with a 0.01 600 v. disc ceramic from pin 3 to ground on the 1626 oscillator tube socket and replace C_{58_C} with another. The latter may be installed in the oscillator circuit shield can or directly from pin 6 of the oscillator coil to ground. The replacement for capacitor C_{58_B}, a 0.01, is not critical.

While on the subject of C_{58} it might be well to add that in converting many 274-N receivers, lots of leaky capacitors of this type have been removed. Their failure has been a common source of trouble in the receivers.

Remove the screws from C_{58} so that it can be moved out of the way while working on the oscillator circuit. Disconnect pins 7 and 8 on the 1626 socket from each other. Install a .001 disc ceramic bypass between them. Connect a 2.5 mh r.f. choke from pin 8 on the 1626 to pin 5 on J_{64}. Check C_{59} (removing R_{72}) to be sure this capacitor is not leaky. If leaky, replace with a .00018 silver mica and reconnect or replace R_{72}. Connect R_{68} directly to pin 3 on J_{64}, or replace R_{68} with a 2.5 mh r.f. choke; both work equally well.

TVI Elimination

Some claim that these units are a source of TVI. This has not been the case here at W8DG. Elimination of TVI is a problem based on which channels are in use locally. As a precaution, therefore, and as a first step in preventing it, for the final alteration, install one or more sodering lugs directly under J_{64}. Then install ceramic disc bypass capacitors from pins 2 and 7 to ground. The value is not critical, from 0.001 to 0.01 will be satisfactory.

Remove the cover with markings for the antenna loading coil; remove the two pins to which this is fastened. Cut a 5" × 1⅝" aluminum panel to replace this and mount a Johnson #147-329 (for bayonet base bulb) or #147-330 (for screw base bulb) in the center of the panel; install light, mount it on the front panel and wire it to the filament circuit. This will improve the appearance of the unit, will provide an indicator light, will light the calibration dial and the solid panel should help in TVI elimination by removing one source of r.f. leakage from inside the unit. The screw holes for mounting the antenna tuning coil and associated parts can be used to mount the new front panel addition.

274-N and ARC-5 Differences

The circuits shown, and conversion instructions given are based on the 274-N Air Force units. Their companion units in the ARC-5 (Navy versions) have some minor differences which must be considered now. Some units also carry a CBY or CGT type designation. These are similar to the Air Force 274-N versions in circuitry, connections and other characteristics. Following is a table of unit designations and frequency ranges.

Range in mc	ARC-5 Model	274-N Model	CBY or CGT Model
1.3 to 2.1	T—17	none	not known
2.1 to 3.0	T—18	none	52232
3.0 to 4.0	T—19	BC-696-A	not known
4.0 to 5.3	T—20	BC-457-A	not known
5.3 to 7.0	T—21	BC-458-A	not known
7.0 to 9.1	T—22	BC-459-A	not known
100 to 156	T—23	none	not known

The 1625 plate circuits of the amplifiers of the 274-N and ARC-5 units are different. The 274-N units have series feed through the "A" of T_{54}. The ARC-5 units are parallel fed through an r.f. choke to RL_{50} (fig. 1) and coupled to T_{54_A} through a 400 mmf tubular capacitor mounted on the top of T_{54}. They work equally well. For the purposes of this conversion the ARC-5 units might just as well be rewired to conform to fig. 2.

The ARC-5 equivalent to the J_{64} connection jack on the rear of the unit is different in dimensions, pin spacing and internal connections. The overall diameter of J_{64} on the outside of the unit case is 1⅛ inches, while the ARC-5 jack is 1 5/16 inches overall. The following table gives the internal connections.

Pin Number	274-N Units	ARC-5 Units
1	Chassis	No Connection
2	1625 G_1 return	+250v. osc. plate
3	+250v. osc. plate	Relays
4	+250v. 1625 G_2	Chassis
5	Relays	Filament hot
6	Filament Hot	+250v. 1625 G_2
7	+H.V. 1625 plates	+H.V. 1625 plates

Mounting Racks

The transmitter units were plugged into mounting racks when installed on planes. The FT-234A rack is for a single 274-N unit while the MT69/ARC-5 is the single unit Navy version. A twin unit rack, FT-266A, carries two 274-N units and the Navy model designation is not known to me. A three unit rack was provided for in the instruction books for the

274-N units but as far as I know, none of these was ever manufactured. Whether the Navy had a 3 unit rack or not is also not known. The FT-331A rack held four 274-N units, and its Navy counterpart, if any, is not known. *Warning—do not try to force an ARC-5 unit into a 274-N rack or visa-versa. They will not fit.* The small male pins on the rack jack will be irreparably damaged.

If possible to obtain mounting racks, it is recommended that they be used, especially if more than a single v.f.o. unit is involved. Remove all the wiring in the racks and connect a 7 wire cable or cables, long enough to reach your power supply, directly to the matching jack for J_{64}. Terminate each cable in a 7 prong male connector which can be plugged into a female connector on the power supply. The reasons for this will be seen later when the power supply is discussed.

The BC-696-A, T-17 ARC-5, BC-459-A, T-22 ARC-5, and the T-19 ARC-5 will cover the amateur bands without recalibration. With changes in the oscillator and p.a. padders, the T-18 ARC-5 or CBY52232 or CGT 52232 will cover the 160 meter band; the BC-457-A or T-20 ARC-5 will cover the 80 meter band and the BC-458-A or T-21 ARC-5 will cover the 40 meter band. Changes in the oscillator or p.a. coils will not be necessary.

Calibration

A set of Bristo wrenches will be required to unlock and relock the set screws on the padders. The shield can will have to be removed from the oscillator circuit, and a hole drilled in it so that a screw driver can be inserted to shift the oscillator padder setting. The spring insert on the side of the unit must be removed to get at the p.a. padder shaft.

Loosen the shaft locks on both padders with the Bristo wrench and then tighten up slightly so that the rotor shaft can be turned with a screw driver but will not move from its own weight.

Decide where you want the band to fall on the dial and then use a frequency meter or calibrated receiver to plot a new frequency curve for the unit. *Warning—The adjustment of the oscillator padder is very critical.* Make this very slowly and carefully with the trimmer on top of the padder capacitor set at half capacity. Try and get the padder set with the trimmer at near half capacity to allow for future readjustment to correct for drift due to tube aging, temperature changes, *etc.*

After the oscillator has been set for the starting frequency for recalibration, lock the capacitor shaft carefully so as not to disturb the setting. Adjust with the trimmer. Then proceed to calibrate for the rest of the band. Next apply a load consisting of a 25 watt lamp to the output of the p.a. and set the p.a. padder for maximum lamp brightness; then lock the p.a. padder.

Adjustment of the p.a. padder is not as critical as is the oscillator. A slight discrepancy here will not harm the performance of the unit too much. For maximum accuracy of calibration, the split plate of the oscillator tuning capacitor can be used.

Coverage

The four unit arrangement used here provides coverage for all bands from 160 meters to 10 meters with associated units to be described in the following articles. It further provides considerable flexibility when used with the associated units. For example, the recalibrated 2.1 to 3 mc unit will cover 160 and can handle a following stage doubling to 80. The 3.0 to 4.0 mc unit can work straight through on 80 or drive a following doubler to 40. A BC-458-A with standard calibration at 5+ mc output is used to cover 15 meters with an associated multiplier unit. Doubling twice in the multiplier will hit 15 meters with the 5+ mc v.f.o. output. This multiplier is also used to cover 10 meters with the BC-459-A as a v.f.o. The BC-459-A may be used straight through on 40 or with the above multiplier to handle 20 and 10 meters. It has also been used with a properly designed multiplier to handle six meters.

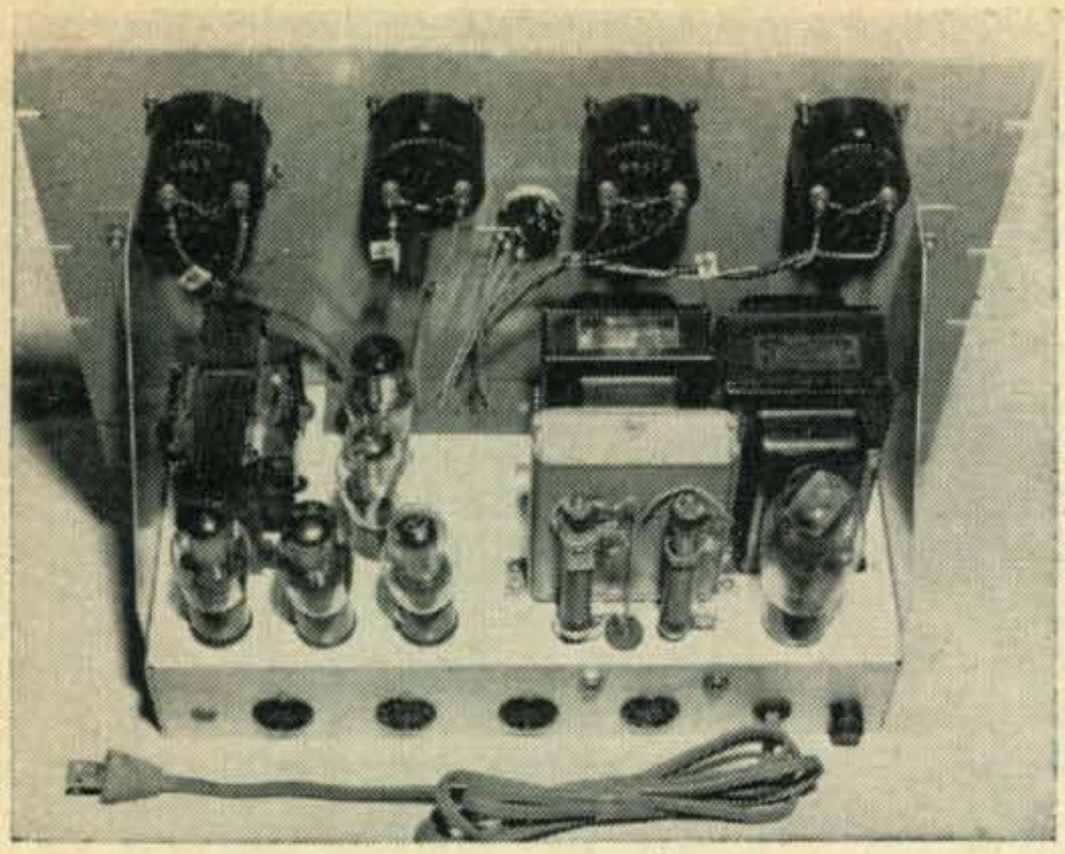
Keying Systems

Complicated keyers were not desired here. Therefore, many hours of research and experimentation have been devoted to keying to get the chirp out of the BC-459-A units which seem to be notorious for a chirpy signal. The solution presented here has been satisfactory.

The K_{53} relay is readily adjusted for this service. Adjust the relay so that the oscillator will make first and break last, and the p.a. will make last and break first. Key the oscillator cathode and the p.a. screen. The adjustment to obtain the sequence above is easily accomplished by bending the springs on the relay contacts. The contact spring farthest from the relay coil of K_{53} is grounded to the relay frame, therefore connect the lead from pin 5 on J_{64} through S_5 to the second contact. The connection from pin 4 on J_{64} through S_5 and, the 1625 screen grid circuit meter lead should go to one of the remaining contacts and the other remaining contact is connected to the contact arm of S_4.

The 24 volts d.c. required for the relay coil is obtained from a 24 volt step down transformer, with a 100 ma (or better) selenium rectifier and associated filter as shown in the power supply schematic, fig. 4. On tests with a 46 volt power supply (with no load), this relay drew 95 ma at 31 volts. It will follow a bug at high speed at much less voltage and current and has performed completely satisfactory for keying service here for over 10 years.

The relay is mounted in the power supply and switched to serve all v.f.o. units. Relays have also been mounted on sponge rubber in the 274-N units so as not to jar the oscillator



Top view of the power supply for the modified SCR-274-N v.f.o.s. The meter functions are, from l. to r., P.A. Plate, P.A. Screen, P.A. Grid and Oscillator Plate. On the left of the chassis is T_3, center, the swinging choke and alongside, T_2, the power transformer. On the rear lip of the chassis we have the power outlets for the v.f.o. units and J_2 and J_3. Transformer T_1 is located beneath the chassis as is the keying relay K_{53}.

when keyed. They have been just as satisfactory there. This, however, requires one relay for each unit.

Power Supply

The power supply used with these v.f.o. units makes a major contribution to their satisfactory operation. Good voltage regulation is essential. For v.f.o. use, 400 volts on the p.a. plate is ample. The plate power transformer should have a capacity of 150 to 200 ma and show very little voltage drop under load. Regulation of the oscillator plate and p.a. screen voltages is necessary. Swinging choke input, 4 mf or more of filtering and a moderately heavy bleeder help. The unit shown here shows only a few volts drop on the p.a. plate voltage from no load to full load.

The supply is built on a 7 × 15 × 3 aluminum chassis and has an aluminum rack panel 19 × 12½ for meters and switches and keying relay jack. Milliameters are installed in the oscillator plate, p.a. control grid return, p.a. screen and p.a. plate circuits. Without the meters you are "flying blind." A four pole four position switch, S_5, shifts the oscillator plate voltage, the p.a. screen voltage, the p.a. plate voltage and the cathode of the oscillator to the unit to be used. The p.a. control grids are all always conected, through pin 2 on J_{64} on each unt. to the metering circuit. The filaments and dial lights are energized on all units whenever the a.c. switch S_1 is on. The 250 volts regulated is supplied to the oscillator plate and 250 volts maximum, regulated, to the p.a. screens. The screen voltage is selected by S_4 so that three steps of voltage may be obtained to regulate drive or to accommodate the difference in drain if an 837 tube is used in one of the units instead of the 1625. Meters should read approximately as per the following table when feeding the driver units or multiplier units described elsewhere in this issue.

P.A. Tube	Osc ma	P.A. Grid	P.A. Screen	P.A. Plate
1625	23-28	3-6	6-9	40-70
837	23-28	4-9	15-20	40-60

Figure 4 is the schematic wiring diagram of the power supply. The photos show the parts layout and construction details. Layout of parts is not critical. Switch S_1 cuts off the a.c. supply. Switch S_2 cuts off plate voltage to both the oscillator and the p.a. and also the p.a. screen voltage. This switch may be used for standby. Switch S_3 cuts off the plate and screen voltage to the p.a., but leaves the oscillator plate voltage on for setting frequency. Switch S_4

[*Continued on page 133*]

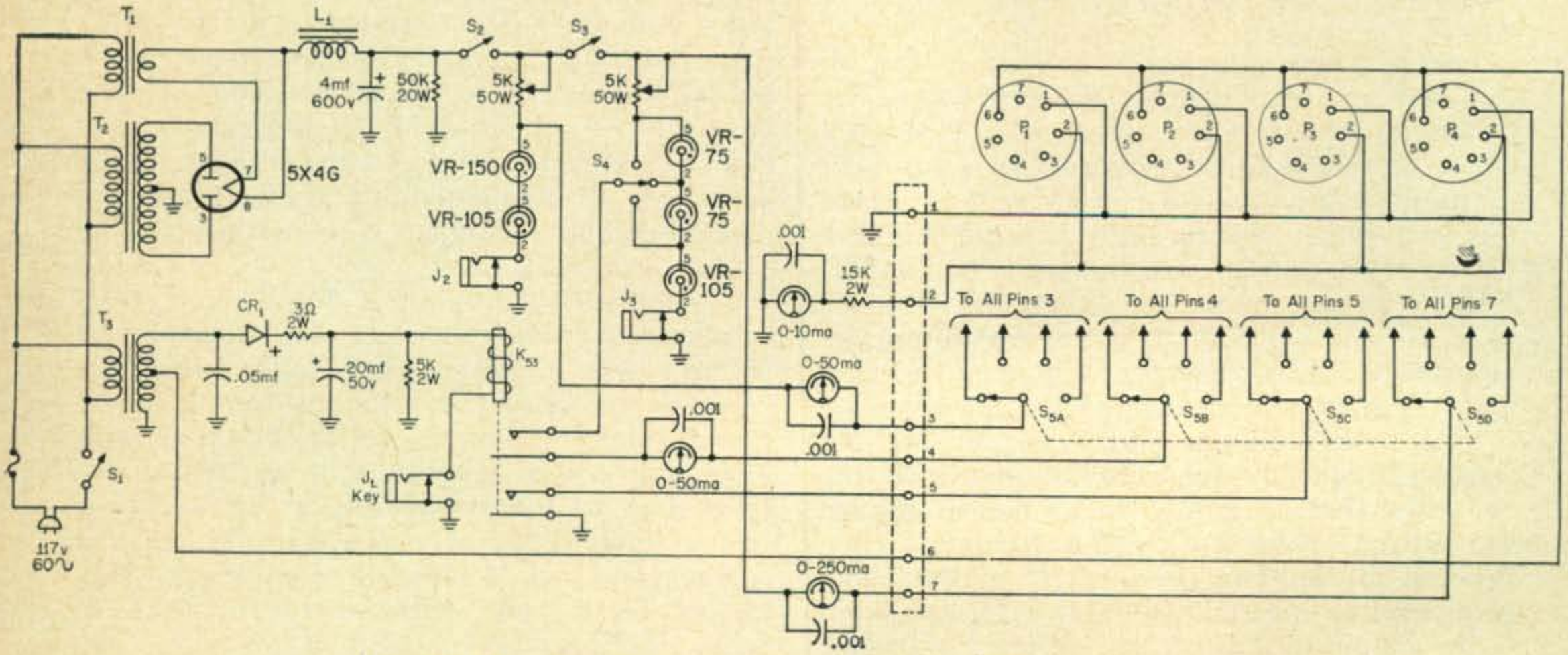


Fig. 4—Schematic of the power supply and switching arrangement.

CR_1—Selenium rectifier, 100 ma.
L_1—10-30 H, 200 ma swinging choke.
T_1—5v @ 3 amps.
T_2—800 v.c.t. @ 150 to 200 ma.
T_3—117 v to 25 v.c.t. @ 5 amps.

A High Frequency 24G Multiplier

D. C. McCOY*, W8DG

This inexpensive multiplier, built with surplus components, will permit operation of the ARC-5/SCR-274-N v.f.o. units, described in the previous article, on the 15, 10 and 6 meter bands.

Most amateur frequency control units, be they crystal controlled, v.f.o. or heterodyne type, are built today for output in the 80 meter band, and sometimes the 40 meter band. While initial frequency control at higher frequencies is possible, it is not S.O.P. (standard operating practice) for the amateur fraternity. The power output of these units is also low. Therefore, when anything except low power operation is required and when 10, 15 and 20 meter output is desired, the output frequency has to be multiplied and the power stepped up. Using the 274-N or ARC-5 units for frequency control, the 40 meter band is the highest frequency range directly available from the standard control unit. The BC-459-A has been successfully modified for 20 and 10 meter output, and probably could be for 15 meter output.

There are numerous approaches to frequency multiplication and power step-up available for the amateur. Much thought and experimentation resulted in a final decision to develop a unit having two stages of tunable multiplication with 5+ mc input from a BC-458-A for 15 meter output, and with 7 mc input from a BC-459-A for 10 meter output. In the latter case the 20 meter output is obtained from the first multiplier plate, when desired.

The next problem was to select the tubes to be used. Various combinations of tetrodes were tried, particularly the 1625, since they were cheap and in plentiful supply. The final choice was 24G/3C24 (VT-204) triodes which produced a unit free from parasitics. These tubes also were not overdriven by the v.f.o. and the first multiplier. Type 35TG tubes may be used with equal success if available. Power gain at moderate plate voltages when driven by the 274-N v.f.o. units is ample. We are partial to triodes and pentodes here as we have found them normally free from parasitics and spurious signals and require little or no tedious debugging. More often than not the initial layout will be found trouble free, whereas the tetrodes have given us many major headaches. Figure 1 shows the circuit of the final model of the 10, 15 and 20 meter multiplier unit.

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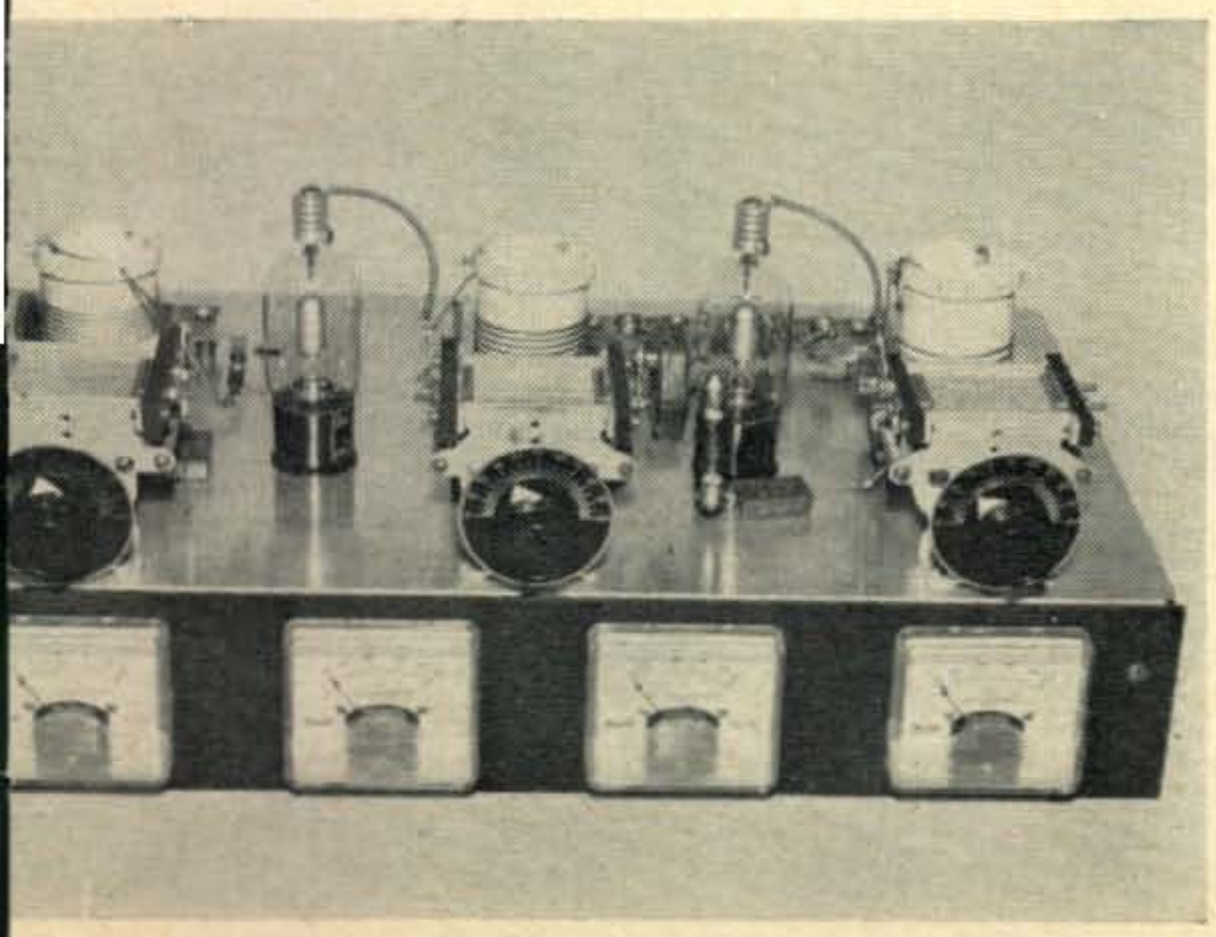


Front view of the multiplier chassis. The meter functions are, from l. to r., 1st multiplier grid, 1st multiplier plate, 2nd multiplier grid and 2nd multiplier plate.

The 10, 15 and 20 Meter Multiplier Unit

For the adapted design of this unit, shown in fig. 1, the inductances and tuning capacitors were selected so that input to the first tube grid could be tuned from 5250 kc through 7500 kc with the plate of this tube doubling and tuning to 10.5 mc through 15 mc. The plate of the second tube doubles and tunes through the range of the 15 and 10 meter bands. The major design problem was to determine these capacitor and inductance combinations so that plug in coils would not have to be resorted to.

The Command units came to the rescue by providing the coils needed. Those finally selected were the p.a. coils from the BC-457-A or ARC-5 T-20 (coil numbers 7248 from the 458 or 9293 from the T-20) for the input tube grid; from the BC-458-A or ARC-5 T-21 (coil 7249 from the 458, or 9294 from the T-21) for the first multiplier plate; and with slight modification, the coil from the BC-459-A (coil #7250) is used for the plate of the last multiplier. This last coil is modified by removing the top two turns which is easily done. For better appearance, and since they served no useful purpose in this application, the tuning slugs and plate parasitic suppressors were removed.

Flexibility in power output is obtained in

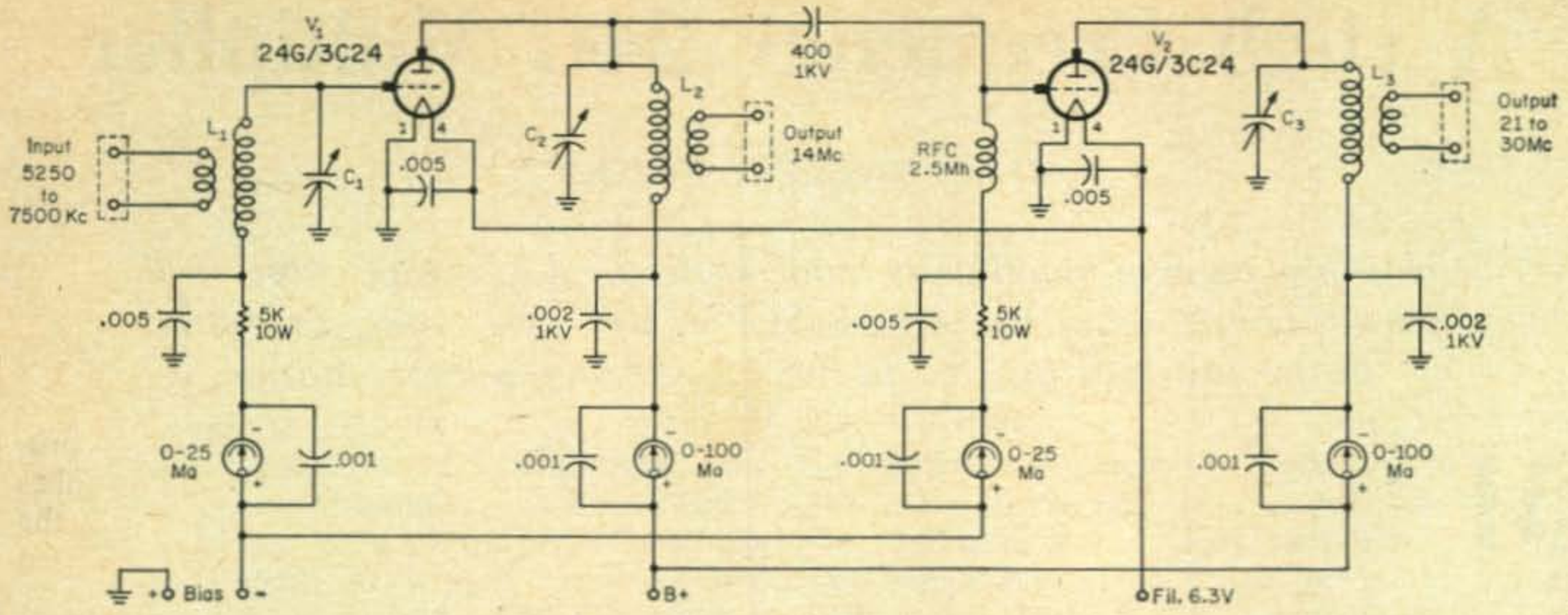


Fig. 1—Circuit of the multiplier for operation on 10, 15 and 20 meters. Rather than 4 separate meters, use may be made of the alternate circuit shown in fig. 2. This circuit may also be used to multiply to the 6 meter band but with component changes. These are discussed in the text. The entire unit is built on an 8" × 17" × 3" chassis.

C_1—150 mmf. Cardwell MR-150-BS or equiv.
C_2, C_3—50 mmf. Cardwell 410-B or equiv.
L_1—#7248 coil from BC-457-A or #9293 coil from ARC-5-T20, or 16½t. #18, 2" long, 1 9/16" d.
L_2—#7249 coil from BC-458-A or #9294 coil from ARC-5-T20, or 11½", #16, 2" long, 1 9/16" d.
L_3—#7250 coil from BC-349-A or 6½ t. #16, 1⅝" long, 1 9/16" d.

two ways. The coils selected have variable output links. These can be used if it is necessary to reduce the input to the stage following the multiplier unit.

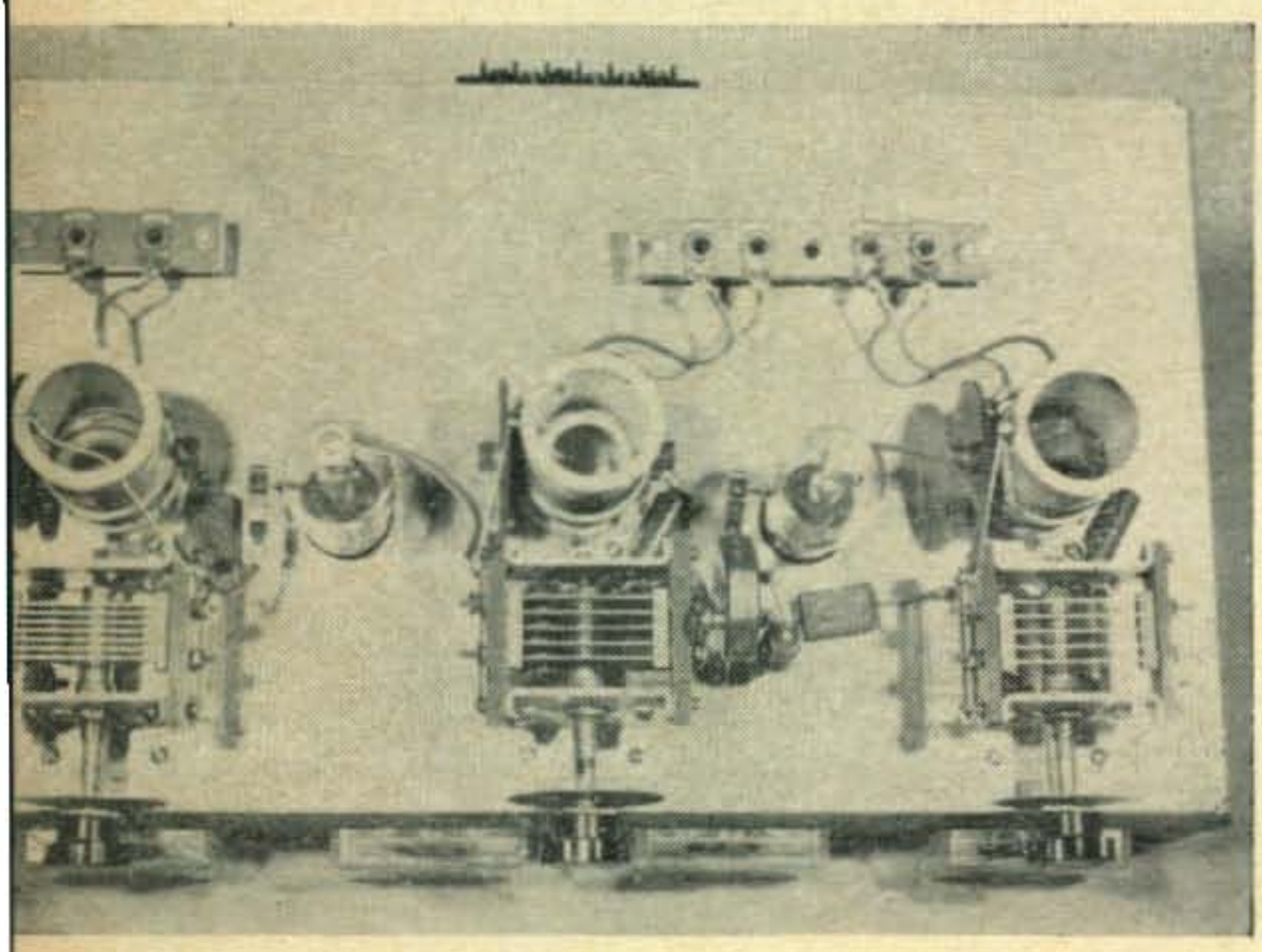
According to the data sheets, the 24G tubes are capable of operation with 2000 volts on the plate. They have never been used here at that voltage level, however should it be necessary to increase the drive to the stage following the multiplier, raising the voltage is a simple way of attaining this result. Satisfactory results to meet our needs have been obtained with about 400 volts on the plates. By use of the coupling links on the coils and variation of plate voltage, a very flexible unit is achieved.

The two tubes are capacity coupled. In the layout, the tubes are oriented on the chassis so the grid terminals face the input end of the unit. With the coil and capacitor combinations selected, the variables are at a little less than half capacity for 10 and 20 meter output and at 60 to 75 percent capacity for 15 meter output.

Both stages are biased by a combination of grid leak and fixed bias from a bias power supply. High bias is required for best performance when multiplying and fixed bias is required for cut-off when operating c.w.

The bypass capacitors are not critical. Values from 0.01 to 0.001 will be suitable. For those who may not have Command Set coils available the parts list, in fig. 1, gives specifications for these coils which are wound on ceramic forms 1-9/16 inches in diameter. Ceramic forms 1½ inches in diameter will probably be suitable if the exact diameter cannot be obtained. Of course the flexibility given by the variable link of the 274-N coils will then have to be sacrificed, but a two turn link about ⅛ inch from the cold end of the winding will probably be found suitable for those who will have to "roll their own." For reduced output without link control, plate voltage to the output tube, or both tubes, can be reduced.

The Cardwell tuning capacitors used happened to be on hand. Small variable capacitors similar to the Hammarlund MC types may be substituted unless high plate voltage is to be used, in which case wider spaced tuning capacitors should be used in the plate circuits. For frequency multiplying, neutralization is not required and this materially simplified the layout and choice of components.



The multiplier unit uses two 24G triodes as well as surplus components from the Command sets.

Metering

Both grid and plate circuits are metered. If it is desired to save the expense of four meters, one 100 ma meter may be mounted on the front of the chassis with a 2 pole 4 position switch to change it from circuit to circuit as shown in fig. 2. An insulated mounting panel containing four closed circuit jacks in place of the meters may be installed on the front or back of the chassis and a 100 ma meter, equipped with a plug, shifted from circuit to circuit, can then be used. Be sure the polarity of meters is observed.

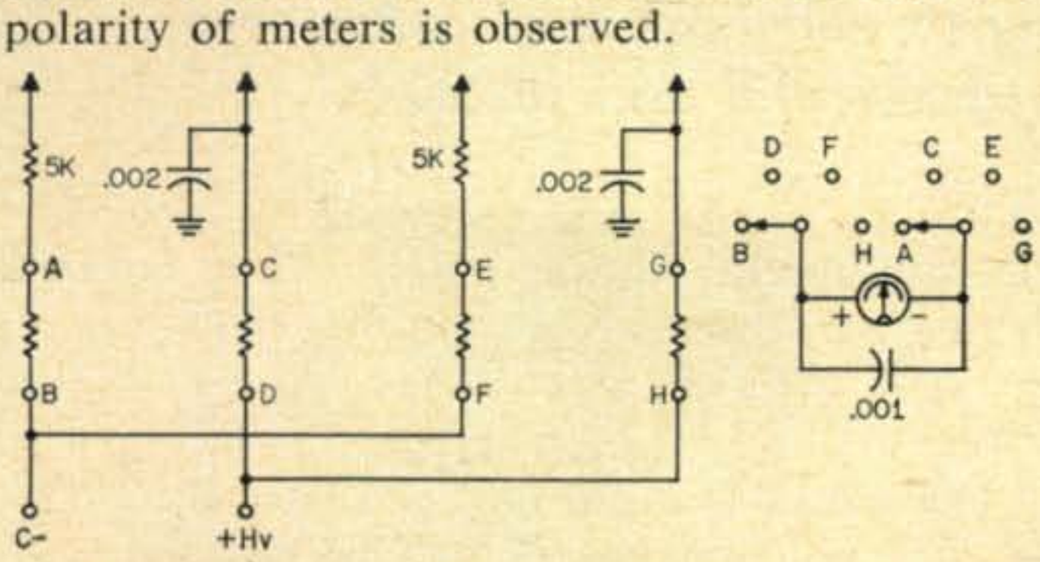


Fig. 2—Alternate metering circuit using a 4 position switch and a single meter.

Under operating conditions, driving the 10 and 15 meter driver unit described in another article, the following readings were observed at 28,016 kc output with the multiplier being driven by a BC-459-A as v.f.o.

Circuit	Multiplier #1	Multiplier #2
Grid	14 ma @ −135 volts	18 ma @ −135 volts
Plate	45 ma @ +460 volts	40 ma @ +460 volts

Unit For 6 Meter Output

The schematic for this unit is exactly the same as for the 10, 15 and 20 meter output unit. The physical layout is also the same. The only difference is in the choice of tuning capacitors and coils for the plate circuits. The unit is driven by the BC-459-A as a v.f.o. in the range 8333 kc to 9000 kc and triples in the first multiplier and doubles in the second. Instead of the .0004 coupling capacitor used in the 10, 15 and 20 meter unit between the two stages, .01 was used.

The input coil to the grid of the first tube is the #7248 P.A. plate coil from the BC-457-A with a 100 mmf tuning condenser. The Plate coil for the first tube is made from an oscillator coil #6030 from a BC-457-A unit. Oscillator coil forms from other models of either the 274-N or ARC-5 could be used just as well. The windings are all removed and the inner coil form also removed. Unsolder the heavy wires holding the inner coil form and pull them through the outside form—do not clip with pliers as the strain may break the outer form. The outer form is then wound with eight turns of #14, spaced to cover a 1⅝ inch length. For those not having one of the coil forms available, a 1¼" diameter ceramic form will probably do just as well. A double spaced 35 mmf Hammarlund type 35 capacitor was used for tuning (double spaced just because it happened to be on hand—see previous comments on plate capacitors on the 10, 15 and 20 meter multiplier unit). In place of the 2.5 mh r.f. choke shown in fig. 1, an Ohmite Z-50 choke is used.

The plate coil for the last multiplier is an old Bud 5 meter 5 prong plug-in coil, with the same size and type capacitor used in the first multiplier plate circuit. This coil is 1⅛ inches in diameter, air wound and has four turns of #14, 1½ inches long with a 2 turn link over the cold end. The bypass capacitors are not critical.

Power Supplies

A conventional power supply providing 400 to 500 volts at 100 or more ma will be adequate for these two units. Filament supply of 6.3 volts at 6 amperes will be required for the 24G/3C24 tubes and 5 volts at 8 amperes for the 35TG tubes. A bias supply of minus 125 to 175 volts across a 5000 ohm bleeder will be adequate for the fixed bias required. The additional bias needed for multiplying is furnished by the grid leak bias resistors of 5000 ohms in each grid circuit.

