SECOND LEAGUE FORMED — SEE PAGE 5

March 1968

75¢

CQ

ICD

SPECIAL:
A Second Radical Licensing Proposal

Q LAB TESTS THE HENRY 2K-2

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THE MONICEIVER REVISITED

THE DXPEDITION: EUROPE

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The Radio Amateur's Journal

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COLLINS

See page 126 for New Reader Service

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Receiver Incremental Tuning	**Yes**	No	No
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MARCH, 1968 VOL. 24, No. 3

CQ

The Radio Amateur's Journal

TAFF

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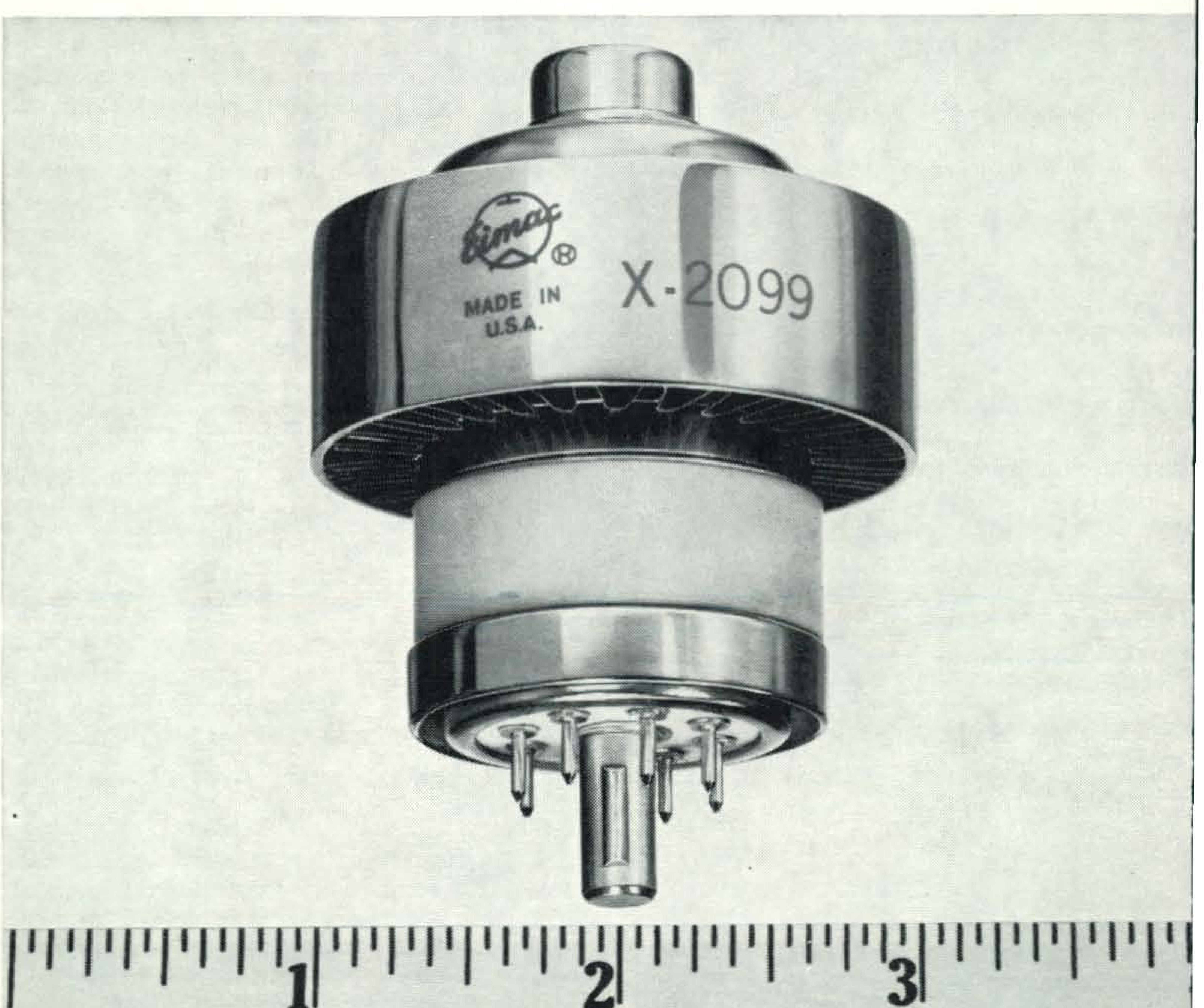

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ZERO BIAS

WITHIN the past several weeks we've received two separate requests for information about *CQ* advertising rates from groups of amateurs on opposite ends of the U.S. Neither of these groups knew of the existence of the other, but they had something in common which struck us as meaningful and worthy of mention. Both groups, it seems, were assembled for the sole purpose of opposing the new incentive licensing regulations which began to take effect on November 22, 1967.

Opposition to unjust legislation is an integral and honorable part of the American way of life. We, therefore, respect the right of these groups to seek a reversal of the long-awaited regulatory changes. However, we question the wisdom of their timing and their intent.

As we suggested in our November editorial, the new regulations are not flawless. But, when the complexity of the original proposal is considered, in addition to the multitude of changes proposed by individuals, the real difficulty of FCC's task in producing a manageable set of incentive oriented rules becomes evident. Faced with this unpleasant task, FCC did the necessary job with the least hardship to the greatest number of amateurs. This, of course, is our opinion.

What we ask about these two groups is, "Where were you when the paper was blank? Where were you when incentive licensing was only a topic for lively discussion, and not a reality as it now is"? Five months have elapsed since the new rules were announced and for at least the last two years it has been generally assumed that some form of Incentive Licensing would be adopted as a result of ARRL's RM-499 proposal. Now is not the time to begin opposing the whole concept.

Of the two groups, one has formed an association: The National Amateur Radio Association, a non-profit organization based in St. Helens, Oregon. The stated purpose of NARA is "to further the cause of amateur radio, not bring it crashing down in dissension." For this stand we applaud NARA, and wish only that their first goal were something more constructive than the direct opposition to a new set of rules which have torn amateur radio apart for the past four years.

We don't agree with all that is done by ARRL either domestically or internationally. But, we do feel that in their high-handed, stodgey way, they have kept the best interests of amateur radio in mind. NARA would better serve amateur radio by seeking to supplement ARRL's services than by trying to undo Incentive Licensing.

Survey Results

New month we'll be bringing you the results of our January Reader Survey. Reader response has been excellent, as usual, and total returns number well over 1,000. Several questions have surprised us with their results, and we're certain you won't want to miss April *CQ*.

Writing For CQ

We're continually receiving inquiries from prospective authors regarding what type of material we want for *CQ*. Almost invariably, the answer is the same: Construction articles in almost every area of amateur radio with special emphasis on v.h.f. and u.h.f., and on solid state circuitry. We don't always hear from these would-be authors again, but we do have need for material. If you're a builder or experimenter with a flare for writing, keep us in mind. And remember, we pay for what we publish—at the highest rates in the business.

73, Dick, K2MGA

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OUR READERS SAY

Refugee and Immigrant Amateurs

Dear OM:

Having read your Zero Bias in January *CQ*, I wish to make a few comments on the subject. Having been a native of Germany and immigrated to the U.S. in 1961, I think I am qualified to speak on the matter of licensing immigrants and fully support your view in letting immigrants become radio amateurs in the U.S. However, if eligible for citizenship they should become citizens or else lose their license. This is the way our neighbors in the north (Canada) handle it. To wait 5 years is a long time and to me it seemed unfair to let foreigners operate while visiting U.S. just because they were hams in their own country. Thank you very much for your support and outspoken opinion on this matter, Dick. You most certainly have my support and let's hope our law makers can see it the same way.

Hal Kostlin, WN6YNG
Ontario, California

Editor, *CQ*:

I am a holder of Telephone 1st, Telegraph 1st and Advanced amateur licenses and I wish to state that I am in favor of amateur license for permanent residents of our country.

Your editorial in January *CQ* certainly points up a problem which has been neglected or overlooked so far.

Carl H. Paulson
Pearl River, N. Y.

Dear Dick:

As a reader and subscriber to *CQ*, I would like to congratulate you for your January 1968 editorial and for bringing to the attention of your readers a problem which has unfortunately received all too little care.

I know of one particular case of an Eastern European refugee who was an active amateur in his home country and who fled his native land in order to find new opportunity and a new future in the United States. Although he has declared his intentions to become a U.S. citizen and has filed the necessary papers to that effect, he is prevented from obtaining even a temporary amateur license. There is no logical reason for this injustice and I would hope that legislation can be passed to remedy the situation.

I, for one, am writing to my Senator in Washington in the hope that other amateurs may feel inclined to do likewise, and so bring this situation to the attention of our legislators. U.S. amateurs are, for the most part, extremely well treated when they visit foreign lands; there is no reason why we cannot at least extend some sort of courtesy to those who seek new homes in our country.

Thanks again for bringing up a timely and important topic in your editorial column.

Ives A. Feder, W1EOX
Chester, Connecticut

Dear Mr. Ross:

I am writing to you to commend you on your stand in Zero Bias concerning political refugees. I happened to know one of these fellows . . . and I am not surprised to realize how lucky they feel we are! The point he made was, we have so many people (inactive hams), who don't exercise their privilege! I'm afraid I had to agree with him . . . not only that, his dedication to the hobby was intense rather than a fly by night attitude.

After reading your article, I can't see where a temporary license could not be issued. It seems the least we can do under the circumstances.

Besides, these amateurs can offer a wealth of exchange information concerning all gear used. This country became great by the very acceptance of people like this and we should continue to be the one country in the world who make no conditions on citizens of the future.

Warren Jarvis, K2LUE
Bayside, New York

Printer's Error

Editor, *CQ*:

In *CQ*'s introduction to the Don Miller series (January *CQ*, page 69), you refer to another excellet DXpeditioner as "the infamous Danny Weil."

The word "infamous" is defined in my Webster as "of evil fame or reputation," hardly the way to treat a fellow amateur who gave us DX'ers so many pleasant operating hours during his unforgettable *Yasme* adventures.

I think you have been grossly unfair and, in my opinion, owe Danny Weil an apology.

Jose Toro, KP4RK
Caparra Heights, Puerto Rico

The statement which appeared in *CQ* was indeed unfair to Danny, and we can only assure our readers that it was not intended to appear as it did. Last minute changes at our typesetter unfortunately robbed us of the time necessary to properly proofread several pages in January, and allowed a number of typographical errors to creep through. We agree with the DX fraternity that Danny is a noteworthy and famous DXpeditioner, but by no means is he *in*famous. Our sincerest apologies.—*K2MGA*

Sylvia

Editor, *CQ*:

It is a genuine pleasure for me to write to you about your regular contributor, Sylvia Margolis.

About two years ago, I purchased a copy of *CQ* on a newsstand, read the article by Sylvia, was enchanted, bought the next copy, dug up old copies in the used book stores, and then subscribed to *CQ*.

Reading the articles by Sylvia, I believe was one of the determining factors in deciding me to become

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a ham. I began to learn the code and brush up on my theory. I am now just about ready for my General examination, and if all goes well, I hope to be licensed within a month or two.

Before reading the adventures of Sylvia, I was just about convinced that Hams were a group of "nuts" who could find nothing better to do than go to great lengths just for the purpose of discussing their rigs on the air.

The very human trials and tribulations of Sylvia, her husband, and their relationships with visiting Hams presented a very human and social aspect of Hamdom. A very real desire to become part of this world-wide group took hold, a desire, I hope, soon to be realized.

Last summer I visited London for a month. I felt that a month away from my code practice would set me back. I wrote to Sylvia, asking for her help in arranging facilities for me to continue my code work.

As it happened, Sylvia was in America at the time. Maurice got in touch with me in London, and immediately invited me to the RSGB dinner that was held in London in July.

The dinner (the one at which Don Miller had a slide show) was a treat. Sylvia, who had returned to London by then, was a most gracious hostess. After only a short time, Sylvia and my wife were comparing notes and husbands. Before the evening was out, code practice had been arranged for me, I had joined the RSGB, and we both had invitations to the forthcoming Bar Mitzvah of Sylvia's son. This is to be held in July. We will likely be in London next July, and if so, will surely attend.

As it happened, I was too busy with one thing and another to do any code practice. But the idea had been a good one.

Lawrence Levenstein
New York, N.Y.

Pulse Tuning Linears

Editor, *CQ*:

With regards to the article "Pulse Tuning of Linears" in January 68 issue of *CQ*, page 28, figure 3. The circuit will not function as intended because the multivibrator is not controlling the transistor that controls relay K_1.

The base of the control transistor should be connected to the collector of the second transistor of the multivibrator.

Oscar Leary, Jr.
Patrick AFB, Florida

Type-Tested Equipment

Editor, *CQ*:

Regarding your editorial in Dec. 1967 *CQ* and the amateur radio section of the EIA, I recall a talk by Irv Strauber of Hammarlund at the Western New York Hamfest in May 1967. He stated that congestion of the amateur frequencies will be such that he expects that performance standards will be established and that only type-tested equipment would be allowed on the air.

Now as you know, type-testing of equipment is an involved affair and would normally be done only by commercial manufacturers. What it would amount to, as Irv stated, is that "homebrew" equipment would no longer be allowed on the air.

I am glad *CQ* is affiliated with the EIA. Maybe you can neutralize some of the foolish thinking such as this idea.

I believe the problems of amateur radio are just like the highway accident problem—more troubles are caused by the operator behind the microphone than by the equipment.

Grady B. Fox, Jr., W2VVC
Rochester, N.Y.

Announcements

Midland, Texas

The Midland Amateur Radio Club (W5QGG) of Midland, Texas has scheduled its annual swapfest for St. Patrick's Day weekend. The dance will be held Saturday night, March 16, 1968 at the Sands Motel, and the swapfest, Sunday, March 17, 1968, in the Midland County Exhibition Building. Homebrew and c.w. contests are scheduled and many prizes will be given away. Further information and registration forms may be obtained by writing P.O. Box 967, Midland, Texas 79701.

Teen-Age Net on 15m.

The organization of a fifteen meter teenage net to be called The American Teen-Age Net, (ATAN) was recently announced by club Manager, Bruce E. Wampler, WA7EWC. The first meeting will be April 27th, 1968. The net will meet every Saturday at 2015 GMT on 21.295 mc. There will be three net control stations to get complete coverage of the country: WA9STI, WA7EWC, and a W6. If you desire any further information contact Bruce at 1309 South Mitchell, Casper, Wyoming 82601.

Hams to Play Vital Role In Indianapolis 500 Parade

Amateur Radio operators will provide public safety communications for the 1968 500 Festival Parade in Indianapolis, Indiana. The Marion County Amateur Radio Communications Unit will be responsible for public safety communications along the parade route. This will include at least 26 mobile and portable stations on the street with a unit at every major intersection to provide communications for the police officers stationed there. In addition, at least 16 stations will be operated in buildings overlooking the parade route so that all portions of the route will be under observation for trouble in the parade itself or among spectators.

The operation will be managed for the 500 Festival Committee by the Marion County CD ham unit under the direction of Dick Andrews, K9SVB. Any licensed amateur in the Indianapolis area who wishes to participate will be given a role in the project. Almost every club in the Indianapolis area is cooperating by furnishing operators and equipment. CD units from Morgan and Johnson counties will assist also.

The 500 Festival Parade is held every year in Indianapolis as part of the 500 Festival that surrounds the Indianapolis 500 Mile Race. The parade will be Tuesday, May 28, 1968, in the evening over a two-mile parade route. There will be national television coverage by the Sports Network, which will include over one hundred television stations.

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SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Well, Scratchi are doing it again. Yes indeedy, are coming up with idea that are reely red-hots. In fackly, it can revolutionize amchoor radio if we handling it rite this time.

Yes—we—on acct. I letting old Seek-You magazine in on grounded floor again. I figyouring no need for Scratchi to hogging hole thing, and besides, there are plenty glory in idea for both of us.

Maybe you'll recalling that I writing you about a year ago with idea to doing away with QSL cards. I suggesting you letting amchoors recording there QSO on tape, then sending tape to your Hon. Dee-X editor for getting WAZ and other goodies.

I'm surely you'll also recalling that you turning Scratchi down cold. You being very sticky about it at the time. You telling me you having no way to knowing if voice on tape are ackchewally voice of dee-x amchoor, and that if chance for any hanky-panky, then Hon. Seek-You are not having anything to doing with skeem.

Now, Hon. Ed., modern science are coming up with answer. Are you heering of voice-prints? It new electronic tecknique for making record of person's voice. It like fingerprints, only with voice-print you get recording of a certain word or phrase that is spoken or recorded on tape.

Everybuddies voice are different—like everybuddy having different fingerprints. If you having voice print of one person, and one of an unknown voice, you can compare these voice-prints and telling if the word or phrase is spoken by same person.

OK now, let's stop shilly-shallying around and getting on with skeem to doing away with QSL cards. Hon. Ed., it your patriotic duty—what with big overload of mail in Hon. Post-office, we got to stop messing up Hon. U.S. Govt. mails with QSL cards

Here's what we doing. You running big 1/c artickle in your Hon. Rag about how all dee-x stayshuns sending in taped voice print. You can making big claims about how Hon. Seek-You are taking revolutionary step forward in amchoor radio by no longer requiring QSL cards for proof of dee-x contact.

Also suggesting you run down to Washington, Dee-C and getting some photographs of you shaking hands with Hon. Postmaster General. Then you can run picture in Hon. Mag. with capshun "Editor Get Congratyoulayshuns For Cutting Down on Volume of U.S. Mail."

Then in same issue you run speshul editorial patting yourself on back for grate step forward you taking. You knowing what I meen.

Also, if you are going through with this idea, you better arranging to buying all the scientific equipment that you will be using to compare voice-prints with. In answer to your question, I haven't foggiest idea where to buying it.

I don't even think it made commercially. It being tested in electronic laboratories, and that's about all. It reely not perfected yet. Even if you could buy it, it would probably cost a millyun bux or so.

Hon. Ed., I don't know where you get all these nutty ideas. You don't think, reely, that all the dee-x amchoors are going to send taped voice-prints to you, do you? Not only that, how can you doing away with QSL cards—all those companies that print them would be dropping there advertising with you.

Gracious to goodness, if such a thing are practickle, then the Hon. FCC are grabbing up idea faster than you can hiccup. When all FCC monitoring stations are fixed up for handling voice-prints, nobuddy being safe.

Hon. Ed., if you persisting in this stoopid voice-print idea, I sending you nasty petition signed by hundreds of amchoors. I'll even stop reeding free copy of your Hon. Mag you sending me.

Down with voice-prints—they impinging on freedom of speaking.

Excoosing me, Hon. Ed., but my glass of fermented cactus jooce seem to be empty. I'm going to open up another jug. It awfully dry here today. While I looking for jug of cactus jooce, I'll also looking for stamp to mailing this letter.

In case I not finding stamp, just ignoring hole letter,

Respectibly yours,
Hashafisti Scratchi

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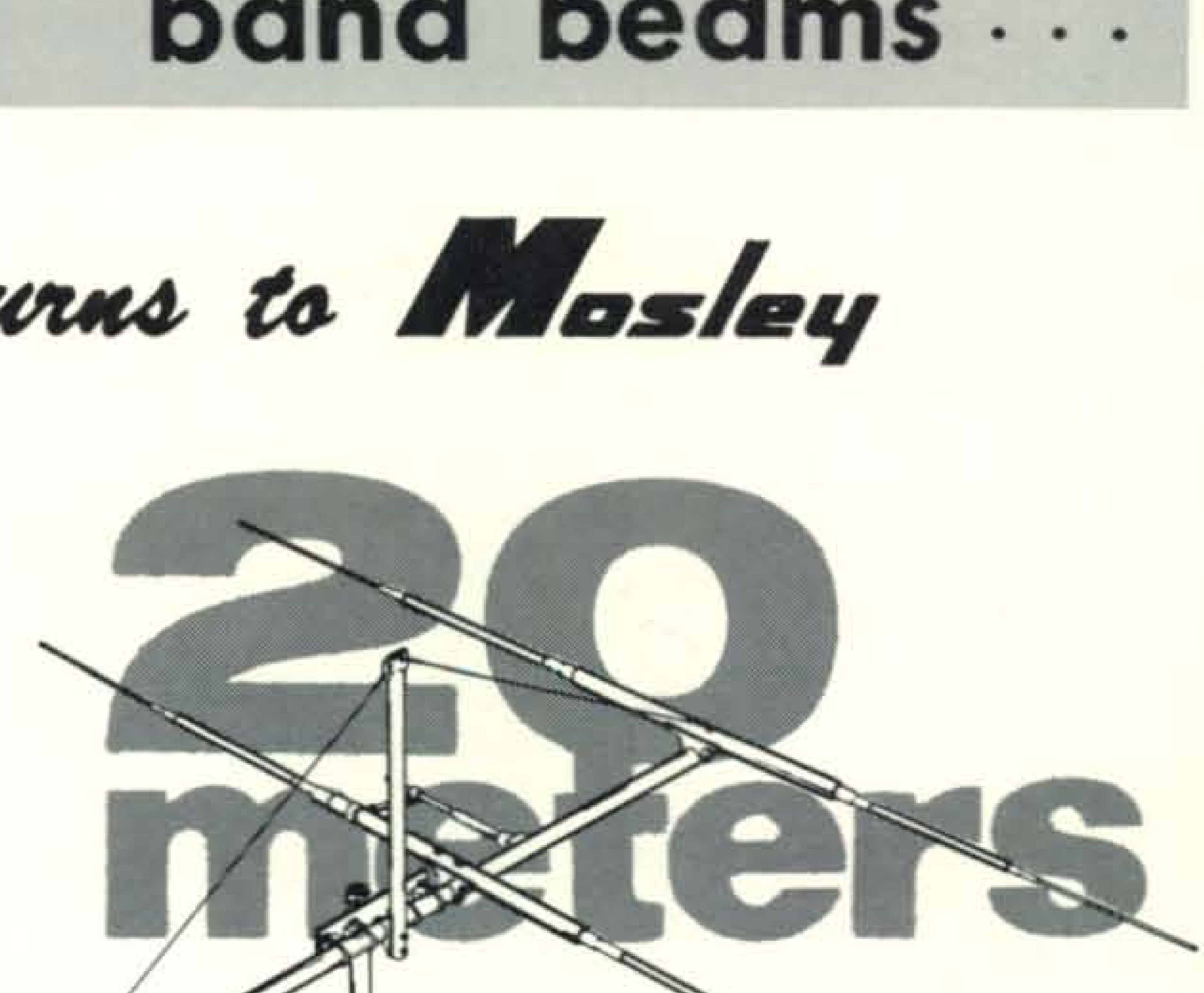
When hams discuss 'OPTIMUM SPACING' in single band beams . . .

. . . . The subject turns to Mosley

20 meters



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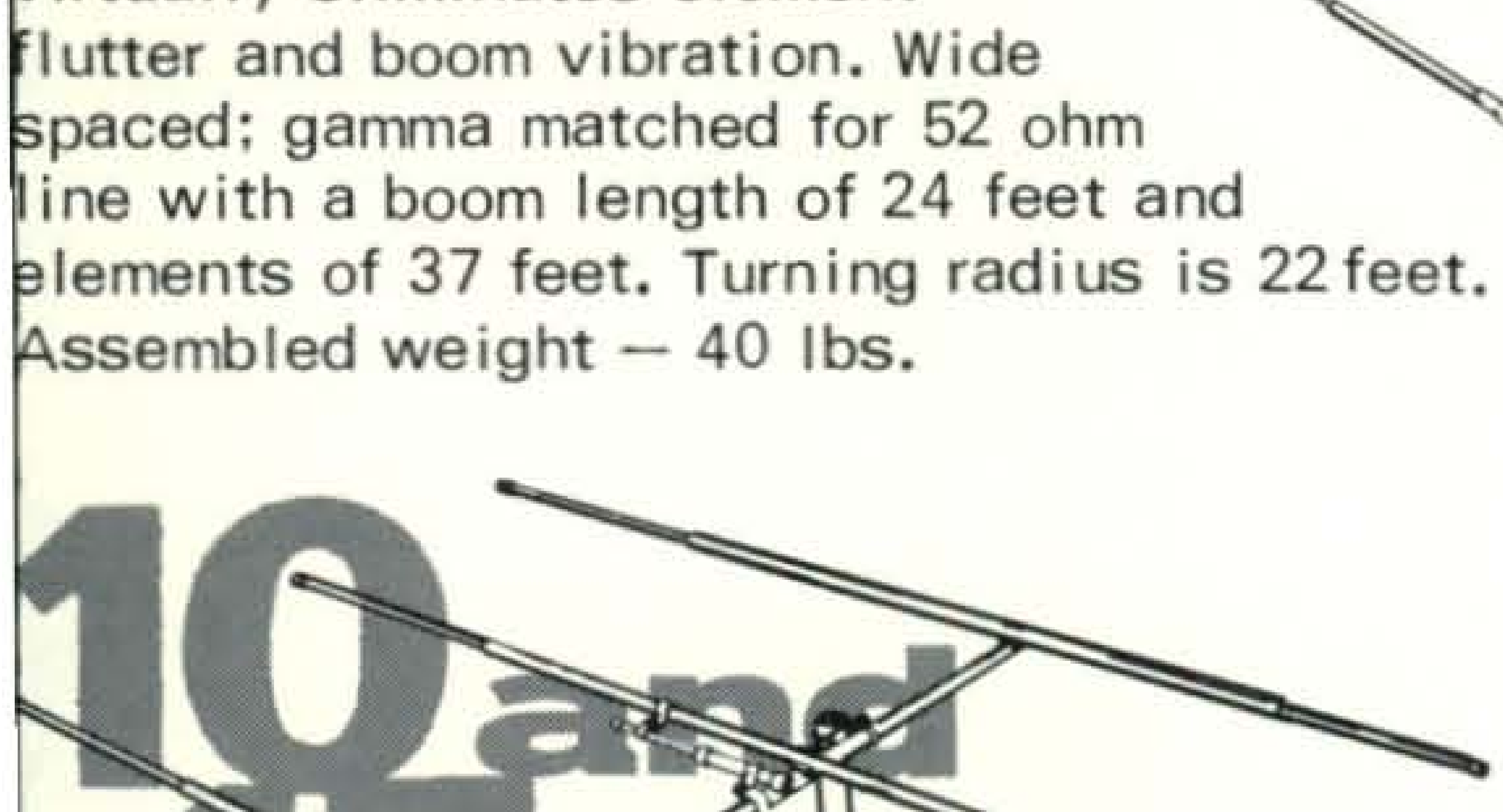
10 and 15 meters



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A RADICAL PROPOSAL PART II

BY RAPHAEL SOIFER, *K2QBW

In the February 1967 issue of *CQ*, I had an article published concerned with some of the effects which the current downward trend in amateur licensing might have on the future of ham radio and of amateur frequency allocations[1]. After examining several alternatives, I concluded that the most serious factor behind the licensing decline was (and is) the Class D Citizens' Radio Service. I then went on to propose a possible means for meeting this competition for potential recruits through the adoption of a short-term, non-renewable Restricted Class amateur license which would be granted without code test and would confer limited privileges in certain of our v.h.f. bands. The thought behind this was to create a new channel into ham radio in which the Restricted Class licensee would have two years to qualify for a permanent Technician Class license and continue to occupy the v.h.f. bands, or, at his option, continue to study for General Class and proceed up the incentive ladder.

As I had hoped, the proposal brought out into the open some enlightened discussion (as well as rather less heat than one might have thought) which, when viewed overall, tended to support the general premise that something serious has to be done soon about this growth rate problem. It is my purpose here to reconsider my February article in the light of this constructive criticism and to propose modifications.

By far the most common criticism, and very well founded, was that the amateur growth problem should not be considered apart from the problems which we know CB to be having. Rather than looking at the two services separately, perhaps it would be productive to consider them together as part of "the s.w.l./ham/CB dilemma", as Mr. Ferrell (Editor, *Popular Electronics*) phrased it. When this is done, it may be seen that a solution should really encompass the whole problem, and not just the amateur segment of it, in order to be truly effective. The Citizens' Band at 27 mc is horribly overcrowded. There are over 800,000 licensees using over 2,500,000 transmitters all on 23 crystal-controlled channels. To make matters worse, a number of hobbyists bent on using CB for recreational purposes create interference for the "legitimate" users. Repeated FCC attempts to secure compliance have had but limited success, for reasons which could have been foretold (and were) at the time Class D was created in 1958-59. I submit, ten years after the fact but nonetheless true, that 27 mc is the wrong place in the allocation table for the Citizens' Radio Service.

As a number of correspondents pointed out, although the Restricted Class license would offer 75 watts and legally unrestricted antenna gain to the ex-CBer, its appeal to the hobby-minded operator might not be as great as the present Class D simply because one cannot work on 146 mc the kind of DX which is naturally possible on 27 mc under "skip" conditions.

The original choice of 27 mc was influenced by two factors. One was the accupancy of that band by the ISM, or Industrial, Scientific and Medical Service, which, according to theory, would severely limit the band's usefulness for communications. Amateurs,

*60 Rockledge Road, Hartsdale, New York, 10530

1 Soifer, Raphael, "A Radical Proposal," *CQ*, February 1967, p. 19.

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th multiband stations, tended to go to mc rather than fight the diathermy sets 27 mc, but I think it fair to say that the perience of 27 mc during the last decade s proven its usefulness for long range voice nsmission, using perhaps as low power as e watts. The second reason was economic equipment for the 460-470 mc band then d now belonging to Classes A and B was ore expensive than for eleven meters. However, times and techniues are changing, and h.f. gear would cost little enough today if ade in large-enough quantities to permit reamination of the entire eleven-meter question.

Thus Part II of the Radical Proposal: Recate Class D to a suitable portion of 460-0 mc now allocated to the Citizens' Radio rvice. This could be combined with an inease in the number of channels—100 annels would take up but one megacycle—hich would help to alleviate the CB overowding problem. It would permanently minate the opportunity for noncommercial nspheric "skip" communication by anyone cept an amateur.

I recognize that under present CB regulans "skip" is unlawful. It is also unavoidle, given the present condition of the ionohere, and thus the FCC regulation against it about as realistic as those of King Canute. propose that we enlist nature on the same le as the law in making CB a place for ort-range, non-hobby communication, and aving the DX to the amateur bands.

The key to this relocation proposal is in e timing: Rather than requiring that all Bers move to 460 mc immediately, I propose that FCC do in this case what it has en fit to do in a wide variety of other cases which equipment obsolescence figured as major factor—allow sufficient time for the itch to enable present station licensees to nortize their investment in present equipent. Most recently, this was done in the alkie-talkie case, where present owners of 7 mc equipment under 100 milliwatts were ven a period of years to move to 49 mc. was also done in the various f.m. channellitting cases and in the marine a.m.-to-s.s.b. vitchover. Specifically, my proposal is as llows:

1. Beginning two years after the date of adoption, no new Class D station licenses would be issued for 27 mc. This cut-off would also apply to new units of exsting base stations. New licenses would be issued for 460 mc only.
2. Seven years from the date of adoption, all CB operation on 27 mc must cease.

The first provision would allow a two-year period during which 27 mc equipment could still be sold and licensed, giving manufacturers time to deplete existing stocks and to prepare the new 460 mc equipment for the market. The second would guarantee that each user of 27 mc equipment, even if he purchased it on the last day before the cut-off, would still have five years to use it and to derive its value as an investment. Operation of Class D on 460 mc would, of course, begin as soon as the first licenses are issued two years after the adoption of this proposal by FCC, and would build gradually until the 460 mc band assumes the full load seven years after adoption.

I will not discuss here what should be done with the 27 mc band after it ceases to be a CB allocation, but I am sure that FCC will be able to allocate it to a service having long-range communication requirements. Perhaps the ham readers of this article will have their own ideas about this subject.

[*Continued on page 114*]

Amateur Emergency Communications

An impression seems to have gotten around that my earlier article advocated the abolition or de-emphasis of amateur interest in emergency traffic handling on the ground that CB can do the job better. What I did say and still maintain is that amateur radio faces difficult competition from CB in the short-haul traffic mission as a result of smaller number as well as certain inherent advantages of CB regulations and equipment.

As an old traffic man myself, I certainly did not mean that amateurs should run from this competition and abandon the field to CB. Although the importance of amateur emergency traffic work to the public interest may show a *relative* decline over time as a result of the fact that amateurs face increased competition, and of the fact that commercial services are always gaining in reliability, we owe it to ourselves and to the public whose airwaves we use to accept this as a challenge. As W1NJM observed in December *QST*, amateurs have advantages too. Let's sharpen and use them!—R. S.

THE MONICEIVER REVISITED

BY DAVID F. PLANT, *K9LAJ/2

The author discusses some revisions and modifications to upgrade the Moniceiver.[1] These include a case and panel, multiple fixed frequency, continuous tuning, "S" meter, noise limiter switch, pilot lights and transceiver operation.

BECAUSE Club Project Moniceiver[1] was to be built by many people with varied skills in building, its construction was kept as simple as possible, consistent with good design practice. However, once the various owners got them in their shacks, several changes, or modifications, if you will, startec happening. It found a cabinet, a few circui refinements, and in one case, became th tunable receiver portion of a 6 meter trans ceiver. These modifications will be discussec in this article starting with the simple anc working toward the more complex.

* 5 Weehawken Street, New York, New York 10014.

1 Plant, David F., "Club Project: The Moniceiver," *CQ*, January 1968, page 34.

Front view of the Moniceiver combined with the transmitter, shown in fig. 7, for transceiver operation. The continuous tuning for the receiver covers 49.6 mc to 53.00 mc. The transmitter section is on the right and the meter on the left is used as the "S" meter for RECEIVE and the plate current meter in TRANSMIT.

Perhaps the most common addition to th Moniceiver chassis is a front panel. This eas and useful addition does much to dress u the unit and also provides a place to moun components such as switches, "S" meters and pilot lamps. If the tunable feature is con sidered, the panel is necessary to provid suitable mounting for a vernier dial.

The panel measures 5 inches wide by 5¼ inches high and is made of aluminum. Tw

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holes are drilled to fit the control shafts, and the nuts holding the controls will also fasten the panel quite firmly.

The enclosure is formed of aluminum stock in an inverted "U" shape as shown in the photo. Some of the club members left a quarter inch lip around the front panel to provide some protection to the squelch and volume controls and enhance the Moniceiver's appearance. Holes should be drilled along the sides of the enclosure above the chassis line, and on the top to provide cooling for the unit. The enclosure is held to the Moniceiver chassis by 4 self-tapping screws through the sides of the enclosure.

A small speaker can also be mounted in the enclosure by placing it toward the rear along the top of the enclosure. An area should be cut out of the cabinet to allow sound from the speaker and this area should then be covered with a speaker grill cloth or perforated aluminum to protect the speaker. An alternative to cutting out an area of the enclosure for the speaker would be to drill many holes for the speaker output. In any case having the speaker mounted within the cabinet is a definite convenience.

Multi-channel Operation

As the Moniceiver was designed as a club project with one specific club frequency in mind, crystal switching in order to cover more than one channel was not considered necessary. A few of the club members were, however, engaged in other activities such as CD, mobile, or MARS operation and decided to add the components for this purpose.

Multi-channel operation is made possible by adding more crystal sockets and crystals, and a single pole multi-throw selector switch. If two channels are needed a simple s.p.d.t. slide or toggle switch may be employed, while more than two channel work requires a rotary switch with as many contacts as desired

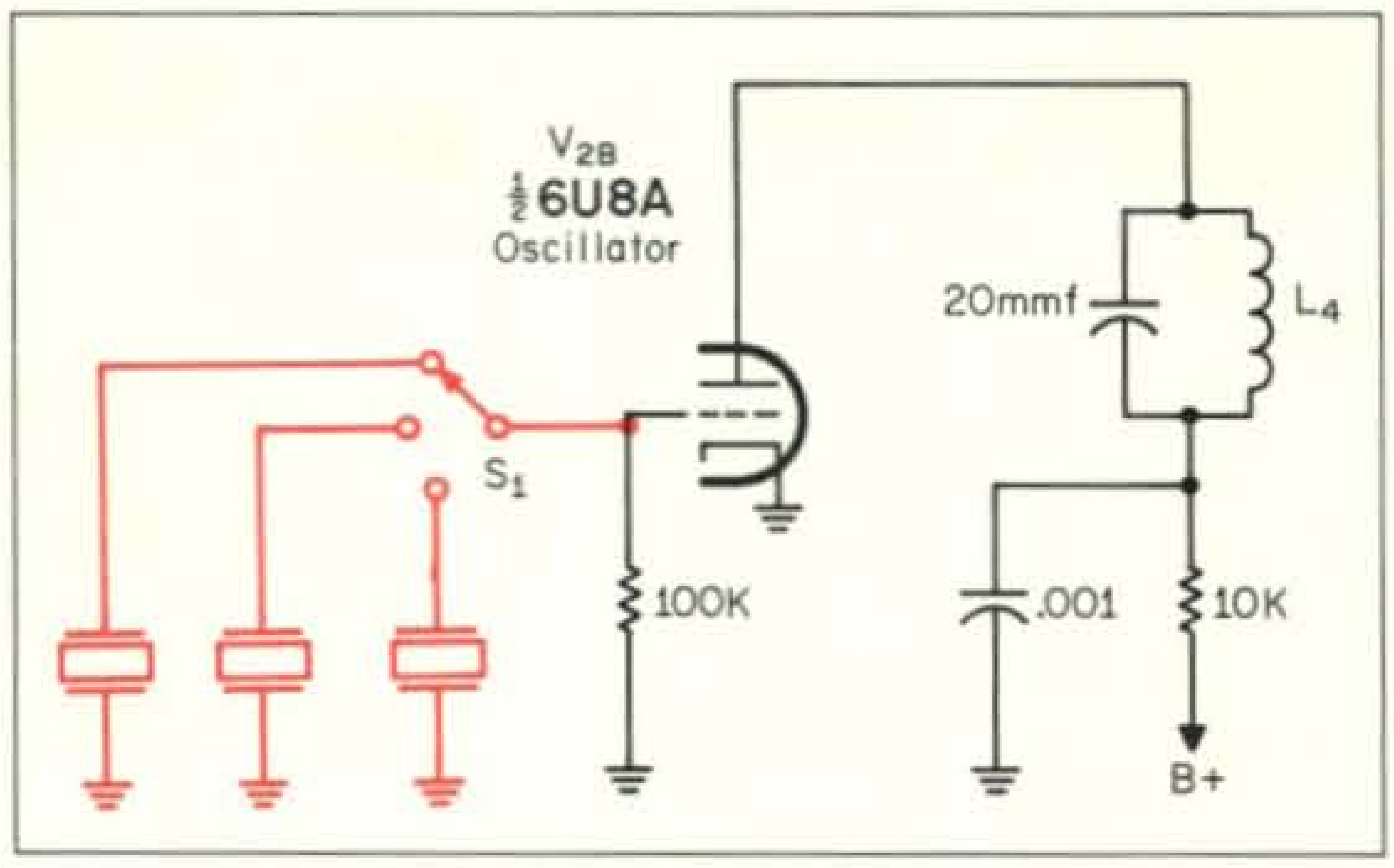

Fig. 1—Circuit showing how multiple crystal switching is accomplished. If more than three crystals are used S_1 will have to have additional positions.

frequencies. Figure 1 shows the wiring for a three frequency unit.

Pilot Lamps

A simple but useful addition to the Moniceiver is a pilot lamp, and there are several approaches that can be used. If the receiver is to be used with only one filament voltage (either 6 or 12 volts) the wiring consists only of connecting the proper voltage bulb across the filament circuit. If the 6 or 12 volt feature is to be retained, the wiring for the pilot lamp should be brought out to an unused pin on the Moniceiver power plug and jumper-connected to the appropriate filament pin at the power supply. This method requires changing the bulb when the filament voltage is changed. Figure 2A illustrates suggested wiring for this method.

The second method of installing a pilot lamp is to use a neon lamp powered from the B plus supply. This approach allows the pilot lamp to be independent of the filament voltage circuit so a bulb change is not necessary whenever the filament voltage is changed. A safety feature is also built in because the bulb serves as a reminder that the plate voltage is on.

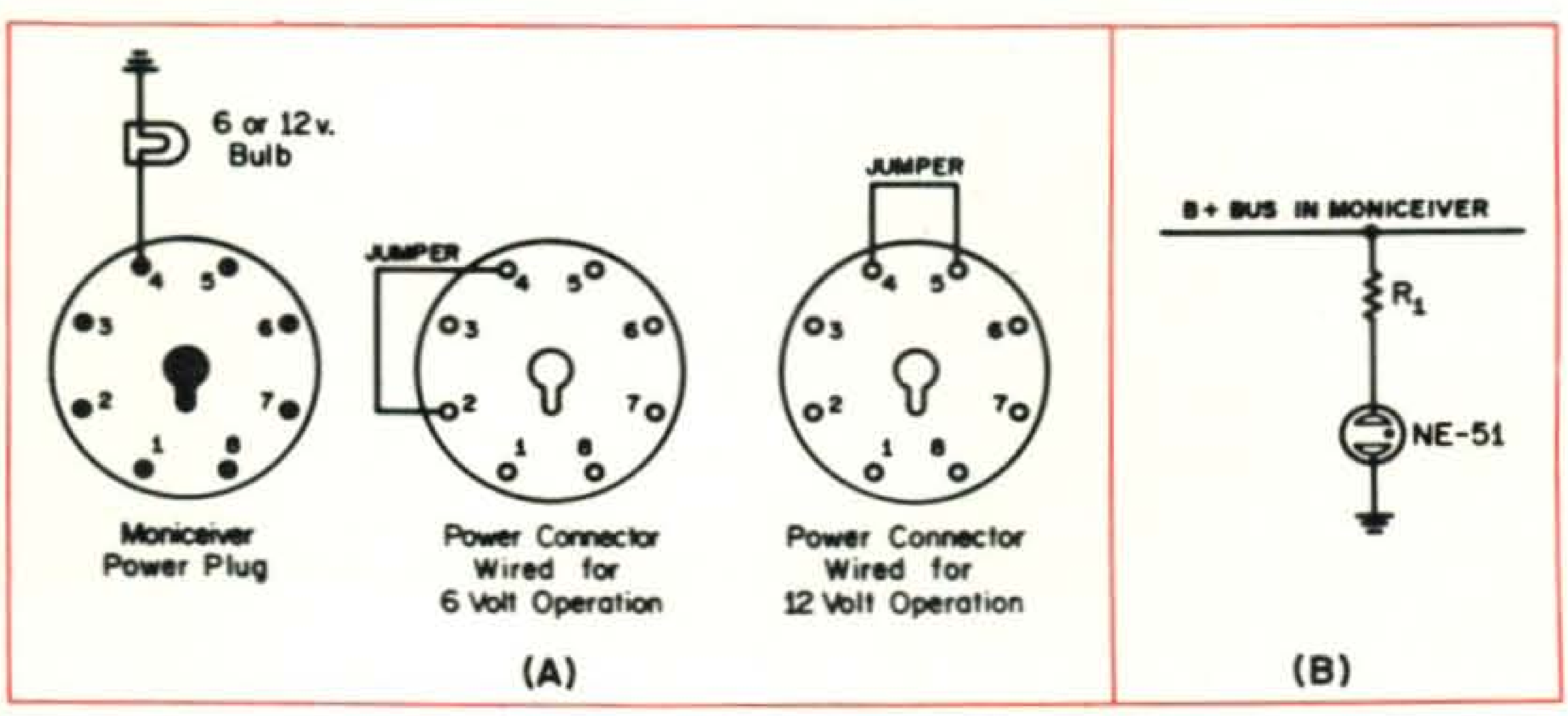

Fig. 2 — (A) — Method of connecting a 6 or 12 volt pilot lamp to Moniceiver. For 6 volts a #47 bulb is used; for 12 volts a #53 is used. (B)—Simple method of connecting an NE-2 or similar neon bulb across the B plus line. Resistor R_1 would be approximately 100K.

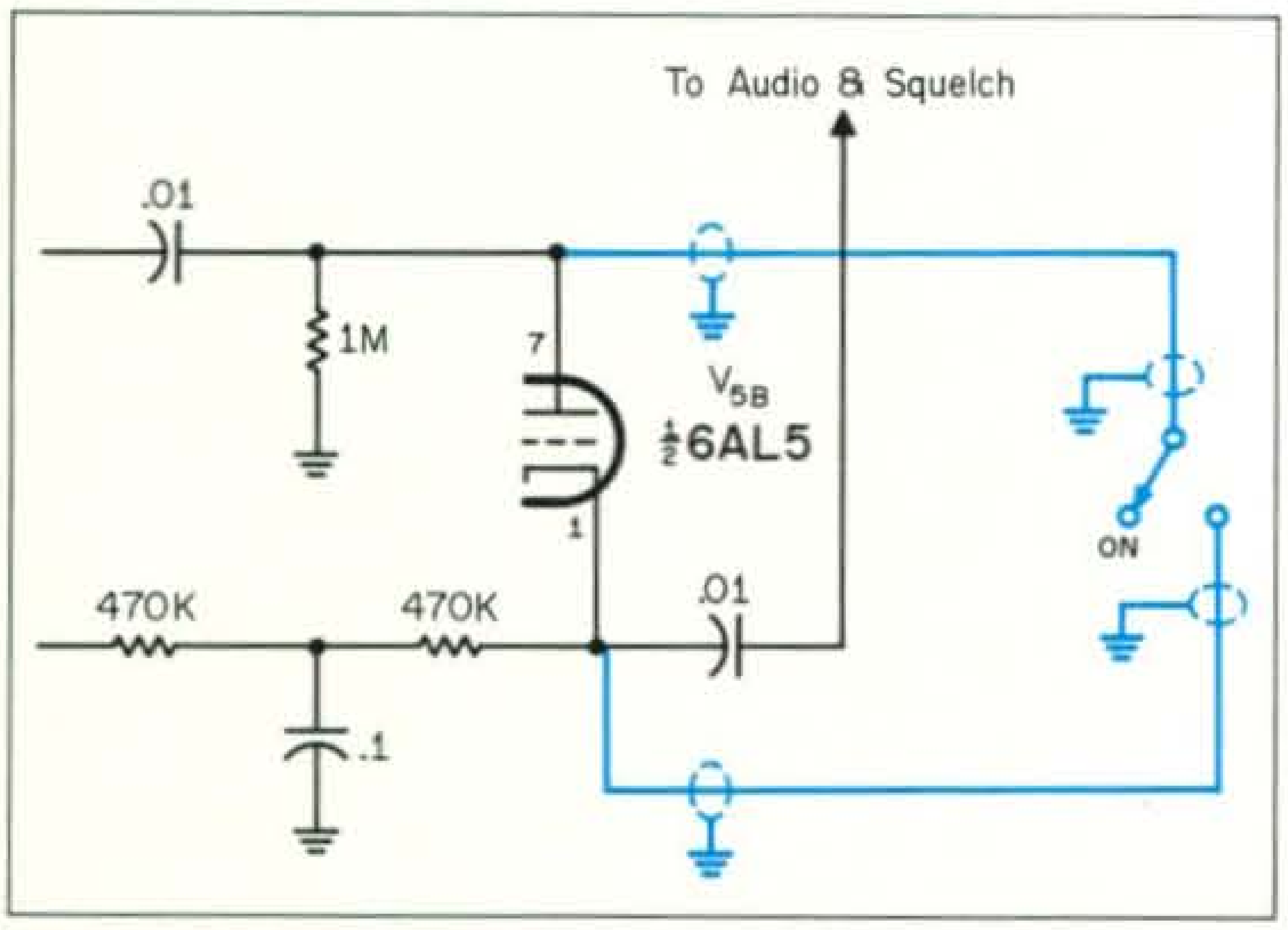

Fig. 3—Method of adding a noise limiter On-Off switch. The switch is shown in the On position.

Figure 2B shows the wiring for the neon lamp. Resistor R_1 is used to limit the current flow when the bulb ionizes. The value of R_1 is usually several megohms and can be determined experimentally, depending of the degree of brightness required and the type of neon lamp used.

Noise Limiter Switch

Adding a switch to the noise limiter circuit is actually more of a refinement than a modification, for it allows the noise limiter to be bypassed if not needed. Without it there is a slight increase in audio output and improved fidelity. (It also serves as good indication of how well the limiter actually *does* work.)

The wiring consists of running two shielded wires to a front panel mounted switch, as per Fig. 3. When the switch is in the OFF position (closed) the noise limiter circuit is defeated, thus disabling it. Turning the switch to the ON position allows the limiter to function normally.

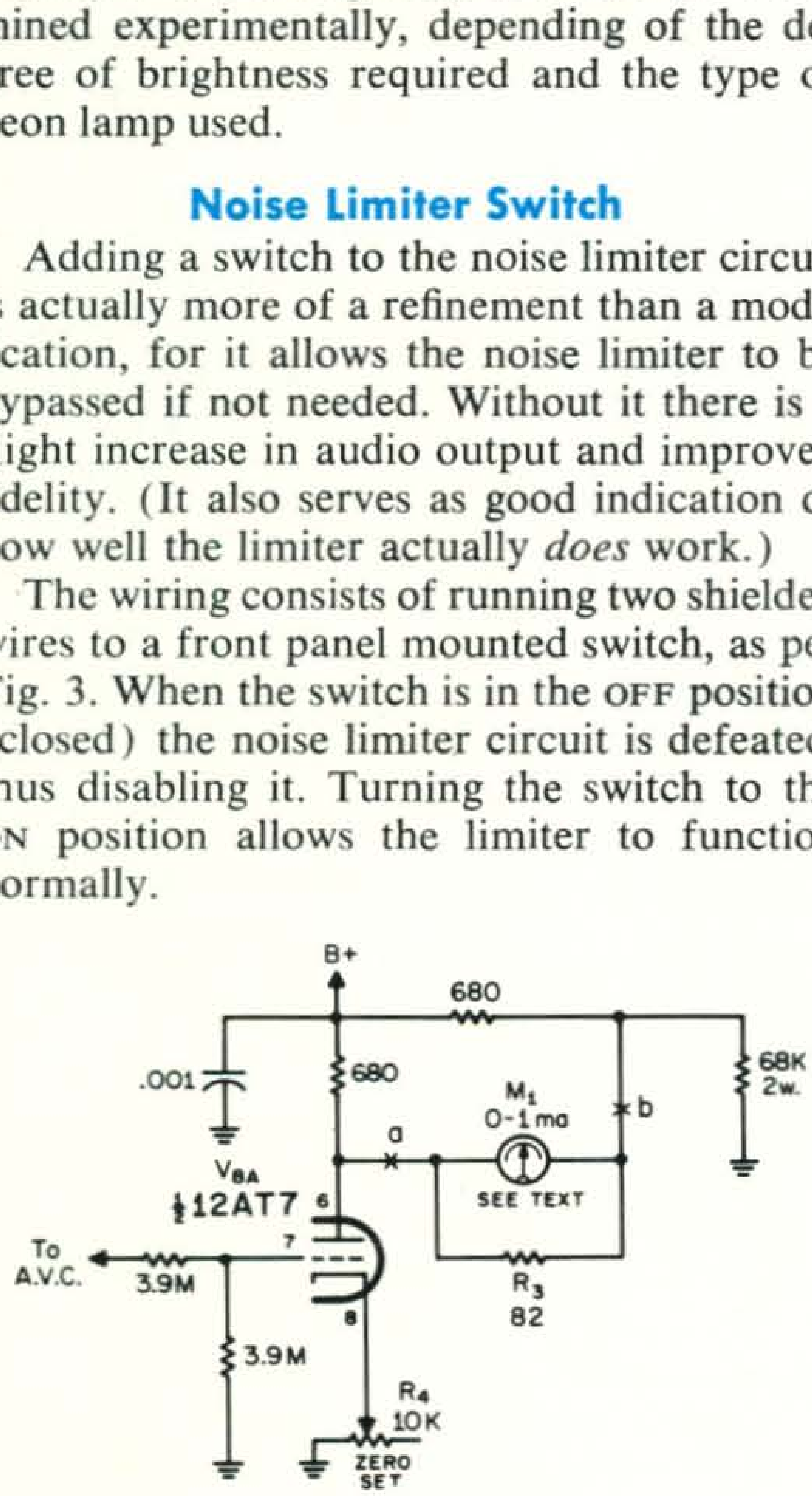

Fig. 4—Circuit used to add the S meter to the Moniceiver. The meter may be switched at the points marked × if M_1 is to be used to measure the plate current of the transmitter section (fig. 6).

"S" Meter Circuit

Although certainly not essential to the function of the Moniceiver, an "S" meter is a very useful addition. With it, comparative signal reports can be given for testing antennas and transmitters, and it also can be an aid in aligning the receiver by giving a visual indication of proper i.f. and front end tuning.

Figure 4 shows the "S" meter circuit found best with the Moniceiver. It proved to be more stable and sensitive than the circuits without the a.v.c. amplifier tube, and required a minimum of adjustment once installed. Tube V8A can be a triode such as a 6C4, or triode section of a dual tube like a 12AT7. The latter is recommended if the addition of tunable operation is contemplated (see next section), for the 12AT7 works well as an oscillator and has filament provision for 6 or 12 volt operation. Filament wiring for the 12AT7 is shown in fig. 6.

The zero set control is a 10K potentiometer, and is mounted anywhere on the chassis. When the wiring is completed, adjust R_4 for zero "S" reading on the meter with the antenna disconnected. Connecting the antenna should cause an increase in the meter reading. Then apply a strong signal such as the station transmitter to check the top end of the meter scale. With the strong signal the meter should not quite "pin", or show maximum reading. If the meter doesn't show a high enough reading increase the value of R_3, and if the meter appears too sensitive decrease the value of R_3. Eighty two ohms worked well for the meter used in the author's receiver.

Tunable Oscillator

The Moniceiver was intended for single frequency monitoring so a crystal controlled oscillator was chosen for stability and reliability. Some Moniceiver owners wanted the receiver to perform regular receiver duty as well as monitoring, so the tunable oscillator circuit shown in fig. 5 was added to be used instead of the original local oscillator. The circuit chosen is the Clapp type, and it allows about two megacycles of the 6 meter band to be covered. The additional circuitry is minimal and easy to adjust. Tube V8B is the other half of the dual triode 12AT7 discussed in the previous section on "S" meters, or 6C4.

The mounting of the tuning capacitor, C, should be the first step. Since part of the stability of the oscillator is dependent on the mechanical rigidity of the tuned circuit, car

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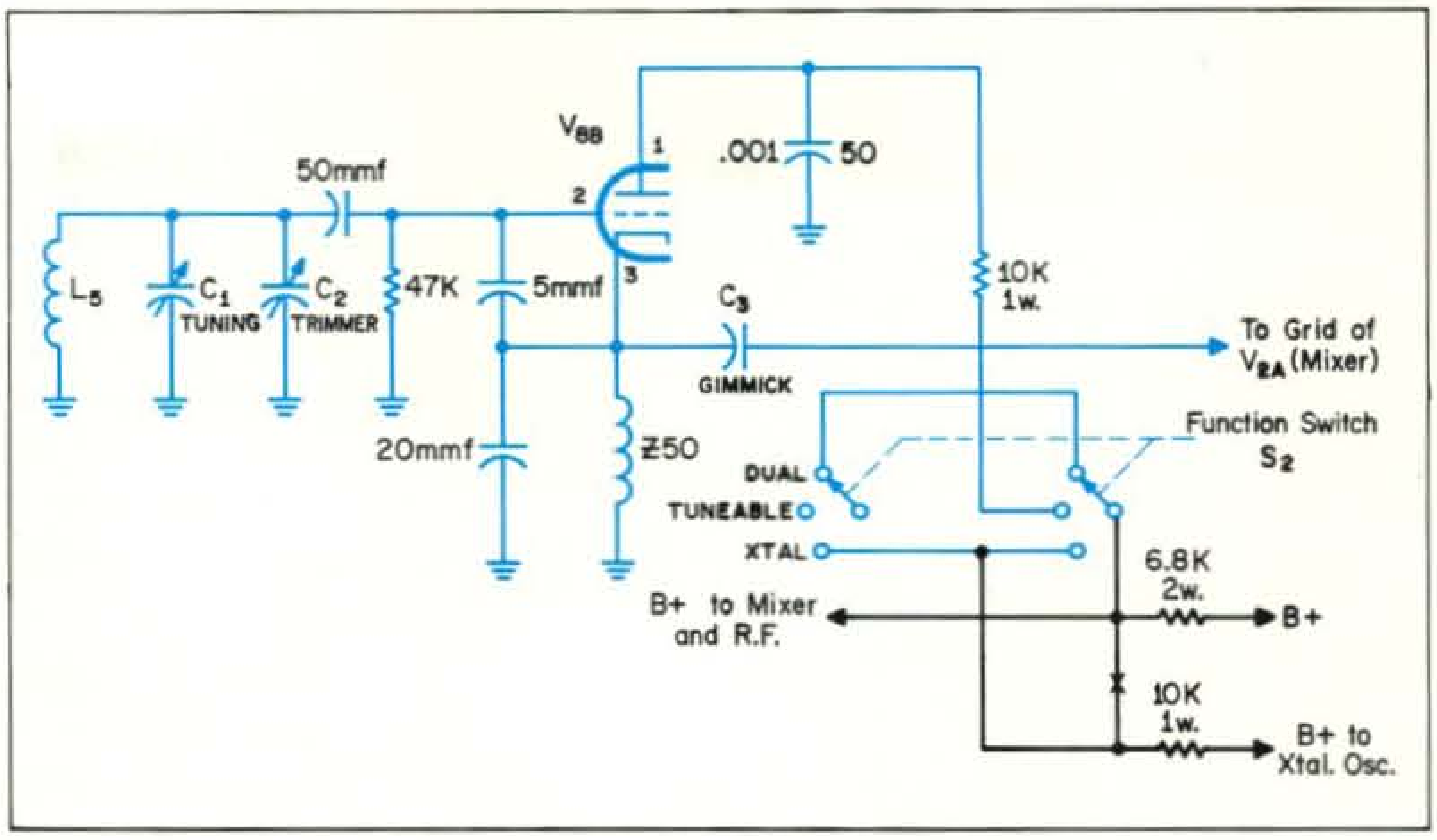

Fig. 5—Circuit of a tunable oscillator that converts the Moniceiver to a unit capable of tuning 2 mc of the 6 meter band. The selector switch chooses the crystal oscillator or the tunable oscillator or *both* as explained in the text.

C_1—HF-15, with one rotor and one stator
C_2—4.5—25 mmf band set capacitor.
C_3—Gimmick; 3 twists of hookup wire.
L_5—6 t. #18 e. ½" dia., ⅝" long.
S_2—2 pole 3 position rotary switch.

should be taken with this mounting. Any number of vernier tuning mechanisms can be used, the most popular being the Millen, National, and Jackson Bros. dials, and the location of the tuning capacitor is dependent upon the type of dial selected. A tube socket and selector switch (TUNE or CRYSTAL) will also be required

The bandset trimmer, C_2, and the coil, L_1, are mounted on the tuning capacitor above the chassis The lead from this tuned circuit should be as short as possible and made of stiff wire passed through the chassis with a grommet and tied to the grid circuit capacitor at a terminal strip.

Oscillator injection to the grid of the mixer is through a gimmick capacitor made of several turns of hookup wire. This allows the amount of oscillator injection to be adjusted for best reception.

The oscillator tunes approximately two megacycles and coverage should be adjusted so the low end of the tuning range is around 49.5 mc. This allows a margin and also facilitates coverage of the MARS frequency below the 6 meter band. The oscillator tunes 1.5 mc (1500 kc) below the incoming signal frequency so it should tune 48 to 50 mc to cover 49.5 mc to 51.5 mc. The oscillator is set to frequency by the trimmer, C_2.

The Moniceiver coils, L_2 and L_3 should be stagger-tuned, one peaked around 50.3 mc and the other around 50.8 mc for best coverage of the popular portion of the 6 meter band.

An interesting phenomenon occurs when the crystal and the tunable oscillators are working simultaneously, for the receiver is then actually capable of monitoring two frequencies *at the same time*. The combined injection voltages of the two local oscillators does increase the noise level in the mixer stage, giving some loss of sensitivity, but for local work the performance is satisfactory. Also it will be noted that when two signals are being received at the same time there will be a heterodyne, just as if they are on the same frequency. This should be no problem because when a signal is heard the receiver can then be switched to single frequency reception.

Switch S_1 has to be a double pole triple throw rotary in order to enjoy the dual channel monitoring function of the Moniceiver. One section selects either the tunable or crystal position by switching B plus to the desired oscillator. The second section of the switch connects the B plus to both oscillators simultaneously for dual channel monitoring. Figure 6 shows the tunable oscillator circuit with the dual monitor feature.

Transceiver

The 6 Meter transceiver is actually a separate transmitter and receiver mounted behind a common front panel. The receiver portion is the Moniceiver chassis with the "S" meter, pilot lamp, and tunable oscillator added as described; the transmitter is a simple 10 watt unit built on an identical size chassis.

The transmitter circuit shown in fig. 6 was chosen to keep construction as simple as possible. The crystal oscillator is the popular and dependable Colpitts type with its plate circuit tuned to the third harmonic of an 8.3 mc

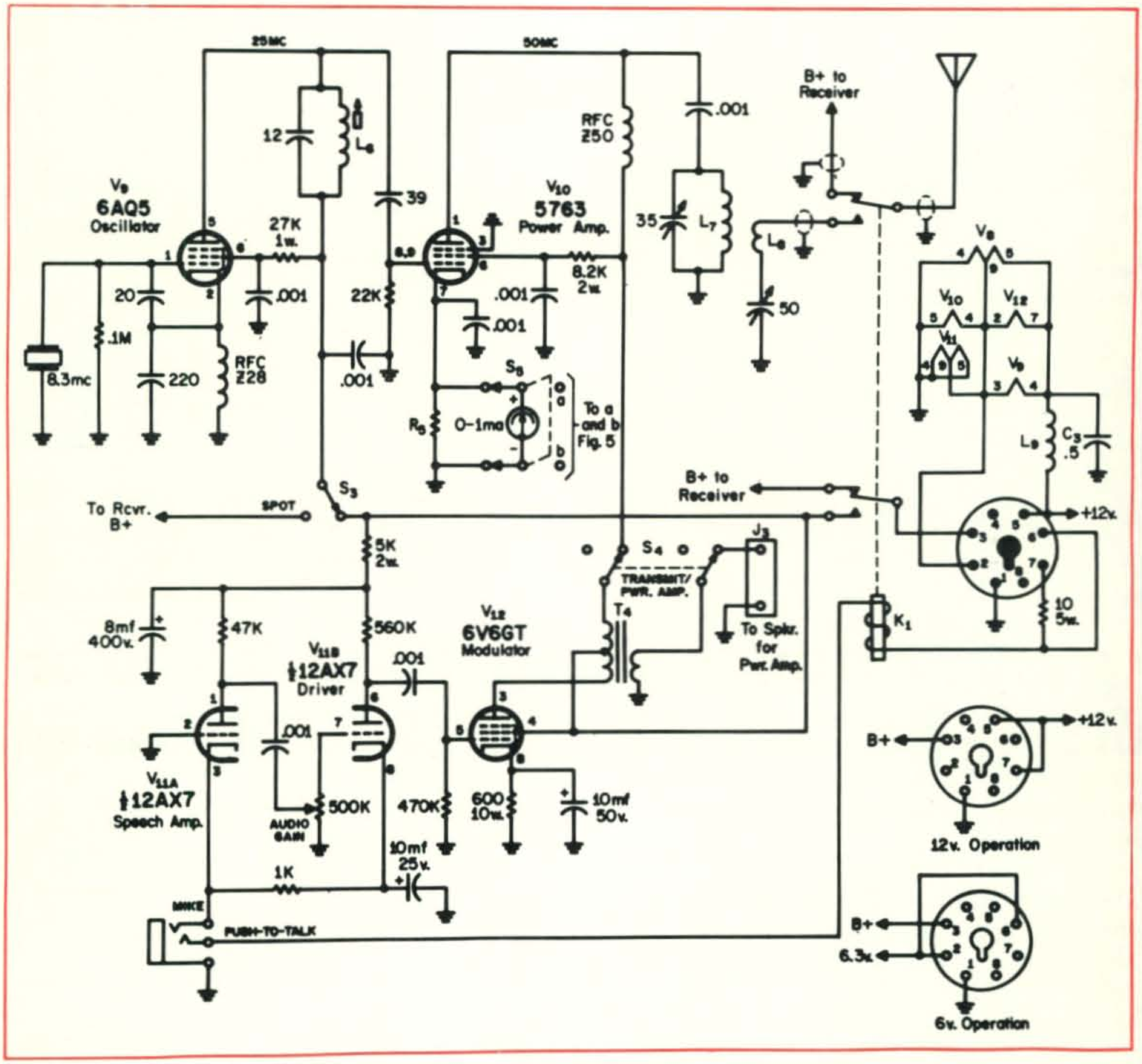

Fig. 6—Circuit of simple 6 meter transmitter that can be built alongside of the Moniceiver to provide transceive performance. The power supply may be a d.c. to d.c. inverter for mobile or an a.c. type for fixed operation.

K_1—d.p.d.t. 6 v.a.c. relay.
L_6—7 t. #20 e. close wound on a ½" dia. slug tuned form.
L_7—6 t. #20 e. ½" dia., ¾" long.
L_8—2 t. #20 e. over cold end of L_3.
L_9—30 t. #18 e. ½" dia. close wound.
R_s—Meter shunt, 1/100 of movement resistance (0.5 ohms for 50 ohm movement).
T_4—Triad M4Z modulation transformer or equiv.

crystal. This function is performed by a 6AQ5 which drives a 5763 doubler to 50 mc output. The ease of tuning, simplicity of circuitry, and stability were felt to justify the loss of output encountered when the final amplifier is not run straight-through.

Plate modulation of the final is accomplished by a 6V6GT running class A and a Triad M-4Z Modulation Autoformer. This transformer also has a low imp secondary so switch S_4 was added to disable the transmitter and connect the audio system to a loudspeaker so the rig could be used as a public address system. A 12AX7 serves as speech amplifier and driver, giving the carbon microphone operating current by placement in the cathode circuit.

Switching between transmit and receive is done by a small d.p.d.t. relay with a 6 v.a.c. coil. For 12 volt operation a small resistor is automatically placed in series with the relay coil at the power plug. The series-parallel wiring of the filament circuit also allows for 6 or 12 volt operation.

[*Continued on page 114*]

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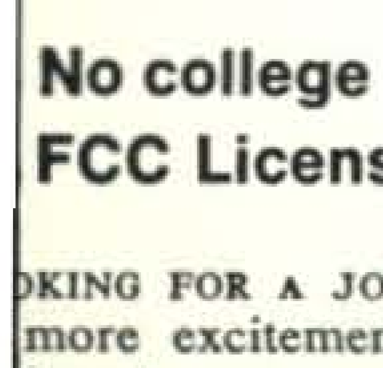

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For further information, check number 2, on page 126

A UNIVERSAL PASSIVE COMPRESSOR

BY JOHN J. SCHULTZ, *W2EEY/1

One usually reads of vacuum tube or transistorized compressors which can be used to regulate the audio or r.f. level in a transmitter in order to increase the average power. However, with a few resistors, capacitors and diodes, it is possible to build a compressor that requires no power supply. Performance is not as good as an extensive tube or transistor unit, but adequate for many applications.

THE value of signal compression has been proved many times over under weak-signal conditions. The argument of whether audio signal compression or compression of the modulated r.f. signal is best is still a bit cloudy, although the latter type seems to have the edge when a compressor is really carefully installed and adjusted. Those amateurs who have not yet tried either type might find the circuit described in this article a simple, but effective means to do so. Although it will work on audio or r.f. signals, trying it first between audio stages will prove simpler and it cannot upset any r.f. alignment adjustments. The effect when used with a transmitter without any a.l.c. or other type of distortion control is particularly noticeable.

* 40 Rossie St., Mystic, Connecticut 06355.

