November 1967
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CQ

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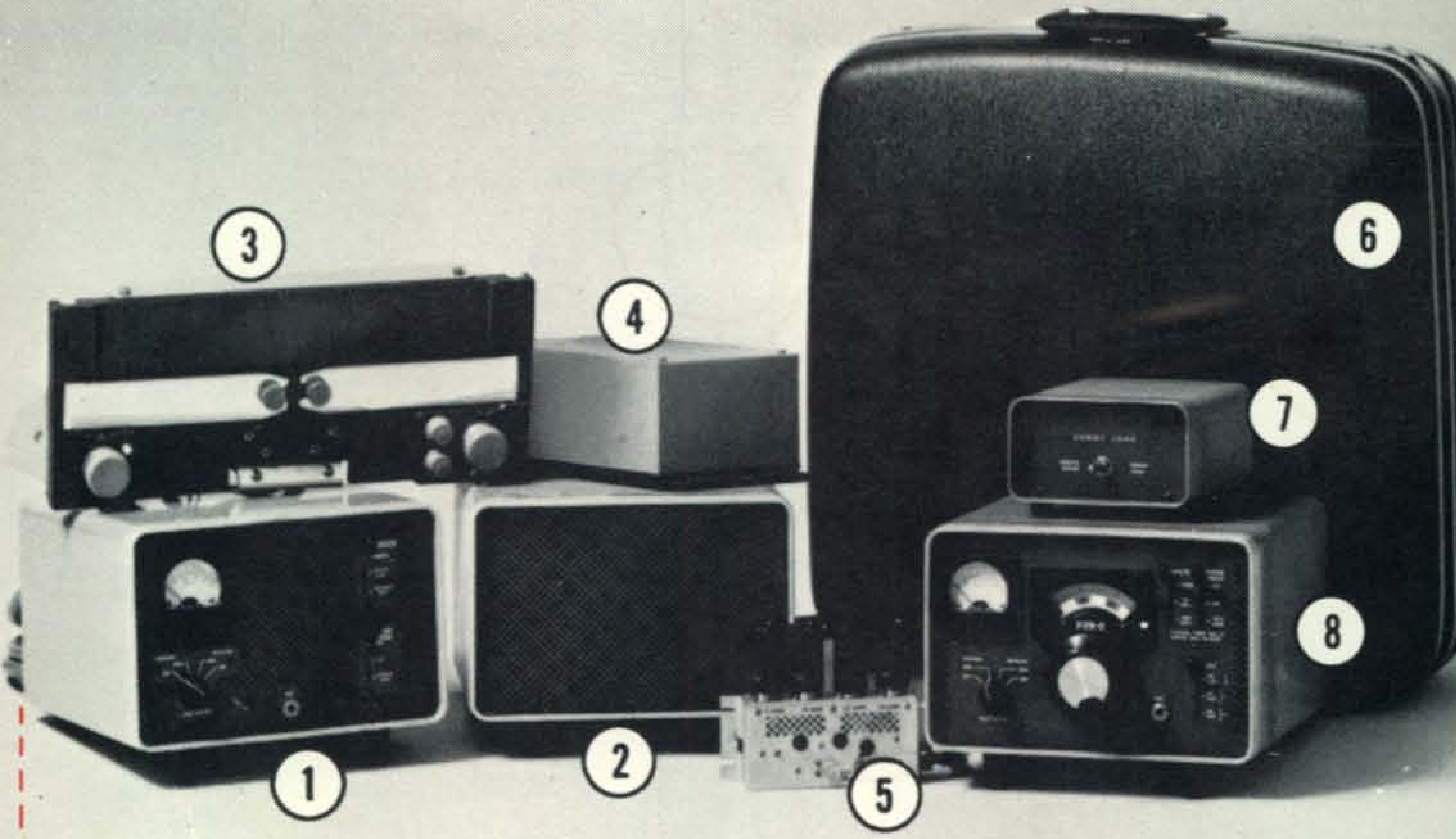
The Radio Amateur's Journal



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For further information, check number 25, on page 126

COLLINS

How to get into one of today's hottest money-making fields—*servicing 2-way radios!*

He's flying high. Before he got his CIE training and FCC License, Ed Dulaney's only professional skill was as a commercial pilot engaged in crop dusting. Today he has his own two-way radio company, with seven full-time employees. "I am much better off financially, and really enjoy my work," he says. "I found my electronics lessons thorough and easy to understand. The CIE course was the best investment I ever made."