Details Of Construction

The layout of parts for both the 10-15 meter and 6 meter units is identical, varying only in the components used. As built, it forms a neat symmetrical unit of good appearance. The two end capacitors and coils are mounted on a center line (fore and aft) 2½" in from either end. The middle coil and condenser is mounted on the fore and aft center line of the chassis. The coils are four inches (on each center line) back from the front edge of the chassis.

Meters are mounted on the front edge of the chassis and are placed symmetrically. A six terminal Jones strip is mounted on the rear of the chassis to connect the bias, filament and plate supply to the unit. With the low plate voltage used, a six prong socket and matching tube base and cable could just as well be used.

All connections from the top of the chassis to its under side are made through ¼" holes insulated with spaghetti. All r.f. is bypassed to ground above the chassis as may be seen in the photo. All connections are short and direct.

The r.f. input and output jacks were made up from a broken terminal jack from a BC-375 tuning unit. Here at W8DG we have standardized all our equipment for ¾" spacing on output jacks (initiated by the use of National "FWJ" R-39 terminals adopted for output on the v.f.o.'s) and a one inch spacing for input jacks. The Mycalex jack bar used on the BC-375 tuning units can be readily sawed with a hack saw for dimensions to suit, and is easily drilled with regular metal drills to accommodate the mounting screws. Small 72 ohm twin lead connects the links on the coils with the input and output jacks. There is no magic connected with the BC-375 jack, any termnals suitable for r.f. could just as well be used.

The following table gives the settings for the

[*Continued on page 136*]

A Driver for a 1 KW Final

D. C. McCOY*, W8DG

Here is a pair of drivers for a kw final, one with plug-in coils and the other with multi-band tuning units that operate from 160 to 20 meters. Here is an opportunity to get those dust collectors off the shelf. The unit is extremely simple and uses an 804.

IT has always been our ambition to have a full kw transmitter for each band from 160 to 10 meters. Today, this is partly realized and we are moving to completion as fast as ambition and other factors will permit. Of course, with the limitations on the 160 meter band today the kw job there has to be abandoned; but it is mentioned here as the driver unit will do just as good a job there as on the other higher frequency bands. As a suppressor grid modulated low power phone transmitter, it will deliver excellent results and can solve the 160 meter power limitation problem with simplicity and low cost.

The 804 tube is limited to 15 mc as its high frequency end point. Performance drops off very rapidly above 14 mc. So for today's use this driver unit is suitable for from 80 through 20 meters with excellent results.

For 10 and 15 meters we have had to come up with another answer which will be covered in the next article.

Construction

The circuit is shown in fig. 1. An 8" × 17" × 3" aluminum chassis will be adequate for the unit. Filament, screen grid and suppressor grid bypass capacitors can be mounted on the tube socket bracket giving short and direct leads to ground for r.f. Four or five prong ceramic form plug-in coils are used for the grid circuit and B&W 150 watt type "BEL" end link plug-in coils are used for the plate circuit. Coil specifications are given in fig. 1 for those who wish to "roll their own."

The grid coils are wound on Hammarlund 1½" diameter ceramic 4 or 5 prong forms. Wind the link in the space provided at bottom of the form or ⅛" from the main coil if using

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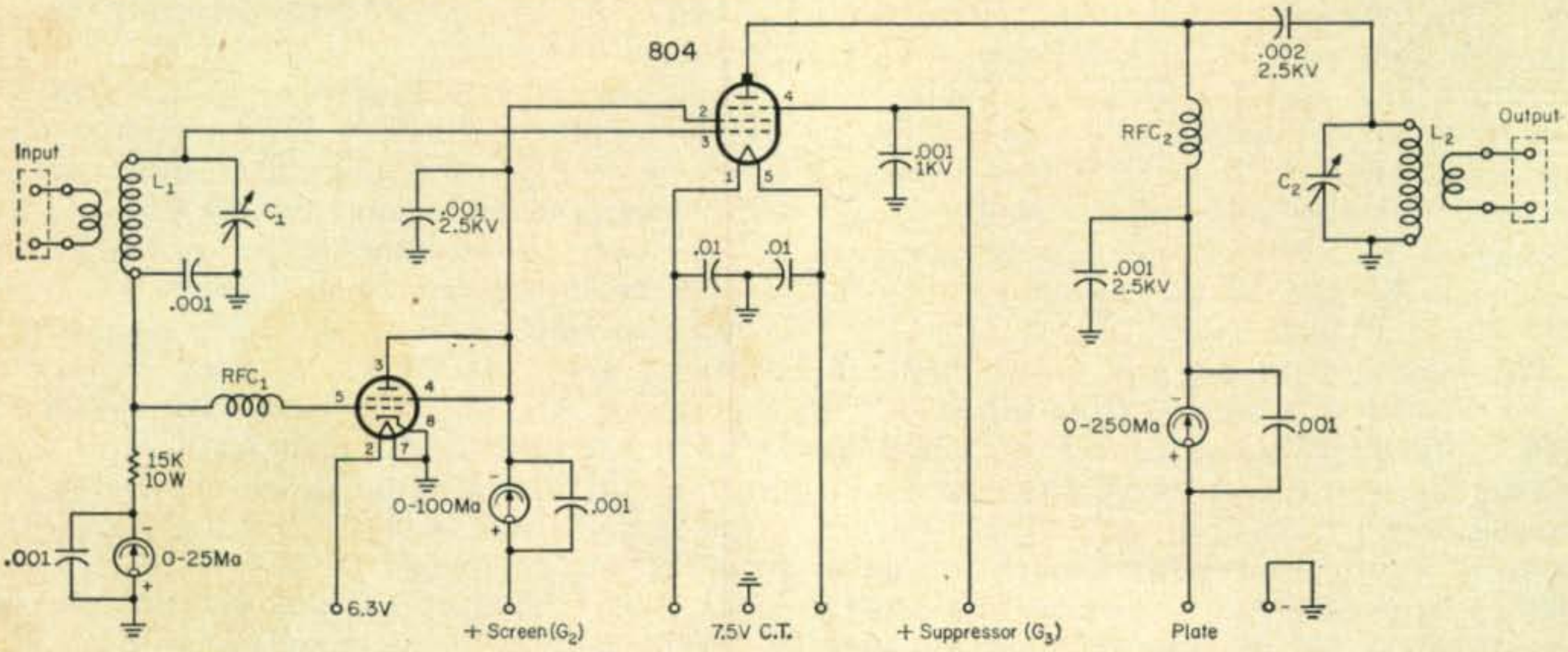


Fig. 1—Circuit of a simple driver for a kw rig. This model uses plug-in coils for full coverage. All capacitors are in mf rated at 600 volts unless otherwise noted.

C_1—100 mmf Hammarlund MTC-100-C or equiv.
C_2—70 mmf double spaced.
L_1—80M—32t, #20 d.c.c. close wound on 1½" form. 7t link.
40M—18t, #20 d.c.c., wire spaced on 1½" form. 5t link.
20M—9t, #18 d.c.c., ⅛" between turns on 1½" form. 5t link.
L_2—80M—B&W BEL 80 as is, or
29 t #16 E, 2½d. wire spaced. 2t link.
40M—B&W BEL 40 with 7t removed, or
13 t #14 E, 2⅛"d. ⅛" between turns. 2t link.
20M—B&W BEL 20 with 2t removed, or
8 t #14 E, 2"d. ¼" between turns. 2t link.
RFC_1—2.5 mh.
RFC_2—Ohmite Z7 or equiv. If 160 m. is to be covered, use Ohmite Z4.

other forms. Use # 22 d.c.c. wire for the links. The links for the plate coils are wound ⅛" to ¼" away from the cold end.

Clamp tubes have been used ever since they were first introduced some years ago and have been completely satisfactory. For c.w. operation, with 250 volts (at 25 ma) on the screen and 45 volts (at 4 ma) on the suppressor grid with key down, the clamp tube will drop the screen voltage to about 60 volts drawing about 50 ma and completely cut off the tube with key up. Suppressor grid voltage drops to practically zero, key up.

Both series feed through the plate inductance and parallel feed through an r.f. choke have been used with equal success in the plate circuit. If the unit is to be used for several bands where the plate coils are changed frequently, as a matter safety, to protect you against that thoughtless moment which could mean "Silent Key,", parallel feed is recommended and is shown in the schematic. The unit shown in the first photo uses parallel feed with the r.f. choke being below the bread board. In some units this choke was mounted above the chassis; no difference was noted due to its location. Be sure to select a choke which is effective for all the bands used.

Voltage Dividers

Voltage for the screen and suppressor is taken from a divider as shown in fig. 2. A 100K 100 watt bleeder is also used in the power supply. Heavy resistors should be used, at least 100 watts for that portion which carries the current between the full plate voltage and the screen voltage pick off point. The first units built had the voltage divider under the chassis. For some years now later units have had the divider placed in the power supply where its heat can be more readily dissipated.

On several occasions it was desired to drive a medium power final with these drivers. The full driver output needed for a kw final was too high for the medium power final so a two pole two position switch, as shown in fig. 2B, has been used in the power supply to ground the suppressor and tap further down on the divider to reduce the screen voltage. This has worked very well and adds to the flexibility of the unit.

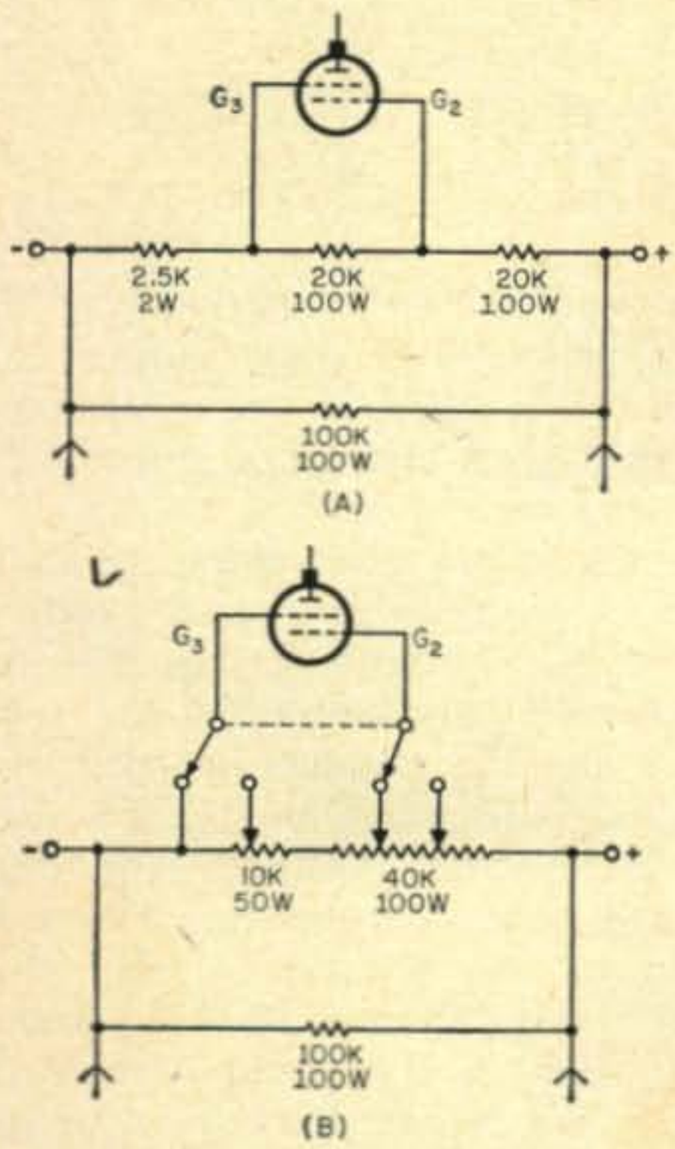


Fig. 2—Power supply voltage dividers. Circuit (A) is used when driving a kw final. Circuit (B) may be used to reduce output when driving a lower powered final. The power supply output is 1250 volts at 300 ma.

Power Supply

The power supply is conventional. A 300 ma transformer at 1250 volts d.c. with 866 rectifiers, a 300 ma swinging choke and a 4 mf oil filled capacitor is satisfactory. A 100K bleeder is also used, in addition to the voltage divider, as a safety measure should one or the other open up.

The 6.3 volts required is at 1.25 amperes for the 6Y6G filament with one leg being grounded and 7.5 volts center tapped at 3.25 amperes is used for the RK-20/804 filaments, with the center tap grounded.

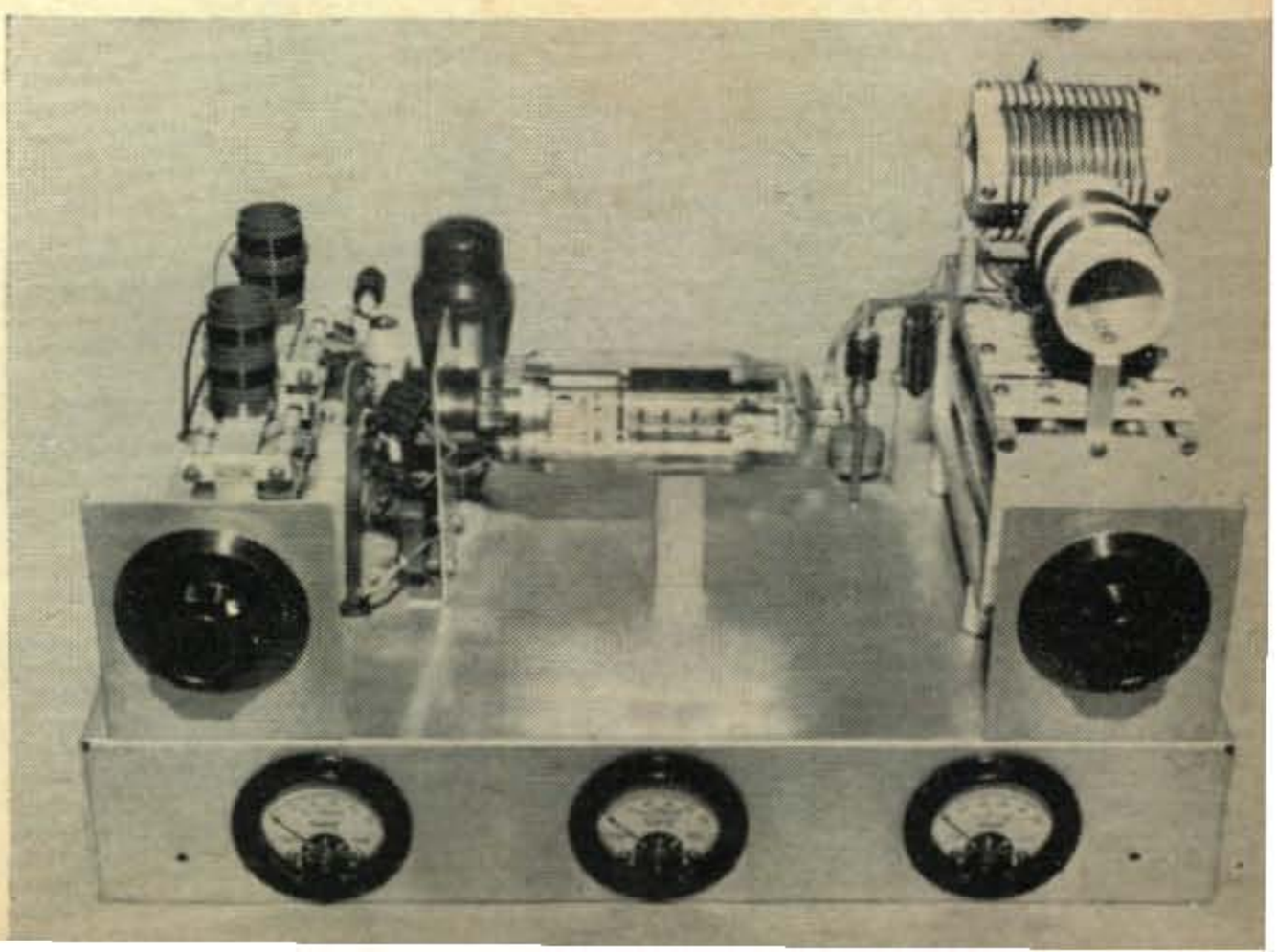
Set Up

The units are driven by 274-N v.f.o.s, link coupled with small 72 ohm twin lead. The final is also coupled to the plate of the driver with the same type twin lead; it has been entirely satisfactory. Twisted pair was used before twin lead was introduced and was also okay. Those preferring coax will find it satisfactory too. Plate current runs about 80 mils at 1200 to 1250 volts when driving a kw final.

A Multiband Tuner Variation

Some years ago, when National first introduced their "Multi-Band" tanks, we were intrigued with the idea and promptly purchased

Front view of the driver unit using an 804 and National multi-band tuning units. The grid multi-band tuner is on the left. The 804 socket mounting bracket also supports the filament, screen and suppressor bypass capacitors. The meters read, from l. to r., control grid, screen grid and plate current.



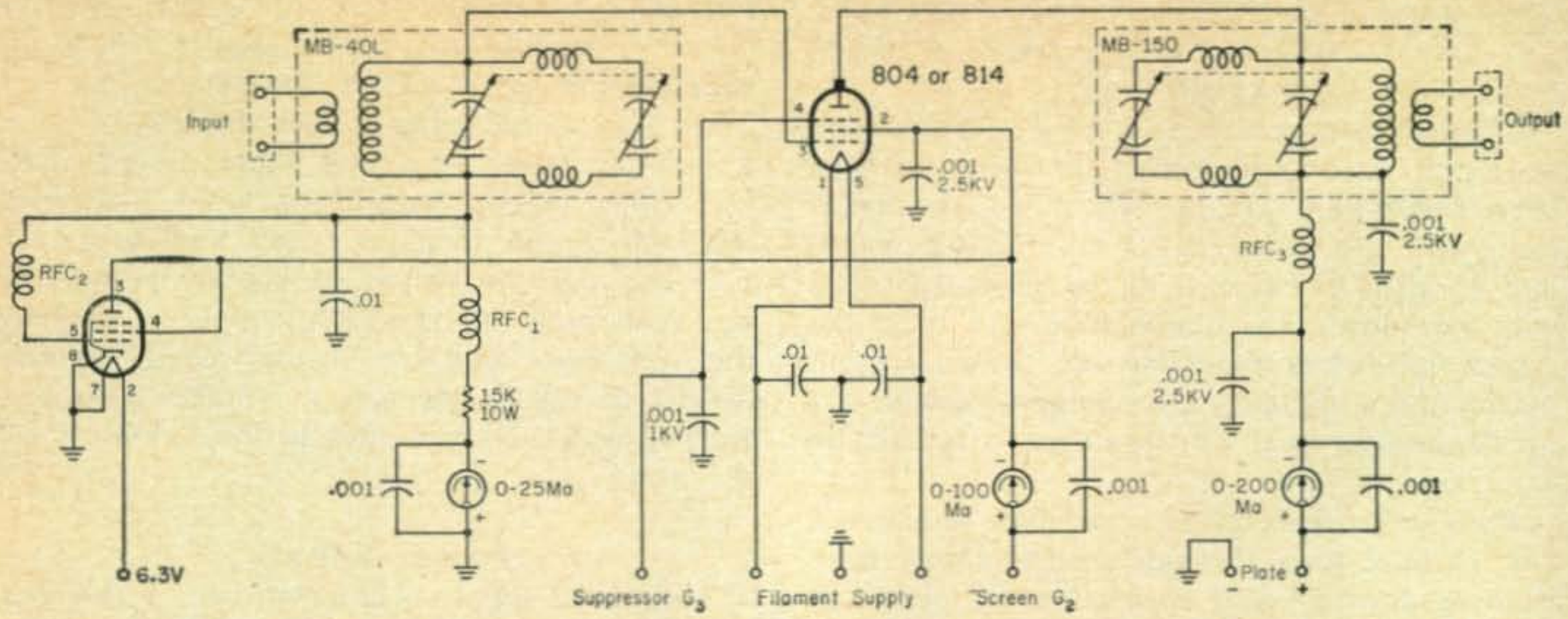


Fig. 3—Circuit of the all band driver using the National tuning units. The output unit comes with an r.f.c. connected to the center tap of the parallel tuning capacitors. For a single ended p.a. it should be removed and RFC_3 should be used. All bypass capacitors (minimum values shown) should be 600 volt units unless otherwise noted.

RFC_1, RFC_2—2.5mh, 100ma.

RFC_3—National R-300U, 300ma.

a pair of them. These gathered dust on the shelf until about two years ago when the inspiration to try them in one of these driver units hit us. At the time we had forgotten about the high frequency limitations of 15 mc for the RK-20/804 having in mind a unit primarily for 10 and 15 meter use. The photos show the completed unit and fig. 3 the schematic which is more or less the same as fig. 1.

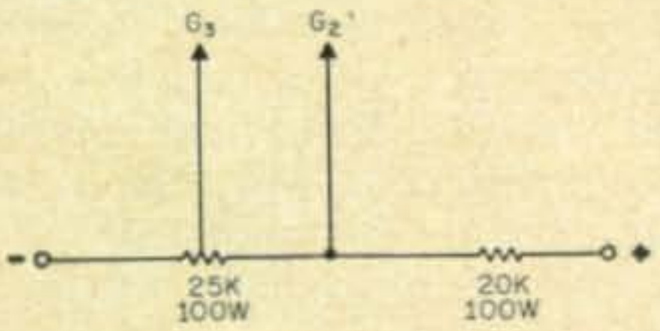
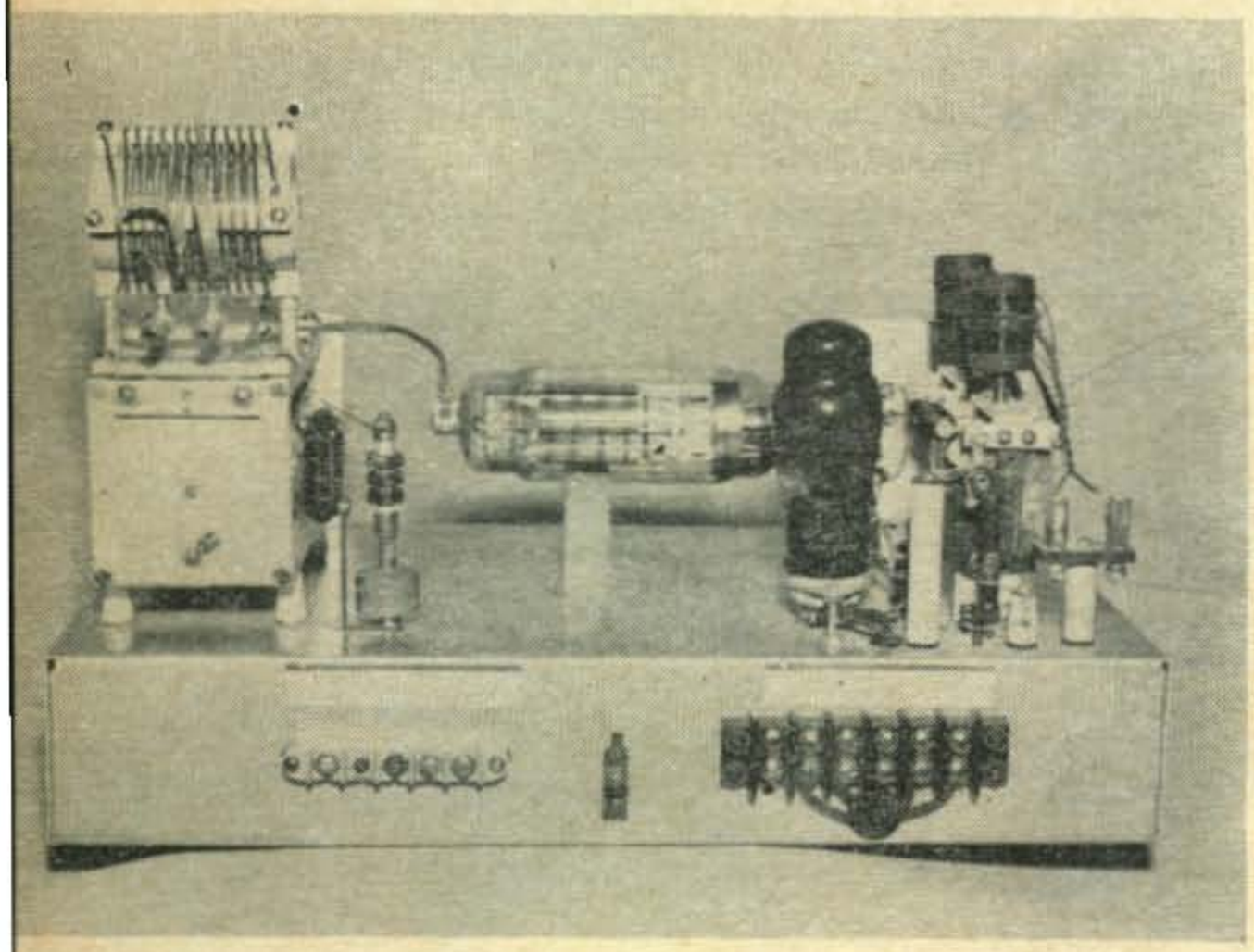


Fig. 4—Modified voltage divider for the multi-band version of the driver shown in fig. 3.

Rear view of the all band driver unit. The output jacks (left) and input jacks (right) may be clearly seen. Note the hardwood V block supporting the tube.



Because of the dimensions of the MB tuning units, a 10" × 17" × 3" chassis was used. The voltage divider for screen and suppressor voltage was placed in the power supply and the circuit is shown in fig. 4.

The unit worked perfectly from 80 to 20 meters. However, tuning was found to be rather critical. When an attempt was made to operate on 10 and 15 meters, the high frequency limitations of the tube were quickly apparent as the output became decidedly sour. However, the unit hit all the bands in both grid and plate circuit.

The following table gives the tuning setting for the capacitors with 0 being full capacity.

Frequency	Approximate Capacitor Settings	
Mc	Grid	Plate
3.5	18	17.5
7.0	84	92.0
14	20	40
21	67	81
28	81	93

It occurred to us that perhaps an 814 might solve the problem of poor output on 10 and 15. Tube tables show 30 mc as the upper limit for the 814. No change in tube sockets was required. So having several on hand, the substitution was made after changing the filament transformer to provide the 10 volts required in place of the 7.5 volts for the 804, grounding the suppressor connection on the tube socket and removing the connection from the power supply, and readjusting the screen tap to give the required screen voltage. The output was much better, but spurious frequencies and parasitics showed up. We did not take the trouble to try and solve these but began a hunt for a better solution in a pentode capable of operation at 21 and 28 mc. However, for those who have 814 tubes available, work on eliminating these problems will probably prove rewarding. Our search for a better tube was rewarded with success and is the subject of the next article. ■

A 10 and 15 Meter Driver Unit

D.C. McCOY*, W8DG

Here is a driver unit capable of pushing a kilowatt final on 10 and 15 meters. It contains a 4E27 and 6Y6 clamp tube.

THE inspiration to get organized on the 10 and 15 meter bands found me without a satisfactory driver unit. The 804 pentode drivers for my kilowatt finals used for many years, are not satisfactory below 15 mc. Several other tubes were tried without satisfaction, so a search for a suitable pentode was made. The 4E27/5-125B looked likely. It has a 75 mc limit at full power input; consequently, it should be satisfactory for 21 to 30 mc. Though not needed for this service, it has much higher power capabilities. Typical operation on the data sheets at 3000 volts shows a power input of 500 watts, far in excess of what is needed as a driver. Operated at lower plate voltages the data sheets indicate that performance would be as good if not better than the old favorite 804.

Accordingly a haywire assembly was made up and tested in the shop. Because of the necessity for vertical tube mounting, a different layout is required from that used with the 804 drivers. The data sheets recommend installation of the grid circuit below the chassis with the plate circuit above. So the first experimental model had the grid circuit mounted below the chassis deck. It worked perfectly on all bands. A plate coil jack and grid coil socket were installed so plug-in coils could be used to determine performance on all bands from 160 to 10, also to work out a capacitor and coil combination to cover 10 and 15 meters without changing coils.

However, because of the lack of symmetry and for appearance sake, a second model was built with all components placed above deck in hope that it would work as well as the old 804 drivers. It was very quickly apparent that we could not get by with it. Key up, the tube took off beautifully. The next move was to put the grid circuit in a shield can above deck. This worked out fine for 80 and 40, but was still not satisfactory on 10, 15 and 20 meters. The tube still took off and would not cut off as it did on lower frequencies. Four spurious frequencies, with beautiful raw a.c. notes within a range of almost 800 kc, were found on 10 meters, some also on 15. We figured that if we could eliminate those on 10, the problem would be solved on 15.

It was next decided to relocate the grid tank circuit below deck as per data sheets and our experience with the first haywire model. The 6Y6G clamp tube remained above deck in the shield can. Still not okay. Next a perforated shield for the bottom of the chassis was made in the hope of eliminating the parasitics, caused perhaps by external coupling. The perforated metal is necessary to provide ventilation around the tube base. The parasitics still persisted. The parasitics were finally removed by inserting a small r.f. choke made of 15 turns of #22 E. wire on a piece of ¼" bakelite rod between the hot end of the grid tank coil and the control grid pin on the socket.

The photo shows the final assembly retaining the shield can. The schematic is shown in fig. 1. The plug-in coils are retained in the plate circuit, but a permanent grid coil and capacitor have been mounted below deck as shown in the photos. The grid shield can may now be omitted, but was not removed when the photos were taken.

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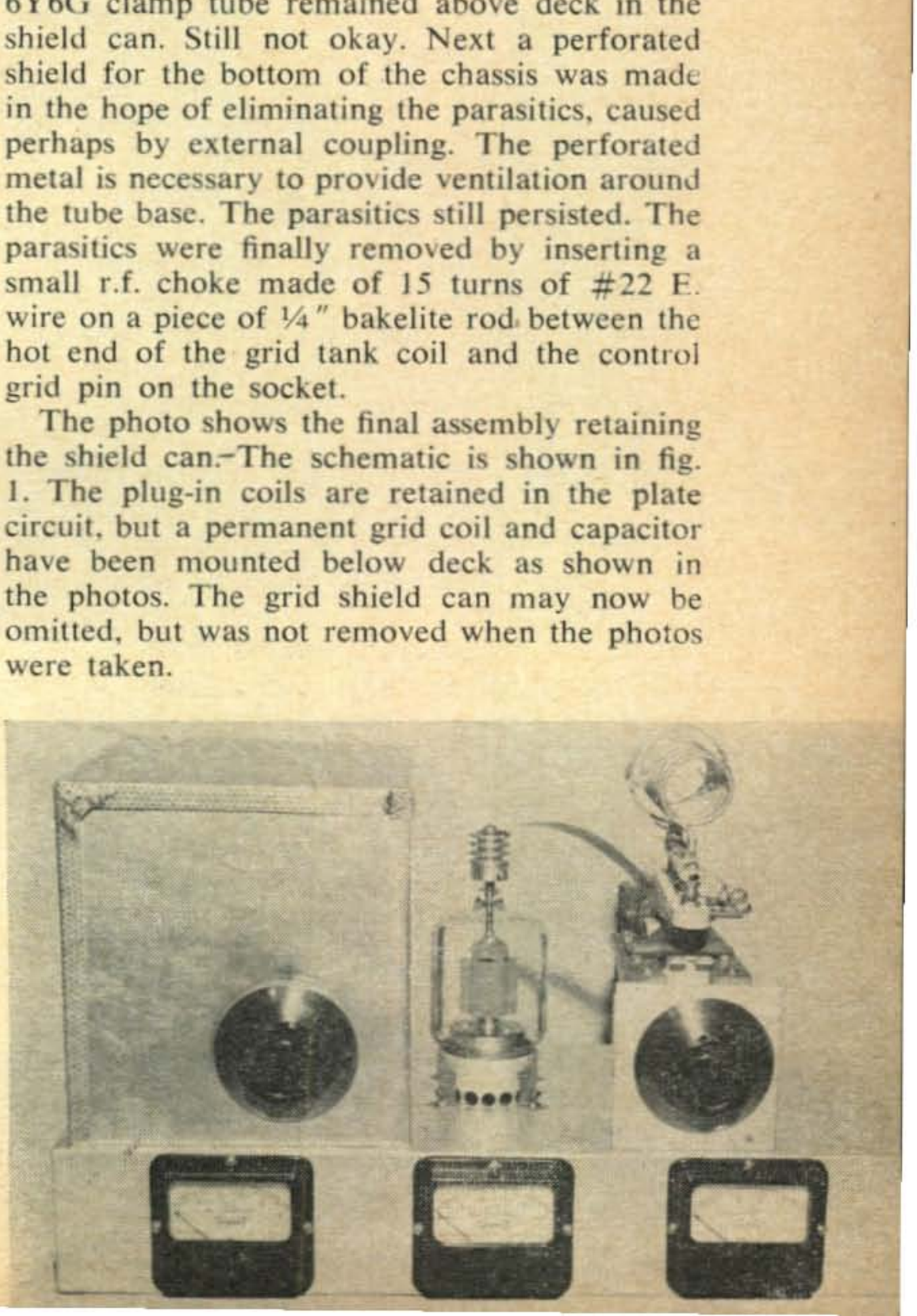


Front view of the 10 and 15 meter driver unit. The grid circuit shield-can on the left was found to be unnecessary after the grid components were moved below the chassis. The plate cap connector is a Bud TC-489 or Eimac HR-5 heat radiating type. The meter functions are, from l. to r., control grid, screen grid and plate current.

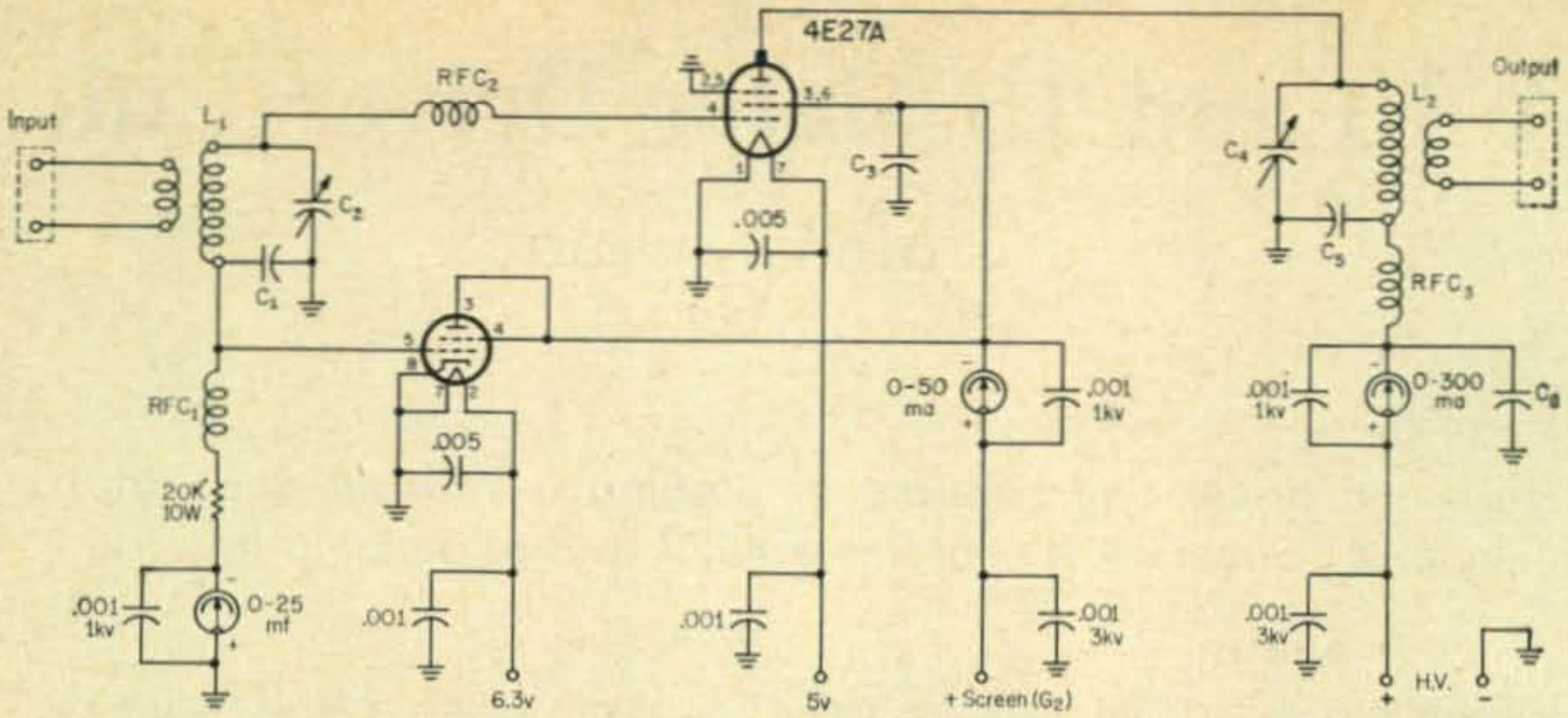


Fig. 1—Circuit of the 10 and 15 meter driver. The grid circuit components are all placed beneath the chassis and the 6Y6 clamp tube above the chassis is shielded. All capacitors are rated in mf at 600 volts unless otherwise noted.

C_1—.01 mf 2500 v., CD type 4LS or equiv.
C_2—100 mmf Bud MC-905 or equiv.
C_3—.002 mf, 2500v. CD type LS or equiv.
C_4—70 mmf, 0.1" minimum spacing.
C_5—.002 mf, 2500 v. Sangamo type L or equiv.
C_6—.001 mf 10kv. TV type.
L_1—8t #18, ¾"d. spaced ⅛" between turns. B&W Miniductor #3010. Two turn link #20 plastic insulation hookup wire over cold end, twisted.
L_2—7t #8 1½" d., spaced ⅜" between turns, mounted on B&W #3914 ceramic bar with G.R. plugs to fit B&W #3228 type B jack bar. A 3t link of #16 is wound over the cold end spaced 3/16" from the main coil.
RFC_1—2.5 mh.
RFC_2—15t #22 E on ¼" bakelite rod, closewound.
RFC_3—Ohmite Z2, 1 amp.

Mounting The 4E27

Certain precautions must be observed in mounting the 4E27 tube. Ventilation of the base is very necessary. The tube is mounted in the center of the chassis with center lines of the tuning capacitor shafts 4" either side of the center. The tube socket is mounted with 3/16" spacers between the socket and the chassis so that the ventilating holes in the tube base shell are well above the chassis. In mounting any ceramic socket it is advisable to put a fiber washer on either side of the socket and not have the ceramic in contact with either the metal of the chassis, the spacers, or the screws and nuts holding the socket in position. Orientation of the socket with the filament connections to the rear of the chassis provides a convenient positioning. The bottom view of the chassis shows location of the tube socket and grid circuit components.

It is also necessary to ground the tube base shell. Four spring brass clips visible in the photos were used. Figure 2 shows the dimen-

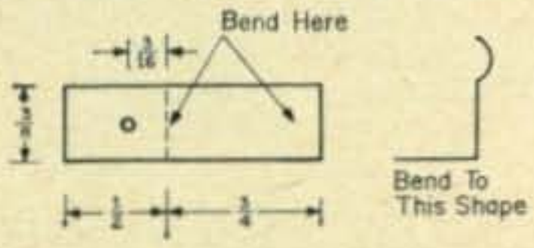


Fig. 2—Details for forming the tube base grounding clips. Four are required.

sions and methods of making these clips. Spacing the 8-32 screw holes 3/16" from the bend, positions them correctly to give good contact with the shell.