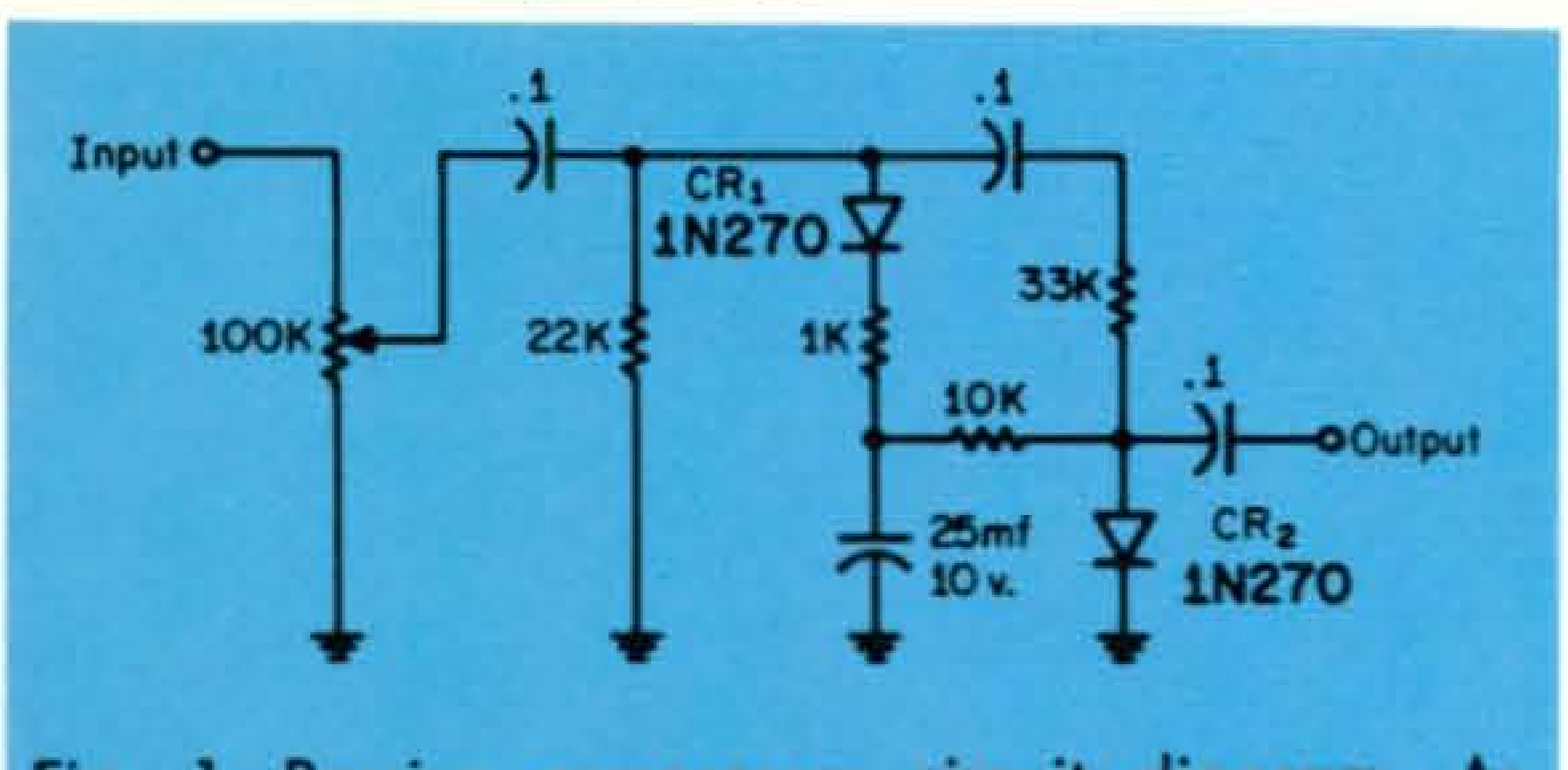

Fig. 1—Passive compressor circuit diagram. As noted in text, various other diodes such as 1N34, 1N54 or 1N538 may be used to vary compressor action. The basic circuit is applicable to use both as audio and r.f. compressor.

Circuit Description

Figure 1 shows the complete circuit of the compressor. The input potentiometer simply regulates the amount of signal input to the compressor; it may not be necessary when the unit is used between stages having their own gain or output controls. The 22K ohm resistor following the 0.1 mf coupling capacitor provides a load resistance for the input signal. The signal is then split. Part of it is rectified by the 1N270 diode, CR_1, and produces a filtered d.c. control voltage across the 25 mf filter capacitor. The other part of the signal passes through the 0.1 mf coupling capacitor and then is impressed on a load resistance consisting of the 33K ohm fixed resistor and the resistance of the second diode. The output is taken, through another 0.1 mf coupling capacitor, from across diode CR_2.

When only a low level signal occurs at the input to the compressor, very little d.c. control voltage is developed and the resistance of the output diodes remains relatively high. Most of the signal impressed across the load resistance consisting of the 33K ohm resistor and the diode, appears across the diode and thus at the output of the compressor. As the input signal level increases, however, more d.c. control voltage is developed, the output diode is increasingly forward-biased and its resistance and the output signal level drop.

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Thus, compressor action is achieved as the output remains relatively high for low level signal inputs but drops as the input level increases.

The operating characteristics depend very much on the diodes used and the signal levels at which they are operated. For instance, a diode operated at very low levels, in its so-called square-law response region, will have a characteristic as shown in fig. 2 (A). The output is proportional to the square of the input and at higher input level the response is linear; that is, the output is some constant figure times the input. Such action is desirable for the rectifier diode in the compressor as proportionately less control voltage is produced for low level inputs as for high level inputs. The characteristics of the diode used in the signal output divider can also be varied for best circuit action. Germanium diodes will generally show a fairly linear resistance change with bias voltage increases while other types, such as silicon as shown in fig. 2 (B), will exhibit high resistances at low voltage levels and a rapidly decreasing resistance at higher voltage levels.

Application As Audio Compressor

Most transmitters have an excess of gain in their audio channels as reflected by the low setting necessary on the audio gain control on most commercial transmitters. If some excess gain is available, the compressor circuit shown in fig. 1 can simply be inserted between stages in the microphone amplifier chain. Since a few volts of signal is necessary to obtain proper action, the compressor should be placed either between the first and second audio stages or after the second stage. Shielded leads can be brought out from the transmitter to the compressor if some experimentation is done on diode types to provide the most desirable compressor action. The time constant of the circuit can also be chosen by varying either the value of the 25 mf filter or the 10K ohm isolating resistor between the capacitor and the output diode.

The input level potentiometer on the compressor and audio gain level in the transmitter will interact somewhat as compression and level controls. Probably the easiest method of adjustment is to place the potentiometer on the compressor at mid-range while the normal audio gain control is set for full modulation. Then the compressor potentiometer can be adjusted during an on-the-air check for best operation while the audio gain is used to maintain full modulation.

Application As R.F. Compressor

The basic circuit of figure 1 can also be used as an r.f. compressor between stages that have some excessive gain. The operating voltages on the stages may have to be increased somewhat to provide enough gain to allow use of the compressor because of the loss it introduces. For low intermediate frequency amplifiers an input potentiometer may be used as shown, especially if it is of the miniature printed circuit type that can be adjusted with in insulated alignment tool. At intermediate frequencies, 9 mc for instance, no potentiometer should be used and the d.c. operating voltage on the stage feeding the compressor should be varied to regulate the input to the compressor.

The values shown for the coupling capacitors can be reduced to 0.01 mf as well as the

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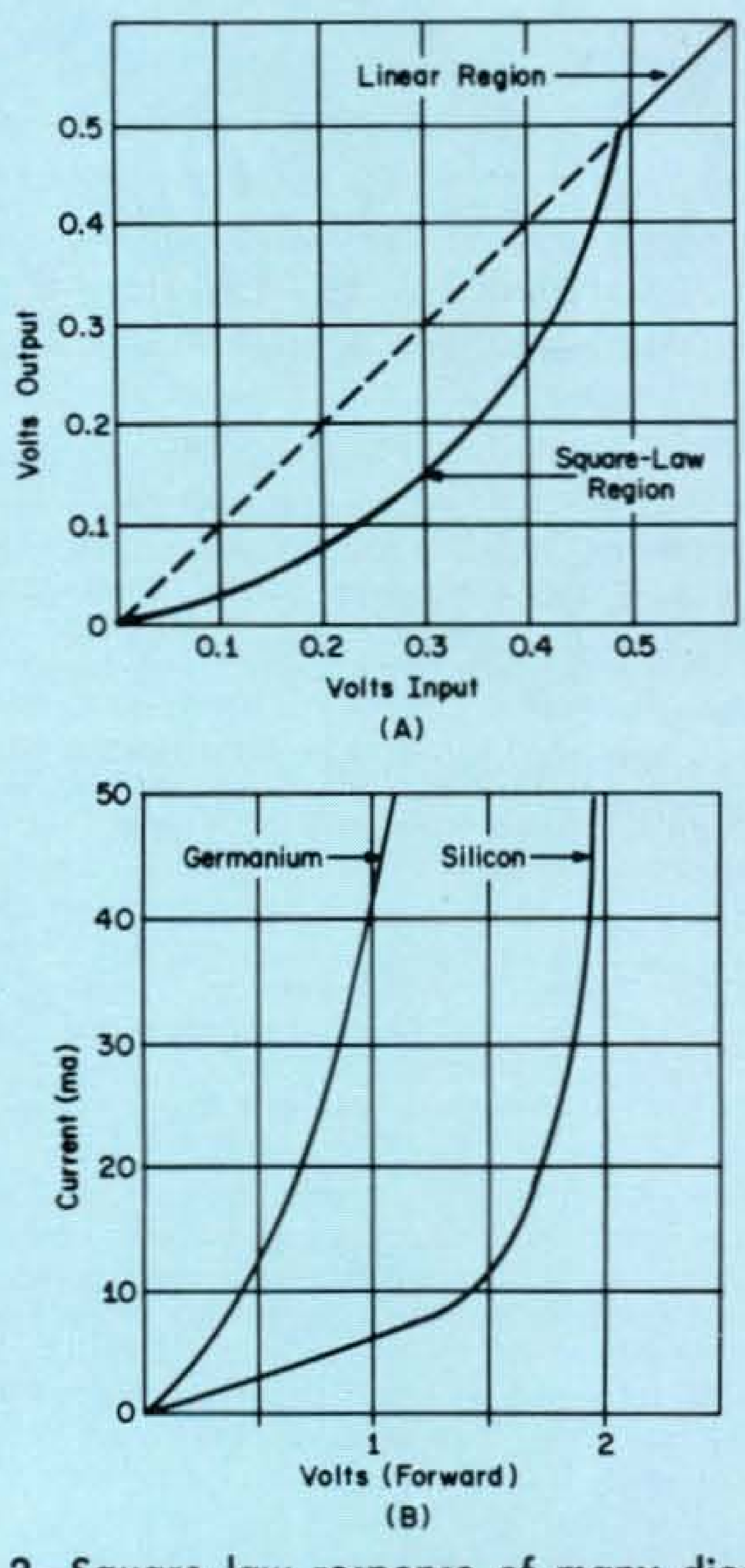

Fig. 2—Square law response of many diodes (A) makes them particularly useful as control voltage rectifiers. Resistance properties of diode types (B) can also be chosen to obtain desired compressor action.

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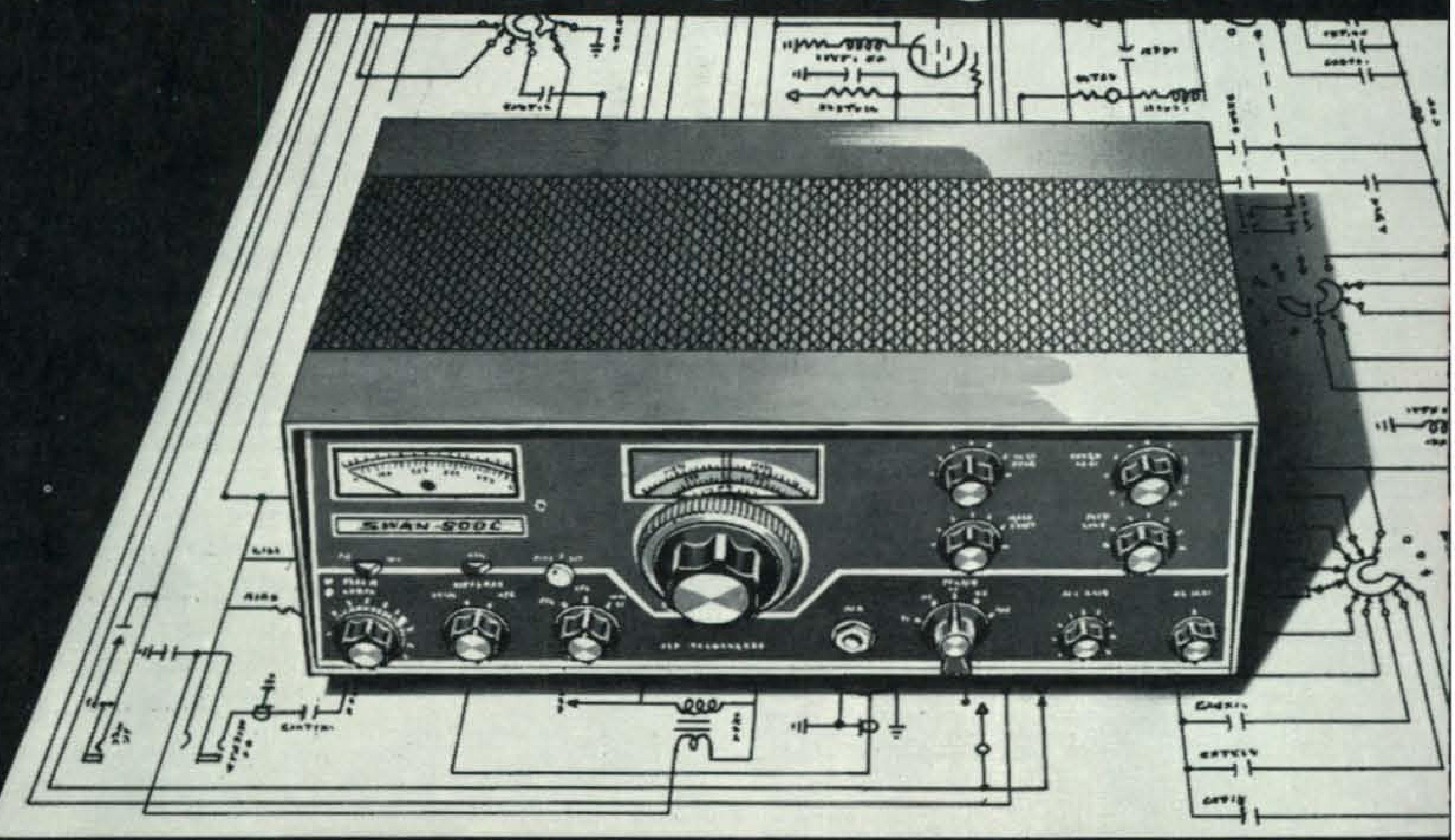

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CQ Reviews:

The Henry 2K Linear Amplifier

BY WILFRED M. SCHERER,* W2AEF

HAVING heard a lot about the Henry 2K-2 Linear Amplifier, we made a special effort to get hold of one to find out about it first hand. Happily, we were not disappointed, inasmuch as here is not only a solidly-built and efficient powerhouse with a good 2 kw p.e.p. input, but it also is one with excellent linearity and comparatively low intermodulation distortion. This is all realized through the use of two 3-400Z zero-bias triodes operating in parallel in a grounded-grid circuit with a tuned input for the cathodes.

The 2K-2 is a floor-console model in which the amplifier is installed at the top of the cabinet which houses a really husky power supply. Operation may be had throughout the 3.5-28 mc amateur bands using s.s.b., a.m. c.w. or RTTY. It also may be set up for use on frequencies outside of the ham bands.

Other features include: full-time plate meter and a separate multimeter for other readings; built-in s.w.r. bridge indicating forward and reflected relative power; instant operation (no delay required for warmup); immediate transfer between linear-amplifier operation or direct feedthrough from exciter alone; electrical and mechanical interlocks for safety of operating personnel; equipment protection with circuit breakers, fuses or overload relay; Pi-L output network adjustable with plate-tuning and loading controls equipped with illuminated dials, squirrel-cage type air blower; silicon rectifiers; choke-input filter with high-capacitance output; excellent dynamic voltage regulation; operation from 115 or 230 v.a.c., 50-60 c.p.s.; oversize com-

* Technical Director, *CQ*.

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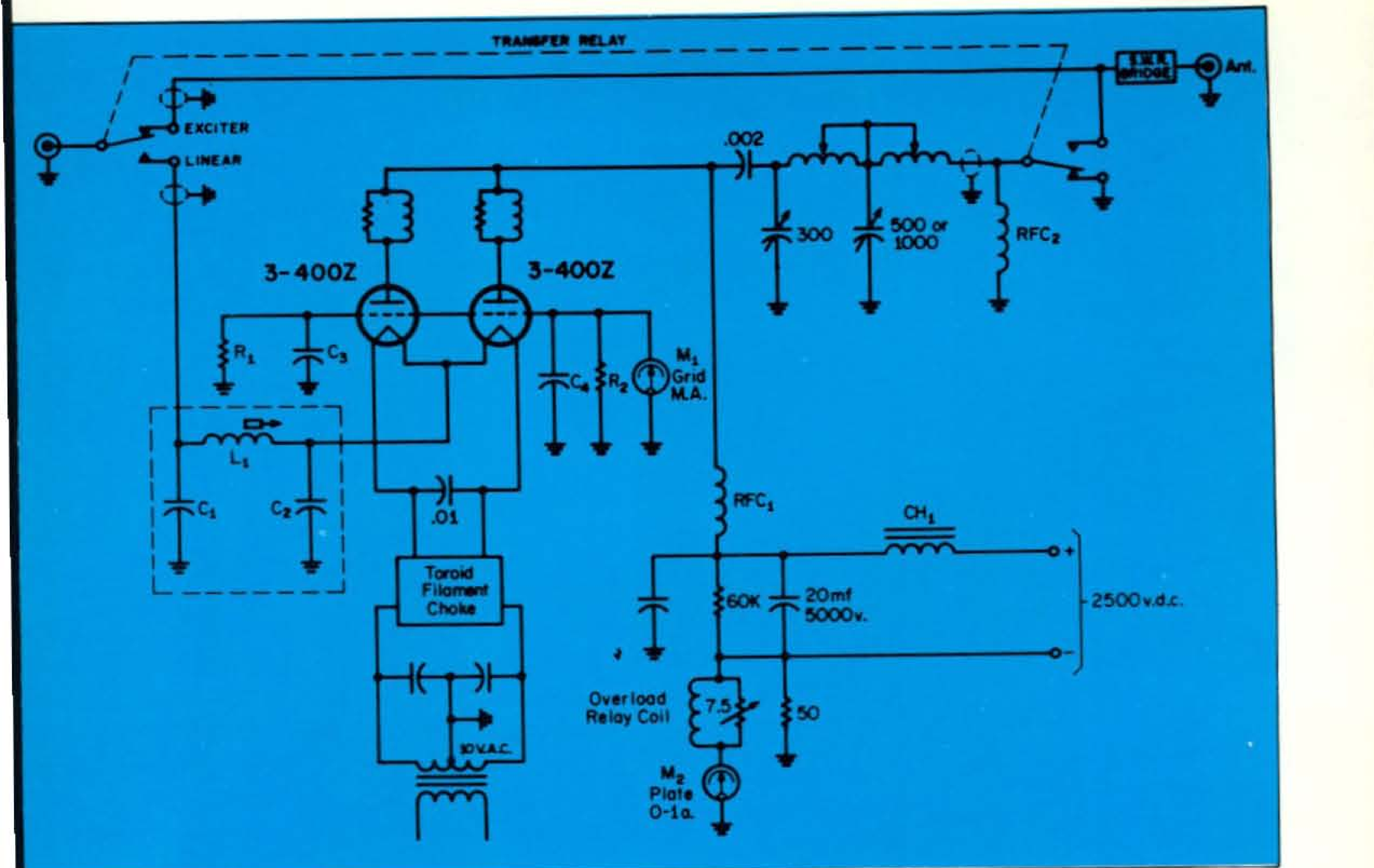


Fig. 1—Basic circuitry for the 2K-2 amplifier. Different modules for the various bands are switched in for the input Pi-section L_1, C_1-C_2. The r.f. excitation is applied to the mid point of the series-connected filaments. C_3-C_4 are .027 mf and R_1-R_2 are about 1.7 ohms (see text). Multimeter, M_1, is shown connected for grid current only.

onents; rugged commercial-type construction.

Circuit Details

Referring to fig. 1, excitation is applied to he cathodes (filament) of the tubes through fix-tuned Pi-network that has a 50-ohm nput impedance. Separate networks are used or each band and are sufficiently broadanded to cover each range without retuning. hey are contained in individual shielded nodules. The advantages of the tuned-cathde input over an untuned affair is that the mplifier is easier to drive and the distortion roducts can be held to a lower level.[1]

The tube cathodes are maintained above .f. ground by a bifilar toroid-wound choke in ach leg of the filament supply. The power equirements for the filament of each tube are volts @ 15 amperes; however, the filaments or the two tubes are connected in series cross a 10-volt supply, so the total current maintained at 15 amperes, rather than 30 amperes as would the case with a parallel connection for 5 volts. The lower current requirement thus eliminates the need for extra-large connecting leads, reduces heating in conductors or at certain connections and places less stringent requirements electrically and physically on the toroid filament choke and the power transformer.

In order to provide a means for reading grid current while maintaining freedom from instability that might be caused by parasitics, the grids are maintained at r.f. ground through a minimum amount of reactance using two 10-ohm composition resistors at each of the three grid terminals for each tube and with three .003 mf bypasses at the same points.[1] There are 12 resistors all told and since they are in parallel, the total resistance is about 0.8 ohms, the voltage drop across which, as a result of grid-current flow, is indicated by the meter calibrated in terms of current. Stability is further enhanced with a parasitic suppressor at each tube plate.

The Pi-L output tank facilitates an optimum impedance match to the tubes and im-

[1] Orr, Rinaudo, Sutherland, "The Grounded-Grid inear Amplifier," *QST*, Aug. '61, page 16.

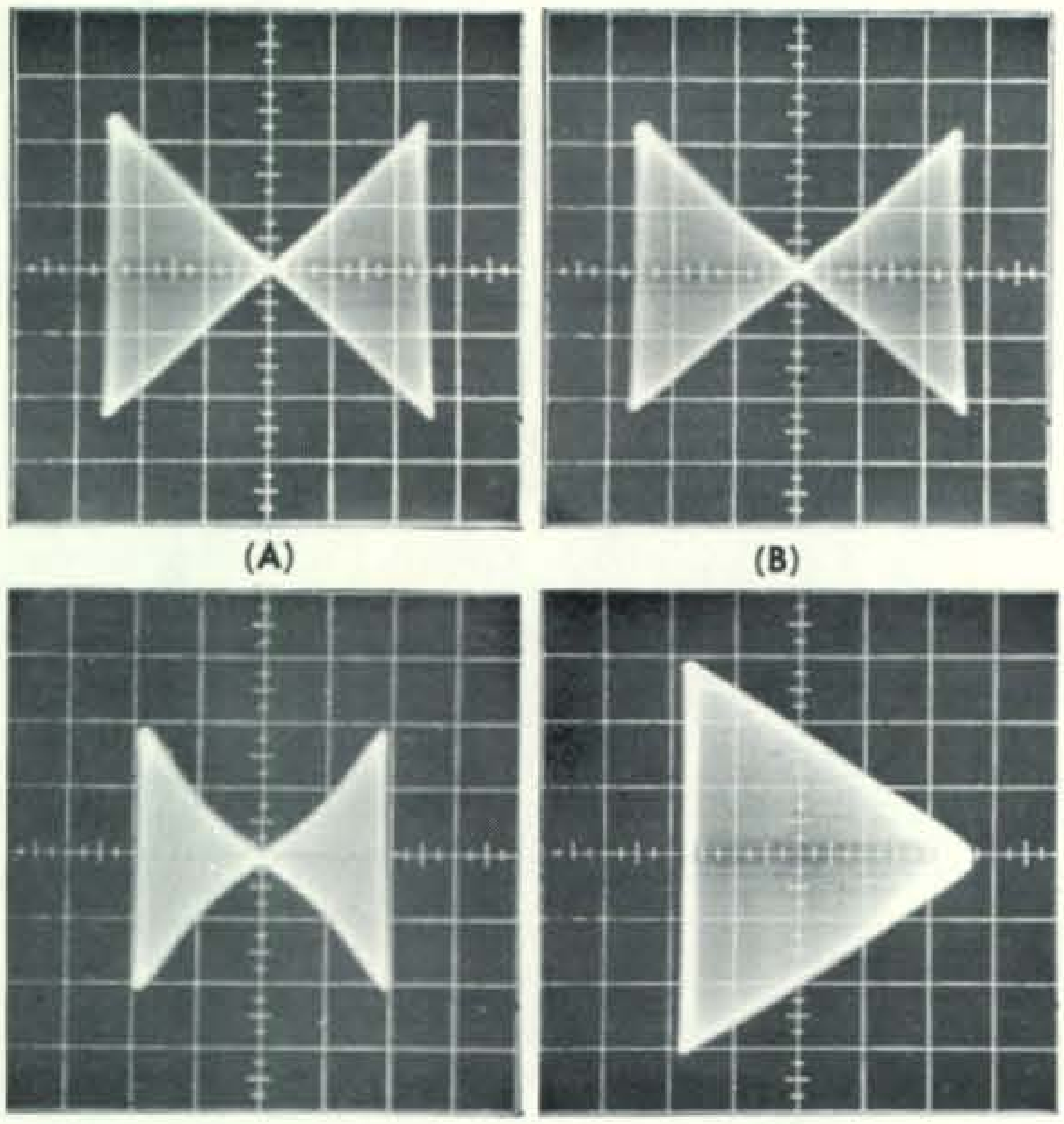


Fig. 2—Oscilloscope displays for linearity. A—Bow-tie pattern of exciter alone. B—Bow-tie pattern of exciter plus the 2K-2 amplifier with 2 kw p.e.p. input. C—Same exciter with another popular "linear" of the same rating as the 2K-2. D—Trapezoid display of the 2K-2 alone. Note the good linearity indicated by the straight slopes as compared to the non-linearity indicated by the curvature at C.

proves harmonic attenuation. The inductors are tapped for the various bands. Included are two separate taps for the 3.5 mc band to optimize operation in either the 75 or 80 meter region. For the latter section, an additional loading capacitor is switched in. All the network capacitors are heavy-duty variables with large plate spacing. Inductors and r.f. connecting straps are silver-plated.

Power Supply

Plate power is obtained from a 2500 v.d.c. supply which employs four silicon diodes in a full-wave bridge circuit. High dynamic voltage regulation is maintained by a choke-input filter with a 20 mf output capacitor which is a husky 5000-volt job in contrast to a string of series-connected l.v. electrolytic capacitors often employed as an inexpensive expedient. Likewise, a comparatively low-resistance (high-wattage) bleeder is used in place of a high value, thus permitting the filter capacitor to discharge relatively fast when power is removed.

Filament voltage is obtained from a second winding on the transformer which has two individual primaries that can be parallel o series connected for operation from 115 o 230 v.a.c. respectively.

A separate transformer provides 12 v.d.c through a full-wave center-tapped silico rectifier, for relay operation. Voltage for th indicating lamps also is taken from this trans former. Power for the air blower is obtaine from across one of the 115-volt primaries o the main transformer.

Protective Circuits

Equipment protection is provided by a 15 ampere circuit breaker for each primar winding on the large transformer, separat fuses for the blower and for the relay suppl and an overload relay in the p.a. cathode d.c return. Personnel protection is furnished wit two electrical interlocks which open th solenoid circuit of the power-on relay whe either the power-supply door or the ampl fier cover is opened. Similarly located me chanical switches at the same time short-ci cuit the h.v. line to ground.

Metering

The plate meter, which operates full tim is located in the negative return, for the h.v supply. Should a short to ground occur acros the h.v. line, either by one of the groundin switches or some other cause, the mete therefore could be damaged, but to avoid th possibility, it is protected with a 1½ ampe fuse.

A second meter functions as a "mult meter" that can be switched to read pla voltage, grid current and forward or reflecte relative power from the s.w.r. bridge which the conventional trough-type reflectometer

Transfer Circuits

When de-energized, the transfer relay co nects the r.f. input jack directly to the anten through normally-closed contacts for oper tion with the exciter alone. This relay is a ranged to be controlled by auxiliary contac (open on receive, grounded on transmit) c the exciter relay, but it will not be energize until the linear's line power has been applie to furnish the necessary relay voltage. Whe this is done, the tube filaments also go on well as the plate voltage and the energize relay transfers the r.f. input to the linear i put and the antenna to the linear output.

Switching the amplifier power on or c

thus transfers operation between the linear or exciter alone, respectively, whenever the exciter itself is activated. Since the 3-400Z's have instant-heating filaments and since silicon rectifiers are used in the power supply, no warmup time is needed and transfer to either type operation can be made immediately.

Operation

The normal procedure for tuneup is to first adjust the exciter for proper operation while the linear is turned off, also making sure the s.w.r. of the load is under 2.5:1 as indicated by the s.w.r. bridge.

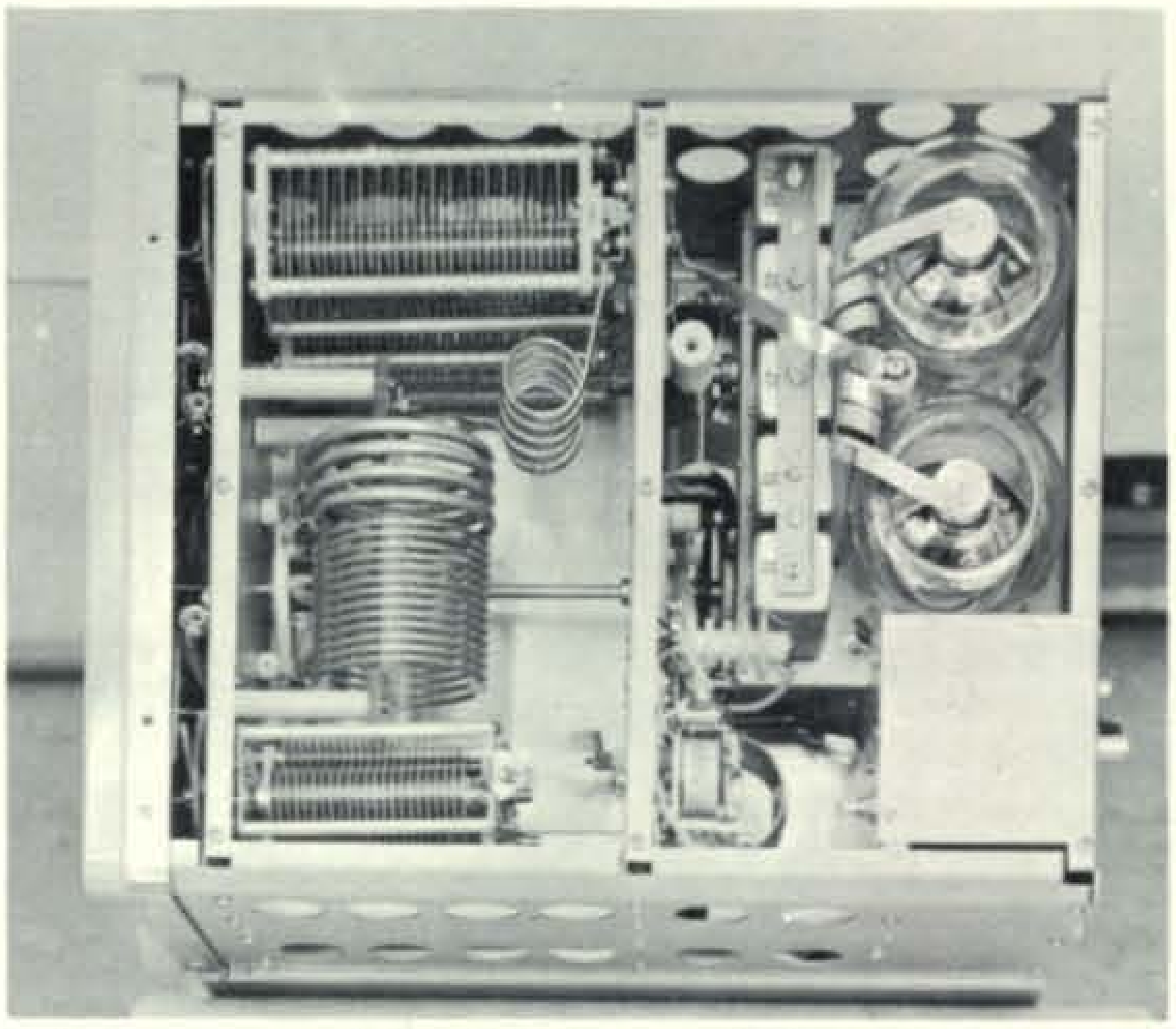
The linear is then turned on and with low drive from the exciter[2] is quickly adjusted with the plate tuning control for a minimum plate-current dip as the loading is simultaneously adjusted for a 400 ma reading at this point. After this has been achieved, full drive is momentarily applied to check for a plate current of 800 ma. If a lower current is indicated, the drive must again be reduced to the amount specified for tuneup and the loading increased for slightly above 400 ma, with a check again made at full drive.

In order to avoid tube damage during the process, resonance must be *quickly* established as indicated by the plate-current dip. Also, the initial tuneup should *always* be done with low drive. Under this condition, the plate dip may be somewhat broad or sluggish near the proper loading point and may necessitate a slight reduction in loading, before the dip is clearly defined.

Another point to keep in mind is that the progression of the dial calibrations for the loading control is backwards as far as minimum and maximum loading goes. Minimum loading is at the *high*-numbered end, maximum loading at the *low*-numbered end.

From our experience with the unit, it was found quicker and safer to set the drive as specified and quickly switch to the forward-power meter and tune for maximum output with the rated tuneup plate current, following which the check can similarly be made with full drive.

Another procedure, particularly desirable for determining optimum loading, is to apply a two-tone a.f. signal to the exciter, tune up with low drive and then with full drive, *gradually* make final adjustments for maximum



Interior view of the 2K-2's amplifier. Heavy straps are used for the parasitic chokes at the tube plates. The five cans alongside the tubes are the Pi-input modules. The box next to the tubes contains the s.w.r. bridge and resistors for the meter circuits. The r.f. transfer relay is next to the pi-wound choke (RFC_2), below it is the L-output inductor. The 10-meter Pi-inductor is wound with ⅜" strap and ¼" tubing is used for the sections added for 15 and 20 meters. Large-spaced variable capacitors are used in the output circuit. A perforated shield fits on top of the unit which is then enclosed in a wrap-around cover.

peak output with best linearity and without flattopping as indicated by an envelope or trapezoid display with an oscilloscope at the linear output. As a matter of fact, this is a preferred method of tuning up *any* linear amplifier for proper operation.

In any event, it cannot be stressed too strongly that during tuneup, the plate should first be quickly resonated and maintained as near as possible thereat while the loading is simultaneously adjusted. In addition, correct loading is a *must* for proper operation with maximum p.e.p. Although both procedures require meticulous care, it is well worth it for the high-quality performance that is possible.

Performance

It was found that with a line potential of 230 volts under load, the d.c. input with 110 watts drive was 2000 watts, while the r.f. output was 1400 watts. P.e.p. with voice modulation ran up to 2.2 kw input with 1530 watts output.[3,4]

2 For 100-125 ma linear grid current. Exciter output usually may be varied by a carrier, exciter-grid or carrier-balance controls.

3 About 5% less on 10 and 15 meters. Output includes drive power.

4 With other line voltages, power will vary by a percentage equal to about twice the percentage of line-voltage difference from 230 volts.

5 Not taking into consideration the drive power.

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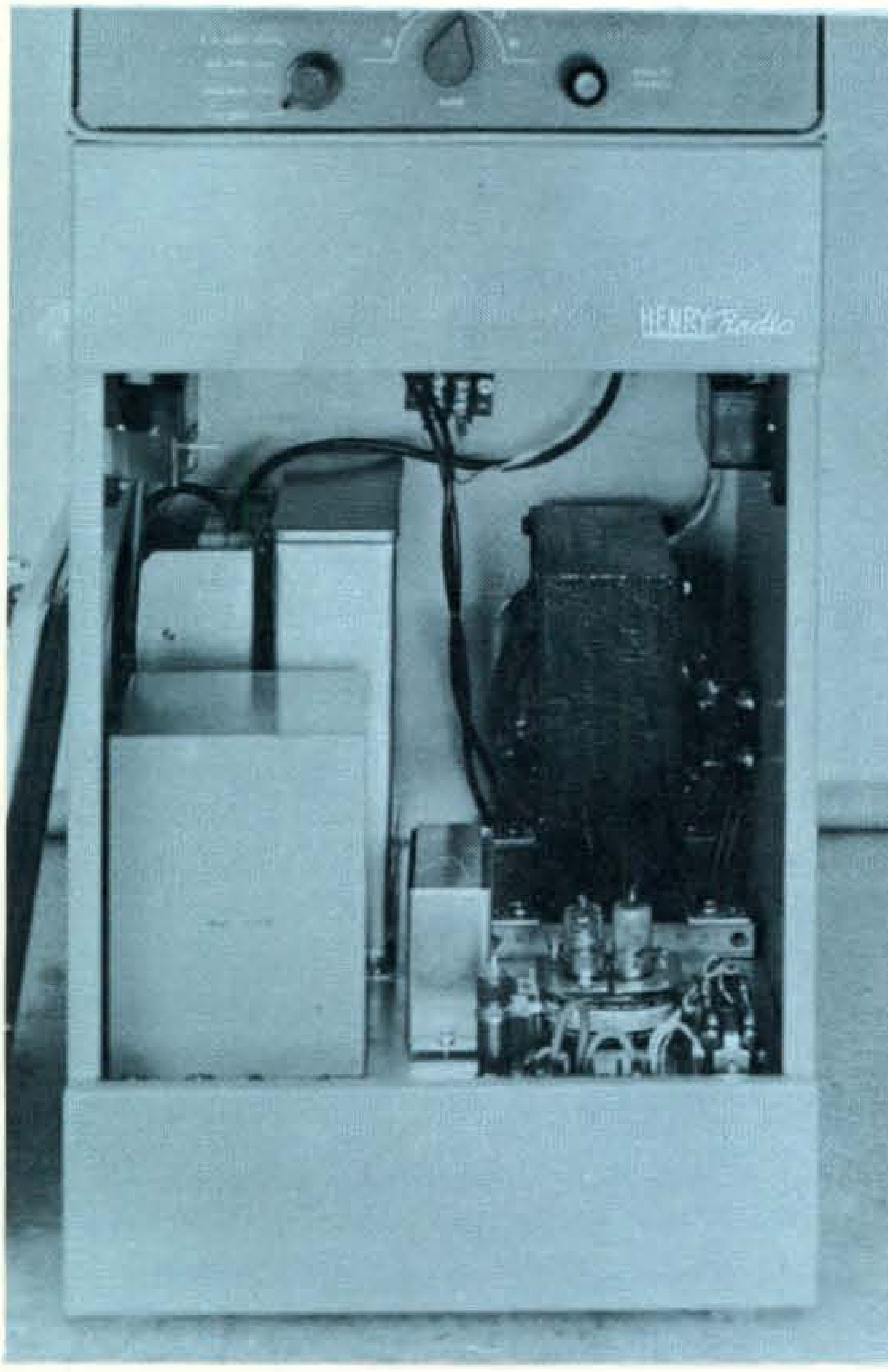

The Henry 2K-2 Linear Amplifier Floor Console. Interior view of the 2K-2 power-supply section. The power transformer is at the right rear in front of which may be seen the glass envelopes for the mercury contacts of the power relay. The filter choke is encased at the left foreground. The filter capacitor is at the rear. The mechanical grounding switch for the h.v. is at the upper left corner.

Under these conditions it was noted that the plate meter does not kick up to 400 ma as would be indicative of the maximum legal 1 kw[5] (400 ma × 2500 v.) meter reading with modulation. Due to this slow meter action, peaks of 400 ma usually are not possible with normal voice operation and for this reason the 2K-2 has an erroneous and unfortunate reputation of requiring a great deal of drive; however, the maximum p.e.p., as noted above, is possible with plate meter peaks of 300 ma. Operation above this point not only may exceed the legal average input but also may overdrive the amplifier as is best determined with oscilloscope observations.

As for distortion products, the 3rd order ones averaged −35 db with 2 kw p.e.p. input on all bands, with higher-order products proportionately lower. The excellent linearity is demonstrated by the oscilloscope displays at fig. 2.

The addition of the L-section to the Pi network and the extensive shielding and bypassing contributes much to the reduction of r.f. harmonic production, as was evident by the relatively little TVI experienced on a nearby TV set with the linear in operation.

Although special care must be exercised during tuneup, once this is properly executed, the tubes run within their dissipation rating, even at full d.c. input, as may be evidenced by the color of the tantalum plates in the tubes which remain below the bright orange range that is indicative of maximum dissipation. With modulation the tubes just loa along.

The 2K-2 can be operated at 2 kw inpu with c.w. or RTTY, but to remain within th legal limit, the input power must be reduce as explained in the manual, in which case th output is approximately 600 watts. Conventional a.m. operation (d.s.b. with carrier) also must be held within the legal carrie input, in which mode the carrier output i near 350 watts with 1400 watts p.e.p. outpu at 100 per cent modulation.

There are no provisions for a.l.c., so wher an exciter is capable of delivering more tha 100 watts p.e.p., the possibility of overdrivin the amplifier must be minimized by prope monitoring with the plate meter or an oscilloscope.

It is interesting to note that the line c Henry Radio gear, such as the 2K-2 alon with higher-power versions, is fast finding i way into the commercial and military fiel which speaks well for its performance, qua ity construction and dependability.

The size of the Henry 2K-2 is 29½" × 14 × 17½" (H.W.D.) and it weighs 12 pounds. The price tag is $675. Anothe model, the 2K-3 which was announced aft this review was prepared, is identical, excep for the use of two 3-500Z tubes for 200 wat greater plate dissipation and correspondingl higher-power capabilities (about 1 db worth) Price is $745. The manufacturer is Henr Radio, 11240 W. Olympic Blvd., Los Angel 64, California.—*W2AEF*

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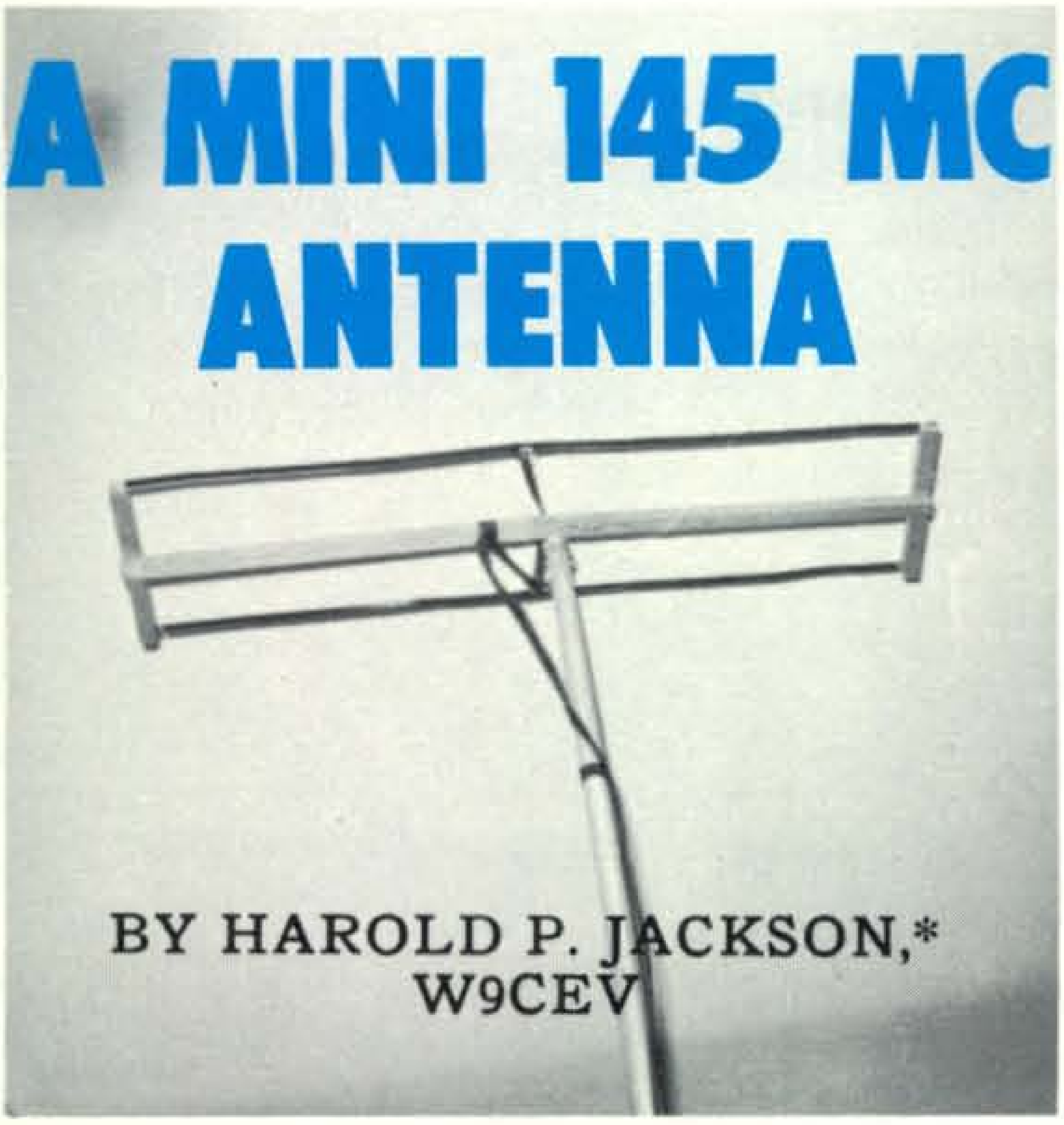

A MINI 145 MC ANTENNA

BY HAROLD P. JACKSON,*
W9CEV

WHILE vacationing in an area where the towns are far apart, I decided that for 145 mc, although easy to carry, a Halo antenna with its omnidirectional pattern was not good enough. Consequently, when I again visited the area, I took a portable antenna that I had worked on with a great deal of "cut and try" for spacing, length and feeding. A couple of years ago, I used an antenna figured out with the help of my good friend John, K9MUI, for portable use of 50 mc, which was patterned after the "ZL Special," so this was where I started.

The antenna was constructed with 300 ohms transmisson line, sometimes called twin lead. The type used was Belden 8230 (similar twin lead is also made by Amphenol and others). The antenna is a Mini 145 mc ZL Special with directivity and a gain of about 8 dB over a Halo and has a front-to-back ratio of about 20 db, and is made of the above mentioned twin lead as shown in the photo and fig. 1.

The two folded dipoles are fed 135° out of phase and are spaced 8½" apart, mounted on a hinged boom 36½" long, made of ¾" ×¾" white pine, which is very light weight. The cross-arms at each end are 8½" lengths of ¾" × ¾" wood, notched in center for extra strength. (See fig. 2.) The wood should be given a coat of waterproof varnish or clear plastic spray. The hinge at the center of the boom enables it to be folded in half for portability. A #1 mast clamp is mounted just

*1425 South 13th Avenue, Maywood, Illinois 60153.

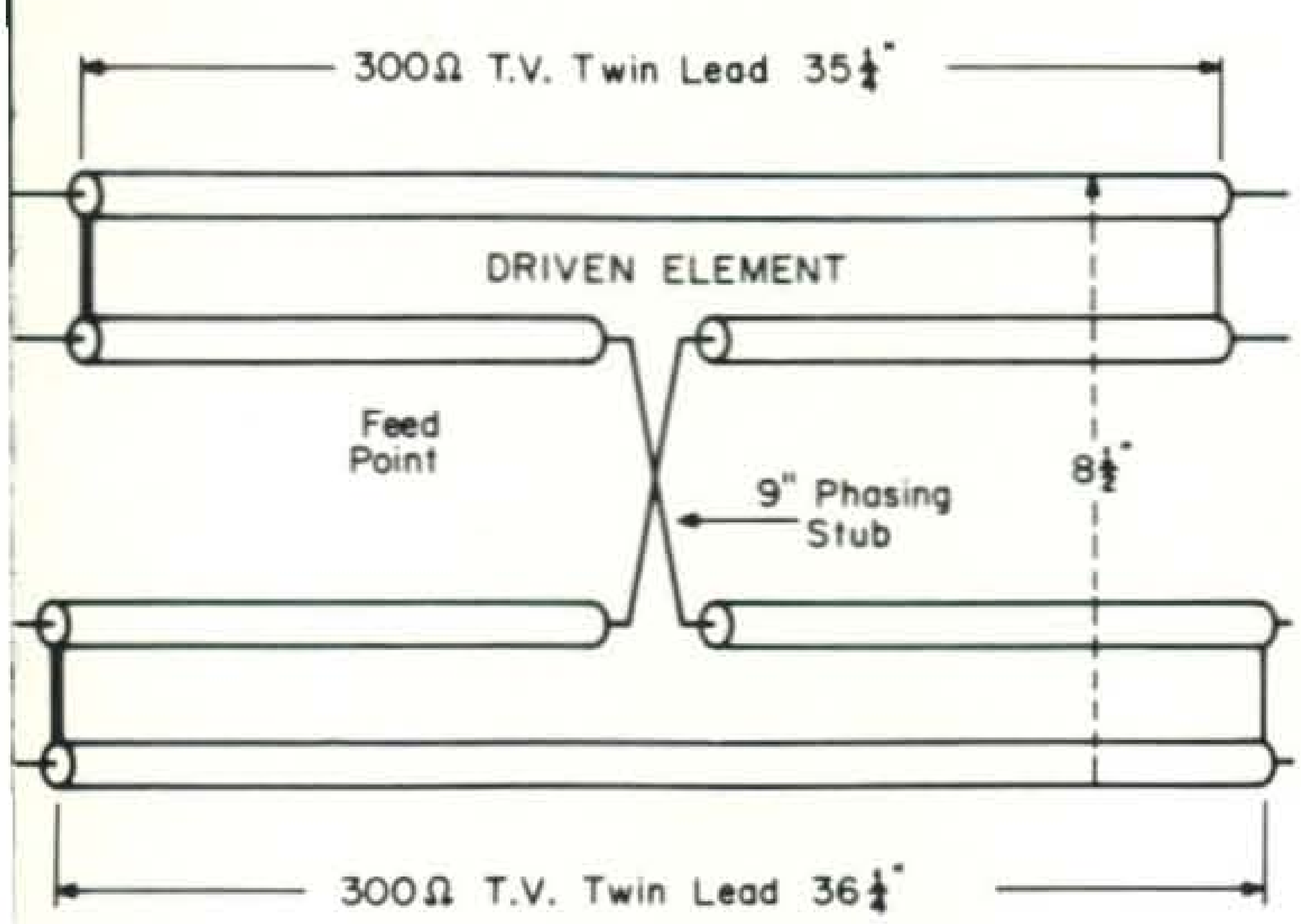

Fig. 1—Wiring diagram and element length for a 145 mc portable antenna constructed from 300 ohm twinlead. Feedline connects to the driven element, the shorter length of twinlead.

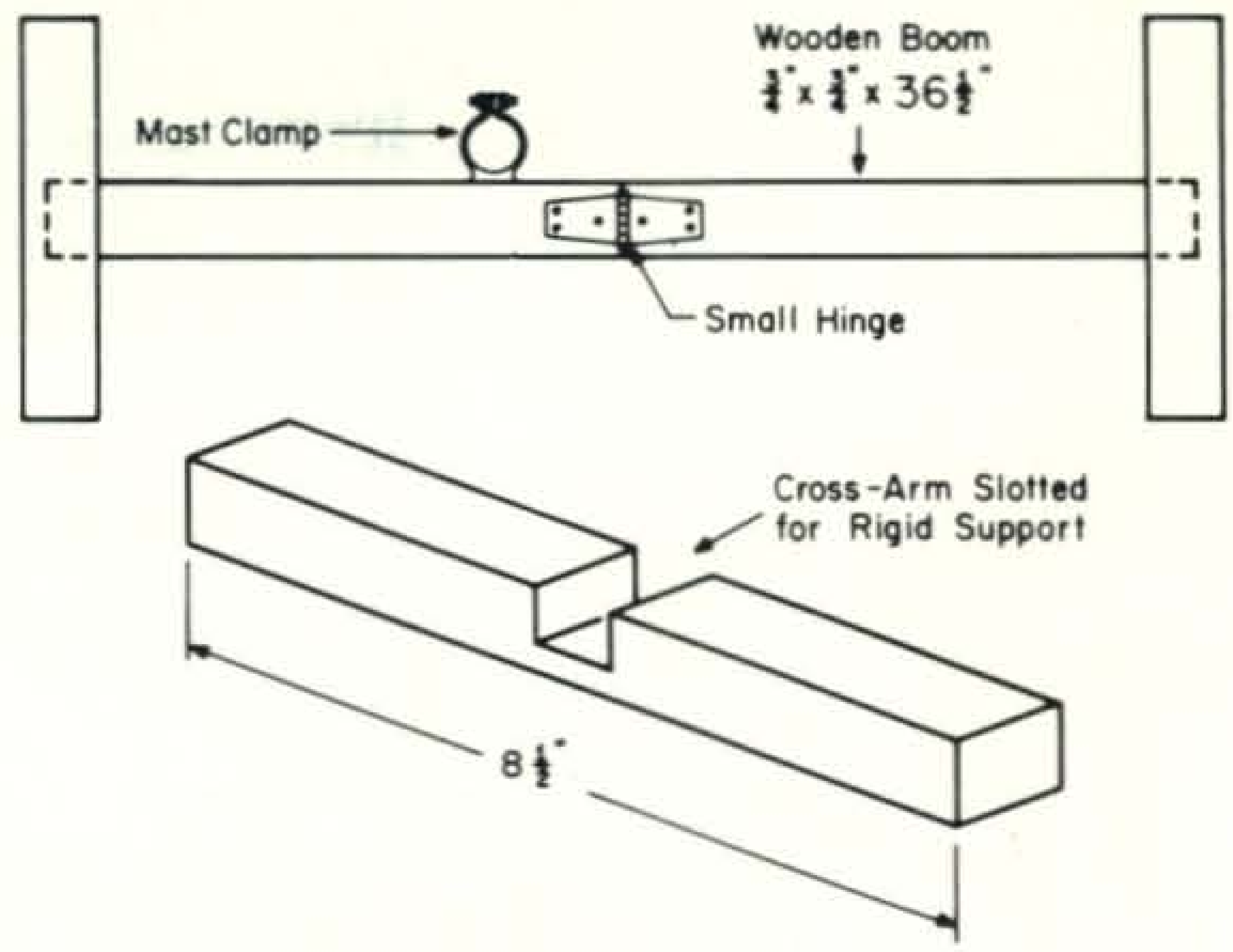

Fig. 2—Construction of the boom and cross-arms for the 145 mc antenna. The boom is hinged in the center to reduce size when in transit.

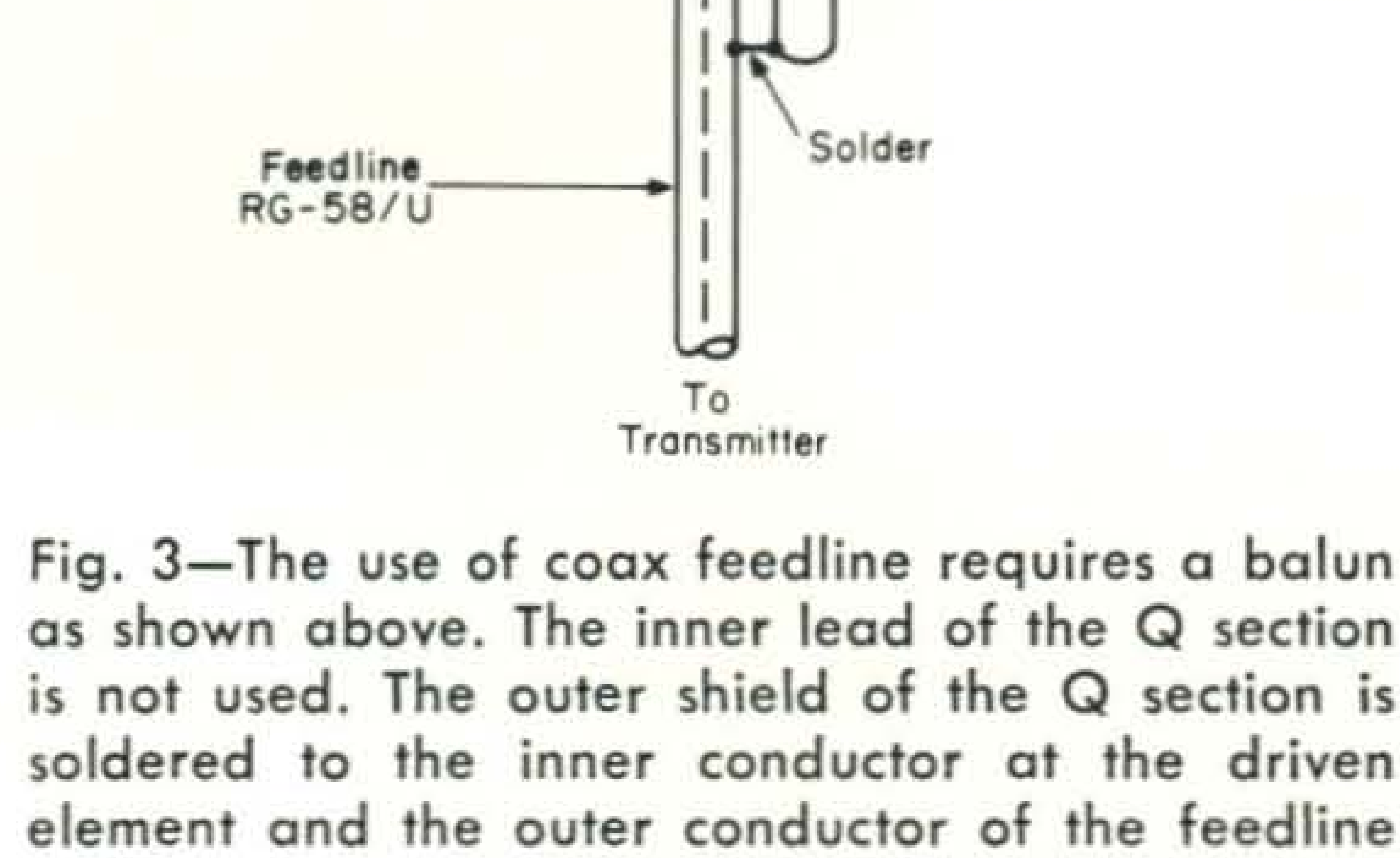

Fig. 3—The use of coax feedline requires a balun as shown above. The inner lead of the Q section is not used. The outer shield of the Q section is soldered to the inner conductor at the driven element and the outer conductor of the feedline 18" down.

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off center which does not interfere with folding and allows you to mount antenna on a mast, a camera tripod or even a broom.

The driven element, 35¼ inches of 300 ohm twinlead, is held to the cross-arms with a strip of ¼" × 2½" plastic, cut from the center of a piece of twinlead and looped through the ends of the doublet, which are soldered together (see fig. 1) and nailed with ½" wire nails.

The rear doublet is made of 36¼ inches of twin lead, the closed ends of which are nailed or cemented to the cross-arms. The exact center of each Doublet is cut on one side only and the insulation removed for about ¼" as in fig. 1. The "Phasing Stub" which is 9 inches long, is also 300 ohm twin lead and is twisted once and soldered between the two Doublets. I used RG-58/U coaxial cable as feed line, but as this is a Balanced Antenna, I matched it with a "Q" section of 18 inches of RG-58/U which is connected as shown in fig. 3. This gave a low s.w.r. of 1.2 to 1 and thus eliminated feed line radiation. For portability, I soldered 15 feet of coaxial cable directly to the antenna and if needed can always add on more with coax connectors.

When the antenna is folded to its 18" it will fit in a suitcase or even a shopping bag.

For portability what could be easier? ■

THE GATE DIPPER

BY CALVIN SONDGEROTH, *W9ZTK

The author built this f.e.t. dipper on a Heath Tunnel Dipper chassis and cabinet. It covers from 3.5 to 30 mc and is powered by a 1½ volt penlite cell.

ONE of the most useful pieces of test equipment around the hamshack is a grid dip meter. Recent semiconductor advances have made possible the use of solid state devices in an instrument to accomplish the same purpose. Transistors can be used in a "dip" instrument, but their inherent low impedance characteristics do not lend well to the type of circuitry involved in such a device. The field effect transistor, however, with its high input and output impedance is quite well suited to the job. After a little experimentation with f.e.t.s, the dip oscillator to be described was developed. Original efforts with h.f. transistors were marginal, but the installation of a f.e.t. in the oscillator section made the dipper quite stable and very easy to tune over the frequency range desired.

Circuit

The schematic diagram is shown in fig. 1. A 2N3819 f.e.t. is used in the oscillator in a grounded gate configuration similar to a grounded grid connection for vacuum tube circuitry. Feedback is adjusted by C_2 for optimum results over the 3.5 to 30 mc frequency range. R.f. energy from the source of the oscillator is sampled by loose coupling to a d.c. amplifier consisting of Q_1 and Q_2 in a Darlington connection. The potentiometer can be adjusted for a mid-scale reading on the indicating meter.

Construction

The dipper was built using a Heathkit Tunnel Dipper chassis and associated parts as a framework. All resistors and capacitors were removed from the printed circuit board along with all the interconnecting wiring. The original tuning capacitor, sensitivity potentiometer on-off switch and 0-1 ma meter were left intact. After the circuit board has been cleaned off, enough copper lands are available to wire in the circuit shown in fig. 1.

Original work was done with a 9 volt transistor battery as the supply, but it was found that too much voltage at the drain of the f.e.t. caused it to oscillate too vigorously making it difficult to get a good dip out of the d.c. amplfier. As a result, the original battery compartment and a 1.5 volt penlight cell

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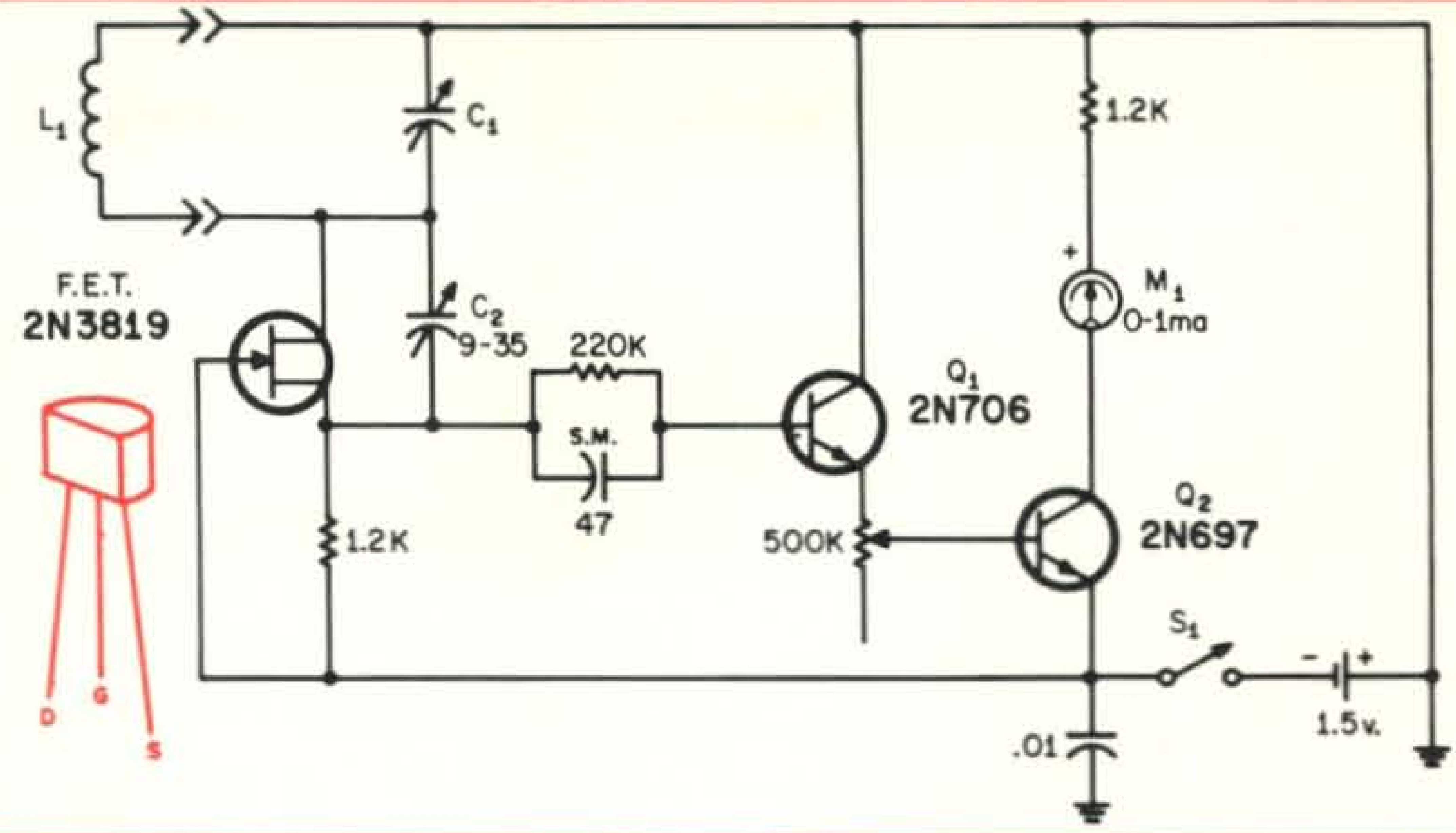
Fig. 1—Circuit of an f.e.t. dipper that covers from 3.5 to 30 mc. Capacitor C_1 is the original tuning capacitor from the Heath Tunnel Dipper. This unit is built on the old chassis as explained in the text. Capacitor C_2 is a ceramic trimmer. All resistors are ¼ watt.



were used. This turns out to be rather fortunate since a new battery mount need not be devised.

Coils

New coils were found for the dipper. The original Heath coils worked, but their small diameter did not seem to produce enough *Q* for the entire range and the new circuit destroyed the dial calibration. The RCA phono plugs with the long center pins were removed from the original coils and used as connectors for the new coils which were wound on spent plastic pill bottles. The phono plugs were cemented to the bottom of the bottles with epoxy after the coil leads were soldered to the plug terminals. Coil data is shown in fig. 2. The information shown is for decreasing diameters with increasing frequency, and any coils wound on forms from 1 to ½ inch diameter will work. The diameters shown just happen to be those available in terms of used pill bottles.

Battery Mount

The original layout of the Heath Tunnel Dipper makes it necessary to use a positive chassis ground system since one side of the coil socket is connected to the chassis. To accomplish this, it is necessary to turn the battery around in its holder. To make a good connection to the positive terminal on the battery, a small piece of copper about ¼ inch square was soldered to the top of the conical spring on the ground side of the battery holder. To put the negative side of the supply on r.f. ground, it is important to put the 0.01 mf disc capacitor across the battery.

Testing

After the circuit has been wired into the Heath mechanical assembly, check the voltage at the source of the 2N3819. With 1.5 volts on the drain, the source voltage should be about 0.5 to 0.6 volts indicating that the f.e.t. is conducting and working properly. The meter should indicate if the circuit is oscillating and should drop to zero or at least deflect downscale when the coil is touched.

Calibration

After the unit is functioning, it only remains to make a new dial scale and recalibrate the unit. Cut a piece of white paper 1⅛ inches by 7¼ inches to replace the paper scale on the original Tunnel Dipper. Layout three lines on it and stick it to the aluminum dial drum with scotch tape. Calibrate the dipper by listening to a general coverage receiver and marking the even megacycle points with a sharp pointed tool.

Conclusion

This modification to the dipper only covers 3.5 to 30 mc, but the usefulness over this range makes the decreased frequency coverage tolerable. Good deep dips are quite easily recognized. Experiments with high frequency coils for this version of the dip oscillator were rather unsuccessful although it would work up to 50 mc or so with marginal results. For the average amateur the range from 80 to 10 meters is of prime interest, and the gadget just described should fill the bill since it gives very definite indications of the frequency being tuned. ■

FREQUENCY RANGE	COIL — L_1		
	No. of Turns	Diameter	Length
3.5–6.8	35	15/16"	1 1/16"
6.2–15.0	15	13/16"	5/8"
14–30	7	11/16"	3/8"

Fig. 2—Data for winding the coils for the f.e.t. dipper. The wire used is #20 enameled.

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ADDED C. W. SELECTIVITY FOR TRANSCEIVERS

BY DEL CROWELL,* K6RIL

Many transceiver owners have wished for the c.w. selectivity which is available in the more elaborate receivers. The audio filter described below provides excellent selectivity for c.w. reception.