More than 5 million two-way transmitters have skyrocketed the demand for service men and field, system, and R & D engineers. Topnotch licensed experts can earn $12,000 a year or more. You can be your own boss, build your own company. And you don't need a college education to break in.

HOW WOULD YOU LIKE to start earning $5 to $7 an hour...$200 to $300 a week...$10,000 to $15,000 a year? One of your best chances today, especially if you don't have a college education, is in the field of two-way radio.

Two-way radio is booming. Today there are more than *five million* two-way transmitters for police cars, fire trucks, taxis, planes, etc. and Citizen's Band uses—and the number is growing at the rate of 80,000 new transmitters per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Most of them are earning $5,000 to $10,000 a year *more* than the average radio-TV repair man.

Why You'll Earn Top Pay

One reason is that the U.S. doesn't permit anyone to service two-way radio systems unless he is *licensed* by the FCC (Federal Communications Commission). And there aren't enough licensed electronics experts to go around.

Another reason two-way radio men earn so much more than radio-TV service men is that they are needed more often and more desperately. A two-way radio user *must* keep those transmitters operating at all times, and *must* have them checked at regular intervals by licensed personnel to meet FCC requirements.

This means that the available licensed expert can "write his own ticket" when it comes to earnings. Some work by the hour and usually charge at least $5.00 per hour, $7.50 on evenings and Sundays, plus travel expenses. Others charge each customer a monthly retainer fee, such as $20 a month for a base station and $7.50 for each mobile station. A survey showed that one man can easily maintain at least 15 base stations and 85 mobiles. This would add up to at least $12,000 a year.

How to Get Started

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. Without quitting your present job, learn enough about electronics fundamentals to pass the Government FCC License. Then get a job in a two-way radio service shop and "learn the ropes" of the business.

2. As soon as you've earned a reputation as an expert, there are several ways you can go. You can move out, and start signing up and servicing your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you $5,000. Or you may be invited to move *up* into a high-prestige salaried job with one of the major manufacturers.

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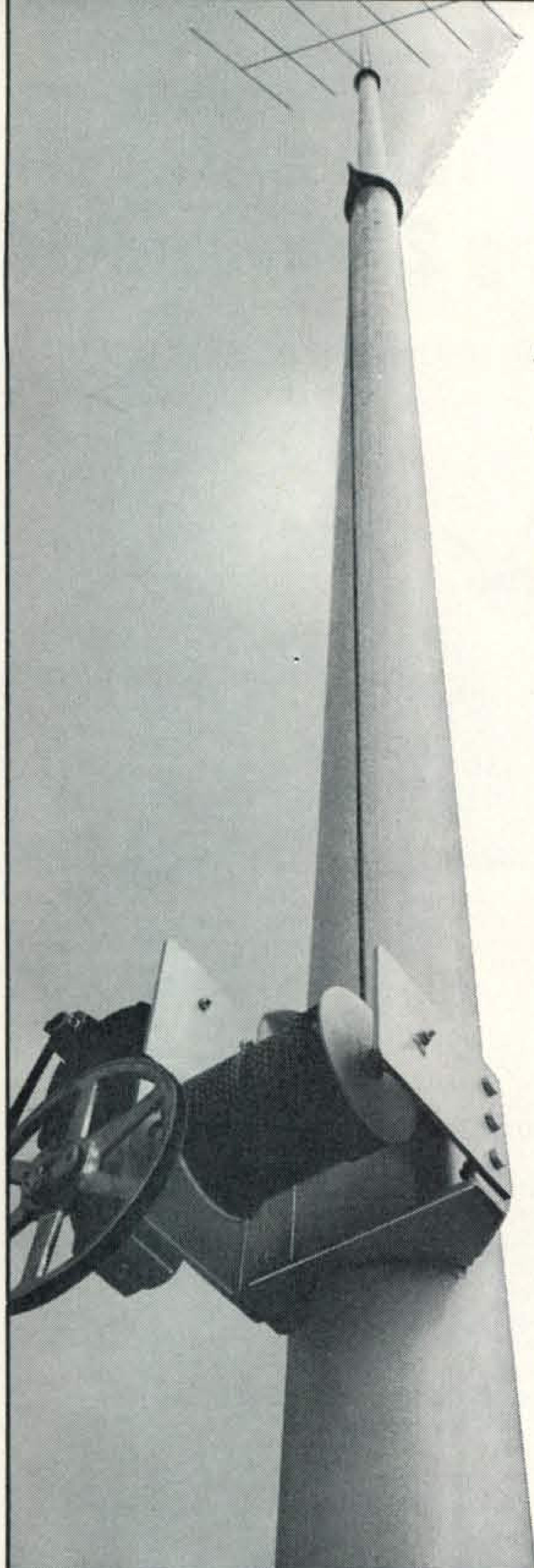