Construction

Meters for the control grid, screen grid, and plate circuits are mounted below deck and on the front of the chassis. The tuning capacitors used and shown in the photos happened to be on hand. Other makes and types with the same capacity range will suffice. Mounting brackets for the plate capacitor were made from 1/16" sheet aluminum, high enough so that it could be used with the 2-¾" dials shown. Other makes of capacitors will require different types of mounting, and brackets can be fabricated to suit. A plate is also furnished on the front edge of the chassis for the dial on the plate capacitor for symmetry and good appearance. The shaft is connected to the dial with an extention and a fiber flexible connector as there is no high voltage on the shaft, it being grounded.

The grid tank capacitor is gear driven from above the chassis by a National Type "RAD" right angle drive shaft. The grid tuning dial is mounted on the front of the grid shield can. With the can eliminated, the 6Y6G clamp tube should be placed in a ventilated tube shield as it dissipates plenty of heat. A bracket similar to that used for the dial on the plate tank capacitor should be used to match the plate dial arrangement for symmetry and good appearance if the shield can is eliminated.

Perforated sheet stock such as Reynolds #33 with Lincane perforations, obtainable from their "Do It Yourself" stocks at hardware stores, should be used for the bottom cover on the chassis. The cover was fabricated from

perforated stock which happened to be on hand. When forming the perforated shield for the bottom of the chassis, allow for the thickness of the metal used when bending.

In the rear view of the unit, note the compact assembly of the plate tank with its associated r.f. choke and bypass capacitor. The plate connection from the tank to the tube was made of thin copper strip, ½" wide, and terminates in a heat dissipating connector on the plate lead of the tube. In the final assembly every effort was made to make all leads of frequency determining components and bypass as short and direct as possible. Ceramic by-pass capacitors (.001) are provided where the clamp tube and 4E27 filament supply leads enter the chassis, and also inside the chassis where the plate voltage and screen voltage leads enter. These were installed in an effort to eliminate all possible r.f. coupling between the grid and plate circuits. They probably will help where TVI is a problem.

Returning to the bottom view, note that all r.f. ground connections are made to the lower left hand socket mounting screw. When mounting the socket, make this screw ⅜" or so longer than the other three to accommodate the grounded end of bypass capacitors connected to it. A .002 mf 2500 volt mica bypass is used for the screen, pins 3 and 6, which are tied together with a #14 wire and bypassed from the middle of the wire. The suppressor terminal, pin 2, is grounded to the common ground connection near pin 1, and a #14 wire runs between pins 2 and 5, the other suppressor connection which is also grounded at the nearby socket mounting screw. A .005 mica bypass is installed between the two filament terminals pins 1 and 7, pin 7 being the hot filament connection. The clamp tube filament is also bypassed with a .005 mica.

Performance

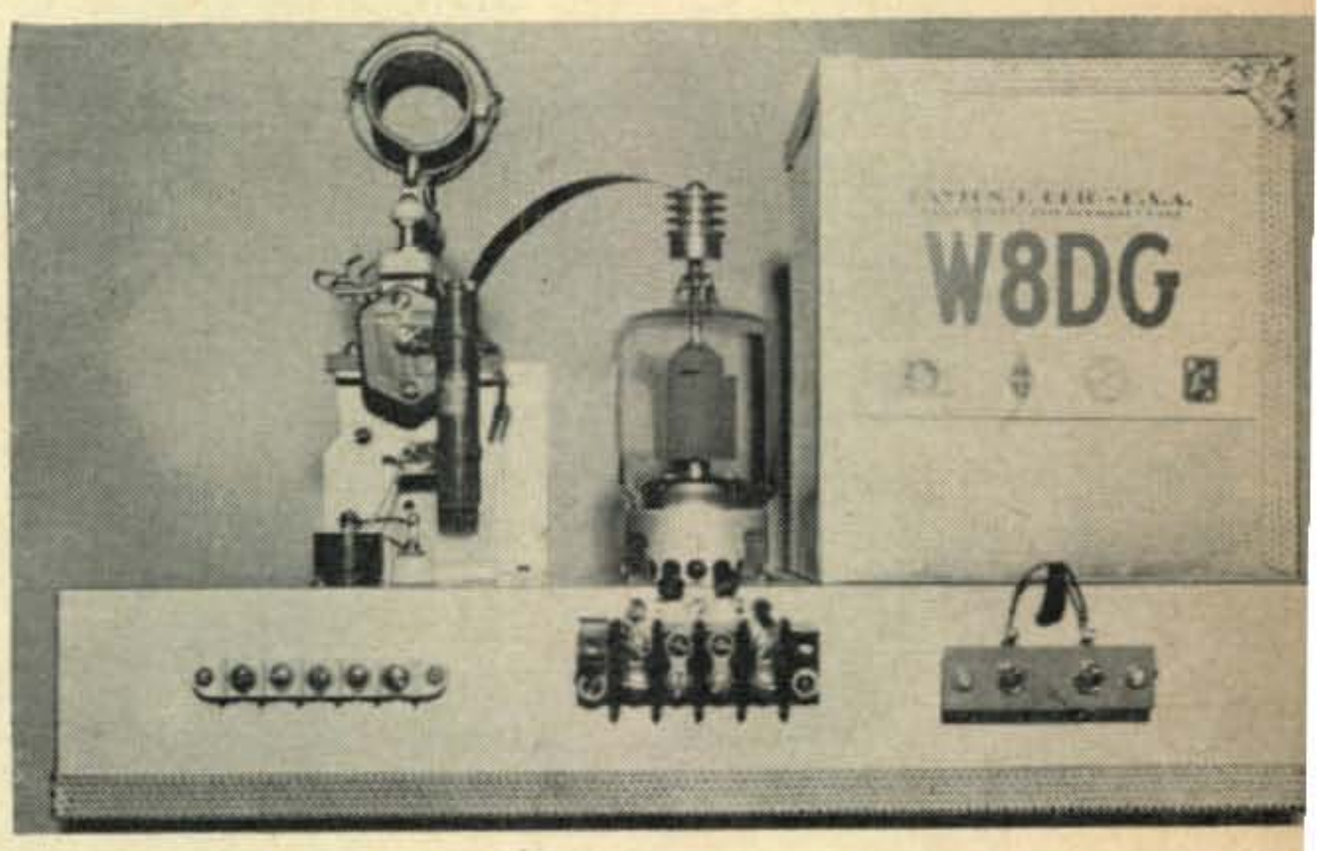
After bench tests were completed, the unit was installed in place of the regular 804 driver unit on the kw, set up for 10 and 15 meters, for on the air tests. Substitution was made without changing the voltage divider tap for the screen voltage. The suppressor connection to the divider was disconnected as the 4E27 is operated with the suppressor grounded. It provided adequate drive to run the 304TL to a full kw and performed beautifully.

The grid and plate coils specified were those finally arrived at for 10 and 15 meter operation without changing coils. During the course of experimenting with the grid circuit, a coil was made up with 10 turns of B&W 3010 Miniductor which covered 10, 15 and 20 with the 70 mmf grid tank capacitor. However, when the grid parasitic choke of 15 turns was installed, this coil had to be cut down to its present size and the capacitor would not hit 20 meters.

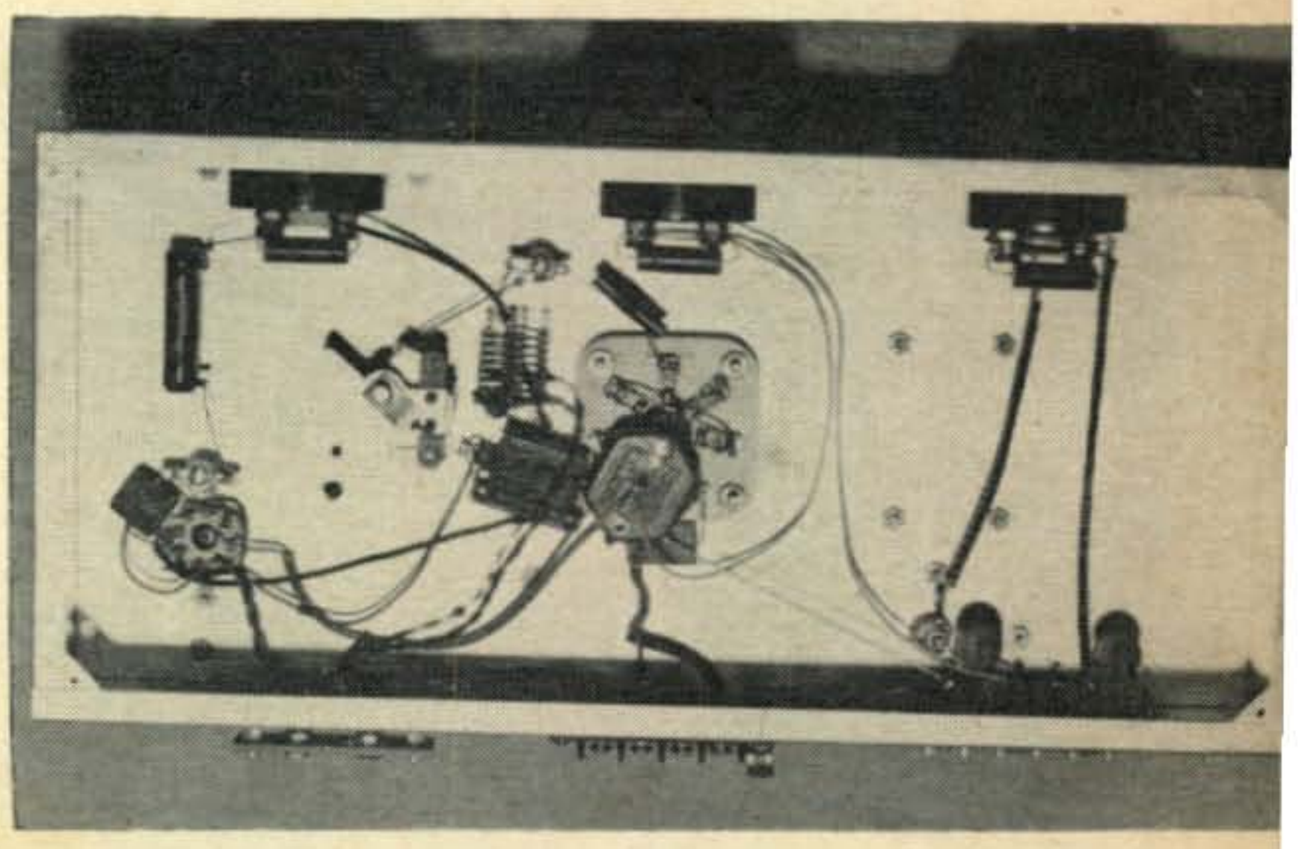
In the shop tests a 75 watt lamp coupled to the plate tank with 72 ohm small twin lead was used as a load and lit up to full brilliance on both 10 and 15.

For the bench tests a BC-459 was used as a v.f.o. for 10 and the BC-458 for 15. Multiplication was provided by two 24G unit described in a previous article in this issue.

No extensive work on the air has been done with this unit for the bands it was intended for except some limited work on 15 meters. Both 10 and 15 meters have been pretty dead since it was completed. However, results to date indicate it will be a worthy companion for the old 804 driver units for use on the 10 and 15 meter bands. ■



Rear view of the 10 and 15 meter driver unit. Visible in the plate assembly on the left is RFC_3 with C_5 at the top connection and C_6 below the chassis. The high voltage is fed to the r.f.c. through the Millen #32100 feedthrough alongside C_6. The ceramic terminal strip on the left of the rear chassis flange is a Millen #37035 for h.v. connections. The center strip is for the filament connections and the end strip is for the r.f. input. The output is taken from the two fahnstock clips up on the plate coil assembly. Note perforated bottom shield.



Bottom view of the driver unit. The input tank circuit components may be seen to the left of the tube socket. All the bypass capacitors around the socket are junctioned at the lower left mounting screw.

A Medium Power Final Amplifier

D.C. McCOY*, W8DG

Here is final, rated at 375 watts, built from surplus and junk box parts. If your junk box is as complete as W8DG's, then perhaps you can match the cost—nothing!

SHORTLY after World War II was over, the BC-375 aircraft transmitters were in liberal supply in the surplus market. Many were purchased by amateurs, but the amateur fraternity showed little enthusiasm for these units for many reasons which will not be enumerated here. The 211/VT4B or VT4C tubes used in these transmitters were also in generous supply at practically give-away prices.

In the spring of 1940 a medium power final using two of the then new "low price high performance" tubes was built with results much short of satisfactory because of the short life and over rated power capabilities of these tubes. This old amplifier was on the shelf so it was dusted off and modified to accommodate the 211 tubes. The driver, power supplies and modulator were also still available. It was not long before the unit with the 211s was ready for on the air tests.

Much to my surprise I found it very easy to run this amplifier at 500-600 watts c.w. without any apparent damage to the tubes, though their normal data sheet rating is 375 watts. I also approached the use of these tubes on 20 meters with considerable misgivings since their maximum frequency limit at full rating is given as 15 mc. Hence, this amplifier proved to be far better than anticipated as it will take more input than the data sheets show without trouble. It was also found to do a good job on the 20 meter c.w. band. These finals have also been used plate modulated on 80, 40, and 20 meters with excellent satisfaction.

*Cons. Engnr., 7546 Normandy Ln., Dayton 59, Ohio.

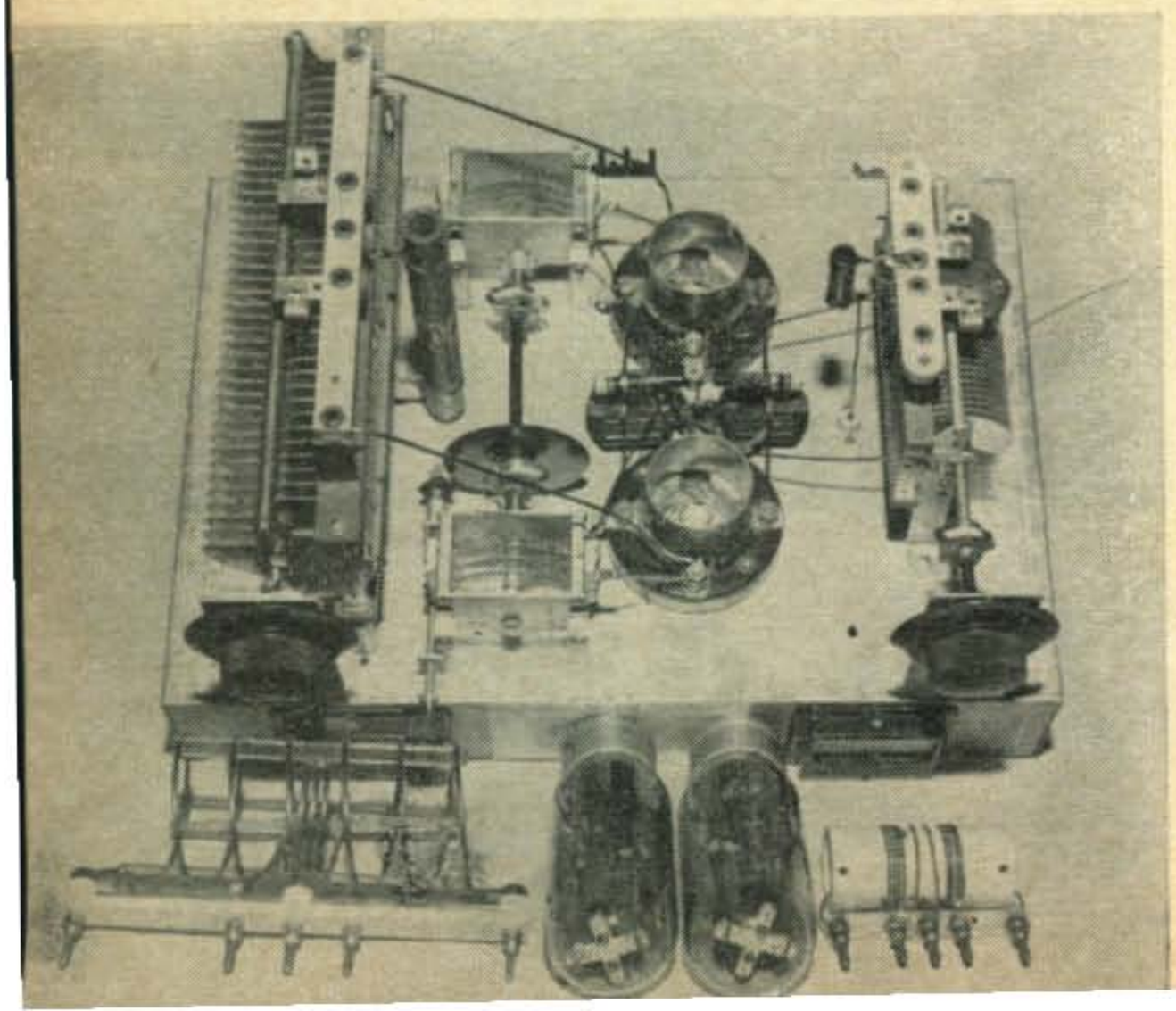
Half a dozen of these units have been built since. The photos show the last model which was built early in 1961 and fig. 1 shows the schematic.

Construction

The unit is built on a 12 × 17 × 3 chassis with grid and plate meters mounted below deck on the front This particular unit uses much higher capacity tuning capacitors than customary in both grid and plate current simply because they happened to be on hand. Consequently, the coils have a smaller number of turns than the normal commercial coils available today for the various bands. For example, the plate coil being used for 20 meters was a standard commercial kilowatt plug in coil for 10 meters. Tuning capacitors of 100-100 mmf for both grid and plate circuits would be suitable with commercial coils and, in fact, have been used on previous models.

Neutralizing capacitors were salvaged from tuning units of the BC-375 and are ideal for this service. The tubes neutralize readily on all bands. In fact, it has been my practice to neutralize the amplifier for 20 meter service which usually suffices for the other bands without change. The neutralizing condensers are mounted to the chassis using the ceramic standoffs with which they are equipped in the BC-375 and with their shafts facing each other. The shafts are connected to ceramic insulated flexible couplings with an insulating shaft between the couplings. On this insulated shaft is mounted one of the tuning dials which controls these capacitors in the BC-375. With an assembly of 2 small aluminum brackets, a conical rubber gadget on the inside end and a small tuning knob on the outside end of a small shaft, adjustment of neutralization can be easily handled without getting your fingers in the "hot" areas. The top view of the amplifier shows the mounting of the neutralizing capacitors and the adjustment feature clearly.

The female jacks for the plug in coils on both grid and plate tuning capacitors are mount-



Top view of the medium power final showing the details of the neutralizing capacitor ganging. Filament circuit components may be seen between the tube sockets. It operates on 80, 40, and 20.

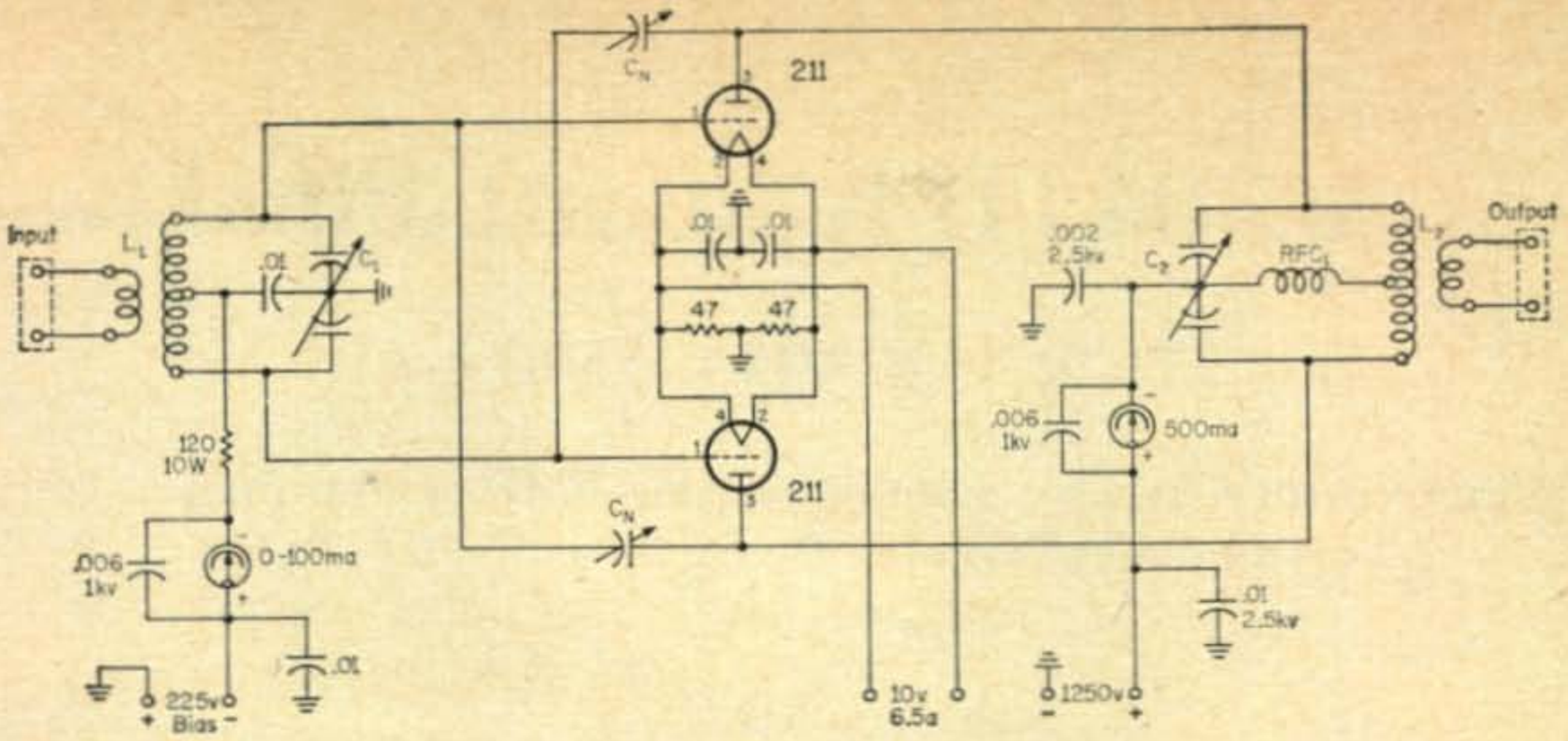


Fig. 1—Circuit of the medium powered final using push-pull 211s. All capacitors are in mf at 600 volts unless otherwise noted.

C_1—180-180 mmf. Cardwell MO-180-BD or equiv.

C_2—240-240 mmf. Cardwell XE-240-XD or equiv.

C_N—25 mmf double spaced Hammarlund T7550443-8 or equiv. 2 each.

L_1—80M-30t #16 E., 1¾" d. ceramic form, close-wound, center tapped. Link, 2t #18 insulated wire over center of coil.

40M—14t #14 E, 1½" d. ceramic form, turns spaced ⅛" apart, center tapped. 2t link of #18 insulated wire over center of coil.

20M—8t #16 E, 1½" d. ceramic form, turns spaced ⅛" apart, center tapped. Wind with a ¾" space at center of coil. 2t link #18 insulated wire ¼" apart. Locate link ⅜" from each main coil.

L_2—80M—12t #10 E, 4 ¾" d. air wound, spaced ¼" between turns, center tapped. Link, 3t #12 E spaced ¼" between turns, inside main coil ⅜" from main winding.

40M—10t #10 E, 3" d. air wound, spaced 5/16" between turns, center tapped. Link, 3t #12 E spaced ¼" between turns, inside main coil ⅜" from main winding.

20M—6t #10 E, 3" d. air wound, spaced 1" between turns, center tapped. Link, 3t #10 E spaced 3/16" between turns, inside main coil, ⅜" from main winding.

RFC_1—Ohmite Z-4 or Z-7 or equiv.

ed with heavy copper straps giving a mechanically stable assembly and short r.f. connections. As may be seen from the photographs, the layout is symmetrical and of pleasing appearance.

Mount the grid coils on a B&W #3914 male jack bar fitted into a #3228 female bar. Equivalent items may be used. Grid coils could be wound on 1½" five prong ceramic or plastic forms and a 5 prong ceramic socket used instead of a jack bar.

Mount the plate coils on a Coto 8" × ⅝" ×¼" ceramic 5 prong jack bar with a female bar to match. Equivalent items may be used here also. To avoid breaking the jack bars, pick one grid and one plate coil as a standard. Loosen both male and female contacts, adjust all contacts to allow easy insertion of coil pins and then tighten. Loosen the male pins on all the rest of the coils and insert them into the female bar, then tighten the male pins. This will provide easy insertion and removal, without strain, for all coils. Standard B&W "BCL" center link coils are satisfactory for the grid circuit with smaller capacitors and B&W "TCL" or "TVL" 500 watt, or "HDCL" or "HDVL" kilowatt coils may be used for the plate circuit with smaller capacitors. Of course, equivalent coils by other manufacturers will be just as satisfactory.

The grid tuning capacitor is mounted on homemade aluminum brackets, and the plate tuning capacitor is mounted on ½" diameter ceramic standoffs shimmed up with fiber washers. It is always advisable to use fiber washers between ceramic parts and a metal chassis or other components.

The bypass capacitors at all points in the circuit are not critical. Resistors, 47 ohm 2 watt composition types, are used as a voltage divider for center tapping the filaments and are bypassed with 0.01 micas, these again not being critical. The tubes are mounted in Johnson 123-211 sockets.

Operation

When this last amplifier was first fired up, vicious parasitics developed with the key up, and it was necessary to resort to the ancient practice of making either the grid or plate leads much longer than the other circuit. In this particular instance, the plate leads were lengthened as it was more convenient from a layout standpoint to do so. This simple change completely eliminated the parasitics, and the amplifier has since behaved beautifully. As an additional precaution a small 120 ohm wire wound resistor (No. 7010 salvaged from the filament circuit of the 1629 tube in a 274-N command unit) was inserted in the grid return circuit. This is another old time trick useful

[*Continued on page 133*]

A 304TL Kilowatt Final

D. C. McCOY*, W8DG

This kilowatt final uses a single surplus 304TL with a plug in coil arrangement suitable for 80 through 20 meters.

THE old reliable 80 meter transmitter using push-pull 204-A tubes gave up the ghost in December, 1959. Several spare 204-As were in stock but had been in storage so long that they were as bad or worse than the old pair that passed out. Since no replacements were available, a change in tube type became mandatory. A number of 304TLs were in stock. Checking the tube tables, it was decided to try one of these single-ended to see if results could be obtained equal to the old amplifier. The parts usable from the old amplifier were salvaged. A 19 × 15 × 1½" copper plated steel chassis was on hand so it was decided to mount the parts on this. The photos shows the completed unit as in use today, and fig. 1 shows the schematic.

The 304TL provided plenty of fun getting it to the final satisfactory operating condition. When first fired up, at reduced voltage for shop test, the plates quickly became white hot and plenty of smoke poured forth caused by burning up of 2 wire wound resistors used across the filaments. This happened when the key was up indicating parasitics and/or the amplifier taking off by itself when not excited. The old trick of increasing the length of the grid lead was tried without success. Checking back on the tube tables, we came to the conclusion that the 200 volts bias, used for the old 204-A's, was not high enough so a new bias supply was substiuted. This supply was capable of producing 450 volts bias without excitation and used a 7000 ohm 100 watt bleeder. This improved the situation materially, but we were still getting overheating of the tube and parasitics with the key up. This was finally solved by placing a 120 ohm wire wound resistor in the grid circuit between the grid tank and meter and placing a parasitic suppressor consisting of an old style 100 ohm 2 watt composition resistor with 6 turns of #18 enamel wire wound over at it the grid connection. Thereafter, the amplifier behaved beautifully.

It was also found necessary to place all of the grid components in a shield can mounted above the chassis, the size of the can being dictated more by the desire to achieve symmetry of appearance in dial locations rather than the need for so much space. The photos show an end view into the grid circuit shield can. All of the components are plainly visible. Note the compact assembly, short and mechanically stable leads and short bypass leads.

*Cons. Engnr , 7546 Normandy Ln., Dayton 59, Ohio.

Construction

When experimenting with neutralization in a previous attempt to build a 304TL amplifier,

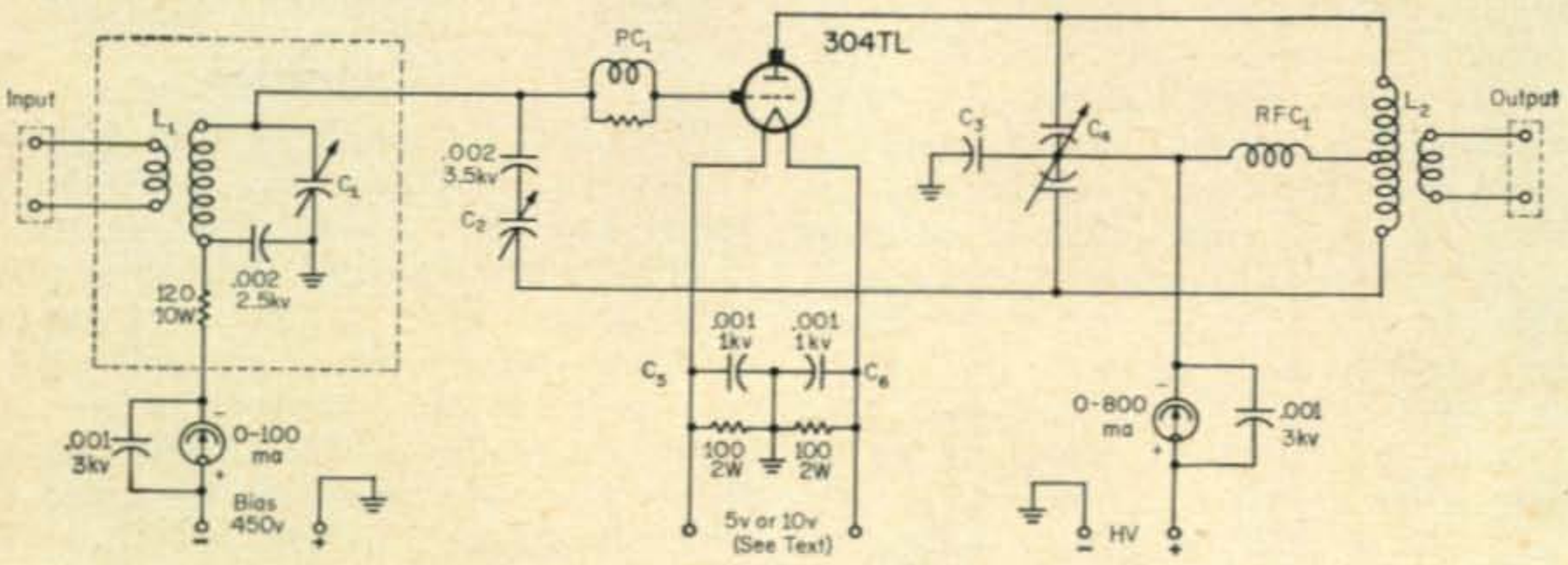


Fig. 1—Circuit of the kilowatt final used on 80 meters.

C_1—140 mmf.
C_2—6-27 mmf, Bud #NC-1002 or equiv.
C_3—2-0.001 10 kv units in parallel.
C_4—150-150 mmf, Johnson 150-DD-70 or equiv.
L_1—B&W BEL end link for desired bands.
L_2—B&W HDVL center link for desired band.
PC_1—6t #18E on a 100 ohm composition res.
RFC_1—Ohmite Z7.

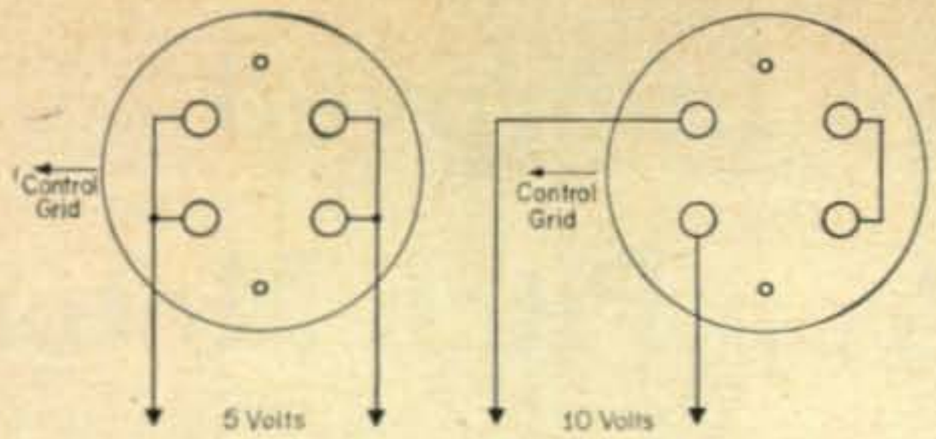


Fig. 2—Filament connections for 5 or 10 volt operation for the 304TL.

they were found rather difficult to neutralize. Possibly due to parasitics, several flashovers occurred burning up several grid circuit meters. Since the meters are costly we decided not to repeat this performance. This time a blocking capacitor was installed between the neutralizing capacitor and the parasitic choke, PC_1, at the grid to prevent flashover onto the grid circuit. No effect has been noticed on neutralizing characteristics and, of course, no flashovers have occurred here.

The filaments of the 304TL may be operated at 10 volts requiring 12½ amperes or 5 volts at 25 amperes with equally good results. It is, however, necessary to wire the sockets properly for the voltage selected. Figure 2 shows the correct socket wiring for both 10 and 5 volt filaments. We selected 10 volts because we had several surplus filament transformers on hand with ample current rating for the 304TL filaments and an additional winding at 7½ volts suitable for the 804 driver filaments, eliminating one transformer from the power supply.

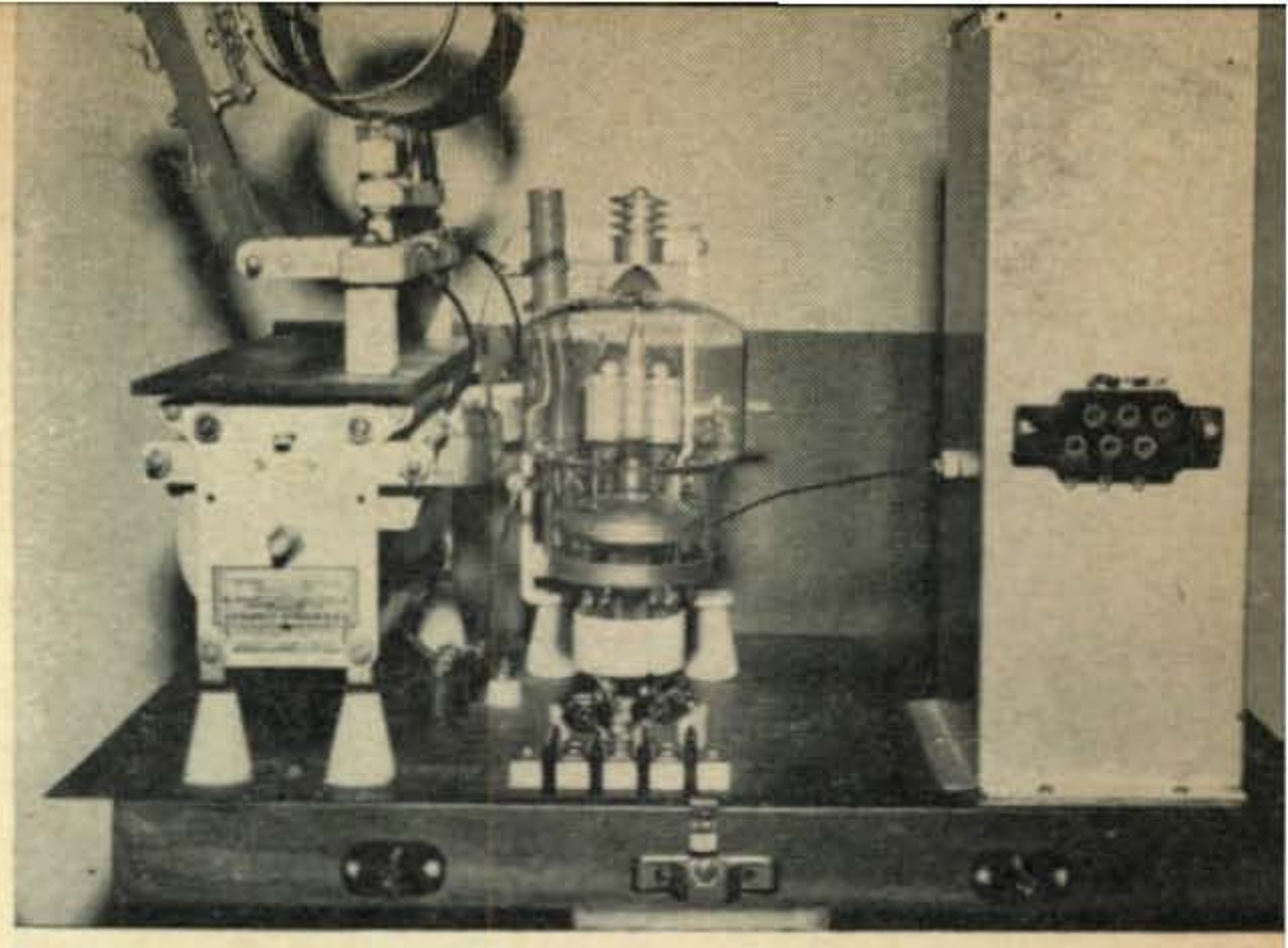
The plate tank capacitor is mounted on 1¼" ceramic stand-off insulators raising the center line of the shaft quite a ways above the chassis which accounts for the use of a large shield can for the grid circuit. The B&W "HDVL" coil jack is mounted on 1½" ceramic stand offs on a piece of hard rubber above the tuning capacitor. The plate bypass capacitors are mounted on the chassis inboard toward the tube. All connections are short and direct. The plate tuning capacitor is an old style one not having the shaft contacts at the center. Rather than try to obtain parts and rebuild it, a strap of spring brass was cut and fitted over the center of the shaft to form the return connection. This trick has since been used for other old capacitors with complete satisfaction.

The power supply employs an old "pole-pig", center tapped and capable of producing 2500 volts at 1 ampere under load. Type 872 rectifiers are used with a 500 ma swinging choke, a 100,000 ohm bleeder, and a 4 mf 4000 volt filter capacitor.