Most transceivers have only a 2.5 kc bandpass filter which is used for sideband reception. However, they are also equipped for c.w. bands. The filter described in this article was used on a Drake TR4 transceiver, an R4A receiver and a Collins 75S-3B. Compared with the 400 cycle filter in the R4A and 500 cycle mechanical filter in the Collins, this filter gave very close results.

* 1674 Morgan Street, Mountain View, California 94040.

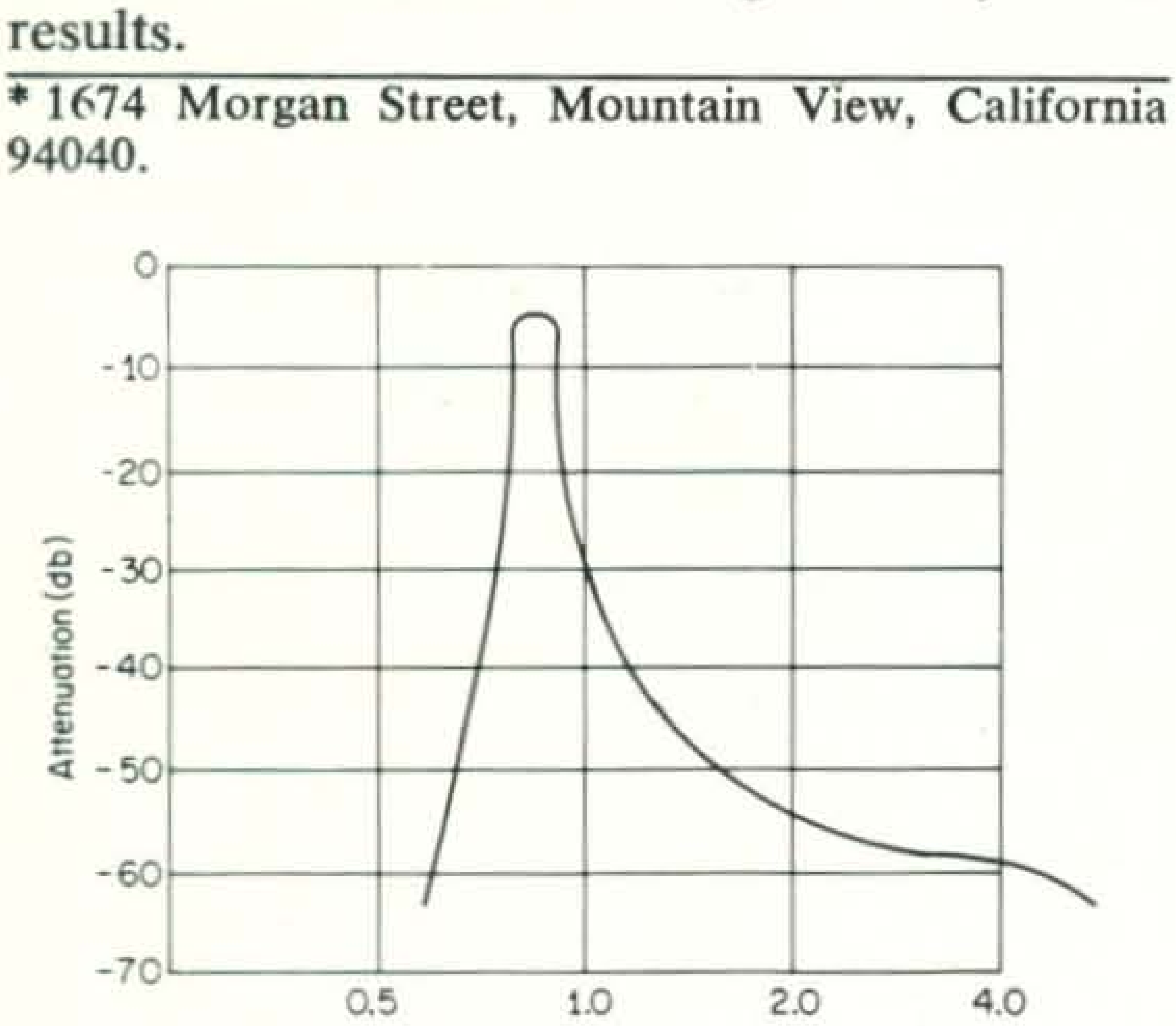

Fig. 1—Frequency response of the Drake TR4 audio section with the filter switched in.

The filter described gives a transceiver selectivity nearly equal to a sharp crystal or mechanical filter. As an added accessory this filter can be simply plugged in between the transceiver and speaker. The performance is outstanding; when the filter is switched into the circuit, QRM disappears. Stations 200 cycles or more away are rejected and the only station you hear is the one you have

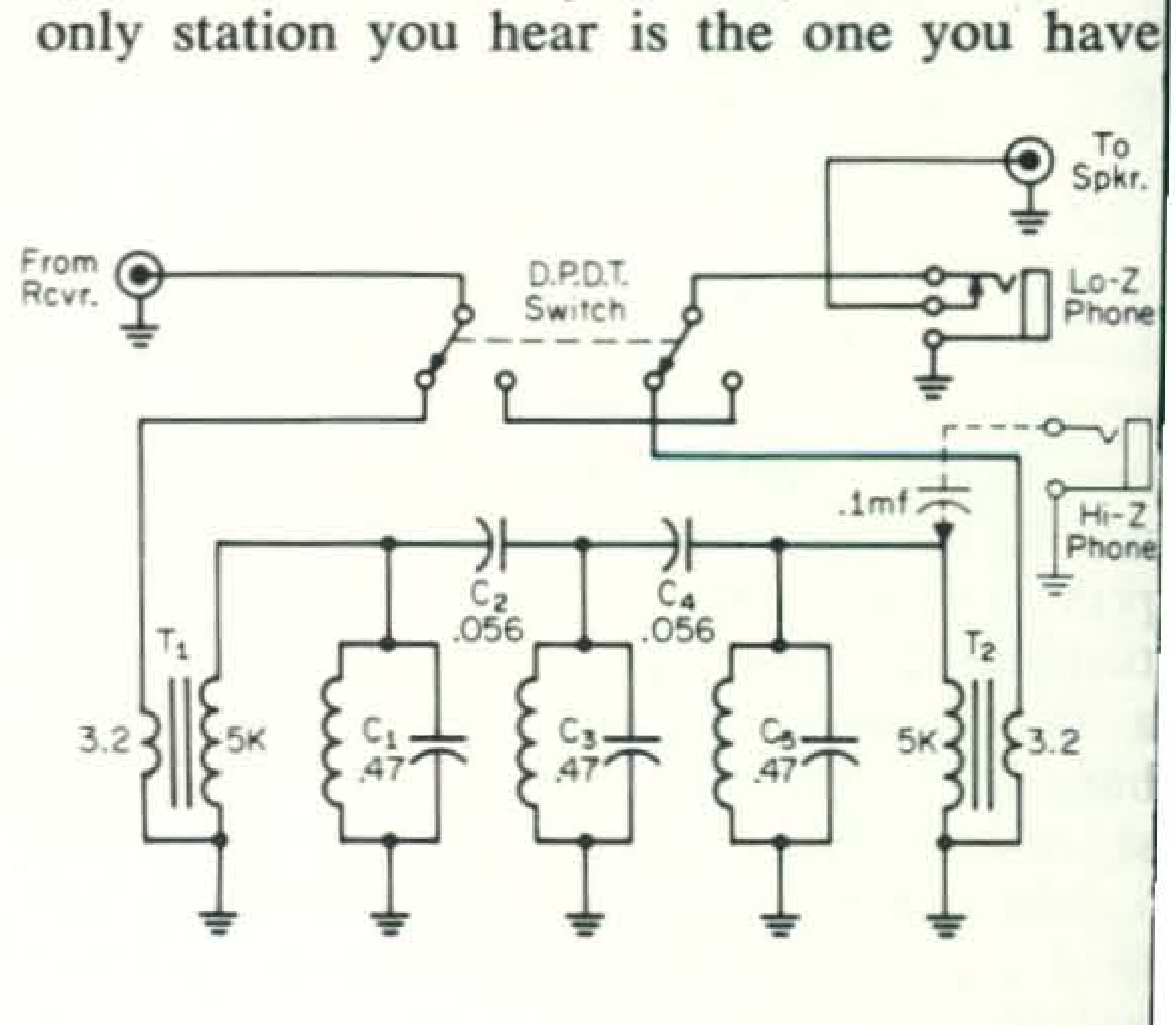

Fig. 2—Circuit of 200 cycle bandpass audio filter for c.w. reception. All capacitors are in mf, all inductances are 88 mh toroids and transformers T_1 and T_2 are 3.2 ohms to 5K, Midland #25-611 or equivalents.

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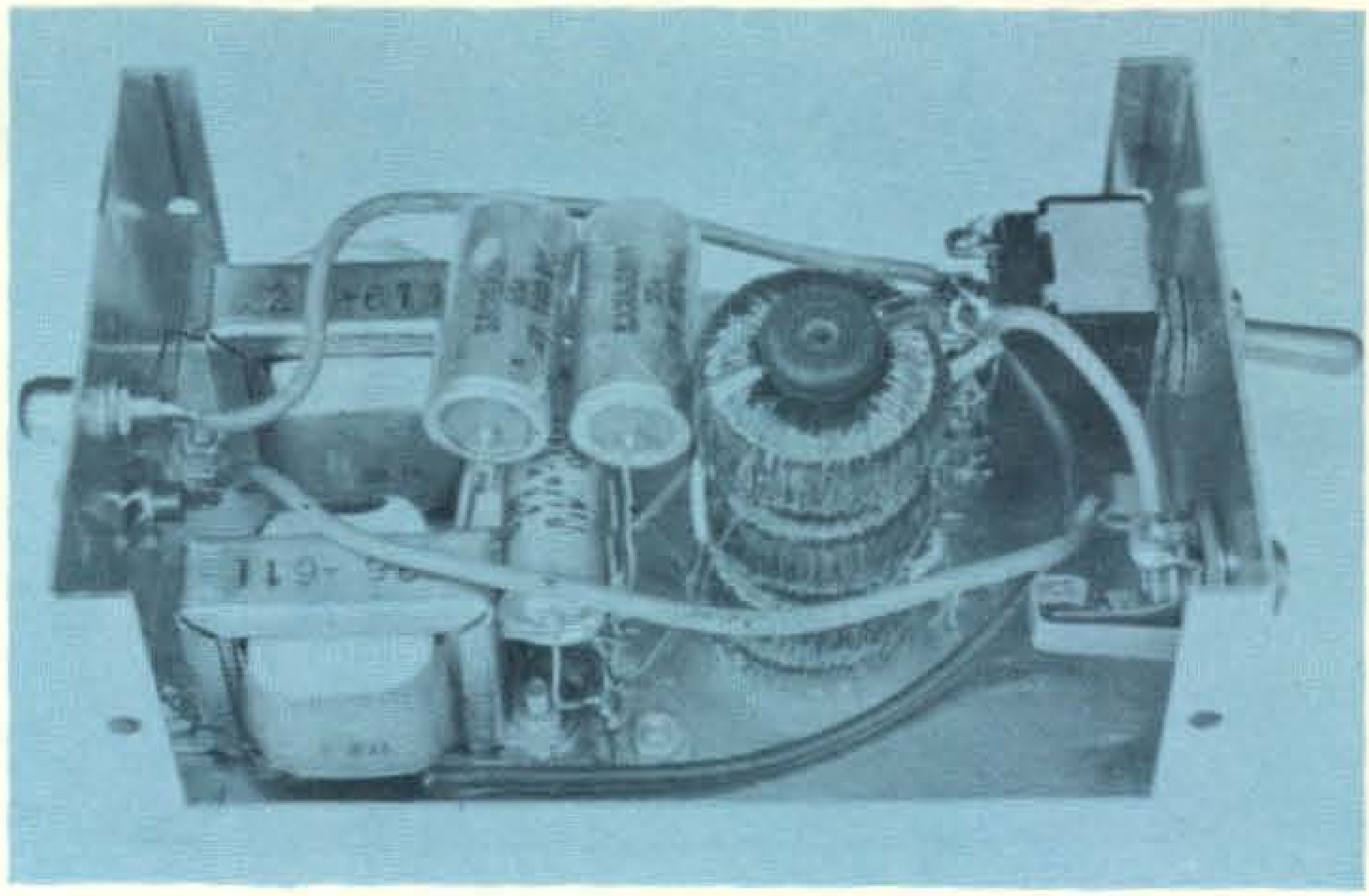


On the left is a view of the sealed filter showing the IN-OUT switch and phone jack. The interior view of the a.f. filter on the right shows the toroids mounted on ¼" hollow plastic rod with rubber grommets used as spacers.

tuned to the filter frequency. The response curve of the filter is shown in fig. 1.

Circuit Description

This filter used standard 88 mh toroid cores in a high Q three pole bandpass circuit. Each pole is tuned to the same frequency (about 800 cycles) and the bandwidth is approximately 200 cycles wide. The filter impedance is approximately 450 ohms and standard 5K to 3.2 ohm plate to voice coil transformers are used to step the impedance from the voice coil to the filter and back to the speaker impedance. The 5000 ohm transformers provide minimum loading on the filter elements; this keeps the operating Q very high. The filter can be switched in or out of the circuit as desired.

Operation

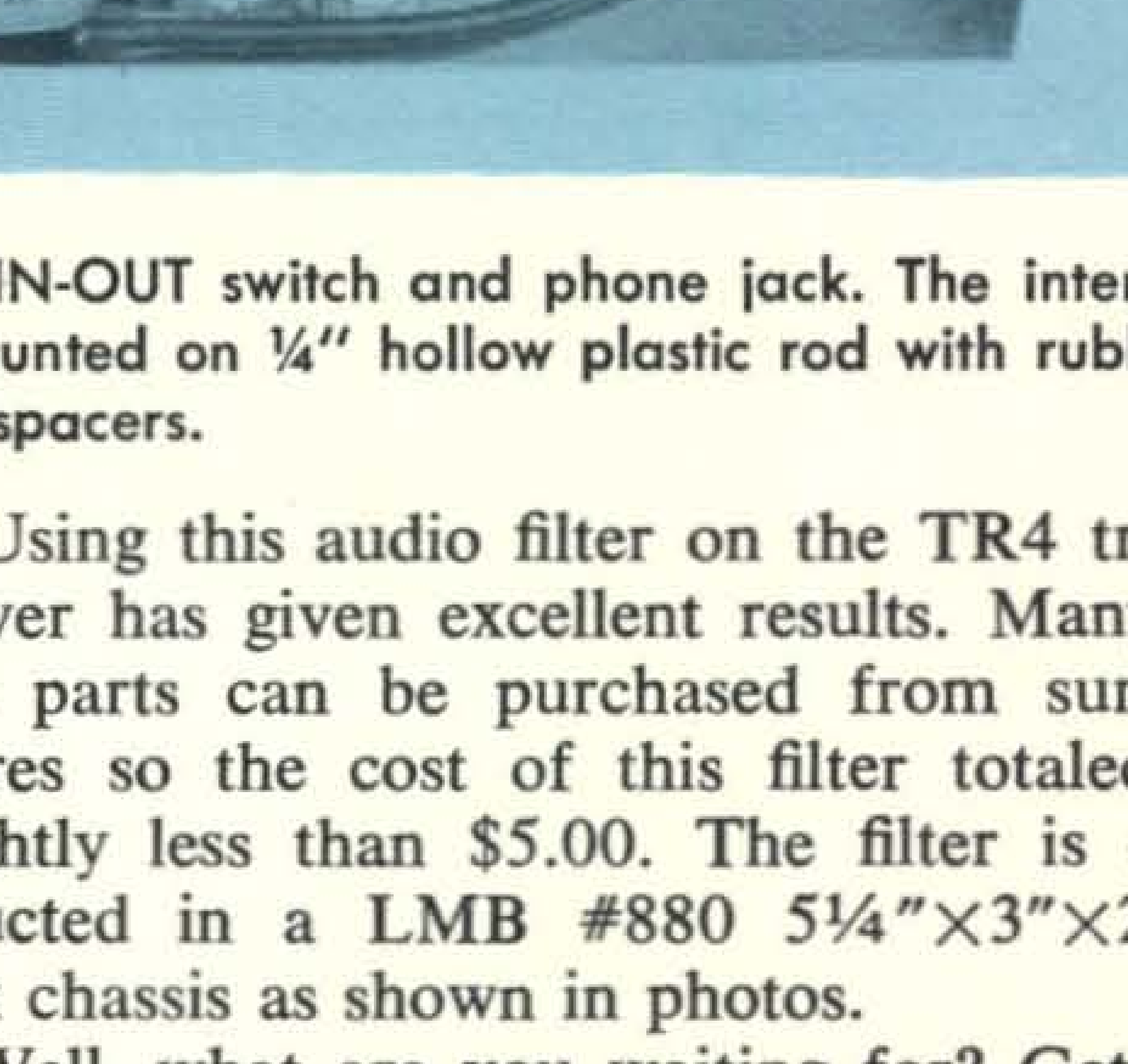
Since this filter is extremely narrow the operator must tune slowly or a c.w. station can be missed. Background noise is very low as the receiver is tuned across a station nothing is heard; then all at once the station pops into the filter bandpass. One poor feature is, since this filter is in the audio section, a strong nearby station will not be heard but still control the a.g.c. and lower the signal tuned to the filter slot.

Due to the selectivity requirement the filter has about 6 db loss but speaker volume suffers only slightly.

A phone jack is connected to the 3.2 ohm output. If the builder desires, however, the high impedance phones can be connected to the 5K side of the output transformer.

Using this audio filter on the TR4 transceiver has given excellent results. Many of the parts can be purchased from surplus stores so the cost of this filter totaled to slightly less than $5.00. The filter is constructed in a LMB #880 5¼"×3"×2⅛" box chassis as shown in photos.

Well, what are you waiting for? Get the junk box out and start building. ■



". . . And another thing—He insisted on naming our twins 'Dot' and 'Dash'!"

$240!

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Kit HW-100, 18 lbs., no money dn., $22 mo. **$240.00**
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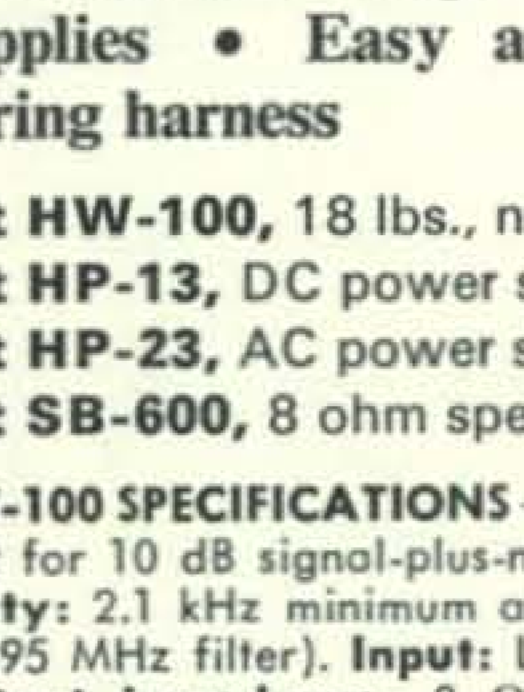
Kit HP-23, AC power supply, 19 lbs., $5 mo. **$49.95**
Kit SB-600, 8 ohm speaker, 6 lbs. **$18.95**

HW-100 SPECIFICATIONS — RECEIVER. Sensitivity: Less than .5 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **Selectivity:** 2.1 kHz minimum at 6 dB down, 7 kHz maximum at 60 dB down (3.395 MHz filter). **Input:** Low impedance for unbalanced coaxial input. **Output impedance:** 8 Ω speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB. Internal spurious signals below equivalent antenna input of 1 microvolt.

TRANSMITTER. DC Power input: SSB: (A3a emission) 180 watt P.
(normal voice: continuous duty cycle). CW: (A1 emission) 170 watts (5
duty cycle). **RF Power output:** 100 watts on 80 through 15 meters;
watts on 10 meters (50 Ω nonreactive load). **Output impedance:** 50
75 Ω with less than 2:1 SWR. **Oscillator feedthrough or mixer produ**
55 dB below rated output. **Harmonic radiation:** 45 dB below r
output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provi
by operating VOX from a keyed tone, using grid-block keying. **CW S**
tone: Internally switched to speaker or headphone, in CW mode.
proximately 1000 Hz tone. **Microphone input:** High impedance wi
rating of —45 to —55 dB. **Carrier suppression:** 45 dB down from sin
tone output. **Unwanted sideband suppression:** 45 dB down from sin
tone output at 1000 Hz reference. **Third order distortion:** 30 dB d
from two-tone output. **RF Compression (TALC):** 10 dB or greate
.1 ma final grid current. **GENERAL. Frequency coverage:** 3.5 to
7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.
29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 H
per hour after 30 minutes warmup from normal ambient conditions.
than 100 Hz for ±10% line voltage variations. **Modes of operat**
Selectable upper or lower sideband (suppressed carrier) and CW.
calibration: 5 kHz. **Dial mechanism backlash:** Less than 50
Calibration: 100 kHz crystal. **Audio frequency response:** 35
2450 Hz. **Front panel controls:** Main tuning dial. Driver tuning and
selector. Final tuning. Final loading. Mic and CW Level control. M
switch. Band switch. Function switch. Meter switch. RF Gain control. A
Gain control. **Side controls:** Meter Zero control; Bias; VOX Sensiti
VOX Delay; ANTI-TRIP; Neutralizing. **Tube complement:** OA2 R
lator (150 V); 6AU6 RF amplifier; 6AU6 1st receiver mixer; 6AU6 I
tion amplifier; 6AU6 1st IF amplifier; 6AU6 2nd IF amplifier; 6BN8 Pr
detector and AVC; 6AU6 VFO Amp.; 6CB6 2nd transmitter mixer;
Driver; 6EA8 Speech Amplifier and cathode follower; 6EA8 1st t
mitter mixer; 6EA8 2nd receiver mixer and relay amplifier; 6EA8 CW
tone oscillator and amplifier; 6GW8 Audio amplifier and audio ou
12AT7 Heterodyne oscillator and cathode follower; 12AT7 VOX amp
and calibrator oscillator; 12AU7 Sideband oscillator; 6146 Final ampl
(2). **Diode complement:** 6 Germanium Diodes: Balanced modul
RF sampling, and crystal calibrator harmonic generator; 9 Silicon Di
ALC rectifiers, anti-trip rectifiers, and DC blocking; 1 Zener D
cathode bias. **Transistors:** 2N4304 FET- VFO; 2N3393 — Voltage
lator. **Rear apron connections:** CW Key jack; 8 Ω output; ALC i
Power and accessory plug; RF output; Antenna; Spare. **Power req**
ments: 700 to 850 volts at 250 ma with 1% maximum ripple; 300
at 150 ma with .05% maximum ripple; —115 volts at 10 ma with
maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensi**
14-13/16" W. x 6-5/16" H. x 13-3/8" D.



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ANTENNA FEEDPOINT INVESTIGATION

BY FRED JOHNSON,* ZL2AMJ

Using an r.f. bridge to make impedance measurements at the transmitter end of the antenna feeder can lead to improvements in antenna performance and a better understanding of its operation.

IN NOVEMBER and December 1963 *CQ* published articles on the use of the Smith chart as an aid to the solution of aerial matching problems.[1] This was followed in March 1964 with a further article on the use of the chart for designing a broadband matching unit.[2] These articles showed how the chart could provide answers that are otherwise difficult to determine without lots of calculation. These articles stimulated enthusiasm to analyze the performance of an eighty meter antenna using the Smith chart to see if its performance could be improved.

* 15 Byron Street, Upper Hutt, New Zealand.

[1] Amis, P.C., "Antenna Impedance Matching," *CQ*, Nov., 1963, Part I, page 63; Dec., 1963, Part II, page 33.

[2] Lee, P.H., "Broadbanding the Mark III Antenna on Eighty Meters," *CQ*, March, 1964, page 43.

An idea of the construction of the antenna in question can be gained from fig. 1. The length of the flat-top was determined from the formula $468/f_{mc}$. A center feed-point is used for it is the more convenient and 75 ohm coaxial cable is used as the feeder. The transmitter uses a pi-coupler and feeds the coax direct; no antenna tuner or balun is used. This antenna has operated for many years and has given good performance across the entire ZL eighty meter band (3.5 to 3.9 mc). The antenna was restricted by siting problems and added height could not be managed. The theory books show that the

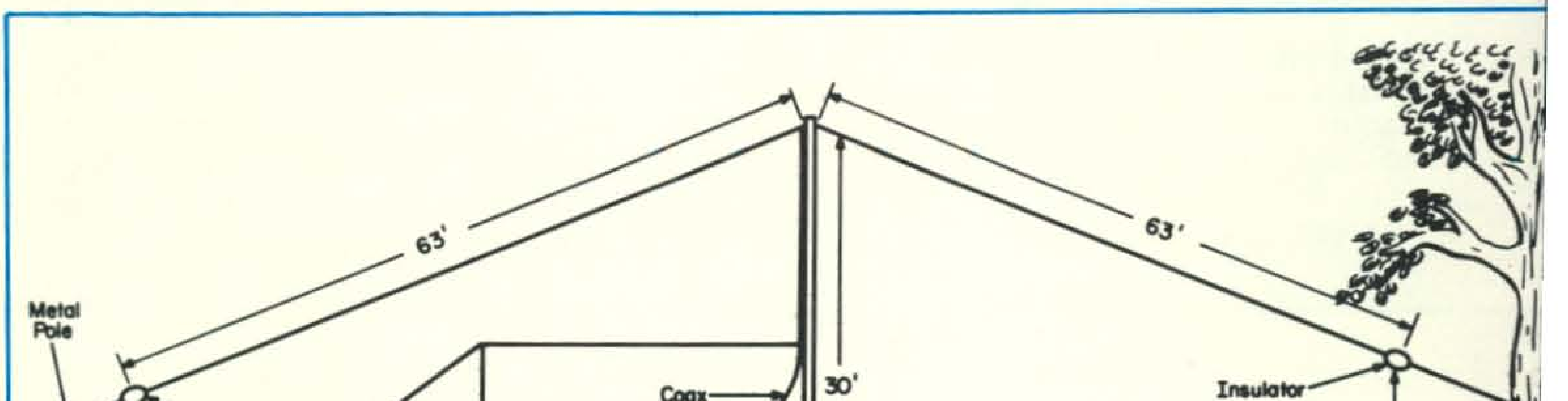

Fig. 1—The antenna at ZL2AMJ prior to the investigations.

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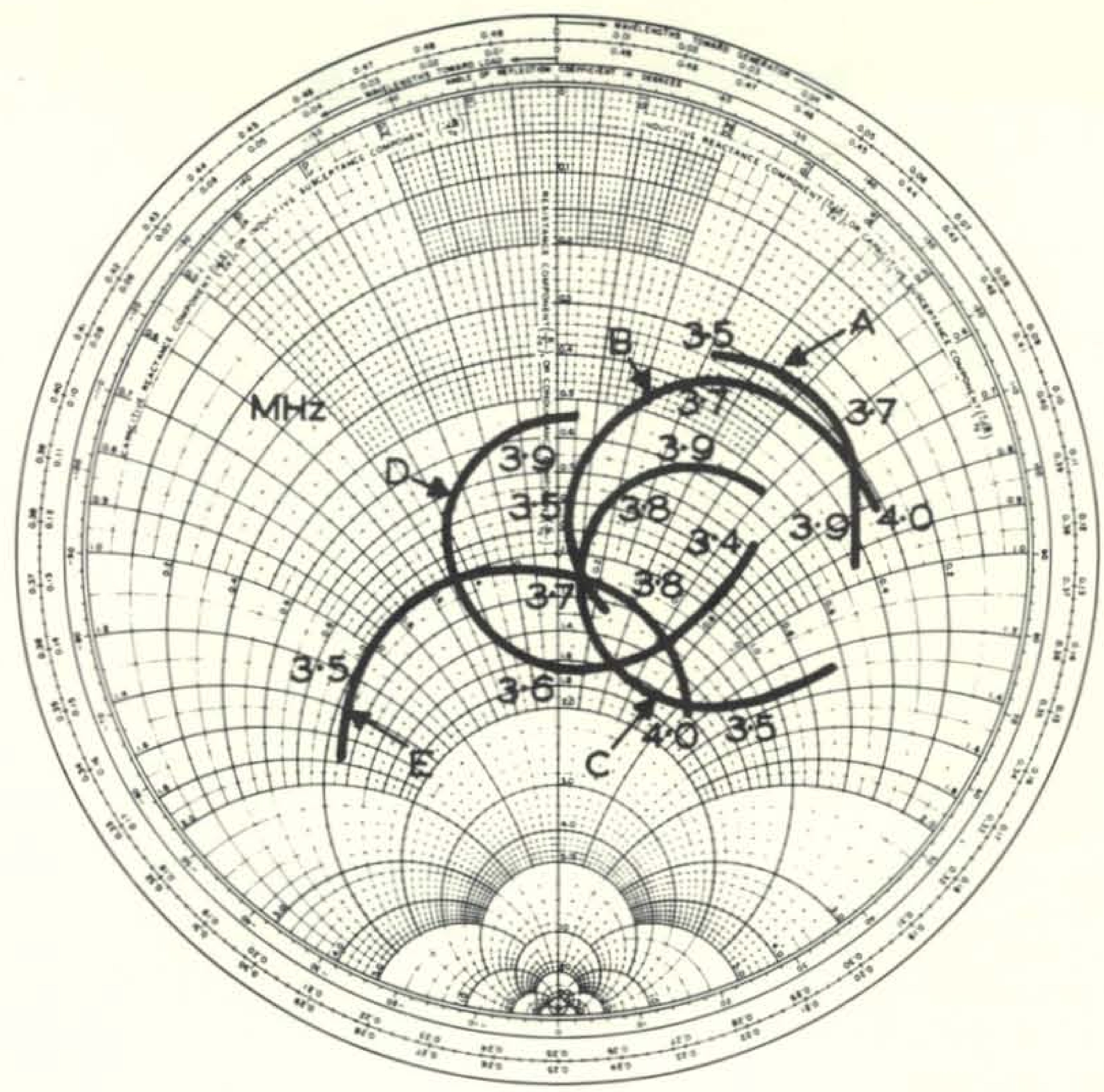

Fig. 2—The Smith chart showing the impedance plots for the various measurements. Curve "A" is for the original antenna. Curve "D" the transmitter end of the feeder and curve "E" the impedance at the dipole center after the improvements were made.

nput impedance of a half-wave dipole lo-ated less than a quarter of a wavelength bove ground will not be 75 ohms. On this asis alone a standing-wave could be ex-ected to exist on the feeder. The presence f the ground and obstacles would have the ffect of lowering the resonant frequency of he antenna. In spite of these points the de-ice worked, loaded up in the approved man-er, and gave acceptable results. It was only re-read of the *CQ* articles that prompted ny further work.

Smith Chart

A General Radio r.f. bridge type 1606-A as obtained on loan and used throughout e experiment. The shack receiver was used s a null detector and a signal generator as e signal source. The input impedance to e coaxial cable at the transmitter end was easured at different frequencies. These re-lts were normalized (*i.e.* divided by 75) nd plotted on the Smith chart. This chart as then used to determine the nature of e improvements. The plot of the input impedance of the original antenna is shown as curve "A" on fig. 2. The standing-wave voltage ratio plotted as rectangular coordinates is shown in fig. 3 (curve "A"). These were obtained from direct measurement from the radial scales of the chart. Note that the s.w.r. varies from 3.5 to 4.9 across the band —not very good! The final curve, the s.w.r. as seen by the transmitter, is shown as curve "D" on fig. 3. This is the result of some very simple improvements. To improve the s.w.r., the impedance plot on the Smith chart should be "shifted" to be as close to the center of the chart as possible.

Antenna Adjustment

The first adjustment made to the antenna was to cut six feet off one leg of the flat-top by inserting an insulator at a point six feet from one end. A second plot was then made from a second set of impedance measurements. This is shown as curve "B" in fig. 2. At 3.5 mc the s.w.r. is now 1.2 rising to 4.7 at 3.9 mc. A distinct improvement! It appeared that the antenna should be shortened

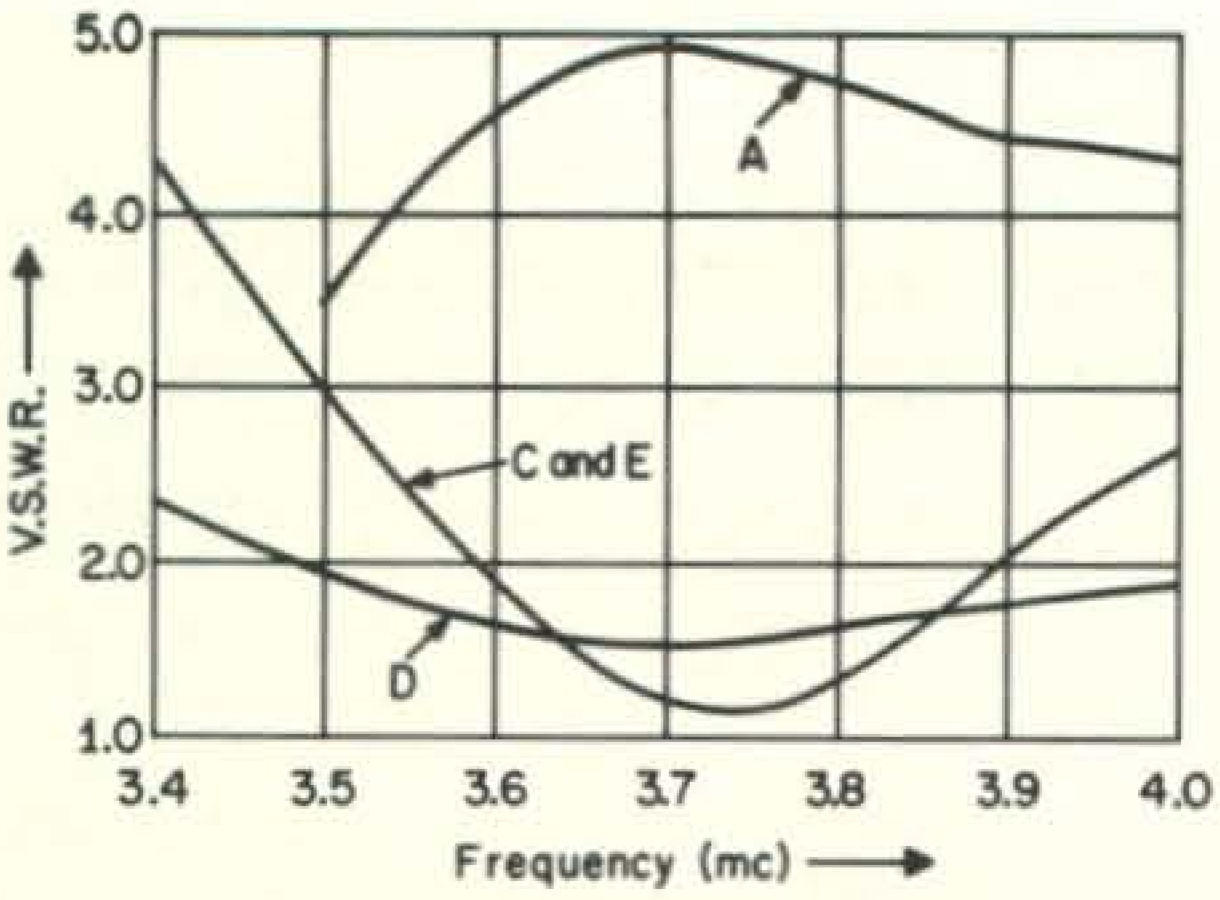

Fig. 3—The voltage standing-wave ratio for the various curves of fig. 2. These have been read off the Smith chart using the radial "voltage standing-wave ratio" scale and transferred to these rectangular coordinates for easier interpretation.

further to bring the point of lowest s.w.r. towards the band center (3.7 mc). So the next adjustment was to shorten the other leg of the flat-top by six feet and make a third set of measurements. These are plotted as curve "C" in fig. 2. The s.w.r. is now 3.0 at 3.5 mc and 2.0 at 3.9 mc with lowest value 1.1 at about 3.75 mc. This would be ideal provided operation was contemplated around 3.75 mc with a higher s.w.r. accepted at each end of the band. The transmitter loaded into this quite happily but further improvements were considered possible.

If the plot could be shifted to enclose the center of the chart then a lower s.w.r. could be expected at each end of the band but with a higher s.w.r. at the center, possibly a constant value of s.w.r. across the band.

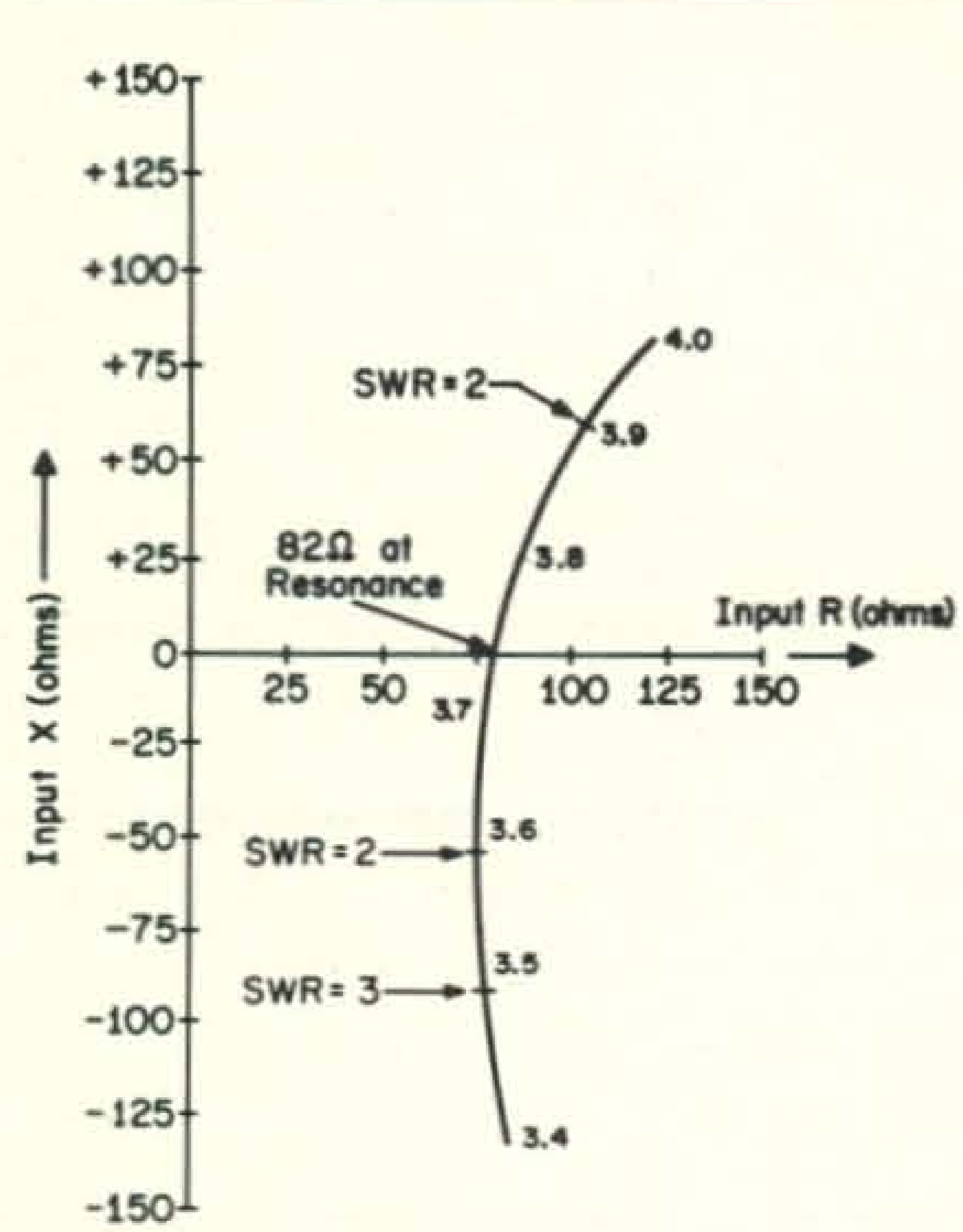

Fig. 4—The input impedance at the dipole center expressed in rectangular coordinates. This diagram is obtained from curve "E" of fig. 2.

Inspection showed that if 0.55 ohms capaci-tive reactance at 3.9 mc were added in serie at the transmitter end of the cable, then th loop would encircle the center. This 0.5 value is a normalized value and is 0.55 × 75 = 41 ohms in practice which works ou to be a capacitor of 1000 mmf. With thi capacitor in series at the feed point, th input impedance as measured is shown a curve "D." The s.w.r. is now 1.6 across mos of the band and rises to 1.8 at the ends. Thi is a vast improvement over the original inpu characteristic. It must be remembered tha the transmitter "sees" curve "D" but th actual s.w.r. on the feeder coaxial is sti curve "C". This is important whe feeder-line losses are to be considered. A the frequencies in question, these losses ar negligible and can be readily neglected.

Feeder Length

The physical length of the feeder used i 67 feet. By putting a temporary short acros the distant end (at the dipole center) an measuring the input impedance of the coaxi cable, it was found that the input impedanc was zero ohms at 4.86 mc. This represen the frequency for which the cable length i an electrical half-wavelength or multiple o a half-wavelength. The free-space wav length for this frequency is 101 feet, so th velocity factor of the cable is 67 ÷ 101 o 0.66.

Now that the velocity factor and physic length is known it is possible to produc a table showing the electrical length of th cable as multiples of a wavelength, for eac of the frequencies under consideration. Th is shown as Table I.

Curve "E" is produced from Table I an curve "C." This represents the input im pedance at the center of the dipole. It is co structed by travelling round the chart on constant s.w.r. circle for the distance state in Table I towards the load. Each frequenc point is plotted independently using the out wave-length scales on the chart. For exampl travelling counter-clockwise (*i.e.,* towar the load) for 0.393 of a wavelength fro the 3.9 mc plot (curve "C") and at a co stant distance from the center of the cha produces the 3.9 mc plot on curve "E."

Curve "E" is the plot that would obtained if the r.f. bridge and all its trin mings could be elevated to the dipole cent to measure its input impedance. This of course, rather impractical.

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f_{mc}	length
3.4	0.343λ
3.5	0.353λ
3.6	0.363λ
3.7	0.373λ
3.8	0.383λ
3.9	0.393λ
4.0	0.403λ

TABLE I

Table I—Relationship between frequency and the electrical length of the feeder.

From curve "E" a graph with rectangular coordinates can be produced to show how the input reactance and resistance varies with frequency. This is shown as fig. 4. The normalizing has been removed to give practical figures.

The bandwidth of an antenna can be expressed in several ways, between frequencies of certain s.w.r. (say 2 or 3) or between frequencies where the input impedance phase-angle is 45 degrees. It's necessary to express the method of measurement whenever quoting the antenna bandwidth. The size of wire used for the flat-top could be altered to effect some change in the bandwidth. However the pi-coupler in the transmitter can handle the present feeder input impedance characteristic quite successfully —so things are going to be left as they are.

Fig. 4 shows that the input impedance of the dipole is 82 ohms resistive at 3.73 mc. Figure 3 (curve "D") shows that the s.w.r. is 1.9 maximum across the band of frequencies in question. These are features that I was not aware of before this experiment started.

The radiation pattern from this antenna has not been considered for with limited space there is little that can be done to improve it.

From a transmitter point of view the antenna now loads better and on-the-air tests indicate an improvement *at negligible cost.* Even if there had been no improvement, I now *know* a lot more about my antenna, which, after all, is one of the things ham radio is for! ■

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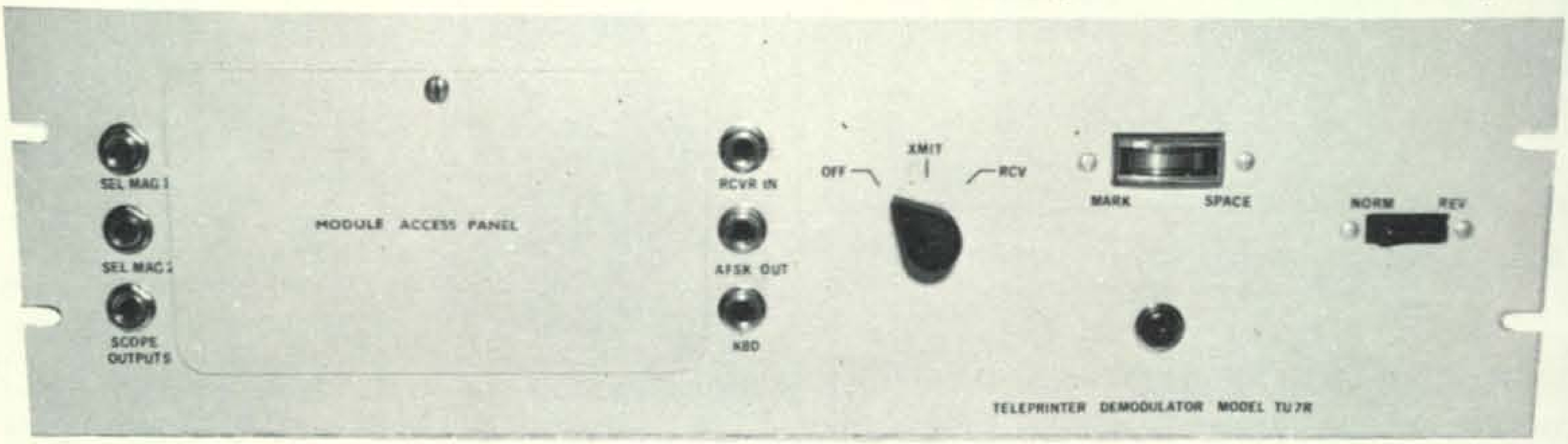

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WHAT'S YOUR ANGLE?

BY KENNETH SCHOFIELD, *W1RIL

This article explains the relationship between the horizontal and vertical radiation patterns, antenna height and the vertical radiation angle.

My first few years as a radio amateur were filled with gaping voids on many aspects of the art. One of these voids was the understanding of antenna operation relative to the makeup of the fields forming the radiation pattern, and particularly the vertical angle of radiation.

Participation in an FAA training course at Oklahoma City in the late 1950's brought to me a greater depth of understanding in this area. From QSO's on the bands it becomes apparent that other hams are plagued with the same lack of understanding.

It is the intention of this article to tie together the horizontal and vertical radiation from an antenna of a given type and to show the relative effects of antenna height changes to the resultant vertical radiation angle.

True Ground

True ground is difficult to find without extensive research and specialized equipment not usually available to the average amateur. In order to circumvent this obstacle of true ground location, let us *assume* in all subsequent calculations in this article that true ground is the surface of the earth, is a perfect conductor, and will reflect the radiated signal totally, without loss of energy.

*21 Forestdale Road, Paxton, Mass.

Past articles in amateur publications have listed pros and cons about antenna heights and types, *etc.* Most DX men will agree, that the higher the antenna the better. By delving into a little background, defining of terms, applying some simple trig, and taking examples of an antenna at different heights, it is relatively simple to show the effect height has upon the vertical angle.

Radiation Patterns

Figure 1 depicts a free space horizontal radiation pattern of a 2 element beam. (dipole with reflector) If it was possible to vaporize a drop of ink in the final tank coil to color the radiation pattern, fig. 1 would then depict a birds-eye view of what would be seen.

Putting the same fictitious ink again into the final tank coil, we color the vertical

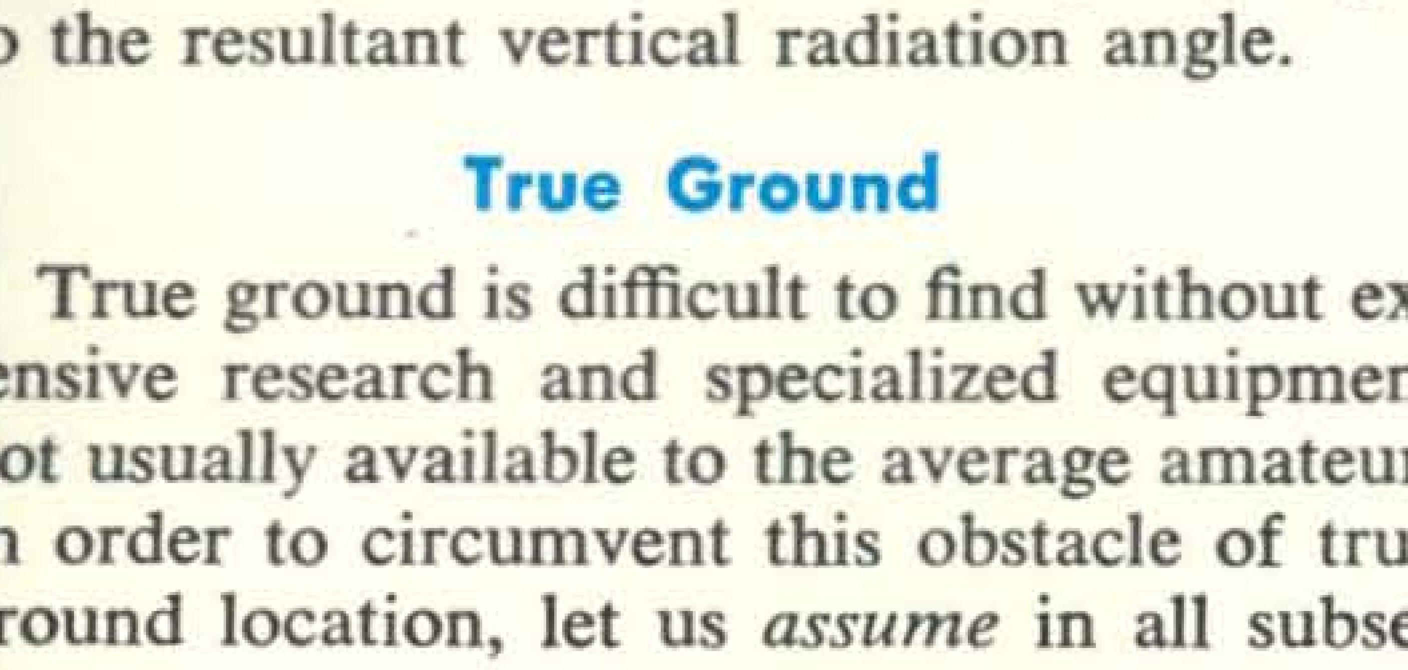

Fig. 1—Horizontal radiation pattern of a 2 element beam antenna.

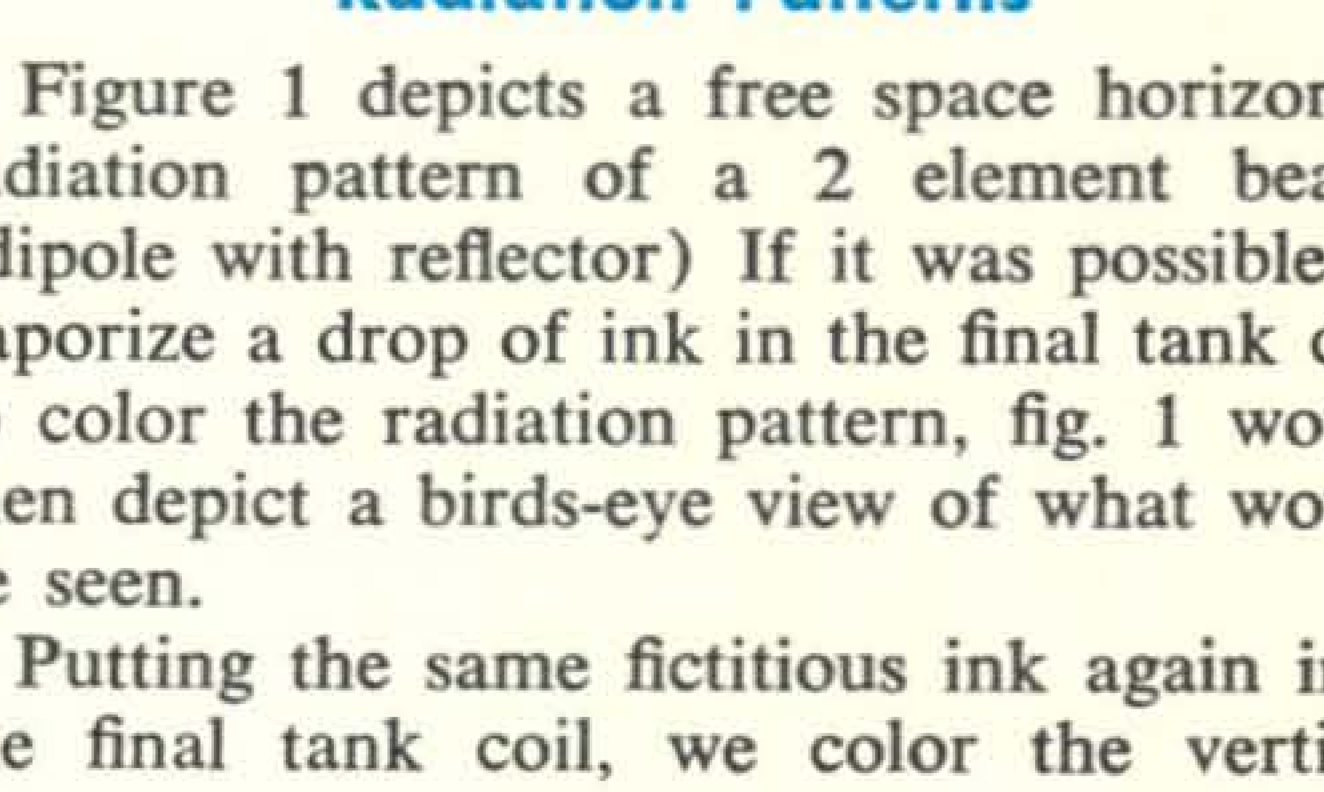

Fig. 2—Vertical radiation pattern of a 2 element beam antenna.

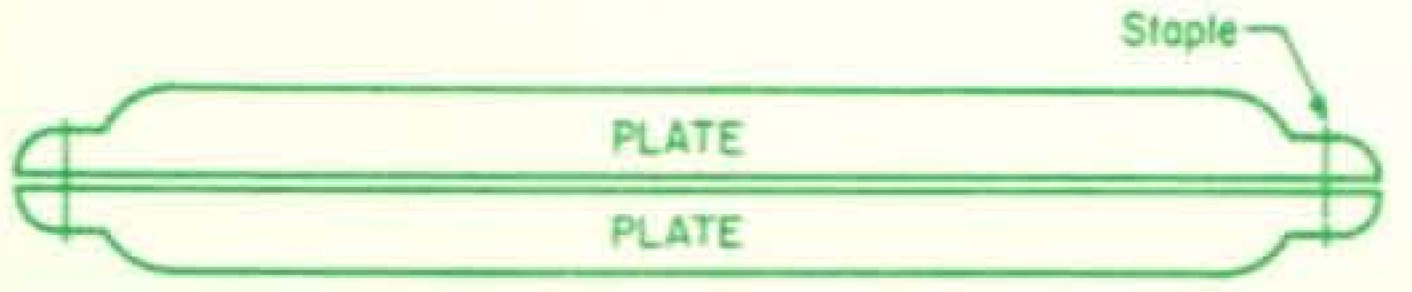

Fig. 3—Fabricating a model of a lobe using paper plates.

radiation pattern, and this might be viewed by standing on a hilltop looking toward the ends of the beam as per fig. 2.

These two patterns, horizontal and vertical, are combined and form the radiation from the antenna which is essentially a three dimensional phenomenon. A small scale model of a radiation pattern can be constructed using paper plates, to give an overall picture of the combination of the 2 patterns. Place two large paper plates together face to face and staple the edges as in fig. 3. This is used as lobe 1 as shown in fig. 2. Repeat with two slightly smaller plates for lobe 2. Using 4 small plates construct lobes 3 and 4. Staple lobes 1, 2, 3 and 4 together at point *X* (fig. 2) and bend the lobes to resemble fig. 2 as viewed from the side. The minor lobes, 5 and 6 can be added using smaller diameter plates if desired and attached to each side at point *X*.

Vertical Radiation

Now that we understand the combined patterns we can go on to the vertical radiation angle. Figure 4 illustrates a vertical radiation pattern (as viewed off the ends of the beam), plotted on a degree scale. Zero degrees represents the front of the antenna, 90 degrees is directly above the center of the antenna and 180 degrees is off the back of the antenna. At point *A* we find a maximum radiation in the first *major* lobe. At point *A'* we find a maximum radiation in the second lobe. Points *B* and *B'* are nulls (minimum radiation).

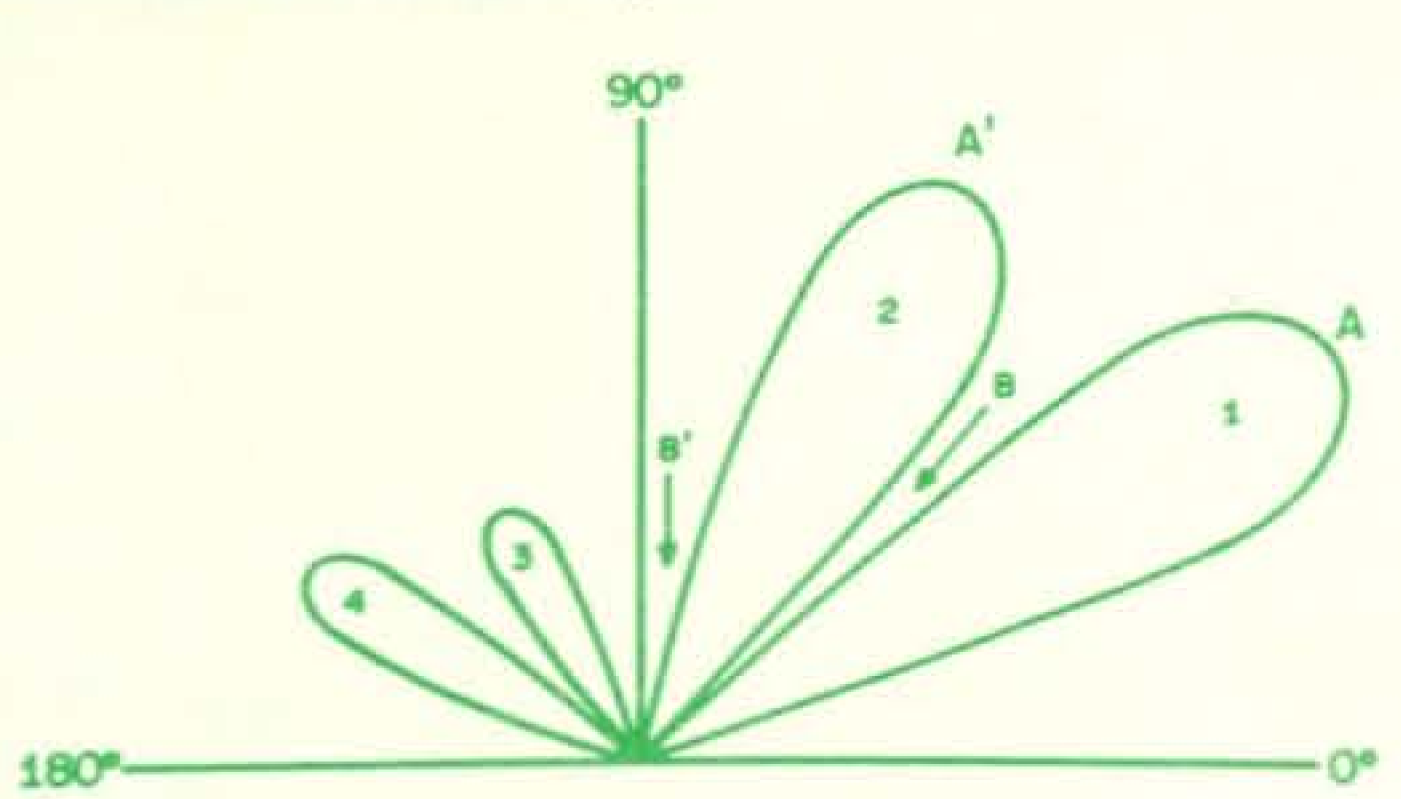

Fig. 4—A vertical radiation pattern showing major and minor lobes and the mirror image angular relationships explained in the text.

The area between 90 degrees and counterclockwise to 180 degrees will be a mirror image of the pattern found between 0 and 90 degrees insofar as location of maximum and nulls are concerned. The only difference will be the intensity of the lobes will be greatly reduced and are called *minor* lobes. The angle of the fourth lobe to the 180 – 0 degree line will be the same as that of the first lobe to the 0 – 180 degree line, and the angle of the third lobe will be the same as that of the second lobe.

The number of lobes is determined principally by the height of the antenna above ground. The angle formed by the first major lobe to the 0 degree line is the vertical angle of radiation of interest. The smaller the angle at which the wave leaves the antenna the less will be the bending required in the ionosphere to bring it back, and generally, the greater the distance covered.

Vertical Angle

Let us now calculate the vertical angle of a two element beam at various heights.

Given: *Height:* 46 feet above ground (earth's surface).
Frequency: 21.391304 mc (used only to simplify calculations).
Antenna: 2 element beam, dipole with reflector at 90 degree spacing.
Polarization: Horizontal.

Determine the height of the antenna in electrical degrees:

$$\text{Wavelength in feet} = \frac{984}{f_{mc}} = \frac{984}{21.391304} = 46 \text{ feet.}$$

Since the antenna height is 46 feet we are I wavelength high, or 360 electrical degrees above ground.

Image Antenna

Figure 5 depicts this antenna illustrating the real antenna 360 degrees above ground. Let us assume that an r.f. current I_r is flowing in the real antenna. At point *P* (a receiving point), energy will be received over the direct path P_1 and also by way of a

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eflected path P_2. From the geometry of ig. 5, wave P_2 could be considered to have een radiated by an antenna located 360 de- rees below ground. This imaginary antenna s called the *image* antenna.

Consider fig. 6. When point P is very nuch greater than the distance h (360 de- rees), path P_1, P_2 and P_o (midpoint between eal and image antennas) can be considered arallel as illustrated. Through geometric elationships, distance D is equal to $h\ sin\ a$. 'his, $h\ sin\ a$, is the vertical directivity factor. Energy can be assumed to be radiating from he midpoint of the real and image antennas.

Phasing

At the beginning of this article we as- umed our ground to be a perfect conductor vith no losses to reflected energy. Consider- ng this, horizontally polarized waves will e reflected without change in amplitude ut with a 180 degree change in phase be- veen the incident and reflected waves.

Referring to fig. 7, we see the real antenna 60 degrees above ground and the image ntenna 360 degrees below ground. An as- umed current, I_{real}, is flowing in the real ntenna at a phase angle of 0 degrees. (I_{real} 0.) Also, current I_{image} at 180 degrees, ows in the image antenna. (I_{image} 180.) t point X, half way between the real and nage antennas we find that I_{real} /0 has aveled 360 degrees from the real antenna nd will arrive at point X at the same phase ngle of 0 degrees. (360 degrees is the same s 0 degrees.) At this same point X, current $_{mage}$ /180 has traveled 360 degrees from ne image antenna and will arrive at point X t the same phase angle of 180 degrees. /180 + 360 = /180) Therefore at point , I_{real} and I_{image} are 180 degrees out of hase and cancel, resulting in a null.

Now consider point X', 90 degrees above round, shown on fig. 7. The current from ne real antenna will reach this point in 270 egrees, whereas to the ground line it is 60 degrees. In other words, the current $_{eal}$ has been advanced 90 degrees.[1] (rep- esented on the vector diagram, fig. 8, as a ounterclockwise rotation of the I_{real} vec- r.) The current from the image antenna avels 360 degrees to reach the ground line ut now has to travel 90 degrees further to ne point X'. This current is therefore re- rded 90 degrees and is represented on the ector, showing I_{image} rotating clockwise) degrees.

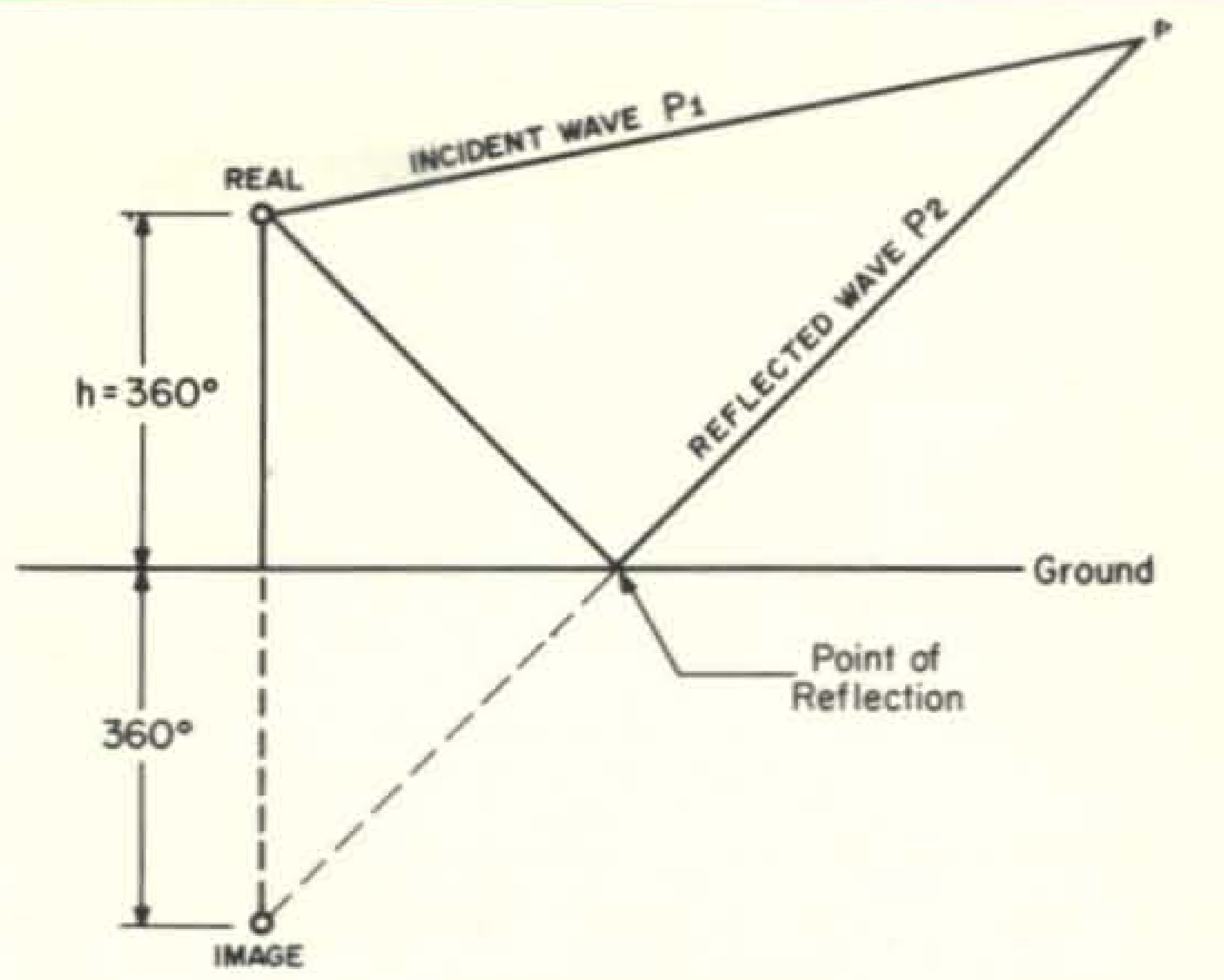

Fig. 5—Relationships between the real and image antenna and the incident and reflected waves.

Consider point P in space. By geometric construction it can be proven that at point P, the same situation will evolve, that is to say, the phase of the real current will be advanced and the phase of the image current will be retarded, relative to point X.

Vertical Angle Calculations

On the vector diagram, fig. 8, the currents I_{real} and I_{image} are shown. If the I_{real} is advanced 90 degrees and the I_{image} is retarded 90 degrees they are then in phase and add, and we have a maximum radiation. The vertical directivity factor, $h\ sine\ a$ will be set to equal the points at which these

[1] As an electromagnetic wave is propagated into space its phase is considered to be retarded in respect to the point of origin.