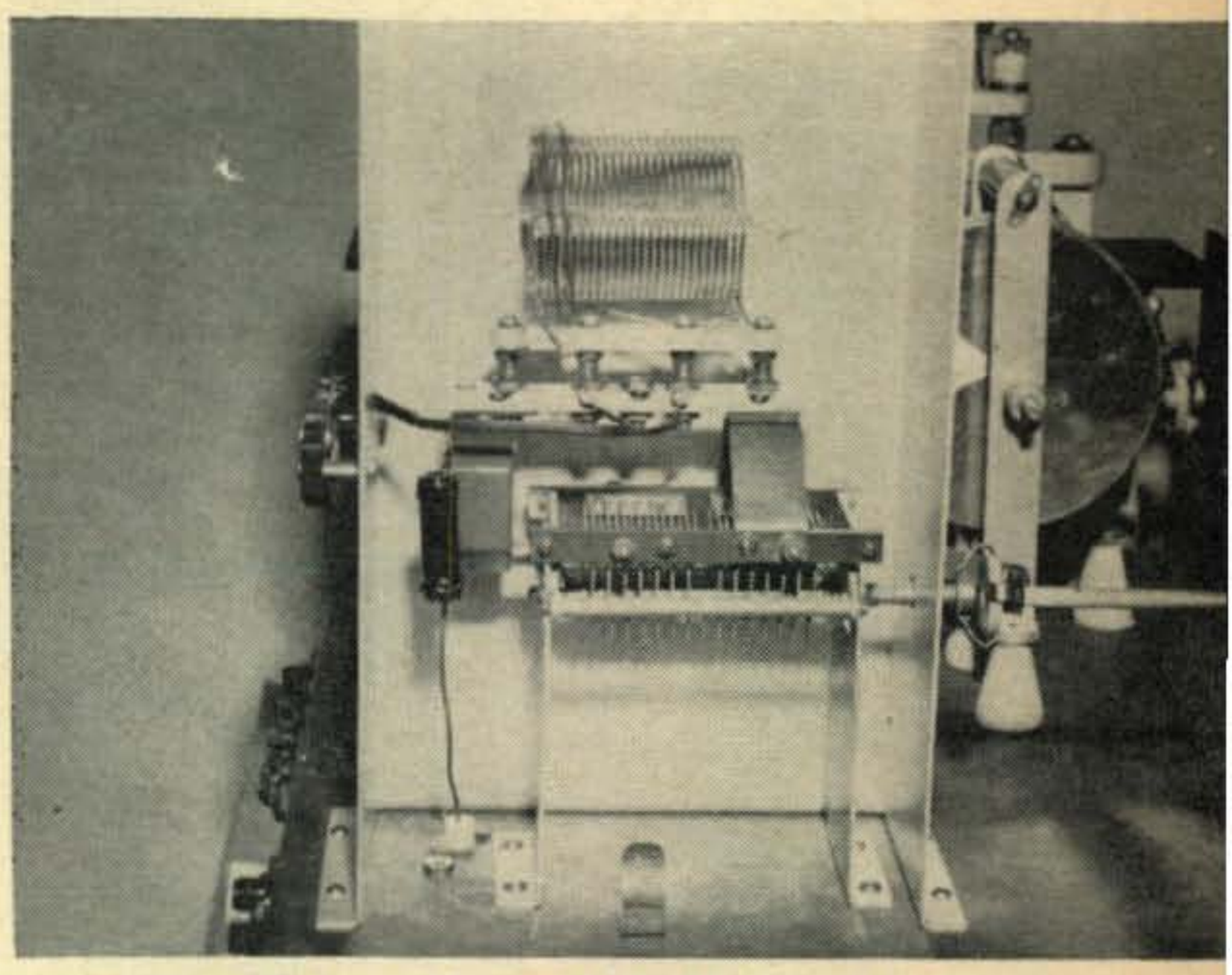
Operation

Since this final is used occasionally in net traffic handling, it was essential that considerable variation of frequency from the v.f.o., for

[*Continued on page 137*]

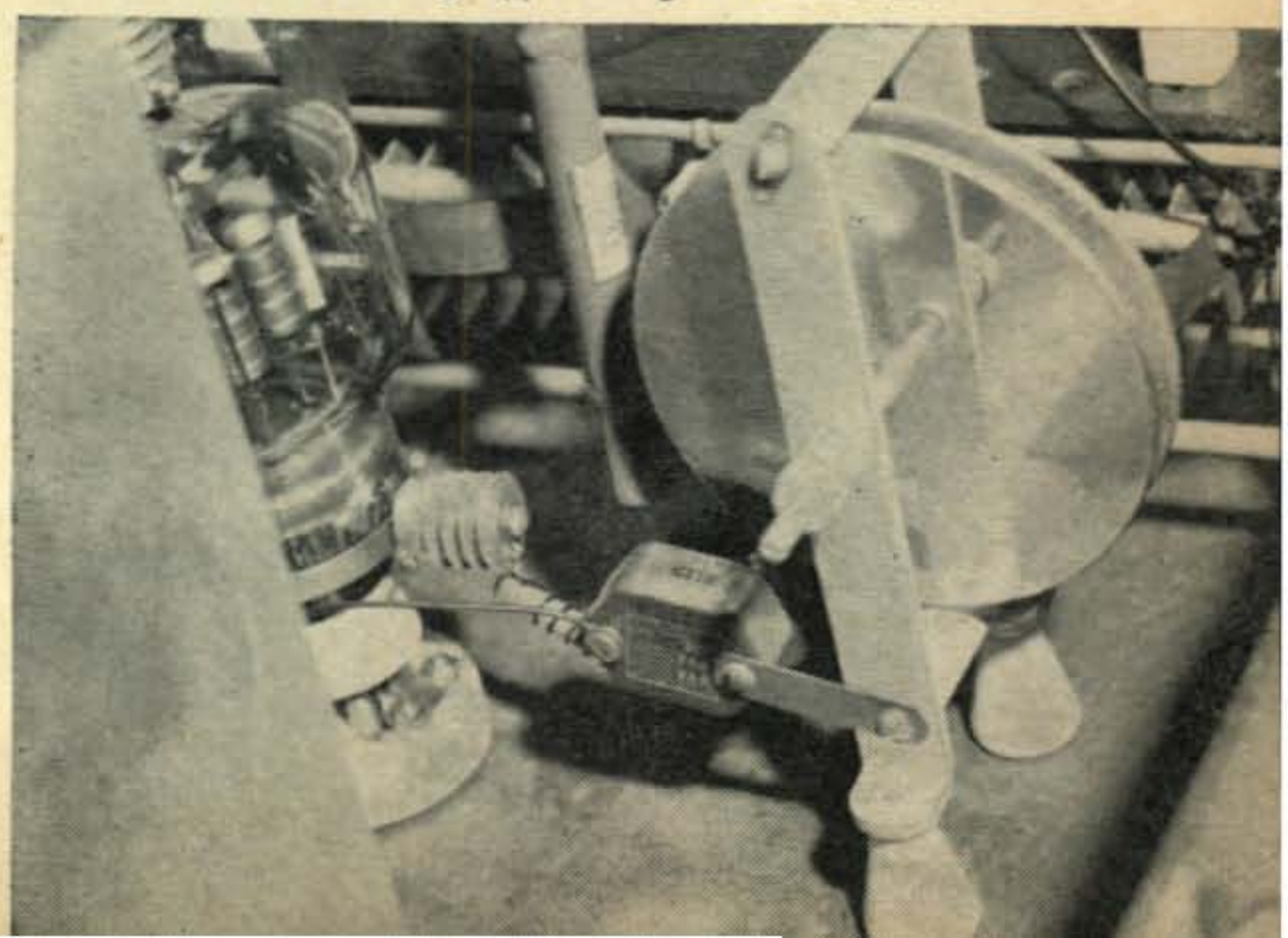


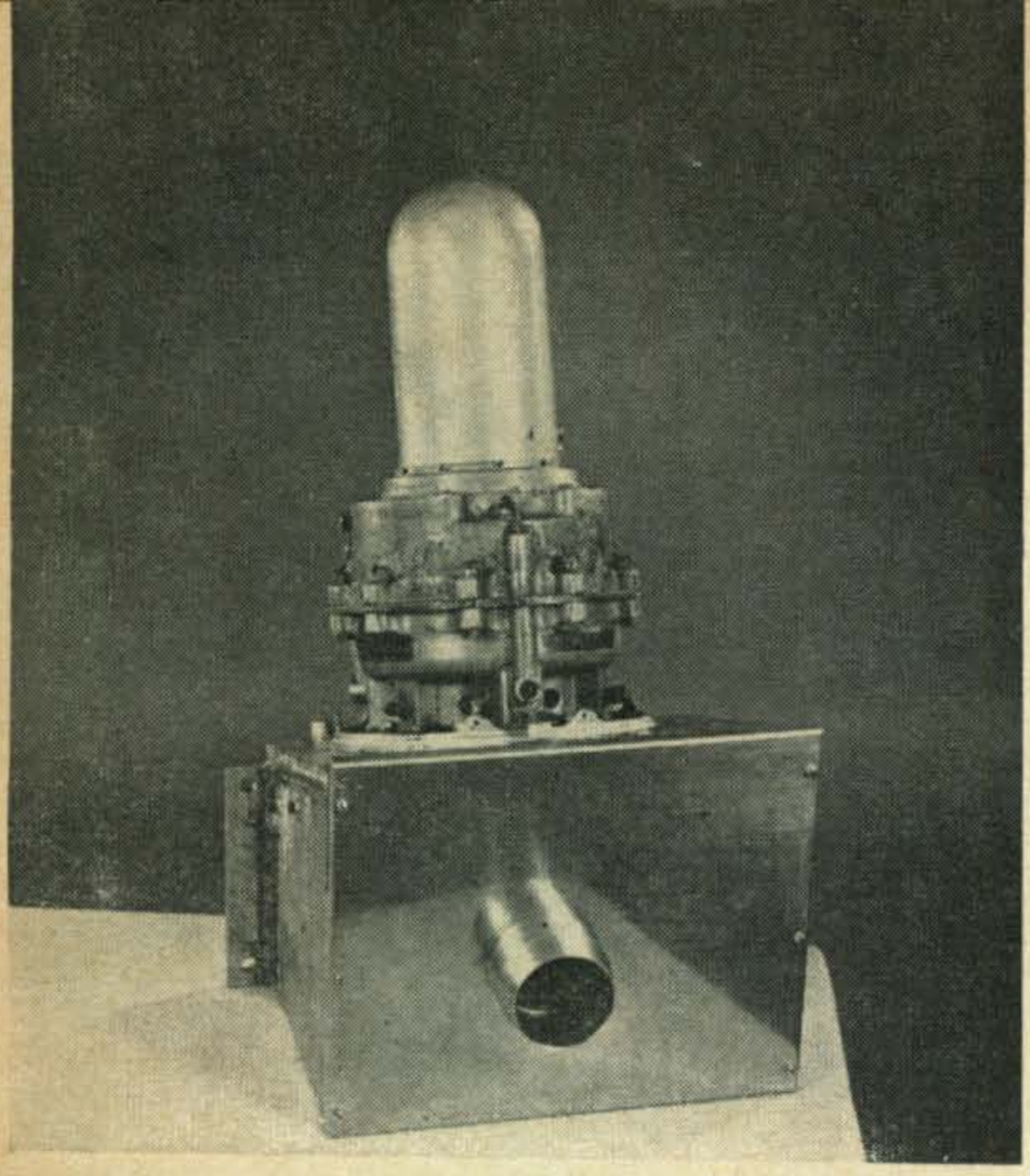
Rear view of the 304TL final. The grid circuit box is 4" × 7" × 12". The large size was due to the desire to place both tuning capacitors at the same level. Use is made of strap copper wiring in the plate circuit. The connector on the left of the rear chassis edge is for the h.v. Filament terminal block and components are on the chassis close to the tube socket.

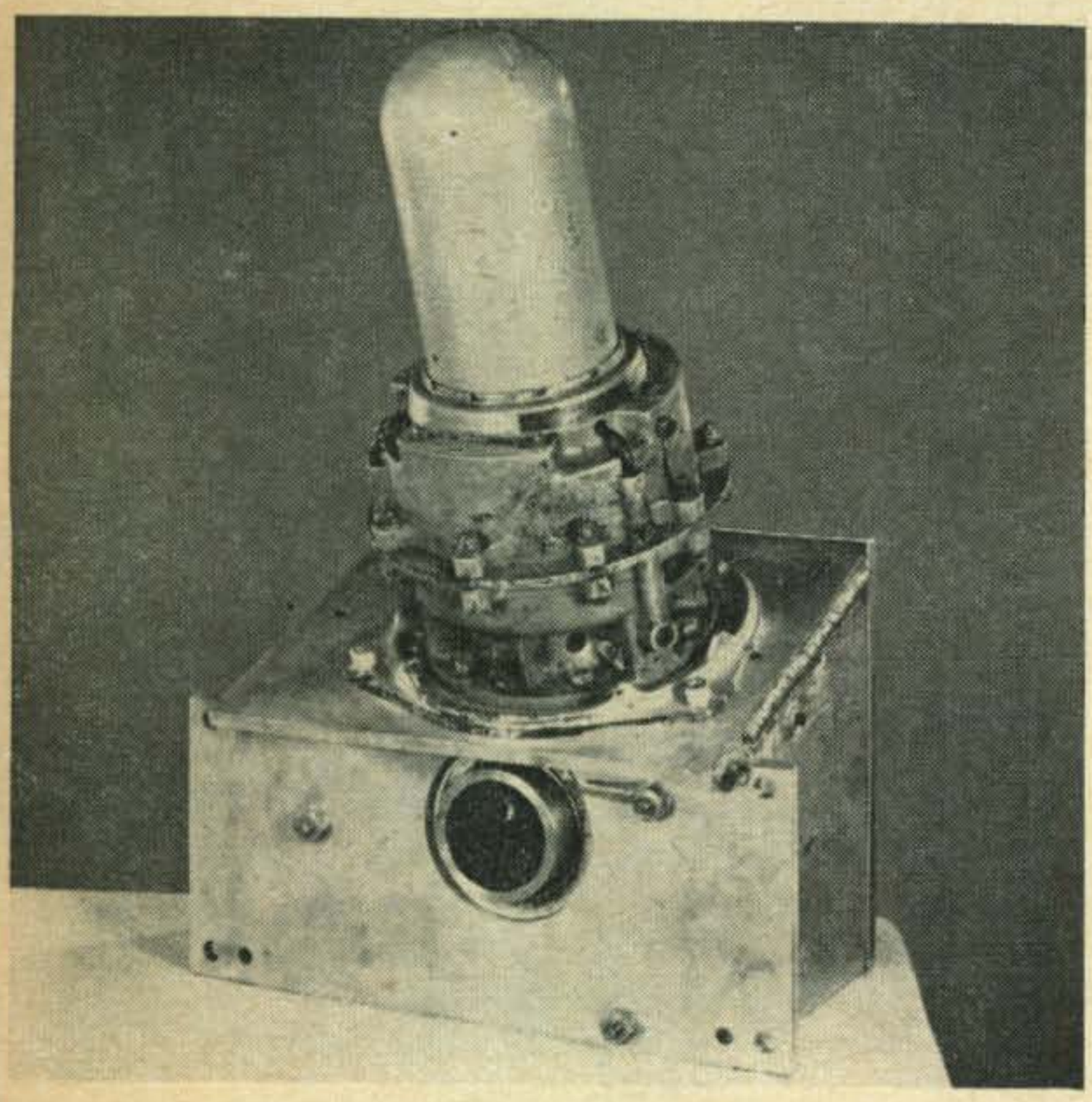


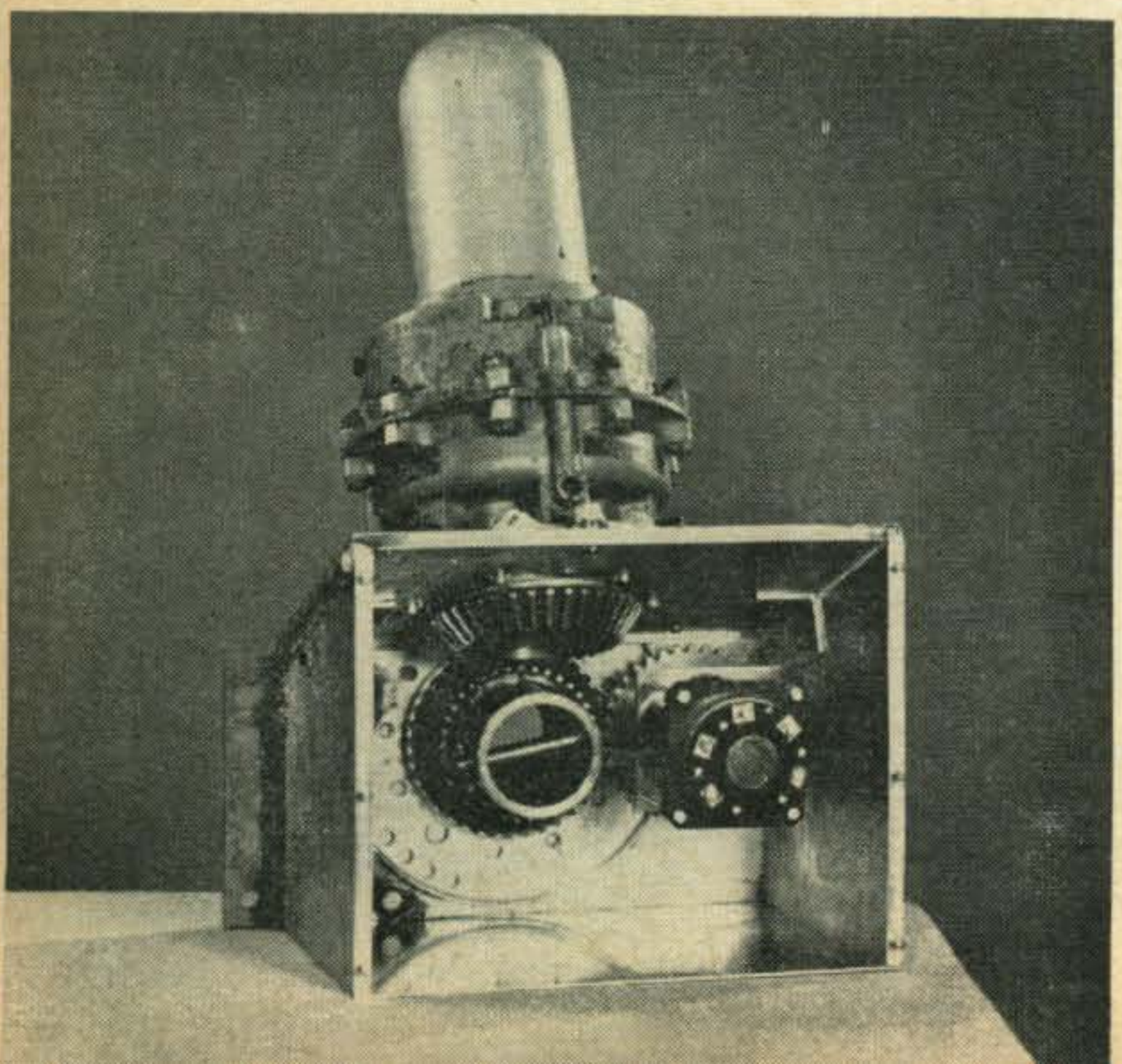
Interior view of the grid circuit shield can with the 80 meter coil in place. Note the 72 ohm feed to the input link. The coil jack bar is supported on one end by the 0.002 grid bypass. The cage cover is held in place by spring clips to permit quick coil change.

Close-up view of the neutralizing arrangement for the 304TL kilowatt final. The 0.002 blocking capacitor connects to the grid through PC_1. Note use of the heat radiating type of grid connector.









An Improved Prop Pitch Motor Antenna Rotator

H. E. PARSONS*, VE3QA

Two considerations led to the fabrication of the prop pitch motor rotator described herein. The writer and VE3KF have used very similar antenna installations for some years, hunting DX together. The only difference in the installations has been that the writer has used a unit designed from scratch as an antenna rotator, and VE3KF has used a prop pitch motor with the usual modifications as to output speed, etc.[1] However, in the severe Eastern Canadian climate, VE3KF ran into considerable icing troubles when using the prop pitch motor as it is normally used, that is, upside down about four feet from the top of the supporting tower, and with a pipe mast extending upward concentric with it and supported by a steady bearing at the top of the tower. Under these conditions moisture unavoidably appears to collect in the planetary reducer gear part of the case and down around the brushes in the motor case. Under either of these conditions the VE3KF "Christmas Tree" would be immobilized pointing in one direction for days or even weeks at a time. Inevitably this would always be a direction opposite to any current DX-pedition. Presumably these same climatic conditions apply to much of the New England states and the Middle west. Various palliatives such as silicone

*R.R.3 Metcalfe, Ontario, Canada.

[1]Saunders, D., "A Quick Change of Pace for the Prop-Pitch Motor," *CQ*, August 1949, p 20.
Orr, W. I., "Building a Wide-Spaced Twenty-Meter Rotary Beam," *CQ*. April 1950, p 11.
Marriner, E. H., "Back To The Prop Rotor," *CQ*, July 1959, p 46.

Fig. 1—(Top) Top view of the improved prop pitch rotator. The pipe protruding from the top is the waterproofing cap and fastens to the antenna pipe mount as shown in fig. 4.

Fig. 2—Bottom view of the prop pitch rotator showing the drive sleeve protruding from the bottom plate. Note the angle at which the prop motor is mounted.

Fig. 3—Interior view of the prop motor unit. Note the extra output gear and mounting plate used to drive he antenna shaft. The selsyn motor is for directional indication.

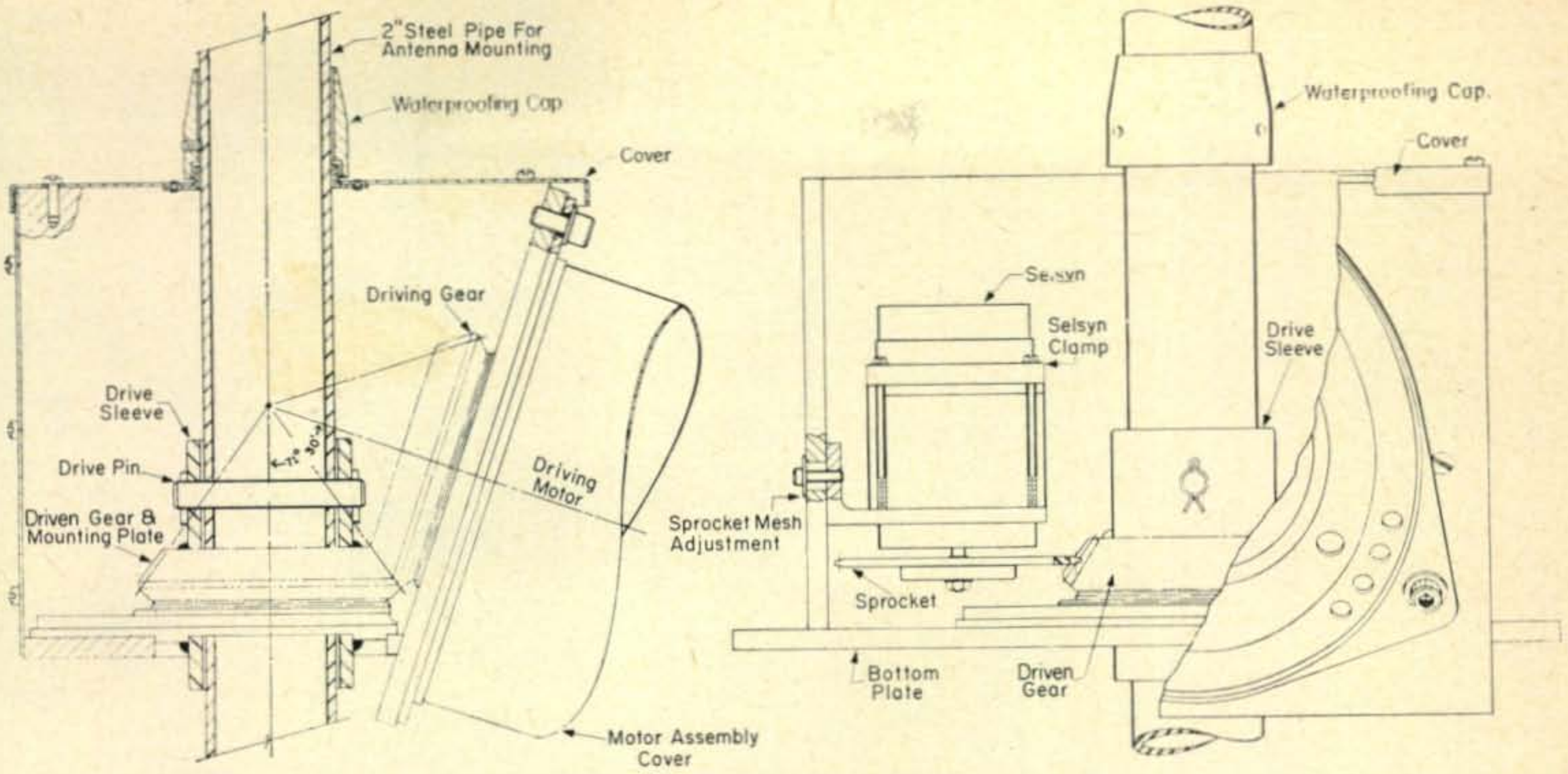


Fig. 4—Construction details for the improved prop pitch motor rotator.

greases and DC4 ignition sealing compound were tried but to no avail.

For "Christmas Tree" installations the author was also much impressed with the system introduced initially, I believe, by Telrex, that of using a reducer unit with a hollow shaft so that the pipe supporting the various beams of the "Christmas Tree" could be lowered and the beams removed one at a time from a working position at the top of the tower. This adapter is an attempt to overcome the shortcomings of the inverted vertically mounted prop pitch motor and at the same time incorporate the advantages of the hollow shaft rotator.

Construction

The general arrangement is quite apparent from the photographs, figs. 1, 2 and 3 and from the drawing, fig. 4. Figure 1 shows a top view of the completed gearbox with the waterproofing cap, normally rotating with the pipe, shown sitting on top of the box. Figure 2 is the corresponding view from the underside showing the drive sleeve protruding through the bottom plate. Figure 3 is an inside view with the top cover removed to show the internal layout. As will be noted, an extra output gear and gear mounting plate from an otherwise defunct prop pitch motor is used to provide the new vertical output shaft. A 4½" length of 3" O.D. ¼" wall tubing is welded into the internally splined hole in the gear. This provides a 2½" I.D. hollow output shaft which is a nice loose fit for a length of 2" galvanized water pipe (2⅜" O.D.). The drive is transferred to the pipe by a ½" diameter drive pin and ½" holes in the pipe at appropriate spots. The output gear of the now almost horizontal prop pitch motor doing the driving, mates with this extra gear at approximately 70° as shown in the cross section of fig. 4. This of course does not make a properly mating miter gear set but the mismatch and corresponding sliding tooth action is unimportant at the speeds and loads involved in this application. Ideally it would be desirable to obtain the mating gear from a propeller blade, in which case the gearbox could be rectangular and the motor truly horizontal. This gear does not appear to be readily available on the surplus market.

As there seem to be a number of variations in the prop pitch motors available, no detailed dimensions have been given for the adapter. These can be worked out to suit the particular prop pitch motor and gear on hand.

The one used in this case is the so called small size. The mounting plate of the extra gear has to be cut away on the side close to the motor to clear the sloping side of the gearbox. This can be seen in fig. 3 and in the section of fig. 4. As will also be noted from figs. 3 and 4, a selsyn is provided for direction indication. The selsyn shown is one of the 60 cycle type which mounts through a 2 57/64" diameter hole and uses a clamping ring with a similar hole to allow it to be rotated for zero setting, although this can be done at the receiver end. This seems to be the type most readily available on the surplus market. It is driven by means of a Boston Gear roller chain sprocket available from most machinery supply houses. This is catalog number K2536, 36 tooth sprocket for ¼" pitch single #25 rollerless roller chain. It will be found that this meshes very nicely with the extra drive bevel gear at a point about half way up the tooth face as shown in fig. 4. The sprocket is located at the proper spot on the gear face by the location of the 4" × 1½" × ¼" aluminum mounting angle which shows in figs. 3 and 4. It is bolted in position with ¼" bolts

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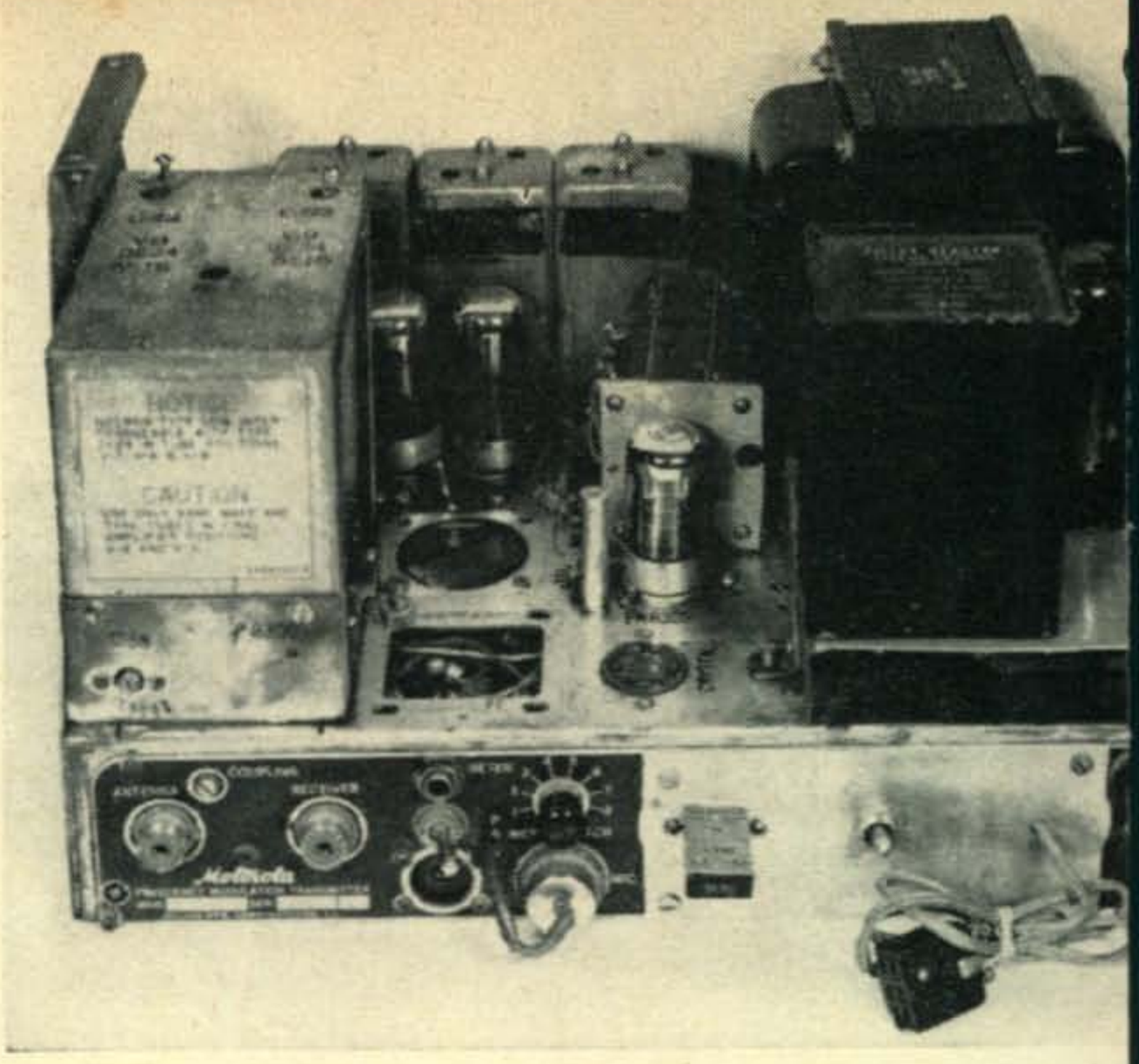


Front view of the FMTU-30D after modification for two meter operation. The phone jack on the front panel labeled meter is J_1 and is used to meter various stages of the unit by means of a 50 microamp meter. The rotary switch to the right of J_1 is the meter switch. At the right is the *T-R* switch and the connector and cable for modulator input.

Putting the FMTU-30D on Two

BY JOSEPH W. SEIBERT*, W5VLE

Here is a 60 watt, a.m., 2 meter rig that may be had for a minimum amount of work and cash outlay. The unit, requiring an outboard modulator, is a modified Motorola f.m. transmitter.

With the advent of the FCC ruling as to split-channel operation of commercial f.m. transmitters, the described transmitter does not easily adapt to meet the new requirements. As a result they have become available as police, taxi, utility, forestry and other such services are discarding them by the thousands. It was with this in mind that the following article was written about the FMTU-30D. This is a crystal controlled f.m. transmitter with 60 watts input and a range of 152-162 mc. The conversion to 2 meters is not too difficult if care is taken.

Get It Working

It would be most desirable to get the unit into operating condition before making the conversion *if* the original crystal is still available. How this is to be done depends upon whether or not the dynamotor is still mounted in the transmitter. If the dynamotor is included, connect six or twelve volts (as necessary) between any pin on P_1 (power input) and ground, with the negative input grounded. The output of the dynamotor should be connected to the dynamotor reverse strip so that the red wire is on the positive terminal.

Connect pins 1, 3 and 7 together on P_2 (control). To key the transmitter when using the dynamotor short terminal 4 of P_2 to ground.

If the dynamotor is not available it is necessary to connect the filament voltage to P_1 (between any pin and ground) and about 450 volts d.c. between the positive terminal of the reverse strip and ground. Wedge the contacts on relays K_2 and K_3 (identified in the photos) closed. You are now ready to tune up.

If the original crystals are not available skip the tune-up procedure and perform the conversion. When the conversion is completed the same tune-up procedure, using 3 mc crystals, may be followed.

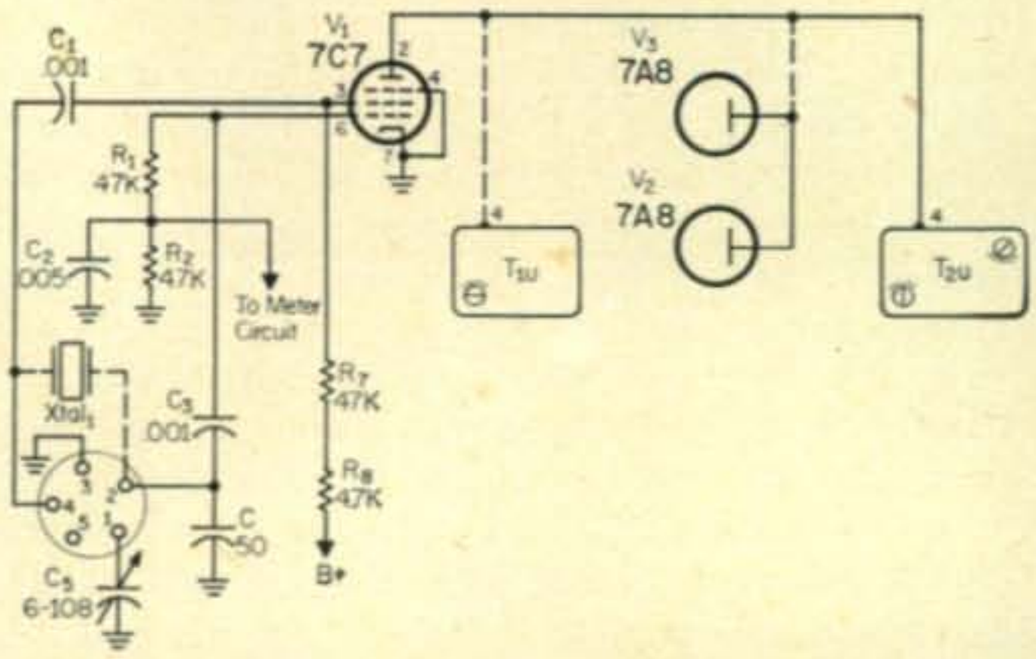


Fig. 1—Modifications made in the oscillator modulator circuit of the Motorola FMTU-30D for conversion to 2 meters. The 7A8 modulators and circuitry are completely removed and the output of V_1 is fed directly to the transformer T_{2U}. Dotted lines indicated wires to be removed.

*4019 8th Street, Gulfport, Mississippi.

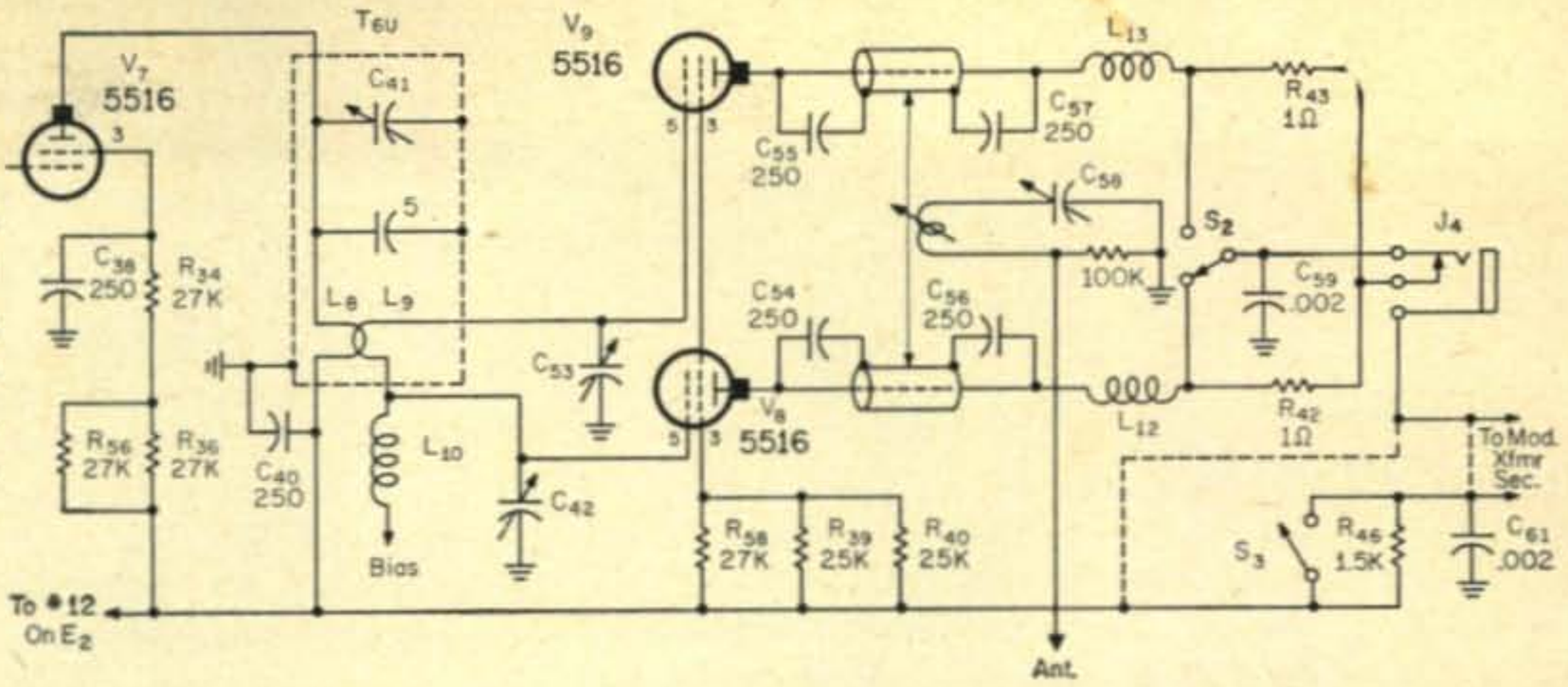


Fig. 2 — Modifications made to the final and driver B-plus circuit to adapt the unit for plate modulation. Specific directions are given in the text.

Tune Up

Connect a 25 watt bulb to antenna coax connector. Insert the crystal supplied with the unit between terminals 2 and 4 of the crystal socket as indicated in fig. 1.

Insert a 0 to 50 microampere meter in jack J_1, as identified on the front panel, positive to the sleeve and negative to the tip. Set S_3, the HIGH-LOW LOW B-plus switch to the position. Turn on the power and adjust C_5 for maximum reading with S_1, the meter switch, in No. 7 position. Set S_1 to the No. 1 position and adjust C_9 on T_{1U} for a maximum reading. Adjust the primary and secondary of T_{2U} for maximum in position 2 of S_1. Adjust the primary and secondary of T_{3U} for maximum in the No. 3 position of S_1. Adjust the primary and secondary of T_{4U} in the No. 4 position of S_1 and adjust the primary and secondary of T_{5U} in the No. 5 position, all for maximum output. In the No. 6 position of S_1, tune C_{41} on T_{6U} and C_{53} and C_{42} located beside the two power amplifier tubes for maximum reading.

Decouple the antenna loop by means of the screw (COUPLING adjustment) on the front chassis and set C_{58} for minimum capacity. With the meter plugged into the PA PLATE jack, tune the shorting bar for a dip with the PA SCREW. Now set S_3 to HI position and tune C_{58} for maximum. Adjust the coupling for a maximum of 37 microamperes. Check for equal plate current in both tubes by throwing S_2 (fig. 2) to both positions. To the left reads right plate current and to the right reads left tube plate current. (This may vary with some transmitters.) Equalize the readings by adjusting C_{42} and C_{53}. Now we are ready to convert to a.m. and reduce the frequency to 144 mc.

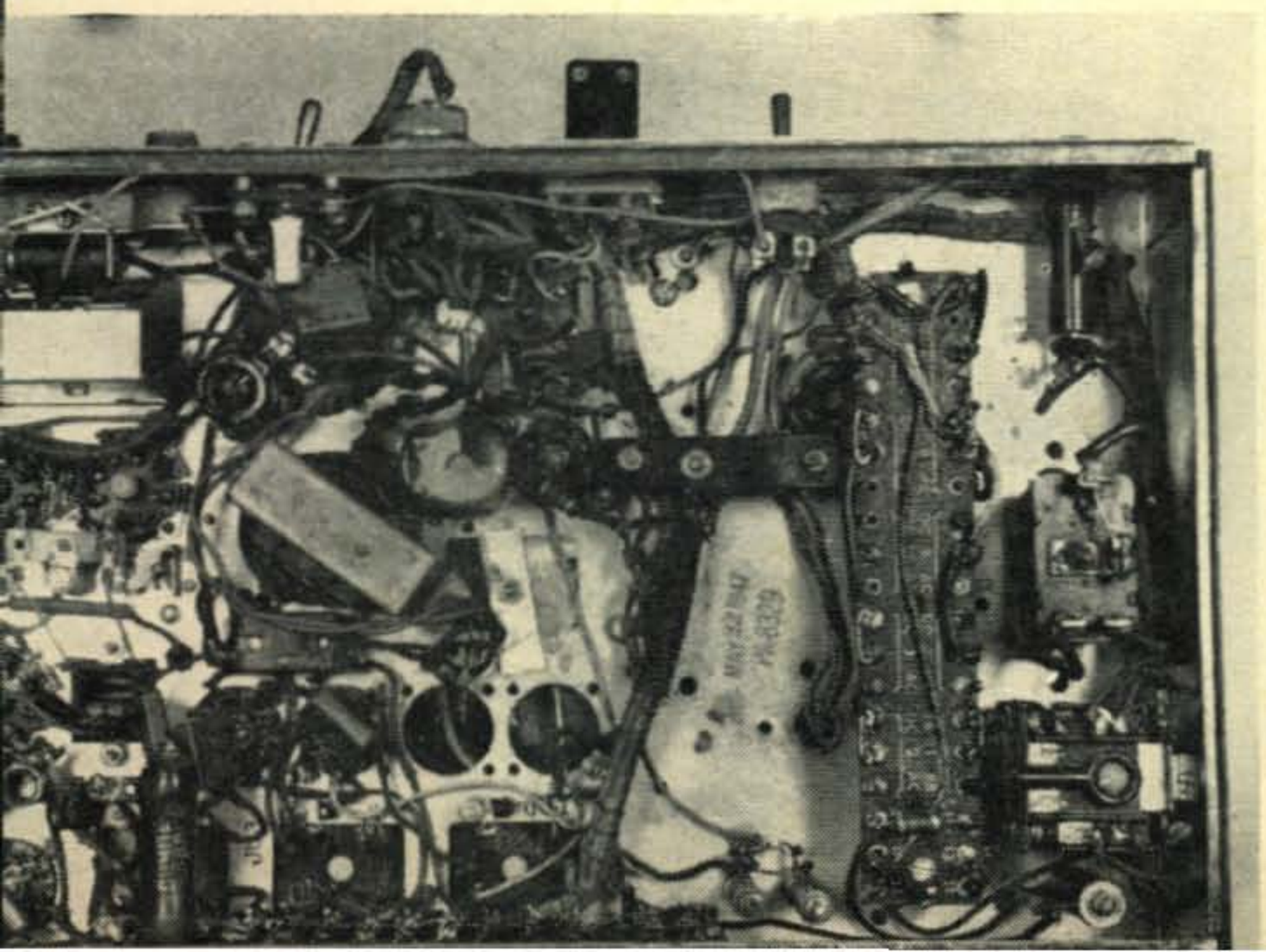
2 Meter Conversion

Oscillator Section–Remove the blue wire from terminal 4 of T_{2U}. Disconnect the wire from terminal 4 of T_{1U} and connect it to terminal 4 of T_{2U}. Completely remove T_{1U} being careful to leave R_7 and the red-blue wire which were connected to terminal 6 of T_{1U} tied together. It is advisable to use a terminal strip here. Be sure the rotor of C_5 is still grounded. Remove all wiring from V_2 and V_3, the modulator tubes, tieing the heavy brown filament wires together on a terminal strip. Remove the two metal encased capacitors located beside V_2 and V_3. Remove C_{60} and the IDC strip located directly above T_{1U} if your set has one.

Control Section–Remove the dynamotor; remove K_4 as shown in fig. 3. Leave K_2 in place, removing the wires to the coil (orange-white and blue-white) also as shown in fig. 3. On terminal board E_2, run a jumper from terminals 8 to 9 to 5 and a wire from 17 to 12. Leave K_1 in place and strap together terminals B and H, and remove the wire from either terminal S.

Completely remove P_1, P_2, J_5 and J_6 and install a 2½ by 5¾ inch aluminum panel to cover the holes.

B-plus Distribution–Remove the red wire from the bottom of R_{36} (point nearest to tube socket)



Bottom view of the converted surplus 2 meter ig. At the upper left corner is the antenna relay K_3. At the center of the unit is the 12.6 volt transformer T_2 which is used to power plate relay K_2 which is located in the lower left corner with K_1 above it. Running from top to bottom at the right is terminal E_2 with dynamotor polarity reverse strip at its left.

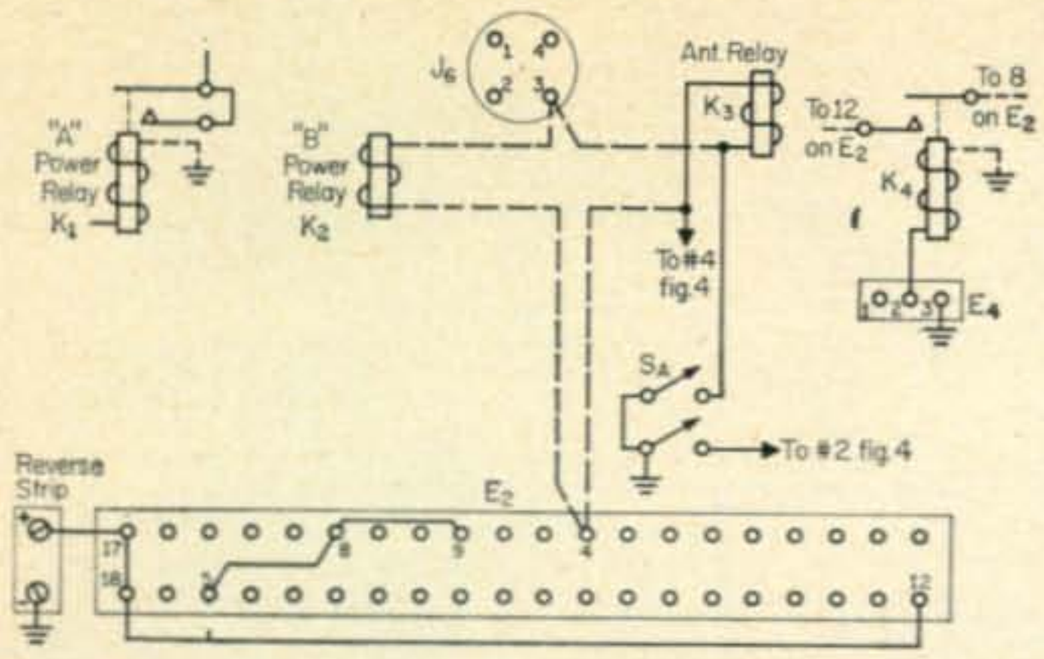


Fig. 3—Modifications made in the FMTU-30D control circuit. Jack J_6, the microphone connector is completely removed as is K_4. The new jumpers added to the E_2 strip are shown. Relay K_1 contact points are shorted with heavy wire and one side of the solenoid is disconnected. Switch S_A is added as directed in the Power Supply section of the text.

and connect R_{36} to 18 on E_2. Remove the red wire from S_3 (that goes through the grommet) and reconnect it to the wire just added to R_{36}.

Install a three lug terminal strip near V_1. Remove the solid red wire from S_3 and attach it to one lug of the terminal strip. (The secondary of the modulation transformer is connected in series with this lug and B-plus). Remove, from R_{46}, (mounted vertically besides K_2) the wire that goes to the bottom of R_{39}-R_{40} and connect it to the other lug of the terminal strip just added. Cut the three leads from the barrel of the PA tuning jack $J4$ and run a wire from here to the terminal strip lug connected to R_{39} and R_{40}. The final circuit is shown in fig. 2.

R.F. Modification–Remove T_{6U} from the chassis and tie a 5 mmf ceramic capacitor directly across C_{41}. This is necessary to enable the driver output to tune to 144 mc and still maintain sufficient grid drive. Reinstall T_{6U}. Now disconnect the two red plate leads that connect to L_{12} and L_{13}. Remove the four screws holding the plate tuning lines in place and remove the final tank assembly. Disconnect one of the plate lines and bend two strips of ¼ inch copper tubing in the exact shape of the plate line, making the top end ⅜ inch longer and the bottom end ⅝ inch longer. You might try filling the tubing tightly with sand to prevent it from kinking during bending. Drill holes in each end to match the original lines and run an insulated wire through them and reconnect the assembly to the chassis, reversing the removal procedure.

The proper crystal frequency is the desired operating frequency divided by 48; in this case 3.000 to 3.083 mc for the two meter band.

Power Supply

The power supply is constructed on an 8¾ × 5 inch chassis and fastened in the area vacated by the dynamotor. The power supply circuit is shown in fig. 4. Notice that it includes a source of 6 volts d.c. for operating the antenna relay, K_3. I used a 500 ma full wave disc rectifier but a half wave unit could be used with some filtering to prevent relay chatter. Relay K_3 is controlled by the d.p.s.t. switch, S_A, shown in fig. 3. Switch S_A is mounted in the panel where J_5 was formerly located.

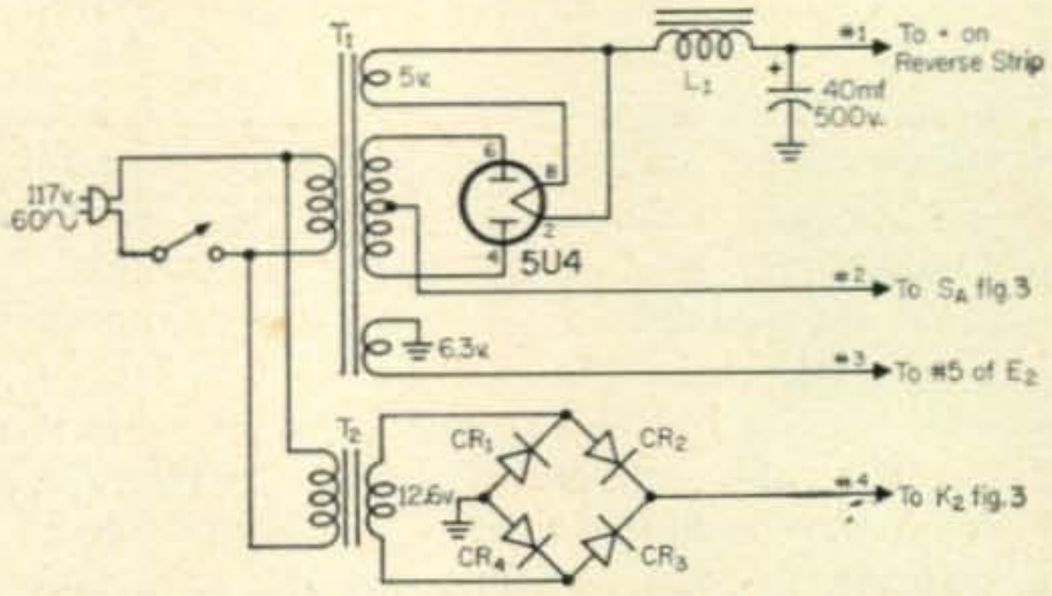


Fig. 4—Circuit of a power supply suitable for handling the FMTU-30D.

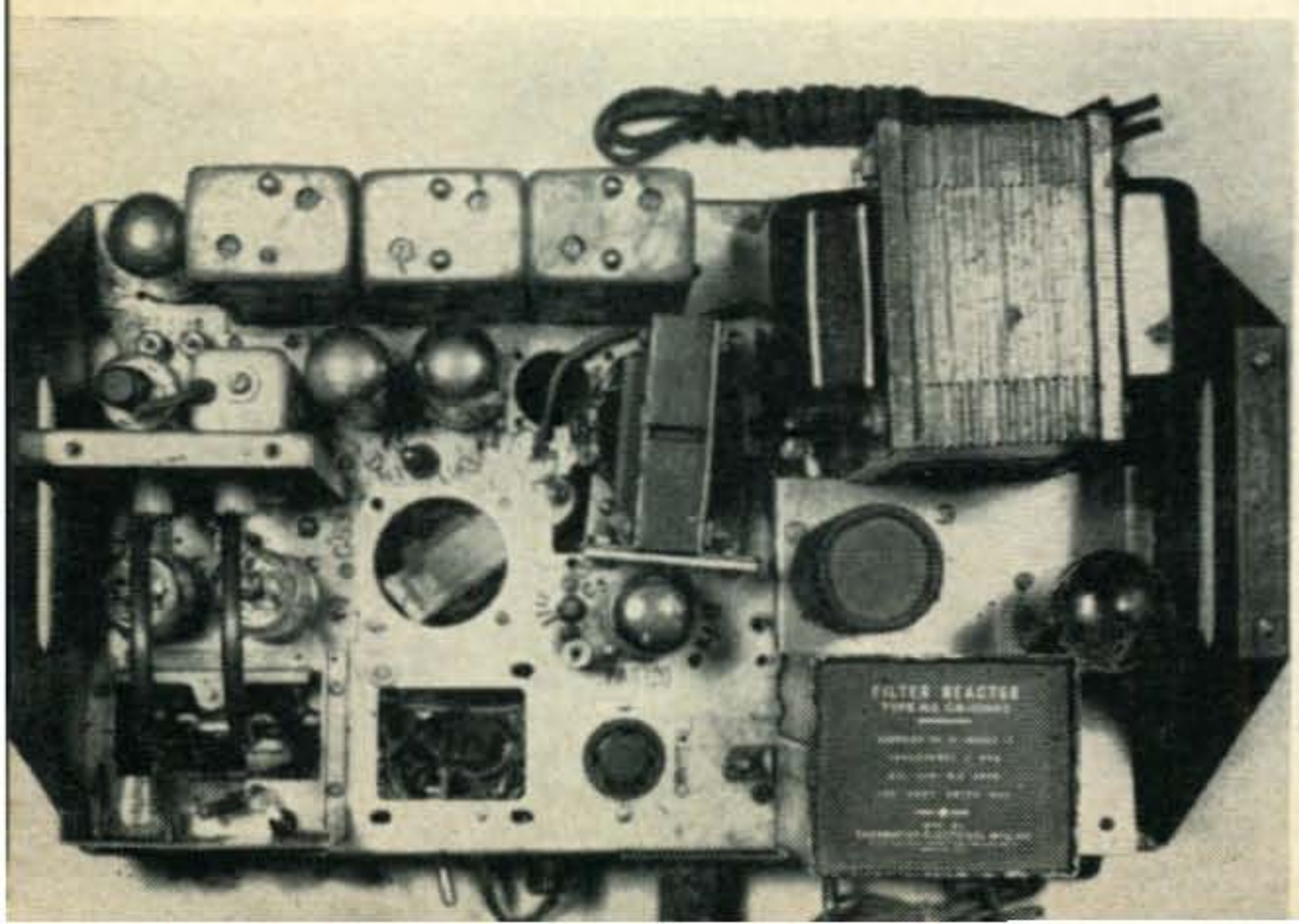
CR_1-CR_4—1N536 diodes.
L_1—7h or more at 200 ma.
T_1—TV-type Replacement Power Transformer.
T_2—117 v. to 12.6 v filament transformer at 1a or two 6.3 units in series.

Modulator

Any modulator capable of delivering about thirty watts can be used provided the modulation transformer offers a fairly good match to the impedance of the r.f. amplifier. In our case with a plate supply of about 400 volts the plate current is about 150 ma which is a plate impedance of about 2,700 ohms.

Testing

The transmitter is now ready to retune, using the same procedure as outlined in the beginning of this article. No reading will be obtained in position 1 since this metered the frequency modulator circuit which has been removed. ■



Top view of the modified FMTU-30D ready for two meter operation. The power supply is located in the space formerly occupied by the dynamotor. To the left of the supply is the filament transformer used to operate the relay. The crystal oscillator is just below the filament transformer. Its output is fed to T_{2U} and then down the multiplier chain to the final. The Hi-Lo toggle, S_3, may be seen atop the chassis alongside the 7C5 multipliers.

ARC-5/SCR-274N [*from page 114*]

selects the voltage for the p.a. screen, 105, 180 or 250 being available. Switch S_5 selects the v.f.o. unit to be used by shifting the oscillator voltage, the keyed oscillator cathode, the keyed p.a. screen and the p.a. plate circuits in the power supply to one of 4 seven prong sockets mounted on the rear of the power supply chassis. These, in turn, connect through 7 wire plug-in cables which terminate at the mating jacks for J_{64} on each v.f.o. in the mounting rack.

A closed circuit jack, J_1, on the front panel in the lower right hand corner is for the low voltage keying circuit. Jacks J_2 and J_3 are mounted on the rear of the power supply chassis. These facilitate the adjustment of the dropping resistors for the regulator tubes for the regulated oscillator plate voltage and the regulated p.a. screen voltage. To adjust, plug in a 100 ma meter and adjust the resistors in these circuits for a reading of 30 ma with key open. Individual tubes may require some readjustment of these two circuits. The objective is to draw enough current through the v.r. tubes to keep them ignited, key open or key closed.

One common source of chirps in these units is a bad 1626 tube. After a unit has been performing properly for some time and suddenly starts to collect chirpy signal reports, better change the 1626; it will often clear up the trouble. They do not seem to have the life that the 1625 tubes have. ■

Med. Power Final [*from page 125*]

in killing parasitics in triode amplifiers.

These units have been used here with from 600 volts up to 1500 volts on the plate circuit with no difficulty. Operated as a Class C amplifier on c.w. with 200 to 250 volts fixed bias from a power pack and using a 10k bleeder on the bias pack (equivalent to the bias requirements for resistor bias) resulted in complete satisfaction.

The original model constructed, now in use at the local Red Cross, uses a 24G operated at 600 volts plate to drive the amplifier to full 300 to 500 watts. The 24G is operated either straight through or doubling. In turn the 24G is driven by a 274-N command transmitter modified as outlined in the first article. The amplifier can also be driven directly by the 274-N using two 1625 tubes and somewhat higher plate voltage than on the 1625's in the v.f.o.

The model in use at Red Cross was used here on 20 meter phone for several years. In a.m. phone service it was modulated by Class B RK-12 zero bias tubes. The original RK-12 tubes are still in use. RCA 811's or the old reliable TZ-40 tubes or 830-B tubes

[*Continued on page 136*]

A 90 Watt Mobile Power Supply

DONALD L. STEINBACH*, W7FLC

A low-cost mobile power supply for the "Cheyenne" or similar transmitter, transceiver combination.

HERE, for the economy minded operator, is a complete mobile power supply that will deliver, simultaneously, 290 v. at 100 ma and 580 v. at 150 ma. The power supply was primarily designed for the Heathkit Cheyenne, but is ideally suited for any mobile rig in the 90 watt class. The heart of the unit is the once popular PE-101C dynamotor.

In the author's installation, the dynamotor is keyed with the push-to-talk switch. This power supply could, however, run continuously and power any of the transmitter-receiver combinations currently available.

Converting the PE-101C

The following instructions for 12 volt conversion of the PE-101C were found to be most satisfactory:

1) Remove both end bells.
2) Remove and discard the right-angle plug housing on top of the dynamotor.
3) Cut the wires close to the plug. Free and discard the original plug.
4) Remove and discard the gear box and its associated white wire.
5) Remove and discard the a.c. brushes and the two small red wires.
6) Check and tighten all connections and replace the end bells.

Assuming all went well, there will be seven wires protruding through the top of the dynamotor housing. The four heavy wires (brown, yellow, red, and grey) come from the two 12 volt motor windings. The three white wires having the colored tracers provide connections to the high-voltage windings.

The dynamotor is now ready to be wired into its associated circuitry (fig. 1) and should be fastened to some sort of base. A piece of 1" × 6" pine board about 18" long is ideal.

Final Wiring

Connect the heavy yellow and grey wires together. These will be connected to the negative battery terminal. In the same manner, connect the heavy brown and red wires together, forming the positive 12 volt connection. The two 12 volt motor windings are now in parallel with each other.

Connect the white wire with the orange tracer to the pair of heavy wires that will serve as automobile ground. This will be the grey-yellow pair for a negative ground electrical system, or the red-brown pair for a positive ground system. A peek at the automobile battery will reveal whether the positive or negative battery terminal is connected to the car frame.

The dynamotor armature will now rotate when the proper primary wires are connected to a 12 volt battery. With no load on the dynamotor, about 440 volts will be present between the white wire with the blue tracer and ground. The white wire with the green tracer will be about 850 volts above ground. The remainder of the circuit should be wired as shown. Figure 1 is for a negative automobile ground system. For a positive ground system, reverse dynamotor leads 1 and 2.

*Three Forks, Montana.

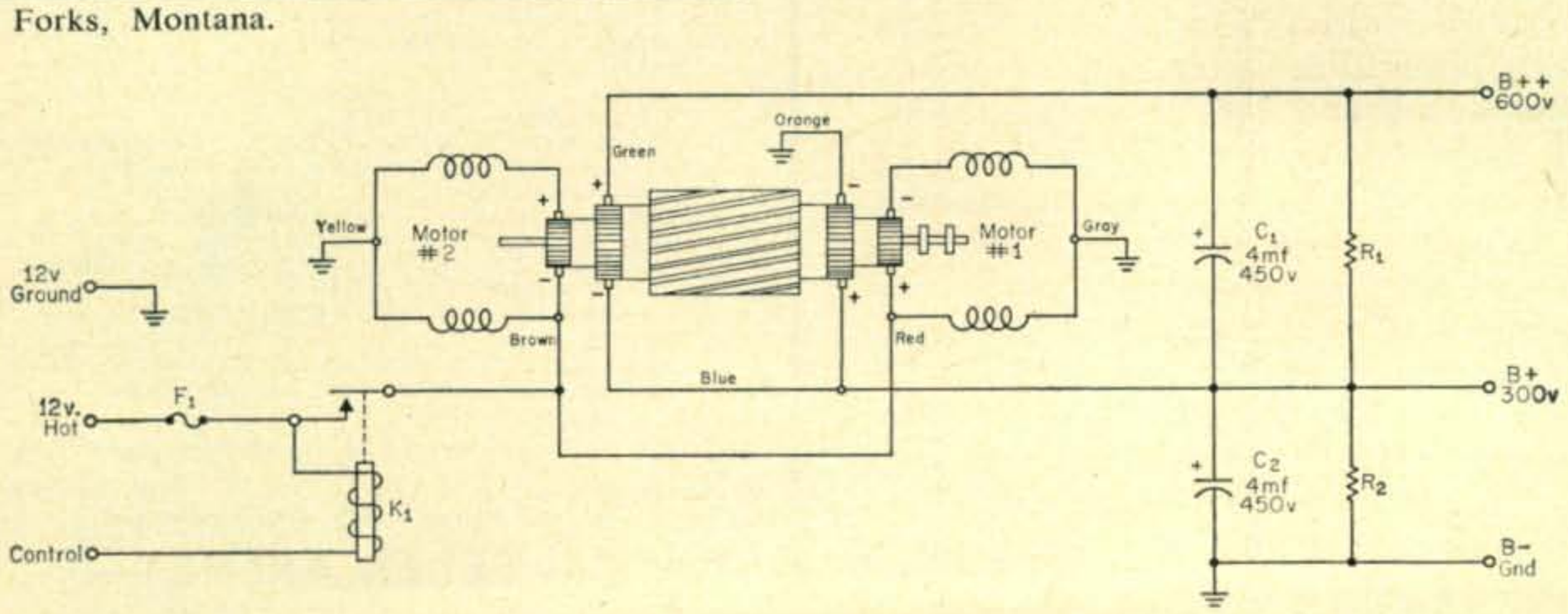
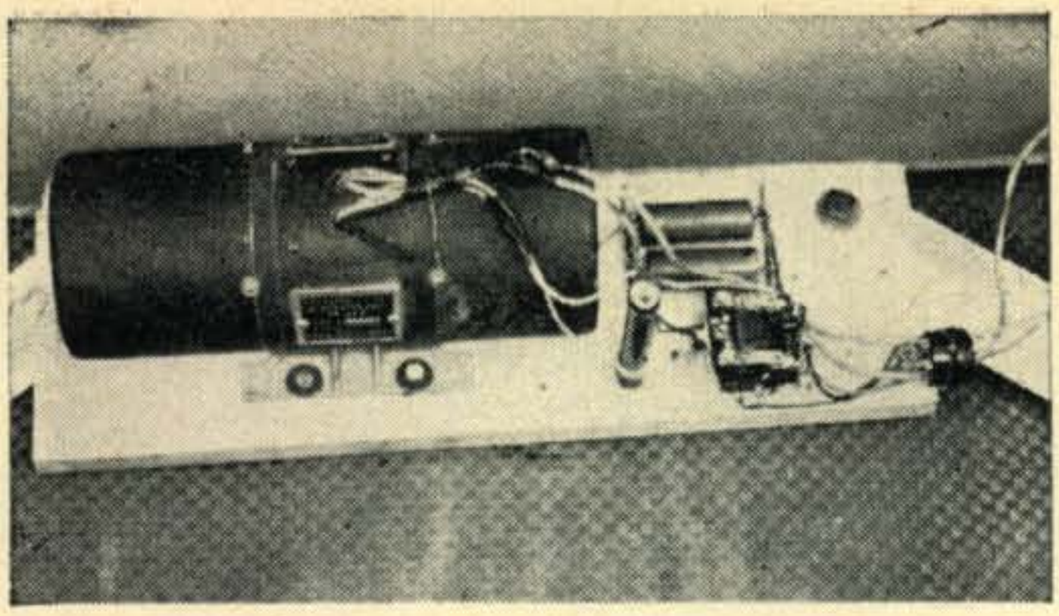


Fig. 1—Schematic of the PE-101C dynamotor power supply. The values of R_1 and R_2 are discussed in the text.



Trunk installation of the PE-101C dynamotor shows all the added components on the mounting board.

The relay, K_1, *must* be connected in series with the 'hot' wire from the battery. The relay used by the author was purchased from Burstein-Applebee Company (#18B769) for 99¢. It has a 12 v.d.c. coil and a pair of 10 amp contacts. The relay is closed and the dynamotor started when the 'control' lead is grounded.

The fuse, F_1, is a standard 30 amp automobile replacement. It will handle the starting load of the dynamotor, yet will open should the dynamotor malfunction.

Capacitors C_1 and C_2 provide more than adequate filtering for the B plus lines. Resistors R_1 and R_2 are 100,000 ohm 2 watt carbon. If the dynamotor is to run during receive periods, R_1 and R_2 should be changed to 20,000 ohm 5 watt wirewound units. The lower value of resistance will insure a constant minimum load of 15 ma on the dynamotor at all times.

If this power supply is used with the Cheyenne transmitter, the dynamotor will deliver about 440 volts when the spotting switch is used to zero-beat another station. For this reason, it is advisable to replace the 15,000 ohm 2 watt resistor found in the original spotting circuit with a 20,000 ohm 5 watt wirewound resistor.

Observations

The author's transmitter is located in the center of the instrument panel, filling the space previously allotted to the glove drawer. The glove drawer was removed and brackets were fastened to the transmitter so that it would slide in and out on the original glove drawer tracks. The microphone was moved to the left side of the car (not a bad idea for any mobile) and connected to a junction box.

The dynamotor is situated in the trunk and connected to the battery with about 18 feet of No. 10 wire. Total current drain is on the order of 20 amps when transmitting.

Summary

While the dynamotor arrangement is not as efficient as the popular transistor power supply, the monetary savings more than offset any disadvantages. Several thousand miles of trouble-free mobile operation attest to the ruggedness of this installation. ■

Med. Power Final [*from page 133*]

could just as well be used, or 211's with proper bias for Class B. The plates of the Class "B" modulators were fed 650 volts and 1050 volts was applied to the r.f. tubes with 225 volts fixed bias. The 24G driver was operated at 700 volts plate and 160 volts fixed bias. All stages were link coupled. The original Class B modulator transformer (a Kenyon T-495) used on the transmitter was damaged and was replaced with a United S122.

When the replacement was made, a PHONE-C.W. switch was installed which cut the plate voltage off both the Class "B" and Class "C" windings of the modulation transformer when the transmitter was used for c.w. operation.

Excellent results have been obtained using the Viking Ranger as a driver for this amplifier. The Ranger can also be used as a speech amplifier by using the 500 ohm output connected to a 500 ohm input on the Class B modulator. At present, the new version of this amplifier is used here at W8DG on 20 meter c.w. driven by a "Ranger." Some of the other small transmitters using a single 6146, 807 or 1625 output tube could probably be used with just as good results as the drive on the Ranger has to be cut back to drive the amplifier here at 500 watts c.w.

For anyone wanting a good reliable medium power final amplifier, and who will set aside prejudices for the old type tubes, this unit will be found most desirable. The tubes are still in good supply at low prices. Many could be scrounged from your ham friends prejudiced against the old types of tubes to your advantage.

The 1962 model shown in the photos was built entirely from the "junk box" without one cent being spent for parts. "Go thou and do likewise" and acquire yourself a fine medium power job for 80 to 20 meter operation. ■

High Freq. Mult. [*from page 117*]

tuning capacitors at a point in the 10 and 15 meter bands. Full capacity is obtained at 100 dial divisions.

Frequency	1st. Mult.		2nd. Mult.
	Grid	*Plate*	*Plate*
5300 in 21,200 out	82	98	65
7005 in 28,020 out	45	38	24

For 14 mc output the r.f. is picked off the link of the plate coil of the first multiplier.

This unit, as built, does a fine job of driving a 10-15 meter driver unit which is in turn designed to drive a 1 KW final. Both will be described in the next parts of this series. Using higher voltages on the plates this multiplier could readily be used for driving a *medium* power triode final without a following intermediate stage. ■

304 TL Final [*from page 127*]

quick QSY, must be tolerated without retuning either the driver or the final. The 804 driver used here meets this requirement nicely; 100 or more kc variation from where it is tuned makes no substantial difference in its output. The old 204-A amplifier also met these conditions. The 304TL does nearly as well but will not stand quite as much frequency variation without retuning or loss of output as the old 204-A amplifier did.

These two 304TL amplifiers were built entirely from components salvaged from retired units and from the junk box without any additional expenditure. Performance has been so satisfactory that we have decided to standardize on them. Tubes are on hand, including ample spares, which will probably outlast my earthly days. None of the more modern or up to date tubes intrigue us toward a change. Very shortly two additional amplifiers will be added, one for 20 meters and one which we hope, by judicious juggling in the shop, will wind up like our 4E27 driver unit where we will not have to change coils to shift from 15 to 10. When this comes to pass, our ambition will be finally realized, to have a 1 kw outfit on every band. ■

Prop. Pitch Rotor [*from page 129*]

in ½" slots. Whether all versions of the prop pitch motor bevels have 36 teeth I am unable to say. However the sprockets are available with 30, 36 and 40 teeth in the probable range of other bevels. This sprocket would also provide an excellent place for limit switch cams if these are desired.

Beam Weight

The ¼" × ¼" cross section full type ball bearing behind the bevel, takes the weight of the beam when using a prop pitch motor alone so should be quite adequate in this application. However with exceptionally heavy assemblies it might be well to take part of the vertical load on the top steady bearing at the top of the tower. This steady bearing may be an oil saturated split hardwood or a bakelite plate. For a more sophisticated layout a flange type pillow block might be used. The waterproofing cap is a loose fit on the pipe so that it will slide up easily when lowering same. To prevent water running down into the gearbox, half lapped turns of scotch electricians tape should be wrapped around the conical part of the cap and up the pipe a few inches.

This rotator has now functioned without any trouble for two winters in temperatures down to 35° below zero. Changes in antennas have also been carried out with ease. It does, I consider, represent a very worthwhile improvement in performance over the conventional prop pitch motor alone. ■

Cliff Corne, K9EAF [*from page 35*]

"As you would imagine, I have elaborate files with all QSOs registered on Autodex and Roladex file cards . . . followups on QSL cards, work sheets for awards, correspondence files, etc. Incidental to ham operations, we have a collection of books, dolls, animals, figurines, novelties, etc. from all over the world. We keep up correspondence with scores of folks in many different countries. Stamp collecting and stamp distribution comes in for some attention. We are continuously moving our magazines call books, radio parts, post cards, etc., to friends all over the world. We agree with you that there is a lot more to amateur radio than just operating the rig.

"Yes Clif, [K6BX] your CHC was an inspiration that has turned into a ball of fire . . . words cannot describe the world-wide impact. You have won your seat alongside old Saint Peter. Needless to say, ham radio and people like you, are the therapy which keeps me alive . . . Thank you, and God Bless you and all who follow in your footsteps."

Gosh Cliff, it's my pleasure being your friend and we know all hamdom is mighty proud of you.

Cliff works all bands and modes but you are most apt to find him hanging out on CHC frequency, 14075. Give Cliff a call and say Hello. You will marvel at his excelelnt fist and operating proficiency.

Yes, Cliff is an inspiration to all hamdom by his many achievements, now over 250 awards. What say we all send him a card at Christmas time with our well wishes. ■

Antenna Design [*from page 33*]

covered in detail in another article, but this is the reason why the Cubical Quad antenna has been used with such success. The Quad consists of orthogonally polarized elements, and it responds well to a signal whose polarization is changing.

Which type of antenna do I prefer? Personally, I prefer the vertical for sound technical reasons, and because it has given me the best all-round performance for many years. It has given me reliable long distance communications on 14 mc and excellent contacts at all distances out to 2000 miles and more, on 7 and 3.9 mc. An article appearing in this magazine will describe the construction and electrical details of the W3JHR "Mark III DX Antenna" which is a 1½ element colinear like the one in fig. 5D on 14 mc, and which is an ordinary 0.37 and 0.22 wave length vertical on 7 and 3.9 mc respectively. This article will show how the 14 mc phase reversal is accomplished by the use of a ¼ wave coaxial sleeve. This antenna has equalled or out-performed nearby rotary Yagis

[*Continued on page 171*]

Ham Clinic [*from page 72*]

would be the lazy man's way of tuning the antenna for each band—and that is for me!

The antenna is certainly worth the little price paid for it, and the serious consideration of the advanced as well as the novice amateur when shopping around for an inexpensive but effective antenna.

Super-regen 10 M Receiver—"I have need for a tiny 10 meter super-regenerative receiver. Can you help me?"

Sure. See fig. 1. This circuit works extremely well. As a super-sensitive field strength meter it is excellent. You can connect an 0-1 milliameter in series with a silicon rectifier then connect this combination in the secondary of the output a.f. transformer; this works fine for field strength measurement purposes.

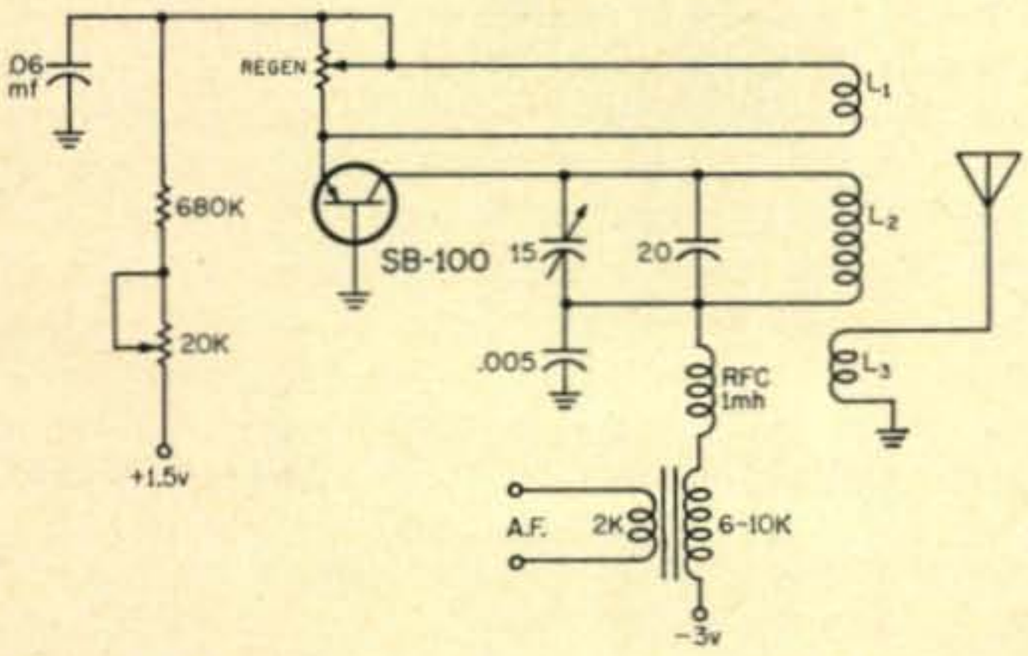


Fig. 1—Simple regenerative receiver for 10 meters. The 20K pot may be replaced with an appropriate fixed resistor after initial adjustments have been made. Regeneration control R_1 is adjusted for maximum sensitivity on each received signal.