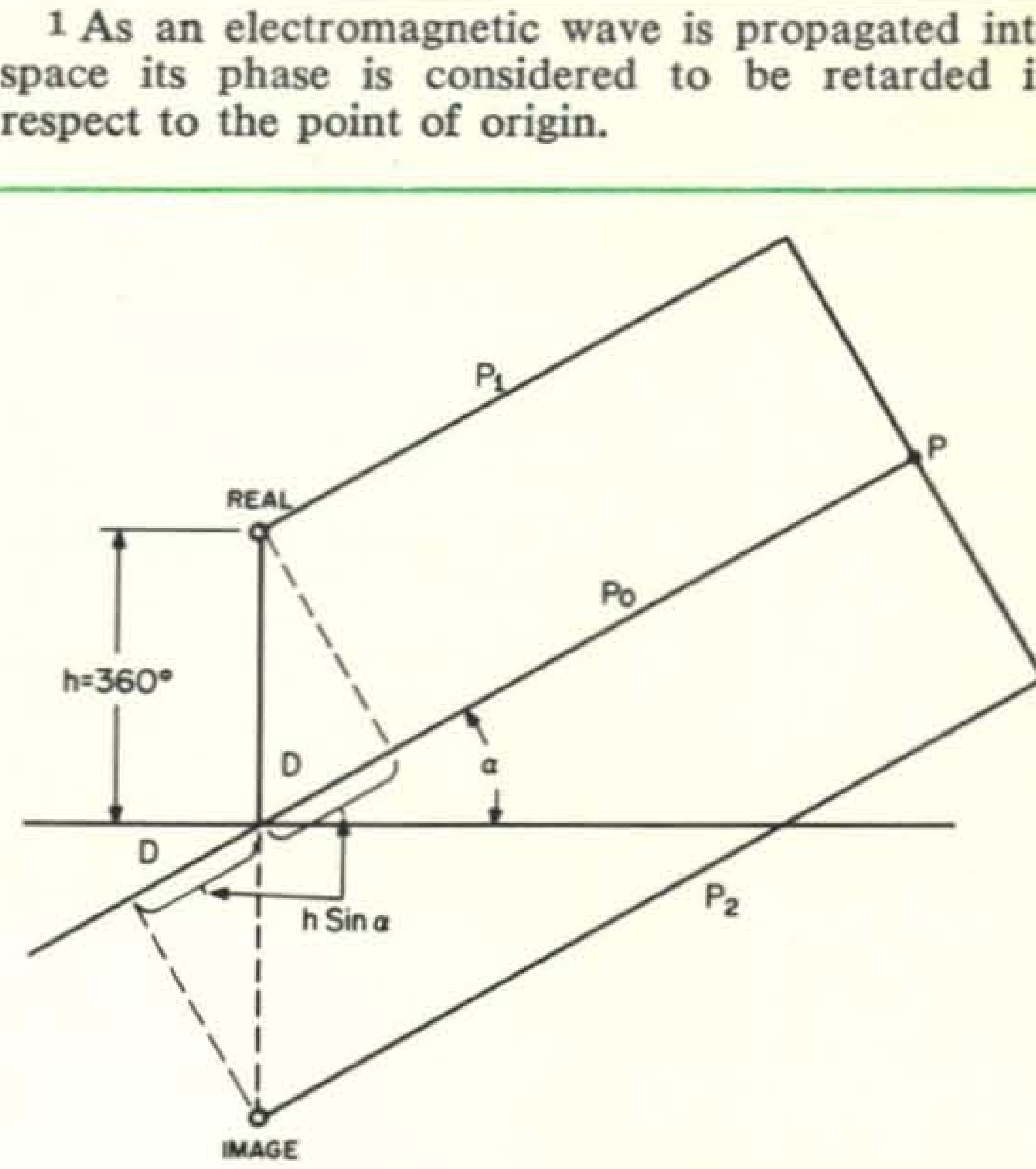

Fig. 6—Geometric construction showing how energy can be thought of as radiating from the midpoint of the real and image antennas.

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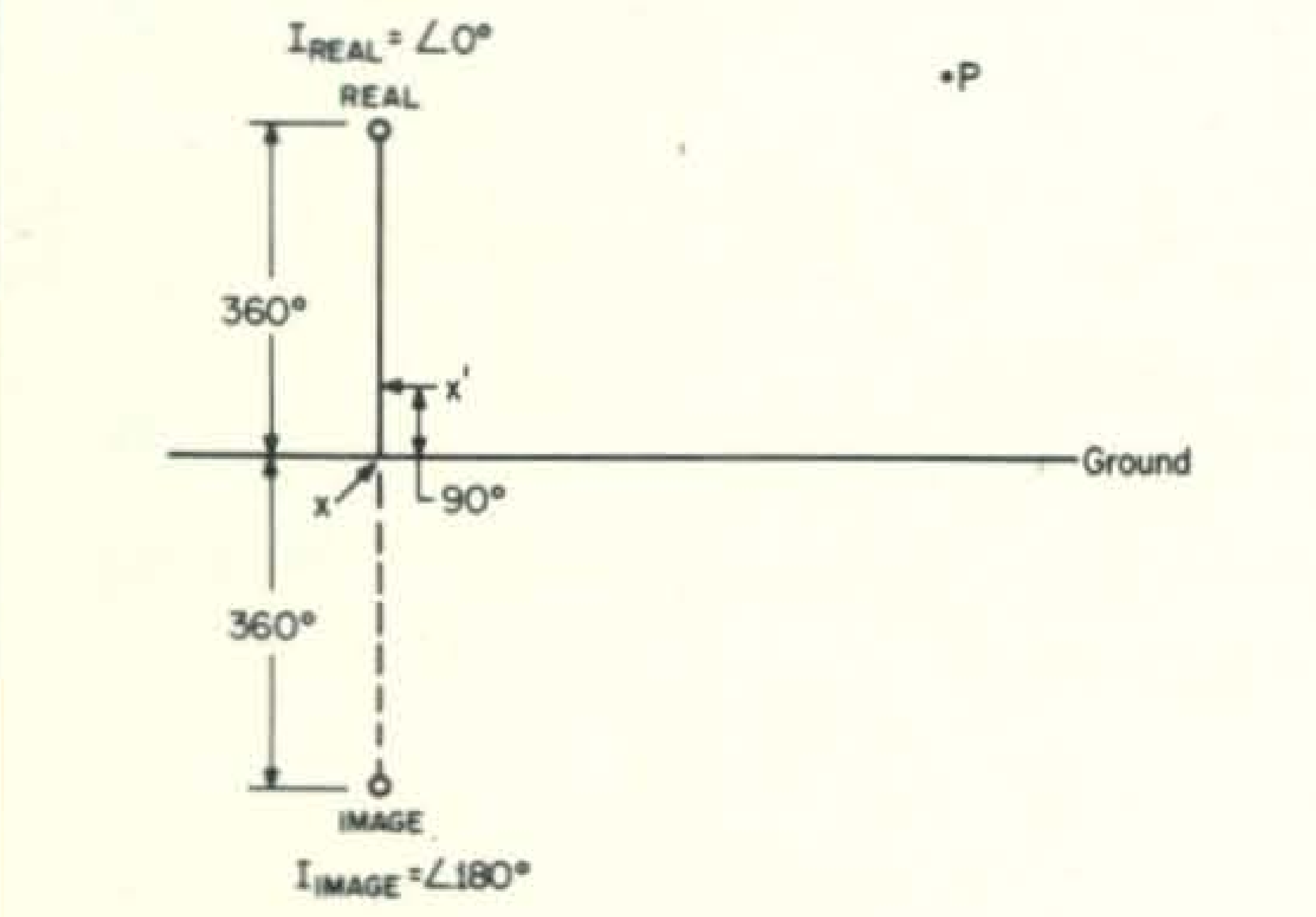

Fig. 7—Phase relationship between I_{real} and I_{image}.

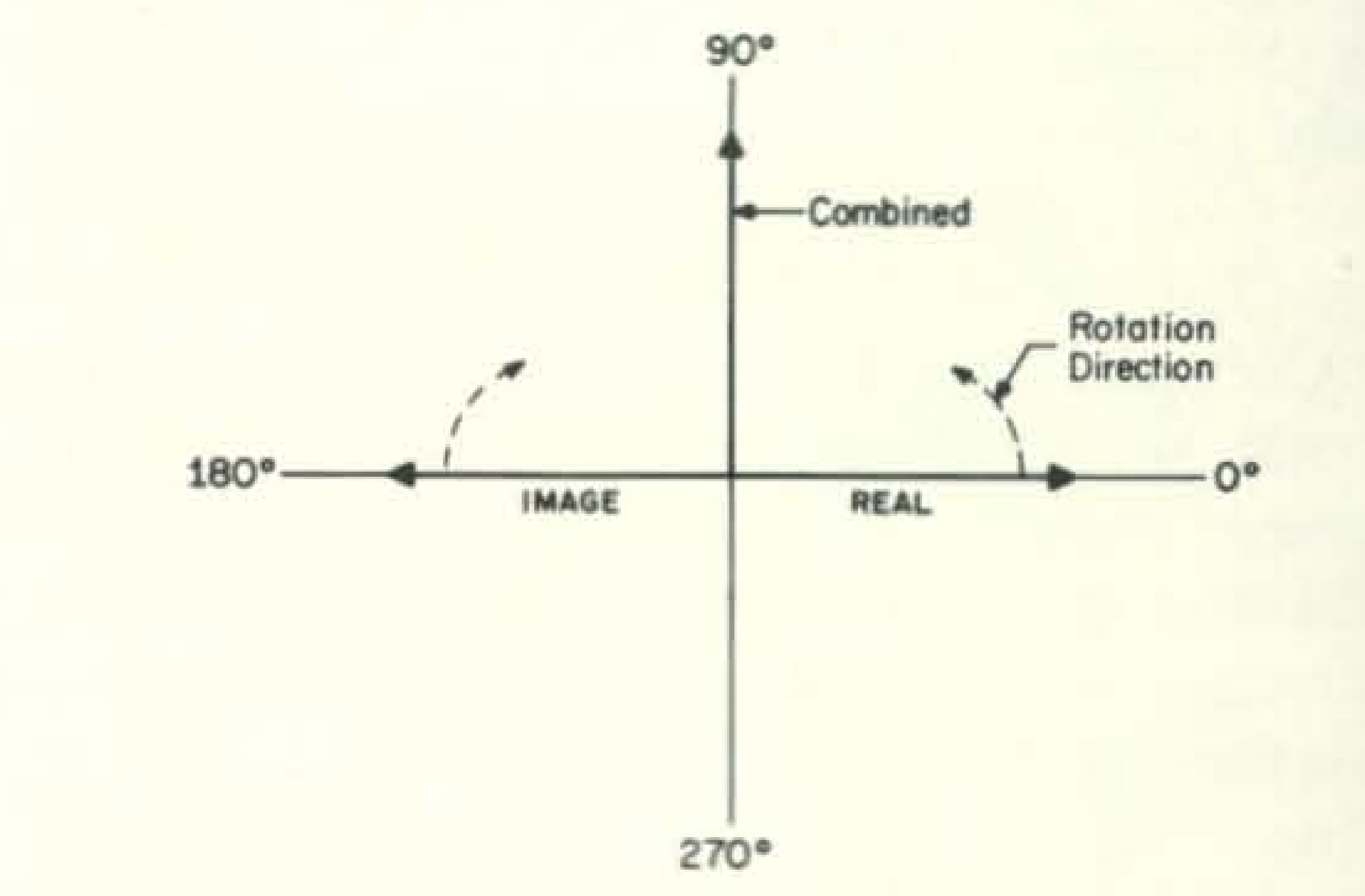

Fig. 8—Vector relationship between I_{real} an I_{image}.

two currents are in phase, 90 degrees, 270 degrees, 450 degrees, *etc.*, and we can now calculate the vertical angles of radiation for the antenna.

Substituting our known value of *h* we have:

$$360 \sin a = 90 \quad 270 \quad 450$$
$$\sin a = \frac{90}{360} \quad \frac{270}{360} \quad \frac{450}{360}$$
$$a = 14.5 \quad 48.5 \quad \text{(Not valid)}$$

This, 14.5° equals the angle of the 1st major vertical lobe, and 48.5° equals the angle of the second vertical lobe.

Raising the antenna from 46 feet to 69 feet will give the following radiation angles: 69 feet is equal to 540 electrical degrees. Thus, *h,* in *h sin a,* is now equal to 540 degrees.

$$540 \sin a = 90 \quad 270 \quad 450 \quad 630$$
$$\sin a = \frac{90}{540} \quad \frac{270}{540} \quad \frac{450}{540} \quad \frac{630}{540}$$
$$a = 9.6 \quad 30 \quad 56.5 \quad \text{(Not Valid)}$$

Now, 9.6° is the angle of the 1st major vertical lobe, and 30° is the angle of the second vertical lobe. The angle of the third vertical lobe equals 56.5°

The increased height has resulted in the addition of a third vertical lobe at 56.5 degrees which was not present at the 46 foot level. Notice, also, that the radiation angle of particular interest has dropped from 14.5 degrees to 9.6 degrees.

At an antenna height of 92 feet (720 degrees) the vertical angle of the first major lobe will be 7.2 degrees. The second and third lobes will not reach the maximum intensity of the first lobe because of antenna directivity. Those calculations are not within the scope of this article.

Back to reality—the ground under ama teur antenna installations is not perfect no can the height of the antenna be determine easily. Imperfect ground reflections reduc the amplitude of the maximum lobes an increase the amplitude of the mins (nuls) If however, we can consider it perfect an take the idealized conditions approximat angles of radiation can be calculated. What' your angle? ■

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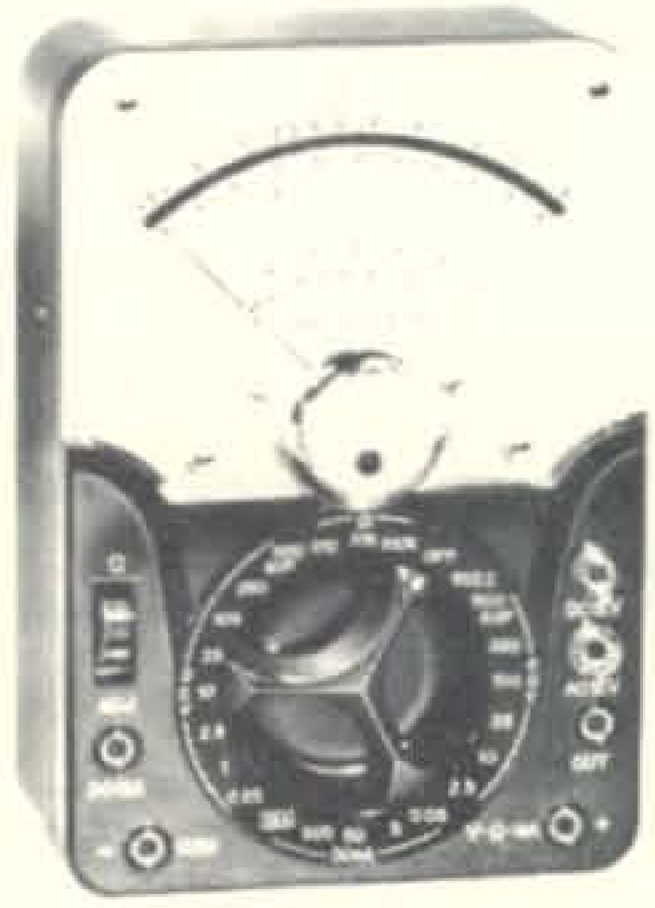

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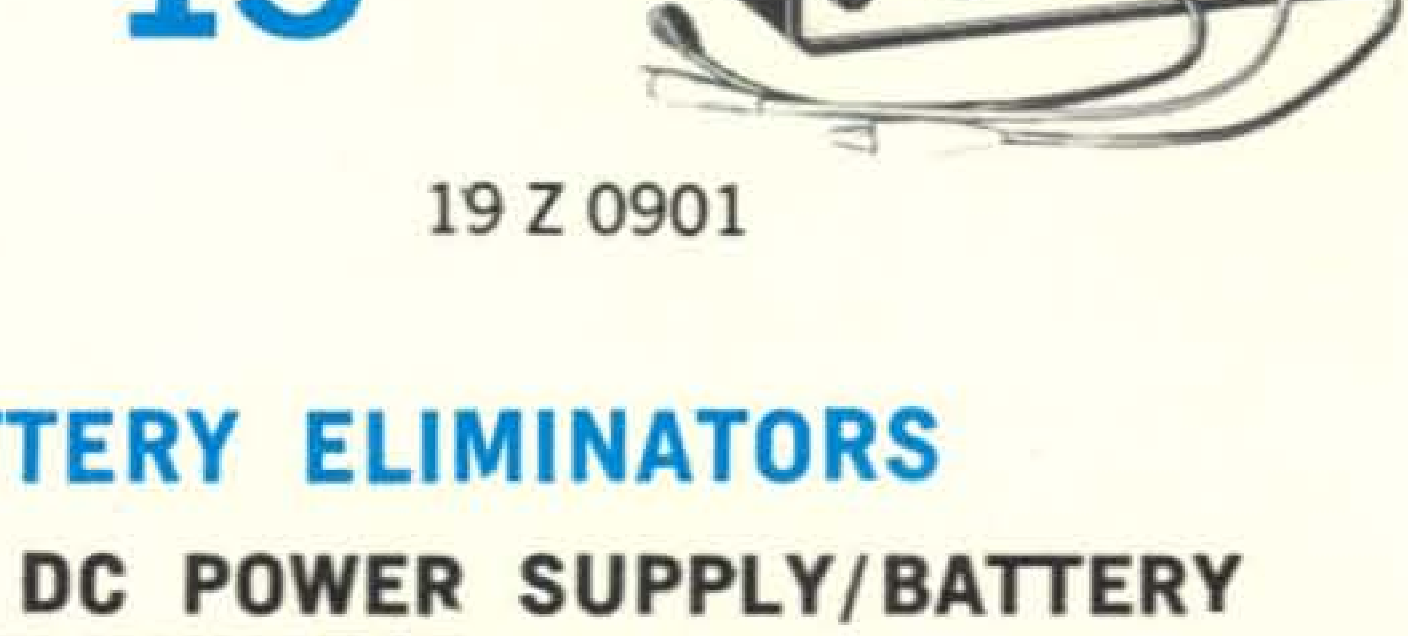

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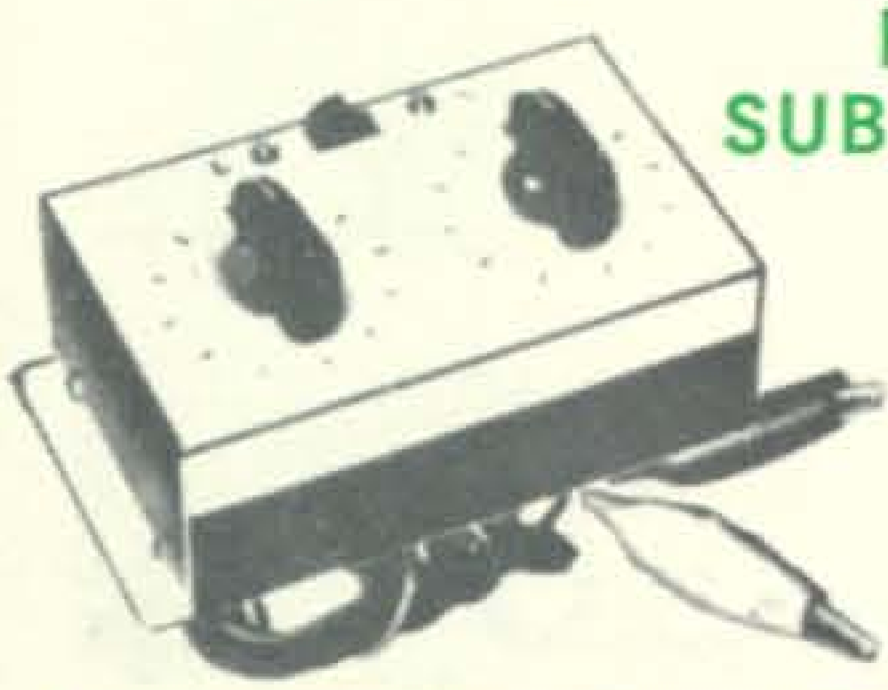

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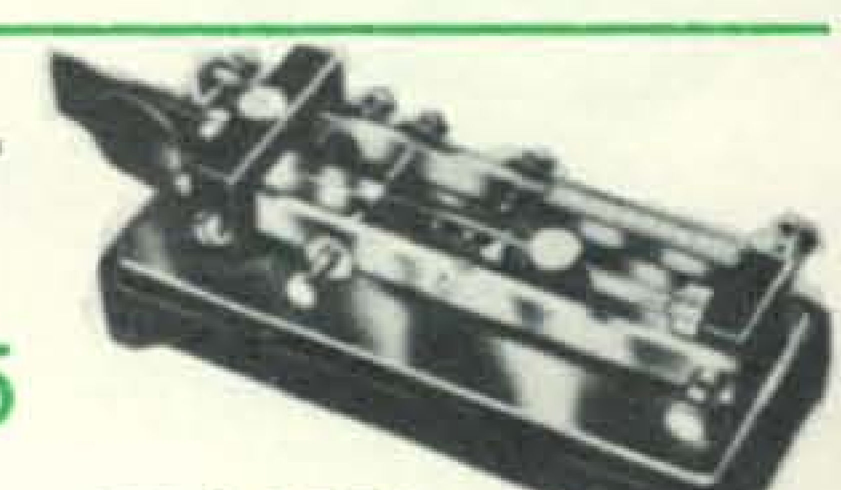

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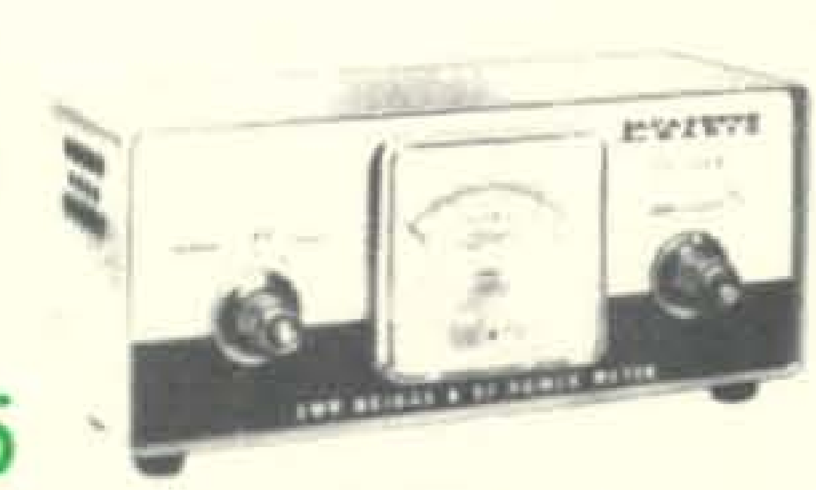

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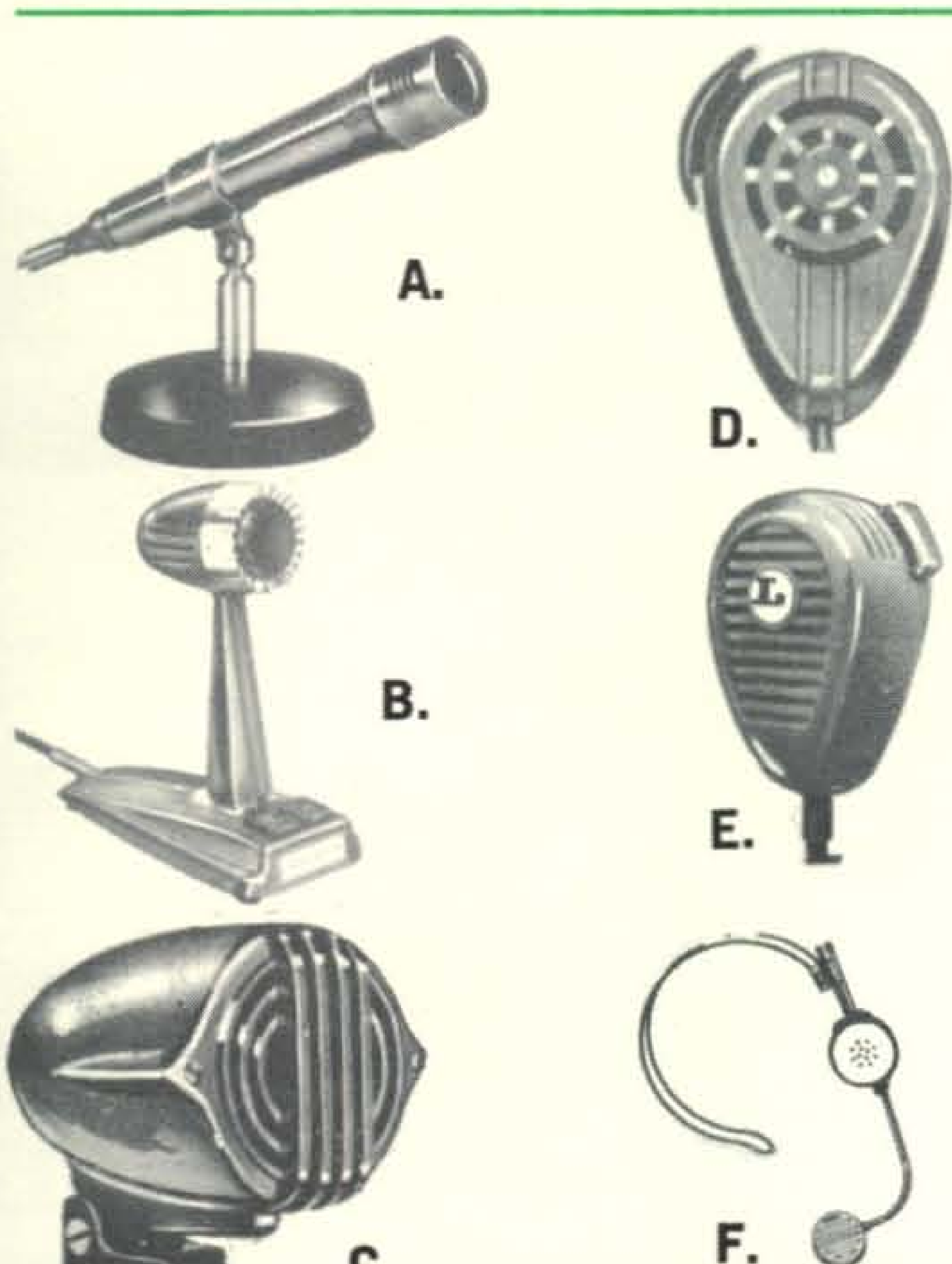

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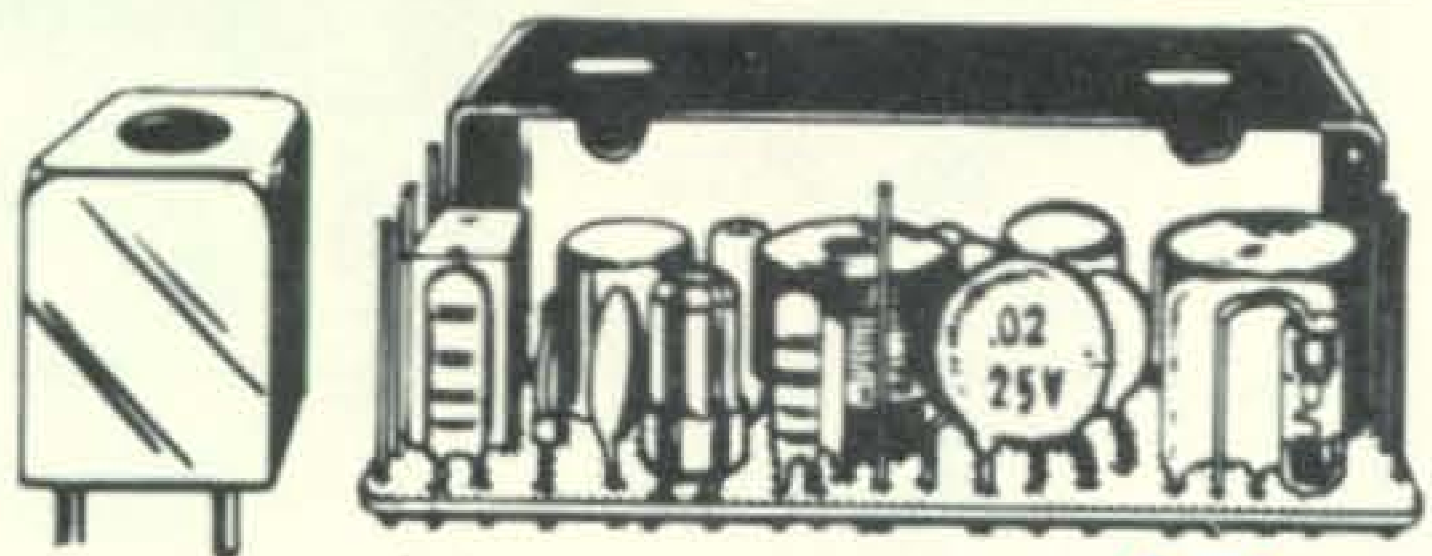

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A ONE MAN MAST

BY GEORGE P. SCHLEICHER,* W9NLT

This 33 foot wooden mast made of 2"×2" lumber can be used to support a long dipole or a simple vertical antenna wire. The installation method can easily be handled by one man.

Do you need an inexpensive antenna mast? Maybe one that will hold up the end of a dipole, a long wire or the center of an inverted Vee? How about two of them to be carried out to a field day location and erected quickly? I have used a mast of simple design in such situations and have always been pleased with the results. The mast that is described here is not a big brute and I wouldn't try to put a beam on it. It's great, though, for horizontal wires of any kind and can be used simultaneously with a vertical radiator.

The mast is made of wood and stands 32 or 33 feet above ground, depending on the base arrangement. Its cost is only a few dollars but its main advantage for me is that one person can build it, raise it, lower it or move it without help. In this regard it ought to appeal to the older ham whose family may not be close at hand to help with antenna work.

The upper part of the mast is shown in fig. 1. It consists of two 16' lengths of 2"×2" baluster that have been spliced together. Baluster is an especially good grade of lumber that has a fine, straight grain and is free of knots. It is used because the mast parts must be free of imperfections so as to withstand the flexing that takes place when it is raised or lowered. At the present time, 2×2 baluster retails for about 21¢ per lineal foot in the Chicago region. The other parts of the mast—base section and splice—are made of construction grade lumber at a cost of only 7¢ per lineal foot for 2×2s.

* 1535 Dartmouth Lane, Deerfield, Ill. 60015.

The base section is shown in place in fig. 2. It goes a little more than two feet into the ground. The base is made of two 4½' lengths of 2×2; two 6" lengths are used as spacers between the two upright pieces at the bottom and at the ground line. Two cadmium plated bolts hold the base section

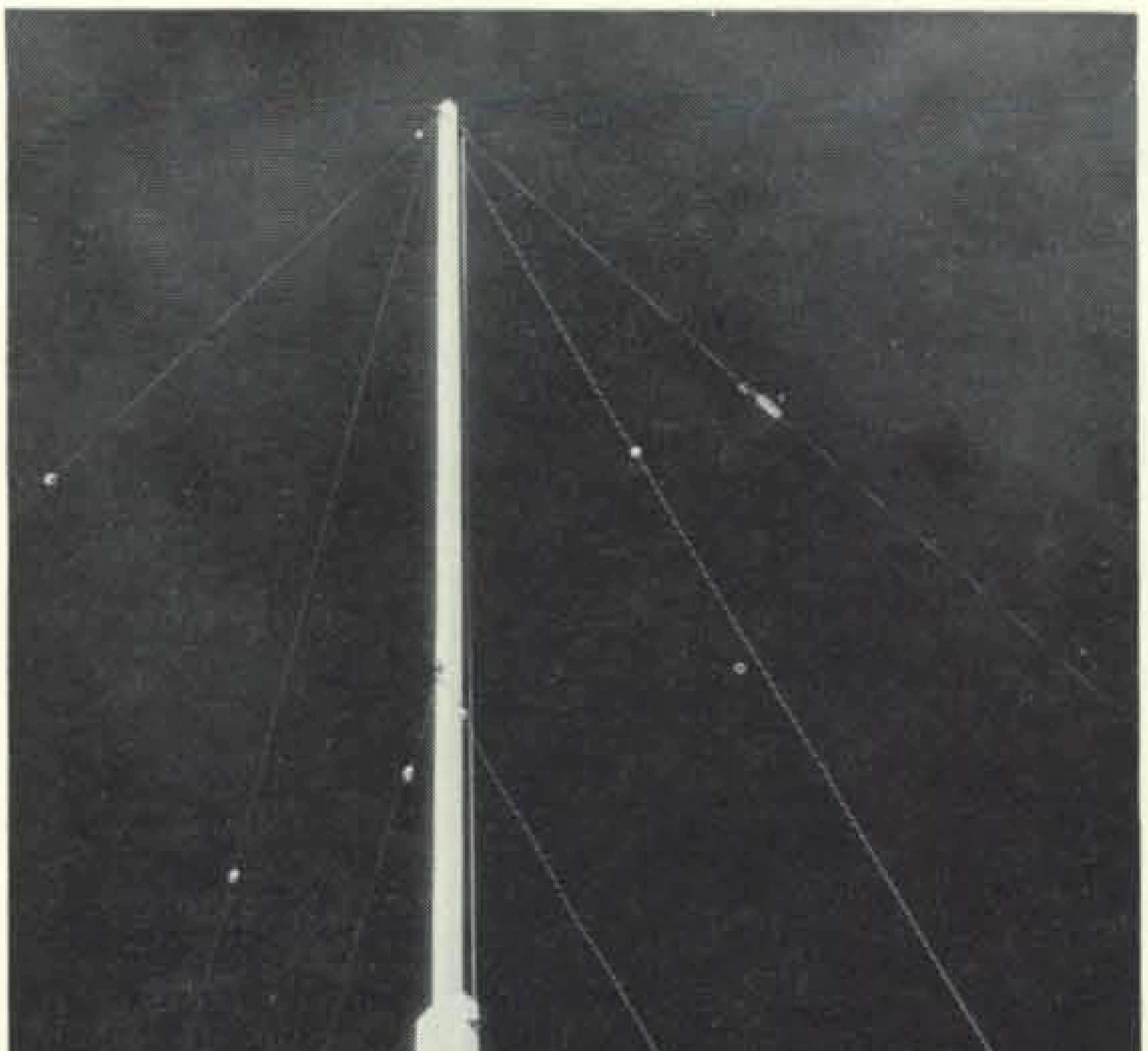

Fig. 1—This view shows the splice between the two 16' sections. The guy wires have strain insulators at 12 foot intervals.

together; they are below the ground line in the picture. Two more bolts hold the mast in place; the lower of the two is used as a hinge when the mast is raised or lowered. It is possible to use the mast without a base section for a short period of time such as a Field Day weekend but without the base raising it will be more than a one man job.

Guying

The mast should be guyed in three directions at the top and at its middle. The guys (or "stays" if you are British) are attached to the mast by means of screw eyes; one eye is sufficient for all of the guys at either level. I made one mistake that you won't need to repeat; I used hard drawn copper wire for the antenna and had enough left over for the guy wires. A storm battered the mast with heavy gusts of wind and some of the guy wires unwound where they were fastened to the egg-shaped strain insulators. I am now convinced that permanent guy wires should be made either of galvanized iron or #14 gauge copper clad steel; I use the latter. For Field Day use, ⅛" nylon line makes an excellent guy and eliminates the need to bother with strain insulators. I also

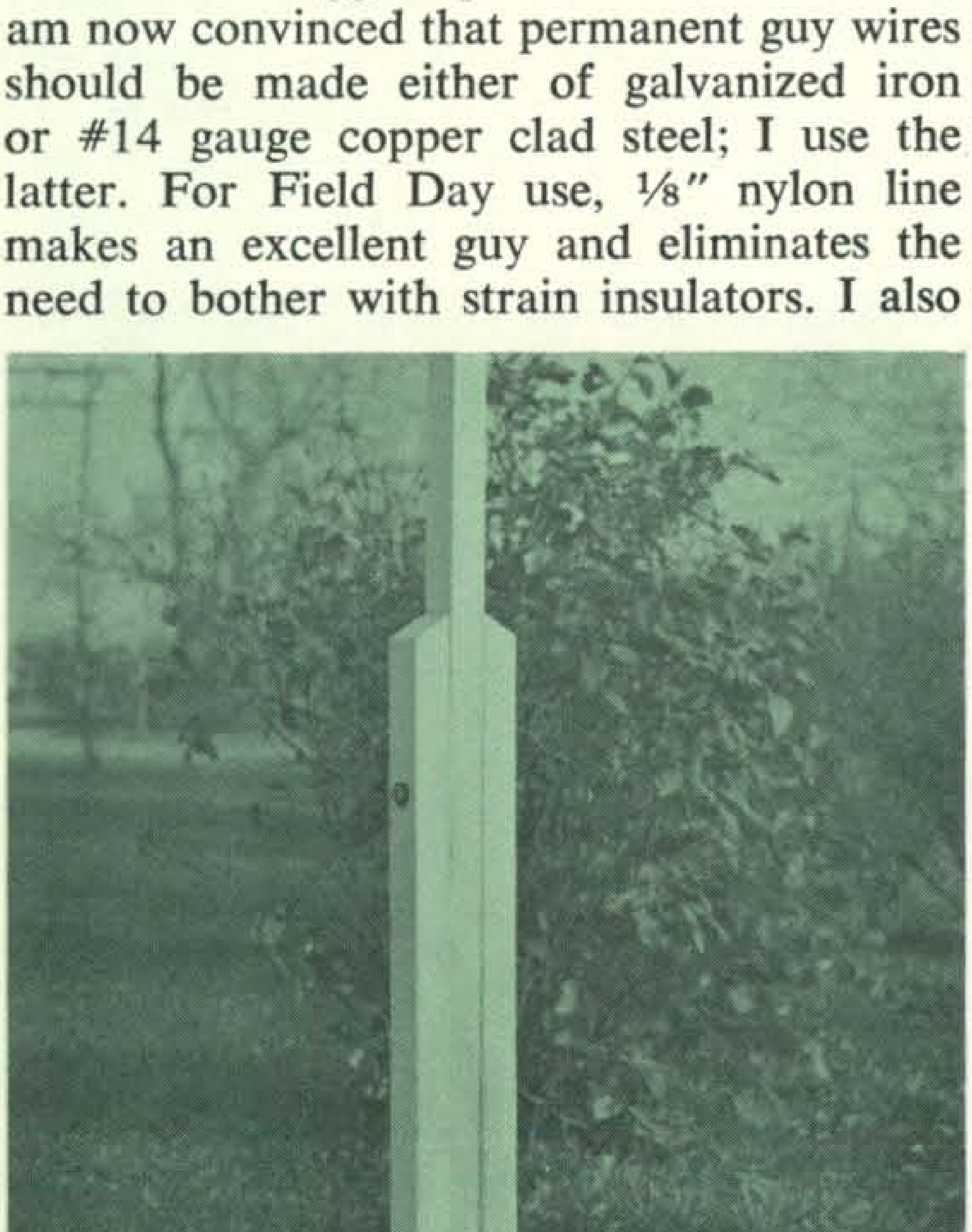

Fig. 2—The base section is shown above with the mast in place.

recommend it as the best possible material for use as a halyard, connecting to the antenna end insulator and running through the pulley and down the mast to the awning cleat.

A number of ways to anchor a guy are shown in the handbooks. I prefer to use metal anchors that can be augered into the ground without any hand digging. For field day a small auger only 18" long is used. These are usually available from stores that sell children's swing sets or outdoor play equipment. For permanent installation I use anchors that are 4' long and have a 4" auger tip. They are rated at 1500 pounds holding strength; one of them is shown in place in fig. 3. These anchors are available from many hardware stores. This and one or two smaller sizes that work well may be found at airports, being offered for sale to flyers who want to buy "tie-down kits" for their aircraft. Only three anchors are required as the middle and top guy are fastened to the same anchor on any one side of the mast.

You may be wondering about the unusual appearance of the photos figs. 1 and 3. Those of you who are also photographers will probably recognize that these two pictures were taken with infra-red film; a deep red filter was also used. As a result, the sky is very dark and foliage (which reflects, rather than absorbs, infra-red) appears light.

Shown below are two lists of the materials that would be required to build a mast of the kind described here. The first list includes the material recommended for a fixed or semi-permanent installation. The second list includes all of the items needed for a field day installation. The main difference is that for field day it is assumed that no base section will be used; the mast will rest on an 8" square piece of lumber. It also assumes that nylon line will be used for the guys as well as the halyard. The cleat is also omitted as the halyard can be tied directly to the mast.

After you have gathered the materials together inspect the wood; if there is a discernible difference, the best piece of the baluster should be used at the bottom of the mast as that is where the greatest strain will occur when it is raised or lowered. From each of the two 8' lengths of 2×2 cut a 4½' piece for the base section and a 3' length for the splice.

There is no magic in these dimensions; they can vary 6" either way without impair-

See page 126 for New Reader Service

Table I—Materials required for one permanent mast.

- 2 pieces 2″×2″×16′ baluster lumber
- 2 pieces 2″×2″×8′ construction grade lumber
- 8 5/16″×6″ cadmium plated bolts with washers and nuts
- 3 1″ dia. screw eyes
- 1 ¼″ single sheave aluminum pulley
- 1 5″ awning cleat with screws
- 50′ ⅛″ nylon line
- 3 4′×4″ anchors *
- 200′ 14 gauge copper clad steel wire
- 12 small strain insulators
- 1 qt. paint and primer

* Aircraft Components Inc., Benton Harbor, Mich. Item #A-1006, $2.79 each.

ing the performance of the mast. Try to make the cuts in the wood so that any large knots will be left in the waste. From the scrap save two pieces that are 3″ or more in length; they will serve as spacers for the base.

Hole Locations

Drill 11/32″ holes for the bolts that will hold everything together. In splicing the baluster I placed the bolt holes 12″ apart and 3″ from one end of each long piece. A foot or so of additional height might be gained by separating the ends of the baluster in the splice but that will require a longer splice, adding weight to the middle of the mast. The uprights that form the base section and a spacer can be drilled 3″ from one end. A bolt can be inserted and made hand tight; this will hold the base together while the other three holes are drilled. The second hole and spacer should be about 2′ from the first one; this will also be about where the ground line will be when the base is in place. The upper hole should be about 6″ from the top of the upright and the next one down should be 18″ from it. These holes are for the bolts that hold the mast in place; they can be seen in fig. 2. Note that a gap of an inch or more is left between the bottom of the mast and the nearest spacer in the base. The gap is necessary to permit the mast to hinge on the lower bolt when it is raised or lowered. After all of the holes have been drilled the parts of the mast and base should be assembled for a trial fit.

Locating the Mast

Before attaching the screw eyes for the guys or the halyard pulley, decide whether you will want the mast to swing up in line with the antenna wire or at right angles to it. It won't make any difference to the mast; your decision should be based on what fences, flower beds and power or telephone wires are in the vicinity. Remember that you will need a clear path from the base of the antenna mast to a point 32′ away when the mast is down and plan accordingly. The locations for the three anchors can be determined at this time. They should be placed from 10′ to 15′ from the base of the mast and spaced equally around it, conditions permitting. One of the anchors should be directly in line with the antenna wire. Whether it is on the same side of the mast as the antenna wire or opposite to it is not important; I prefer to place it opposite to the wire if I have a choice.

Assembling

After you have decided which way the mast will swing you can attach the small hardware items. Pilot holes can be drilled for the screw eyes and cleat mounting screws to avoid splitting the wood. Whether you attach the hardware before the mast is painted or afterward is up to you. I do recommend that all of the mast and base parts be painted before they are assembled, however. I usually mount the halyard cleat

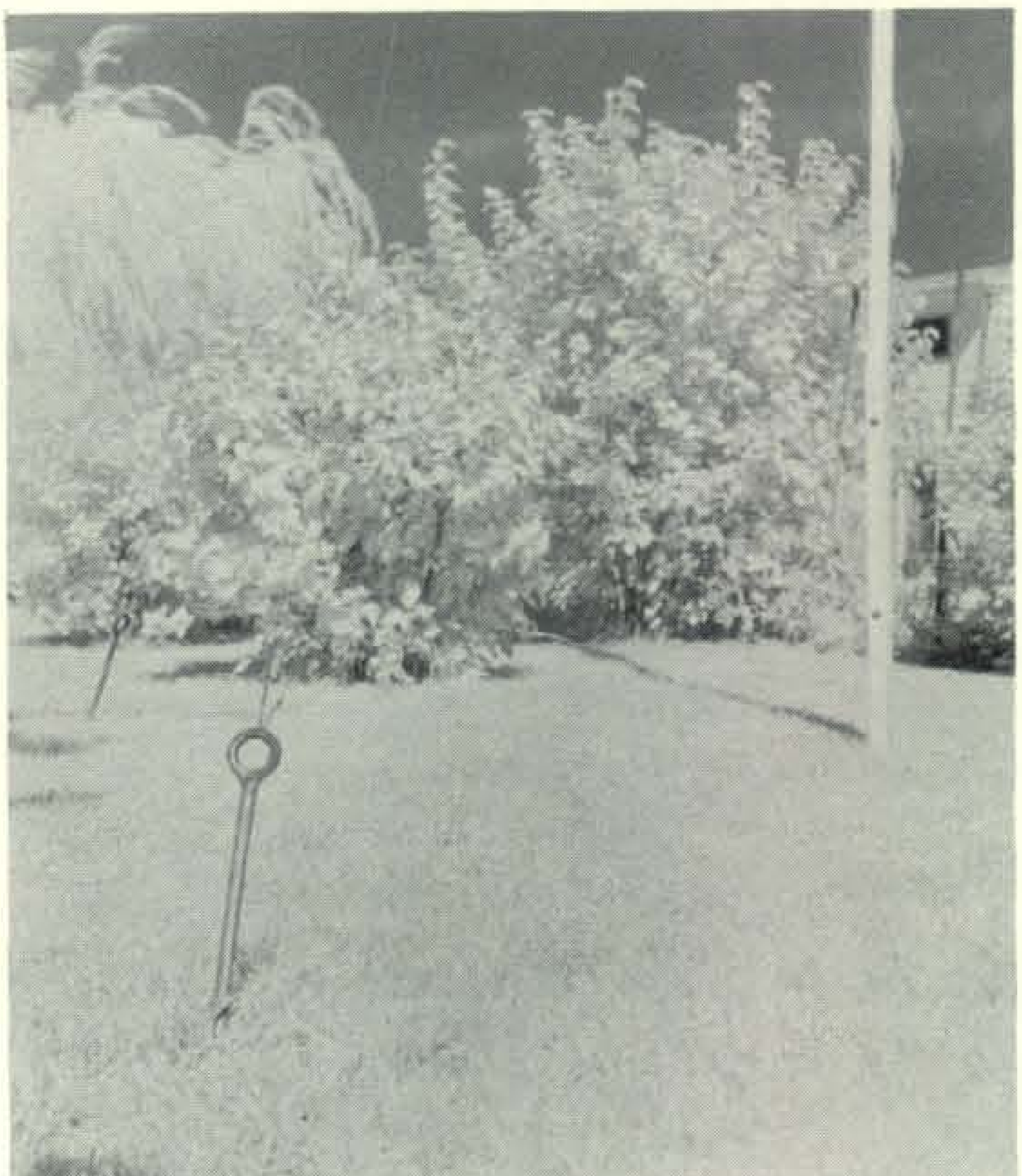

Fig. 3—A close up of one of the anchors used to hold the guys in place. A second anchor may be seen in the left background and the mast is on the right.

about 8′ from the bottom of the mast. The practice requires that a short stepladder be used to fasten the halyard to the cleat but it leaves the halyard well out of the reach of neighborhood children.

Tension Weight

I have had very good luck over the years with an arrangement that keeps a constant tension on the antenna. The halyard at one end of the antenna is fastened firmly. To the halyard, at the other end, I attach a sash weight weighing between 12 and 15 pounds. This small weight will be adequate for an antenna over 100′ in length and fed in the center with ¼″ coax. The sash weight is also attached about 8 or 9 feet above ground; a short restraining line fastened between the weight and the house or mast permits about 2 feet of movement in either direction. This degree of freedom is enough to avoid damage to the antenna as the result of storm winds or temperature changes. The sash weight is shown in fig. 4.

Installation

After the paint is dry put the anchors and base in the ground; try to keep the base plumb. A carpenter's level will help you here. A post hole auger of from 6″ to 8″ diameter will make it easy to put the base in place. The base should be put into the ground a depth of 2′ to 3′, depending on whether the soil is usually firm or soft.

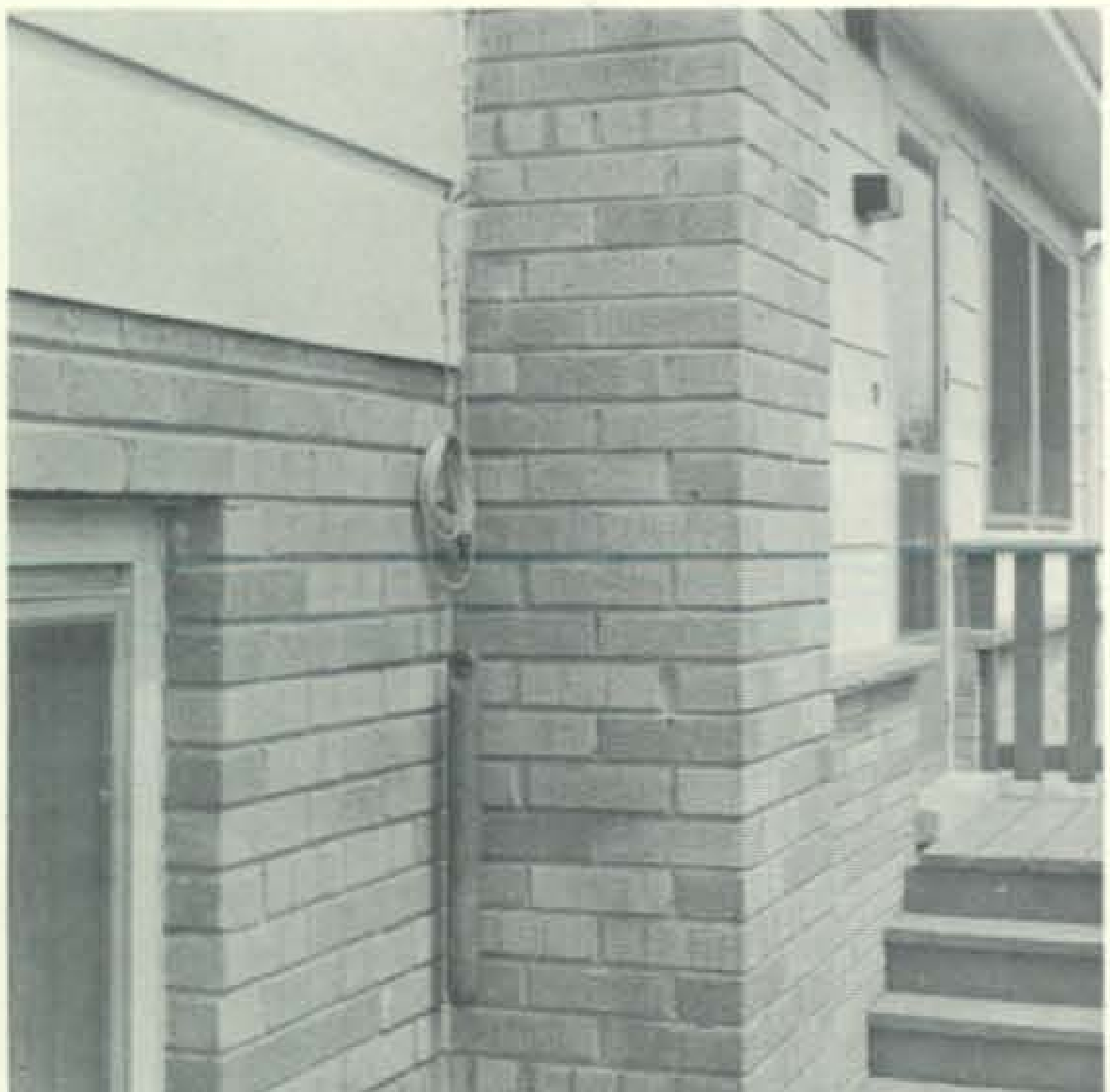

Fig. 4—The antenna is kept under constant tension through the use of a sash weight as shown above.

2 pieces 2″×2″×16′ baluster lumber
1 piece 2″×2″×8′ construction grade lumber
1 piece 8″×8″×¾″ lumber or plywood
8 5/16″×6″ cadmium plated bolts with washers and nuts
3 1″ dia. screw eyes
1 1¼″ single-sheave aluminum pulley
250′ ⅛″ nylon line
3 anchors, Aircraft Components #A-1002, set of 3: $4.50 or Sears Roebuck Catalog #49B7198 @ $1.19 each

Table II—Materials required for one field day mast.

After the mast has been assembled the guy wires should be made up. Use insulators at 12 foot intervals. Cut the guys at least 3 longer than their computed length to make handling easy. Remember that the top guys will be longer than the mast. For example if the top of the mast is 33′ above level ground and the anchor is 15′ away from the base the guy will be nearly 35′ long; make them 38′ long to start with. The diagonal length of the guy is computed using the square root of the sum of the squares of the mast height and the distance from the base to the anchor (the Pythagorean theorem).

Fasten the mast to the base by means of the bottom bolt but don't tighten it. Be sure the pulley will end up on the side toward the antenna! Attach the guys to the mast and thread the halyard through the pulley, tying the ends to the mast where they will be within reach after it is raised. Put the top mast mounting bolt through one of the two base uprights so that it will be handy when you want it. Now pick up the mast at its middle, raise it over your head and walk it up into position. Slip the top bolt into place to hold the mast while you attach the top guys loosely to the anchors.

Walk around the mast at a distance of 25′ or so and sight along the mast to the corner of nearby buildings or to a short plumbline held at arm's length. This will help you to see which guys to tighten to bring the mast to true vertical. The guys should be tightened firmly by hand and fastened securely to the anchors when you are finished; the base bolts should then be made snug with a wrench.

The mast can be erected by two people if no base section is used, one holding the bottom in place and the other lifting it up.

[*Continued on page 118*]

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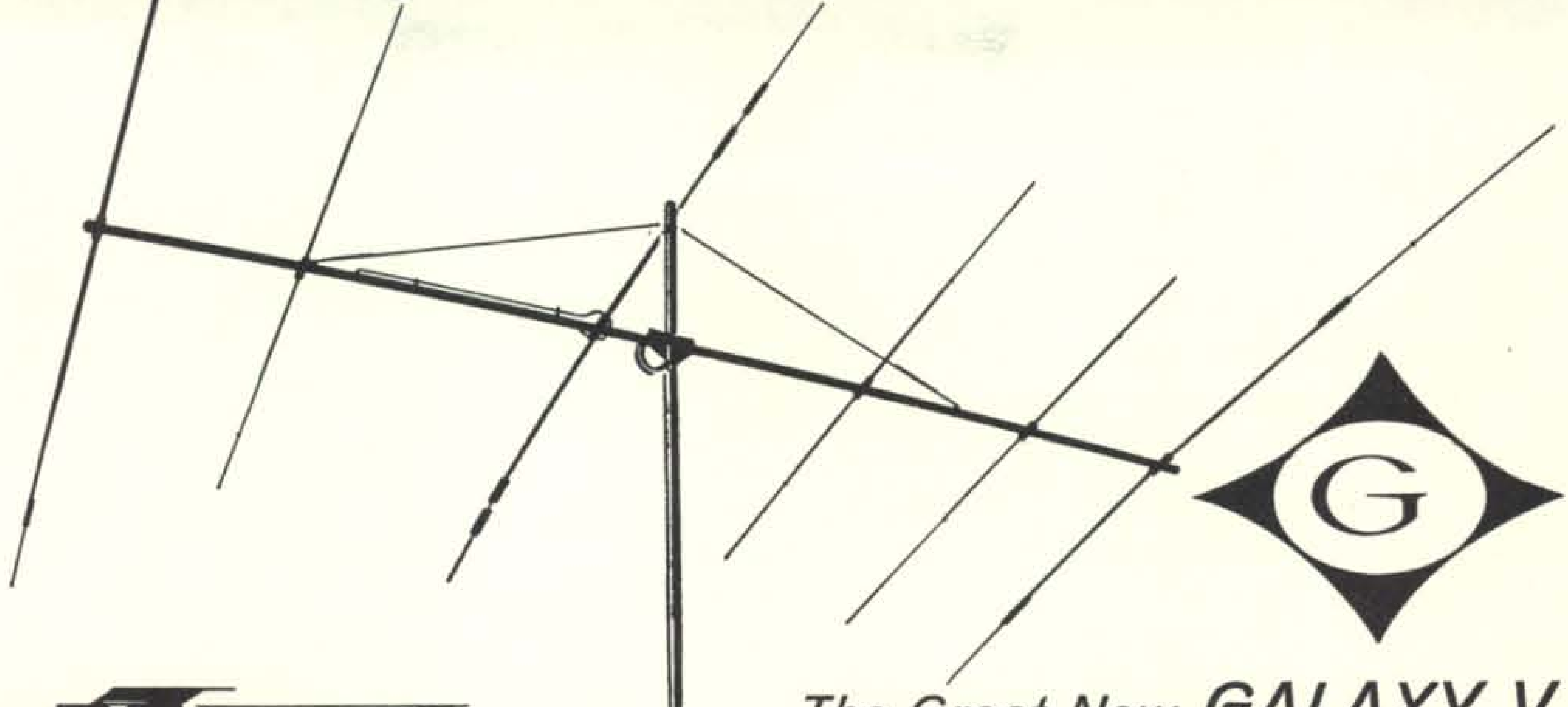

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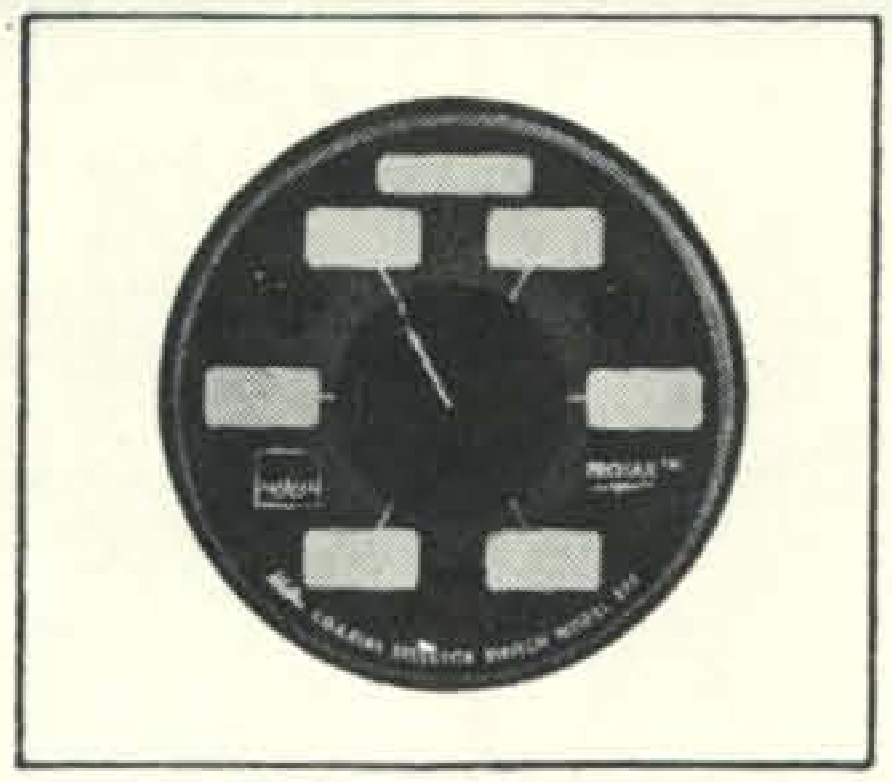

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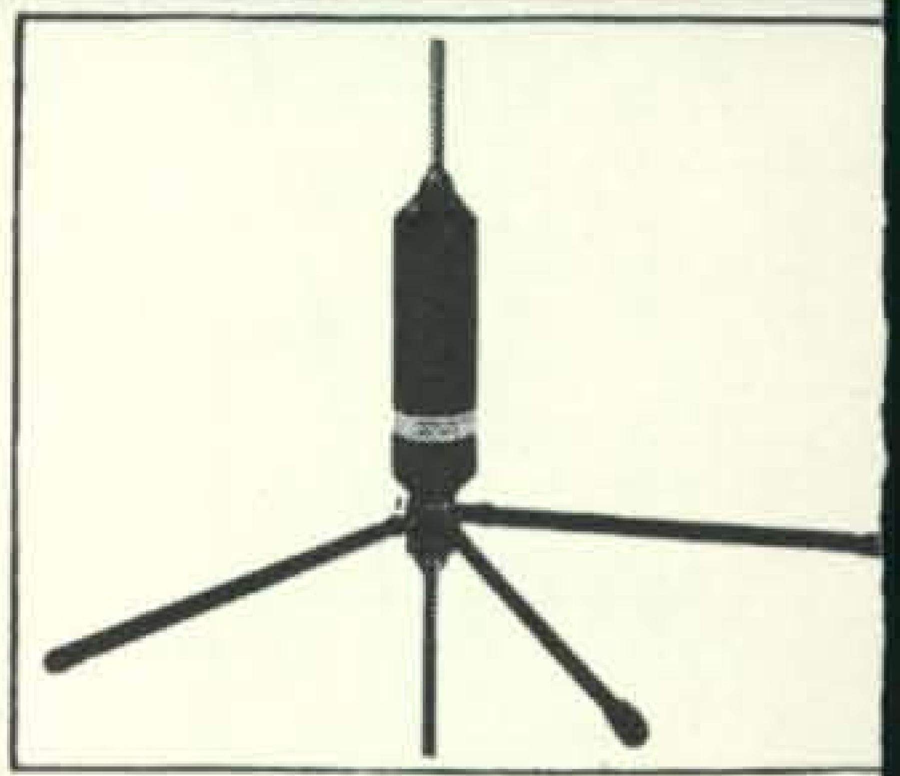

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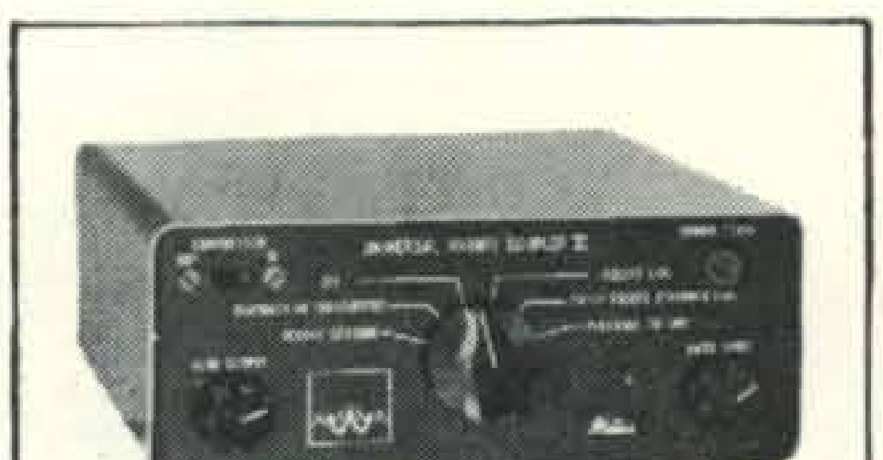

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HOW EFFECTIVE IS AMATEUR RADIO SELF-POLICING?

BY MAURICE J. HINDIN,* W6EUV

Some time ago a study was made of the effectiveness of the self-policing activities of amateur radio.[1] The recent release of the Federal Communications Commission 32nd Annual Report covering the fiscal year 1966 makes a current review timely.

In analyzing statistics a word of caution is always in order. Many factors enter into the results reported in dry numerical statistics, but despite the old saw that "figures do not lie but liars figure", there is value in the statistical method.

The term "self-policing" as applied to amateur radio is, of course, not literally correct under the laws of the United States. Only the F.C.C. has legal authority to regulate amateur radio activity. No amateur body has any disciplinary powers or control over any individual operator. The weight and influence of amateur approval, however, is a very strong element in forcing the amateur to abide by the rules.

From a long range point of view, the less the government effort is required to regulate and police amateur activities, the more favorable will be the amateur's position in official eyes. In contrast to amateur band monitoring problems citizens band monitoring problems prompted the F.C.C. to report in the 1966 Report as follows: "Radio spectrum surveillance in all parts of the country, made possible by mobile monitoring, reveals that a great many nonidentifying stations are not only cluttering the class D citizens channels but also are conducting clandestine operations on frequencies allocated to the Industrial Radio Service. Many of these illegal operators exercise no restraint or inhibition, often filling the air with obscene and indecent transmissions which, besides being offensive, prevent legitimate purposeful use of the channels.

Approximately 4,500 notices of violation were issued to citizens radio licensees for on-the-air violations during the year. This is almost twice as many as 4 years ago, and with one exception (ship) was more than issued in any other radio service".

The F.C.C. operates on a fiscal year basis of July 1st to June 30th. All of the statistics quoted are made on that basis. The following is a comparison of the available statistics for the fiscal year ended June 30, 1956, as compared to the fiscal year ended June 30, 1966.

1. As of June 30, 1956, there were 150,549 licensed amateur radio *stations* in the United States. As of June 30, 1966, there were 270,560 licensed amateur stations. In that ten-year period the amateur station population increased 120,011 stations, or

* 10471 Le Conte Ave., Los Angeles, Calif., 90024

[1] 9641 F.C.C. Citations; Hindin W6EUV; *CQ* October 1958

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approximately 80%, over the 1956 figures.

2. As of June 30, 1956, there were 146.-835 licensed amateur *operators* in the United States. As of June 30, 1966, there were 257,602, or an increase of approximately 80%, being the same increase as is noted for amateur stations.

3. For the fiscal year ending June 30, 1956, the F.C.C. issued a total of 5,248 advisory notices and violation notices to amateur operators. For the fiscal year ended June 30 1966, the F.C.C. issued a total of 3,490 advisory notices and violation notices to amateur operators. Thus the record indicates that advisory and violation notices decreased by 1758 citations. This is equal to a drop of 33% in number of citations issued in 1966 as compared to 1956. This is a highly encouraging fact that should stand in well for amateur radio.

A breakdown between advisory warning notices and violation notices reveals the following interesting statistics:

4. For the fiscal year ending June 30th, 1956, the F.C.C. issued 3,308 advisory warning notices to amateur radio operators. For the fiscal year ended June 30, 1966, the F.C.C. issued 2,313 advisory notices, or a decrease of 995 notices. Thus, in the fiscal year ended June 30, 1966, the F.C.C. issued 30% fewer advisory warning notices than were issued for the fiscal year ended 1956.

5. For the fiscal year ended June 30, 1956, the F.C.C. issued 1940 violation notices to amateur operators. For the fiscal year ended June 30, 1966, they issued 1177 violation notices. Thus, the decrease in violation notices issued for the fiscal year 1966 was 763 less than in 1956. This amounted to a decrease of 39% based on the 1956 figures.

It has been argued in some quarters that the incident of violations bears a somewhat constant numerical ratio to the number of licensed stations. The statistics available, however, happily seem to disprove this argument. In that connection the following statistics are interesting:

6. For the fiscal year of June 30, 1956, the ratio of advisory warning notices and violation notices issued to licensed amateur stations was 5,248 citations to 150,549 station licensees, or a ratio of 1 citation to each 28 licensees. Based on the 1 to 28 ratio as of the fiscal year ended June 30, 1966, if the constant ratio argument is valid, one could anticipate that approximately 9600 citations would have been issued in the fiscal year ended June 30, 1966, since as of that date the number of licensed amateur stations had increased to 270,560. The facts, however, show that only 3490 citations in all were issued for the fiscal year or only approximately 36% of the anticipated number of citations.

7. The actual ratio of citations to station licensees for the fiscal year ended June 30, 1966, was 3490 citations to 270,560 station licensees, or a ratio of 1 citation of each 77 station licensees. Thus, on a pure citation to station ratio basis, it appears that the ratio of citations issued to station licensees dropped in the ten-year period under observation from 1 violation out of every 28 licensees in 1956 to 1 citation out of every 77 licensees in 1966.

8. The statistics relating to violations serious enough to result in suspension of amateur licenses likewise showed a marked drop. For the fiscal year ended June 30, 1956, 17 amateur licenses were revoked or suspended. For the fiscal year ended June 30, 1966, 7 licenses were revoked or suspended. This is a drop of approximately 59% as against the 1956 number.