L_1—3t #22e. on hot end of L_2.

L_2—3 t #22e. 1" dia spaced over 1⅛".

L_3—2½t #22e. on cold end of L_2.

V.H.F.-V.F.O. Stability—"Do the same design considerations applicable to h.f. v.f.o. stability apply to v.h.f. v.f.o. stability"

Yes, but more care must be exercised in v.h.f. v.f.o. mechanical design. Furthermore, care must be taken that the load offered to the v.f.o. is correctly matched, and that the v.f.o. is fed from an ultra-stable power supply, even if the v.f.o. does contain a v.r. tube. At very high frequencies (2 and 6 meters), a small change in capacitance or inductance can have a large effect on frequency change. If you buy an average commercial v.h.f. v.f.o., remember that it takes at least 90 minutes (yes 90!) before a unit will really settle down properly. Do not expect a unit to be on frequency from a cold start in 15 minutes—especially if it costs under $45.00. I advocate leaving the filament voltage on v.h.f. v.f.o. tubes on all of the time. Most commercial units are calibrated when they have been on two or more hours, or when the temperature (operating) peak is reached.

Thirty

If there is any special subject you would like to see covered in HAM CLINIC, by all means let us know, it only takes a postcard.

For this month then, Happy Thanksgiving to all of our fine readers. 73 and 75 and to all DX'ers 72.

Chuck, W4VZO

BARRY'S NOVE

RCA PRECISION 500 KC CRYSTAL OSCILLATOR $5.00

Accuracy plus or minus 0.0012%. Contains Precision 500 KC crystal, BMS Labs Crystal oven, 5840 sub-miniature tube. Hermetically sealed nickel plated rectangular case. Mounts in standard 7 pin miniature socket. Requires 6.3 VAC or DC, 75 to 100 V.D.C. With schematic. RCA Type A8838300-1. Size: 4½"H x 7-7/16"W x 1⅛"D. Wt.: 1 lb. Cat. #4-500 CRV. (Orig. Govt. Cost: $172.00.

VERY SPECIAL . . . ONLY $5.00 Postage Prepaid.

Thomas & Betts Wire-Welder

Consists of a 115 VAC 60 CPS 1 phase pwr supply, fused for 15 Amps. The on/off toggle on front is also a magnetic circuit breaker, with special delay characteristic to protect welding unit and the line. The xfmr in the pwr supply has 6 taps selected by a switch on the panel. The low numbered taps are used for welding low melting point alloys and fine gauge wires. Dark glasses are not needed, with proper use of the gun, because the arc is inside the nose tip, out of sight. This wire welder makes a fusion weld. Normally used for welding up to #10 wire or an equivalent solid metal mass. Larger masses may be welded intermittently. New unused. (orig. cost **$140.00**), Our price: **$39.00.**

Transistor Power Supply

Torroidal type transistor Pwr Supply. In: 12 VDC. Out: 250 VDC @ 100 Ma. Ideal for Receivers Converters or Exciters. Use 2 units in series for 500 VDC @ 100 Ma. (Chassis not grounded). **$19.90** Each.

10,000 Ohm Dummy Load: Has enclosed 0-750 Ma. meter. This unit designed to test Pwr Supplies. Will dissipate 2000 Watts. Enc. in aluminum case 8" x 17¼" x 12½", with 83-1R Coax input connector. **$49.00,** fob, Ga.

Dummy Load: 52 or 72 Ohm Dummy Load. Unit with Coax input. Will handle 1500 Watts, without forced cooling & up to 5000 Watts, for short periods with forced cooling. With RF Ammeter only **$49.00** fob, warehouse, Ga. (specify **52** or **72** ohms when ordering).

Eicor Rotary Inverter: 28 VDC in. at 2.5 Amps. Out: 19 VAC @ 2.1 Amps. (Power factor =1.) 6300 RPM cont. duty. Temp. rise: 43° C. **$4.95.** Silicon Rectifier: 750 Ma/600 PIV . . . W5DX says "By using ten of these in a leg of a full-wave hook-up, I replaced two 866's, did away with a fixed choke. filament xfmr & 2 sockets. Gained 600 V. & ran stone cold". **.36¢** each

RCA 4x150A. New Jan Stock (Not Pull-outs) **$11.50.**

RCA Compact 125 Watt MOD. GMFR. 3 Lbs—**$4.95** W/ sheet.

Modulation Reactor Transformer

2.5 KW of class B audio, husky, commercial grade. Will modulate 5 KW xmtr. Pri Imp: 12000 Ohms. Sec. Imped: 7500 or 5000 Ohms. Designed to rigid Gvt. specs. **$49.50.**

AMECO . . . BRAND NEW

CN 50K—Deluxe Nuvistor Converter in kit form for 50 Mc. **$34.95**

CN50W same as above . . . only wire tested **$49.95**

CN 144K—Deluxe Nuvistor Converter in Kit form for 144 Mc. **$34.95**

CN50W (same as above . . . only wired and tested) **$49.95**

TX-86 90 Watt Xmtr: 6 thru 80. Phone & CW (wired) **$119.95**

PS-3 AC Power Supply for TX86 (wired & tested **$44.95**

General Electric Plate Transformer: Pri: 100, 105, 115, 200, 210 or 230 X VAC @ 60 CPS. Sec: 3525 VAC @ 2 KVA. Use a pair of these xfmrs to get 7050 VCT @ 800 Ma. Each xfmr has a net wt. of 40 lbs. 4½"H x 5¼"D x 10¾"W. **$19.95** each.

Full-Wave Rectifier/Tube Substitute (8 Prongs). Replaces Octal base tubes, such as 5AU4, 5AW4, 5U4G, 5V3, 5V4G, 5Y3G, and 5Z4 and similar type tubes. Rated up to 1800 PIV at 700 Ma. full wave. **$1.10.**

Heavy Duty RCA Plate Xfmr. Pri: 220 VAC with taps/60 CPS/1 phase. Sec: 7,000 VCT (3500-0-3500) at 1 Amp. Wt: 176 lbs. via economical motor freight. **$65.00.**

2½" Diam. PM Speaker. 3.2 Ohm Voice Coil. 3 Ozs. **.95¢.**

BC-221 Metal Case. Unused. 9"H x 10"W x 11"D. **$4.00.**

Westinghouse Rotary Inverter: DC Input: 28 V. @ 2.6 Amps (.045 KVA) 100% P.F. Out: 19 VAC @ 2.37 Amps. Compound wound. 6300 RPM min. Westinghouse type FK. **$4.95.**

MBER SPECIALS

Super Sale on Melpar Audio Fre. Filters
All unused. Clearly marked with hook-up connections and frequency. Following freq. are available (all in Kilocycles): 9.90 450, 1125, 1375, 1625, 2125, 2375, 3625, 4625. (Many **$60.00** value) **$2.95 ea.**

Mity-Amp 2 Watt Audio Amplifier: For Stereo, Intercom, Public Address, Signal Tracer, Monaural or Convert monaural to Stereo. Fits in the palm of your hand. Full 2 Watt Power. Specs: Freq. response: 20 Cycles to 15 KC plus or minus 2 db at 1 Watt level. Input volt. needed to drive to full power: .5 Volts. Input Imped: 45 Ohms to 50 K Ohms. Out Imped: 3.2 Ohms to 45 Ohms. Power requirements: 6 to 12 V. @ 300 to 700 Ma. Current is determined by impedance of speaker voice coil. 2" x 3½" x ⅞" 6 Ozs. **$8.95.**

4 Position Coax Switch: Orig. boxed. Hermetically sealed. Handles up to 2KW. General Communication Co. Model 4N9MP-2. Radio Freq. range: 0 to 10,5000 Mc. VSWR: 1.2: 1 max to 1000 Mc.; 1.5:1 Max to 10,500 Mc.
Insertion loss: 0.2 db @ 3,000 Mc. RF Power rating: Handles up to 2 KW on any freq. up to 100 Mc. and 100 watts at 3,000 Mc. Volt. rating: 500 V. Peak. Crosstalk. Greater than 60 db to 300 Mc.; Greater than 40 db to 10,500 Mc. Characteristic Imped: 50 Ohms nominal. RF Connector: Type "N". 4" x 3" Diam. **$24.90.** (Orig. Cost about **$160.00** each)

TS-175/U Heterodyne Freq. Meter: 85 to 100 Mcs. **$175.00.**

Hammarlund SPC-10 SSB/CW, AM/MCW Converter. Rack Mounted. Made for use with SP-600 or any Receiver with 450 to 500 KCS IF. Regularly **$375.00.** Like-new condition. Special price (one only) **$275.00.**

Signal Gen. TS-497B/URR Model 80: 117 VAC @ 60 CPS. Range in 6 bands: 2 to 400 Mcs. **$350.00.**

Westinghouse Power Silicon Rectifier: Type 1N1291/322A. Each rectifier rated at 160 Amps @ 50 PIV. Assembly consists of a pair of 1N2191's mounted on heat sink. Overall size: 5½" x 5" x 3". **$20.00.**
Same as above, with addition of a pair of "Surge" 1N1199/304A's mounted on heat sink. Size: 3¼" x 8" x 3½". **$22.00.**

Amphenol Type 82-831 Coax. Chassis Connector. Takes BNC Plug. With washer & mtg. nut. **25¢.**

Kilowatt Power Supply: Modern design. Finest components used. Mtd on stan. relay rack panel (19" W x 14"H). Uses Silicon Rectifiers. Has 0 to 250 VAC line meter and 0 to 4000 VDC meter. In: 210, 220, 230, 240 or 250 VAC @ 50/60 CPS, 1 phase. Out: 3000 VDC tested @ 350 Ma. One control switch for off, low voltage output for tune up, and full voltage. FOB, warehouse, Ga. **$95.00.**

APWII Transmitter Cavity: Tunes from 2700 thru 2950 Mcs. Furnished with 2C40A tube. Mfd. by J.V.M. Engineering and others, under AF33(600) 28235. **$39.90.**

18AMP/150 PIV Silicon Diode—Westinghouse Type 303-C-A **$14.00**—Value for only **$3.95.**

50 Feet Hi Quality, 8 conductor Color-Coded Cable. Rubber insulation. Can be buried. A best buy—**$2.50.**

Eimac 4X150A/4010 Air System Socket a **$12.00** value for only **$6.95.**

Plate Transformer: Operates from 115 or 120 VAC @ 50/60 CPS. Sec: 3750-0-3750 VAC. Tested @ 250 Ma. Oil-filled. Packed 2 to the wooden case. **$35.00** each (two for **$65.00**). The current is incorrectly stencilled on this xfmr. However, unit thoroughly tested and guaranteed for 250 Ma.

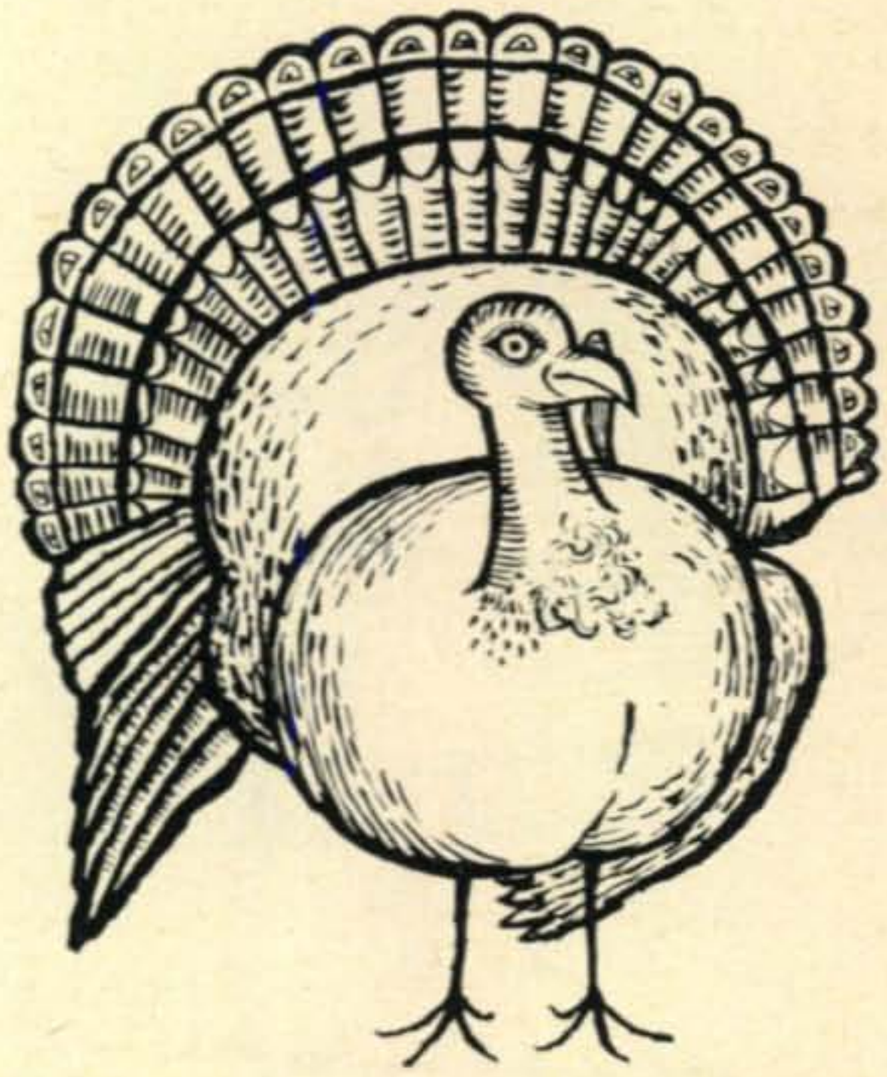
Elmac PMR-8 Mobile & Home Miniature SSB/CW/AM, Receiver, with 115 VAC/12 VDC Power-Supply. Like-new condition. **$147.00.**
Covers B.C. Band-80-40-20-15-10 and 6 meters.

One Hour Bell Timer. Deluxe. Mfd by M. H. Rhodes. **.70¢** each (10 or more **.60¢** ea.)

Miniature Step Down Xfmr: Pri: 110 VAC @ 60 CPS. Sec: (1) 6.3 V. @ 150 Ma. (2) 55 V. @ 100 Ma. 3 Ozs. **.60¢.**

FT-141 Aluminum Shock Mount Assembly: Brand new. With 4 miniature shock mounts. 6½" x 4-3/5". For mtg mobile equip. dynamotors, etc. **.60¢** each (10 for **$5.00**).

Experimenter's Xmtr Assembly: Consists of the following: Ceramic socket for 829B or similar types. Pair of Octal sockets. Qty of High voltage By-Pass capacitors, RF Chokes, Resistors, Mtd. on low-loss phenolic base. **$3.50.**
PL-55 Plug: 3" Long. Bakelite Insul. **.12¢.**



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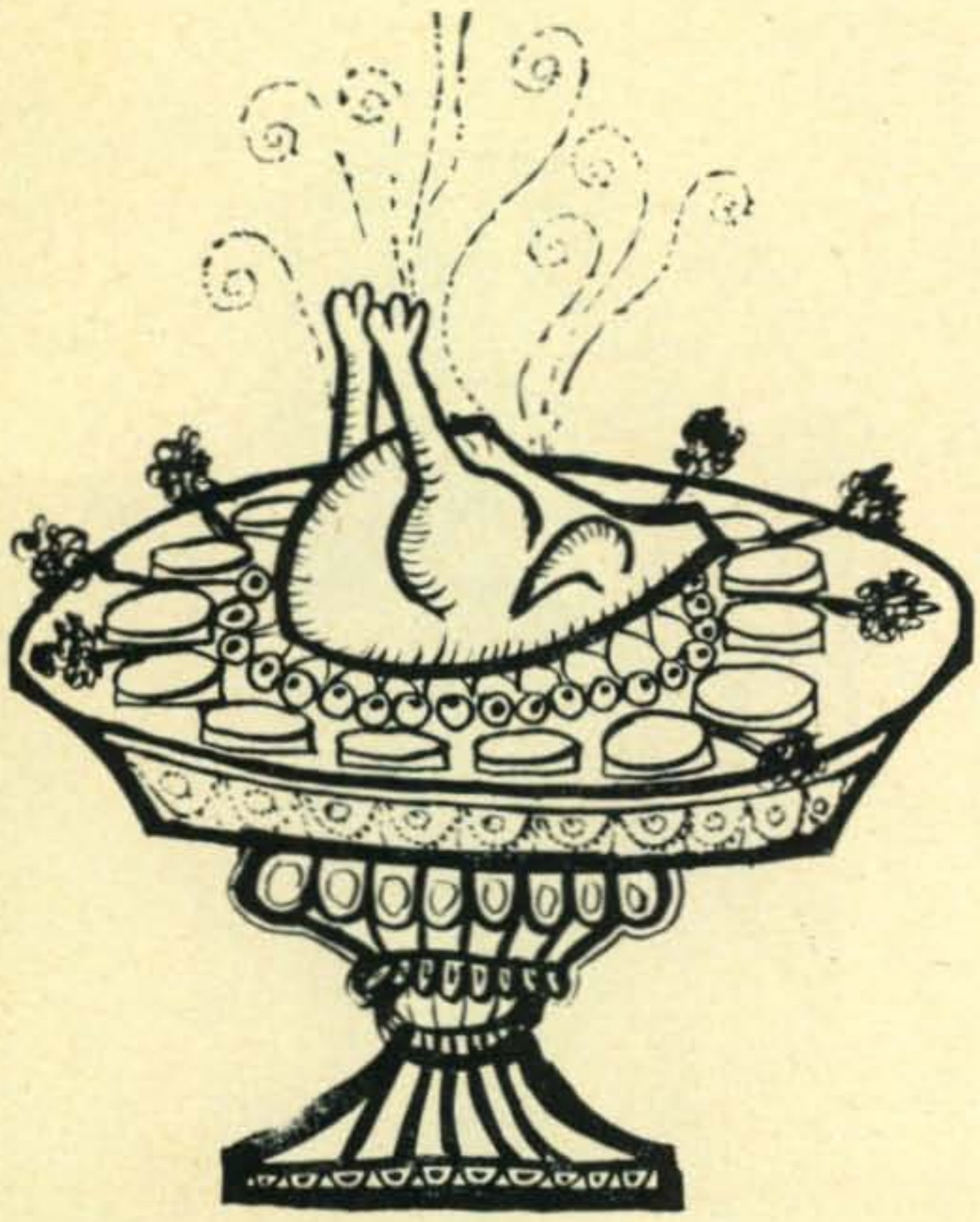
5842/417A	$6.90	6922	$3.25	3B25	$2.95	57	$1.40
5847/404A	$3.90	6955 (CBS)	$6.50	3B28	$2.50	58	$1.10
5879	$1.20	7025	.80	3CX100A5	$9.90	59	$1.35
5881	$1.80	7034—See 4X150A		4-65A	$9.00	80	$1.00
5894	$21.00	8008	$5.75	4-125A	$24.00	83	$1.50
5896	$1.00	8013	$2.95	4-250A	$35.00	100TH	$14.00
5915	$1.00	8020/GL451	$4.50	4-400A	$37.50	211	$1.75
5963	$1.05	9001	.50	4-1000A	$95.00	D250 (Ohmite Dummy Load)	2.90
5965	.95	9002	.70	4CX250B	$33.00	404A/5847	$3.90
5998	$2.50	9003	$1.50	4CX300A	$44.00	WE416B	$16.95
6004	.30	9004	.25	4CX300A socket (SK-710)	$12.90	417A/5842	$6.90
6072	$1.20	9006	.20	4E27	$7.50	450TL	$28.00
6073	$1.00	9902/5868	$47.50	4H4C	$1.80	803	$6.50
6080	$3.75	9903/5894	$21.00	4X150A	$11.50	806	$6.50
6096	$1.20	OA2	$1.00	4X150D	$11.00	807	$1.75
6111	$1.90	OB2	.85	4X250B	$32.00	807W/5933	$2.75
6112	$1.75	OB3/VR90	$1.25	4CX250B	$38.00	808	$1.00
6135	$1.50	OC3/VR105	.65	5BP1	$5.75	809	$4.95
6136	$1.15	OG3/85A2	$2.25	5BP4	$6.50	SK-810 (Elmac Socket for 4CX1000A)	$30.00
6146	$3.25	1N34A/1N120	.25	5R4GY	$1.75	811A	$3.75
6161	$45.00	1N69	.15	5U4GB	.75	812A	$3.75
6201/12AT7WA	$1.50	1N1341/341A	$2.25	6AF4/6AF4A	$1.35	813	$14.95
6252	$19.50	2C40	$6.00	6AG5	.75	814	$4.95
6263	$9.50	2C43	$6.00	6AG7	$1.0	815	$3.40
6264/6264A	$11.00	2C51	$1.25	6AJ5	$1.00	816	$2.50
6268/9911	$29.50	2D21	.65	6AK4	.60	832A	$6.95
6293	$5.40	2E26	$2.75	6AK5	$1.10	833A	$44.00
6350	$1.75	2G21	$1.50	6AK5W/5654	$1.20	866A	$1.50
6360	$3.95	2K25	$10.00	6AL5W	.75	866 Jr.	$1.50
6383 (RCA)	$25.00	2K28	$21.00	6AQ5W/6005	$1.25	872A	$4.75
6550	$4.00	2N255A	$1.20	6AR6	$1.20	884	$1.25
6550 (Matched Pair per pair	$8.50	2N404	.35	6AS7G	$2.50	885	$1.15
6893	$3.70	2X2	.20	6CA7/EL34	$1.75	918	$1.50
		3AL5	.50	6CL6	$1.30	1619	.30
				6CW4	$1.90	1624	$1.20
				6DJ8	$2.15	1625	.35
				6J4/6J4WA	$3.00	2050	$1.50
				6J6	.75	5514	$5.95
				6L6G/GA	$1.35	5517	.60
				6SN7GT	.90	5642	.95
				6V6GT	.75	5670	$1.00
				6V6M	$1.65	5687	$1.20
				-0	.75	5691	$4.50
				12AT7	$1.05	5692	$3.75
				12AT7WA/6201	$1.50	5693	$3.50
				12AX7/ECC83	.90	5696	$1.90
				12AY7	$1.20	5718	.95
				12BY7	$1.05	5719	.80
				12SG7	.80	5725/6AS6W	$1.25
				1616	.85	5726/6AL5W	.75
				T20	$1.75	5727/2D21W	$1.00
				21AXP22A	$88.00	5749/6BA6W	.95
				T21	$2.50	5750/6BE6W	$2.70
				EL34/6CA7	$1.75	5751	$1.25
				35TG	$3.75	5763	$1.50
				TZ-40	$6.50	5814/5814A	$1.25
				45	$1.25	5823	.80
				46	$1.00	5829	$1.00
				47	$2.00	5840	$1.25
				T55	$4.75		



G.E. 1.5 Mfd. @ 20 KV Capacitor: These high-quality capacitors are G.E. Pyranol. They are actually two capacitors of .75 Mfd. each. In parallel the total capacity is 1.5 Mfd. **$29.90.** New Unused.

UTC Swinging Choke: UTC #F3605. 10Hys @ 63 Ma/35 Hys. at 12 Mc. DC resistance: approx. 195 Ohms. 700 V. insulation. Grade 1, Class A. **$1.25.**

800 Ma. Filter Choke: Mfd. by Acme Electric. 2.5 Hys. @ 800 Ma. 8 KV insulation. **$5.75.**

6 Hy @ 500 Ma. Choke: 26 Ohms DC resistance. Open frame construction. **$2.50**

1 Mfd/2000 V. Capacitor

Mfd. by **Sprague/CD/**or **GE.** With mtg clamp. 3½"H x 2"W x ⅞"D. **$1.00.**

Technical Material Corp. VFO-VOA-(2 to 64 mcs) RACK-Mounted **$395.00.**

Technical Material Corp. Dual-Diversity Mixer—DCU **$99.00.**

SK-710 Eimac Socket for 4Cx300A. New, Boxed. Sale **$12.50.**

Capacitor Sale:

800 Mfd/150 VDC @ **$1.00.**
1500 Mfd/80 VDC @**$1.00.**
2500 Mfd./80 VDC @**$1.00.**
3000 Mfd./40 VDC @**$1.00.**
4000 Mfd./50 W.V. @**$1.25.**
8000 Mfd./55 W.V. (65V. Peak) @**$2.95.**

Filament Transformer 6.3 V. at 17.5 Amps.
Pri: 115 VAC @ 60 CPS.
Sec: (1) 6.3 V. @ 15.5 Amps.
Sec: (2) 6.3 V. @ 2 Amps. **$3.50.**

Filament Transformer 6 or 12 V.
Pri: 115 VAC @ 60 CPS. Sec: (1) 6.3 V. @ 4.4 Amps; (2) 6.3 V. @ 3.3 Amps. In series good for 12.6 VAC @ 3.3 Amps plus. In parallel good for 6.3 V. @ 7.3 Amps plus. **$2.95.**
Filament Xfmr: 6.3 VCT @ 4 Amps. Pri: 115 VAC @ 60 CPS. Sec: 6.3 VCT @ 4.0 Amps. **$1.50**

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☐ I have available for trade-in the following .....

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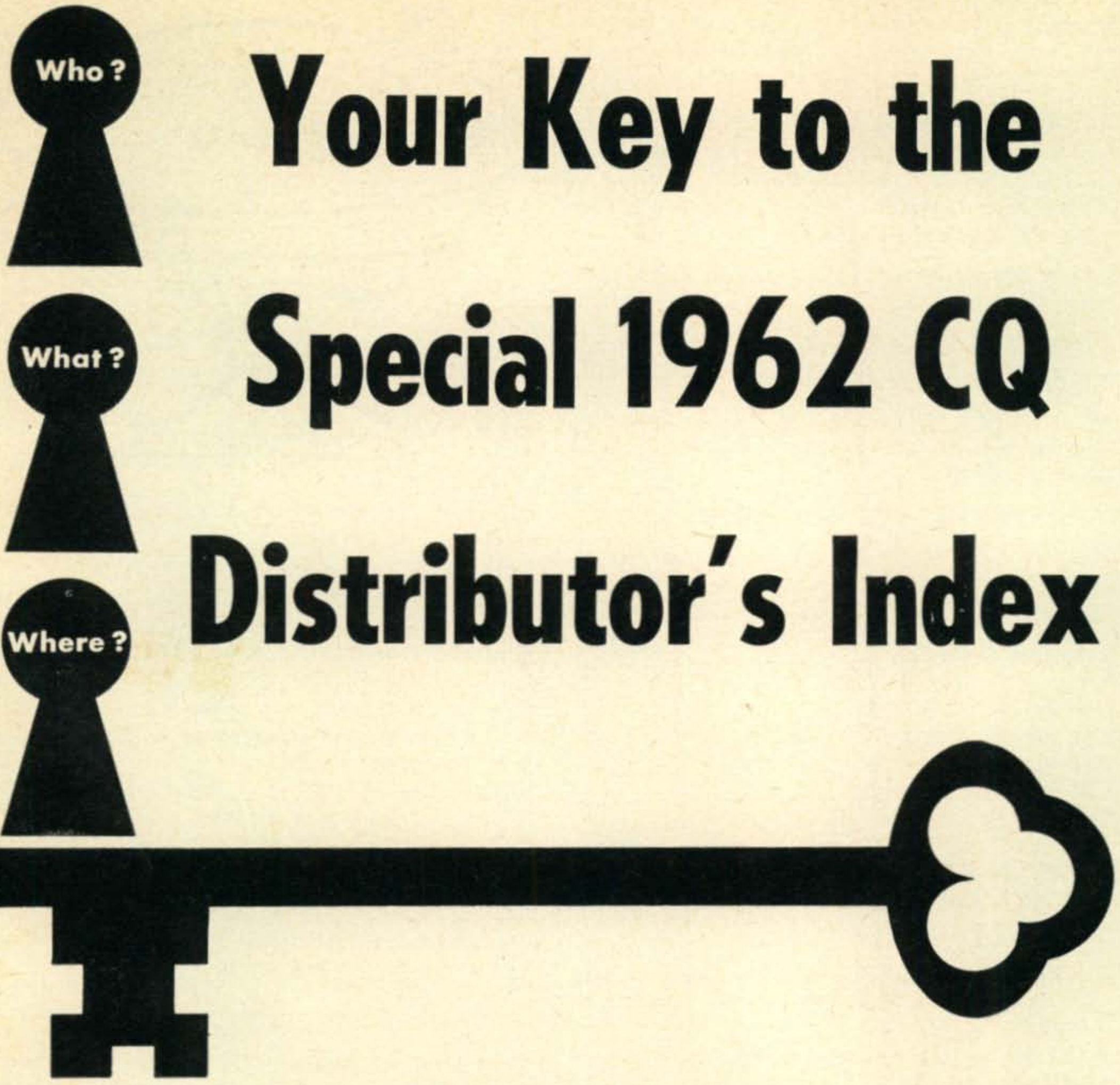
Company .....

Address .....

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

For further information, check number 88, on page 181



Your Key to the Special 1962 CQ Distributor's Index

Alphabetical Listing of Distributors

1 Alco Electronics
3 Wolcott Avenue
Lawrence, Massachusetts

2 Allied Radio Corp.
100 N. Western Avenue
Chicago 80, Illinois

3 Allied Radio of Wisconsin
5314 N. Pt. Wash. Rd.
Milwaukee 17, Wis.

4 Amateur Electronic Supply
6430 Milwaukee Avenue
Chicago 31, Illinois

5 Amateur Electronic Supply
3832 W. Lisbon Avenue
Milwaukee 8, Wis.

6 Amateur Electronics, Inc.
2802 Ross Avenue
Dallas, Texas

7 Amateur Electronics, Inc
215 South Jennings
Fort Worth, Texas

8 Armies Electronics
320-322 W. Federal St.
Youngstown, Ohio

9 Arrow Electronics, Inc.
525 Jericho Turnpike
Mineola, L.I., N.Y.

10 Arrow Electronics, Inc.
65 Cortlandt Street
New York 7, New York

11 Arrow Electronics, Inc.
225 Main Street
Norwalk, Connecticut

12 Walter Ashe Radio Co.
1125 Pine Street
St. Louis, Missouri

13 Atkinson & Smith, Inc.
20 Broad Street
Eatontown, New Jersey

14 Barry Electronics Corp.
512 Broadway (between Spring & Broome Sts.)
New York 12, New York

15 Lew Bonn Co.
67 South 12 Street
Minneapolis, Minnesota

For further information, check number 21, on page 181

16 Burghardt Radio Supply, Inc.
621 Fourth Street, S.E.
Watertown, South Da.

17 Burstein-Applebee Co.
1012-14 McGee
Kansas City 6, Mo.

18 C & G Electronics Co.
2502 Jefferson Avenue
Tacoma, Washington

19 Communications Equipment Co.
518 State Street
LaCrosse, Wis.

20 Dahn Electronic Supply
14 Jayne Street
Algonquin, Illinois

21 Down-East Ham Shack
82 Washington Street
Auburn, Maine

22 Electronic Wholesalers, Inc.
1301 Hibiscus Blvd.
Melbourne, Florida

23 Electronic Wholesalers, Inc.
9390 N.W. 27 Avenue
Miami, Florida

24 Elmar Electronics
140-11th St. at Madison
Oakland 7, California

25 Evans Radio, Inc.
Route 3A, Bow Jct.
Box 312, Concord,
New Hampshire

26 Fair Radio Sales
132 So. Main Street
Lima, Ohio

27 George's Electronic Supplies
320 West Superior St.
Kokomo, Indiana

28 Gotham
1805 Purdy Avenue
Miami Beach, Florida

29 Graham Electronics Supply, Inc.
122 South Senate Ave.
Indianapolis, Indiana

30 Graham Radio, Inc.
1105 No. Main Street
Randolph, Massachusetts

31 Graham Radio, Inc.
505 Main Street
Reading, Massachusetts

32 H & H Electronic Supply, Inc.
506-510 Kishwaukee St.
Rockford, Illinois

33 Hargis-Austin, Inc.
410 Baylor Street
Austin, Texas

34 The Hargis Co., Inc.
1205 Washington Ave.
Waco, Texas

35 Harrison Radio Corp.
144-24 Hillside Avenue
Jamaica, New York

36 Harrison Radio Corporation
225 Grrenwich Street
New York 7, New York

37 Harvey Radio Co., Inc.
103 West 43 Street
New York 36, New York

38 John Iverson Co.
216 Second Street, S.W.
Minot, North Dakota

39 Jeff-Tronics Unlimited
4791 Memphis Avenue
Cleveland 9, Ohio

40 Key Electronics
100 South Wayne Street
Arlington 4, Virginia

41 Knox Electronic Supply, Inc.
67 North Cherry Street
Galesburg, Illinois

42 Lafayette Radio Electronics Corp.
110 Federal Street
Boston, Massachusetts

43 Lafayette Radio Electronics Corp.
542 E. Fordham Road
Bronx, New York

44 Lafayette Radio Electronics Corp.
165-08 Liberty Avenue
Jamaica, New York

45 Lafayette Radio Electronics Corp.
24 Central Avenue
Newark, New Jersey

46 Lafayette Radio Electronics Corp.
100 6th Avenue
New York, New York

47 Lafayette Radio Electronics Corp.
182 Route 17
Paramus, New Jersey

48 Lafayette Radio Electronics Corp.
139 West 2nd Street
Plainfield, New Jersey

49 Lafayette Radio Electronics Corp.
691 Central Avenue
Scarsdale, New York

50 Lafayette Radio Electronics Corp.
111 Jericho Turnpike
Syosset, L.I., N.Y.

51 The Mytronic Co.
2145 Florence Avenue
Cincinnati 6, Ohio

52 Oregon Ham Sales
409 W. First Avenue
Albany, Oregon

53 Payette Radio Ltd.
730 St. James West
Montreal 3, Canada

54 Priest Electronics, Inc.
6431 Tidewater Drive
Norfolk 9, Virginia

55 RSE Ham Shack
Div. Radio Supply & Eng., Co.
90 Selden
Detroit 1, Michigan

56 Radio Electric Service Co.
30 Market Street
Camden, New Jersey

57 Radio Electric Service Co.
709 Arch Street
Philadelphia, Penn.

58 Radio Electric Service Co.
3412 Germantown Ave.
Philadelphia, Penn.

59 Radio Electric Service Co.
5930 Market Street
Philadelphia, Penn.

60 Radio Electric Service Co.
29 York Road
Willow Grove, Penn.

61 Radio Electric Service Co.
3rd & Tatnall Street
Wilmington, Delaware

62 Radio Electric Service Co.
1114 Roosevelt Ext.
York, Pennsylvania

63 Radio Products Sales
1501 So. Hill Street
Los Angeles, California

64 Radio Products Sales Co.
1237 16th Street
Denver 2, Colorado

65 Radio Shack Corp.
730 Commonwealth Ave.
Boston 17, Massachusetts

66 Reno Radio Co.
1314 Broadway
Detroit 26, Michigan

67 Selectronics
1206 S. Napa Street
Philadelphia 46, Penn.

68 Slep Electronics Co.
301 Highway
Ellenton, Florida

69 Two-Way Radio Communications
236 Hylan Boulevard
Staten Island 5, N.Y.

70 V & H Radio Electronics
2053 Venice Blvd.
Los Angeles 6, California

71 World Radio Laboratories
3415 West Broadway
Council Bluffs, Iowa

Radio Product Sales 63
1501 So. Hill Street
Los Angeles, California

V & H Radio Electronics 70
2053 Venice Blvd.
Los Angeles 6, California

Elmar Electronics 24
140-11th St. at Madison
Oakland 7, California

Radio Product Sales Co. 64
1237 16th Street
Denver, Colorado

Arrow Electronics, Inc. 11
225 Main Street
Norwalk, Connecticut

Radio Electric Service Co. 61
3rd & Tatnall Street
Wilmington, Delaware

Slep Electronics 68
301 Highway
Ellenton, Florida

Electronic Wholesalers, Inc. 22
1301 Hibiscus Blvd.
Melbourne, Florida

Electronic Wholesalers, Inc. 23
9390 N.W. 27 Avenue
Miami, Florida

Gotham 28
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Miami Beach, Florida

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KT-390

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79.50

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COMPARE QUALITY!
COMPARE PRICE!

• 90 Watts Phone or CW on 80 Thru 10 Meters • Built-in 3-Section Low-Pass Filter • Clear, Chirpless Grid Block Keying

Dollar for dollar you can't beat this new Lafayette **Starflite** transmitter. Easy to build and operate, it glistens with quality and performance all-over. Features in addition to those listed above: 5 crystal positions and provisions for external, VFO, illuminated edgewise panel meter and pin-net work output for proper antenna match. Buy one now — we know you'll be satisfied with it.

THE LAFAYETTE HE-30

Professional Quality Communications Receiver

99.95

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• TUNES 550 KCS TO 30 MCS IN FOUR BANDS • BUILT-IN Q-MULTIPLIER FOR CROWDED PHONE OPERATION • CALIBRATED ELECTRICAL BANDSPREAD ON AMATEUR BANDS 80 THRU 10 METERS • STABLE OSCILLATOR AND BFO FOR CLEAR CW AND SSB RECEPTION • BUILT-IN EDGEWISE S-METER

Sensitivity is 1.0 microvolt for 10 db, Signal to Noise ratio. Selectivity is ± 0.8 KCS at —6db with Q-MULTIPLIER. TUBES: 6BA6—RF Amp, 6BE6 Mixer, 6BE6 OSC., 6AV6 Q-Multiplier—BFO, 2-6BA6 IF Amp., 6AV6 Det-AF Amp. ANL, 6AQ5-Audio output, 5Y3 Rectifier.

NEW LAFAYETTE HE-50A DELUXE 6-METER TRANSCEIVER

MADE IN U.S.A.

114.95

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- Highly Sensitive Superheterodyne Receiver Section for 28-29.7 Mc
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- 3-Stage, 12-Watt Transmitter with 2E26 Final
- Illuminated Panel Meter for Plate Current and "S" Readings
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Provides maximum convenience and flexibility in either mobile or fixed operation.

LAFAYETTE HE-45A 10-METER TRANSCEIVER
Similar to above except for 6 meter operation **114.95**

TOP VALUE COMMUNICATION RECEIVER

KT-200
in Kit Form
64.50

HE-10
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WIRED AND TESTED

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The Communications Receiver that meets every amateur need—available in easy-to-assemble kit form. Signal to noise ratio is 10 db at 3.5 MC with 1.25 microvolt signal. Selectivity is —60 db at 10 kc, image reflection is —40 db at 3 MC. Tubes: 3—6BD6, 2—6BE6, 2—6AV6, 1—6AR5, 1—5Y3.

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Address .....