The statistics support the argument that amateur radio's self-policing effort has been effective. A word of caution should be included, however. The issuance of citations by the monitoring services of the F.C.C. to a large extent depend upon the availability of monitors and the priorities assigned to the various radio services for the monitor's attention.

There is no way of knowing how many monitors were available and on duty covering the amateur bands during the respective years under consideration. If there was a material reduction of monitors available, or assigned to observe the amateur frequencies during the fiscal year ending June 30, 1966 from the number on duty in 1956 that fact could alone account for the reduced number of citations. On the other hand, if there was a marked reduction in monitors assigned to the amateur frequencies during the latter fiscal year under observation, it may well have been because the Commission recognized that the amateurs self-policing activities were effective and and that less monitoring time was required.

Regardless, however, of the reasons, the statistics look good. Continued effectiveness of self-policing cannot fail to be helpful to amateur radio. ■

See page 126 for New Reader Service

ANOTHER ADDITION

AEROTRON is proud to announce the acquisition of the famous Gonset line of quality amateur radio equipment. This acquisition appreciably broadens the line of equipment and components which we have to offer to the amateur and related markets. We are now shipping directly from our award-winning plant in Raleigh, the Gonset Communicators, Single Sideband VHF transceivers, HF and VHF linear amplifiers and other items bearing the Gonset name. In the coming months we will have even more.

AEROTRON, with more than twenty years in the two-way radio manufacturing business, has also acquired the AMECO Equipment Corporation during the past year. Ameco, formerly of Mineola, New York has been completely moved to our Raleigh plant and we are constantly adding to this popular line of economically priced equipment which is sold by more than a thousand radio supply outlets throughout the country.

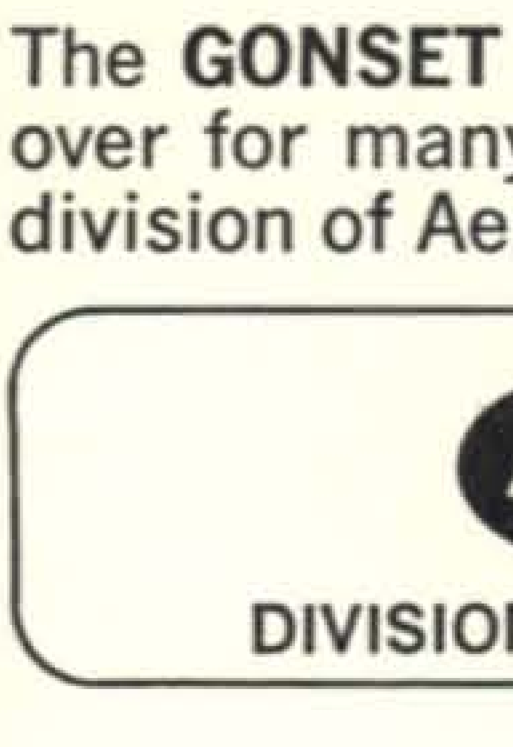
The **GONSET** name has been a familiar and respected one by hams the world over for many years. It is with a great deal of pride that we now have it as a division of Aerotron, Inc.

AMECO
DIVISION OF AEROTRON

GONSET
DIVISION OF AEROTRON

AEROTRON

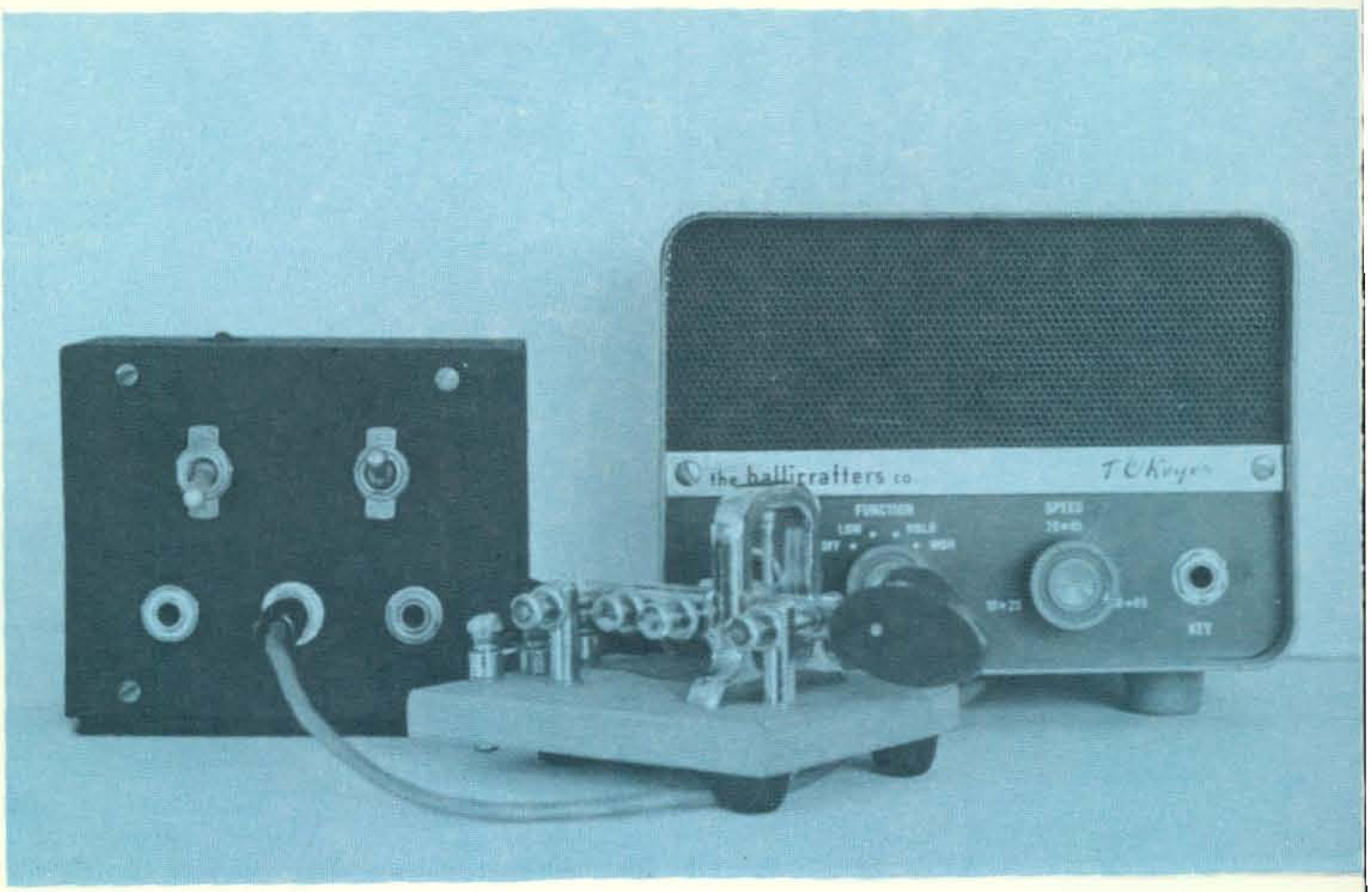
U. S. HIGHWAY 1, NORTH RALEIGH, NORTH CAROLINA 27608



CU at the Single Sideband Show,
Tuesday, March 19 during IEEE Week.
Statler-Hilton, New York City.

Stuart F. Meyer, W2GHK/4.

IMPROVING THE HA-1 KEYER



BY COL. CHARLES FELSTEAD,* KH6CU

THE T.O. Keyer model HA-1, manufactured by Hallicrafters, is a sweet job; but it has one deficiency that is shared by most electronic keyers: it can be operated only as an electronic keyer with a paddle key.

There are times when an operator may want to use a straight telegraph key and still have the sidetone from the keyer, such as when he is preparing for an F.C.C. examination, where a straight key is recommended, or he may wish to work a Novice at very low speed and with the individuality that only a straight key can provide. Then there is the Old Timer who was raised on a Vibroplex "bug" key and who wishes sometimes to return for awhile to the "banana boat" or "Lake Erie" swing, where some of the dashes are exaggerated in length. This "swing" that was so popular in the early days of "wireless" has a beat like a drum, an almost musical rhythm.

Modifications

Luckily, the T.O. Keyer can be very easily modified to provide for operation with a straight key, a bug key, or to use the paddle as a bug key. The basic circuit change was devised by Charles J. Schauers, W6QLV, and was described in his Ham Clinic series;[1] so all credit must go to him.

The circuit changes within the HA-1 T.O. Keyer consist simply of breaking the existing connection between pin 4 of XK_1 (the socket for the mercury-wetted relay K_1) and pin 4 of SO_1, and then connecting a 47K resistor from pin 4 of SO_1 to pin 2 of V_{4A}. Thus a straight key, or a "bug" key, connected between pin 1 and pin 4 of the Control Plug can key the T.O. Keyer by

* Colonel, AUS-Ret., Suite 2043, 1777 Ala Moana Blvd., Honolulu, Hawaii 96815

[1] Schauers, C. J., "Ham Clinic," *CQ*, October 1966, p. 93.

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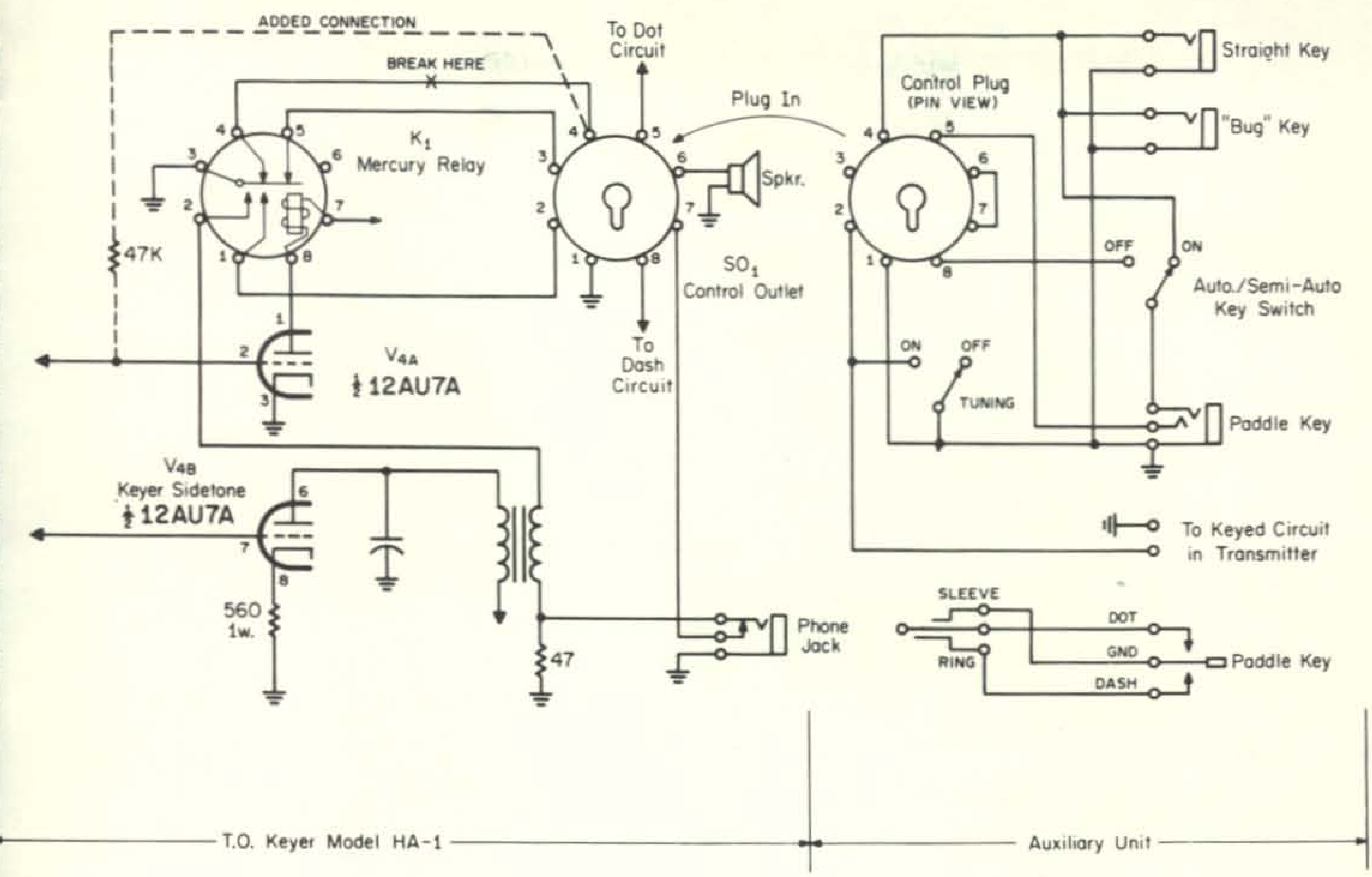


Fig. 1—Circuit of the auxiliary unit and the necessary modifications of the T.O. Keyer.

grounding the grid of V_{4A} through the 47K resistor. The connections are shown in fig. 1.

This simple modification will not depreciate the selling price of the keyer; in fact it should enhance the price since it makes the keyer more versatile. When the paddle key is plugged into the key jack on the front panel of the T.O. Keyer in the normal manner, the keyer operates exactly as it did before the modification.

Auxiliary Unit

The new auxiliary unit for the keyer, which contains the jacks and switches, can be built into a 4" × 5" × 3" deep aluminum Minibox. It is connected by a five-conductor cable to the Amphenol type CP-8 control plug that is supplied with the keyer. The CP-8 connector is plugged into SO_1, the control outlet on the rear of the keyer chassis.

Two switches and three phone jacks are mounted on the panel of the auxiliary unit. The two two-conductor open-circuit jacks are provided for the straight key and a bug key; the three-conductor open-circuit jack is for plugging in the regular keyer paddle.

Operation

With the keys plugged into the auxiliary unit and the two switches in the OFF position, the paddle key operates fully electronic, just as it normally would if plugged into the key jack on the keyer panel. When the key switch is thrown to the ON position for semi-automatic operation, the paddle acts like a bug key, producing automatic electronic dots when the paddle lever is against the dot contact, and a single dash as long as the paddle lever is held against the dash contact. The operation of the straight key and the

[*continued on page 116*]

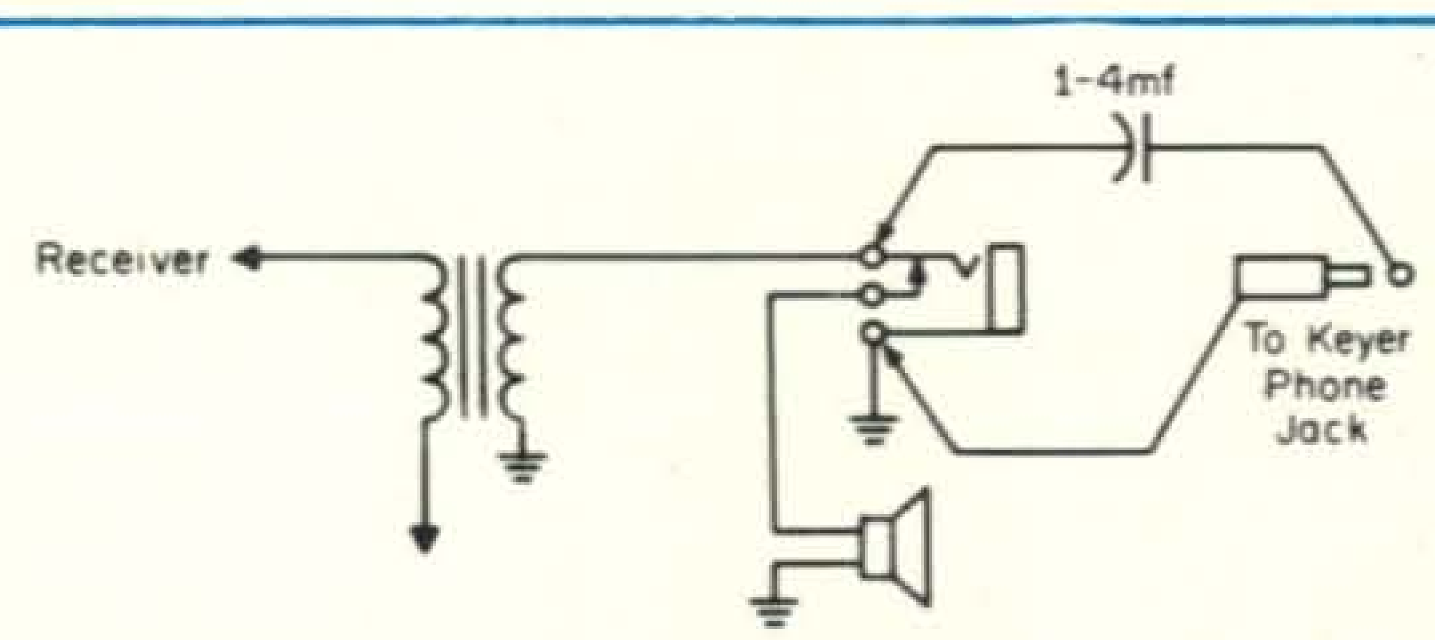


Fig. 2—Modification permitting keyer sidetone to be combined with the audio output of the receiver. The output circuit shown is that of the Swan 350, which is similar to most receivers.

See page 126 for New Reader Servic

Grumbles

by Sam

I WAS going to mention this a few months back but I wanted to wait to confirm my first predictions on how hams were going to receive the new class-conscious *Radio Amateur Call Books*. I was right in thinking that the idea would go over like the proverbial lead balloon.

For years we have all known those guys who were operating on 6 meters "because I just can't stand the QRM on the low bands." Now it turns out that they were Technicians all the time—not that there's anything wrong with being a Tech, some of my best friends are Technicians (I always loved that expression).

Of course, many operators for years have gone far past the inference that they were licensed for the low bands, they actually claimed to be Generals and more! I personally know that one of the biggest 6 meter DX hounds in 6-land, who also operated 10 meters regularly, always claimed to be a General. Turns out now that he's always been a Tech. A 2-land Tech of my acquaintance has operated a Collins S-Line for the past several years.

Well, that's all in the past now. I haven't the heart to try and push any of these guys for an explanation of their past actions, although at least one fellow has come out and flatly denied that he ever claimed to be anything other than a Tech.

As it turns out, many of the *Callbook* license listings are screwed up beyond all hope. Some operators are listed with no class of license shown, at least several Techs I know are shown as Conditionals, some Generals are shown as Techs—and there are infinite other combinations of confusion.

Just what we needed.

It's all pretty silly anyway when you come right down to it. Ham radio just *isn't* what it was years ago and we're all living in a fantasy world trying to build our hobby on the values of yesteryear.

Years ago you got your ticket and then proceeded to scrounge up parts for a 2 watt 160 meter c.w. one-lunger. The rig would keep you amused for the entire period of your license.

Today you get your ticket by going through the idiotic ritual of rote memorization of a lot of questions and answers on subjects which you will never have any occasion to use. It's like pounding your brain with Geometry in high school—an exercise in futility. Today you get your ticket and run out to buy a gallon of sideband. If you can dip the final and solder a PL-259 you know all it takes to be a ham—and now you can even get *solderless* PL-259's!

Why should you have to learn about neutralization, about oscillator circuits, about Class A modulation? If the rig breaks, you don't fix it, you send it back to the factory and let them worry about it.

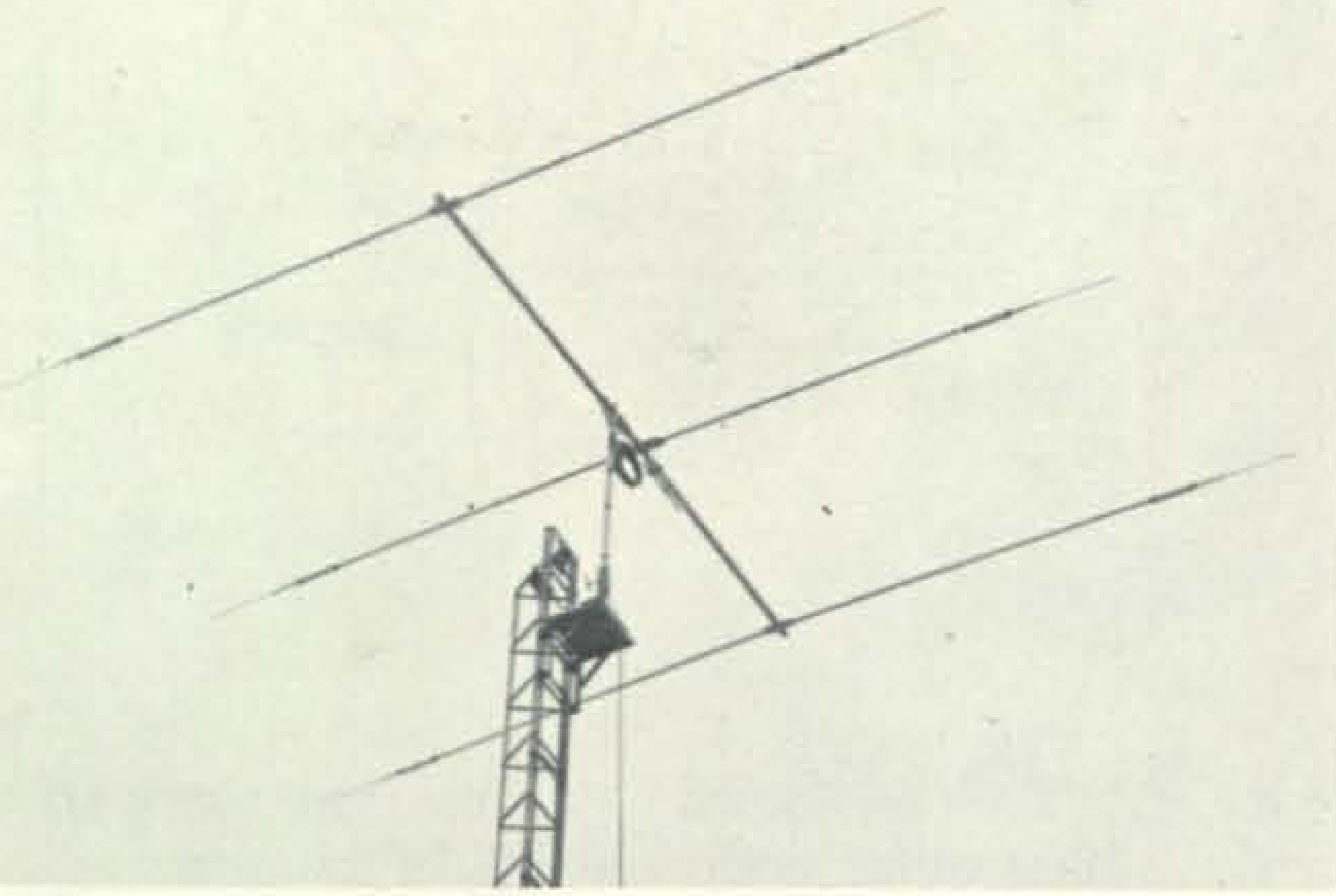
C.w.? Haw, don't make me laugh. The majority of rigs sold today aren't even designed for c.w. operation. Probably because the majority of new operators wouldn't know a dit for a dah if they tripped on one in the sunlight.

Mind you, I'm not knocking the new breed of operator—I, myself, am prone to calling the manufacturer of my kilocycle in-

[*continued on page 116*]

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

Call EVANSVILLE for hy-gain



DUOBANDER

Model DB10-15

Takes maximum legal power. Delivers uncompromised total performance on both bands. Easily installs on rooftop or lightweight tower.

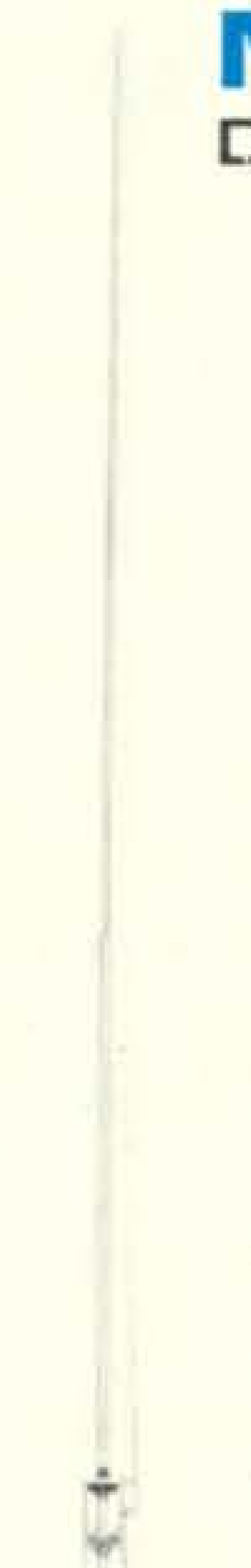
Hy-Gain's new Model DB10-15 is the perfect answer to maximum performance for both Stateside and DX contacts. Equipped with famous Hy-Gain Hy-Q traps, the Model DB10-15 delivers uncompromised full-size performance on both bands. Exclusive Beta Match insures maximum transfer of energy for optimum performance . . . outstanding F/B ratio. SWR less than 2:1 at resonance on both bands. Terrific for short skip this Summer . . . the only answer for DX next Fall.

The Model DB10-15 is simple to install in minimum space . . . either rooftop or on a lightweight tower. Easily stacks as an ideal companion for a 20 and 40 meter duobander or with 20 and/or 40 meter beams. Rotates with TV rotator. Heavy gauge 13 ft. boom; longest element, 23 ft. Turning radius, 13.5 ft. Net weight, 38 lbs. Withstands 80 MPH winds. Model DB10-15 . . . **$85.95** Net.

HY-TOWE

MODEL 18HT

Designed for 80 through 10 Meter Operation



RUGGED DURABILITY

Installed on a mere 4 sq. ft. of estate, this 50 ft. vertical radiator tures automatic band selection thro the use of unique stub decoup systems which are impervious to weather and wear and effectively late various sections of the ant so that an electrical ¼ wave le (or odd multiple of a ¼ wave len exists on all bands.

Hy-Tower . . . unquestionably the est vertical system on the marke day. Realistically priced at **$159.50**

WHERE CASH IS KING

WE STOCK COMPLETE LINE OF *Hy-Gain* **AND MANY OTHERS. WE WANT YOUR BUSINESS, WRITE OR C**

EVANSVILLE AMATEUR RADIO SUPPLY

WILLIAM OGG — WA9RMO — PROP.

1629 S. KENTUCKY, EVANSVILLE, INDIANA **PHONE: 812 — 422-**

See page 126 for New Reader Servic

Announcing

THE *CQ* WORLD WIDE WPX SSB CONTEST

April 6-7, 1968

I Contest Period: Starts: 0000 GMT Saturday. Ends: 2400 GMT Sunday. Only 30 hours of the 48 hour contest period permitted for Single Operator stations. The 18 hours of non-operating time may be taken in up to 5 periods anytime during the contest, and must be clearly indicated on the log. Multi-operator stations may operate the full 48 hours.

II Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III Bands: All bands, 3.5 thru 28 mc may be used, but operation is confined to two-way single sideband *only*.

IV Type of Competition: 1. Single Operator (a) All Band, (b) Single Band. 2. Multi-operator, All Band *only*. (a) Single Transmitter, (only one signal permitted) (b) Multi Transmitter, (one signal per band permitted)

V Exchange: Five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact. (Continue to four digits if pass a 1000) (Multi Transmitter stations use separate numbers for each band.)

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

2. Contacts between stations on the same continent but not in the same country count one (1) point. (Exception: Contacts between stations in different countries in North America count two (2) points. This applies to N.A. *only*.)

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

The WAC continental boundries will be the standard.

VII Multiplier: The multiplier is determined by the number of different prefixes worked. W2, WA2, DL1, DJ1, 4X4, 5A1 and etc. See Each prefix may be counted only *once* during the contest.

A "prefix" is considered to be the two or three letter/number combination which forms the first part of an amateur call. (W1, W2, WA2, DL1, DJ, 4X4, 5A1 and etc. See WPX rules.)

VIII Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on that band multipled by the number of different Prefixes worked.

2. Multi-Operator stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

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

IX Awards: Certificates will be awarded to the highest scoring station in each category listed under Sec. IV.

1. In every participating country.

2 In each call area of the United States, Canada and Australia.

All scores will be published. However to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single band award *only*. If a log contains more than one band it will be judged as an all band entry, unless specified otherwise. However a 12 hour minimum is required on the single band.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

X Special Awards: 1. WORLD – Single Operator, Single Band. A trophy donated by Jack Chalk, KW6EJ.

2. WORLD—Single Operator, All Band. A Trophy donated by Paul Bavassano, I1RB.

3. WORLD—Multi-operator, single transmitter. The Ted Thorpe, ZL2AWJ, Memorial Award, donated by Don Miller, W9WNV.

4. WORLD—Multi-operator, multi-transmitter. The Chuck Swain, K7LMU, Memorial Award, donated by Don Miller, W9WNV.

5. CANADA — Single Operator, Single Band. A Trophy donated by Gene Krehbiel, VE6TP.

6. OCEANIA — (Excluding Hawaii)

See page 126 for New Reader Service

WORLD-WIDE WPX SSB CONTEST

Page 1 of 5 Pages

CALL 4U1ITU Log For 14 Mc Band (Use separate log for each band.) COUNTRY I.T.U. PHONE ☐ CW ☐

DATE / Time GMT	STATION	SERIAL NUMBER Sent	SERIAL NUMBER Received	Fill in only when QSO is mult. PREFIX	Points
APRIL 6TH 0003	K1HVV	59001	59002	K1	3
05	WA2SFP	59002	59004	WA2	
06	VO1HI	58003	59001	VO1	
09	HI8XAL	59004	59005	HI8	
10	K3IWW/VO1	57005	57003		
12	VE6TP	57006	56006	VE6	
25	WA4PXP	56007	56010	WA4	
36	W9EWC	55008	55011	W9	
48	KP4CL	56009	55009	KP4	
50	~~VO1HI~~	~~55010~~	~~45007~~	DUP.	0
OFF:	0100 –	0400 –	3 HRS.		
0405	YV5BIG	59011	59088	YV5	3
09	YV5AGD	59012	59089		
12	HK4AET	58013	57081	HK4	
23	HC1EY	57014	56090	HC1	
33	CX9CO	56015	55092	CX9	
45	PY2CQ	56016	55100	PY2	
0600	VK9GN	56017	56516	VK9	
12	VK2APK	57018	57525	VK2	
13	VK3QV	56019	56320	VK3	
24	VK3AXK	56020	56290		
35	ZL1KG	56021	56615	ZL1	
47	KW6EJ	55022	55555	KW6	
OFF:	0700 –	1000 –	3 HRS.		
1000	G3NMH	59023	59756	G3	1
02	DL4FS	57024	57001	DL4	
03	DL4SK	59025	59561		
05	DJ6QT	59026	59770	DJ6	
17	5T5KG	56027	56600	5T5	3
20	I9RB	59028	591021	I9	1
29	~~DL4FS~~	~~56029~~	~~57001~~	DUP.	0
30	OH2AM	58030	581025	OH2	1
42	4X4FV	56031	56575	4X4	3
53	UR2AR	57032	57461	UR2	1
OFF:	1100 –	1700 –	6 HRS.		
APRIL 7TH 2201	JA1AEA	55933	571120	JA1	3
05	VU2DKZ	55934	55190	VU2	
10	UL7JR	55935	55281	UL7	
15	UA9KHA	55936	55366	UA9	
20	DU1FH	55937	55475	DU1	
			TOTAL POINTS THIS SHEET	31	91

CQ Form 1066 eff. Feb., 1968

A sample log sheet already filled out. Official log sheets are available from CQ, see (7.) below.

Single Operator, All Band. A trophy donated by Jack Chalk, KW6EJ.

XI Club Competition: No club award is planned at this time, however one may be given if sufficient interest is shown.

XII Log Instructions: 1. All times must be in GMT. The 18 hour non-operating periods must be clearly shown.

2. Use a separate sheet for each band.

3. Prefix multipliers should be entered only the FIRST TIME they are contacted.

4. Logs must be checked for duplicate contacts and prefix multipliers. Recopied logs must be in their original form, with corrections clearly indicated.

5. A prefix check list is not only desirable but a *must* for proper contest operation. (It is recommended that you also send it along with your contest log.

6. Each entry must be accompanied by a Summary Sheet listing all scoring information, the catagory of competition and the contestant's name and mailing address in BLOCK LETTERS.

Also a signed declaration that all contest rules and regulations for amateur radio in the country of the contestant, have been observed.

7. Official log and summary sheets are available from *CQ*. A large self-addressed envelope with sufficient postage or IRCs must accompany your request.

If official forms are not available you can make your own by following the attached sample, with 40 contacts to the page.

(Daystrom Limited has made an International Log Form which is available to Canadian amateurs. We will supply them with Summary Sheets. Write to: 1480 Dundas Highway East, Cooksville, Ontario.)

XIII Disqualification: Violation of the regulations of amateur raido in the country of the contestant, or unsportsmanship conduct, or taking credit for incorrect QSOs or Prefixes or duplicate contacts in excess of 3% of the total made, will be deemed sufficient cause for disqualification.

Actions and decisions of the Committee are official and final.

XIV Deadline: All entries must be postmarked *no later* than May 15, 1968. In rare isolated areas the deadline will be made more flexible.

Logs go to: CQ WPX Contest Committee 14 Vanderventer Avenue, Port Washington L.I., N.Y. 11050.

See page 126 for New Reader Servic

The Tuned Doublet

BY PAUL C. AMIS,* W7RGL

This antenna, also known as the Center Fed Hertz or the Center Fed Zepp, has been out of favor since the introduction of coaxial cable. The author dusts off this old antenna, couples it to a tuner and finds out that the old timers might have had something after all.

IF-AND-WHEN you finally become dissatisfied with your present restrictive or not-too-efficient wire antenna which periodically winds up sulking in great snarls on the lawn after anything but the mildest of zephyrs, you might consider the "Tuned Doublet" with open wire feeders (also known in certain circles, for Heaven's sake, as the "Center-Fed Hertz" or the "Center-Fed Zepp"). As background, this high efficiency, all band coppered cat's cradle was a standby in the 1930's before World War II inflicted coaxial cable upon the long suffering Hams with the result that the term "plug-in coils" became akin to a social disease, such as bad breath, or Yaws, and were summarily banished from the business end of transmitters. Reinforcing this demise was the first stirrings of television and its associated interference-prone public.

An early approach to TVI was to tightly button-up the transmitter cabinet on the hazy assumption that the "bad" signals could be bottled in. This "locking-the-door" technique, together with the pi-coupler, banished tuned feeders and their associated antenna couplers into limbo. Actually, that extra tuned circuit between the transmitter output and the antenna would have probably solved a number of problems with TVI. Pi-couplers were used to feed dipoles, folded-dipoles (those miraculous antennas which, at one time, were cloaked with the supposed ability to eradicate TVI), random-length wire, metal downspouts, and a growing family of coaxial cable fed devices, to the extent that today those few gray-beards still using Tuned Doublets, while ridiculed for their old-fashioned stubbornness, wear their spreader insulators as a badge of the "old timer". This almost forgotten antenna then, and its installation, is the subject of this article.

* Route 2, Box 2378-B Bainbridge Island, Washington 98110.

The Tuned Doublet

What exactly is a Tuned Doublet? It is a dipole antenna, cut for the lowest frequency on which you wish to operate (or have room for), fed in its exact center with a very low-loss open two-wire line. The common two-inch "Ladder Line" used in some low-loss TV installations is suitable for transmitter powers up to several hundred watts, while for kilowatt rigs, four- to six-inch spaced line

	Open Wire Line			RG-8A/U	300Ω TWINLEAD
Band	Line Attenuation In db (if matched)	Plus attenuation in db added due to 5:1 v.s.w.r.	Total Attenuation In db	Total Matched Attenuation In db	Total Matched Attenuation In db
3.75 mc	.032	Negligible	.032	.30	.18
7.15 mc	.051	.08	.13	.46	.29
14.20 mc	.072	.13	.2	.67	.43
21.20 mc	.084	.16	.24	.84	.53
29.00 mc	.13	.22	.35	1.0	.63

Fig. 1—Comparison of transmission line attenuation characteristics for a one hundred foot length.

See page 126 for New Reader Service

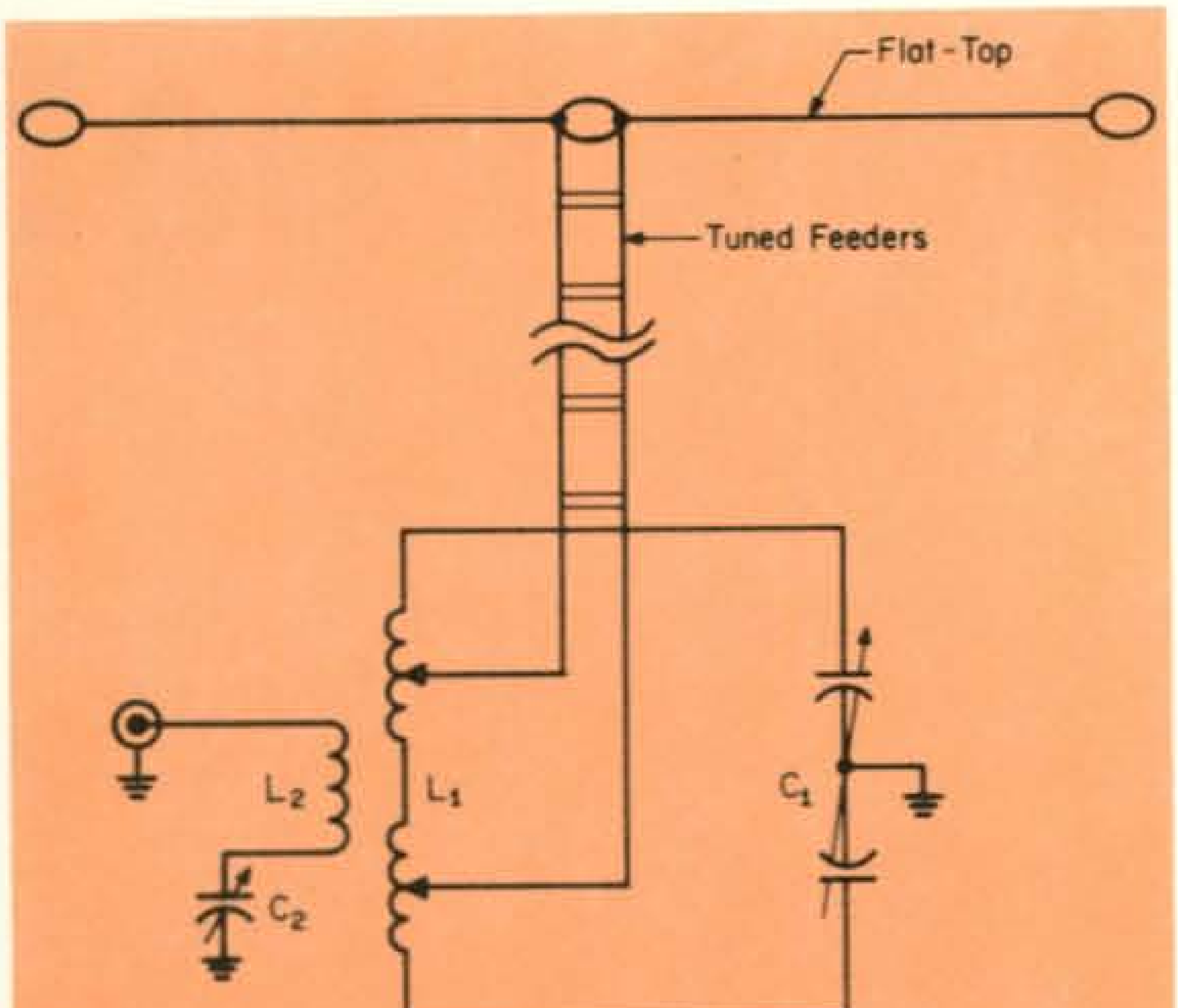


Fig. 2—Basic circuit of a parallel tuned antenna coupler connected to a tuned doublet antenna. Construction details for the tuner may be found in any one of the many antenna handbooks.

is recommended. Note that besides referring to the wide-spaced line by its generic name of "600 ohm" line, there has been no mention of the nominal impedance of open wire line. For a Tuned Doublet, the line spacing is chosen to handle the *voltage* developed across the line, not to match the antenna. The higher the transmitter power, the wider the line spacing.

One loudly-voiced objection, often heard, about a Tuned Doublet is that the feeders are lossy due to the necessary high s.w.r. Well, the latter part of that statement is often true. The s.w.r. on the feeders may run as high as 5:1 or more. So what? The feed-line has negligible radiation if it is properly symmetrical, and a reasonably high s.w.r. on an open wire line creates no problems. Refer to fig. 1 and compare the losses in a hypothetical 100 foot length of 600 ohm open wire feeders against a like length of RG-8A/U coaxial cable or 300 ohm ribbon line. s.w.r., remember, merely *adds loss to the existing matched line loss.* Since open wire feeders have the lowest initial loss, the high s.w.r. will add a very small amount of additional loss, and this sum will still be a fraction of the loss of matched coaxial cable.

Feeder Length

How long should these feeders be? Paraphrasing Abe Lincoln, long enough to reach from your antenna to the antenna coupler in the shack. Assuming an antenna flat-top length of, say, 135-feet (c.w.) or 125-feet (phone), up in the air about 40-50 feet, and the shack somewhere in the immediate vicinity, the feedline length will be very close to the recommended 75-80 feet set forth by the tables on the Tuned Doublet in the antenna books. In this case, then, parallel feed can be used on all bands and, by and large, with most amateur antenna locations and feedline lengths, a parallel-fed antenna coupler is the easiest to tune and to build.

What do I mean "parallel feed"? The coupler is built so that the tank capacitor is parallel to the coil, with the feeders tapped across a portion of that coil. In a series feed situation, a special capacitor for each feeder leg, gang-tuned, would be used. If the end of your feedline has a reasonably high impedance on all bands, you will use parallel feed.

If, due to flat-top or feeder length, you have a low impedance in the shack, you could use series feed. However, construction is simpler if only one type of antenna feed is required. Using parallel feed only, with a Tuned Doublet, you may find that on one band the feeders must be tapped rather close to the coil center. This results in a more sharply-tuned circuit which would have to be retuned more often than if the feeders were tapped out from the center of the coil. If you find that the feeder taps must be practically together at the center of the parallel tank coil, you have a current loop at this end of the feeders, and a series feed situation would be normally required. However, by decreasing or increasing the feeder length from five to twenty feet (called "pruning the feeders"), the impedance at the end of the feeders can be raised so that the taps can be moved out on the parallel tank coil. If the feeder length cannot be changed the antenna can be lengthened a few feet. Remember, such "pruning" or lengthening will shift the coil taps for the other bands, too, one way or the other. The point is, that a feeder length can usually be found which will work with a parallel antenna coupler on all bands.

Tuning

For discussion purposes, fig. 2 shows a typical parallel tuned antenna coupler. "Judge" Glanzer's *Antenna Handbook* Volume 1, describes several excellent antenna couplers, so we won't present any here.

Once you have the antenna up and the

[*Continued on page 112*]

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The DXpedition

BY DON MILLER, W9WNV

Part III: CQ DX Europe

PARTS I and II (January and February CQ) summarized the DXpedition's background, including the steps leading to our departure from the States in June, 1967, to renew the DXpedition. This month we hit the highlights of the first half of our trip through Europe, en route to the Indian Ocean.

BILL and I had decided to spend as much time as necessary, en route to the Indian Ocean, arranging for possible future DXpedition operations, meeting the DX gang as we had done in the States, and continuing our investigations into the recent ARRL actions. We realized the DX fraternity's eagerness to get some rare DX on the air but agreed it would be quite unwise to be in such a hurry as to overlook such urgent matters as public relations and pre-arrangements which would be difficult to complete at some later date. Although no meeting has been arranged in advance, we took our projector and DXpedition slides along, hoping to meet with at least a few DX groups on short notice. We hadn't been able to establish any definite itinerary, wishing only to accomplish as much as possible without wasting time, and not knowing how much time would be consumed in tackling a few of our projects at each stop. We were traveling, for the most part, on "open" tickets which were to be revised umpteen times before we arrived at Mauritius.

Spending about six weeks in Europe we visited individual DXers and groups in Norway, England, Germany, and Switzerland, conducted six lectures and slide presentations, arranged for several future DXpedition stops, cleared up a few "mysteries," and created a great deal of good will and favorable publicity.

Generally speaking, our impression of DXing European style (probably shared by most other American DXers), turned out to be quite inaccurate, being quickly dispelled by a few visits to DXers' shacks and a little operating. DX competition in Europe seems more "healthy," and is held more in its proper perspective. You may be surprised to learn, however, that the European DXer runs just as much power, and in some cases more, than his American counterpart, his antenna is generally as good, and his operating at least as efficient and a bit more courteous.

Assisted by "Ragnar," LA5HE, Bill accomplished most of the footwork in Oslo. Chris, LA7Y, has assisted in obtaining our call-signs for Bouvet (3YØAB and 3YØAC). Ragnar arranged a visit to the Antarctic Institute, where the DXpedition was provided with valuable data and suggestions for our Bouvet trip. Some of the local DX gang got together for a DX discussion and slide presentation.

The U.K.

We spent three weeks in England, where there was much to be accomplished. The G-gang seems to be spread out all over the Isles, the greatest concentration of DXers being in the Birmingham and London areas. At the time of our visit there weren't any DX Clubs, as such, but most of the DXers in the London area attend regular meetings of the RSGB and just recently the Birmingham gang has formed the first DX Club—the West

Midland DX Club, with Doctor John Allaway, G3FKM, as first President.

I think it important to take some time to explain that the American concept of DXing and DXers is a far cry from that outside the States. Consider that practically all contacts made by the typical amateur in England, for example, are with stations outside his own country, the majority of those being with amateurs whose native language is not English. Consider also the amateur in a country like Germany, Brazil, Japan, or Italy—practically *all* his QSO's are with stations in other countries, and few can been conducted in their own language. For these amateurs, therefore, and for most living outside the United States, most of their contacts are, indeed, *DX* QSO's, and practically *all* amateurs in these countries are *DXers!*

This raises another noteworthy item. Since most DX QSO's are conducted in English, the typical American DXer tends to overlook the fact that the amateur with whom he is speaking is communicating in a foreign language (for him), and takes it for granted that anyone is expected to speak and understand English. He may even become irritated when some "foreign" DXer has difficulty in speaking or understanding English. There is no "foreigner" in DX circles—we are all members of the same fraternity; But the language barrier does remind us, from time to time, of our Geographic and ethnic differences.

Since English-speaking amateurs outnumber—by far—those of any other language, English has become the most universally-accepted tongue for amateur radio DX communication. Some of us tend to overlook the ordeal that most "foreigners" must go through, learning at least some basic English to become an accepted DXer. Most amateurs outside the USA can communicate in at least two or three languages; if it weren't for their effort in learning English, how many countries more would you have missed? Next time you have difficulty raising an amateur in a rare location and find yourself cursing because he doesn't speak better English, ask yourself why you can't communicate in *his* language, or in at least one other language. Think of how many thousands of "foreign" DXers have taken the trouble to learn your language. Why don't you return the favor? You'll find it educational as well as gratifying!

Arriving in the U.K., we were met at London Airport by Roy ("Steve") Stevens, G2BVN, along with Ken, G4MJ and John, G3FKM from Birmingham. Steve, a former RSGB President, is currently Vice-Chairman of the IARU Region I. We were the guests of many of the local DXers during our stay in England and their hospitality was moving. I don't want to turn these articles into a travelogue, so we'll just hit the DX highlights of our visit to the U.K. and Europe.

The Rockall Hoax

One item of research was to solve the "Rockall mystery." For three years now we've been reading and listening to how this rock would be a "new country" but how "impossible" it would be to land there. First we learned that the reason no DXpedition has ever reached Rockall is because none has ever departed for Rockall. Two DXpeditions in recent years did reach the plannin stages, however; the plans for the first (by Ron, G3AAJ) were cancelled due to lack of funds; the second failed to materialize when military assistance was denied because the British Fleet had more urgent commitments.

Next we learned that, although Rockal presents a most difficult landing, particularl without fine weather, it is by no means "im possible" to land there. This is supported b the fact that in recent years there have bee two attempted landings and both have bee successful.

Then, we had been mystified by variou claims and photographs appearing in ama teur publications; one showed a "90 foot wav breaking over Rockall." Both Bill and had done a fair share of sailing but neve saw any wave approaching that height, eve in the severest of storms. I asked a goo number of experienced sailors from the Nort Atlantic, and continued to do so througho the rest of the world, but the only 90-fo waves ever claimed to be seen were durin cyclones (not well documented) which don occur in that area. A closer look at the photo graph in question revealed what must hav been a normal 15 to 20 foot wave, breakin against the rocks on a windy day, with fair amount of spray blown over the are We were shown two excellent photograp of Rockall on a calm day; seas and wind were light and it would have been qui simple to merely step onto the edge of th rock. The leaward side of Rockall presen a handly ledge twelve feet above the se from which a ham station could be operat on a calm day.

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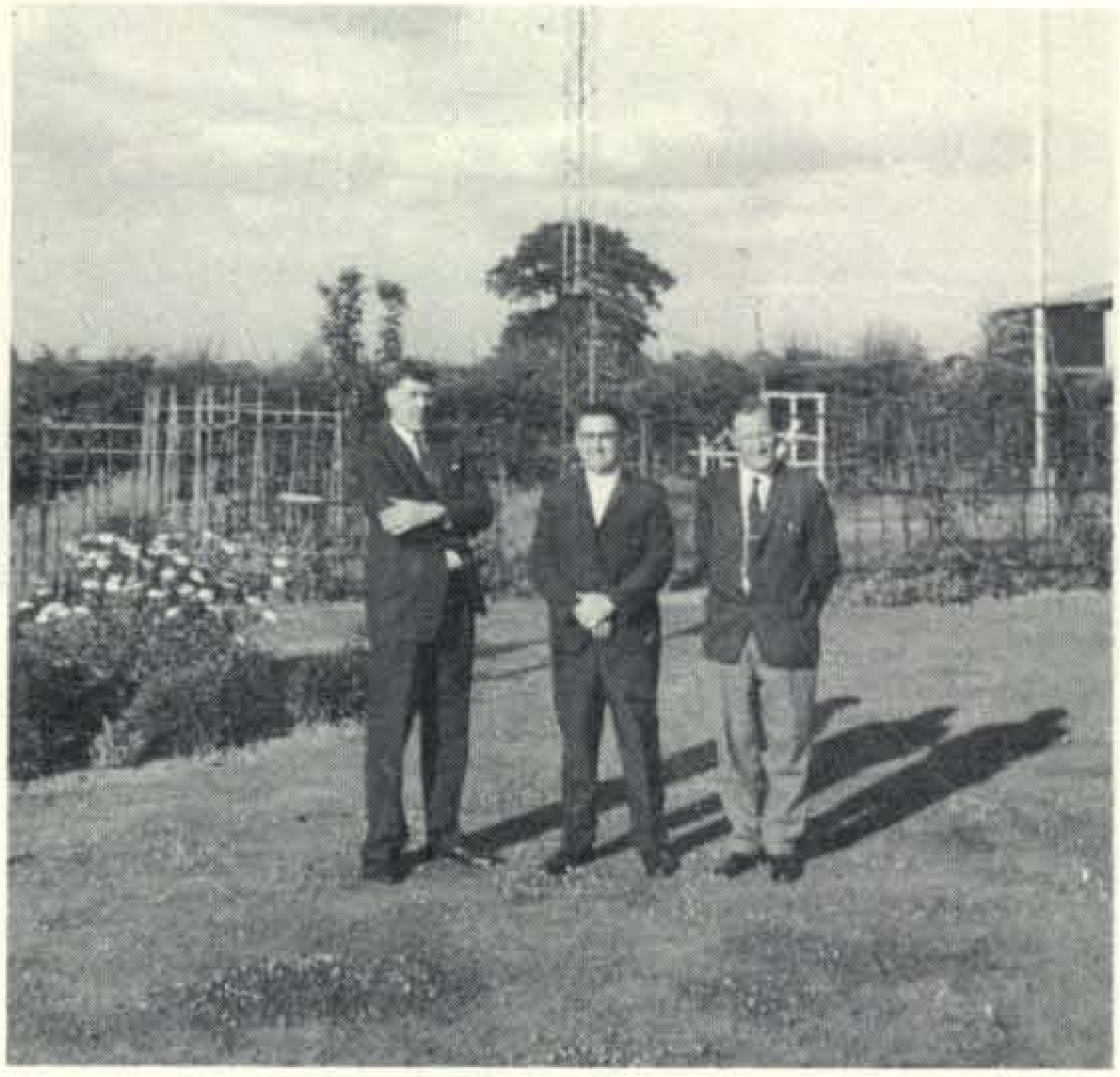
Bill and I had planned to charter a small fishing boat, well-provisioned to allow for a considerable wait for fair weather if necessary, and to operate from the top of the island. We had planned to take along some experienced mountain climbers (there is a climbing society and a number of clubs in Scotland, from where we were to sail), and let them scale the cliff first, dropping a rope ladder from the top for easy access by us and the equipment. Except in the worst of weather we could stay at the top, operating in shifts around the clock for a day or two, and getting out quite well from that QTH with a vertical (a beam if the winds permitted) and low power. As for a.c. power, we had decided to leave the generator on the boat and employ a 100-yard power cable via a small buoy to the operating position. We had already obtained confirmation from Bob White that this procedure would not violate DXCC rules (after all, when operating from your home QTH where does your a.c. power originate?). Our plans progressed quite well, but the license provided the shock which stopped us in our tracks!

Obtaining the license was no problem, the only prerequisite being a written OK from the Scottish Office in London, obtained without any difficulty, although they informed us we would have to notify the Commander of the Royal Artillery when we intended to sail, as Rockall is on a guided weapons range (now inactive). Our license was issued but the call-sign really threw us! Bill (G5AIA) and myself (G5AEW) were given permission to operate from Rockall as GM5AIA/P and G5AEW/P. The problem was that, by using the GM call-signs, Rockall would not be a new country; it would not meet DXCC requirements for separate country status because it is only 375 miles from other "GM" Islands (The Hebrides Is.) by open water, being no islands in between.

We had heard rumors that other DXpeditions had planned on using "G" or "GR" callsigns from Rockall, which may have explained why it was considered for separate country status. However, the chief of the Radio Services Department, London explained emphatically that a "GR" permit would never be issued and that "GM" is the only call-sign permitted from Rockall![1] It was quite clear, therefore, that Rockall did not meet the 500-mile requirement for separate country status. I had been through a similar ordeal with the Awards Committee a few years before regarding New Zealand's offshore Bounty and Antipodes Islands—the rules were quite clear on this point. Neither Bill nor I wanted to get into any further squabbles with the Awards Committee. Rockall would count the same as Scotland and the venture wasn't worth the time, money, or risk involved. We dropped the idea of a Rockall DXpedition, content that we had cleared up a great deal of rumor and misunderstanding. Of course, the Committee sometimes conveniently ignores or invents rules, and there's no telling what could happen, but anyone who thinks that Don Miller could get a favorable consideration from the ARRL Awards Committee had better see his psychiatrist!



In the garden of G3FKM at Birmingham, England, Don chats with G3HDA (left) and G3FKM, DX editor of *Radio Communications*, formerly *RSGB Bulletin*.

Paperwork

One of the most exasperating facets of this DXpedition has been the incessant paperwork. Hardly a day goes by without facing the monotonous chore of forms—applications for licenses and visas, customs declarations and clearances, immigration and police papers and documents, and so on. European Officials, in pursuit of the almighty U.S. dollar, have practically eliminated the paperwork for American tourists, but DXpeditions have been overlooked.

Besides the Rockall documents we obtained visas for Bouvet Island, Bill's VQ9 license application, my G license renewal

[1] A group of British amateurs has recently obtained permission to use the "GR" call-sign from Rockall, but the island is still under Scottish administration.

and a new one for Bill, secured written confirmation that our Mauritius visas covered Rodrigues and St. Brandon as well, assurance that our Laccadives visa would be granted, and quite a number of similar documents hardly worthy of mention except for the time consumed in obtaining them.

During a week of this I did manage to locate a few of the "right people;" The representative of the British Indian Ocean Territory informed me she never heard of anyone asking for a visa before; the Director of the Mauritius Commission was quite helpful, however. I obtained the necessary documents and information on most locations after continued correspondence with the people concerned.

A Realistic Approach

I was mentioning these capers to Steve (G2BVN) over a tall Coca-Cola one afternoon; Steve told me I should have let him know about this, as the RSGB has good relations with the Government and some staunch amateur radio spokesmen in Parliament. Although most of these matters had already been initiated or taken care of, it was, indeed, gratifying to know that at least some IARU societies (we found a number of similar instances in Europe) recognized the importance of a strong government link and realized the necessity for a healthy relationship between the government, and amateur radio. Having long been an advocate of this principle, and recognizing the need for such a link with our own government, I mentioned this during a recent visit to ARRL, only to be met with the usual defensive retorts. I asked why ARRL maintained no formal or informal link with congress, especially with amateur radio being a gift from our government and with the ARRL's legal counsel being located in Washington, D.C. The reply hinted that amateur radio was doing quite well (?) without it, that they could not understand the importance of such a relationship, and that I was foolish to even suggest it and had better leave such matters to the boys in Newington to decide. Good grief!

It was quite comforting to find that the European IARU Societies had adopted a more realistic approach; they recognize that the future of amateur radio depends primarily upon the attitudes of governments, and every effort is made to establish and maintain a sound, working relationship between the IARU Society and its government.

Just as important, emphasis is placed on conscientiously representing the amateurs in such a relationship—in actuality, and not merely on paper. For example, no European IARU Society would stoop so low as to petition its government for incentive licensing, pretending to represent its amateurs in such negotiations, without first consulting its members!

Thus, we find amateur radio on a much more sound and realistic footing in Europe, even in the communist countries, with far less bickering and more attention to the basic task of providing a service. Right down the line, their approaches to the problems facing amateur radio are far more practical and realistic, (1) because of close cooperation with their government, (2) because the amateurs actually have a voice in their society and are well represented, and (3) because those responsible for the societies are equally as practical and realistic. Their leagues' directors, for example, meet several times each year instead of once, even though their operating budgets are far below that of ARRL, not having any million-dollar-a-year income from publications. The Directors keep in close touch with amateurs in their districts, actually directing the Society according to the wishes of its members, instead of routinely OKing all the major decisions of the "hired help" without consulting the membership. One classic example is their modern approach to the problem of interference on the amateur frequencies; the "Intruder Watch" program was originated by the RSGB (*not* ARRL), and we have done well to follow their guidance and suggestions. Until such time as America's amateurs are given a voice in the action of their Society, there will be no hope for a practical and realistic approach to amateur radio and its future.

Meetings

By July 20th most of the leg-work had been completed and we had obtained many of the documents and papers we sought. We had also learned a great deal more about the recent ARRL attacks. When visiting the ARRL Convention in Montreal, RSGB's President had been informed by John Huntoon that I had forged certain documents(!), and Mr. Huntoon admitted he worked closely with the Coast Guard to have Navassa discredited ("I guess you know Chuck Dorian is working closely with us on this matter.") More about Navassa in a future issue. It was disheartening to know tha

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the campaign was still raging and the malice was still forthcoming from Newington.

Details weren't quite completed. We still had to collect information for a couple of other future operations and purchase materials, including a goodly quantity of navigation aids, pilots, charts from London's Admiralty Office, and ship them to Mauritius. Finally, we had a little time to relax and meet some of the DXers.

I wanted Bill to meet Les Hill, G8KS, an old friend. Mainly, we discussed the recent Harvey Brain "sabotage." It was Les who first gave me the shocking news of the death of Doctor Harold Magibow, K2HLB. It was utterly heartbreaking. Although we had seen little of each other since the DXpedition began two years earlier, we were more than just close friends. We had even seriously considered a partnership together in medical practice. My respect for Harold was not limited to his professional aptitude and dedication, nor to his wise personal advice. As a fellow DXer, Harold always placed respect and dignity above the "new country" as goals, and those of us who knew Harold Megibow will never forget this.

Another old DX-pal, Dave Bootman, G3MWG, took us to lunch, and the Margolis Family Maurice, G3NMR and Laurie, G3UML (Sylvia had not yet returned from her visit to the States) invited us for an evening of dinner, DXing, and a refreshing discussion of DX philosophy.

We spent a day in Birmingham, visiting the shacks of the Midlands DXers and meeting the DX-gang formally at the Cricket Club with drinks, hors d'oeuvres, and the usual DX talk, discussion, and color sldes. The most classic comment of the evening was made by John Allaway, G3FKM, who defined "semi-retirement" as "that state which, when enjoyed by a DXer, permits him to return to his shack at any hour of the day to work a new country." Amen. Bill and I were convinced we'd have to go a long way to match the mature enthusiasm of the Birmingham DX gang.

On Friday, July 21st, we were the guests of the RSGB for dinner and a talk at the Kingsley Hotel. I finally met Sylvia Margolis, fellow-author, and found her to be a most delightful conversationalist. The DX discussion and slide show were delightful. We always endeavored to keep these talks on the highest possible plane, but I guess we just couldn't satisfy everybody. A W8 who was present at the affair, wrote to the ARRL: "The dinner

At the Margolis QTH (Essex, England) the finer points of DXing are discussed by (l. to r.) G3UML; Don; G3FPK; G3KZI; G3OBJ; G3NMR and G2BXI.

was excellent and the members were very gracious and cordial . . . However, a possible completely pleasurable evening was marred by the talk given by the program guest, Don Miller. His uncomplimentary references to the ARRL and John Huntoon made me, as an American, very much ashamed and embarrassed that he was there speaking as an amateur from the U. S. . . ."

Now, this really upset all of us, Steve and myself included, for no such remarks were made at any time. I suspected a "plant." My suspicions were later confirmed. A tape recording belonging to one of those present reveals that John Huntoon was not even mentioned and that the most "uncomplimentary" remark was: "When you write a nasty letter to RSGB, you get a dignified reply; when you write a nasty letter to ARRL, you get a nasty reply . . ." (going on to discuss the need for dignity in amateur radio affairs).

Bill and I returned to Birmingham, the guests of John (G3FKM) and Ken (G4MJ) for a fantastic steak dinner with all the trimmings. The last two days in London were spent catching up on some correspondence, although the mini- and micro-skirts were much too irresistible to spend *all* the time in our room. "London swings" is a gross understatement. The miniskirts reminded me of the recent ARRL publications against us—what they revealed was interesting; what they concealed was vital.

We had spent a month in Europe and, although a great deal had been accomplished, the DX fraternity was getting "edgy" for some operations. Bill and I agreed to try to wind things up as quickly as possible and get to Mauritius within ten days. By this time we had already arranged to meet the DX groups in Frankfurt, Geneva, and Zurich, and to make three other stops en route. On July 25th we flew to Frankfurt.

Next month—a rebuttal. ■

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THE DUAL-BAND FOLDED DIPOLE

BY JOHN J. SCHULTZ, *W2EEY/1

A folded dipole is generally regarded as being a single-band antenna. However, a simple modification can both improve the bandwidth of the antenna on its design band as well as allow operation on a higher frequency band, also as a folded dipole antenna.

FOLDED dipole antennas are favored by many amateurs because their bandwidth characteristic is broader than a simple single-wire dipole and they can be constructed from commonly available materials. Such a dipole using 300 ohm twinlead for both the flat top portion and for the transmission line is a common example. The main drawback to such an antenna is that it is basically a single-band affair. The only exception is when the antenna is operated on odd harmonics of its fundamental, the same as a simple dipole. Thus, a 40 meter folded dipole can be effectively used on 15 meters since the center impedance on 15 meters is about the same as on 40 meters. The disadvantage of such operation is that the radiation pattern changes. On 40 meters, maximum radiation is broadside to the line of the antenna while on 15 meters a cloverleaf radiation pattern results. It is not possible to obtain maximum radiation in the same direction on both bands.

Folded Dipole Impedance

An interesting point to examine and fundamental to use of a dipole on two bands, other than the 40 and 15 meter exception mentioned, is what determines the impedance of a folded dipole. The antenna consists simply of two dipole elements connected in parallel, only one of which is directly connected to the transmission line. If the same amount of power is delivered to the folded dipole as to a simple dipole, half of the current which flowed in the single wire of the simple dipole must flow in each wire of the folded dipole. For this to occur, the impedance of the folded dipole must be four times that of a simple dipole. This assumes that both wires of the folded dipole are the same conductor size so that equal currents flow in each. If the conductors are not equal in size, the total current is not split equally between the conductors and the impedance is no longer simply four times that of a simple dipole.

This situation is illustrated by the graph of fig. 1. As the size of one conductor becomes larger or smaller than the other and depending on the spacing between conductors, the impedance stepup either becomes more or less than four to one. The most pertinent situation is when the impedance stepup is exactly four to one, by virtue of the conductor diameters being the same. Notice that this situation occurs for any value of conductor spacing to conductor diameter ratio or, in other terms, for any value of impedance of a transmission line which may constitute the flat-top portion of a folded dipole antenna. It is not necessary to use 300 ohm twinlead for the flat-top portion of a folded dipole to produce a match to a 300 ohm transmission line. In fact, almost any twinlead of any impedance but with equal diameter conductors will serve as the flat-top section. Of course, in the usual folded dipole it is convenient to use

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the same line for both the flat-top section and transmission line but it should be noted that the terminal impedance of the flat-top section is not a function of the impedance of the line used for its construction.

Improving Folded Dipole Bandwidth

Various methods have been used to improve the bandwidth characteristics of folded dipoles on their fundamental frequency. Instead of directly connecting the dipole element ends together, capacitors having a value related to the capacitance per foot rating of the transmission line used for the flat-top can be used. Stubs can also be placed at the ends of the dipole elements. The theoretical basis for the bandwidth improvement produced by these means seems to be a bit obscure but, nonetheless, numerous amateurs have found them to be effective.

One interesting method of bandwidth improvement involves the placing of direct jumpers across the conductors of the flat-top portion as illustrated in fig. 2. The jumpers are placed a quarter-wave from the center of the antenna with allowance made for the velocity factor of the line used for construction of the flat-top. Thus, when the flat-top is considered as a transmission line, the closed-end quarter wave stub (which part of the flat-top forms) reffects an open circuit to the center of the antenna and no effect is noted at the antenna terminals. However, when the antenna is operated off of the frequency at which the entire flat-top resonates as a ½λ element, the stub produces a reactance opposite to that of the entire flat-top section alone and the antenna bandwidth is improved. In a sense, the flat-top portion of the antenna serves both as a radiating element and partly as a frequency corrective stub.