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

For further information, check number 25, on page 181

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67 North Cherry Street
Galesburg, Illinois

H & H Electronic Supply, Inc. 32
506-510 Kishwaukee St.
Rockford, Illinois

Graham Electronics Supply, Inc. 29
122 So. Senate Avenue
Indianapolis, Indiana

George's Electronic Supplies 24
320 West Superior St.
Kokomo, Indiana

World Radio Laboratories 71
3415 West Broadway
Council Bluffs, Iowa

Down-East Ham Shack 21
82 Washington Street
Auburn, Maine

Lafayette Radio Electronics Corp 42
110 Federal Street
Boston, Massachusetts

Radio Shack Corp. 65
730 Commonwealth Ave.
Boston 17, Massachusetts

Alco Electronics 1
3 Wolcott Avenue
Lawrence, Massachusetts

Graham Radio, Inc. 30
1105 No. Main Street
Randolph Massachusetts

Graham Radio, Inc. 31
505 Main Street
Reading, Massachusetts

RSE Ham Shack 55
Div. Radio Supply & Eng., Co.
90 Selden
Detroit 1, Michigan

Reno Radio Co. 66
1314 Broadway
Detroit 26, Michigan

Lew Bonn Co. 15
1211 LaSalle Avenue
Minneapolis 3, Minn.

Burstein-Applebee Co. 17
1012-14 McGee
Kansas City 6, Mo.

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St. Louis, Missouri

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Box 312,
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New Hampshire

Radio Electric Service Co. 56
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Camden, New Jersey

Atkinson & Smith, Inc. 13
20 Broad Street
Eatontown, New Jersey

Lafayette Radio Electronics Corp. 45
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Lafayette Radio Electronics Corp. 47
182 Route 17
Paramus, New Jersey

Lafayette Radio Electronics Corp. 48
139 West 2nd Street
Plainfield, New Jersey

Lafayette Radio Electronics Corp. 43
542 E. Fordham Road
Bronx, New York

Harrison Radio Corp. 35
144-24 Hillside Avenue
Jamaica, New York

Lafayette Radio Electronics Corp. 44
165-08 Liberty Avenue
Jamaica, New York

Arrow Electronics, Inc. 9
525 Jericho Turnpike
Mineola, L.I., N.Y.

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65 Cortlandt Street
New York 7, New York

Barry Electronics Corp. 14
512 Broadway (between Spring & Broome Sts.)
New York 12, New York

Harrison Radio Corporation 36
225 Greenwich Street
New York 7, New York

Harvey Radio, Inc. 37
103 West 43 Street
New York 36, New York

Lafayette Radio Electronics Corp. 46
100 6th Avenue
New York, New York

Lafayette Radio Electronics Corp. 49
691 Central Avenue
Scarsdale, New York

Two-Way Radio Communications 69
236 Hylan Boulevard
Staten Island 5, New York

Lafayette Radio Electronics Corp. 50
111 Jericho Turnpike
Syosset, L.I., N.Y.

John Iverson Co. 38
216 Second Street, S.W.
Minot, North Dakota

The Mytronic Co. 51
2145 Florence Avenue
Cincinnati 6, Ohio

Jeff-Tronics Unlimited 39
4791 Memphis Avenue
Cleveland 9, Ohio

Fair Radio Sales 26
132 So. Main Street
Lima, Ohio

Armies Electronics 8
320-322 W. Federal St.
Youngstown, Ohio

Oregon Ham Sales 52
409 W. First Avenue
Albany, Oregon

Radio Electric Service Co. 57
709 Arch Street
Philadelphia, Penn.

Radio Electric Service Co. 58
3412 Germantown Ave.
Philadelphia, Penn.

Radio Electric Service Co. 59
5930 Market Street
Philadelphia, Penn.

Selectronics 67
1206 S. Napa Street
Philadelphia 46, Penn.

Radio Electric Service Co. 60
29 York Road
Willow Grove, Penn.

Radio Electric Service Co. 62
1114 Roosevelt Ext.
York, Pennsylvania

Burghardt Radio Supply Inc. 16
621 Fourth Street, S.E.
Watertown, South Da.

Hargis-Austin, Inc. 33
410 Baylor Street
Austin, Texas

Amateur Electronics, Inc. 6
2802 Ross Avenue
Dallas, Texas

Amateur Electronics, Inc. 7
215 South Jennings
Fort Worth, Texas

The Hargis Co., Inc. 34
1205 Washington Ave.
Waco, Texas

Key Electronics 40
100 South Wayne Street
Arlington 4, Virginia

Priest Electronics, Inc. 54
6431 Tidewater Drive
Norfolk 9, Virginia

C & G Electronics Co. 18
2502 Jefferson Avenue
Tacoma, Washington

Communications Equipment Co. 19
518 State Street
LaCrosse, Wis.

Allied Radio of Wisconsin 3
5314 N. Pt. Wash. Rd.
Milwaukee 17, Wis.

Amateur Electronic Supply 5
3832 W. Lisbon Avenue
Milwaukee 8, Wis.

Payette Radio Ltd. 53
730 St. James West
Montreal 3, Canada

Alphabetical listing of Manufacturers

KEY NUMBERS INDICATE DISTRIBUTORS HANDLING THEIR PRODUCTS

ALCO ELECTRONICS MFG. CO.
ALCO ELECTRONICS PARTS
3 Wolcott Ave., Lawrence, Mass.
Griddip Meters, 1, 8, 28, 33, 34, 51, 55, 68

AMERICAN CRYSTAL CO.
P.O. Box 2366, Kansas City, Missouri
Crystals, 27, 33, 34

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[Continued on page 154]

Sturba Curtain [*from page 48*]

with anything higher than 1.5 to 1, and with this tuner you can get it down to 1:1. I've built three of them now, and they all work the same, so take the extra few minutes and do a good job. With this tuner, output is taken from coil L_3 for both 80 and 40 meters, and from either L_3 or L_4 for 20 meters. With modern pi-network transmitters, you'll have to manipulate both capacitors in the tuner, as well as the final and loading controls on the transmitter. I don't think there is any possible way to describe a set procedure for this, as there are so many variables involved. In fact, the best bet would be to use a dummy load on the output of the tuner until you get the thing in line.

I know many people will look askance at the idea of a tuner, but once you find the right settings, put a couple of dials on the capacitors and mark them carefully; it only takes a few seconds to reset the dials when you change bands. In addition to what the tuner does for your transmitted signal, have you heard what a tuner will do for the received signal? Don't malign it; it may make the difference between lost contacts and solid QSOs.

Results

The first evening I put the curtain on the air on 40 meter, the log shows the first QSO was with IT1AGA, who reported the signal was 589 in Palermo. In the next hour, OK1, DM3, UB5, GM3, and OK3 were worked with all reports either 579 or 589. A couple of evenings later, I tuned up on 80 meters, and again tried a one hour session, this time ending with EA4, OK1, G3, DJ5, DM3 and UA3. By some odd coincidence every report was 579, which convinced me that the curtain was doing the job. In the contest it lived up to my hopes by bringing in all districts of G-land, plus other tidbits such as ZC4 and VS9, for quite a decent contest log. Since then most of Europe has been worked on 80 meter and various parts of the world on 40. All this with 150 watts!

Anyway this is all beside the point. The fact remains that for an antenna that is fairly easy to build, non-critical to feed or tune, can be built (within reason) as large or as small as you like, and which will pay off with a real QRM-busting sign, I don't think you can beat the Sterba.

One thing that must be done — a hearty thanks to Ed, VE1ZL, Ray Ortmann, and Al McDonnell for the time they spent slogging around in a cold snow covered field hauling on wires and ropes, and to Gordy, VE1IM, who encouraged me to keep going and finish the thing. ■

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Terry Sterman, W9DIA

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S-100 SPKR. 9
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Antennas, 28

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GONSET
DIV. OF YOUNG SPRING & WIRE CORP.
801 So. Main Street, Burbank, California

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GOTHAM
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Antennas, 13, 28, 29, 30, 31

GREENLEE TOOL COMPANY
2371 Columbia Avenue, Rockford, Illinois

Hole Punching Tools, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 32, 33, 34, 35, 36, 37, 38, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 53, 54, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 69, 71

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HALLICRAFTERS COMPANY
4401 W. 5th Avenue, Chicago 24, Illinois

Receivers, Transmitters, Amplifiers, and Accessories 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 71

HAM KITS
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Dummy Loads, 21, 28, 33, 34, 38

HAMMARLUND MFG. CO., INC.
460 West 34 Street, New York 1, New York

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HEATH COMPANY
Benton Harbor, Michigan

Transmitters, Receivers & Accessories, 4, 5, 9, 10, 11, 12, 15, 18, 19, 26, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 40, 56, 57, 58, 59, 60, 61, 62, 64, 67, 68, 71

HI-PAR MANUFACTURING COMPANY
347 Lunenburg Street, Fitchburg, Massachusetts

Antennas, 1, 8, 9, 10, 11, 14, 22, 23, 25, 28, 29, 30, 31, 32, 35, 36, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 55, 56, 57, 58, 59, 60, 61, 62, 69, 71

HONEYWELL

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P.O. Box 808, Duncan Oklahoma

Antennas, 28

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INSTRUCTOGRAPH CO., INC.
4711 Sheridan Road, Chicago 40, Illinois

Code Practice Equipment, 4, 5, 12, 18, 19, 26, 28, 29, 35, 36, 64, 67, 71

INTERNATIONAL CRYSTAL MFG. CO., INC.
18 North Lee Street, Oklahoma City 2, Oklahoma

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Waseca, Minnesota

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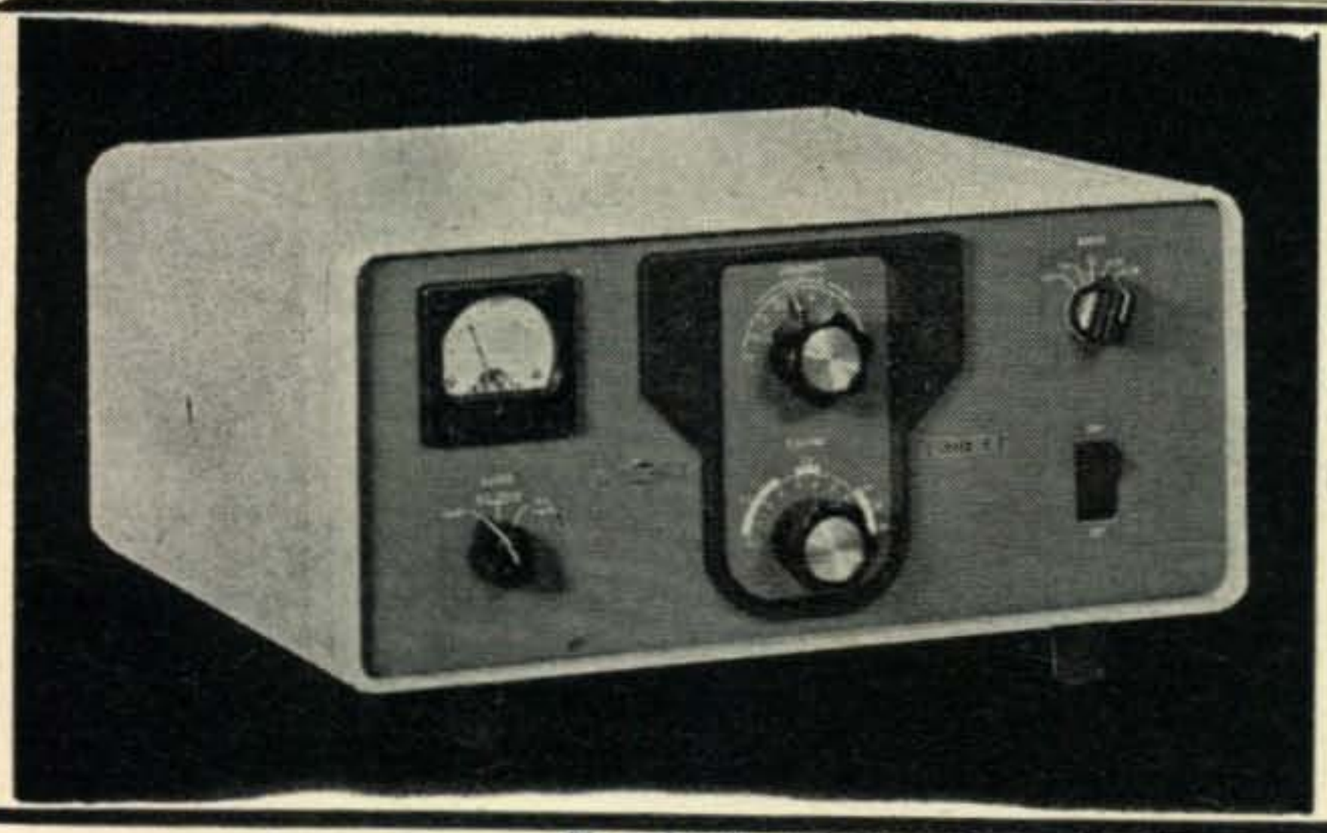

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Antennas, 1, 8, 9, 10, 11, 14, 22, 23, 25, 28, 35, 36, 37, 51, 54, 68, 69

LW ELECTRONIC LABS
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Transmitters, Converters, 8, 28

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Antennas—Antenna Equipment, 17, 28, 51, 54

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Antennas, 14, 28, 55

SOLAR ELECTRONICS
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VHF Transceivers, 28, 33, 34, 69

SONAR RADIO CORPORATION
73 Wortman Avenue, Brooklyn 7, New York

Transceivers, 2, 3, 6, 7, 9, 10, 11, 16, 17, 25, 28, 29, 30, 31, 35, 36, 37, 38, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 53, 54, 55, 63, 65, 68, 69

SPRAGUE ELECTRIC CO.
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SWAN ENGINEERING COMPANY
Oceanside, California

Transceivers, 6, 7, 9, 10, 11, 16, 17, 23, 24, 25, 28, 29, 31, 35, 36, 38, 55, 56, 57, 58, 59, 60, 61, 62, 63, 66, 71

SYLVANIA
730 Third Avenue, New York 17, N.Y.

Electronic Tubes, 2, 3, 4, 5, 6, 7, 12, 16, 18, 19, 23, 24, 26, 28, 29, 33, 34, 55, 70, 71

TAPECODE
Langhorne, Pa.

Code Instruction Courses, 28, 29, 35, 36, 42, 43, 45, 46, 47, 48, 49, 50, 52, 69

TAPETONE, INC.
10 Ardlock Place, Webster, Mass.

Transmitters and Converters, 1, 4, 5, 12, 17, 18, 19, 26, 28, 29, 30, 31, 51, 64, 67, 71

TECHNICAL MATERIEL CORPORATION
Mamaroneck, New York

Receivers & Accessories 1, 14, 25, 28, 29, 35, 36, 38, 54, 71

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VHF Converters & Transmitters, 2, 3, 4, 5, 9, 10, 11, 12, 13, 16, 18, 19, 23, 25, 26, 28, 29, 35, 36, 37, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 55, 64, 67, 69, 71

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TELREX, INC.
Asbury Park 2, New Jersey

Antennas, Rotators and Accessories, 4, 5, 9, 10, 11, 12, 15, 16, 18, 19, 20, 23, 24, 25, 26, 28, 29, 31, 35, 36, 37, 38, 51, 54, 55, 56, 57, 58, 59, 60, 61, 62, 64, 65, 66, 67, 71

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U.S. CRYSTALS, INC.
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Crystals, 28, 63

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For further information, check number 75, on page 181

Propagation [from page 68]

CQ Short-Skip Propagation Chart

November & December, 1962

Band Openings Given in Local Standard Time

At Path Mid-Point (24-Hour Time System)

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	*Nil*	10-16 (0-1)	09-10 (0-1) 10-14 (1-2) 14-16 (1)
15	*Nil*	*Nil*	09-11 (0-1) 11-14 (1-3) 14-17 (0-1)	08-09 (0-1) 09-11 (1-3) 11-14 (3-4) 14-16 (1-3) 16-17 (1-2) 17-19 (0-1)
20	*Nil*	09-11 (0-1) 11-14 (0-3) 14-16 (0-2) 16-18 (0-1)	07-09 (0-1) 09-11 (1-4) 11-14 (3-4) 14-16 (2-4) 16-18 (1-2) 18-20 (0-1)	06-07 (0-1) 07-09 (1-3) 09-16 (4) 16-18 (2) 18-20 (1)
40	07-09 (0-1) 09-12 (2-4) 12-14 (3-4) 14-16 (2-4) 16-18 (1-2) 18-20 (0-1)	07-09 (1-3) 09-14 (4-2) 14-16 (4) 16-18 (2-4) 18-20 (1-3) 20-00 (0-2) 00-07 (0-1)	07-09 (3) 09-14 (2-1) 14-16 (4-2) 16-18 (4) 18-20 (3-4) 20-22 (2-4) 22-00 (2-3) 00-03 (1-2) 03-07 (1-3)	07-08 (3-2) 08-09 (3-1) 09-14 (1-0) 14-16 (2-1) 16-17 (4-2) 17-18 (4-3) 18-22 (4) 22-00 (3) 00-03 (2-3) 03-07 (3)
80	08-17 (4) 17-20 (2-4) 20-22 (1-3) 22-07 (1-2) 07-08 (2-3)	08-09 (4-2) 09-16 (4-1) 16-18 (4-2) 18-20 (4) 20-22 (3-4) 22-07 (2-4) 07-08 (3)	08-09 (2-1) 09-16 (1-0) 16-18 (2) 18-06 (4) 06-07 (4-2) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (2-0) 18-20 (4-3) 20-04 (4) 04-06 (4-2) 06-07 (2-1) 07-08 (1)
160	09-17 (1-0) 17-19 (3-2) 19-07 (4) 07-09 (3-2) 09-11 (1-0)	17-19 (2-1) 19-05 (4) 05-07 (4-3) 07-09 (2-1)	17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-05 (4-2) 05-07 (3-1) 07-09 (1-0)	19-21 (2-1) 21-04 (4-3) 04-05 (2) 05-07 (1-0)

Hawaii To:

*Openings Given in Hawaiian Standard Time**

TO:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	06-08 (1)† 08-11 (2)† 11-13 (1)† 06-07 (1) 07-08 (2) 08-12 (3) 12-14 (2) 14-16 (1)	06-08 (2) 08-13 (1) 13-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	16-18 (1) 18-02 (3) 02-04 (1)	18-20 (1) 20-01 (2) 01-03 (1) 18-21 (1)‡ 20-02 (1)‡

*Hawiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST and 2 hours *behind* PST.

†Indicates possible 10 meter openings.

‡Indicates possible 160 meter openings.

Central USA	06-08 (1)† 08-09 (2)† 09-12 (3)† 12-13 (2)† 13-15 (1)† 06-07 (1) 07-08 (2) 08-13 (4) 13-15 (3) 15-16 (2) 16-17 (1)	06-07 (2) 07-08 (3) 08-12 (2) 12-15 (4) 15-17 (3) 17-18 (2) 18-20 (1)	16-18 (1) 18-00 (3) 00-02 (4) 02-03 (2) 03-04 (1)	17-20 (1) 20-02 (2) 02-04 (1) 18-20 (1)‡ 00-03 (1)‡
Western USA	06-08 (1)† 08-10 (2)† 10-12 (3)† 12-13 (2)† 13-15 (1)† 06-07 (1) 07-08 (2) 08-13 (4) 13-14 (3) 14-16 (2) 16-17 (1)	05-07 (1) 07-08 (3) 08-14 (4) 14-16 (3) 16-18 (2) 18-20 (1)	06-08 (3) 08-09 (2) 09-14 (1) 14-16 (2) 16-02 (4) 02-04 (3) 04-06 (2)	16-18 (1) 18-20 (2) 20-04 (3) 04-06 (2) 06-07 (1) 19-00 (1)‡ 00-04 (2)‡ 04-06 (1)‡

Alaska To:

Openings given in Alaskan Standard Time§

TO:	*15 Meters*	*20 Meters*	*40 Meters*	*80 Meters*
Eastern USA	08-10 (1) 10-12 (2) 12-14 (1)	08-12 (1) 12-14 (2) 14-16 (1)	20-04 (1)	NIL
Central USA	09-11 (1) 11-13 (2) 13-15 (1)	09-13 (1) 13-15 (2) 15-17 (1)	20-04 (1)	NIL
Western USA	10-12 (1) 12-15 (2) 15-17 (1)	09-11 (1) 11-15 (3) 15-16 (2) 16-18 (1)	15-17 (1) 17-22 (2) 22-08 (1)	18-23 (1) 05-07 (1)

Forecast Ratings

The numerical ratings appearing in parenthesis following each predicted time of opening indicate the *total* number of days during each month of the forecast period that the opening is expected to occur, as follows:

(1) Less than 7 days
(2) Between 8 and 13 days
(3) Between 14 and 22 days
(4) More than 22 days

On the Short-Skip Propagation Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the longer distance.

For the *specific* days of each month on which a particular opening is most likely to occur, as well as a day-to-day forecast of reception conditions (signal quality, noise and fading levels), see the "Last Minute Forecast" which appears at the beginning of this column.

All times are shown in Local Standard Time, using the 24-hour time system. In this system midnight is shown as 00, 01 is 1 A.M., 02 is 2 A.M., etc. Noontime is shown as 12, 13 is 1 P.M., 14 is 2 P.M., etc.

The *CQ* Short-Skip Propagation Charts are based upon a c.w. effective radiated power of 75 watts from a half-wave dipole antenna, a half-wave or higher above ground. The Charts are valid through December 31, 1962. These forecasts are based upon basic propagation data published monthly by the Central Radio Propagation Laboratory of the National Bureau of Standards, Boulder, Colorado. ■

§Alaskan Standard Time (from Skagway to 141 degrees west longitude), is 4 hours *behind* EST; 3 hours *behind* CST; 2 hours *behind* MST and 1 hour *behind* PST.

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I have worked over 100 countries and have received very fine reports from many DX stations, including 599 reports from every continent except Europe (589)! I have also worked enough stations for my WAC, WAS, WAJAD and ADXC awards, and I am in the process of working for several other awards. And all this with your GOTHAM V-80 vertical antenna!

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Sincerely yours,
Thomas G. Gabbert, K6INI (Ex-TI2TG)

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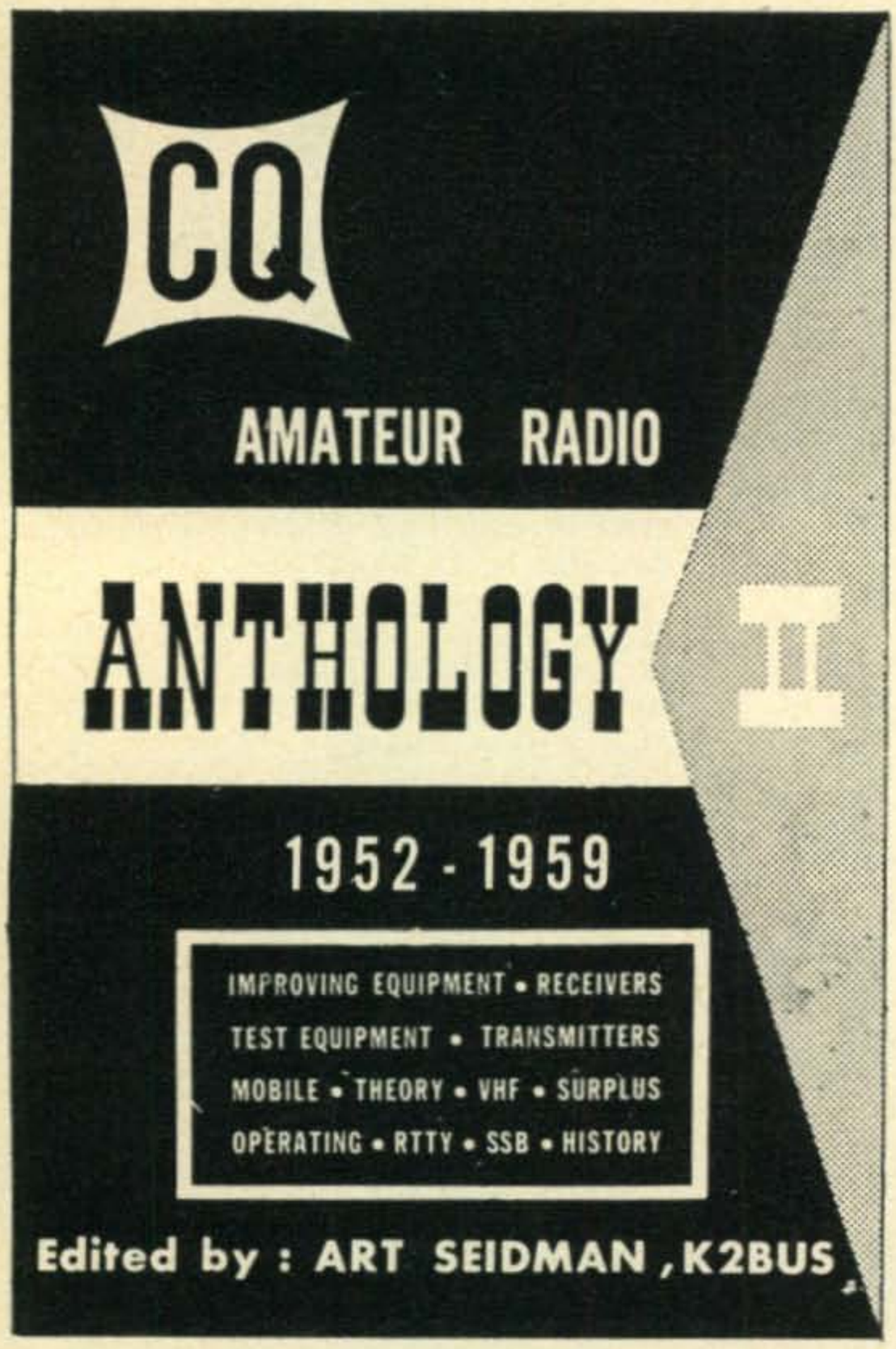

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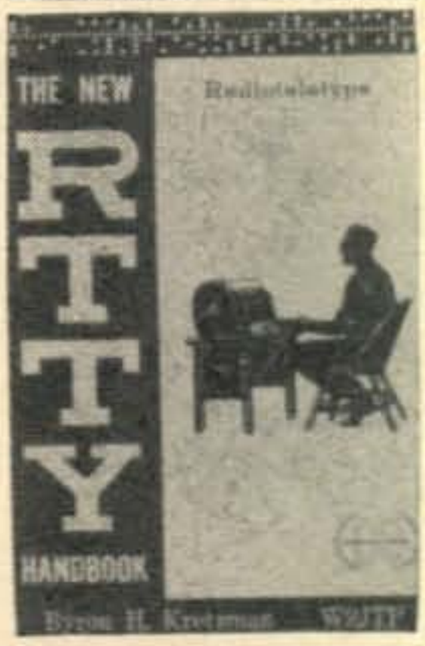

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Kerry Mathews, WA6SYV

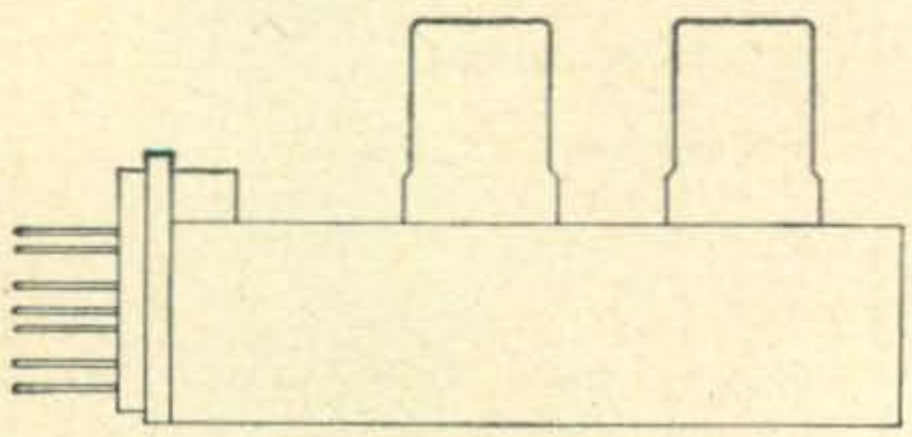
A RECENT report on the Raytronics Nuvistaplug unleased a considerable barrage of reader mail. "Will the gadget work with my 3 tube Apex R.F. Sniffer" . . . or "Will it improve my 19 tube triple-duper superhet?" These are typical of numerous questions aroused by the report (in September's *CQ*). So we queried the manufacturer and came up with considerable additional information. It should leave virtually no questions unanswered on the installation, operation and performance of the device.

As reported in September, the Nuvistaplug replaces the r.f. amplifier tube in the receiver's first stage. Equipped with two Nuvistors, the device is designed to improve receiver performance by cutting the amount of internal noise generated in this portion of the circuit. There are no connections required other than simply inserting the Nuvistaplug into the socket originally occupied by the r.f. amplifier tube. While every attempt has been made to keep the Nuvistaplug as "universal" as possible, it may not be plugged into every receiver without regard to tube type. Thus, the first step in deciding whether the device will work with your rig is to scan the chart shown in Table I which lists the tubes which may be interchanged with the various Nuvistaplug models. With few exceptions, these 7-pin miniature pentode tubes are found in the r.f. amplifier position of most modern superhet receivers.

Table I
Nuvistaplug Replacement Chart

Model	*Replaces These Tubes*
62	6AH6, 6AK5, 6BH6, 6CB6, 6CE6, 6CF6, 6DC6, 6DE6, 6BZ6.
625	6BJ6
675	6BA6, 6AU6, 6BD6.
1275	12AU6, 12BA6.

Another consideration in the installation of the unit is the physical size of the Nuvistaplug. In checking with most of the popular equipment on the market today, it has been found to fit into position with ample room to spare. But, if you like to test-fit before purchasing the unit, use the outline drawing given below as a guide to physical size.



Actual size outline drawing of a typical Nuvistaplug.

Once the Nuvistaplug is in place, some simple "touch-up" is needed to match it perfectly into the circuit. The "touch-up" spots are the antenna and r.f. coils located near the tube (in almost all cases they are coils with a single slug adjustment). To perform this "touch-up," first tune the

receiver to the center of the band you use most often. With a signal being monitored, tune the slugs for best reception—either loudest sound in the speaker or a peaking of the S-meter.

For some 6 and 10 meter transceivers, the antenna coil also serves as the transmit tank coil; for example, the Lafayette HE-45. In these rigs it is only necessary to repeak the r.f. coil (which is located on the output side of the tube).

The newly installed Nuvistaplug may produce two effects which may, at first, seem abnormal. One is a lowering of the usual background noise heard through the speaker—the other is reduced readings on the S-meter. These effects do occur since the Nuvistaplug may actually have slightly less gain than the tube it replaces. However, the important effect (and the entire reason for using the Nuvistaplug) is that it is greatly reducing the noise in relation to the signal. The manufacturer states that the improvement gained by using the Nuvistaplug is approximately equivalent to a doubling the power at the transmitting station (a gain of 3 db).

Of course the device has no effect on noise which originates outside of the receiver, typically from man made (ignition, etc.) or atmospheric sources. Nuvistaplugs may in some instances be of advantage when used as substitutions in the i.f. amplifier stages of a receiver. •

Letters [*from page 18*]

where we all have a chance to express one of our freedom, that being of free thinking. I would like to see *CQ* probe into this 10 meter thing as much as possible. I think we can all benefit in the long run. Keep up the good work!

C. "Clif" Morris, WA6PWN
3467 Mt. Armour Pl.
San Diego 11, Calif.

Editor, *CQ:*

The Technician Class of license officially came into being 1 January 1951 with F.C.C. supervised examinations and all amateur operating privileges above 220 mc. If that situation had remained *status quo* the amateur today would still be in a position to mutually respect his fellow amateur. As things stand today there is a very wide gap existing between the Technician and General Class ranks, with the poor Novice caught in the crossfire.

In 1954 the mail-order license became the law of the land. At that time the Technician class privileges were unchanged from "all above 220 mc." Everyone went along with the League's statement regarding mail order licenses, to wit, "The League offers no objection to the proposal to give Novice and Technician Class amateur operator examinations by mail only. In the League's view, this action involves but little danger to the present high examination standards, because in one instance the license is limited to a one-year term, and in the second instance the license is sharply restricted as to operating frequencies." Admittedly the mail order idea was a good one, *at the time!*

The ranks of the codeless license grew by leaps and bounds. But not with persons interested in v.h.f./u.h.f. operation or experimentation but rather with persons eager to grab a piece of the operating pie without having to work for it Freeloaders! Their numbers became so vast that enough pressure was brought to bear on the powers that be so that the codeless licensee received more "reasonable" operating frequencies . . . exit 6 meters from the realm of the true v.h.f.er. Soon after, the death knell sounded for half of the 2 meter band as well.

And now they are after 10 meters? Ten is not a band which requires much in the way of technique, theory or construction. It's for just sitting and yakking, and goodness knows the Technicians are well qualified to do that! I say let them have it! Give them 15, 20, 40, 75 and 160 too, but strictly limit them to A1 only and 5 watts input!

Al La Placa, K2DDK
28 The Beach Way
Manhasset, New York

License Plates

Editor, *CQ:*

I would like to take this opportunity to thank all those amateurs in New York State who gave their time and effort in support of the Call Letter License Plate Legislation.

Every amateur in New York State listed in the Spring, 1962 *Call Book* will have received, or is in the process of receiving a personal invitation in the mail to secure their special plates. As far as we know, no other state has actually issued an invitation such as this and Commissioner Hultz of the Motor Vehicle Department expects a heavy response. The Committee urges all amateurs who can take advantage of these special plates to do so.

Those not listed in the Spring *Call Book* can apply for their call letter plates January 1, 1963.

May I take this opportunity to say that because of their efforts to promote the good will of the radio amateur, a round of applause be given Governor Nelson Rockefeller, Assemblyman Goiffre of Port Chester, N.Y. and Senator Speno of East Meadow, L.I., in expression of our appreciation for their interest in us.

Stan Zak, K2SJO
N.Y. License Plate Committee
485 Westchester Ave.
Port Chester, N.Y.

Antenna Design [*from page 138*]

in working DX on 14 mc, and it lays down a very strong signal at all distances on 7 and 3.9 mc.

I will say one thing further, and that is that I talk to many amateurs who are surprised that I am putting out a strong signal from a vertical, and even some who say that a vertical is no good. These latter people have either been unfavorably influenced by experience with one of the factory-made so-called "all band" verticals which are not optimized for anything, or else they know very little about antennas and propagation. I am quite certain that this article will evoke much interest and comment, and I shall try to answer any inquiries which are accompanied by a stamped envelope.

I shall be glad to furnish a comprehensive list of references to any who wish to seriously study antenna design in their own. ■

Space [*from page 69*]

law the Communications Satellite Act of 1962. This act sets the stage for the development of a commercial global satellite communications system.

Commenting on the Act at the signing ceremony, the President said by enacting it "Congress has taken a step of historic importance. It promises significant benefits to our own people and to the whole world. Its purpose is to establish a commercial communication system utilizing space satellites which will serve our needs and those of other countries and contribute to world peace and understanding."

The President continued, "The benefits which a satellite system should make possible within a few years will stem largely from a vastly increased capacity to exchange information cheaply and reliably with all parts of the world by telephone, telegraph, radio and television. The ultimate result will be to encourage and facilitate world trade, education, entertainment, and many kinds of professional, political, and personal discourse which are essential to healthy human relationships and international understanding."

The Act authorizes the creation of a "Satellite Corporation," which will be privately financed and managed, but with representatives of the Government sitting on the board of directors. The Corporation will bring together as a team, private and government experts in the field of space communications so that a commercial system can be established as soon as possible.

Although communication satellites are operating experimentally at the present time (TELSTAR, RELAY, ECHO, *etc.*, the new act, and the Satellite Corporation which it creates, may bring about the initial stages of a globe-girdling commercial system within the next two years. 73, George, W3ASK

DX [*from page 67*]

than ever, arranged for any kind of record keeping you may want to keep. Copies are available without charge from GE Tube distributors, or can be ordered directly from GE Ham News, Receiving Tube Departments, General Electric Company, POB 1009, Owensboro, Kentucky, at 5 copies for 50¢. Make check payable to General Electric Co.

QTH's and QSL Managers

AP2IJ via KH6IJ.
EI8P via W4OPM.
FG7XK Georges Goydadin, 5 Cite Deboisvieux, Pointe-a-Pitre.
HI8CLU via K4BMS.
HL9KH via W9VZP.
K5FOQ/KS6 Detachment A, JTF8, APO 953, San Francisco, Cal.
LZ1AH Todor "Ted" Todoroff, POB 205, Sofia, Bulgaria.
MP4QBB via Southeastern DX Club, Box 749, Atlanta 11, Georgia.
MP4MAO Same as above.
OA4BN Frank Crosby, Box 538, Lima, Peru.
PY1FO via W2CTN.
ex-VE3BQL/SU E. C. Veale VE3BQL, 439 E. 42nd St., Hamilton, Ont. Canada.
TG9JL Jim Lester, c/o U. S. Embassy, Guatemala City, Guatemala.
VR5AR via W9EXE.
ZL1ABZ via ZL2GX.
3A2CZ via ON4QX.
4X4IX via Jack Bromberg, WA2KNC, 451 Rockaway Pkwy, Brooklyn 12, N.Y.
9NT5O Box 27, Kathmandu, Nepal.
SM5CBC/9Q5 via SM7ACB, Gillis Stenvall, Kopenhamnsvagen 47A, Malmo, Sweden.
9U5CB Box 1122, Usumbura, Burundi.
9U5JL Box 5, Ruhengeri, Ruanda.
9U5PC Box 18, Usumbura, Burundi.
9U5PE Box 142, Shanguqu, Ruanda.

73, Urb, W2DEC

Contest Calendar [*from page 70*]

prefix, regardless of band.

5. Your final score therefore will be the sum of QSO points and bonus points. No multiplier.

6. Log sheets should be columned and show in this order: Date/time in GMT, station worked, serial number sent and received, band, blank column, bonus points and points claimed. If you don't want to go to all that trouble, a large addressed envelope plus sufficient IRCs will get you a supply from the RSGB.

7. Each entry should also include a summary sheet with name and address (block letters) and other pertinent information. And don't forget the usual signed declaration that all rules and regulations have been observed. This is important.

8. Certificates will be awarded to the leading stations in each country and call areas in the following: VE, VK, W/K, ZL and ZS.

9. There is also a SWL section. Rules are the same as listed above, except that the bonus points listed under Rule #3 is 20 points. CQ and Test calls will not count. The station logged must actually be working someone and the call and report must also be listed.

10. Logs go to the R.S.G.B. Contest Committee, New Ruskin House, Little Russell Street, London, W.C.1, England. Postmark deadline is Dec. 17th.

OK DX

Starts: 0000 GMT Sunday, December 9th.
Ends: 2400 GMT Sunday, December 9th.

This is the 6th International C.W. DX Contest run by the Central Radio Club of Czechoslovakia.

It's a world wide type of competition, the object being to work as many stations in other countries as possible. (Not OK stations only.)

And altho the contest runs for 24 hours, only a maximum of 12 continuous hours can be counted for scoring.

1. Use all bands 3.5 thru 28 mc c.w. only.

2. The usual six numeral serial number, RST plus a progressive 3 digit contact number starting with 001.

3. Each completed exchange of serial numbers counts 3 points. However contacts with Czech stations will have a double value or 6 points.