Dual-Band Operation

If a folded dipole with flat-top shorting connections is operated at a frequency such that the portion of the flat-top between shorting connections forms a ½λ dipole, the configuration shown in fig. 3 results. The inner portion of the antenna forms a conventional ½λ folded dipole. The sections of the flat-top portion beyond the shorting connections form a closed-end stub. However, since whatever reactance they present at the shorting connections is ineffective due to the direct short they have no more effect than if a capacitor were placed across a short circuit. The flat-top portion of the antenna is capable of a dual resonance—once at a frequency

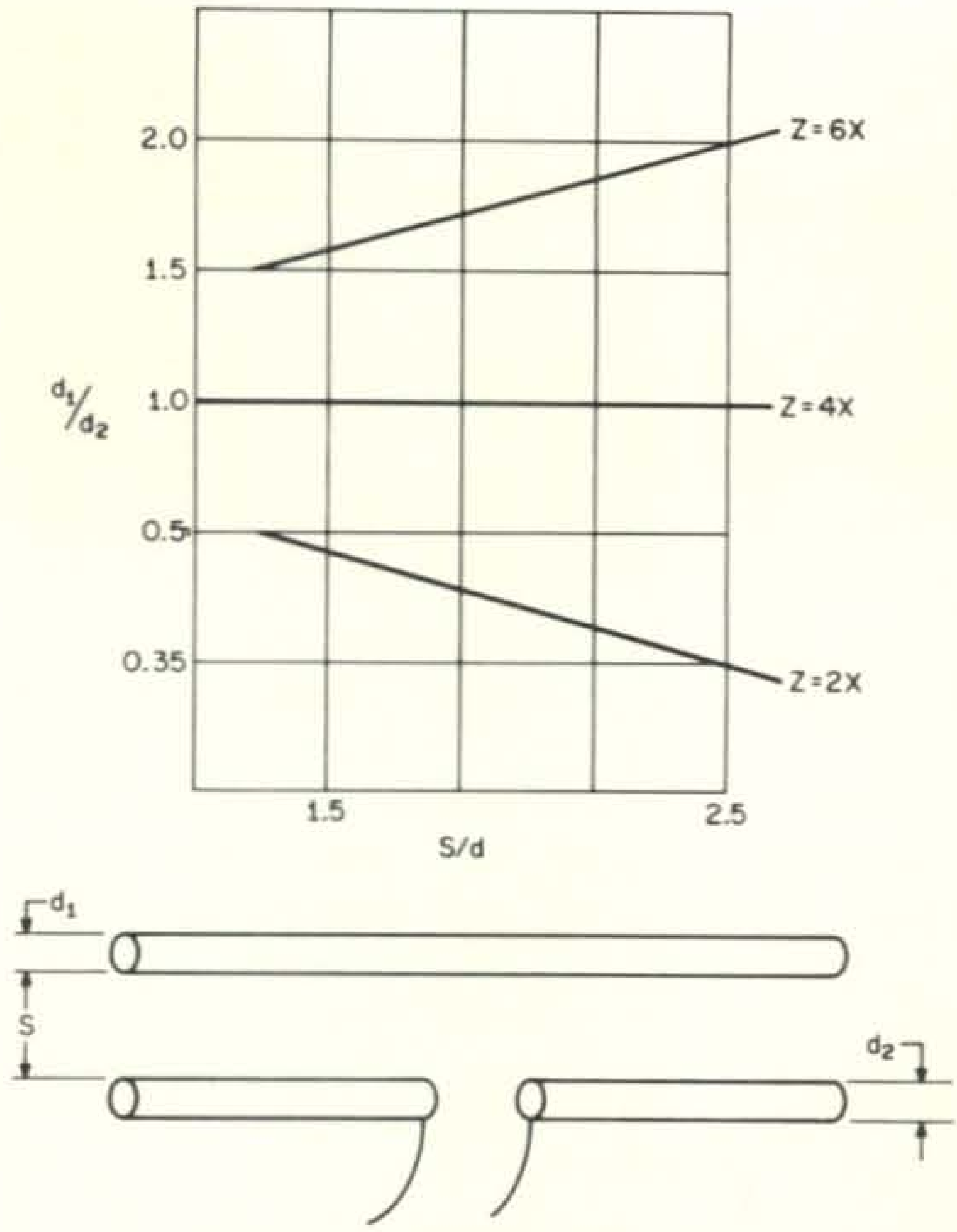

Fig. 1—Variation of the terminal impedance of a folded dipole antenna as a function of conductor diameter and the spacing between conductors.

where the physical length of the entire flat-top portion constitutes a ½λ length and once where the physical length of the flat-top portion between shorting connections constitutes ½λ length.

The practical usage of the advantage of dual resonance of the flat-top depends on the velocity factor of the line used to construct the flat-top. For instance, if standard 300 ohm twinlead would be used to construct the flat-top, its velocity factor would be about 0.82. If the antenna for 20 meters were made 33 feet long and shorting stubs placed 13.5 feet from each side of the center of the antenna, a second resonance of the flat-top would occur at a frequency where 26 feet constituted ½λ or 18 mc. Obviously, such a resonance is not useful for amateur oper-

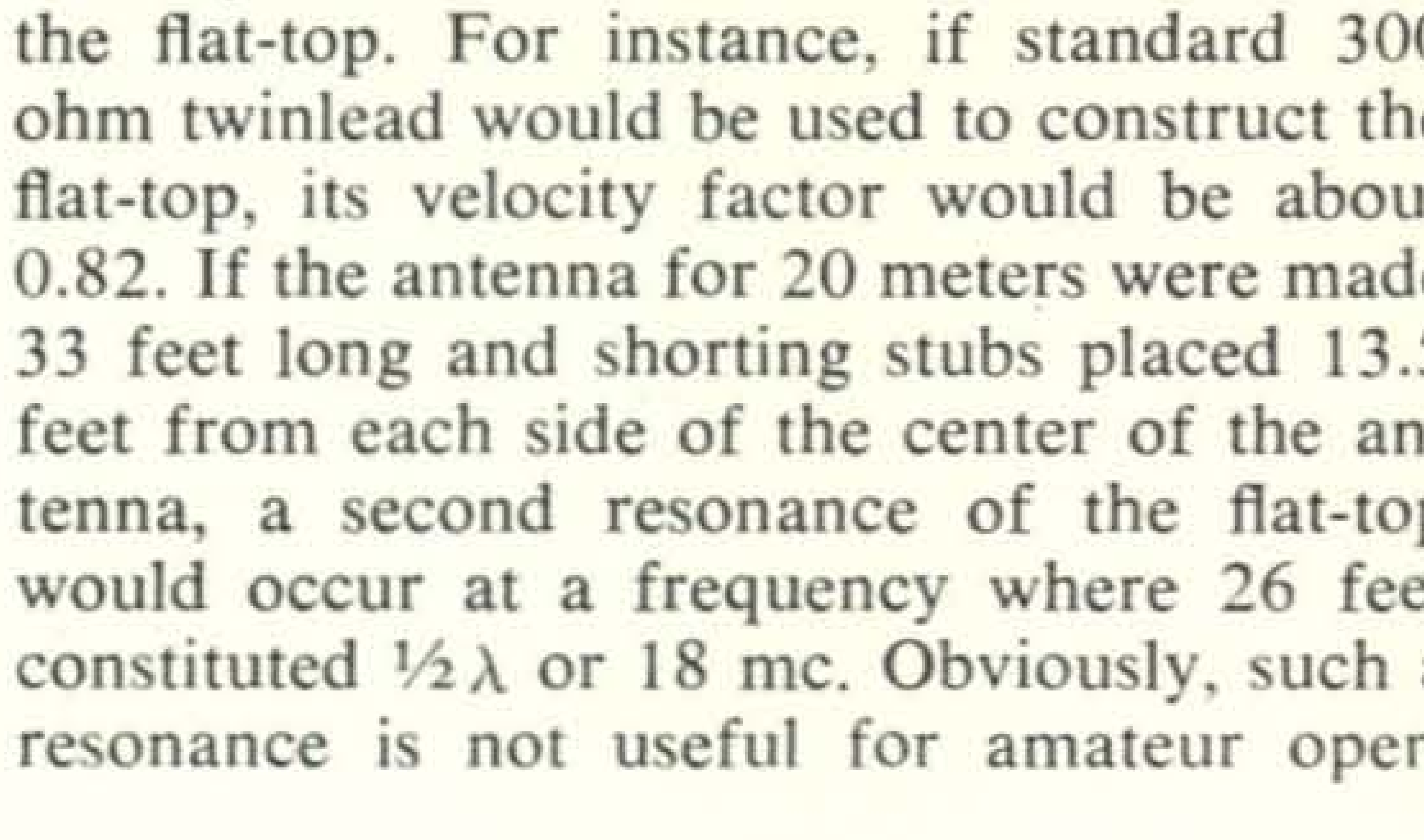

Fig. 2—Placement of shorting connectors not only improves bandwidth of folded dipole on fundamental frequency, but forms basis for use of antenna on a secondary frequency.

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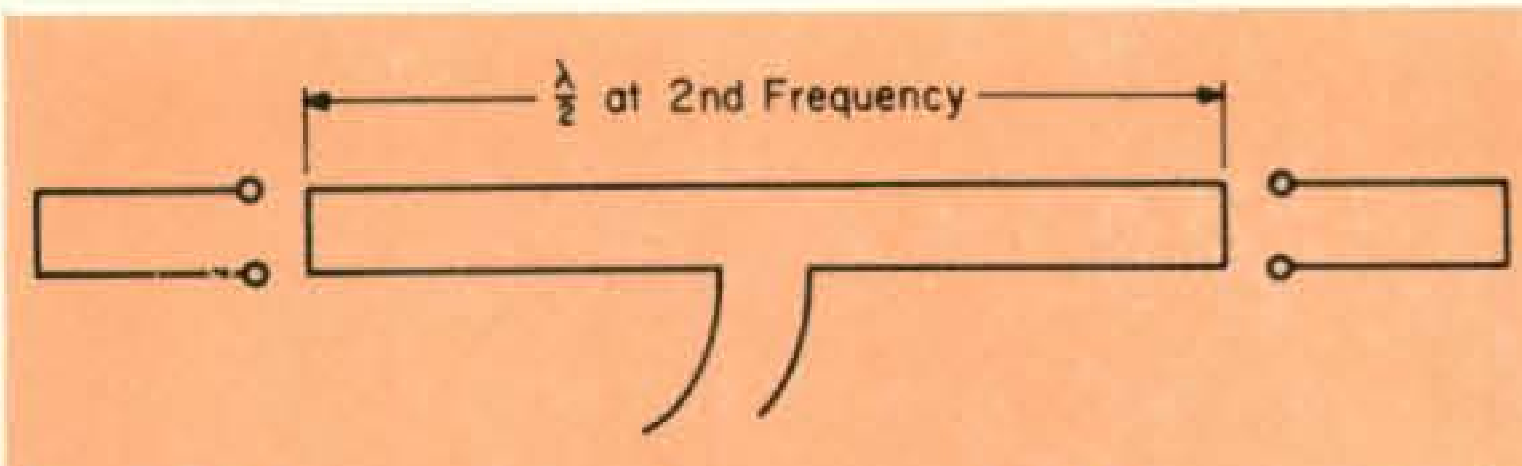

Fig. 3—Operated on frequency which corresponds to center portion of antenna shown in fig. 2 becoming ½λ long, another folded dipole is formed where end portions are ineffective in determining resonant frequency because of shorting connections.

ation. However, if the flat-top of the same antenna were constructed of 75 ohm twinlead, the velocity factor would be about 0.67. The shorting connections would be placed 11 feet from either side of the antenna center. The center 22′ portion of the antenna would then resonate nicely in about the middle of the 15 meter band. Thus, both 20 and 15 meter coverage would be achieved without compromise performance on either band and with completely automatic bandswitching. Although the flat-top portion is constructed of 75 ohm twinlead, it still presents an exact match to a 300 ohm transmission line on both bands as explained previously.

Thus, by choosing a twinlead with the proper velocity factor, and disregarding its impedance as a transmission line, a folded dipole antenna can be produced that will operate on two distinct frequency bands. Figure 4 shows the attenuation and velocity factor figures for some common types of twinlead. It should be noted that velocity factor is a function of the materials used in construction of the twinlead and an exact value should be obtained from the manufacturer of the twinlead used. The major manufacturers of twinlead, such as Amphenol and Belden, can supply exact data on each of their twinlead transmission lines.

The typical velocity factor figures shown in fig. 4 will allow the construction of a variety of antennas such as a 20 meter dipole operative on 15 meters, a 15 meter dipole operative on 10 meters, an amateur band antenna also resonant on one of the international broadcast bands or WWV frequency, *etc*.

One major advantage of this form of dual-band antenna is that the radiation pattern remains the same on both frequencies at which the antenna resonates, that is, broadside to the line of direction of the antenna. If the antenna is constructed to resonate both in an amateur band and a nearby international broadcasting band, which is used for DX spotting, there will be no confusion as to in which direction a band opening is at its best.

Although theoretically possible, the velocity factor of the commonly available twinlead transmission lines do not allow the construction of an antenna which will resonate on bands with a 1 to 2 frequency ratio such as 80 and 40, 40 and 20 and 20 and 10 meters. This would require the use of a transmission line for the flat-top portion of the antenna with a velocity factor of about 0.5. Many transmission lines approach this figure, but the author has been unable to find any commonly available commercial transmission line which would be suitable.

Summary

Taking advantage of the shorting connection feature made possible by the velocity factor of a dipole constructed from twinlead transmission line, offers an unique method of dual-band antenna operation. The idea might be expandable to a tri-band antenna if the basic dipole is operated on an odd multiple of its fundamental frequency. No experiments or theoretical analysis of such operation has been tried and the idea can only be offered as a basis for experimentation. The basic principle should also be applicable to the driven element of a beam antenna and thus allow dual-band beam operation without any loading reactances being necessary in the driven element. ■

Transmission Line	DB/Attenuation/30 Mc	Velocity Factor (Approx.)
300 ohm TV Twinlead	0.86	.82
150 ohm TV Twinlead	1.1	.77
75 ohm TV Twinlead	2.0	.68
75 ohm Transmitting Twinlead	1.5	.71

Fig. 4—Typical characteristics of various types of twinlead. Exact characteristics vary with manufacturer.

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Fig. 1—Homebuilt station of W1RIL using methods described in the text to obtain the commercial look.

THE COMMERCIAL LOOK

BY KENNETH SCHOFIELD,* W1RIL

Many articles have been written on home-brew equipment, most of which dwell on the electronic connections of the various coils, capacitors, resistors, etc. that make up a particular unit. This article is meant to pass along some ideas on home-brew equipment where the others leave off—making the equipment look commercially made.

The most important factors in getting the commercial look is cleanliness and neatness. Nothing looks worse on a front panel than jagged saw cuts, or on a chassis, finger prints or file gouges.

Another important feature is style! That statement should start some controversy, but let's face it, style is important. Several equipment manufacturers recognize this. Notice how some equipment has the same stylish cabinet lines as others, and even some of the panel arrangements are similar. Style here isn't as important as in women's clothing, but it is important and has to be considered.

The next ingredient necessary to get the commercial look cannot be seen in the equipment or in the operation of the equipment without considerable thought. It is that old adjective that all of us wish we had a lot more of—patience. The more patience we have in building and paying particular attention to each minute detail, the more commercial the homebrew equipment becomes, and so the more pleasurable and reliable its operation.

Let's get down to brass tacks—or I should say, aluminum sheets. Figure 1 shows the home-brew equipment at W1RIL. On the left is the KSL-1 linear, featuring: 4CX250B's in AB_1, capable of 800 watts d.c. input, a.l.c., Grid—Plate—Screen and relative r.f. output metering, self contained regulated bias supply, blower and bias failure protection, automatic plate and screen voltage delay and cabinet interlock for safety.

To the right of the linear is the KSSB-2 exciter. See *CQ*, July 1965 for a complete description.

The next unit in line is the KSC-1. It is the receiver power supply, phone patch, speaker and control unit of the station. It is "key-switch" operated and makes unauthorized use of the station impossible.

To the right is shown the KSR-3 receiver. It covers 80 thru 10 meters and features: 7360 balanced first mixer, audio derived a.g.c., 6EH7 r.f. amplifier with attenuation steps for overload protection, 9 mc i.f. with McCoy s.s.b. filter for selectivity, crystal controlled side-band switching and b.f.o. (100 kc oscillator and Pre-i.f. noise limiter are planned future additions.)

The antenna control unit to the right of the receiver is designated the KSA-1 and houses the power supply for the prop-pitch motor, selsyn receiver and readout and r.f. forward and reverse wattmeter. Special features include: automatic cutoff at the end of rotation (this could be classified as an "anti-idiot switch", so we don't pull the antenna out of the tree). The wattmeter reads 200—2000 watts in the forward and reverse directions. (See *CQ*, Dec. 1966—A Directional Wattmeter.)

* 21 Forestdale Road, Paxton, Mass., 01612

The back drop behind the equipment hides the interconnection unit terminal boards. Wiring from the units to the terminal boards is run in "Panduit", a plastic "U" shaped strip with cover, producing a neat and orderly means of interconnection wiring.

Style

A check of the commercial equipment on the market will give you an idea of what basic design you want the equipment to follow. From a general idea of what your are going to build, along with parts available, a specific size should be decided upon for the equipment. If more than one unit is to be made be certain you consider all aspects of size on each particular unit so that all of the parts will fit without excessive crowding. Choose a color scheme and use it on all units, rather than the haphazard use of various colors on various units.

Cabinet

The cabinet type will depend upon the style chosen. Some may prefer the standard rack panel with basic chassis and chassis supports, although this type is fast disappearing from the ham equipment line. Others may like the stylish cabinets of Collin's—Heathkit, etc. The Collin's style was chosen here, mainly for its clean and compact looks, affording a neat layout for table top arrangement.

The cabinets of all the units are of the same basic design as shown in Figure 1. Aluminum cookie sheets were used on the first unit built and when expansion to the complete station was planned a sheet of Reynold's do-it-yourself aluminum was purchased. This proved to be less expensive, as three of the cabinets were made from one sheet selling for a little over $5.00. Don't confuse this sheet with the thin ones sold by Reynolds—this is a relatively new item and is about the same thickness as a cookie sheet.

When working the aluminum, keep all cuts neat, draw-file the edges, clean thoroughly with an SOS, Brillo pad, or equal abrasive, and then *KEEP* it clean. For parts of the cabinet you will paint, use fine sandpaper to scratch the surface slightly to give the paint something to bond to. This will pay off later in that the paint will not chip or peel easily. The surfaces you prefer to remain unpainted are given an extra good cleaning with SOS, all rubbing done in the same direction, after which a coat of furniture wax is applied. Aluminum treated thusly will give years of high luster with only an occasional re-waxing.

Corners of the cabinet are easily bent once a radius is decided upon. A broom handle, having the desired radius for the front and rear panel corners is laid across the aluminum sheet at right angles and the bend made by pulling up on one end while holding the handle firmly across the aluminum stock. The bend on the other end is made in a similar fashion, using extra care to get it in the proper place so a snug fit will result. After bending, the surplus material on each end is trimmed off.

Ventilation holes at first were a problem. Screening was tried under one inch cutouts in the cover but it didn't look right. Special aluminum ventilation stock with holes could be used for the cabinet tops, but it is expensive. The junk box came to the rescue here. It contained a piece of stock with ventilation holes in it. Place the ventilation stock on the cover, choose a drill size exactly the same size as the holes in the stock, drill one or two holes and secure the stock to the cover with nuts and bolts and proceed to drill out the rest of the holes using the ventilation stock as a template. One piece of ventilation stock will last for years and very professional results can be achieved using this method.

Layout

The layout on the chassis should not result in excessive crowding in any one place and should result in a symmetrical and balanced arrangement of the controls on the front panel. This is probably one of the hardest things to do, as shafts and dial drives almost always want to end up someplace other than where you want them. A couple of items can be very useful here and these can also be home-brewed to any size desired. The dual control shaft is one, and the dial pulley is the other. Figure 2 also shows the mechanical diagram of the ¼ inch dual drive with pulley. These two items allow placement of components just about anywhere and still allow a balanced set of front panel controls.

Right about now I can hear someone saying, "This is all fine if you have a machine shop." Most of us have one and don't realize it. A ¼ inch electric drill and a few small files makes a dandy lathe for working small parts of aluminum or brass.

Front panel

It has already been stated that the front panel should be balanced and symmetrical however choices are available as to the finish

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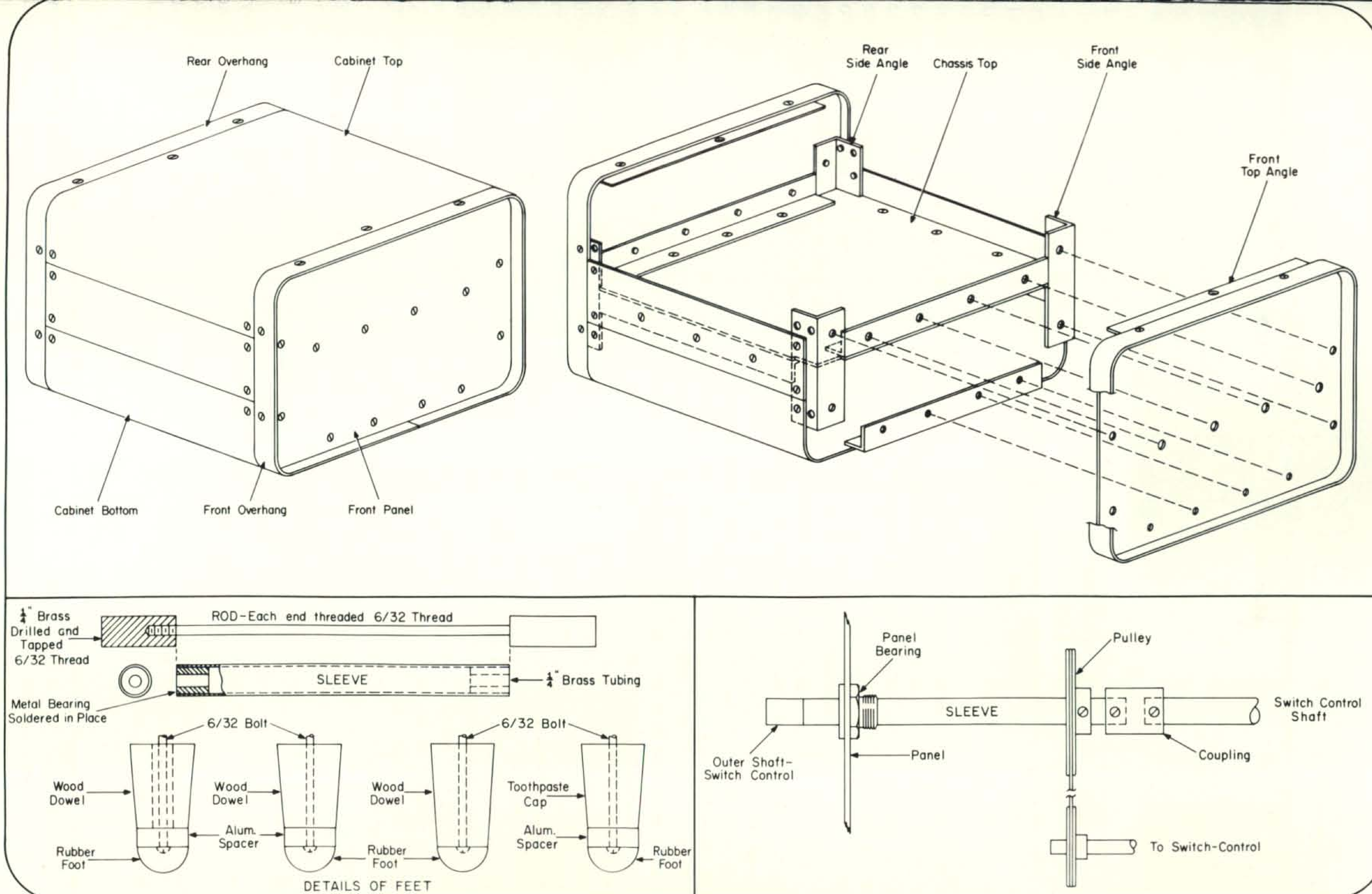
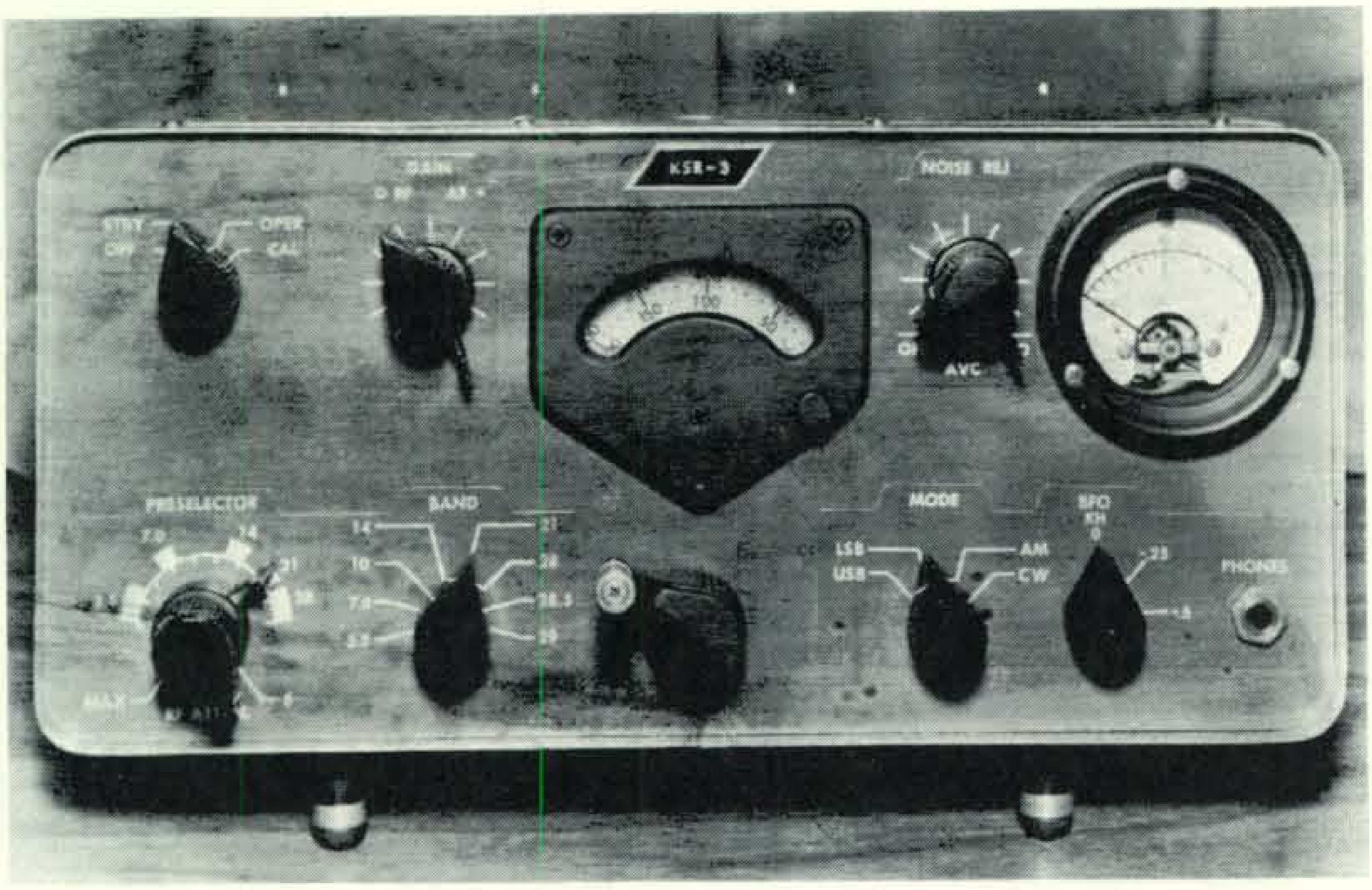


Fig. 2—The basic construction details that give your home-brew equipment that commercial look.



A close look at the author's KSR-3 receiver built according to the text. Looks sort of familiar doesn't it?

plain, painted, leatherette, wood-grain, to mention a few. The plain panel would require cleaning and polishing, and/or painting. By painting, I mean spray painting!—No brushes, please! If you want no bolt heads showing, the angle brackets behind the panel are mounted with flat head screws, countersunk in the front panel. A piece of vinyl leatherette material is cemented to the front panel with Ply-A-Bond cement. If the color of the leatherette isn't in keeping with the color scheme, spray-paint it to the desired color. The leatherette marks will remain, giving it a very handsome appearance. Wood graining is achieved by utlizing contact paper available in 5 & 10 and discount stores. Some of this is very difficult to tell from real wood even upon close examination.

Extrusions for dial faces are made from ⅛ to ¼ inch thick aluminum stock. Old aluminum rack panels are a good source of material. The extrusions can be made to take some wondrous shapes with a little sawing and filing. They can be left shiny, using the treatment already stated, or finished in a color. Flat black Krylon spray does a nice job. By careful filing and sanding these can be made to look as good as those made professionally. The use of philips flat head screws, countersunk for mounting the extrusion, adds to its professional appearance.

Lettering

Many types of lettering techniques were tried, all of which had advantages as well as disadvantages. Datak lettering works well on anything but flat painted surfaces. The protective coating for the Datak puts a gloss on the flat surface. A note of caution: Never use lacquer spray over Datak lettering as the ink is soluble in lacquer and running will result. Clear Krylon works well over Datak without running. Another method, rather than lettering directly to the panel, is to make up small thin aluminum sheets, spray painted the same color as the panel, to which the decal dials and decal lettering are applied. The sheets once lettered are given a coat of clear lacquer (spray). They are held in place on the front panel by the mounting nut of the control or switch shaft they identify. Decals applied in this manner will not peel or chip and the lacquer coating gives excellent protection for years. The lettering looks almost as professional as silk screening. Datak is excellent for making meter scales. The best approach is to remove the meter scale plate and paint the reverse side a flat white for black or red lettering, or flat black for white lettering. No protective coating is applied to the scale or lettering as it is protected by the meter face glass. By careful application of the Datak the finished product cannot be told from a manufactured item, and the meter can always be returned to its original condition by reversing the scale plate.

Input and Output Jacks and Plugs

Nothing looks more home-brew than a bundle of wire protruding from the rear of a unit thru a rubber grommet. Use of good jacks and plugs here can really make the difference. They don't necessarily have to be Amphenol Blue Ribbon connectors or Cannon connectors to look good. The old octal socket and octal plug is far superior to just wires protruding thru the panel. These should be mounted with the same care and consideration as the controls on the front panel, with one exception, symmetry of lay

[*Continued on page 124*]

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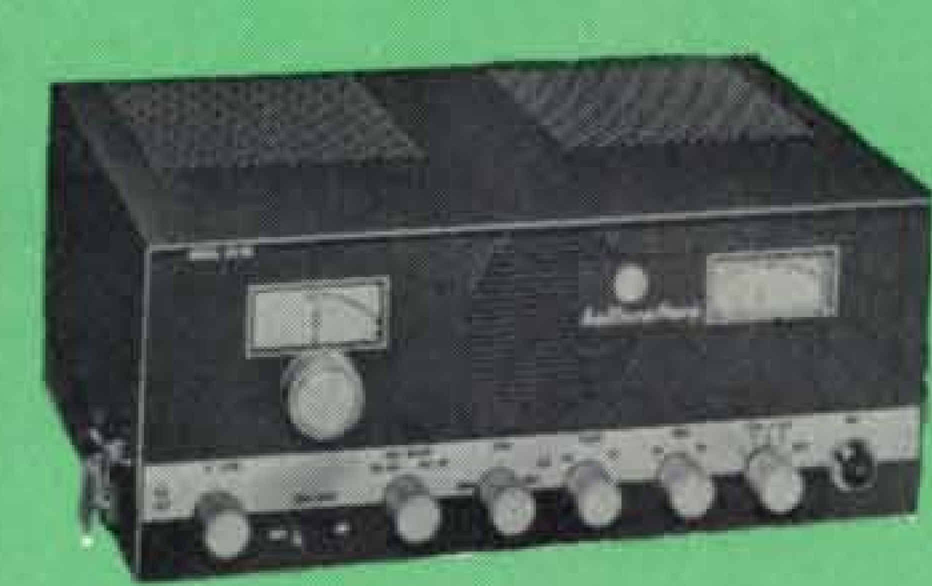

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DX

BY JOHN A. ATTAWAY,* K4IIF

The Award's Program

Headliner among the awards this month is the first Contest Worked All Zones Award which went to Paul Bavassano, I1RB, and Paul, Jr., I1RBJ, for their I9RB operation during the April, 1967, *CQ* W.W. SSB Contest I'm not going to call these fellow "lucky" winners because you all know that it takes more than luck to work all 40 zones on s.s.b. during a one-weekend contest. Congratulations Paul!

Incidentally, Paul and Paul, Jr., who are DX Editors for A.R.I., the Italian equivalent of ARRL, also worked 463 prefixes in this same contest for Contest WPX SSB #2, with 250, 300, 350, 400, and 450 prefix endorsement stickers. Let's see somebody top that in this year's go-round, It'll take some doing.

Now looking at the program as a whole, we awarded 27 new WPX certificates this month, 37 WPX endorsements, 25 new WAZ certificates, and 7 new SSB DX certificates. The hard working winners were the following:

New WPX Awards

Mixed: WA5CBE–151, W2UGM–152, LA8PF–153, DL1MD–154, F8CS–155.

C.W.: W2NEP–815, WA5CBE–816, OK3CAU–817, OK1BP–818, OK2YJ–819, OK1ALZ–820, OK2KFP–821, W3HQU–822, K1IJU–823, CT1OI–824.

S.S.B.: SM7CSN–302, WA5LOB–303, 5Z4KN–304, WØPAN/KH6–305, OK3DG–306, DJ3GI–307, WA4EKF–308, YV5BPG–309, YV1LA–310, SM6CAS–311.

Phone: K3PDC–145.

Contest, S.S.B.: I9RB-2.

The following WPX endorsements have been issued:

C.W. Prefixes: G2GM–650, VK2RJ–500, SM5BPJ–500, G3HIW–500, OK2OQ–400, LA8PF–400.

Mixed Prefixes: DL3RK–750, W3GJY–650, SM5BPJ–600, WB2CDZ–450, CN8AW–450.

Phone Prefixes: K2POA–500.

SSB Prefixes: W4OPM–750, K2POA–500, WA5LOB–450, SM5BPJ–400, YV1LA–400, SM6CAS–400, SM7CSN–250.

21 mc Prefixes: K3PDC, K2POA.

14 mc Prefixes: WA5LOB, SM5BPJ, W3HQU, K2POA.

3.5 mc Prefixes: SM5BPJ, OK1ALZ, OK2DB.

1.8 mc Prefixes: OK1ALZ.

Europe Prefixes: SM5BPJ, W3HQU, LA8PF, K1IJU, W6CHY.

Asia Prefixes: SM5BPJ, I1AMU.

Africa Prefixes: SM5BJP.

New S.S.B. DX Awards

100 Countries: K4KMX (all 14 mc)–502.

200 Countries: DL3RK–147, OK1MP–148, YV1LA–149, W2MJ–150.

300 Countries: G6TA–27, W8EVZ–28.

New WAZ Awards

CW-Phone: SM7BWZ–2372, I1BLF–2373, OH5SS–2374, W4OEL–2375, WA4LXX–2376, DL6WD–2377, K4HNA–2378, W8BVF–2379, W2FJH–2380, K2JWM–2381, VE3FAW–2382, OK1JD–2383, YO4CS–2384, F8CS–2385.

S.S.B.: DL9CQ–494, SM7CRW–495, HK5AOH–496, JA4CNS–497, DL8PC–498, SM5BPJ–499, W7MKI–500, W2MJ–501.

Phone: K5DFZ–367, 9M2DQ–368.

Special Contest (S.S.B.): I9RB–1.

For reprints of the complete rules for the WPX and WAZ Awards, and application blanks, send a self-addressed, stamped envelope (s.a.s.e.) to K4IIF, Box 205, Winter Haven, Fla. 33880. Novices—we have an award for you too, the WPNX Award for working 100 prefixes since May 15, 1967. QSL cards should be in your possession, but it isn't necessary to send them with your application.

Look for a big surprise presentation of DX Hall of Fame Award #2 very shortly, maybe at the North Jersey DX Roundup on March 23.

De Extra

Back in January yours truly was flying into Miami from overseas and chanced to sit next to a "retired DXer" from south of the border. This chap had some very definite opinions relative to DXing in the 1960's compared to DXing some 20 years ago. De Extra doesn't necessarily agree with everything he had to say, but it was an interesting conversation so we'll pass along the highlights for what they are worth to you.

This fellow was an old 7 and 14 mc c.w. man, and well lets let him tell it: "In the 'old days' if you wanted to work DX you tuned up down near the low end of the band and spent most of the evening just listening. After a while, if you were lucky, you would hear a weak signal down under the layers of local and stateside QRM. With patience you pieced

*P.O. Box 205, Winter Haven, Fla. 33880

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together the callsign after 2 or 3 transmissions, and if it was good DX you waited until after he had signed and gave him a call. If you were lucky, persistent, or a good DXer you finally got through, exchanged a 3/4/9 or 4/4/9 report, and went to bed with a feeling of accomplishment. You had really worked some DX.

"Today this is no longer true," he continued. "A few years ago they started this system where some chap charters an ocean liner and takes off with a kilowatt station, and an 80 foot tower with 4 element beams for each band. He sets up on some island somewhere and proceeds to put out a signal guaranteed to be S9 + 20 db for at least 12 hours each day everywhere in the world. They call that DX, but I don't and I don't fool with it. Shooting fish in a barrel is what it is. The whole thing reminds me of a friend of mine who always dreamed of going big game hunting, so he arranged at considerable expense to go on a safari. He was guaranteed the kill of a tiger. When they started out from their 'camp' to seek the tiger my friend was very dubious about the entire matter because the area in which they were hunting was really quite inhabited and there was very little jungle. Finally the guide pierced the darkness with a powerful spotlight mounted on the jeep and instructed my friend to shoot at a pinpoint of light which he said were the eyes of a tiger. My friend was uncertain exactly what the guide was indicating, but he fired his rifle in the general direction that the light was pointing and momentarily there was a tremendous commotion in the bushes following which some of the guide's employees came dragging out a tiger with a neat bullethole between it's eyes. My friend confessed that he isn't really sure to this day whether or not he actually shot that tiger or the guide had it already dead and waiting for him. That's your so-called DX for you."

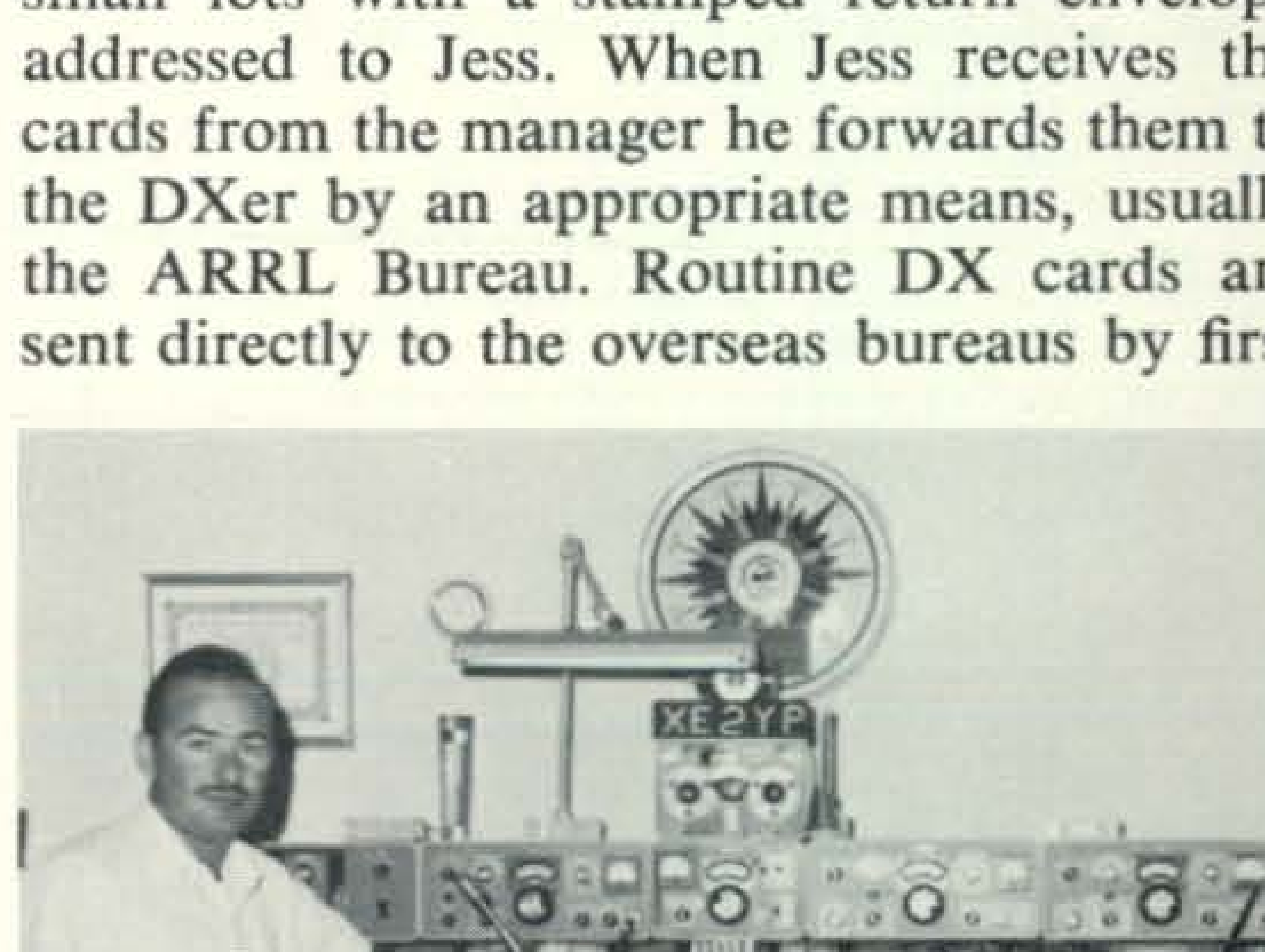
So much for the self-styled, retired DXer and his views. Again, De Extra doesn't agree ciento por ciento and we're sure that many of you could easily write a devastating rebuttal. However, even though you don't fully agree with him neither can you fully disagree with him. He has a legitimate opinion. To balance things off, next month's De Extra will discuss the Advantages of Dxpeditions.

Outgoing DX QSL Services

In previous columns the U.S. QSL Bureaus have been described in considerable detail. However, as you are probably well aware, these bureaus are not equipped to handle outgoing cards for W,K amateurs as do many of the overseas bureaus for their amateurs. Consequently, today's soaring postal rates have produced a crisis for many U.S. hams who are finding they can no longer afford to QSL large numbers of routine DX contacts, particularly those resulting from contest operations. The need for an outgoing bureau is evident.

This need has been partially alleviated by two enterprising W3's, W3KT and W3GJY, who independently operate private DX QSL services. The W3KT service is an operation of long standing and the W3GJY service has been functioning for over two years, so neither is a fly-by-night operation. I have had personal dealings with both of these services and have found them to be operated efficiently and conscientiously. I have never had any cause for complaint. The *modus operandi* of these two services is different so I will give you a brief description of each with the suggestion that you write the proprietors for further details.

The W3KT QSL Service is operated by Jess, W3KT, of RD 1, Valley Hill Road, Malvern, Pa. 19355. Jess finances his operation through a charge of 4 cents per card or 30 cards for $1.00. Cards for stations having QSL Managers are sent directly to the manager by first class mail either singly or in small lots with a stamped return envelope addressed to Jess. When Jess receives the cards from the manager he forwards them to the DXer by an appropriate means, usually the ARRL Bureau. Routine DX cards are sent directly to the overseas bureaus by first



Jorge D. Parada, XE2YP, of Sonora, Mexico. Jorge is one of the top DX chasers of Mexico, and you may have worked him from XF4 land by the time this issue reaches you as he is scheduled to stir up a bit of DX himself.

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class mail for processing in the normal manner.

The W3GJY service, called the "World Wide DX QSL Bureau", is operated by John, W3GJY, of 1400 Chaplin St., Conway, Pa. 15027. It is largely financed on an annual fee basis rather than a charge per card. Membership costs $6.00 per year and all DX contacts, including VE, which the member makes during the membership year may be QSLed through the bureau for this figure. In addition, cards for contacts prior to the membership year may be sent for 1 cent each, giving the member an opportunity to catch up on his backlog of cards cheaply. Membership also carries s.a.s.e. privileges for stateside QSL Managers. The member sends $1.00 which buys 20, 5 cent stamps which are put on envelopes pre-addressed to the member's home QTH. In addition, if a member is a QSL Manager he can send cards from his DX station through the bureau for 1 cent each if he sends less than 600 yearly, or he can enroll the DX station in the bureau for the same $6.00/year and route the DX cards through the bureau in the normal manner.

A QSL service is also operated by the International Short Wave League (ISWL), and I had hoped to describe it for you in this column. However, the information requested from ISWL arrived just after the deadline and will be held until next month.

From the Bulletins

Thanks ot the following DX bulletins and their respective editors for these items which appeared in early January and were selected for their long term value: North Eastern DX Association Bulletin (K1IMP), Southern California DX Club Bulletin (WA6GLD), DX-MB(DL3RK), Florida DX Report (W4BRB), DX News-Sheet (Geoff Watts), DXers Magazine (W4BPD), West Gulf DX Club Bulletin (W5QK), Ontario DX Association Long Skip (VE3DLC), DX-Press (VERON), Long Island DX Association Bulletin (W2GKZ), and the Northern California DXer (K6CQF).

CEØ—CEØPG is located on Navarino Island, 55°S and 67°30'W, near Cape Horn. There has been some speculation that this island might qualify for new country status. However, from a glance at the map it would not appear to be sufficiently far removed from mainland Chile. Sorry fellows, looks like no dice.

CR4, Cape Verde Islands—CR4BC is active on 20 meter sideband in the range of 14170-190 kc. CR4BJ is reported on 15 meter sideband, 21320 at 1115 GMT.

Gene, VE6TP, and somebody you might recognize without a caption.

CR8, Portuguese Timor—CR8AH has been heard on 21225 kc a.m.

FK8, New Caledonia—FK8BG is reported on 14090 kc c.w. and 14125 kc s.s.b. FK8AU has been heard on 21315 kc s.s.b.

FW8, Wallis Island—FW8RC is reported to be very active on the low end of 20 meter s.s.b.

GC8, Guernsey—GC8HT will be happy to make a sked with you. If interested write him enclosing a self-addressed envelope and IRCs. His address is R. H. Taylor, La Cour de Longue, St. Saviours, Guernsey, Channel Islands, England.

LU, South Shetland Islands—LU2ZI has been reported on 21020 kc c.w. at 1800 GMT. LU3ZI on 14013 kc c.w. around 2200-2300 GMT.

OY4, Faeroes Islands—OY4OV is very active on 80 meter s.s.b. Anyone desiring a sked may contact OZ4FF.

PYØ, St. Peter & Paul Rocks—The PYØDX PYØSP trip came off successfully in December. Hope to have pictures for you in a later issue.

ST2, Sudan—ST2PO has been worked on 20 meter c.w. at 1600 GMT.

VK9, Papua—VK9TB is scheduled to be active until November, 1969.

VQ8, Nelson Island—Don Miller's VQ8CBN operation may count as a new one as it is reported that this island is not politically affiliated with the neighboring Chagoes group.

VQ8, Chagoes Islands—VQ8CDC is a legitimate operation. He has been worked around 14004-14015 kc c.w. at 1300 GMT.

XW8, Laos—Bob, XW8BJ, is QRV daily around 21300 kc s.s.b.

ZS2, Marion Island–ZS2MI is active Mondays, Wednesdays, and Fridays on 15 meter a.m. between 21240 and 21250 kc. His favorite times are 1500-1700 GMT.

3YØ, Bouvet–3YØEB is licensed to operate from this very rare one and has been reported on various 20 meter frequencies. This is a Norwegian group.

4S7, Ceylon—Glen, 4S7GV, in Kurunegala is now on the air running 18 watts c.w. He answers slow speed c.w. only at present. QSL direct.

8F1, Indonesia–In a letter to JA1HGY, 8F1SH says that amateur radio is now permitted in Indonesia. Several stations have been recently heard using the old PK prefixes. Most are on a.m. or c.w. *Keep in mind that this is on the banned list for U.S. hams.*

8P6, Barbados–Woody, 8P6CC (ex-VP6WR), skeds his QSL Manager, Joe, W4OPM, every Friday at 2100 GMT on 21300 kc. Anyone interested in a sked can arrange same by contacting Joe. Be sure to enclose that s.a.s.e.

9K2, Kuwait–9K2AD may be heard on 14332 kc s.s.b. at 2020 GMT, 9K2AM on 14208 kc s.s.b. at 1940 GMT, and 9K2BY on 14118 kc s.s.b. at 1620 GMT.

From The Mailbag

de W4NJF: "I would like to reply to the letter in your December column which was reprinted from G3FKM's column in the *RSGB Bulletin.* As you know I have been QSL managering for a couple of years so I believe that I've learned enough to make a few comments.

"I am familiar with the gripe which

This interesting photo shows ⅔rds of the world's ZF1 hams. On the left is Dick, ZF1DX (also K6KDS & KZ5DX), and on the right Edgar, ZF1ES. Missing is Frank, ZF1GC. The big smiles are the result of QSOs with HZ3TYQ just prior to the picture. Dick's ZF1DX card is a beautiful, 7-color job that makes great wallpaper. Self-addressed stamped envelope to K6KDS if you qualify.

WA2RAU expounded with regard to his ex perience with the VK2AVA/LH cards. How ever, I don't think it is well founded! Doc ex pected a flood of money from QSLers to fi nance Arie's trip. As much as I think Do is a great guy he was off on the wrong foo in this one. Lord Howe was only a mediun rare one and the DXpedition did not publi cize itself sufficiently to attract money. Th signal put out was pretty low and it took lot of work to hear the station. To mak matters worse it came at an ill-timed mo ment when certain escapades were fallin under the gun. Consequently, Doc expecte too much from the ham fraternity. The bi boys who understand how to QSL and ge QSLs had all worked Lord Howe and th audience was made up of relative newcom ers to DXchasing who were not acquainte with the finer points such as s.a.s.e., GMT and IRCs.

"I have personally handled over 100 cards for FL8AC, 700 for ET3AC, 400 fo 9J2MM, 500 for VS9ABL, 200 for EL2AT 300 for ZE1CX, and nearly 1000 for YJ8BW I find *none* of the discourtesy set forth in th subject letter! No one has ever complaine when non-receipt of logs forced a delay. I fact I receive notes of thanks in at leas ¼ of the envelope.

"However, I do believe that the new DXer are not getting the word properly, mainl because there is no time for the DX statio to tell them to send s.a.s.e. or IRCs or else th DX station is too embarrassed to do so. Nev ertheless, relatively few cards come minus th necessary return help, and fortunately som philanthropic fellows include a bit of 'lettuc unsolicited which pays for postage to sen batches to the bureaus. No, you don't mak money at this chore, but then neither have ever lost any. My stations always pay the cos of printing the cards.

This brings up the need for an outgoin bureau in this country. It costs quite a bit t send large batches of cards to overseas bu reaus even by 3rd class mail, so lets kee pushing for an outgoing bureau and soone or later it may materialize. The price of pos age has gone skyhigh, and the service ver low. Consequently, after January, 1968 w will have to economize to even carry on cor respondence. I notice that many cards fron overseas arrive by 2nd Class Airmail. Wh can't we have such a thing? We could mak political demands for it if we got together.

"In conclusion, I don't believe the subje

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letter was well founded in respect to the financial situation. However, I do believe that the plea was sincere, but to it should be added that QSLers be more careful with their dates and times and always use GMT."

The next is from Geoff Watts of 62 Belmore Road, Norwich, Norfolk, England, publisher of the *DX News-Sheet*. The subject is "ARRL, DXCC, W9WNV, and All That":

"Lawsuits will avail little in sorting out the past-operations problems of DXCC, but such proceedings will without doubt do untold harm to amateur radio. We all know there have been phoney operations in the past, and by various operators, but after all this while it is just a waste of good money trying to sort them all out. ARRL now has its rules and regulations concerning the documentation required from future DXpeditions if the operators expect same to count for DXCC, and this is a good thing, but in regards to past operations ARRL should continue to give credit for every DXpedition which they have credited in the past. This is the only sensible solution to this problem because DXCC is only just one of innumerable awards these QSLs have been credited for. For the sake of our hobby all DXers should demand that ARRL do this immediately and put an end to such ridiculous hostility in certain quarters. The matter of these past operations can be easily settled for good if ARRL would announce that from Jan. 1, 1973 all QSLs dated 1967 and earlier will cease to count for DXCC. There has been a lot of talk about starting DXCC all over again, but 'deleting' QSLs more than 5 years old might be a good yearly policy for the future. It would give all new-comers a better chance and the old-timers would not have to start all over again. It would put an end to these ridiculous 'deleted' countries and provide a bit more interest for those DXers who have just about 'got the lot' and who appear on the bands only in the pileups to work some new reef so that all the top Honor Roll men move up one. It is reported that FR7 stations are now refusing to work W-stations. This is no doubt just a sample of the sort of thing that we can expect to happen to amateur radio unless a sensible solution and a 'cessation of hostilities' is arrived at very shortly.

QSL Bureau Changes

Please note the following new addresses on your QSL Bureau Listings:

Australia–VK3OR of W.I.A. informs us that because of the very heavy workload at

H.E.H. Green, ZL2GS, one of the top prefix chasers of Oceania. This OM is a double war veteran, British forces from 1914-18 and New Zealand forces from 1940-45. He isn't concerned with this country's standing as getting WPX stickers is his number one hobby.

the central bureau many incoming cards are now to be routed to the district bureaus. The only exceptions are the VK8, VK9, and VKØ cards which are still being handled by the central bureau. The addresses of these are:

VK1 QSL Bureau, Box 1734, GPO, Sydney, N.S.W., Australia.

VK2 QSL Bureau, (Same as VK1).

VK3 QSL Bureau, c/o Mr. E. Trebilcock, 340 Gillies St., Thornbury, Victoria.

VK4 QSL Bureau, c/o Mr. J. Files, VK4JF, 18 Vanda St., Buranda, Sth. Brisbane, Queensland.

VK5 QSL Bureau, c/o Mr. George Luxon, VK5RX, 27 Belair Road, Torrens Park, South Australia.

VK6 QSL Bureau, c/o Mr. J. Rumble, VK6RU, Box F319, GPO, Perth, West. Australia.

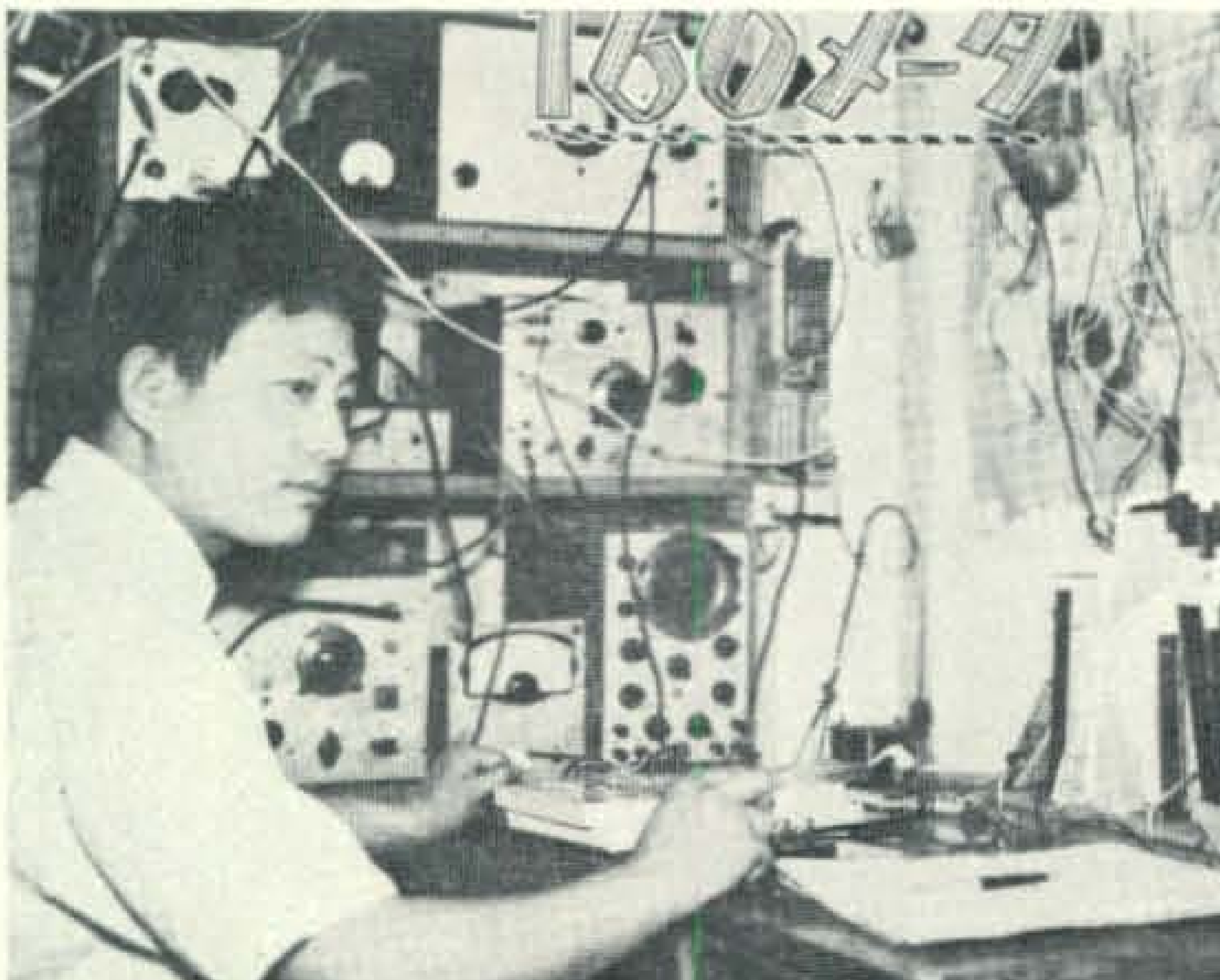
VK7 QSL Bureau, c/o Mr. S. Batchelor, VK7JB, 39 Willowdene Ave., Lower Sandy Bay, Tasmania.

VK8, VK9, and VKØ, Federal QSL Bureau, 23 Landale St., Box Hill E. 11, Victoria.

France–Jacques, F2YS/W2, advises that the new QTH for the F-Bureau is: R.E.F., Boite Postale 70, 75 Paris 12, France.

A New Record

The longest time interval between QSO and QSL record has been broken again. Today I received a message from Lou, W4JV, informing me that he has just received a card from Ivan Pastre confirming a contact between W4JV and FQ3AT/FE8. This QSO took place on Feb. 14, 1948 at 1605 GMT. Can anybody top 20 years??



Atyuki Iwakami, JA1BHG, one of the top JA operators on 160 meters. This OM made an outstanding contribution to the recent Transpacific and Oceanic DX work on 160. *(Photo Courtesy W1BB).*

160 Meter News

PY2BJH using 25 watts on 1803 or 1827 kc was QSOed by K1PBW, W1BB/1, and W1WY in December at 0515 GMT. The big VQ9JW breakthrough in December with *10 watts* from Aldabra Island is still generating conversation. This station, operated by John, G3UDU, gave W1BB his 98th country on 160. That all time first of 100 countries on 160 is just around the corner.

Among the stations recently reported active are GC4LI, 1830 kc; HB9TT, 1830 kc; LA3BG, 1803 kc; ZB2AP, 1807 kc; ZC4RB, 1803 kc; OE5XYL, 1826 kc; and OF2KH, 1846 kc.

KL7FRY is now QRT from Shemya. A great 160 meter era comes to an end.

Change in W4 QSL Bureau

The W4AM group in Chattanooga is no longer handling the cards for the W4 and K4 ops. The new address is W4 QSL Bureau, c/o Pat Parrish, K4HXF, Rt. 5, Box 804, Hickory, N.C. 28601. WA4 and WB4 cards are still being handled by WA4WIP.

QSL Information

BV1USA–c/o W7VMC, 8703 N.E. 94th Ave., Vancouver, Wash. 98662.
CEØAB, CEØAC, CEØAE–Via WA5PUQ.
CEØPK, CEØZN–To WB6GOV.
CR6IK–Via K3ZVM.
CT2IW–c/o Norbert Harting, B. de Rosario, Lote 83, Cascais, Portugal.
EP2DM–Via Don Simonsen, K7GHZ, 32I3 -R- Street, Vancouver, Wash. 98663.
F2YS/W2–To Jacques M. Pecourt, P.O. Box 191, Fishkill, N.Y. 12524.
FB8WW–c/o W4MYE.
FL8FP–B.P. 188, Djibouti, French Somaliland.
FY7YI–Via W3AYD.
HKØAI–To W9WHM, 438 Hamilton St., Forvill Ind.
HKØBIS–c/o Box 81, San Andres Island, Colombi South America.
KG6SA–Via U.S.C.G., Navy 935–Box 338, FPC San Francisco, Calif. 96950.
KG6SL–No longer handled by W4FRO.
KL7FRY–To W8DGP.
KZ5DX–c/o K6KDS, 2 Stallion Road, Palos Verd Peninsula, Calif. 90274.
MP4BFJ–To K1SLZ.
OY9IM–Via Box 184, Torshavn, Faeroes Islands.
PYØAQB–c/o P.O. Box 1043, Recife, Pernambuc Brazil.
YØDX, PYØSP–Via P.O. Box 842, Recife, Pernan buco, Brazil.
PYØTX–P.O. Box 4, Resende, RJ, Brazil.
PZ1CF–Via W3HNK (now handling all contacts of Jan. 1, 1968).
TI2JCC–To W3HNK, 126 Henderson Street, No wood, Pa. 19074.
TJ1QQ–c/o W4DQS.
TY2KG–Via YASME, P.O. Box 2025, Cast Valley, Calif.
VK5XK/2–To Arch Hewitt, 15 Semaphore Roa Semaphore, SA, Australia.
VP1PV–Definitely NOT via G3UML.
VP6WR–c/o W4OPM.
VP7NA–For QSO's between Dec. 24, 1967 ar Jan. 1, 1968 QSL to WAØKXJ.
VQ8CB, VQ8CB/A, VQ8CBN–Via KØTCF, 4 Miriam Ave., Kirkwood, Mo. 63122.
VQ9JW–Maj. D. A. Barry, 67 Harcourt Roa Bushey, Watford, Herts., England.
W9WNV/DXpedition–c/o KØTCF, 423 Miria Ave., Kirkwood, Mo. 63122.
WØPAN/KH6–Larry J. Shima, 11417 Goodri Road, So. Bloomington, Minn. 55431.
WA4RFB/KV4–To WA4RFB.
XW8CC–c/o American School, APO, San Fra cisco, Calif. 96352.
XW8CE–Via WA1CFC, 770 Shennecossett R Groton, Conn.
YN4JAB–c/o W8GIV/S, 413 Maple Ave., Dalha Texas 79022.
YV3KV–To WA4AEB.
YV5AGD–Via W5PWG, 4828 Williams, Lawt Okla. 73501.
ZB2AP–c/o WA8QJK, 2145 Chesaning Dr. S. Grand Rapids, Mich. 49506.
ZD9BH–Via ZS6XL.
ZE1CX–To W4NJF, 421 Saddle Rock Rd., Norfo Va. 23502.
ZF1DX–c/o K6KDS.
ZS9H–Via P.O. Box 17, Gaberones, Botswanna.
ZS9Q–To P.O. Box 45, Francistown, Botswanna.
3C6UP–C. Kropinak, 513 - 19th St. North, Le bridge, Alberta, Canada.
4J7B–c/o P.O. Box 88, Moscow, Russia.
4L3A–Via P.O. Box 88, Moscow, Russia.
5N2KG–To YASME.
5R8BA–c/o KØTCF.
5V4AP–Via P.O. Box 33, Atakpame, Rep. of To
8P6BV (ex-VP6PJ)–C. Moraller, WB2UKP, Silverbrook Road, Shrewsbury, N.J. 07701.
9J2MM–To W4NJF.
9L1GQ–c/o P.O. Box 907, Freetown, Sierra Leo
9M2NY, 9M6NY–Via R. H. Williams, 15B Jal Berjaya, Singapore 20, Singapore.
9U5DP–To W2SNM.

73, John, K4I

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Propagation

BY GEORGE JACOBS,* W3ASK

THE following is an overall picture of h.f. amateur band propagation conditions forecast for March, 1968. For specific times of DX openings, refer to the DX Propagation Charts which appeared in last month's column. This month's column contains Short-Skip Propagation Charts for March and April, as well as Propagation Charts centered on Hawaii and Alaska. The Short-Skip Charts contain band opening forecasts for predominantly *one-hop* opening for distances varying between 50 and 2300 miles. For day-to-day propagation conditions expected during the month, see the "Last Minute Forecast", which appears at the beginning of this column.

10 Meters: Excellent DX openings forecast to nearly all areas of the world from shortly after sunrise through the late afternoon and early evening hours. Excellent short-skip openings are also forecast during the daylight hours over distances varying between approximately 1300 and 2300 miles.

15 Meters: Expected to be the optimum DX band during the daylight hours. Excellent openings are forecast to all areas of the world from shortly after sunrise through the early evening hours Excellent short-skip openings are also forecast for the daylight hours, between distances of approximately 1000 and 2300 miles.

20 Meters: Twenty meters is expected to remain open to one area of the world or another, almost around-the-clock. DX conditions should peak during the sunrise period, and again during the late afternoon and early evening hours. Excellent short-skip openings are expected during the daylight hours, between distances of approximately 650 and 2300 miles. Short-skip openings between 1300 and 2300 miles should be possible during most of the hours of darkness as well.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for March

Days	*Forecast Rating & Quality* (4)	(3)	(2)	(1)
Above Normal: **4, 6, 9, 16-17, 31**	A	A-B	B	B-C
Normal: **2-3, 5, 7-8, 10, 13-14, 18-20, 22, 26-27, 29-30**	A-B	B	C	D
Below Normal: **1, 11-12, 15, 21, 23, 25, 28**	B-C	C-D	D	E
Disturbed: **24**	C-D	D-E	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the *CQ* propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

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

3—With the forecast rating noted above, start with the numbers in parenthese at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating higher than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meanings: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

5—Local Standard Time for these predictions is based on the 24-hour system.

6—These Propagation Charts are valid through April 30, 1968. These Charts are prepared from basic propagation, data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

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

80 Meters: Although some fairly good DX openings are forecast during the hours of

A bright aurora arcing across the northern sky. *(National Bureau of Standards photo.)*

darkness, the band is expected to sound noisier as a result of a seasonal increase in static levels. Excellent daytime short-skip openings are forecast between approximately 50 and 250 miles. During the hours of darkness the short-skip range will increase to between 200 and 2300 miles.

160 Meters: No skip openings are expected during the daylight hours, but short-skip openings as great as 2300 miles, and an occasional DX opening should be possible during the hours of darkness and the sunrise period.

During March and early April there is usually a noticeable seasonal improvement in high frequency propagation conditions between the northern and southern hemispheres. This is expected to result in a greater number of strong-signal openings between the United States and South America, Africa, Australasia, parts of Asia and the Antarctic, on almost all of the amateur h.f. bands.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a mean monthly sunspot number of 123 for December, 1967. This was the highest level of mean monthly solar activity observed since September, 1960. It results in a 12-month smoothed sunspot number of 88 centered on June, 1967. A smoothed sunspot number of 109 is forecast for March, 1968, as the present sunspot cycle nears its maximum level of activity.

V.H.F. Ionospheric Openings

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

Auroral displays tend to occur somewhat more frequently during March than during the early winter months. During such displays, unusual short-skip conditions often occur on the v.h.f. bands. Short-skip openings, generally over distances of several hundred miles, but sometimes as great as approximately 1300 miles, may take place by means of reflection from the ionized regions produced by the auroral displays. On the h.f. bands auroral type openings are generally characterized by flutter fading and multi-path echos, but on the v.h.f. bands these openings may often be exceptionally strong. To take maximum advantage of such v.h.f. openings, rotatable antennas should be beamed towards the auroral display if it is visible, or in a northerly direction, if it is not visible.

The occurrence of auroral activity can often be detected by a sharp decrease in propagation conditions on the h.f. bands. During such displays there is a tendency for ionospheric storms to take place, which can disrupt h.f. communications for periods ranging between several hours to several days. Check the "Last Minute Forecast" appearing at the beginning of this column for a prediction of those days during March that are most likely to be disturbed or below normal. These are the days on which v.h.f. auroral-type openings have their best chance of occurring

Aurora Expedition

Although auroras have been observed scientifically for the past 200 years, there is still no clear understanding of their cause

To learn more about auroras, a special study undertaken by the National Aeronautics and Space Administration began on January 18. The study, in which scientists from fourteen U.S. and Canadian research organizations are apriticipating, involves exploring auroral displays from the ground, from a jet airplane, with sounding rockets, and with a satellite.

A dozen trips are planned in the NASA airborne laboratory, a Convair 990 jet, over a wide area of the northern auroral zone

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in which auroral activity occurs to some degree almost every day. The plane carries a large variety of experimental equipment to measure and photograph auroras. The jet will fly in the area of Fort Churchill, Canada as well as cross-country to Fairbanks, Alaska and Thule, Greenland. The first phase of the expedition ran from January 18 to February 8. A second phase began February 21 and will run until March 12.

At the same time that auroras will be observed from the ground and from the jet laboratory, several sounding rockets will be launched from Fort Churchill directly into auroral displays. NASA's Orbiting Geophysical Observatory satellite, OGO-IV, will also explore the aurora with its scientific instruments as it passes 250 miles overhead.