4. The same station can only be worked once per band of course, and contacts with stations in the same country are not permitted.

5. The multiplier is derived from the number of continents worked per band, a total of 6.

6. Awards will be made for one band and all band operation. But in the latter category, the score will be taken from any 3 chosen bands. And also for single and multi-operator classification.

7. The final score therefore will be computed by multiplying the number of continents worked by the total QSO points. In the all band classification of course it will be the sum of the continents from the 3 chosen bands multiplied by the total QSO points from the same 3 bands.

8. It is requested that separate log sheets be used for each band and your log contain the following data in this order: Date & time in GMT, station worked, serial number sent and received, QSO points and multiplier. (Enter multiplier only *First* time worked.)

Also include a summary sheet with other pertinent information and the following signed declaration: "I declare that I have observed the rules of this contest as well as the regulations of the licensing authority in my country, and that the data stated in this log is true."

9. Certificates will be awarded to the highest scorer in each country. In addition there is a Cup

[*Continued on page 174*]

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You never saw such trade in deals as I'm making right now on all Globe Electronics gear!

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65 Xmtr.	29.00
65-A Scout Xmtr.	34.00
65B Xmtr.	39.00
SD-75A Xmtr.	89.00
DSB-100 Sidebander Xmtr.	49.00
DSB-100 Exciter Xmtr.	49.00
500B Xmtr.	329.00
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755A VFO	39.00
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10% DOWN — E-Z TERMS

$5.00 deposit holds your selection. Up to one year to pay on $60.00 order; two years on $120.00 order; three years on $180.00 sale.

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Description	*Ham Net*	*1 Year*	*2 Years*	*3 Years*
HG-602 6 & 2 Meter Transmitter	$179.95	$16.03	$8.74	$6.31
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Deluxe V.F.O.	89.95	7.79	4.24	3.06
Deluxe Chief Xmitter Kit	59.95	5.20	2.74	1.98
Screen Modulator Kit	11.95	1.20	.60	.40
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City ..... State.....

☐ Send new reconditioned equipment bulletin

For further information, check number 76, on page 181

Contest Calendar [*from page 172*]

for the world highest score outside of Czechoslovakia.

10. The following additional certificates are available.

a. The 100 OK Award for contacting 100 different Czech stations.

b. The S6S Award for working all continents. The certificates will be appropriately endorsed if it is done on a single band.

c. No confirmation will be necessary for these awards, verification will be made from other contest logs.

11. Your logs must be mailed no later than January 15, 1963 and they go to the Central Radio Club, P.O. Box 69, Prague 1, Czechoslovakia.

Frank, W1WY

Sideband [*from page 77*]

automobile while on vacation in Mexico. Mike, YS1MS, was contacted by the family in San Salvador and asked to furnish further details of the boy's condition. Through the services of the Intercontinental Sideband Net, which meets at 1300 GMT on 14.330, YS1MS contacted Fernando, XE1MO, who not only discovered in what hospital the boy was dying but also managed to find the boy's brother in Mexico City, the brother being unaware at the time that the accident had occurred. Mrs. Umana, the Honduran Ambassador's wife, flew to Mexico City to be with her son who tragically died soon after her arrival. Because of restrictions on commercial airliners, the distraught mother could find no way to return with the body to Honduras. Mac, HR1MD, contacted the office of the President of Honduras who in turn requested the government of Mexico for an Air Force plane which was placed at the disposal of the family.

All of the foregoing arrangements were made through amateur radio because the telephone communications among Mexico, San Salvador and Honduras are closed until 8 A.M. and, even when opened, are not always reliable.

Among the amateurs who participated in this very fine display of ham radio service and cooperation were Mike, YS1MS; Fernando, XE1MO; W4NTR, Intercontinental Net Control Station; Arcy, K5SGK; and Sam, W2BKU, who very kindly passed along the details of this operation to us.

73, Irv and Dorothy

Novice [*from page 83*]

Jerry Greathouse, 718 East Elm, Enid, Oklahoma needs help to get on the air. His telephone number is AD-6899.

Don Erickson, 24360 Myers Street, Sunnymead, California offers this help:

"Within the last year I have collected 100 issues of *QST*, 75 issues of *CQ*, 30 issues of *Radio-Electronics*, 25 issues of *Electronics World* and 40 issues of *Electronics Illustrated*. I will be glad to give them to any interested party."

That's a real noble thought, Don, most people would just throw them away and forget it. This is one way to help the aspiring ham.

I have about used up my space this month so 73 es see you next month.

Walt, W8ZCV

Statement of Ownership

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 AND JUNE 11, 1960 (74 STAT. 208) SHOWING THE OWNERSHIP, MANAGEMENT AND CIRCULATION of *CQ* —The Radio Amateur's Journal, published monthly at New York, N.Y. for October 1, 1962.

1. The names and addresses of the publisher, editor and business manager are: Publisher: Sanford R. Cowan, 6 Embassy Court, Great Neck, N.Y.; Editor: Arnold Trossman, 300 West 43rd Street, New York 36, N.Y.; Managing Editor: none; Business Manager, Richard A. Cowan, 6 Embassy Court, Great Neck, N.Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address as well as that of each individual member must be given.) Sanford R. Cowan, 6 Embassy Court, Great Neck, New York.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or either securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and beliefs as the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required by the act of June 11, 1960 to be included in all statements regardless of frequency of issue.) 79,887.

Sworn to and subscribed before me, this 1st day of October 1962.

MORRIS LANGHOLTZ, Notary Public
(Commission expires March 30, 1963)

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The Gonset Division of the Young Spring and Wire Corp. is proud of its record of supplying the amateur field with high quality communications equipment for two and one-half decades. With our current expansion programs, we can promise even greater service and dedication to the communications field in the future.

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Your copy should be preferably typewrittten, double spaced on one side of the page only.

We do not bill for advertising in the HAM SHOP. Full remittance *must* accompany all orders.

Closing date is the 15th of the 2nd month preceding date of publication.

We reserve the right to reject advertising which we feel is not of an amateur radio nature.

Because the advertisers and equipment contained in the HAM SHOP have not been investigated, the publishers of *CQ* cannot vouch for the merchandise listed therein.

TUBES WANTED. All types. Highest prices paid. Write: Lou-tronics, Inc., 131 Lawrence Street, Brooklyn 1, N.Y. Stamp for ham tube list.

SURPLUS "GREAT BUYS" ARR-27 Receiver 70 lbs. easy 432 modification $27.50, two—$50. APIX-2, 56 lbs. $17.50, two—$30. Dynamotor PE94, 45 lbs. $1.50. Gyro APA57, 16 lbs. $3.95 Experimenters Special. All Items New. List 10¢. Fertik's Ninth Tioga, Phila. 40, Pa.

WANTED: Teletype printers, perforators, reperforators, transmitter-distributors test equipment: Model #14, #15, #19, #26, #28, etc. All types Collins receivers, 51J, R-388, R-390, 75A, etc. Cash or trade for NEW amateur equipment. Write Tom, W 1 AFN, Altronics-Howard Co., Box 19, Boston 1, Mass. (Richmond 2-0048).

BARGAINS! Used equipment sold! Traded! Wanted! By other Hams in "Equipment Exchange Bulletin". Sample copy free! Write: Brand, Sycamore, Ill.

COLLINS OWNERS WORK AM: Wired Kit $5.00. Instant Switching! Install five minutes! Kit Kraft, Harlan, Ky.

TOROIDS: 88mhy with mounting hardware. Uncased; like new. Information sheet included. $1 ea, 5/$4.00 postpaid. KCM, Box 88, Milwaukee 13, Wis.

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ONE THIN DIME brings 50 page eye-popping war surplus electronics catalog Fabulous bargains. Meshna, Lynn, Mass.

TOROIDS: Uncased 88 mhy like new. Dollar each. Five $4.00 P.P. DePaul, 309 South Ashton, Millbrae, Calif.

WANTED: TEST EQP'T TS or AN/URM, UPM, ARM, etc. TELETYPE TG-7, Models 15, 19, 26, 28, printers & reperforators, Rcvrs & xmtrs, BC 610E 1; AN/GRC-3 & higher, RT-66, -67, -70, -77, Collins 51J 17L3, -4, 18S-2, R-388, -390, -391; ARN14 and 30; APR-9, 10, ARC-21, -33, -34, -55; APS-10, -31, -33, -42 etc. We pay freight Amber Industrial Corp., 75 Varick St., New York 13, N.Y.

Convert any television to sensitive, big-screen oscilloscope. Only minor changes required. Plan $1.95. Relco Industries, Box 10563, Houston 18, Texas.

Multiplex Adapter—Circuit board, set of 5 coils, sockets and complete instructions $15.00. D. L. Stoner, Box 7388Q, Alta Loma, California.

COMMUNICATION. Teletype. Unusual surplus bargains. Free flyer. MDC-923 W. Schiller, Phila. 40.

Industrial tubes type 5555 $95.00 ea. frequency shift converters AN-7 URA-6 frequency shift converters $295.00 or will swap for other gear. Spera Electronics, 37-10 33 St., L.I.C., N.Y.

TV CAMERA—low cost—easily built—complete schematics, instrucitons 50¢. Denson Electronics, Rockville, Conn.

WANT FOR CASH:—CQ All 1945 issues; VANTRON Q-Probe; sell or swap QSTs 1939-1959. W4ID 461-3rd Ave., Sea Park, Eau Gallie, Florida.

ALTERNATORS, new, 12V, complete with universal installation kit and transistor regulator. Fully guaranteed. Write for details. 30A unit $49.95, 45A $9.95. Electrocon Corp., 115 Ward Street, Boston 20, Mass.

6 & 2 METER FM gear. Surplus police units. Receiver strips $15. Transmitter strips $10. Write for details. Two-Way Radio, 115 Ward Street, Boston 20, Mass.

WANTED: Tubes, diodes, transistors, military, commercial lab-grade test equipment, components, PRC, GRC, equipment, aircraft equipment by Collins. Top Prices. Write details, Bob Sanett, W6REX, V & H Radio Electronics, 2053 Venice Blvd., Los Angeles 6, California.

FOR SALE: Complete instrucitons including 28 page booklet and 22" x 36" schematic for converting the ART/13 transmitter to AM and SSB. Satisfaction guaranteed. $2.50. Sam Appleton, 501 N. Maxwell St., Tulia, Texas.

TELEVISION CAMERA KIT, easy to build step by step instructions, suitable for Ham TV, educational, industrial, Medical uses. Craftsmen Instrument Labs Inc., 60-30 34th Ave., Woodside, L.I., N.Y.

LITTLE GIANT ROTATOR. Will swing any beam 10, 15, 20 or 40 meter. Assemble it yourself for less than $35.00. Gears guaranteed a lifetime. Positive direction indication. Mount on roof, ground or tower. Easy to fabricate. Photos, drawings and directions included in package. Send $1.50 to Little Giant, P.O. Box 2341, Idaho Falls, Idaho. Foreign countries, $2.00.

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QUARTZ CRYSTALS by the thousand and thousands—for fundamental, multiplication or overtone applications. —FT-243, FT-241—A low frequency, CR-A/AR, DC-34/35, HC-10 cylindrical hermetics, HC-6/u miniature hermetics etc—Special FT-243 finished to your specified frequency (.02%) 3450 to 8500. Kilocycles $1.25. (10 or more on same frequency $1.00 ea.). Stock frequencies as available 95¢. Write for crystal listings. Postage 5¢/crystal. R. E. Woods Electronics, 2142 Parkway, El Monte, California.

AMATEUR GRINDING AND ETCHING KIT—contains —12 crystals assorted. 6 crystal blanks. etching and grinding material—containers and instructions. $3.95. Postpaid USA. Quaker Electronics, Box 56Q, Mt. Top, Pa.

COLLINS 455 kc IF's with 3-selectivity positions. (req. 7.50) 60¢ each postpaid. Quaker, Mt. Top, Pa.

A-1 reconditioned equipment. On approval. Trades. Terms. Hallicrafters S-1-7, $69.00; S-85, $79.00; SX-99, $99.00; SX-100, $179.00; SX-111, $149.00; SX-101A, $229.00; Hammarlund HQ-100, $119.00; HQ-110, $169.00; HQ-170, $259.00; Collins, 75S-1, $329.00; 75A-4 $499.00; 32S-1, $499.00; KWS-1, $995.00; Central 10A, $79.00; 20A, $149.00; National Gonset, Elmac, Heath, Johnson, RME, many others. Write us for list. Henry Radio Company, Butler, Missouri.

QSL—Cards LOW prices—Free Samples. Debbeler Printing, 1309-C North 38th Street, Milwaukee 8, Wis.

QSL's? WPE's? CB's? America's Finest Samples 25¢ (refunded). *Sackers. W8DED, Holland, Mich.

FREE: Bargain Bulletin. Write: "Meininger Ads," Jesup, Iowa.

QSL CARDS, 2 COLOR GLOSSY, 100 for $2.50. Samples dime. Ramsbottom Printing, Box 237F, Kirksville, Missouri.

SPECIAL—500 TWO COLOR QSL CARDS $3.95. HOLLYWOOD PRINTING 1423½ N. MARIPOSA AVE., HOLLYWOOD 27, CALIF.

QSLs. Samples, dime. Print Shop, Corwith, Iowa.

QSL's . . . Eyecatching designs . . . Dime. Filmcrafters . . . Martins Ferry, Ohio.

QSL's—CBL's—Finest Quality—Extra Fast service on stock or custom designed multicolor cards. Samples and catalogue 25¢ (refundable). Dunnahoo, 516A Prospect, Fairview, Mass.

RUSPRINT QSLs—SWLs 100 2-color glossy $3 postpaid; QSO file cards $1 per 100. Rusprint Box 7507, Kansas City 16, Missouri.

QSL's SWL's XYL-OM's (Sample assortment approximately 9¾¢). Covering designing, planning, printing, arranging, mailing, eye-catching, comic, sedate, fantabulous. DX-attracitng, protopay, snazzy, unparagoned cards. (WOW!) Rogers, KØAAB, 961 Arcade St., St. Paul 6, Minnesota.

QSL's HIGH GLOSSARY CARDS. Send dime for samples. T. H. Lincoln W1IBB, 18 Hovey St., Woburn, Massachusetts.

HUNDRED QSLs: 80¢. Samples, dime. Meininger, Jesup, Iowa.

QSL's SWL's that are different, colored, embossed card stock and "Kromekote". Samples 10¢. Home Print, 2416 Elmo, Hamilton, Ohio.

QSL—Kromekote 3-Color . . . order 200 get 25 each of 8 different styles—many styles. Samples 10¢. Progress Printing. Box 1154, Biloxi, Miss.

QSL's four colors glossy stock, forty designs—send $5 for 200 and get surprise of your life. 48 hour service. Satisfaction guaranteed. Costantine Press, Bladensburg, Md.

GLOSSY 3-color QSL cards 100—$4.50. Free sampler. Rutgers Vari-Typing Service, 7 Fairfield Road, Somerset, N.J.

QSL's-SWL's samples 10¢. Malgo Press, Box 375 M.O., Toledo 1, Ohio.

QSL's, SWL's, WPE, CB, Samples—5¢. Nicholas & Son, Printery, P.O. Box 11184, Phoenix, Arizona.

QSL's—Samples 15¢. Rubber stamps: Name, Call, Address —$1.35. Harry Sims, 3227 Missouri Avenue, St. Louis 18, Missouri.

QSL cards—BROWNIE—W3CJI—3110 Lehigh, Allentown, Pa., Catalogue with samples 25¢.

CREATIVE QSL CARDS—New catalog and designs being completed. Free samples and catalog. Personal attention given. Wilkins Creative Printing, P.O. Box 1064-2, Atascadero, California.

QSL's 100 $1.25. Free Samples. L. Keller, 3036 Ridgeview, Normandy, Mo.

WANTED: Old wireless gear, tubes, magazines and catalogs before 1925. Amateur or ship equipment only. Please give complete information including price. My purpose is to buy this equipment, put it in first class shape and make it available either on a museum or demonstration basis to all amateurs who didn't live and operate during this era. W5VA, T. Frank Smith, P.O. Box 840, Corpus Christi, Texas.

Aluminum for every ham need. Write to Dick's, 62 Cherry Avenue, Tiffin, Ohio, for list of tubing, angle, channel, castings, plain and perforated sheet, and complete beam kits.

FOR SALE—Complete 500 W. SSB station HQ-170, GSB-100, factory wired Viking Courier . . . $650. Will demonstrate K2GYY Philip Margulies, 9 Pine Court, Westfield, N.J., AD-2-1318.

WANTED in any condition, RCA 1956 color TV, chassis CTC 5D. 21AXP22A picture tube must be in good shape. Will consider cash or trade. W3ASK.

FOR SALE—Heath Mohawk receiver. Used very little. Factory aligned. Professionally wired. Mint Condition. $225.00 F. Fess, 8840 Hubbell Ave., Detroit 28, Mich. VE 7-2298.

SELLING—Drake 2B, Q Multiplier speaker, Xtal Calibrator—like new $260.00 Don Leitschuck, Odell, Nebr.

SALE: Heath, VF-1, VFO, Excellent condition. Used about 7 months, with manual, $15.00. Steve Marshall, K4WUN, 24 Hawthorn Rd., Salem, Virginia.

WANTED: Collins 312B4. Give condition, serial, price first letter. W6CLY.

Tube Tester mounted on embossed satin aluminum panel with charts (self service type) $14.00. Also new EICO 14 watt amplifier kit $15.00. W1KSF, 609 Langston Lane, Falls Church, Va.

VIBROPLEX Deluxe "BlueRacer." Like new; used 3 months. Only $12.00. Mike Lee; Box 177; State College, Mississippi.

GONSET G-76 TRANSCEIVER with AC and DC supplies, used very few hours, $450 for all three. Hallicrafters SX-100, like new, $175; S-38E, practically brand new, $49; Elmac A-54 transmitter with AC supply, $49; AF-67 homebrew supply, $10 as is (working); automobile electric siren, $10; 12V dynamotors, 625V @ 225ma. $10; 220V @ 80ma. $5; Carter 6V dynamotor, 420V @ 280ma. $10. Bill Hunter, K6QAT, Box 17002 San Diego, 17.

I NEED used commercial or mil version SX-73, 51-J, SP-600 or equivalent receiver. State condx and lowest price in first letter. Box S-9, CQ Magazine, 300 W. 43, New York 36.

TCS6 Receiver, Transmitter, and 110 v Power Supply. Mike, Grid Block Keying, Original Manual, 50 AM, 100 CW. What Offer? W1DFS.

ESTATE MUST SELL station including KWS-1 and 75A-4. Write for list. Hank Frey, 39 East 10 Street, New York 3, N.Y.

SELL: B & W L-1001-A linear amp. with matching power supply—$270. HT-27 SSB exciter—$370. Drake 2B with speaker, Q-Mult., xtal calib . . . $280. All in excellent or new condition. Lamb, 1219 Yardley Road, Morrisville, Pa.

Want to buy manual for Digital Instrument Co. model 955 counter; Robert Ireland, Pleasant Valley, N.Y.

MUST SELL: Immaculate Johnson Viking INVADER $500, used less than 10 hours, manual, original carton. Jerry Felch, 2416 Halmac Drive, Huntsville, Alabama.

FOR SALE: 6 meter Gonset Communicator II in very good condition with AR-57 mike and 3 xtals. $110. Mike Lav, W2HFU, 98 Princeton Rd., Rockville Centre, N.Y.

HEATH XMTR. DX 40 wired and tested. A1 $39.00. C. Gerst, 4236 W. 36 St., Cleveland, Ohio.

SELL-TRADE:—10 watt 75 meter mobile station consisting of the following:—transmitter, Vibrapack, push to talk mike, crystal, cables, brackets, 25 feet of new coaxial cable, 75 meter mobile converter that needs no "B" plus. Everything in A-1 mint condition. $50.00 takes all. Stan., W8QKU, 2748 Meade, Detroit 12, Michigan.

WANTED: Junked or unrepairable SP-600 receivers; also replacement parts or components. K4VWT.

Fire lookout selling portable station; 1, Tener, $29.95 with mic and 2 Xtals; 1 Sixer with mic and 2 Xtals, $39.95; 1. Tower with mic. 39.95; 1, vibra-pack for any of above 8.95; 1, 20 watt 6 meter FM transceiver 6 volt 29.95. Will consider trade for test equipment. John Gibson, K7DTS, Napavine, Wash.

Wanted: KWS-1. Invader 2000, or HX500. State condx and serial. Gerald Newton, WA6YKR, 933 Gregory Place, Davis, Cal.

75A-4, serial 5361, $500.00; KWS-1, perfect, extras, $875.00; 75S-1, $375.00; Drake 1A, serial 1043, new condition, $175.00. W8WGA Phone: 513—2770409.

COLLINS 32S-1, 516F-2, 75S-1, 312B4, Astatic Dynamic, Extra 312B-3 speaker, L. H. Vibraplex. Good Condition. $1195.00 No trades. No shipping. John C. Powell, K4IZY, Box 63, Murfreesboro, Tenn.

WANTED: GENERAL RADIO RF IMPEDANCE BRIDGE MODEL 916 A or 1606 A. W5EPB.

GOING HIGH POWER—need couple: 304TL, 833A, 750TL, 4-250-A, 4-1000A, etc., send best price. R. Levenson, 36 Dahill Rd., Brooklyn 18, N.Y.

SELL: Kreco gorund-plane antennas, 15 and 20 meters. Complete with radials and stubs. $20 each—both for $35. W2EQS.

SELL: HQ 129X, best offer over $105.00. Viking 6-2 meter converter $35.00. No Shipping, must pick up personally. F. Corliss, 6431 Ave. A., New Orleans, La.

CANADA. Central Electronics 200 V $950 Hammarlund HQ 180 with new accessory noise silencer $500. Heath Transistor Receiver Mohican, factory aligned, with a.c. power supply $120. all excelelnt condition. Dr. G. A. Asche, VE7AOK, Box 400, Hope, B.C.

SELL: Model 26 Teletype with automatic carriage return and line feed, table $90. Will not ship. W4RVH, Box 719, Charlotte, N.C. 375-4523.

FOR SALE: 300 tubes, caddy; scope WO-91A; battery eliminator 1050; tube checker TC-2; Align-o-pack BE-2; Isotap WP25A; Signal Generator E-200; Raytronic beamer C.R. tester; Good, with manuals. Hot Rod Mags for Elect. mags. Need VHF and HiFi Equipment. Arlie Dalton, Willis, Virginia.

COMPLETE HAM STATION: ART-13, BC-348, with complete mounted power supply. Transmitter has microphone, plugs, technical manual, hand and automatic keys, S-meter, extra audio stage, speaker, Q-5'er, CW filter with six toroids, noise limiter. Bandswitching antenna coupler, metered S.W.R. bridge, oscilloscope modulation monitor, with separate matching black crinkle cabinet. Signal generator, other test equipment, antennas, electric rotator, radio books and magazines, all hookup parts. $300. Steve Anshutz, 904 East Second Street, Ellensburg, Washington.

WANTED: Used PL172, 4 CX1000 and sockets, blower, beam, KW power supply, TR SW, cabinets. Leo Severe RR #, Box #5, Wilmington 1, Illinois.

SALE: Pacemaker $200. Harvey Wells TBS-50C $25. Auto transformer for voltage regulation 95 to 130 volts or 190 to 230 volts input. Output switch selected in six steps 115 volt, 16 amp, 1.8 KVA $12.50. 6 volt 100 amp. alternator complete $25. Trade transformers or RF Signal generator. 2 and 6 meter gear or condenser checker. William Baxter, 3702 North 1st Ave., Tucson, Ariz.

SELL: Station 75S-1 $395.00 Match. spkr $22.00 32S-1 $495.00 516F2 $86.00 M.M.2 scope & adpt. $115.00 80X mike $60.00. All used less than 30 hrs. HyGain Roto Brake new unpacked $145.00 Gonset Monotone $29.50 Millen grid dip $35.00. Consider selling separate. M. E. Brown, 1032 Lee Ave., San Leandro, Calif. W6FHQ.

SELL: Drake 2B rcvr. Also matching Q-mult spkr and crystal calibrator used less than 10 hours. Mint condition $225. M. Kendrick, 61-15 43 Ave., Woodside 77, N.Y.

CENTRAL Electronics 200V, with Filter plus coax ratiometer SWR Bridge excellent condition $650. 32 ft Spaulding Culvert base tower with Thunderbird tri-bander plus Ham-M Rotor $200., grounded grid 813 Linear with 2500 Volt power supply $100., or all for $900. K4HPD, P.O. Box 1385, Huntsville, Alabama.

FOR SALE: Hammarlund HQ-180, like new w/noise silencer and speaker—Best offer over $260. Brand new, never used RME VHF-126 Tuneable converter, for 50 mc, 144 mc, and 220 mc—Best offer over $150. Write Box CR, c/o CQ, 300 West 43rd St., New York 36, N.Y. or Phone JU 2-4460 and ask for Miss Mark.

FOR SALE: JOHNSON Challenger, 122 VFO, TR Switch and B&W low pass, $125. Also Lafayette He-35 6M transceiver with 6v. power supply, mike, crystal and mobile mounting brackets, $50. K3AXB Box 314, Republic, Pennsylvania.

NC-98 With Speaker, $69. W2EEJ.

For further information, check number 47, on page 181

For further information, check number 48, on page 181

TRADE all for transmitter or tribeam Feiler Electronic Stethoscope and Signal Tracer. Regency HFT 1 all transistor preamplifier. Circuit incircuit condenser tester. Century C.R. tubetester. All new condition. Francis Fossa, 2 Fossa Ave., Nashua, N.H.

NEED MORE ROOM: For Sale: NC-300 $175, ameco 2m converter, SX-99 & speaker, TCS Rcvr, Gonset transceiver 2 meter, DX-100 $150, Seneca 6&2, Jackson tube checker $20, Harvey-Wells rcvr R-9a $60, SCR-522 rcvr-xmtr-pwr supply $35, BC-669 & pwr supply, T-19-ARC5, 2 meter beams, LM freq meter, TS-175U freq meter (VHF), ART-13 with power, (DX-100, 669, 522, Gonset, Seneca are with crystals for C.A.P. operation). R. LaBremz, K8HES, RFD-1, Essexville, Michigan.

"YOUR BEST CONTACT" (spiritual side of ham's life). Free. "Rus" Sackers, W8DED, Holland Michigan. An organization composed of Christian hams has been organized for the purpose of Christian fellowship and tract work among hams. Anyone wishing information on the organization can write Rus Sackers, W8DED, P.O. Box 218, Holland, Michigan.

FOR SALE: SX-99; Johnson Valiant; Elmac AF-67 and James C-1050 Mobile Power Supply with connecting cables. Excellent condition! Valiant practically new—used very little. Highest offer takes! Charles Mahnke, 425 State. Iola, Wisconsin.

WANTED: KLEINSCHMIDT TELETYPE, GRC-9 & 10, and R-309A or R-388 Receiver. Will trade ham gear for ur military surplus. George, KH6CSL/2, Box 96, Morrisonville, N.Y.

RECEIVER. Hammarlund HQ-110 for sale, like new $165 K2YFM, 50 Brookside, Allendale, N.J.

FOR SALE: KWM-2 A.C. and D.C. supplies; mobile rack; micro-match; 20 and 40 meter Heliwhips and mount; mike. Little used. K2HEA; 12 Elm St., Lynbrook, N.Y. LY-9-2356.

SELL: HRO 60 with all coils—$255, Gonset III Communicator 2 meter like new—$175. W6OXB, Rt. 2 Box 973, Modesto, Calif.

4CX1000A new $75. SK-800A socket $25; APS-15A with instructions $160; TS-120 X-band Signal Gen. $45; RCA TV camera & transmitter $50; KWS-1, 75A-4, with F.T. knobs, 3 mech filters, antenna relay, pair extra 4CX250B, new condition all for $1395. D. E. Pennington, 4516 Garfield Ave., Dallas 11, Texas.

FOR SALE—Collins 75S1 Excellent condition looks like new $350.00. George P. Rankin, 920 Curry Dr., Macon, Ga. For Sale: Hallicrafters SX100 $240. Also Hammarlund HQ145 with clock $200. Both like new. Robert Burns, 522 E. Center, Warsaw, Indiana.

Selling Out—KWS-1, 75A-4, Station Control, Beam, Telrex, Rotor, Miscellaneous. All in New Condition. High serial numbers. All letters answered. Frank Lindsay, Holdrege, Nebraska.

GOING MOBILE FOR COLLEGE. Must sell my NC-303. Perfect Condx. under 1 year old—$300. Dain, K8MLR, 932 Renwood Dr., Kettering 29, Ohio.

WANTED: Electrical or control part of manual on Signal Corps power unit PE141A Manufacturer Federal Telephone and Radio Corp. W4NFC.

SELL or TRADE—1908 Oldsmobile—Replica. Like new. Want KWM-2 with power or other gear. Leo Avazian, Creston, Iowa.

WANTED model 15 teletype table in good condition. Harris W. Zuelke, 4619 N. Magnolia Ave., Apt. 307, Chicago 40, Illinois.

Torroid Coils—88 m.h. Clean—$1.00 for 1, $3.00 for 5. Postpaid. WØLFH, Algona, Iowa.

FOR SALE—40' Triangular Steel Tower never assembled—$80.00; Johnston 'Matchstik' Vertical with control box, never used—$80.00; Telrex Tribander beam never used, orig. carton—$90.00; Beam rotator (Mims overhauled) Micro switches added w/controls $90.00. Pick-up, no shipping. W2ZM, Locust Valley, N. Y.

NEED CASH FOR COLLEGE. Selling SX-101A $235. Also DSB-100, HT-18 VFO all offers considered. K9GRS/2, Box 731, Troy, N. Y.

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CQ ADVERTISERS INDEX

WORLD'S MOST ACTIVE MARKET PLACE FOR HAM GEAR...

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PROGRESS CREATES CHANGE Nowhere is this more evident than in Electronics. Hardly a day passes without bringing some new development in circuitry, components, materials, or technique. Manufacturers take prompt advantage of this flow of improvements to constantly up-grade the performance of their equipment. The receiver or transmitter coming off the production line today may be just slightly better, or it may be vastly superior to the same model made yesterday.

This is why you get another big plus benefit when you deal with "Ham Headquarters, USA"!

Here, the sales volume is so tremendous (we sell more Collins, for example, than any other dealer in the world!), the turn-over so rapid, that you always get the very latest improved production.

HARRISON MEANS MORE MODELS—BIGGEST INVENTORY Name the new model and you can bet that Harrision has it if available anywhere—the make you want, the model you want, the deal you want. We keep trucking companies extra busy to be certain that our ham friends can see more gear, compare more features at "Ham Headquarters, USA".

HARRISON MEANS HIGHEST TRADE-IN ALLOWANCES Right now our Harrison ham experts are waiting to show you the very latest gear, answer any questions you may have. They'll also tell you about the highest trade-in allowances waiting for you (made possible by Harrison's brisk turnover of used equipment), about your Harrison Charge Account that lets you s-t-r-e-t-c-h payments up to 18 months or more (no down payment because your trade-in is always enough).

Hurry on in. Discover for yourself why it always pays to shop at "Ham Headquarters, USA", why "Harrison" means you save with safety.

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(LONG ISLAND: 144-22 HILLSIDE AVE., JAMAICA—RE 9-4102)

For further information check number 56, on page 181

from ALLIED

Punch Out a Great Signal with this knight-kit® 150-Watt AM-CW Transmitter

MOST "WATTS-PER-DOLLAR"!

- 150-Watt Input 80-10 Meters; 100-Watt on 6 Meters
- Controlled-Carrier Screen Modulat.on for Max Power
- Stable Built-in VFO with Planetary Drive Tuning
- Clean, Chirpless Keying— No HV at Key Terminals
- Adjustable Pi-Network Output Matches 40-600 Ohm Antenna

New! Matching R-100A Receiver Kit

ONLY **$99.95**

$5 monthly

Tremendous quality and value! Covers 540 to 30 mc; bandspread on 80-10 meters; better than 1½ μv sensitivity for 10:1 S/N; selectivity 300 cps to 4½ kc continuously variable; built-in Q multiplier —60 db notch really knifes through QRM; exalted BFO injection; printed-circuit bandswitch; MVC; delayed AVC; noise limiter—and many other professional features. With all parts, tubes, gray metal cabinet (9⅛ x 17⅛ x 9⅝"). Less S-meter, speaker kits. 31 lbs.

83 YU 406 DL. R-100A Receiver Kit, only **$99.95**

83 Y 423. S-Meter Kit. Reads to +20 db over S9, only..... **12.95**

83 Y 424. Speaker Kit. 4 lbs..... **19.95**

New T-150 Transmitter Kit

ONLY **$119.95**

only $6 monthly on Allied's Credit Power Plan

Packed with features to put out a solid signal that really punches thru the QRM! 150 watts AM/CW input on 80 thru 10 meters, 100 watts on 6 meters. Highlights: Highly stable VFO has illuminated dial and planetary drive; socket for optional switch-selected crystal operation; efficient controlled-carrier screen modulation; adjustable pi-network matches 40 to 600 ohm antennas; buffer stage isolates oscillator from final; parallel 6146's in output stage; silicon diodes for reliable high-voltage and low heat; voltage regulator in B+; single knob bandswitching; TVI suppressed with all leads in and out of case by-passed for RF; switched meter reads buffer, final grid and final plate currents and relative power output; mode switch provides for VFO spotting and tuning without placing a signal on-the-air; clean chirpless keying—no high voltage at key terminals; plus a host of other fine features. With all parts, tubes, plugs, wire, solder and step-by-step instructions and handsome gray satin metal case, 8½ x 17 x 10½". Less mike, key, crystals. For 110-125 v. 60 cycle AC. 28 lbs.

83 YU 403DL. T-150 Transmitter Kit, only..... **$119.95**

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New Credit Customers Only: Send name and address present employer, how long employed, position, monthly salary (also same for prior employment); rent or own home, how long at present address (also same for prior address); 2 credit account references; give age (21 min. for credit accounts).

For further information, check number 32, on page 181

NATIONAL'S NEW NCX-3 Tri-Band Transceiver!

- **Complete SSB, AM and CW coverage of the 80, 40, and 20 meter amateur bands!**
- **Full 200 watts PEP!**
- **Every desirable operating feature!**

NATIONAL ONE YEAR GUARANTEE

Now from National — a brand-new Transceiver concept that brings you the three most popular amateur bands at a price equivalent to economy single-band units! No need to compromise on only one band — no need to spend a $300 to $800 premium for coverage of the two steadily deteriorating high frequency bands! The handsome, rugged, NCX-3 complements both your car and the ham shack, and provides you with a solid 200 watts of SSB punch — plus — every feature National could think of for easy, relaxed ham band operation — vox or push to talk, CW break-in, SSB/CW AGC, S-meter — even a separate AM detector! The specifications below really tell the story . . . study them carefully and see your National dealer as soon as possible. We're devoting additional production facilities to the NCX-3 to assure maximum delivery rate, and will start delivery December 30 — don't postpone your enjoyment of the new NCX-3 — get your advance order in now!

NCX-3 SPECIFICATIONS

Frequency Range: 3.5, 7.0, 14.0 Mc. amateur bands • **Types of Emission:** SSB (LSB 80 and 40 meters, USB 20 meters), AM (SSB with carrier inserted), CW • **R. F. Power Input:** 200 watts SSB PEP, 180 watts CW, 100 watts AM • **R. F. Power Output:** 120 watts SSB PEP, 108 watts CW, 30 watts AM • **Output Impedance Matching Range:** 40-60 ohms • **SSB Generation:** 5200 Kc crystal filter; bandwidth 2.5 Kc at 6 db • **Frequency Stability:** 400 cyles long-term after warm-up • **Suppression:** carrier —50 db; unwanted sideband —40 db • **Operating Facilities:** all modes —full AGC and S-Meter on receive; SSB-VOX or PTT transmit, product detector on receive; AM—VOX or PTT transmit, separate diode detector on receive; CW — grid block break-in transmit, product detector on receive • **Audio Input:** High impedance, low level • **Controls:** Front panel — Main Tuning, Band Selector, Audio Gain, R. F. Gain, Microphone Gain, Mode (off, SSB, AM, CW, tune), Carrier Balance, Driver Tune, PA Tune, PA Load; Rear panel — Vox Sensitivity, Anti-Vox, Vox Delay, Bias Adjust, Vox Input, PTT Input, Key, Phones, Ext. relay • **Metering:** PA cathode current on transmit; S-Meter on receive • **Receiver Sensitivity:** 1.0 μV. for 10 db S/N ratio • **Receiver Selectivity:** 2.5 Kc at 6 db • **Receiver Audio Output:** Better than 2 watts; 3.2 ohms • **Size:** 6" H., 13⅝" W., 11⅝" D. • **Shipping Weight:** 20 pounds • **Power Requirements:** 700 V.D.C. @ 300 ma., 280 V.D.C. @ 100 ma., —80 V.D.C. @ 10 ma., 12.6 V. @ 5A. • **Tube Complement:** 17 tubes, 4 diodes; parallel 6GJ5's in final amplifier. **Mechanical:** ⅛" solid extruded aluminum front panel; perforated steel enclosure; cadmium plated steel chassis; chromium plated steel mobile mounting bracket. • **Main Tuning Ratio:** 45:1, employing planetary and split gear drive. • **Finish:** Front panel — Hydro-etch off-white matte with brushed aluminum trim; Knobs — Mil-Spec, matte black; Enclosure — gray-blue wrinkle enamel. • **Accessories:** NCXA 115 V.A.C. power supply/speaker console; NCXD 12 V.D.C. power supply

New NCX-3 only $369

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World Wide Export Sales: Ad Auriema Inc., 85 Broad St., N.Y.C. Canada: Tri-Tel Assoc., 81 Sheppard Ave. W., Willowdale, Ontario

You are looking at a special demonstration of "DARK-HEATER" design. The heater on the right is a "DARK-HEATER." It operates at approximately 350° K lower than the 1500 to 1700° K of the conventional heater, on the left. The much lower temperature "DARK-HEATER" produces the same cathode temperature as the conventional heater—**because of the superior thermal emissivity of the dark coating.**

RCA-8032
13.5-VOLT
"DARK-HEATER"

RCA-8032 Beam Power Tube—70 watts CW output (ICAS) at 60 Mc; 35 watts CW output at 175 Mc.

This is the new RCA-8032—first beam power tube with a "Dark-Heater" for amateur applications.

Heater voltage rating for RCA-8032 is 13.5-volts—just right for modern mobile operation. Power ratings are the same as the prototypes in the world-famous RCA family of 6146 designs.

Here is where RCA-8032 stands out. A cooler operating "Dark-Heater" offers these advantages in transmitter service: It delivers longer heater life—reduces chances of heater failure—cuts down on AC heater-cathode leakage and hum—minimizes changes in heater shape during life, reducing the possibility of heater damage and heater shorts.

RCA-8032 beam power tubes are sold through RCA Industrial Tube Distributors everywhere. For a technical bulletin, write: Section K-15-M, Commercial Engineering, RCA Electron Tube Division, Harrison, N.J.

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