Many scientists now believe that auroras

[*Continued on page 124*]

CQ Short-Skip Propagation Chart

MARCH & APRIL, 1968

BAND OPENINGS GIVEN IN LOCAL STANDARD TIME
AT PATH MID-POINT
(24-HOUR TIME SYSTEM)

Distance From Transmitter (Miles)

Band (Meters)	50-250 Miles	250-750 Miles	750-1300 Miles	1300-2300 Miles
10	*Nil*	09-13 (0-1)	07-09 (1) 09-12 (1-2) 12-13 (1-3) 13-16 (0-3) 16-18 (0-2) 18-20 (0-1)	07-08 (1) 08 09 (1-2) 09-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-21 (0-1)
15	*Nil*	07-09 (0-1) 09-15 (0-2) 15-19 (0-1)	07-08 (1) 08-09 (1-2) 09-15 (2-4) 15-18 (1-3) 18-19 (1-2) 19-23 (0-1)	07-08 (1) 08-09 (1-3) 09-15 (4) 15-18 (3-4) 18-19 (2-3) 19-21-(1-3) 21-23 (1-2) 23-01 (0-1)
20	11-13 (0-1) 13-16 (0-2) 16-19 (0-1)	08-09 (0-3) 09-11 (0-4) 11-13 (1-4) 13-16 (2-4) 16-18 (1-4) 18-19 (1-3) 19-22 (0-2) 22-08 (0-1)	06-07 (1-2) 07-08 (3) 08-09 (3-4) 09-18 (4) 18-19 (3-4) 19-22 (2-4) 22-00 (1-3) 00-02 (1-2) 02-06 (1)	06-07 (2) 07-08 (3) 08-10 (4) 10-15 (4-3) 15-22 (4) 22-23 (3-4) 23-00 (3) 00-02 (2) 02-04 (1-2) 04-06 (1)
40	06-07-(1-2) 07-09 (2-3) 09-18 (4) 18-20 (3-4) 20-22 (2-3) 22-00 (1-2) 00-06 (1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-20 (4) 20-22 (3-4) 22-00 (2-4) 00-03 (1-3) 03-06 (1-2)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-00 (4) 00-03 (3-4) 03-06 (2-3)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-03 (4) 03-04 (3-4) 04-06 (3)
80	07-11 (4) 11-18 (4-3) 18-22 (4) 22-00 (3-4) 00-07 (2-3)	07-08 (4-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3) 20-00 (4) 00-05 (3-4) 05-07 (3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2) 20-03 (4) 03-05 (4-3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2) 22-03 (4-3) 03-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (4) 19-20 (2-1) 20-22 (3-2) 22-03 (4-3) 03-05 (3-2)	05-06 (1-0) 06-19 (0) 19-20 (1-0) 20-22 (2) 22-03 (3-2) 03-05 (2-1)

ALASKA

Openings Given In GMT †

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

HAWAII

Openings Given in Hawaiian Standard Time †

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

*Indicates predicted 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2) or higher.

‡To convert to Local Standard Time in Alaska, *subtract* 8 hours from the times appearing in the Chart in the Pacific Standard Time Zone; 9 hours in the Yukon Zone; 10 hours in the Alaskan Standard Time Zone; 11 hours in the Bering Zone. To use GMT in other areas of the United States, *subtract* 5 hours in the EST Zone; 6 hours in the CST Zone; 7 hours in the MST Zone and 8 hours in the PST Zone.

†To use in other areas of the United States, *add* 5 hours to the times appearing in the Chart in the Eastern Standard Time Zone; 4 hours in the CST Zone; 3 hours in the MST Zone and 2 hours in the PST Zone. For example, when it is noon, or 12 hours, in Honolulu, it is 5 P.M. or 17 hours, in N.Y.C.

THE awards PROGRAM

BY ED HOPPER, W2GT

THE March, "Story of The Month" is:

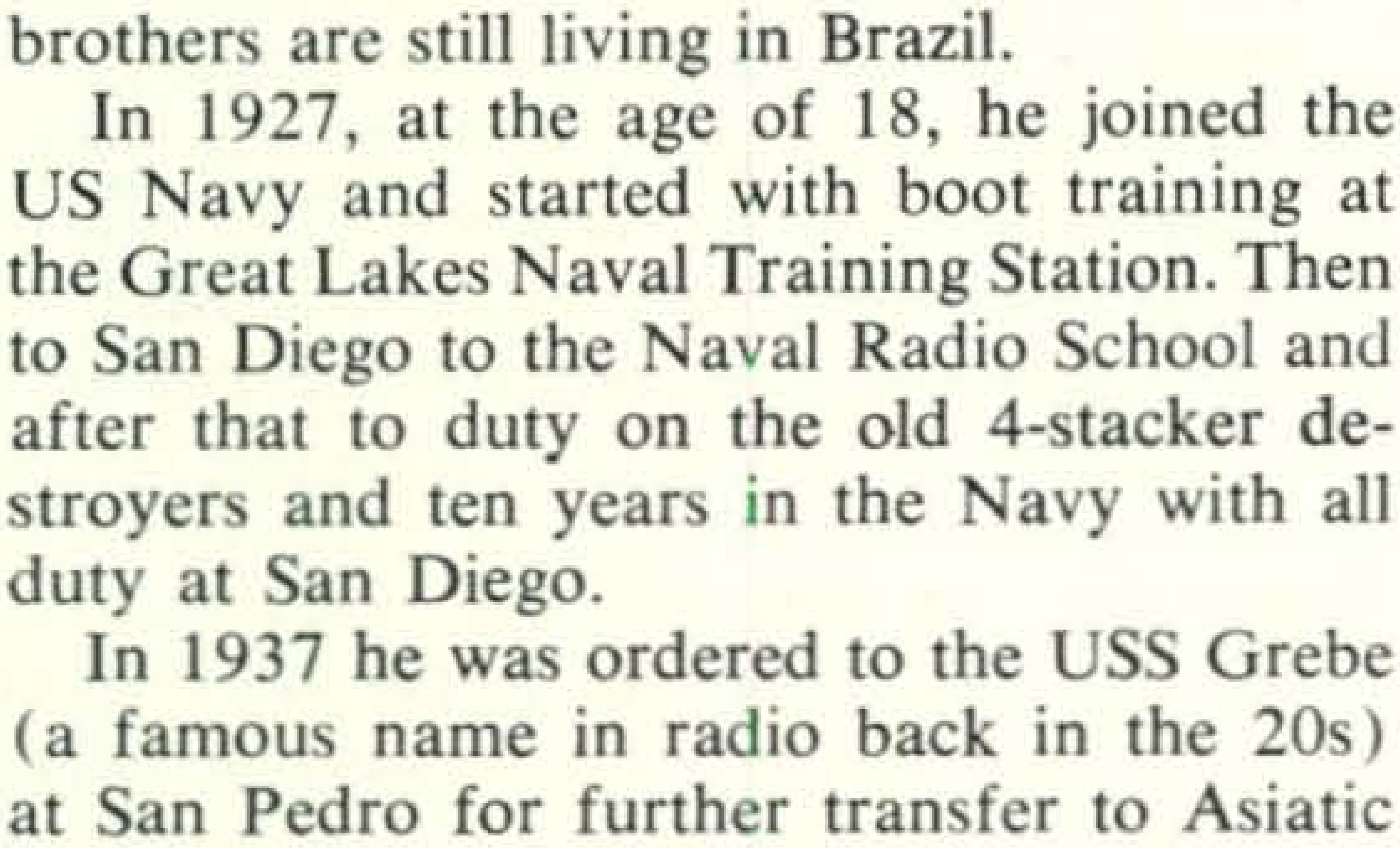
Earl P. Shobe, W7KOI

Earl was born 58 years ago in Richmond, Indiana; raised and schooled in Brazil, Indiana. He was the oldest of 5 sons, his parents and one brother now deceased, other three brothers are still living in Brazil.

In 1927, at the age of 18, he joined the US Navy and started with boot training at the Great Lakes Naval Training Station. Then to San Diego to the Naval Radio School and after that to duty on the old 4-stacker destroyers and ten years in the Navy with all duty at San Diego.

In 1937 he was ordered to the USS Grebe (a famous name in radio back in the 20s) at San Pedro for further transfer to Asiatic duty when a special order discharge was approved by the Navy Department for a position as Junior Radio Operator for the Department of Commerce, Bureau of Air Commerce (as it was known at that time). He was sent to Buffalo Valley Field, 35 miles south of Battle Mountain, Nevada. After one year, Earl was transferred and promoted to

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



EARL, W7KOI catching new counties.

Radio Operator at Elko, Nevada (where still lives), working for the Federal Aviati Agency (as it is now known). In 1964 wi 37¼ years of service (including his Na service), Earl retired and is now employ as an accountant with the Nevada Pow Company, Elko Division.

The family includes wife, Augustin (Augie) and three daughters, Earlene, Ch lene, and Francine. Earlene is married wi one son and lives in Sacramento, Californ Charlene also married with a daughter a a son and lives in Wells, Nevada; and Fra cine unmarried (but with high prospect living at home and working as a secreta in the local bank.

Earl became interested in ham radio ba in 1943 with Marvin Small who also work for FAA, but now in Denver, Colorado, a their licenses came with Marvin getti W7KOA and Earl got W7KOI.

Earl has been one of the more active s tions in the 7th district in COUNTY HUN ING and his record is: USA-CA-500 Awa #355 dated March 12, 1964 now endors Mixed, ALL 21 MC A-3, ALL A3A, A 14 MC. USA-CA-1000 Award #27 da March 12, 1964 and now also with all t same endorsements as the 500. The followi all FIRST for the 7th district: USA-CA-15 Award #47 dated May 7, 1966; USA-C 2000 Award #33 dated February 15, 19 and USA-CA-2500 Award #19 dated Oc ber 6, 1967. At this writing his confirm county score is 2653 with 16 states complet

The present rig includes an NCX-5/NC 2000 with a Heathkit SB-301 spare receiv Antennas are a HyGain tribander on a section crank up tower and a HyGain trapp all band vertical. Other hobbies included fi ing and hunting until troubles started w his eyes, so now haming is the main hob

See page 126 for New Reader Serv

and much fun with the county hunters.

Letters

Ed, K6CAA/KP6AP, writes: "Regarding rare Kalawao county, Hawaii. The trip was a "quickie", I had to go over on business, so I took the company Ford Bronco, d.c.-a.c. inverter, HW-32A, wire dipole and traveled to Kalaupapa Lookout. I put the dipole over the cliff (about a 3000 foot sheer drop), and fired up. I made a total of 24 QSOs in 6½ hours. Finally the gas got low and the band went dead, so I went back to civilization. I was on from 0500Z, 25 August until 1130Z, 25 August.

Then again 0355Z, 26 September until 1630Z, 27 September. On this trip I made 55 QSOs including W2QHH, ZL1HW, W1EQ, K4AUL, PAØGHB, DJ7PW, DL9ST, etc. . . .

Then a third trip 0500Z, 12 October to 1745Z, 12 October. Most QSOs were on 14280 s.s.b. I used both K6CAA/KH6 and KP6AP/KH6.

QSLs have been sent to most everyone and I will be glad to confirm the rare Kalawao county.

I am going again, this time expressly to work county hunters and plan to be there 0500Z, 6 January until 2300Z, 7 January. Then again 0500Z, 10 February until 2300Z, 11 February. I'll be on 14280 again (plus or minus 5 kc), and also on c.w., using 3505, 7005, 14005, 21005, 28005 depending on band conditions. I'll use the band that gets me into the U.S. best but will use all bands. The call will be KP6AP/KH6, Kalawao county, Molokai. Enclosed is a poor photo of the operating QTH.

If anyone would like a sked during the dates mentioned, have them drop me a line—also, any "assistance" would be appreciated to help defray the expenses like air fare. hotel, QSLing, etc.

I'll try to keep you better informed from now on and one of these days I'm going to count up my confirmed counties and send

Certificate Of Commendation

Rare Kalawao County expedition.

you my book." (Write—Ed. DeYoung, K6CAA/KP6AP, 1942-A Iwaho Pl., Honolulu, Hawaii 96819. Naturally by the time you read this, it will be too late, but I wanted you all to know of his letter. It was received too late for publication in time, but I did get writers cramps sending some 35 letters/post cards to different DX Bulletins in U. S. and Europe, and to *many* county hunters—Ed.)

Don, K8BXT writes: "We thought that you and *CQ* magazine would be interested in some of the most recent publicity given the *Worked Trumbull County Award* (WTC). The enclosed newspaper account of the award of 3 WTC certificates at a membership meeting on 19 December. The club is pleased that the local press took a picture of the awards presentation and accurately reproduced the copy that was written describing the WTC award.

Of additional interest in these three particular awards is that two of the recipients, WA8ABE and WA8KIG are the co-editors of the club newspaper *Q-MATCH*, and the other recipient, W8HCL, is a charter member of the club, a QCWA member and Vice-president of the organization.

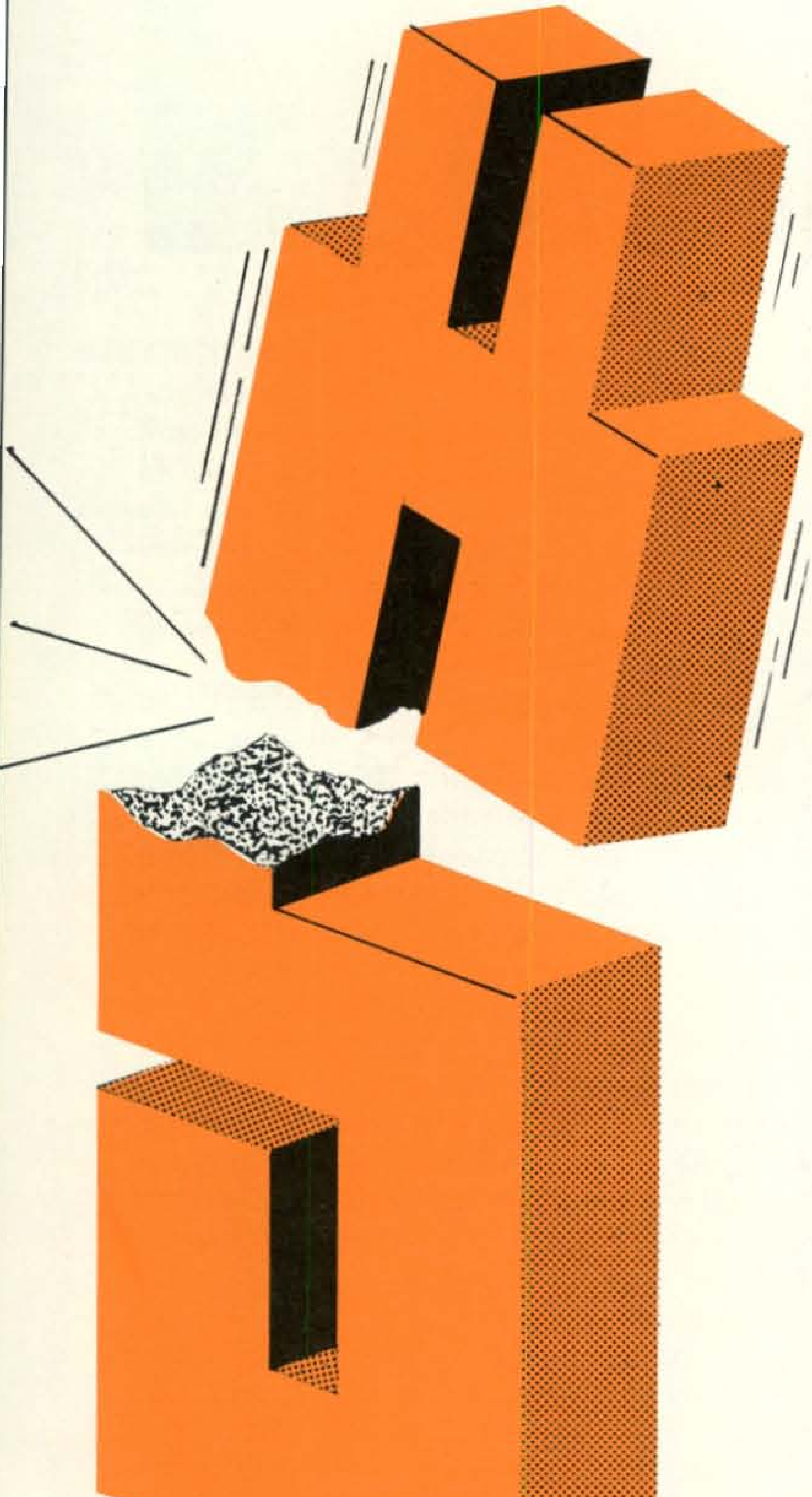
Your cooperation in the pages of *CQ* magazine in the past has been sincerely appreciated by our club. The Warren Amateur Radio Association, Inc., is proud to participate in the awards program sponsoring and offering the WTC award". (For more details, write D. K. Lovett, K8BXT, Box 809, Warren, Ohio 44482.)

Awards

Certificate of Commendation: Is issued by the Amateur Radio Traffic Communications Society for direct and indirect efforts on behalf of organized amateur radio for any of the 22 following reasons:

[*Continued on page 98*]

TIMBER!!



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See page 126 for New Reader Service

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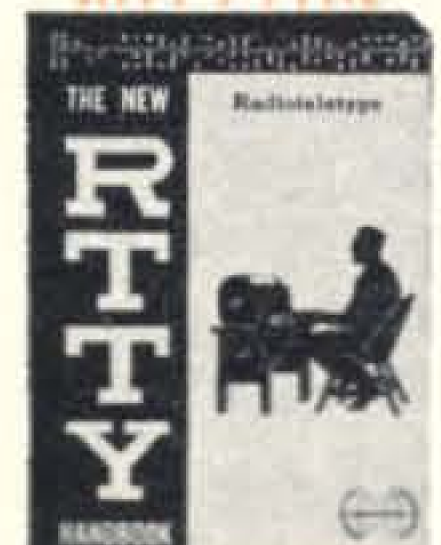
Cat. #119-2. Here's your chance to get a copy of one of the most comphensive books on antennas ever offered to the Amateur. Ten big theory articles backed up by 82 detailed and illustrated construction projects for VHF on into microwave, from long-wires to 17 element beams and Sterba Curtain arrays.



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

CQ ANTHOLOGY I

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

SURPLUS SCHEMATICS

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

VHF FOR THE RADIO AMATEUR

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

ANTENNA ROUNDUP Vol. I

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

SIDEBAND HANDBOOK

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

SURPLUS CONVERSION HANDBOOK

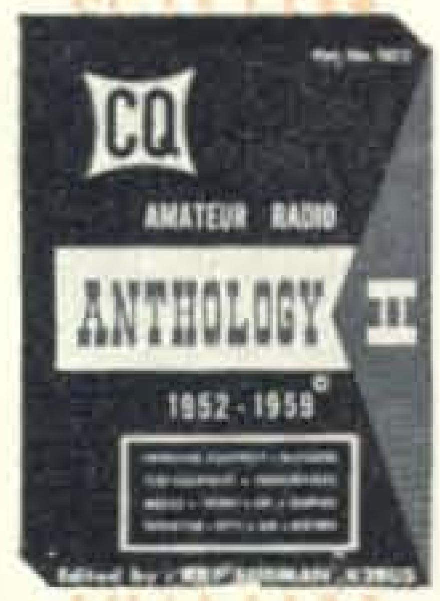
Cat. #122. Contains 192 pages of conversion articles including the famous Command Set's plus a whole slew of the most popular military surplus gear including such gems as: SCR-522, ART-13, BC603, BC659, ARC 1, ARC 3, etc. Actually, it covers almost every piece of surplus gear worth the effort to convert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

ELECTRONIC CIRCUITS HANDBOOK

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

SHOP & SHACK SHORTCUTS

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



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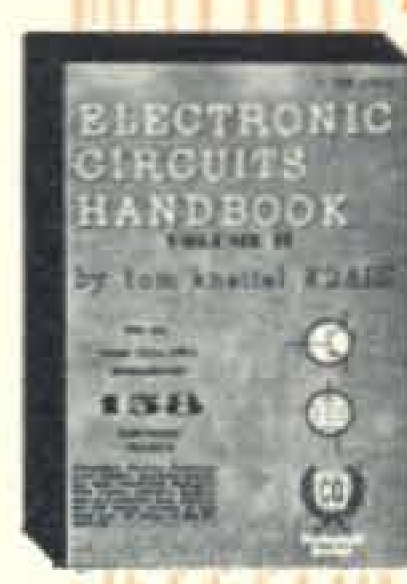

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105	New Mobile Handbook	2.95		119-2	Antenna Roundup vol. 2	4.00	
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USA-CA [*from page 95*]

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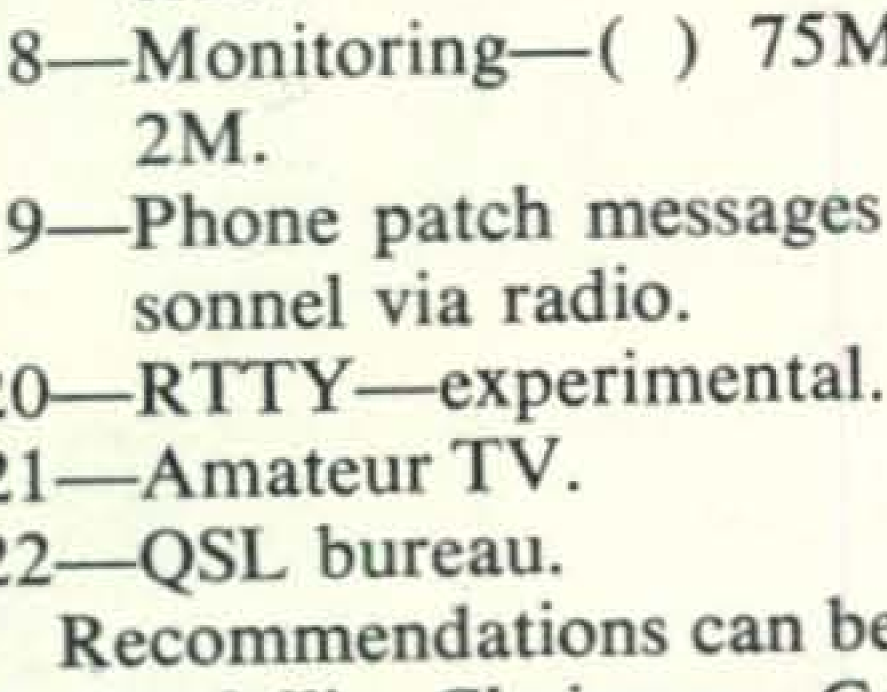
Recommendations can be made to William F. Wydallis, Chairman, Coordinating Committee, 120 West Colfax Ave., South Bend, Indiana 46601.

Golden Screwdriver Award: Issued by the Golden Screwdriver Club of Portsmouth, Virginia to increase interest and activity on 6 Meters in the Tidewater area. Requirements —Local: Must work 10 members and one must be a Charter Member (Local area considered, North to Yorktown; West to Suffolk; South to Virginia/North Carolina line; East to the coast). DX: Must work 3 members, and one must be a Charter Member. Outside USA: Must work 1 member—associate or Charter Member. A QSL must be sent to all members contacted; all contacts must be point to point, no relays. Send log information and certificate number/numbers of contact with 25¢ to Ray Black, WB4FRB, 3905 Clifford St., Portsmouth, Virginia 23707. Charter Members are: #1—WB4FRB; #2—WB4DWR; #3—WA4TJI; #4—WA4ZYP; #5—WB4GMM; #6—WA4WJR; #7—K4CPQ; #8—WA4YOB; #9—K4WLY and #10—WA4DOF.



Golden Screwdriver Award

Area Merit Award

The Amateur Radio Editors Assn. Merit Award: Issued by the Amateur Radio Editors Association free for working AREA members. A $1.00 donation to AREA for operations, is acceptable. Awards are: AREA MERIT: Work 10 members. AREA-WAS: Work AREA members in 10 U.S. states. AREA-WAC: Work AREA members in 6 Continents. AREA-DX: Work AREA members in 5 different countries. AREA-WAPP: Work all past presidents of AREA-W9BAH; W8AEU; W3KPJ; W3ZXV; WA6VTL and W6ECS. Send GCR list to Awards Custodian, Harry Tummonds, W8BAH, 207[illegible] West 85th St., Cleveland, Ohio 44102. This award is recommended by the Amateur Radio Achievement Club.

Notes

Many thanks to Doug, W1KVA for his kind offer of 3 copies of POD 26, one of which has gone to 4U1ITU. All such offers are most welcome and kindly accepted.

Many thanks for all the FB and thoughtful cards, nice notes and letters.

Also many thanks to Geoff Watts for publishing all the fine data on county hunting QSO Parties, and other nice information which is of interest to our county hunters as well as the DXers. Geoff publishes a weekly DX News-Sheet and for information on it and his Islands-On-The-Air Award, write Geoff Watts, 62 Belmore Road, Norwich NOR.72.T, England. Oh yes, please remember to write and tell me—How was your month? 73, Ed., W2GT.

See page 126 for New Reader Service

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Jan. 1 - Dec. 31		I O T A Contest
March	2-3	ARRL DX Phone Contest
March	2-4	B.A.R.T.G. Spring RTTY
March	9-10	YL-OM C.W. Contest
March	9-10	RSGB BERU Contest
March	16-17	ARRL DX C.W. Contest
March	30-31	Florida QSO Party
April	1-30	IARC CPR Competition
April	**6-7**	**CQ WW WPX SSB Contest**
April	6-7	SP DX C.W. Contest
April	20-21	Helvetia 22 Contest
April	27-28	PACC CW/Phone Contest
April	27-28	One Land QSO Party
May	4-5	USSR Dx Contest
May	11-12	OZ CCA Contest
May	18-19	YL Int. SSBers Contest

Islands-on-the-Air Contest

Started: 0000 GMT January 1
Ends: 2400 GMT December 31

Awards are also available for working island groups in the continental areas of the world. A Silver Trophy goes to the top scoring station and swl at the end of the year.

The IOTA Directory lists all the islands and requirements for the different awards. Send 4 IRCs (6 for air mail) to: Geoff Watts, DX News Sheet, 62 Belmore Road, Norwich, NOR 72T, England.

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

Starts: 0200 GMT Saturday, March 2
Ends: 0200 GMT Monday, March 4

Same rules as last year which can be found in the March 1967 CALENDAR.

Logs go to: Alan Walmsley, G2HIO, BARTG Sec., The Firs, 3 Trinity Close, Ashby-de-la-Zouch, Leicestershire, England.

ARRL DX Contest

Phone: March 2-3 **C.W.:** March 16-17
Starts: 0001 GMT Saturday,
Ends: 2400 GMT Sunday
in each instance.

This is the last half of the marathon that had similar week-ends last month. Your logs go to: 225 Main Street, Newington, Conn. 06111. Or mail them to us, we will forward them for you.

YL-OM C.W. Contest

Starts: 1800 GMT Saturday, March 9
Ends: 1800 GMT Sunday, March 10

The YLs had their phone contest last month. They will have a little more operating room for the c.w. week-end. See page 9 of the January issue for the details.

Mailing deadline is March 21st and logs go to: Claire E. Bardon, W4TVT, 2238 Morgan Lane, Dunn Loring, Virginia 22027

RSGB BERU Contest

Starts: 0001 GMT Saturday, March 9
Ends: 2359 GMT Sunday, March 10

This announcement is for the benefit of our VE neighbors and VP friends down Caribbean way. Its the annual contest open to RSGB members residing in countries of the British Commonwealth around the world.

Your logs go to: R.S.G.B. BERU Contest, 28 Little Russell Street, London, WC1, England.

Florida QSO Party

Three time periods:
1500-2000 GMT Saturday, March 30
0000-0500 GMT Sunday, March 31
1400-2400 GMT Sunday, March 31

This is the 4th annual party organized by the *Florida Skip* magazine.

The same station may be worked on each band for QSO points. Phone and c.w. are separate contests. This year provisions have been made for multi-operator Fla. stations to activate some of the rare counties.

Exchange: QSO nr., RS/RST and QTH; county for Fla. stations; state, VE province or country for others.

Scoring: Fla. stations, 1 point per QSO multiplied by the number of states, provinces and countries worked. (Other Fla. stations may be worked but for QSO points only, or for WAFC award and as a state.)

Other stations: 1 point per QSO multiplied

* 14 Sherwood Road, Stamford, Conn. 06905.

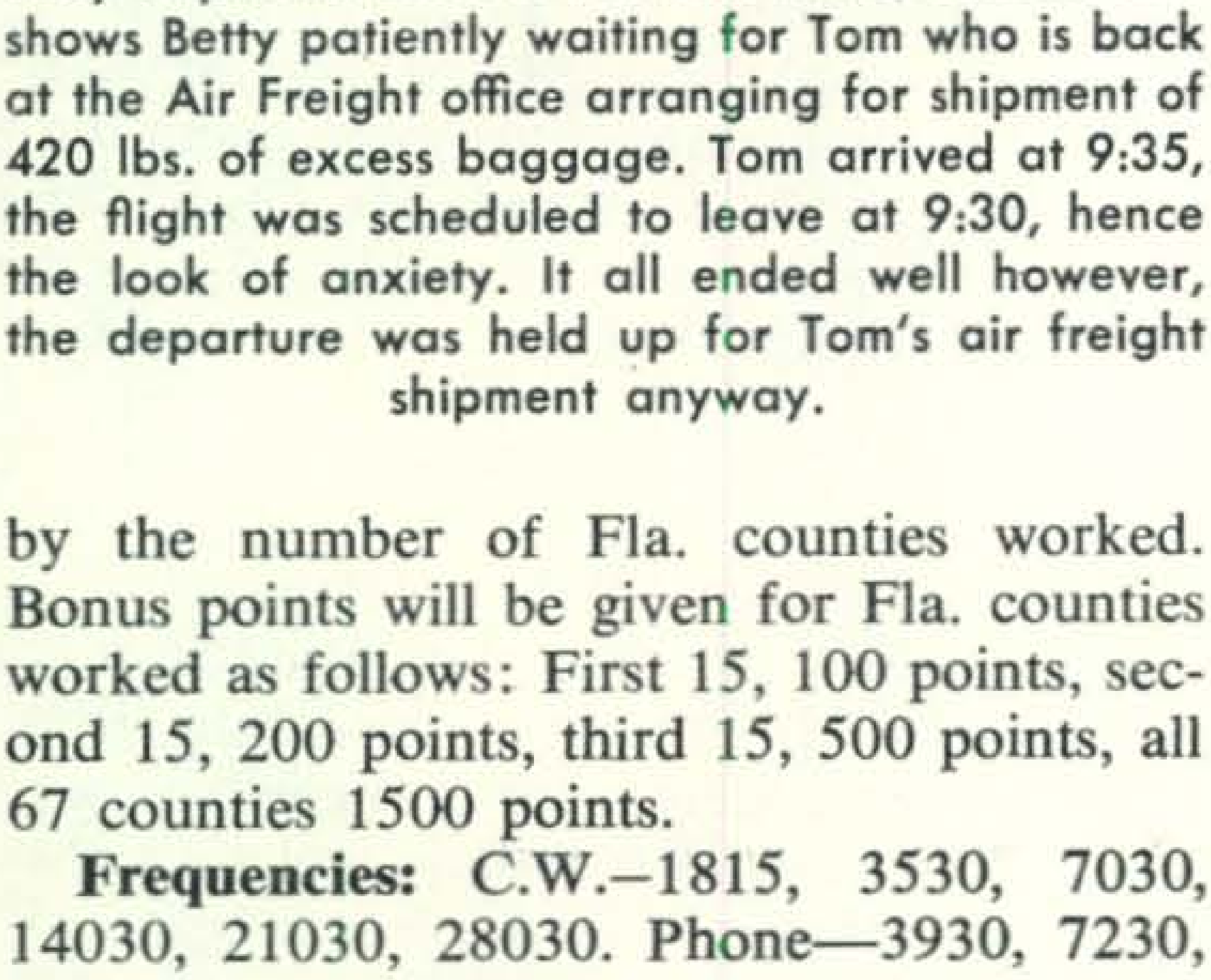
See page 126 for New Reader Service

Tom Christian, VR6TC and his lovely wife Betty spent considerable time in the U.S.A. last fall. They departed back to Pitcairn in November. This shows Betty patiently waiting for Tom who is back at the Air Freight office arranging for shipment of 420 lbs. of excess baggage. Tom arrived at 9:35, the flight was scheduled to leave at 9:30, hence the look of anxiety. It all ended well however, the departure was held up for Tom's air freight shipment anyway.

by the number of Fla. counties worked. Bonus points will be given for Fla. counties worked as follows: First 15, 100 points, second 15, 200 points, third 15, 500 points, all 67 counties 1500 points.

Frequencies: C.W.–1815, 3530, 7030, 14030, 21030, 28030. Phone—3930, 7230, 14230, 21330, 28820.

Awards: Certificates to the highest scoring station in each state, VE province and foreign country. (5 or more contacts) And in each



This is the type of award you will receive if you are a winner in the Bermuda Contest which took place last month. Here is Roger Erskine, VE1PL receiving his award from Mr. W. J. Williams at the annual dinner of the Radio Society of Bermuda held in October. (Roger is from Nova Scotia, the dinner was held in Bermuda. Get the picture?)

Fla. county to both single and mult-operator stations. The leaders in each category will receive a Trophy.

Logs go to: *Florida Skip*, P.O. Box 501, Miami Springs, Fla. 33166. Deadline is April 30th, include a 5¢ stamp for the results issue.

SP DX·C.W. Contest

Starts: 1500 GMT Saturday, April 6
Ends: 2400 GMT Sunday, April 7

Its the world working the SPs in this one. Since its a c.w. *only* contest the unfortunate conflict with the dates of our WPX Phone contest is not too serious.

Besides awards for contest operation, contacts may also be used for other Polish awards. These awards are also available to s.w.l.s.

1. Use all bands, 3.5 thru 28 mc.
2. Exchange numbers will consist of the usual six figures, RST report plus a progressive contact number starting with 001.
3. Each QSO counts 3 points and the same station may be worked once on each band for QSO and multiplier credit.
4. Your multiplier is determined by the number of SP call areas worked on each band, SP1-SPØ, a possible maximum of 50.
5. The final score is the total QSO points multiplied by the sum of the call areas worked from all bands.
6. There are two classifications: Single operator and multi-operator, but only single transmitter operation is permitted. (There is also a s.w.l. section.)
7. Awards will be made to the top station in each classification in each country.
8. Use a separate log sheet for each band and indicate the multiplier only the first time it is worked. Also include a summary sheet with the scoring and your name and address in BLOCK LETTERS. Duplicate contacts in excess of 3% of the total made will mean disqualification.

Your logs go to: PZK Contest Committee, P.O. Box 320, Warszawa 1, Poland.

Helvetia 22 Contest

Starts: 1500 GMT Saturday, April 20
Ends: 1700 GMT Sunday, April 21

The HB boys usually activate some of the rare Cantons for this contest so this offers a good opportunity to fill in some of those missing Cantons for your H 22 Certificate.

Rules are the same as in previous years and will be covered next month.

See page 126 for New Reader Service

CLAIMED SCORES
CQ W W C.W. DX Contest—1967

Single Operator U.S.A. All Band

K1DIR	1,087,674
W1BPW	1,067,136
W2JVU	308,632
W3HHK	343,720
W3NOH	342,516
W4YHD	914,048
W5JAW	490,500
W5BRR	334,452
W6ITA	627,588
WA6QGW	546,930
W6IBD	539,273
W6HJT	516,545
W7GBW	230,830
W7AYY	169,488
W9LKJ	652,526
WØVXO	494,816

28 mc

K1LWI	112,320
W2RDD	42,075
K4HFX	89,100
W4NBV	64,077
W5DWT	66,552
WA5CBE	65,000
W6TZD	47,970
W8WZ	92,768
W9DUB	71,672

21 mc

W2MEL	190,334
WB2MZJ/3	71,760
W4MMD	37,843
W6ITY	78,443
WB6NWW	74,970
W7RQN	73,289
W7PHO	60,235
WN8ZCC	2,800
W9ZTD	96,305
WAØCVS	93,700

14 mc

K1NOL	200,062
W2IRV	29,670
W3AFM	90,945
W4SNU	106,149
W4PLL	74,018
K5BXG	62,348
WB6PNB	67,300
K7ADL	91,478
K9ECO	200,100

7. mc

W2SEI	28,674
K3CYA	46,410
W4BYB	74,304
W5LXG	9,850
W6NKR	17,499
W7JLU	6,903

3.5 mc

K2RBT	20,178
W6GEN	6,724
K6BPR	6,336

1.8 mc

W1BB/1	418
W2EQS	176

No. America All Band

KL7FRY	538,892
KV4AM	339,522
VE7EH	290,121
VE7SV	228,636
XE1WS	209,500
VE2WA	195,720
KZ5QA	103,320

28 mc

VE1TG	139,026

21 mc

VP9BY	60,476

14 mc

KZ5TW	343,850
VE3BHS	105,560

OVERSEAS All Band

ZD8J	1,616,673
5H3KJ	1,071,888
9J2MX	838,508
KA7AB	941,227
JA1CWZ	562,010
ON4XG	331,430
G3HDA	878,257
DL4EG	420,858
DL6WD	292,411
WØGTA/LA	427,720
YU1EXY	354,545
KX6DB	923,841
DU1FH	302,434
CE3ZK	271,254
YV5BOA	278,856

28 mc

JA2WB	72,759
JA1EM	33,356
LZ1CW	53,300
G2BOZ	81,288
OH2BAC	27,056
DL7BA	220,104
VK9GN	149,110
OA4PF	194,732
PY2SO	532,956

21 mc

ZD8HAL	83,216
JH1EYB	107,966
JA2FUA	58,692
G3HCT	235,209
OH6VP	64,700
DJ9TQ	79,480
DL4RW	72,504
SM3CNN	131,675
SM5BUT	63,020
HB9DX	45,666
ZL1IL	95,500
PY1BCA	111,972
YV5BKA	76,650

14 mc

TA2BK	75,969
JA6AD	163,170
JA1NLX	31,080
DU1CF	80,256
PY4OD	596,496
YV5AGD	474,978

7. mc

4X4RD	153,716
JA1LWI	33,366
JA1PPW	17,343
OZ7YH	20,350
G3ESF	67,340
DJ5PA	75,897
OH5UQ	28,980
VK3OP	19,044
HK3ASJ	18,798

3.5 mc

JA3IVW	855
OK3BU	32,155
OH1SH	26,291
SMØGM	9,405

1.8 mc

JA3AA	216
OLØAFQ	585
OF6UW	144
DJ9LJ	1,140
HB9QA	1,425

Multi-Operator Single Transmitter

TGØAA	1,948,360
DJ7IK	1,847,850
W3WJD	1,589,847
W3BGN	1,280,400
W2PCJ	1,054,651
DL8KJ	1,000,593
HB9I	921,196
TY2KG	721,994
KA9MF	471,968

Multi-Operator Multi Transmitter

PJ3CC	5,535,285
W4BVV	3,714,048
W4KXV	2,605,590
W4ETO	2,239,380
W6RW	1,804,168
SM5BPJ	1,795,752
ET3FMA	1,387,680
W3VKD	1,355,035
W7SFA	1,256,520

PACC CW/Phone Contest

Starts: 1200 GMT Saturday, April 27
Ends: 1800 GMT Sunday, April 28

Rules for this one are also the same as in previous years and will be given in details next month. (See March '67 issue.)

One Land QSO Party

Starts: 0000 GMT Saturday, April 27
Ends: 2400 GMT Sunday, April 28

A good opportunity to work some of those hard to get New England counties for your USA-CA certificate. Rules practically the same as they were last year and will be covered next month. (See March '67 issue.)

CQ World Wide WPX SSB Contest

Complete rules will be found on page 65 of this issue. Also a brief rundown in last month's CALENDAR.

You will note that the same pattern is used that is now well established in our World Wide contest rules.

Under special awards you will note that

The trophy that will be donated by Gene Krehbiel, VE6TP for the 1968 World Wide WPX SSB Contest. It will go to the Top Single Band score by a Canadian. (A similar Trophy was presented to VE6ABR for the 1967 contest by Audiocom Electronics)

six trophies have already been donated. These Trophies will be designed and distributed by the donors and should be very interesting. We now include two additional awards for the Multi-operator divisions.

And on the topic of Multi-operator, Single Transmitter operation. This division was originally created to permit the continuous operation of a home station by two or more operators, so that they would not have to compete with some of the more elaborate installations. Basically it is one in which only one operating position is active.

A set-up where two or three operating positions are active on different bands but actually only go on the air one at a time, can hardly be classified as a single transmitter.

If you have such a lay-out you should use your talents and ingenuity to get the most out of your equipment and enter the Multi Transmitter category, now that this classification has been made available.

At a Multi Transmitter station, all bands may be activated simultaneously but not more than one signal per band is permitted.

All the operating positions must be located in the same building or immediate area.

Editor's Notes

After much deliberation and discussion, the Contest Committee has decided to retain the dates of our WW Contest in the Fall. With one small change, moving the Phone section to one week later. So now and forever more the dates will be on the *last full week-ends* of October (phone) and November (c.w.) Therefore in 1968 it will be October 26/27 Phone and November 23/24 c.w.

We have received many letters of dismay from fellows complaining that they did not see their score listed in the January issue. "I spent many hours operating in the contest in October and am very disappointed in not seeing my score listed," they say. Now come on fellows, hope you didn't expect to see the results published two months after the contest The October affair is *not* the SSB Contest, zone and countries are the multipliers, not prefixes. You will have to wait until June for the October results.

In the SSB Contest results, K6SEN/6 the top multi station for the USA, the operators were K6SEN, K6EVR, W6UED, W6VPH and WB6NRO. These were not listed at the time.

The list of claimed scores are only a few of the earlier scores received. They are listed by USA districts and by continents to give you an idea of what the competition looked like. Good luck.

73 for now, Frank, W1WY

"Do you spend much of your salary on your ham radio hobby?"

See page 126 for New Reader Servic

Q AND A

BY WILFRED M. SCHERER,* W2AEF

100 to 1000 Watts—10 db Gain?

This month's introductory remarks will deal with some aspects of r.f. power levels.

Many amateurs are under the misapprehension that the addition of "1 kw" linear amplifier to a "100 watt" exciter will produce the theoretical signal gain of 10 db. Strange as it appears, such a belief may or may not be true. It all depends on whether or not you are considering input or output power for *both* the exciter and the amplifier and if both ratings are for steady state (d.c.) or p.e.p. The latter generally is 10-20 percent higher than the d.c. value.

The misunderstanding that often arises is due to the terminology used for describing each piece of gear. The so-called "100 watt" exciter usually is one that produces 100 watts p.e.p. *output*, while the popular conception of a "1 kw linear is one with a 1000 watt p.e.p. *input*. Since in one case the power rating is for *output* and in the other it is for *input*, the power ratios are not comparable and thus the expected signal increase is not attainable.

Assuming an overall efficiency of 63% for a linear with 1 kw input, the output will be 630 watts, resulting in an 8 db power gain over the 100-watt output exciter. The same linear would have to operate with 1600 watts input to obtain 1000 watts output for a 10 db gain. With the same efficiency an amplifier with 2000 watts input will produce an output of 1260 watts for a gain of 11 db.

From this may be seen that by doubling the power of the linear amplifier, the additional increase is 3 db or only one-half an S-unit. While this small gain in signal level may not appear significantly worthwhile in view of the extra cost involved, an advantage is that the higher-power capabilities of the larger amplifier enable it to be operated near the equivalent power of the 1 kw input job without a significant loss in signal level, but with less effort on its part and that of the exciter. The equipment then coasts along with less wear and tear and, all else being equal, a cleaner signal can be obtained than with the lower-power unit driven to its maximum capabilities. Besides this, you still have some reserve left to help under extremely adverse conditions.

* Technical Director, *CQ*.

W2EEY Product Detector with HQ-129X

QUESTION: I'd like to convert a Hammarlund HQ-129X for s.s.b. and c.w. using the W2EEY product detector shown in July '67 *CQ*. The output of the 3rd i.f. on the receiver is rather complicated as it is tied in with a noise-limiter diode and a detector. How

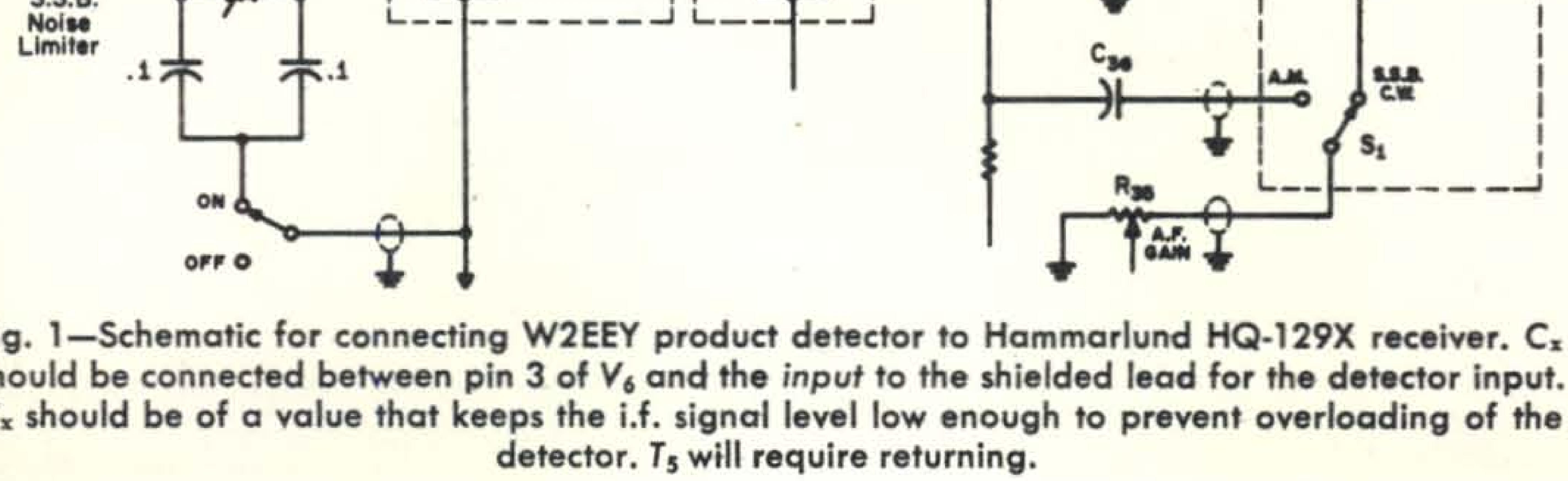


Fig. 1—Schematic for connecting W2EEY product detector to Hammarlund HQ-129X receiver. C_x should be connected between pin 3 of V_6 and the *input* to the shielded lead for the detector input. C_x should be of a value that keeps the i.f. signal level low enough to prevent overloading of the detector. T_5 will require returning.

should the job be done? I'd like to have the product detector as an outboard unit so that the set can be returned to an unmodified condition. The price of $13 for the 3N89 used in the circuit is pretty steep. Is there a lower-priced substitute?

ANSWER: The method for connecting the W2EEY product detector to the HQ-129X is shown at fig. 1. This will eliminate the noise limiter for s.s.b. and c.w., but this type is not satisfactory for these modes anyway. A simple i.f. noise limiter for the purpose may be installed as also shown.

The product detector with its crystal-controlled b.f.o. and S_1 may be built as an outboard unit with shielded leads from the set used as indicated.

With regard to the 3N89 FET, there is no identical substitute, but you might try another dual-gate type such as the RCA 3N140, 341 or 342. They cost around $2.00.

Obtaining Transistors

QUESTION: Where can I obtain the 2N3642 and 2N3643 transistors as needed for the Micro-TO keyer described in August *QST?*

ANSWER: Suggest you write to the author of the article or to Transistors Unlimited, 462 Jericho Turnpike, Mineola, N.Y. 11501.

Requests for transistor information, such as the preceding ones, are not uncommon. We therefore take this opportunity to recommend that authors of articles describing equipment using solid-state devices, whether they are to appear in *CQ* or some other publication, do one of the following:

1—Use easily available units.

2—Name a source of supply.

3—Indicate one or more available types for substitution.

4—Provide specification for each type used. The term "or equivalent" is meaningless, unless the specifications are given (at least as far as the present state of cataloging is concerned). Although this provision may be helpful, it might not be fully satisfactory, inasmuch as specifications usually are not available or on hand for the amateur in respect to the "myriads" of devices produced by the many manufacturers.

Where difficulty is experienced in the procurement or in determining types for substitution, a line to Eli Furst, at Transistors Unlimited (address above) may pay off. Eli has a good line of stock *on hand* and a well cataloged collection of specifications and cross references.

Heath Monitorscope with Drake TR-3

QUESTION: I have a Drake TR-3 Transceiver and Heath Monitorscope Model HO-10 which I would like to use to monitor received signals. I understand that I will have to use a converter due to the difference in i.f.

Is there a suitable converter on the market? If not, can you give directions for building one and for connection to the TR-3?

ANSWER: The vertical amplifier in the HO-10 Monitorscope is a resistance-coupled job designed for operation at frequencies below 500 kc. Since the TR-3 has a last i.f. of 9 mc, a converter would be necessary to obtain a

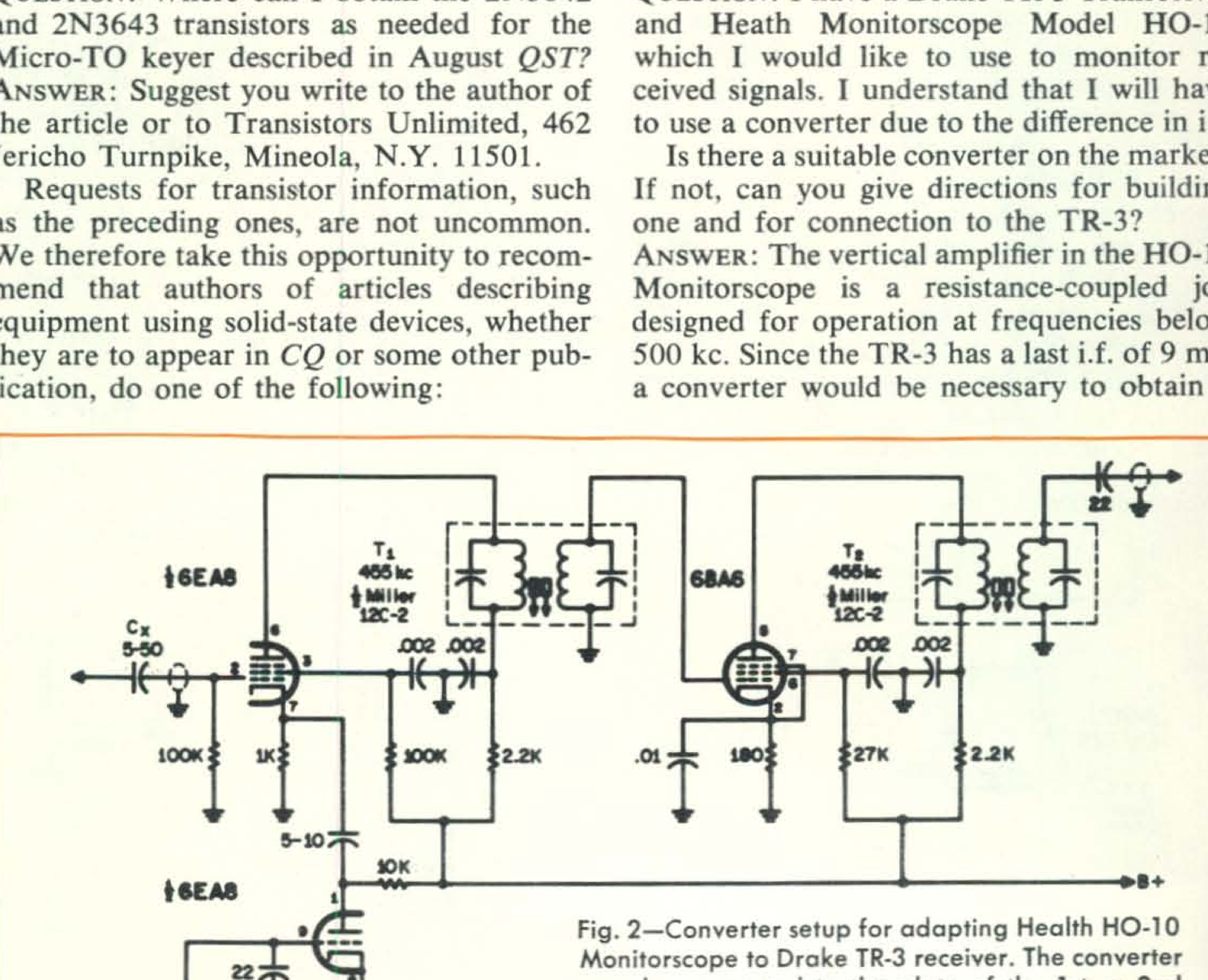


Fig. 2—Converter setup for adapting Health HO-10 Monitorscope to Drake TR-3 receiver. The converter may be connected to the plate of the 1st or 2nd 9 mc i.f. in the receiver. In order to prevent converter overload, C_x should be kept as small as possible consistent with obtaining sufficient 455 kc output for the HO-10.

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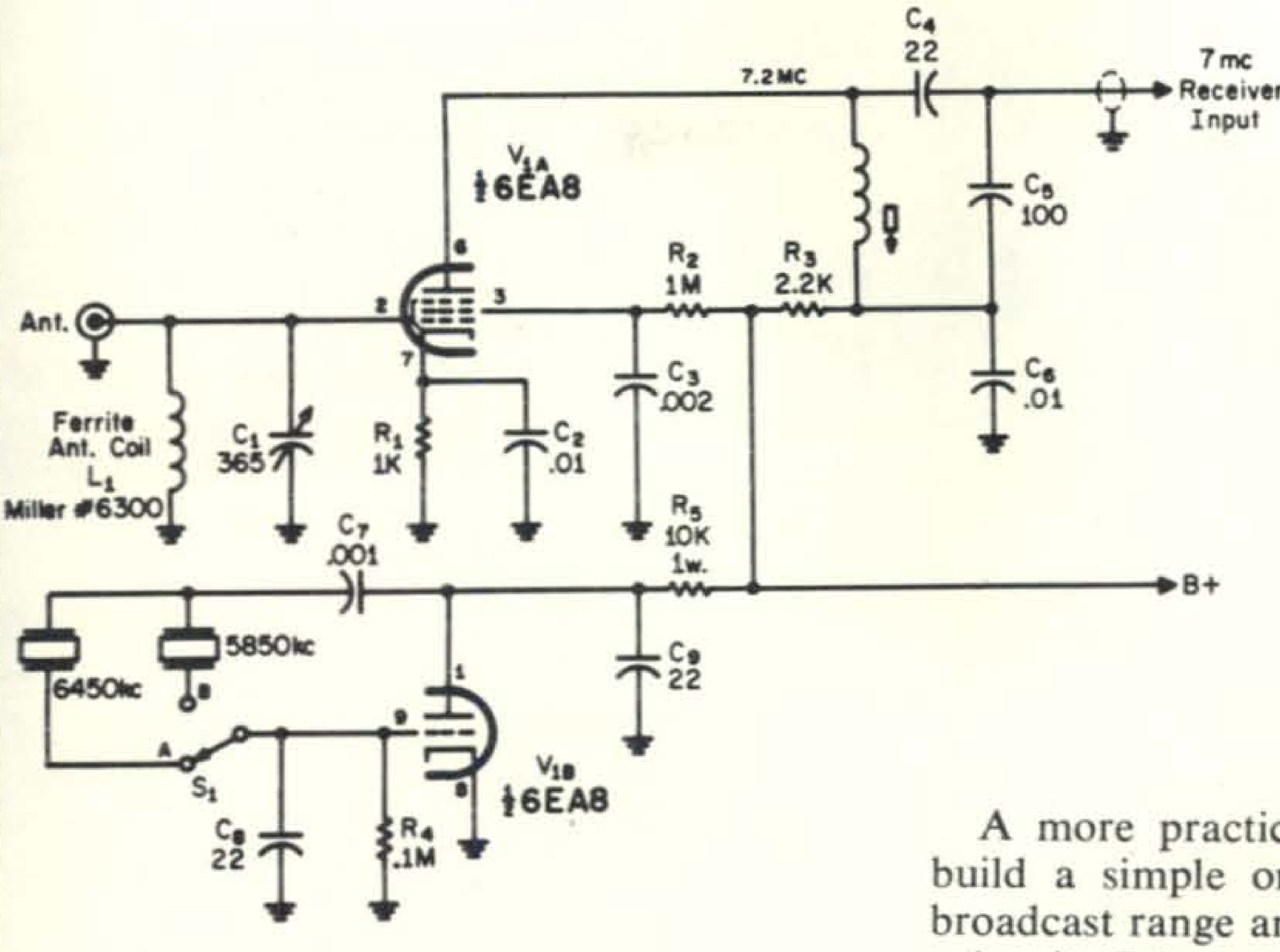

Fig. 3—Circuitry for one-tube standard a.m. broadcast band converter to use with 7 mc band of Lafayette HA-350. Place S_1 at *A* for 550-1150 kc, at *B* for 1150-1750 kc. Coupling between oscillator V_{1B} and mixer V_{A1} is through stray tube capacitance.

lower i.f. for the HO-10, unless the 'scope's vertical amplifier is modified with 9 mc tuned circuits. Because the latter approach requires digging into the unit and thus excludes its use for other intended applications, the employment of a converter may be preferable. Suggested circuitry is shown at fig. 2. Care must be taken to avoid overloading the converter by applying as low a signal level as possible to it, consistent with obtaining a display on the scope.

HA-350 on Broadcast Band

QUESTION: I own a Lafayette HA-350 receiver which has a crystal-controlled front-end. I desire to convert one band to the standard a.m. broadcast band. Is there a crystal available that will cover the required range of 550-1600 kc?

ANSWER: This cannot be done without also changing the r.f. amplifier and mixer coils as well as the variable-tuning capacitors for the preselector.

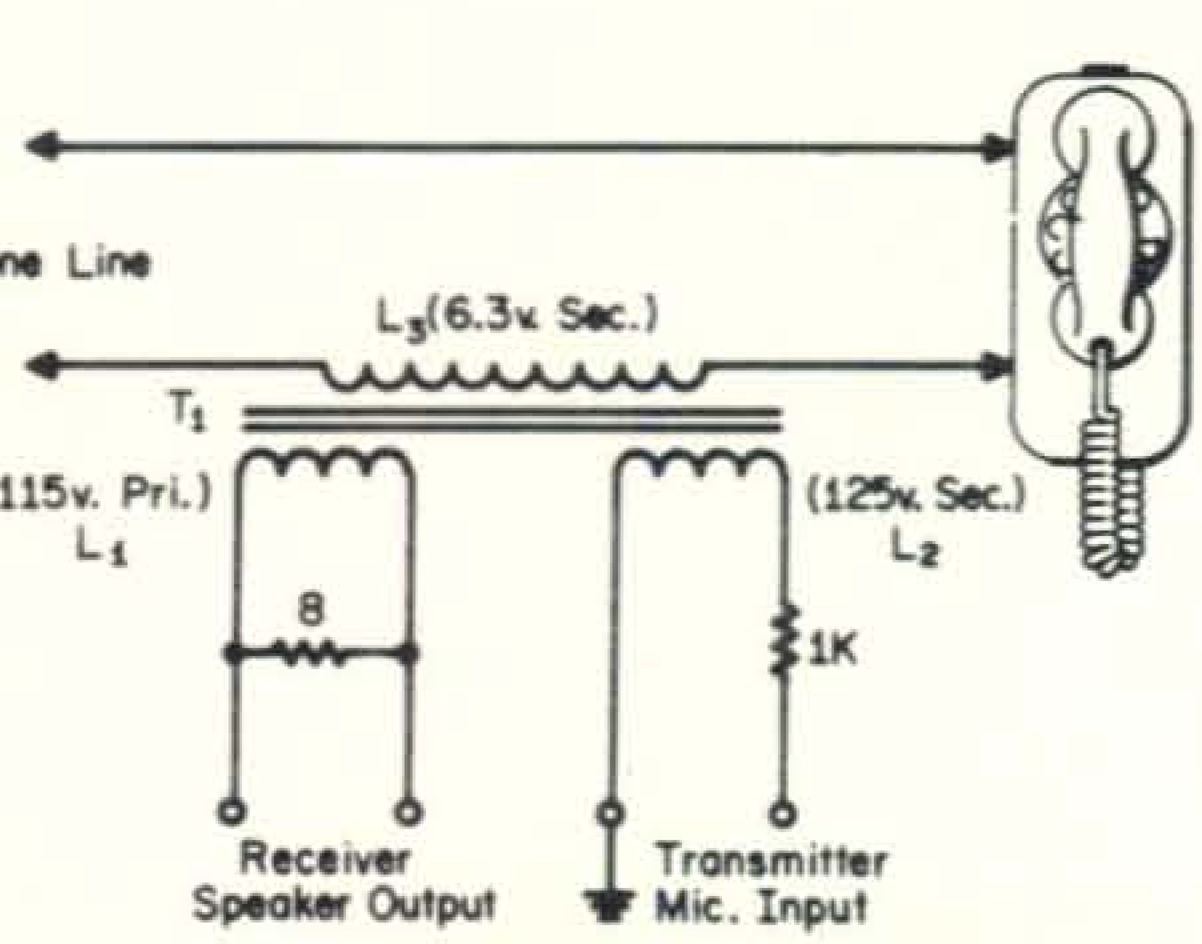

Fig. 4—Simple phone patch. T_1 is a small power transformer with a 115 v.a.c. primary and with 125 and 6.3 v. secondary windings.

A more practical approach would be to build a simple one-tube converter for the broadcast range and feed this to the HA-350 using its 7.0 m.c. band. Suggested circuitry is shown at fig. 3.

Simple Phone Patch

Here is a simple phone patch as submitted by one of our young readers, Fred J. Looft, WA8RZD, 5095 W. 227 St., Cleveland, Ohio 44126. Fred, who is 16, says, "For those hams who wish to have an inexpensive phone patch, perhaps I can help. I don't use a phone patch enough to go out and buy one, therefore I have made my own and have had very good results with it. For the price and effort put into it, it works fairly well."

Fred's scheme is shown at fig. 4. T_1 is a miniature size power transformer, such as Allied Radio part no. 54-B-1410 or of a type used in small instruments. It has a 115-volt primary (L_1) and two secondary windings of 125 v. (L_2) and 6.3 v. (L_3). L_1 has a fairly high impedance at a.f. and therefore is shunted with R_1 to sufficiently load the receiver output transformer. R_2 may have to be altered to prevent overloading of the transmitter mic-input amplifier.

Operating levels are adjusted by the receiver a.f. and the transmitter mic gain controls. Manual switching between transmit and receive must be conducted to avoid a.f. feedback.

Thanks, Fred. It looks like a useful lashup, especially in a pinch.

Correction

On page 96, last paragraph—Electrolytic capacitor size should be 100 mf.

At fig. 1 in last month's *Q & A* Column, 2000 c.p.s. should have been indicated as the frequency for the 2nd a.f. oscillator. ■

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SURPLUS sidelights

BY GORDON ELIOT WHITE*

WELL, your peripatetic SURPLUS EDITOR took one more trip this winter on the trail of surplus goodies. I tore myself away from the cozy north weather to spend four days in Florida, mostly in the Miami area. I can report that the weather was wonderful and the surplus fairly thick, in fact for its size, Miami is the best surplus city I have seen south of Washington, D.C.

Miami is of course the last U.S. outpost before Latin America. Being only 90 miles from Cuba, it is home base for dozens of military, quasi-military, scientific, governmental, private and secret enterprises that operate there and in Central and South America. Miami International Airport is a greater spy haven than West Berlin, and I have been there too! Somehow all this activity has some relation to the surplus business. Gun-running seems to include a lot of communications gear these days.

Not that the surplus dealers I found in Florida are gun runners. They do engage in completely legitimate sales to foreign users of U.S. military aid, with amateur sales generally a side operation.

The largest surplus source I found in Florida was Sam McIntosh's Microwave Equipment Corp., 4121 NW 27th Street, Miami. This is a block-big warehouse, full of everything from 1934 command transmitters to the latest X-Band radar equipment. Despite the name, Microwave is not primarily a u.h.f. dealer, in fact he has some teleprinters that operate on the familiar d.c. loops, and all sorts of other goodies. I found a Command Set unit I had not known existed, and as many readers of my Command Set historical articles in *CQ* have noticed, not much in the Command Set line has escaped me.

Microwave Equipment is located within a block of the freeway that goes from International Airport to downtown Miami, and it can be reached directly off the main airport road. Florida amateurs should try to avoid making the full tour around the airport as I did, looking for the place.

Sam is some sort of a surplus nut, even by my standards. Seems he bought a 10,000 ton freighter, the SS Amarylis a couple of years ago after it was driven onto the beach above Palm Beach in a Hurricane. He was going to salvage it of course, and make half a million bucks. It seemed so simple, but as *Life Magazine* said in its story on the venture last year, things just didn't work out.

First, the Amarylis was really hard aground, and lighters that Sam used to try to float her off went aground too. Then some hippies moved in during a lull in salvage operations and succeeded in setting the ship afire. Other troubles, large and small, beset Sam, and he was finally forced to abandon her, something not appreciated by the Palm Beach residents, who are mostly millionaires fleeing the cold and unsightly northern winters. They didn't like a hulk on their beach, and when I was there the Army Corps of Engineers had taken over and was having the ship cut apart for scrap.

The Amarylis caper didn't really daunt Sam, for he later bought the Miami Consolan station, after the Federal Aviation Agency decided it didn't want it any more. The transmitter, on 190 kc, was part of a three-station network (the others are on Nantucket: TUK, and at San Francisco) which was used to give long, over-ocean navigational information to planes and ships. It has never been a popular system, though many boat owners who were not very good navigators have liked it, but it was not good enough for jet traffic control.

The real problem in Miami however was the ground plane, an $18,000 fan of copper radials buried just below the surface of the beach around the transmitter tower. Seems that local beachcombers dug up the copper and sold it as fast as the FAA could replace it. FAA gave up and sold the whole station as surplus. I gather that Sam has dug up the rest of the copper, but he now has the 300 foot tower and a multi-kilowatt Collins transmitter on his hands, one of the biggest surplus goodies on the market today. Anyone need it?

The next Miami surplus source I saw was The Ham Shack, 2211 NW 36th Street, Miami, only a mile or so from the airport. Ham Shack had a great wealth of the familiar and the exotic in surplus gear, though the connector business seemed to be the prime income producer. Ham Shack should be a

* 5716 N. King's Highway, Alexandria, Virginia 22303.

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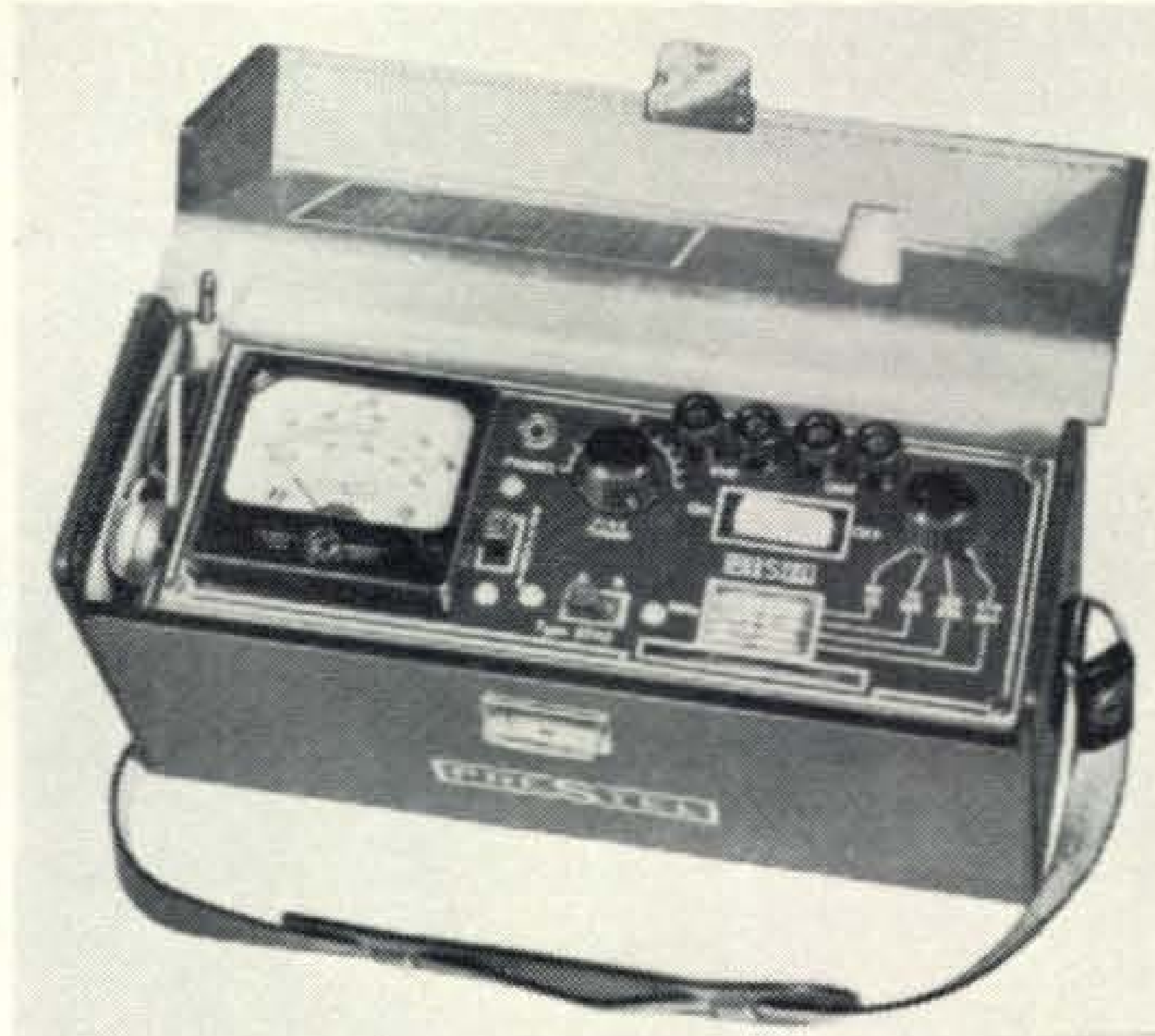

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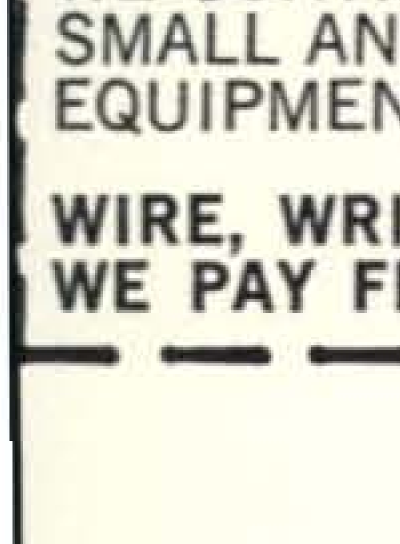

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RECEIVERS: R-220/URR, R-388/URR, R-389/URR, R-390/URR, R-391/URR, R-392/URR, COLLINS 51J-3, 51J-4, URR-13, URR-27, URR-35, RAL.

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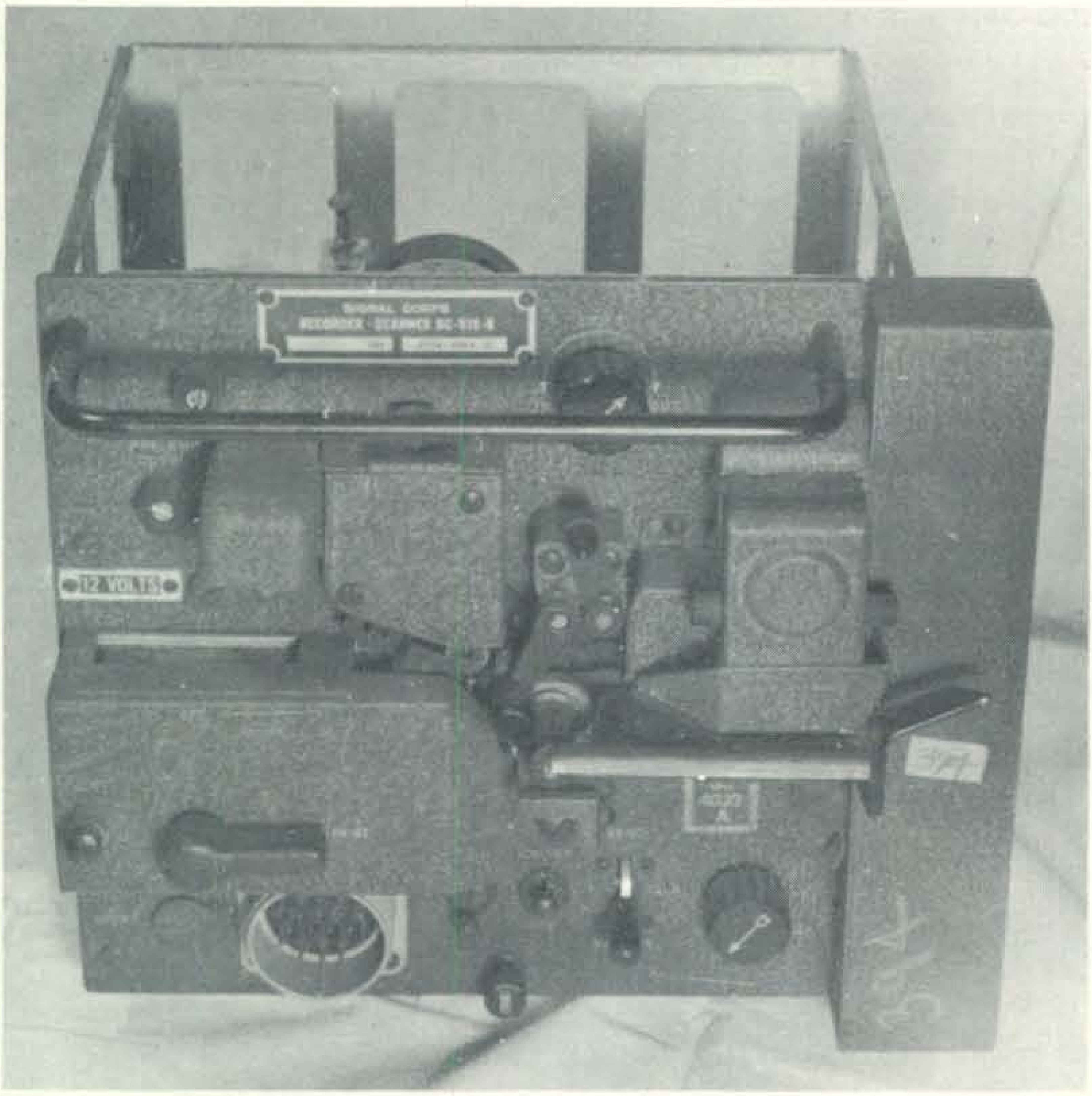

The BC-918 scanner-recorder, part of the RC-58 facsimile system.

gold mine for surplus hounds in the Miami area who have time to dig a little.

Bill Chambreau, in Hialeah, is also in the surplus business, but he was not in when I was there. He specializes in microphones and headsets, but has a sizeable stock of Command components and other gear.

Bill Slep, in Ellenton, Florida, near Tampa, also stocks a large number of surplus items as well as Teletype and aircraft units; he is well worth a visit if you are in that area.

Fred Schmidt, W4NYF, at 405 NW 30th Terrace, in Fort Lauderdale, just north of Miami, is the region's prime RTTY source, in fact he seems to supply the other dealers with most of their information, and is well known in southern Florida. Fred was kind enough to invite me to the annual awards dinner of the Broward County Amateur Radio Club, of which he is a past president. The club has been engaged in construction—largely with surplus parts—of tone tuning devices for blind amateurs, a most generous sort of program.

There is at least one other surplus dealer in Miami, whose appearance is a bit misleading. I found him browsing in The Ham Shack—I thought he was looking at things very oddly—for he was in the uniform of a U.S. Customs Officer. Seems he wasn't on duty, just looking. He said he dealt in Surplus in a small way, though his superiors would not allow him to run a store or advertise widely. You meet all sorts in Miami, a very hospitable town.

RC-58 Facsimile Equipment

The chief item I want to deal with this month is one I found in Miami, at Microwave Equipment, and also noticed at The Ham Shack there. This is the RC-58 facsimile set, of which the major component is the BC-918 recorder-Scanner.

This set is 1944-era FAX gear, still rather widely available. It was the first mass-produced FAX set the military used, though it gave way to military versions of press wire service equipment before the war was over.

The BC-918 and its companion BC-908 amplifier-modulator will transmit typed or written messages by wire or radio circuit, transcribing them on three-quarter-inch paper tape through a helix recording device. The helix is essentially a rotating drum with a blade raised on its surface at an angle to the axis of the drum itself. An inked roller at one side continually provides ink to the blade which is positioned above the moving tape.

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The message is "written" by a solenoid device which drives the tape against the blade where a mark is to be made; a series of dots makes up each figure.

A similar BC-918 unit is of course required at each end of the circuit.

In sending, the tape containing the message is fed through the scanner, and a light is shown on it, then picked up by a mirror and prism system through which it is passed to a photoelectric cell. Depending upon the cell reading "white" or "black" its output modulates an audio carrier. White gives an output of 1,150 cycles per second; black 1,650 cps. This corresponds to rather narrow Audio Frequency Shift Keying, similar to ASK amateur radioteletype (RTTY) which normally uses an 850 cps shift.

The design of the RC-58 is not directly compatible with any of the other FAX systems I am familiar with, such as the TXC-1 or the RD-92. The RC-58 operates at essentially 3,600 rpm, scanning 72 lines per inch. It achieves such a high speed with its restricted bandwidth, through scanning only a three-quarter-inch tape, whereas standard FAX equipment uses 12 inch or wider paper. The standard speeds are 60 or 120 rpm, and even satellite photos are sent at only 240 rpm. I cannot say what the RC-58 might be capable of if geared to turn more slowly, though that might be possible.

The scanner uses an hexagonal prism, rotated at 600 rpm to obtain 3,600 scans per minute across the tape. The tape itself is advanced at 50 inches a minute, and writing to be handled should be large, at least half the tape width, or about a character per inch, including spacing. The system is essentially a line-device, not suitable for reproduction of halftones, as the helix gives either black or white recording.

The RC-58 will operate off 12 or 24 volts, depending upon internal connections, for which the manual, TM 11-374 should be consulted. The entire set includes the BC-918 recorder-reproducer, the BC908 amplifier-modulator, and possibly power supply RA-54. The recorder and modulator each weigh about 37 pounds, and are generally painted Army olive drab. Though the recorder could be used alone, the output of the photo-cell reader and the input of the recording solenoid would require some sort of amplification for useful operation.

The system was built by RCA, my Army Signal Corps sources tell me. It pioneered

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the helix-recording technique for FAX, and in many ways was a better device, though more complex, than the TelAutoGraph "electric pen" which was more widely used, in fact is still used in many areas where teleprinters are not available, such as forecaster to airport tower links.

The recorder requires a type 927 photo tube, and uses two 12SJ7 and one 12SN7 tube plus a pair of special current-regulating (ballast) tubes. The amplifier-modulator requires a 12SN7, four 12SL7's, a pair of 12SJ7's, two 12H6's, and a pair of 12A6 recorder power tubes, with a VR-105 regulator.

In addition to those I saw in Florida, the BC-918 and BC-908 sets are also available at RITCO Electronics, Box 156, Annandale, Virginia, and SASCO Electronics, 1009 King Street, Alexandria, Virginia, and from Jin Cooper W2BVE, 834 Palmer Ave., Maywood, N.J.

Frankly I don't know to what uses the RC-58 FAX can be put, but it is an unexplored surplus goodie that may have hidden value. I would like to hear from readers who have experimented with it. I must credit Dallas Waltman, of 17 E. Mason Street, Alexandria, Virginia, a most advanced SWL, for bringing it to my attention. Dallas has equipment set up to receive AM, SSB, RTTY and standard FAX, plus his BC-918 rig, and is one of my most helpful readers.

I want to note here that I have received a number of requests about the Navy URR-21, 22 and 23 sets, and the companion SRR 11, 12 and 13 receivers. Many readers apparently have inoperative units, distributed through MARS or various school programs. The only source I know for spare modules for these receivers is SASCO Electronics, whose address is mentioned above.

I would like to mention also two other sources for surplus RTTY gear: Bill Bauer, W4NYZ, 119 North Birchwood, Louisville, Kentucky, and Howard Cochran, K91UG/4, at the B.L. Ferris Co., Rt. 1 Box 69, Hendersonville, North Carolina ■

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Why the Regenair 321 Quad is Important to you!

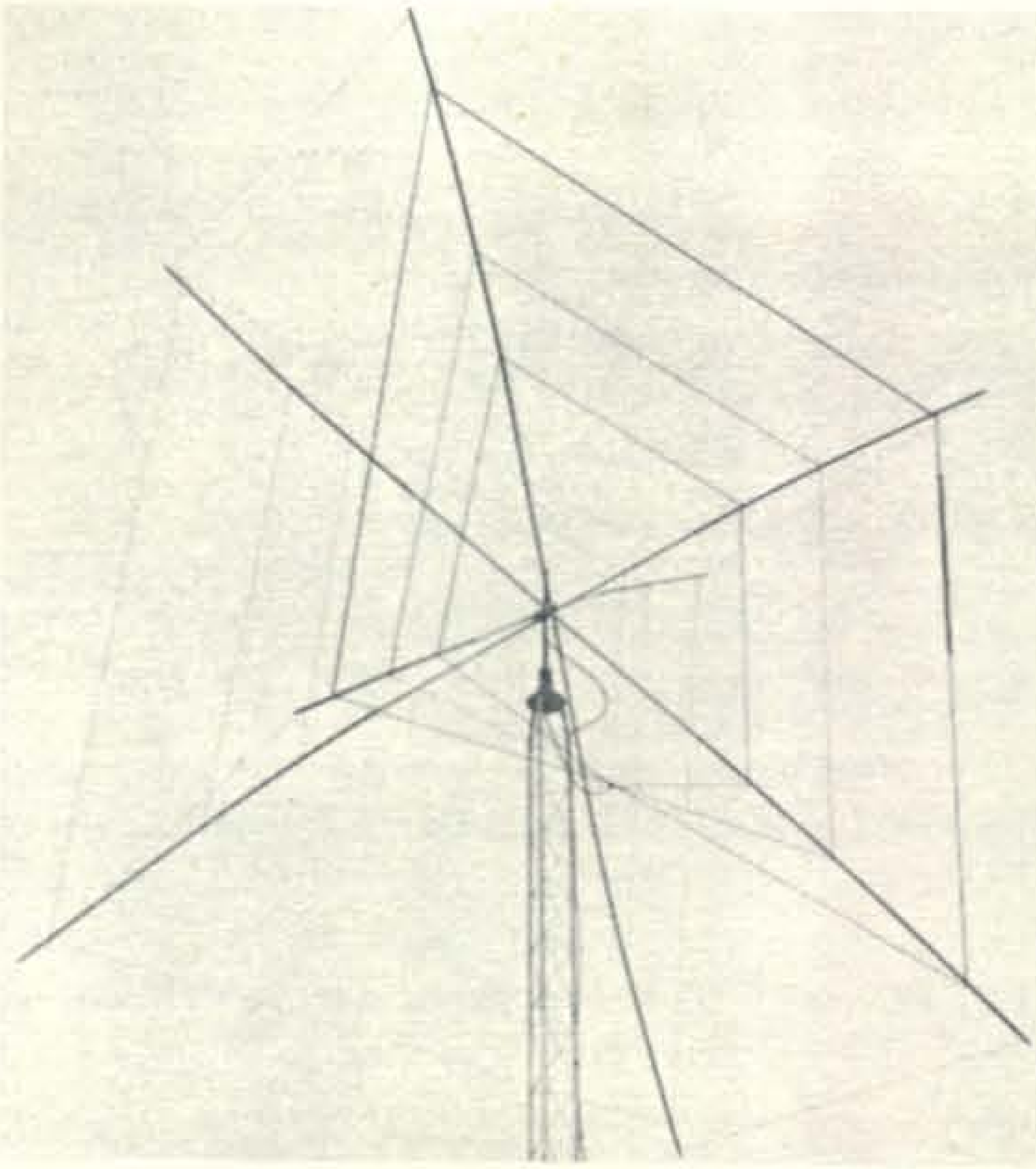
Present day transceiver and transmitter designs require an antenna match with as flat a resonant response as possible. In the olden days a typical 500 watt rig required a relay rack and 500 pounds of gear. The physical spacing and voltage parameter of the tank circuits were such that one never worried about VSWR; indeed, that term had not yet been coined! Flash over and mismatch were laughed at and tolerated.

What a difference today! In a table top box scarcely 1½ cubic feet and weighing less than 50 pounds we find a modern sideband transmitter and receiver thrown in as well. Take a good look at the components: fixed capacitors smaller than ½ a postage stamp; a loading capacitor with .005 inch spacing; and transmitting tubes that are in reality TV horizontal outputs. These, then, are what you find. Do you wonder then why the manufacturer tells us we must operate into loads of 2.5 to 1 or better? Do you wonder then why the factory says to tune up in less than 30 seconds? Is it a surprise to you to find that new finals are required so quickly?

Look at this problem more closely. The 6HF5's are rated 30 watts dissipation. Two of them in parallel equal 60 watts limit. Yet the rig has a PEP rating of 500 watts and can develop up to 265 RMS watts in the forward or incident position. Its power supply furnishes 800 volts. You adjust the bias for 50 mills average, or 40 watts. Here is two-thirds of the total dissipation rating in idling power. The danger comes into the picture because the average ham can't or won't confine his operation over that narrow spectrum where his antenna is in resonance and where his VSWR is less than 2.5 to 1.

Good engineering tells us that at 2.5 to 1 we have 10% of our forward power coming back to stay as circulating current and heat. Ten per cent of 265 watts is 26.5 watts. This added to our idling current equals 66.5 watts—an *excess* of value beyond what the tube manufacturer says his tubes can take.

Sure — new SSB designs are in the works: transceivers whose receivers will have variable selectivity; whose transmitters will use better tubes; rigs that can take more guff. But can you wait that long or afford that much money?



There is an alternative now—in fact, two choices. You can either be more mindful of the frequency tolerances of your setup, or better still, you can obtain one of our Reginair Quads. This is the only commercially available product that gives three band operation with one 52 ohm feed line and absolutely guaranteed low, low VSWR over the entire 10, 15, and 20 meter bands.

This Quad is furnished complete with easy to understand assembly instruction, at only $79.95 FOB Harvard, Massachusetts. We prefer to ship via Railex. Study the box score and see if this antenna isn't the answer to your operating and maintenance problems. You might even find that DXing can be fun now that you are hearing the rare one.

BOX SCORE

Forward gain over dipole	5.9 db
Forward gain over isotropic dipole	8.0 db
Front to back ratio	25 db
VSWR over 28-29.7 MHz; not more than	1.5:1
VSWR over 21-21.45 MHz; not more than	1.5:1
VSWR over 14-14.35 MHz; not more than	1.5:1
Maximum RF input	2 kw
Maximum mast dimension	1¾" dia.
Wind resistance	4.5 sq. ft.
Feed line	52 ohms
Outside dimensions	18'x18'x12'
Turning radius	9½'
Net weight	35 pounds
Shipping weight	40 pounds
Designed for 100 mph winds; ½" radial ice	
Frontal lobe	75°
Standard model price	$79.95
APO model price	$99.95
Deluxe fiber glass model price	$129.95

HERBERT W. GORDON COMPANY

Woodchuck Hill Road, Harvard, Mass. 01451

"Helping Hams to Help Themselves"

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the Tuned Doublet [*from page 68*]

antenna coupler installed, initial tuning would be as follows:

1. Attach feeders about half-way between the center of the coil and the ends. A small "L" of wire can be tack-soldered to a turn and the feeders clipped to it.
2. Turn on the transmitter and resonate the final. Keep initial loading light.
3. Adjust C_1 and C_2 for lowest reflected s.w.r.
4. If 1:1 s.w.r. cannot be obtained, move the feeder taps a few turns at a time, symmetrically, and repeat the above steps.

It should be easy to obtain almost a perfect 1:1 s.w.r. for each band by locating the taps on each plug-in or switched-in coil. Once these taps have been found, a small tab of sheet copper can be wrapped around the selected turn and soldered or, in the case of the tighter-turned, lower-frequency coils, the turns on either side of the tap can be pushed into the coil, thus leaving the turn to be tapped standing in the clear.

Should it happen that a 1:1 s.w.r. still defies attainment, the number of turns of the link (L_2) or the amount of capacity of C_2 may have to be adjusted. But once the coil and capacitor combination for each band has been found by cut-and-try, you are finished with experimentation. The number of link turns, or the extra amount of fixed capacity required to tune a band with a given switchable or plug-in coil can be switched in, the tank resonated, and you are ready to operate with a highly efficient antenna.

Another bonus often forgotten by the average Ham is that almost all antennas reflect the atmospheric and/or ground conditions about them. This means that an antenna will react one way during August, when the earth and surrounding objects are dry and electrical ground is somewhere deep beneath your location, and yet be entirely different after a long soaking rain. The tuning parameters of a fixed dipole, folded dipole, or the like, will even vary appreciably during a rainstorm. With a Tuned Doublet, you automatically *tune* the antenna system for each environmental change that occurs and operate at the peak of efficiency at all times. Try *that* on your trapped, "all-band" fan-doublet. I have personally seen the resonant point of one of these trapped horrors change 70 kc from 9 o'clock in the evening to 9 o'clock the following morning because of heavy dew. This is not to say that a Tuned Doublet won't change with atmospherics, but only the antenna coupler will know—or care.

Having decided upon a wire antenna, putting it up and keeping it up is quite another problem. This will be discussed in a subsequent article. ■

Compressor [*from page 21*]

value of the 25 mf filter capacitor. The values of the other circuit components should be retained. The placement of the compressor between stages which have tuned circuits may cause some detuning to occur and the circuits should be realigned.

Summary

The use of the compressor in r.f. circuits should probably not be attempted unless one has the proper test equipment to determine proper alignment of the stages between which the compressor is used. However, as an audio compressor no special test equipment is required and this application should appeal to many amateurs who would like to improve their transmitter's audio effectiveness. The components comprising the unit are so few in number that they can be placed almost anywhere in an existing transmitter. The components can be simply wired on a miniature terminal strip, for instance. Leads should be kept as short as possible, especially in the case of an r.f. compressor, but aside from this, no special construction techniques need be used.

The compression effectiveness depends to a great deal on proper level adjustment and to some degree with matching diode characteristics to the signal levels used. A compression range of about 15 db should be possible. This is not as great as the 30 db or more, possible with an elaborate tube or transistor circuit, but still very useful, especially in a transmitter which does not have any other form of a.l.c.

Adjustment of either the audio or r.f. compressor can be accomplished by means of on-the-air or oscilloscope checks. If one has the proper equipment to perform the latter, they are, of course, the most reliable. If on-the-air checks are made for adjustment purposes, the receiving station should operate the receiver being used without a.v.c. and with the r.f. gain control and not the a.f. gain control used to adjust the receiver for a just barely readable signal. The purpose is to simulate an actual weak-signal condition. If the receiver is used with a.v.c. and the r.f. gain fully operative, the a.v.c. action of the receiver will mask the effectiveness of the compressor action on a strong signal. ■

See page 126 for New Reader Service

Something Really New!

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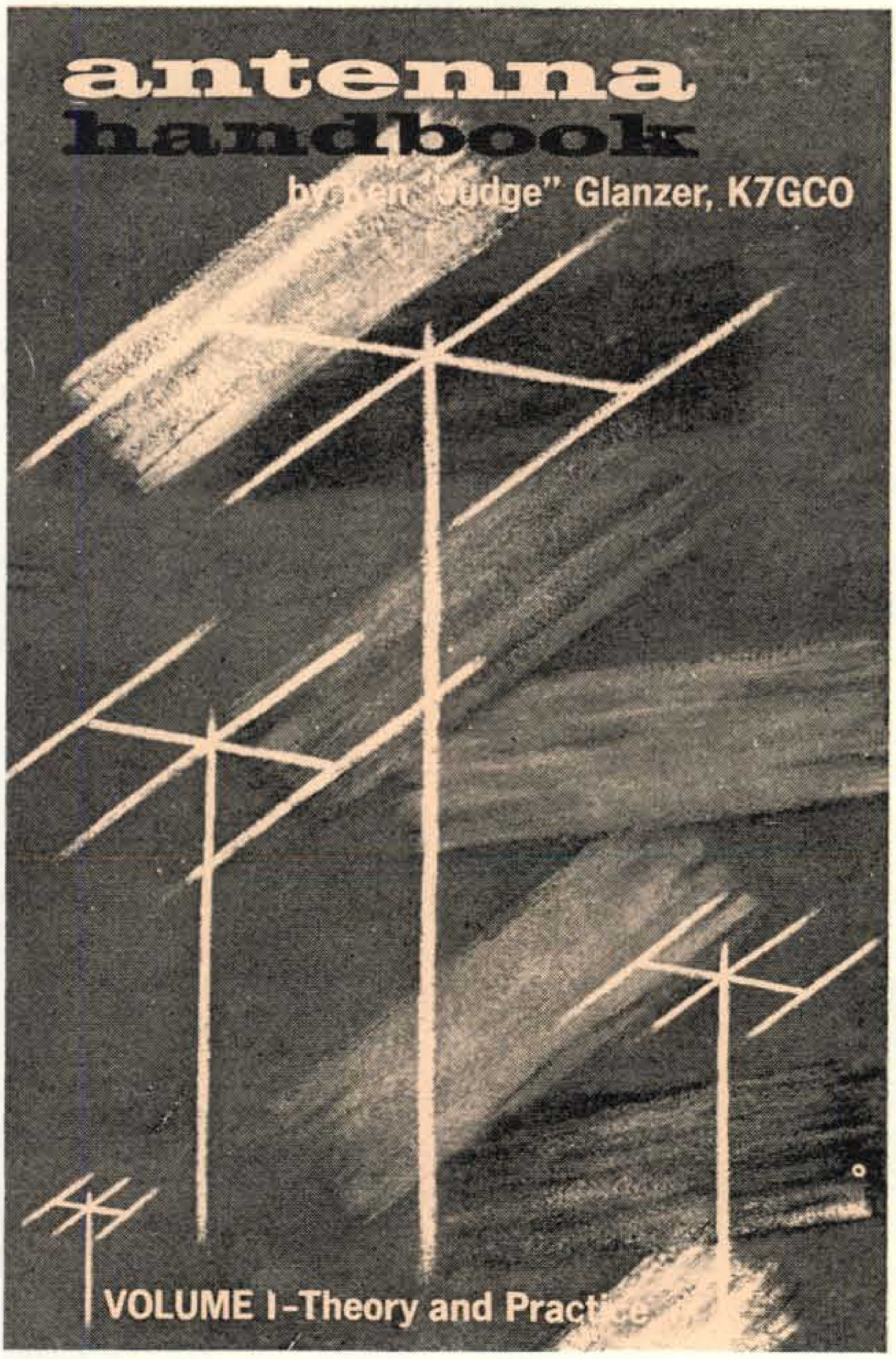

matching, devices, what happens to all that reflected power, which end of feed is more important to match, how to use open wire feed on beams, gamma matches,T-matches, feeding T-match with dual coax, transforming balanced 100 ohm coax lines to 200 or 50 ohms, capacitive match for balanced transmission lines, inductive (hair-pin) match, quarter wave and short bazookas for balanced feed, broad band baluns and effect on feedpoint current, effect of surrounding objects and power lines on feedpoint current, folded dipole matching for beams, feeding stacked beams individually or together.

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Moniceiver Revisited [*from page 18*]

Layout

The transmitter requires about half of the chassis space available and the layout is not critical. The unused chassis space can be used to mount a d.c. to d.c. converter (a device to convert the 12 v.d.c. primary system found in most automobiles to the higher voltage d.c. required by the plates of vacuum tubes) or an a.c. power supply, which ever fills the bill for the type of operation planned for the transceiver.

In the author's model the r.f. stages are located near the front of the chassis so the crystal socket, oscillator coil, *plate tuning, antenna loading* capacitors and *mike gain* control could be mounted on the front panel.

Construction

The 12AX7 speech amplifier, 6V6GT modulator, and the modulation transformer are positioned about midway on the chassis so a piece of aluminum shielding could be placed under chassis to isolate r.f. from the audio section. The audio gain control is mounted on this shield and run to the front panel with a shaft extension.

When wiring keep the cathode and screen bypass capacitor leads as short as possible, and route the filament wiring along the bottom of the chassis. It is also best to use coax between the transmitter output and antenna relay so the chances of r.f. leakage into the audio are minimized.

Tune-Up

Tune-up is simple with this circuit. Peak the oscillator coil, L_6, for maximum output as indicated by a neon lamp, or a receiver tuned to 25 mc. Dip and load the 5763 final as you would any conventional transmitter.

The *mike gain* control is adjusted for proper audio by advancing the control until the plate meter swings upward with modulation. A further check of the modulation can be made by monitoring the rig with a 6 meter receiver, however, make sure that the transmitter does not overload the receiver.

The r.f. filter network composed of L_9 and C_3 was added to isolate the d.c. to d.c. converter from the filament lines. It is not necessary for a.c. operation.

Summing Up

Although these modifications have been presented for use with a specific receiver they may be adapted to other units or incorporated in the future design of equipment. Whatever the equipment used, however, these modifications enable the builder to enjoy two of the benefits of home construction—namely, custom designed equipment, and an excellent education in the field of electronics. ■

A Radical Proposal [*from page 13*]

The other body of constructive criticism dealt with the proposed requirements for a Restricted Class license. As you will recall, the original suggestion was that there be no code test but that the applicant be required to pass a test on theory and regulations at about the Novice level. My good friend Ralph Green, W1HGT, suggested that in lieu of the code test the applicant be required to demonstrate familiarity with internationally-recognized distress signals transmitted in code and by voice. There are several ways of accomplishing this; I lean toward having the dits and dahs of SOS, XXX and TTT included in the written exam along with MAYDAY and the like, to accomplish the highly desirable goal of being sure that every amateur, no matter how low in grade, be able to recognize distress signals when he hears them.

Several others suggested a substantial toughening of the rules-and-regulations portion of the proposed exam. I would have no objection to this, providing that the toughening applied also to other classes of amateur license and that it was not so severe as to raise a serious obstacle to the prospective licensee.

I cannot help but have a little more faith than some of these others, however, in the ability of amateurs to bring the new Restricted Class licensees up to standard quickly and without the need for memorizing a whole series of complex rules to any greater degree than is now done by beginners in our hobby. If we higher class amateurs follow the same precedent in helping these fellows along as we now do with Novices, I see no real problems developing, but rather a lot of eager, enthusiastic new hams.

Ham radio has gone through quite a bit of friction in the past decade, with incentive licensing, the setting up of rival representative bodies, assorted certificate and DXpedition fights and the like. When my last article was printed, I expected to be on the receiving end of all kinds of abuse which I was quite prepared to forgive and chuckle over. With only one or two exceptions, it never came. You know, hams are a pretty good lot. There ought to be more of them, don't you think? ■

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Grumbles *[from page 63]*

haler when something goes on the fritz, it just seems so silly to me that the FCC, the League, and so many other people put so much emphasis on your having to memorize all of this relatively useless mind-exercise material just so you can join their secret society. Ham raido operators simply do not have the ability, in general, to keep themselves on a sweat-and-elbow-grease basis with current electronics technology. How many out there would attempt to build an s.s.b. transceiver from only a parts list and a magazine story? A complete kit with step-by-step instructions, sure, why not; but a start-from - scratch - and - raid - the - junk - box deal, well, hardly.

Yes, somewhere between semiconductors and s.s.b. most of us got lost in the cloud of flying technology. Those with a poor ability to memorize are called Technicians, the students among us have other titles.

If the truth be faced, the people who now "run" ham radio would be kicked in the seat and either forced to straighten out the mess, or told to step down and let others who are part of today's scene call the shots. Let's update the licensing requirements and procedures, let's bury some of the hatchets, let's cut out the sham before we're sitting here with what used to be a damned fine hobby. ■

The HA-1 Keyer *[from page 61]*

bug are always normal and are not affected by the position of the key switch.

The other switch, when thrown to the ON position, shorts the contacts of the straight key and holds the transmitter turned on to permit tuning; but it does not turn on the sidetone in the keyer.

Actuating the transmitter for tuning can also be accomplished by holding the straight key closed or by throwing the FUNCTION switch on the T.O. Keyer to the HOLD position; but when the switch is in the HOLD position the sidetone sounds continuously, and the tone can become annoying during a lengthy tune up.

While not related to the above modification of the T.O. Keyer, there is another addition that can be made to this keyer, and most keyers, that is a marked convenience. If headphones are used for reception and are plugged into the headphone jack of the receiver, the keyer sidetone level must be run up high to be heard when the headphones are on the ears. If the station is in the house,

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this can make the XYL very unhappy; and hams with unhappy XYL's are *very* unhappy, too.

Sidetone Modification

By making the addition shown in fig. 2, the sidetone from the keyer is piped into the headphones, or loudspeaker, of the receiver, and the loudspeaker in the keyer is turned off.

The size of the paper capacitor used will depend on how loud the operator wishes the sidetone to sound in the headphones. The higher the capacity, the louder the sidetone. With a Swan 350, a 4 mf paper capacitor proved to be the right size, for with that capacity when the plug is pulled out of the PHONE jack in the rear of the T.O. Keyer, the sound level is also correct for the speaker in the keyer. ■

A One Man Mast [*from page 52*]

It will be helpful, however, if two or three additional people are around to hold the top guys while this is done. The 8" square board can be nailed to the bottom of the mast before it is raised or it can be slid into place before the guys are tightened. Its main purpose is to keep the mast from sinking too far into soft ground.

Conclusion

This is the end of the story except for one point. Earlier I said that the mast could be used for a vertical; I did that by running a #14 gauge wire up the mast. It was held away from the mast by 1" standoff insulators that were spaced at 3' intervals. The flexing of the mast can tighten the wire enough to break small insulators while the mast is raised if you are not careful. There are several ways to avoid this kind of trouble. I prefer to fasten the wire to the top insulator and let it run through small loops of wire fastened to the other insulators. When the mast is up it can then be fastened to the insulator at the bottom. If the vertical made this way lacks a few feet of height (as when you want a quarter wave at the low end of 40) you can lengthen it easily by mounting a mobile whip near the top of the mast and connecting it to the top of the vertical wire. Choose a whip that comes in sections or one that can otherwise be adjusted in length to make it easy to trim the antenna to your frequency. ■

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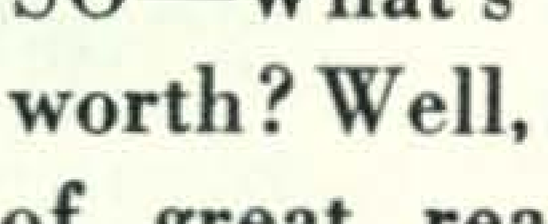

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SELL: SB100 transceiver $250 plus postage, R. J. Christie, 215-28 Spencer Avenue, Queens Village, N. Y. 11427.

RTTY for sale or swap. Mod 15 with table and power supply $60.00. Mod 19 with table tape equip and power supply $120.00, or will swap for good frequency meter fixed or mobile VHF FM equipment or what do you have. W1ZZF, J. Godfrey, 18 Fairview Avenue, Trumbull, Conn. 06611.

FOR SALE: HQ180C Receiver used very little with original carton and instructions, $265. First MO or certified check takes. L. M. Covey, 238 Jenness St., Lynn, Mass. 01904.

WANTED: FR-67/U or equal 1 audio freqcounter. State price and cond. in first letter. Cooper, 834 Palmer Ave., Maywood, New Jersey 07607.

FOR SALE: Vidicon TV camera $150, Apache $70, HD-10 Keyer $30. Telex headphones $12. R-100A w/spkr $65. T. Windmiller, 752 N.E. 128 St., N. Miami, Fla. 33161.

EXCELLENT INVADER 2000 $399; Valiant II $139; immaculate Galaxy 300, $129; husky AC PS, $29. R. Einhorn, 13315 108th A Ave. No., Seminole, Fla. 33540.

CANADIANS: Want top class general coverage receiver and model 111-B X-tal calibrator. R. Fransen, 227 Cottonwood Ave, Sherwood Park P.O. Box 197, Alberta, Canada.

RCA Pocket police receiver, $10. H. B. Smit, 467 Park Ave., Birmingham, Mich. 4800.

SALE: Dynakit 50 watt hi fi amp. $30. Fairchild 240 preamplifier-Equalizer hi fi orig. cost $98.50. Sell $25. Andrew Clar, P.O. Box 501, Miami Springs, Fla. 33166.

HW-12, HP-13 DC Supply for SSB or 75 mobile with newtronics antenna, all for $100. B. Koestler, 640 Trephanny La., Wayne, Pa.

SELL or Swap: New ARC/5 Transmitter 20 all freqs. R. Clark, 126 Slosson, N.Y. 10314.

SWAP NCX 3 matching AC P/S and DC P/S HQ 110A for SB1000 transceiver. C. Byrd, Rt. 1 Box 564-A, Kannapolis, No. Car. 20081.

QST, CQ 73 for sale. 30 each. Printed circuit board, 3 for $2.75. B. Hayward, 3408 Monterey, St. Joseph, Missouri 64507.

COLLINS KWS-1 xmtr.—Good shape, swap for kwm-2 or 32SI-SB401 xmtr and linear. Prefer local deal. J. Owings, 10207 St. Daniel, St. Ann, Mo. 63074.

SELL: SB-300, SB-400, SB200 $650. Firm. No shipping. Will meet or deliver 250 miles. R. Froehling, 1424 Hilltop, New Ulm, Minn. 56073.

COLLEGE EXPENSES Heath Shawnee xcvr and GE FM rig make AM/CW/FM 6 mtr station. Will mic and 4 el beam. L. Gerig, 23523 Paulding Rd., RR 1, Monroeville, Ind. 46773.

HAMMARLUND HQ-100c $95. with clock, top cond. H. Meiseles, 1523 45th St., Brooklyn, N.Y. 11219.

FOR SALE: Drake R4A Rcvr. $275. T4X Xmitter $275. Ship in orig. cartons. A. Brehm, 5081 Sumter Ave., Cincinnati, Ohio 45238.

WANTED: 6+2 meter FM Transceivers, 10734 Dunaway, Dellas, Tex. 75228.

HEATH HW22 Transceiver, AC or DC Power supplies. All cables plus hustler mobile antenna and mount and microphone complete $140. A. Johnson, 29 Boone St., Bethpage, New York 11714.

PRECISION E220C Sig. Gen., E400 sweep gen. cables inc xcell cond. L. N. Best offer. J. Boritz, 1560 Unionport Rd., Bronx, N.Y. 10462.

WANTED: National XCU-27 100Hz crystal calibrator in good cond. G. Cotellis Jr., 1903-32nd St. W., Bradenton, Fla. 33505.

RECEIVER—Knight R-55A, tunes BC to 54 Mcs. $40. R. Albert, 68-61 Yellowstone Blvd., Forest Hills, N.Y. 11375.

FOR SALE: Nc98 receiver, $60., good cond. J. Licata, 710-10th St., Union City, N.J. 07087.

TRADE 60 Mm equatorically mounted telescopes with accessories worth $100 for good electronic keyer. Samkofsky, 201 Eastern Pky, Brooklyn, N.Y.

FOR TRADE: Very nice exacta VX2A Camera, case, lots of acces-sories including telephoto lens. Swap for RTTY gear of SSB Transmitter. F. Gilmore, 560 S. Warren Ave., Springfield, Mo. 65806.

TRADE Rme 45 matching speaker, NBFM Adaptor, and manual, for Freq meter Bezzi or similar or VHF Model. Complete with book and P/S or bat. type can be loss bats. F. Haroman, 314 No. Birch, Pwasso, Okla. 74055.

RAYTHEON marine xceiver 30 watt, 12v, $320 value, new cond. Trade for Hallicrafters SX-117 or SX-146 receiver in good cond. G. Anderson, 1100 New Jersey Ave., Pine Beach, N.J. 08741.

WANTED: 2 VU meters, Broadcast style, 0 VU for 1 milliwatt into 600 Ohms, Weston, Simpson, GE, etc. B. Weitermann, 4549 N. 38th St., Milwaukee, Wisc. 53209.

SELL: Heath GD-1A Grid-Dipper $8. Heath HP 20 pwr supply $15. Gonset communicator II, 2 meter, $65. Manuals for each. W. M. Staddenmaier, 1229 Chante Loup Dr., Hendersonville, N. Car. 28739.

SELL: FB SB400 $265. 2B 2AC 2BQ, $225. Home brew plug-in plate modulator T150 $35. Gonset Super 6 with 12v supply $30. Irv Buxton, 8 Briarcliff Dr., Merrick, New York 11566.

WANTED: AC generator Freq. Meter, reed type, for 60 cycles. Gonset IV 2 meter transceiver—state price anp condition. N. L'Heureux, 13 Libby Ave., Lewiston, Maine 04240.

NATIONAL NC-303 receiver, excellent condx, $150. Aero. Center ARC Postal Station 18, Oklahoma City, Okla. 73169.

TRADE new prop pitch motor, small size for a Blackhawk 2500 cycle crystal filter. F. Hedl, 55 E. 8th St., Sheridan, Wyo. 82801.

JOHNSON SSB Adapter, with all cables and connectors, $140. C. C. Drumeller, 5824 N. W. 58th St., Oklahoma City, Okla. 73122.

WANTED: Vibroplex Deluxe bug mint. condx. F. Miller, 315 S. E. Wilshire Ave., Bartlesville, Okla. 74003.

SEE you at "SAROC" Hotel Sahara, Las Vegas, Nevada, Jan. 8-12, 1969, de W7PBV.

SALE: Eico 720, Heathkit HR-10 with Xtal Calibrator, Heathkit HF-10 VFO. Complete with manuals, $125. WA1EUF, 295 Union St., Manchester, N.H. 03103.

WANTED: Ranger 11 A1 reasonable. R. G. Bosc, P.O. Box 203, Warroad, Minn.

88 Millihenry toroids for sale, uncased, five for $125. Postpaid. L. T. Smith, 6218 E. King Pl., Tulsa, Okla. 74115.

SELL: Clean Ranger two, $135. R. Cobaugh, 29-29 214 St, Bayside, N.Y.

SELL: Western Electric precision Standard capacitors, .2631 Mfd, 250 VDC 1%-60+65C four for $1.50. postpaid. G. Richies, Box 26, Salem, Va. 24153.

COLLECTOR: wants to buy old and antique telephones and telephone equipment. Send description, cond, and price. C. A. Hurray, Rd. 4, Box 286, Gibsonia, Pa. 15044.

BARGAINS: Excellent hardly used, SB400 $280. SB33, D.C. Inverter and mike $190. New Heath HR10 RX $65. BC 348 with AC Supply and manual $40. Ranger xmtr $70. Stamp for list. J. Shank, 21 Terrace La, Elizabethtown, Pa. 17922.

SHACK: Cleanup ultimatum by XYL or else. SASE for list of many years of collection of bargain priced goodies as Collins 70E-2 oscil. $12. Megaff, 50-15 Weeks La., Flushing, N.Y. 11365.

FOR SALE: Gonset Mobile tri-band converter 12V $25. Heath Kit Q-multiplier-wired-new $14. D. Scher, 11 Webster St., Irvington, N.J.

WANTED: Old battery operated radio receivers and transmitters of the early 1920's. Need not be in working condition. D. T. McKenzie, 1200 W. Euclid Ave, Indianola, Iowa 50125.

FOR SALE: 40 foot crank up tower $50. Hygain TH-3 Triband Beam. $50. M. Gutman, 531 Edmands Rd, Framingham, Mass. 01701.

WANTED: Early radio & wireless gear for amateur museum. Call books, magazines, books, parts, tubes, etc. Erv Rasmussen, 164 Lowell St, Redwood City, Cal. 94062.

WANTED: Oct. & Nov. 1960 and Jan. & Feb. 1961 73 mag. Make offer on large quantity of Popular Electronics. M. Hagen, Rd 2, Box 233, Brewer Road, Waterloo, N.Y. 13165.

TOWER 40 Ft. Triex Crankup triband Two el. Quad. Rotator, Guys and coax complete. $125. No shipping. J. Kavan, 9501 Quartz Ave, Chatsworth, Calif. 91311.

WANTED: Johnson SSB Adaptor. K. Schwartz, 43 Vernon Parkway, Mt. Vernon, N.Y.

FOR SALE: 50 Watt hetrodyne CW transmitter described as Hetrocite CQ Mar./Apr. '63, $40 and Linear amplifier with pwr sup 6146's $30. E. Marriner, 528 Colima St, La Jolla, Calif. 92037.

MARRIED law student with 14AVQ needs an inexpensive rig to get on the air. J. Cook, 207 Cedar St, Tipton, Iowa. 52772.

WANTED: Collins CG-1 CG-2 Rtty filter for 73S-3B. O. Hennlein, 107 Wyoming St, Boulder City, Nevada 89005.

FOR SALE: Model Sp-600 JX Hammerlund receiver, just like new. $500. D. Simonsen, P.O. Box 1622, Vancouver, Ca. 98663

SAROC Jan. 8-12, 1969 at Hotel Sahara, Las Vegas, hosted by Southern Nevada ARC, Box 73, Boulder City, Nev. QSL card with Zip for details.

NCX-5 and NCV-A with Diode Balanced modulator. Aprox 50 hrs use. $545. Heath Mohawk, Ex wiring and cond. $135. J. W. Richardson, 321 Anrora, Hudson, Ohio 44236.

FOR SALE: SX-88 Receiver with manual $180. SB-610 Monicor-Scope with manual $70. Variac $5. W. E. Joyce, 2118 E. Q-5 Ave, Palmdale, Cal. 93550.

FOR SALE: Collins 30L1 Linear $360. Firm. Includes cables, etc, Instruction Book—New 811's. Original carton. N. F. Shofstall, 506 N. Orchard Rd, Solvay, N.Y. 13209.

SWAP Four 4-1000A Eimac Air System Sockets for Two Tubes. B. Bouvier, 3712B Herbert Ave., Pennsauken, N.J. 08109.

WANTED: 70 foot, foldover, crankup, heavy duty tower, w 100 miles of Boston. J. Chesler, 5 Bosworth Rd., Framing Mass. 01701.

KNIGHT T150, $65. R. C. McConnell, Rt. 2, Triggs Tlr. Pk., ford, Va. 24141.

MODEL HO-10 monitor scope, factory wired, used little. $50. H. L. Snyder, 2185 Sampson St., Pittsburgh, Penn. 1

SELL: nearly complete set of RTTY Vols. 1-12 and arts bull 9-45. R. Quenstedt, 512 McDonald Rd., Leavenworth, Kans. 66

75A-4 Exc, 3.1 filter, manual, spinner knob serial #3536, certified check for $375 gets it FOB. J. LaBlonde, 404 Be Dr., Madison, Wis. 53711.

DON'T pass this up! $50 takes a model 19 with Terminal Sry, u-haul. 441, Lomabardy Rd., Drexel Hill, Pa. 19026.

SELL: Complete Gmtr SSB station Sb110A, SB600, HP23AC, 13DC, SBA 1001, HD15 patch, Turner 454X. $325 cash. Hav manuals. J. Hart, 31 Crandall St., Glens Falls, N.Y. 12801.

HEATH Twoer Squalo, 10 el beam. 2 extals-Lincoln 6 mtr xc xtals. All $40. M. Craig, 403 N. Burdette Ave., Sherman, 75090.

FOR SALE: Radio receiver BC1068A BC603 DM receiver with built in 110V power supply, AC, and R-23/ARC5. receiver 550Kc. Make offer. R. Eckard, Rd. 2, Cogan, Sta, Pa. 177

WANTED: Old Alaska receiver by Doolittle & Falknar, also bu borrow schematic. N. Fritz Heights, P.O. Box 483, Shelte Is N.Y. 11965.

R274/SX73 $150. Freq mtr Hi-fi, Misc. List to Swap. Sta envelope. C. Spitz, 1420 S. Randolph St., Arlington, Va. 2

FOR SALE: Heathkit TV alignment generator, model TS-2, You ship. Kanakos, 42 Elder Dr., Commack, N.Y. 11725.

FOR SALE: HQ 170C Receiver, used very little, with original ton and instructions, $265. First MO or certified check t L. M. Covey, 238 Jenness St., Lynn, Mass. 01904.

SPEAK NOW or forever hold thy peace if I owe a QSL. Movi W4 land come spring. D. Falk, 5665 Bartlett St., Pittsburgh 15227.

THAT April 1945 issue of CQ still eludes me. Can you fill the gap in my collection? Write, stating price being asked F. ridge, 96 George St., Baskingstoke, Hampshire, England.

SBE-33 $189. SB2DCP $80. Sell or trade: Bolex B8, Normal, photo case, $45. Olympus Autoscope projector $90. Astra pistol $20. O. McMahon Jr., 113 Woodcrest Circle, New Ib La. 70560.

SB100 perfect, built by professional tech & holder of 1st commercial, used 3 hrs. Sold by physician with no oper time. With manual, $360. C. Kollar, Rd. 3 Box 261, Mou Top, Pa. 18707.

WANTED: HX-20 and manual. V. Edgerton, P.O. 44057, Ne Ohio 45244.

RTTY Info for the amateur interested in RTTY. F. Demotte, S. Atlantic Ave., Daytona Beach, Fla. 32019.

WANTED: 73's Feb. '61, QST, July '51 and June '33. CQ's 1 & 2. E. Guimares, 17 West End Ave., Middleborough, Ma. 0

WANTED: 15th Edition of Editors & Engineers Radio Hand J. Bell, 208 Pat St. Levelland, Texas 79336.

WANTED: Panadapter SP44 or PR1 useable or for parts for in an elementary school ham club. Gift or reasonable p Syd Tymeson, 8118 Flower Ave, Takoma Park, Md. 20012.

RECEIVED Hallicrafters for Xmas must sell 2 months old Eico & 751 ac supply. Ship both FOB for $165. E. Talbot, 131 peridge La, Battle Creek, Mich. 49015.

WANTED: Good Heathkit SB200 Linear. State price and c Dennis Quinn, General Class, 88 Woodrow Ct, Sharon, Pa. 16

SELL: Trade: Ac supplies for BC221 and command set recei S. Zuchora, 2748 Meade St, Detroit, Mich. 48242.

QST 55 issues Feb. '31 thru Mar. '36—RCA review 55 issues '48 thru Mar. '61. Make offer. Geo. Smith, 915 Lovera Blvd, Antonio, Tex. 78201.

HQ 180A new HQ 100A new, B + W 5100SB all Set for S With factory modifications. J. R. Popkin, 134 Wheatley Rd, B ville, N.Y. 11545.

FOR SALE: Several new Mallory capacitors #HC5020A, 2000 50VDC will sell for ¼ Lafayette's price (506), or will trad goodies. A. Lewis, 3210 E. Mitchell, Humboldt, Tenn. 3834

SBE-33 mobile power supply. Shure Mike, mobil mount. Exce cond. $200. W. Sather, 10 Cristone Rd, Chemlsford, Mass. 01

WANTED: 5DEP1 oscilloscope tube. G. Baldauf, 175 Werner Blvd, Wernesvile, Pa. 19565.

DRAKE: TR-4 & RV-4 exc cond; one year old. $525. N. Neu 50-44 60th St, Woodside, N.Y. 11377.

SWAP: Collins 500 cycle mechanical filter, which plugs int 9' hole miniature socket and used in 75A4 receiver, for a si one of 800 or 1000 cycles. H. Hicks, 1911 Bermuda St, Sh port, La.

See page 126 for New Reader Ser

SNO ARC Hamfest, May 3, 4, and 5. Tropicana Motel, Fresno f. For info write Fresno ARC, P.O. Box 783, Fresno, Cal. 21. B. Bulbulian, 2735 S. McCall Ave., Sanger, Cal. 93657.

L-Trade tested 6080 untested 6528 tubes. New 3B28 tubes, for $5. G. Hubbell, 6633 E. Palo Verde Lane, Scottsdale, . 85251.

L OR SWAP NC-FB/7 Rcvr; 4.65, 4-250, 4D21, 4D32, P16549 es. What have you? Send sase for list. A. J. Savicky, 105 sery Lane, Lancaster, Pa. 17603.

144-W Converter. Ameco. 2m. Factory wired. Output 28-32mc; lly changed. Almost new. Instructions $30 ppd. J. J. Herro, 7 Pfingsten Rd, Glenview, Ill. 60025.

LICRAFTERS: SX-99 with Speaker. Sell or trade for CB trans- er. C. McGowan, 530 Burnett St, San Antonio, Texas 78202.

LINS KWS-1 for sale. (SSB) (CW) (1KW). 80 thru 10 Spare final ther tubes. Buy the Best. No shipping. H. M. Riddle, 2661 thwood, Toledo, Ohio 43606.

SET FM G151-A Receiver (new) $30. FM 100/W Base Station . Want: Bird #43 Wattmeter. W. J. Davis, 4434 Josie Ave, ewood, Calif. 90713.

ING AUCTION of the Rockaway Amateur Radio Club will be l Friday evening, April 26, 1968, at the American Irish Hall, ch Channel Dr. at Beach St, Rockaway Beach, N.Y. Come to best auction in the N.Y. area. For detailed directions write to Rockaway ARC, P.O. Box 205, Rockaway, N.Y. 11694.

SALE or Trade—Four 4E27's, several 4X150A, S38D Halli- ter receiver, Two pole transformers, 2200 volt and 2450 volt. le for Simpson 260 VOM, Johnson 250 Transmatch. Will ship ect. A. Been, 200 West Sycamore, Greenwood, Arkansas 36.

SALE: 25 New 22,000 MFD. 50 VDC Computer Grade Capaci- . $4 each. C. Vail, 2514 Bircr Dr., Richmond, Ind. 47374.

SALE: HQ-170 Receiver and speaker, mint cond, Factory re- ned, $150. Deliver 50 mile radius or FOB. R. Scott, 371 Clay- e Blvd, Cleveland, Ohio 44143.

ITED: Used Drake DC-3 mobile power supply in mint cond., cables. C. Brown, P.O. Box 600, Kane, Pa. 16535.

SALE: Factory-wired hunter bandit 2000 A, $275 Drake R-4A . Instruction book $1. L. Krenek, 211 Hillwood Dr, No. Little k, Ark. 72116.

ITED: PL172 or PL8295. State price and cond. A. Nuggl, Box Glen Ullen, N. Dak. 58631.

L: Collins 5Kw Coax relays $12 each. New Coax adapters LC l $6 ea.; Bud LP Filter 601A $7. Want Drake R4A Receiver. P. Bittner, 814 4th St. So., Virginia, Minn. 55792.

DE Delcon T210 PS210 for KWM2 or TR4 may consider other s. L. Stroup, 7320 Simpson La, Clinton, Md. 20735.

SALE: BWFC-15A, oil filled capacitors, 1.5 KV to 2.5 KV, -150A with sockets. Write for prices and other parts. L. chemann, P.O. Box 633, Regent, No. Dak. 58650.

P: Heathkit HW-12 for HW-32. Wanted: Heathkit HP-13 and 3 power supplies. M. Ludkiewicz, 143 Richmond Rd, Ludlow, s. 01056.

IT to exchange SP stamps (all year issues, new) for subscrip- to CQ. L. Koscobudzki SP5AFL. QRAR. Minsk Mazowiekki, Blonie 12 M 15, Poland.

P: Factory aligned Eico 753; SSB Xcvr 751 ac supply for SSB r. T. Dornback, 19 W 167 21st Pl, Lombard, Ill. 60148.

ITED: Misc old tubes pre '23. Telefunken EVN193, 194, Welsh Sodion S13, S14, D21, UV213, UV203, UV217, De Forest, 2, 3, 4, 5; DL 4, 5, 6, 7, 15. R. W. Schnedorf, 610 Monroe River Forest, Ill.

BAND Beam and Rotor $35. R. Henrich, 2928 Homewood Ave, Charles, Missouri.

ITED: Instruction Manuals for DZ-2 direction finder and for -1 transceiver. F. Chapman, 1367 Villa Rd, Birmingham, Mich. 08.

TECT Radio gear with a warning sticker that reads "WARN- PROTECTED BY LECTRONIC ALARM SYSTEM." Same as sup- d to commercial burglar alarm companies. 2" x 3½", yellow/ en vinyl applies instantly without water to windows in mobile or operating shack. Also ideal for the back door of your se or basement windows. Money back if not satisfied! 3/50¢ 5/$1.00, prepaid. Order today from: CESR, 4 Parish Court, ny Brook, N.Y. 11790.

AZINE Sale: QST, CQ, 73, most issues. 30¢ each 1952 to 5. Bill Hayward, WØPEM, 3408 Monterey, St. Joseph, Mo. 07.

TIMERS, please forward information on old QSLs. etc. you l from stations W1XM or 1XM. M.I.T. Radio Society, W1MX, 558, 3 Ames Street, Cambridge, Mass. 02139.

NTED—QST's—Last four issues needed to complete private ection. 1916—FEB., MAY, JUNE, JULY. Any reasonable price l. K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Wash- ton, L.I., New York 11050.

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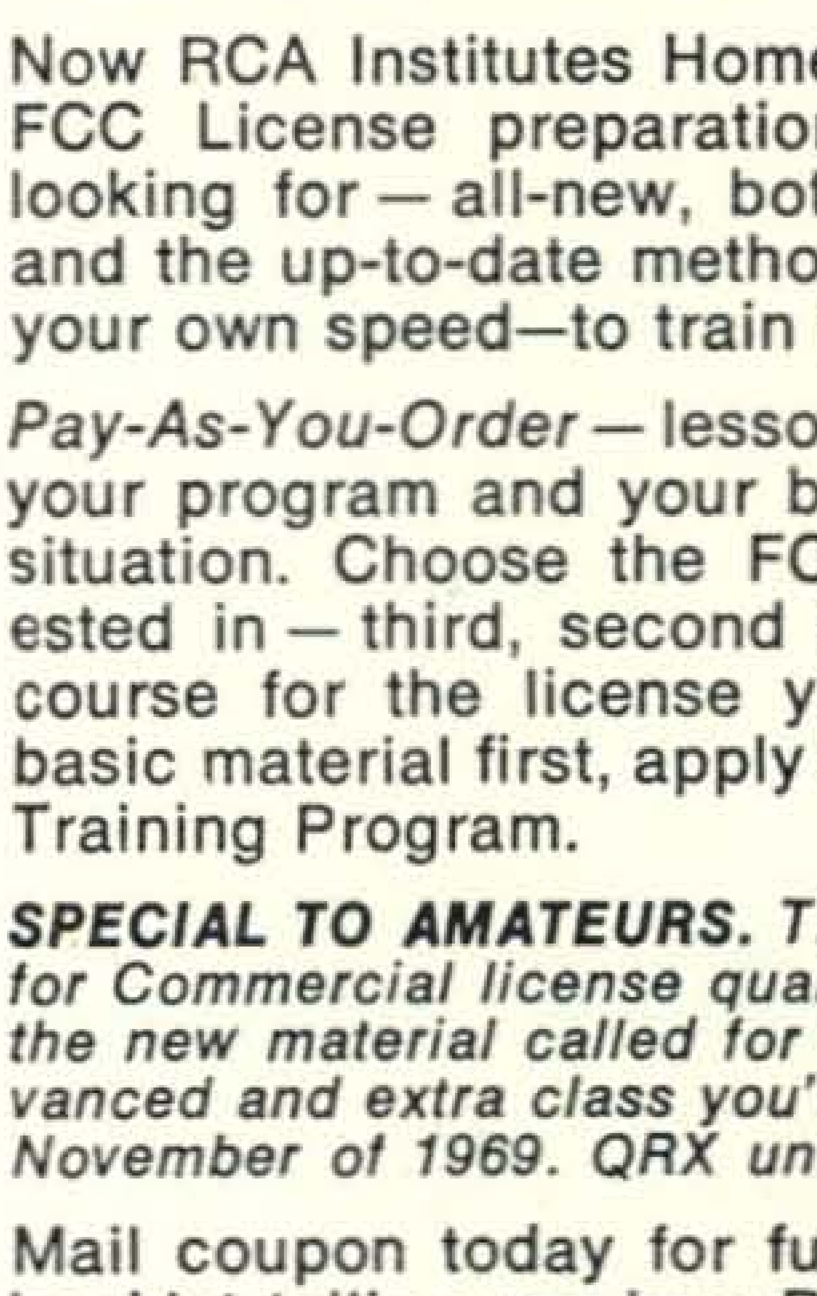

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e page 126 for New Reader Service

The Commercial Look [*from page 82*]

out is not as important on the rear panel. This doesn't mean they should be all crowded down in one corner, but should be neatly arranged and convenient from an internal wiring aspect as well as serviceable from the outside. For single wire feed-thrus, Switchcraft offers a wide variety of plugs and jacks with various insulating materials, suitable for use with a.c. as well as r.f. voltages.

Feet

There are several methods of making feet for the units. Figure 2 depicts several types all of the same basic design. The wooden dowel is turned down in the quarter inch drill, sanded and finished in a flat black. The head of an aluminum bolt is rounded to the correct diameter by filing in the same manner. A 6/32 bolt holds the feet together and onto the bottom of the unit. Toothpaste caps can also be used here for feet. Let your imagination wander, you'll be amazed what you can come up with that's usable.

Well that's it! It's a lot of work, but there is a feeling of satisfaction to the homebrewer, in knowing that his station looks as good, and works as good as "Joe Smith's" down the street, who has many dollars invested in commercial gear. The homebrewer earns a "dividend" that Joe doesn't—when Joe has equipment troubles he carts the rig off to the manufacturer or some other ham to get it fixed. He just can't seem to find his way thru the maze of wiring. The homebrewer built his maze, he knows every nook and cranny. The equipment is as familiar as the back of his hand. He has obtained through his building of the equipment precious experience and knowledge that cannot be obtained by any other means. ■

Propagation [*from page 93*]

may be caused by electrons and protons from space, which follow the earth's magnetic field lines and become "trapped" in the northern and southern polar regions. In some manner, not yet fully understood, these trapped particles are believed responsible for igniting the rarified gases that exist in the earth's atmosphere in the polar regions, causing auroral displays. During the 1968 expedition, which is believed to be the most comprehensive study ever made of the aurora, scientists hope to uncover much new data that may eventually unlock the secrets of the aurora. ■

See page 126 for New Reader Service

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Please send more information on your ads in the March '68 *CQ* keyed as follows:

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32	33	34	35	36
37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60
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73	74	75	76	77	78	79	Total Inquiries ☐				

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advertisers index

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WAN 250 6 Meter Transceiver......	(11.55)	$325.00
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ower Supply for Mark II Linear.......	(8.30)	235.00
17XC AC supply w/spkr. in cabinet........		95.00
4-117 12v DC supply w/Cable.............		130.00
05X MARS Oscillator - less crystals.......		45.00
06B Small Phone Band VFO..............		75.00
10C Full-Coverage VFO..................		95.00
10 6 Meter VFO.........................		120.00
X-11 Plug-in VOX.......................		35.00
SB-2 Selectable Sideband kit for 350C......		18.00
2 Dual VFO Adaptor....................		25.00
00 kc Calibrator kit for 350C..............		19.50
00kc Calibrator kit for 250................		19.50
C-2 Mobile Remote Control kit............		25.00
5 Swantenna – manual...................		65.00
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ustom Contour Bumper Mount.............		24.95
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OTE: Above are listed the "Standard - Everyday" wan Products — Below are listed some special urpose items.

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0XC 230v AC supply, speaker & cabinet....	105.00
-230 12v DC supply w/230v Basic........	140.00

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Milwaukee, Wisconsin 53216 C-3

I am interested in the following new equipment:

____

I have the following to trade: (what's your deal?)

____

Ship me the following New Equipment.

____

I enclose $________ I will pay balance (if any)

☐ COD ☐ 1 year ☐ 2 years ☐ 3 years

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☐ SEND YOUR NEW 1967 CATALOG.

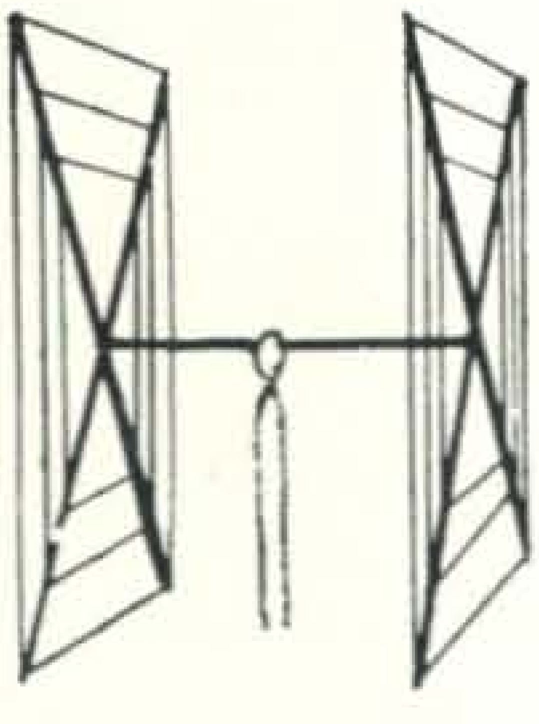
ee page 126 for New Reader Service

GOTHAM'S AMAZING ANTENNA BREAKTHRU!!

How did Gotham drastically cut antenna prices? Mass purchases, mass production, product specialization, and 15 years of antenna manufacturing experience. The result: The kind of antennas you want, at the right price!

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts... W3AZR CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!



10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16′ square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10′ long x 1¼″ O.D.; 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064″ diameter.

X Frameworks: Each framework consists of two 12′ sections of 1″ OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞″ tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

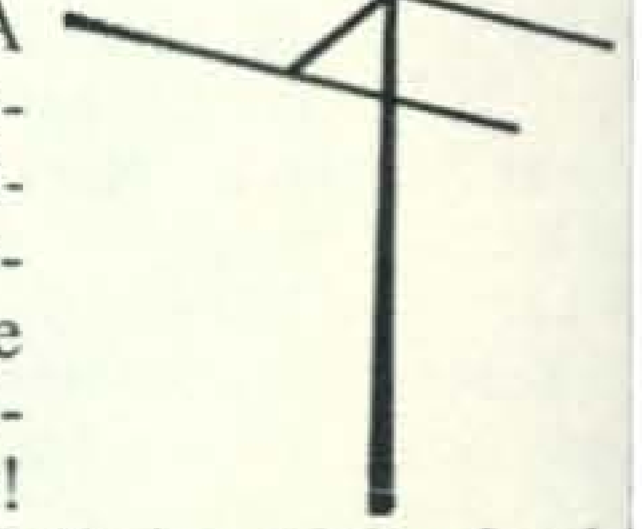
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$35.00
10-15 CUBICAL QUAD	30.00
15-20 CUBICAL QUAD	32.00
TWENTY METER CUBICAL QUAD	25.00
FIFTEEN METER CUBICAL QUAD	24.00
TEN METER CUBICAL QUAD	23.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 e ment Gotham beam (20 ft) I work YO4CT, ON5LW, SP9-ADQ, and 4U1ITU. THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36′ of tub for *each* 20 meter element, for instance); solutely complete including a boom and all ha ware; uses a single 52 or 72 ohm coaxial fe line; the SWR is 1:1; easily handles 5 KW; and 1″ alumnium alloy tubing is employed maximum strength and low wind loading; beams are adjustable to any frequency in band.

2 EL 20	$16	4 EL 10	$1
3 EL 20	22*	7 EL 10	
4 EL 20	32*	4 EL 6	
2 EL 15	12	8 EL 6	
3 EL 15	16	12 EL 2	
4 EL 15	25*	*20′ boom	
5 EL 15	28*		

ALL-BAND VERTICALS

"All band vertical!" asked one skep "Twenty meters is murder these days. Let's you make a contact on twenty meter phone w low power!" So K4KXR switched to twer using a V80 antenna and 35 watts AM. Her a small portion of the stations he work VE3FAZ, T12FGS, W5KYJ, W1WOZ, V ODH, WA3DJT, WB2FCB, W2YHH, V FOB, WA8CZE, K1SYB, K2RDJ, K1M K8HGY, K3UTL, W8QJC, WA2LVE, Y MAM, WA8ATS, K2PGS, W2QJP, W4J K2PSK, WA8CGA, WB2KWY, W2IWJ, V KT, Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked K IKN, KZ5OWN, HC1LC, PY5ASN, FG7 XE2I, KP4AQL, SM5BGK, G2AOB, Y CLK, OZ4H, and over a thousand other static

V40 vertical for 40, 20, 15, 10, 6 meters	$14
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18

HOW TO ORDER: SEND CHECK OR MONEY ORDER. WE SHIP IMMEDIATELY UPON RECEIPT OF ORDER BY RAILWAY EXPRESS, SHIPPING CHARGES COLLECT.

GOTHAM, 1805 Purdy, Dept. CQ, Miami Beach, Fla. 331

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