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CQ

The Radio Amateur's Journal

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ZERO BIAS

As this is written, over a month has elapsed since FCC released its report and order on Docket 15928, the Incentive Licensing proposal. As we all should know by now, the new rules, which take effect November 22, are less objectionable than were those proposed in Docket 15928, with several particularly sore points being handled by FCC in a fair and intelligent manner. Distinctive call signs signifying the class of license have been decided against largely because such a system is unworkable and would serve only to compound the error of the wayward amateur. The forty thousand Advanced Class licensees who comprise the "old-timers" in our ranks have been given due recognition by FCC in the form of privileges substantially more generous than those accorded the General Class licensee. No licensee is to be denied the use of all modes on all bands with only the stipulation that if he desires to roam *all* of each band with abandon, he must prove his superior technical prowess by means of increasingly difficult examinations.

We feel, after a month of reflection, that FCC has done nearly the best job possible with an almost insoluble problem—insoluble, that is, without treading upon someone's toes. We say "nearly the best" because in our opinion the treatment of the Novice license is incomplete and serves only to perpetuate an artificial barrier to many highly desirable would-be amateurs. The barrier, of course is that portion of the Rules and Regulations prohibiting from the Novice license any person who has previously held an amateur license. This includes even the old-timer ex-ham who may not have held a key for forty years. Are the best interests of the hobby being served by forcing a sixty- or seventy-year-old gentleman to immediately tackle the General Exam without giving him the same consideration that we accord to the youngster just starting out? Shouldn't he be entitled to go the Novice route if he so desires? And wouldn't it be a marvelous opportunity for our young Novices, too, to pound brass with a *real* old-timer who was there when it all began? We could certainly do worse.

On another related subject, we'd like to take issue with a statement in October *QST* which said "It [FCC] appears to have accepted the League's recommendations in essence, . . ." Now fellows, only time will tell if it is indeed desirable to seek credit for the origin of the new Incentive Licensing rules, but we're gambling that it is. With that in mind, we'd like to call your attention to a small historical inaccuracy in *QST*'s boast. At no time during the four long years of the Incentive Licensing furor did ARRL suggest, even remotely or in passing, that a split-band system be adopted. No, ARRL was on record in RM-499 (November 1963 *QST*) as favoring the *total exclusion* of General Class operators from the 80, 40, 20 and 15 meter Phone bands. On the contrary, it was *CQ*, in its March 1964 ZERO BIAS that outlined in great detail a divided band system identical to that finally adopted with only minor discrepancies. Come on now, ARRL, you've managed to wangle implied credit for everything from Hiram Percy Maxim's gun silencer to Project OSCAR. Do you need this, too?

Dropping the editorial "we" for a moment, it burns me up to see the history of amateur radio being re-written within the pages of *QST*. Is there nothing in this whole wide amateur radio world that happens because Joe Blow ham did something, or because *CQ* said something, or because Wayne Greene blasted someone, and *not* because of ARRL? Good grief, man, they even imply credit for the native resourcefulness and love of fellow man exhibited by each and every ham involved every time a hurricane strikes! I don't know about you, but I'm sick of "group think".

73, Dick, K2MGA

Earl Lucas, W2JT

FOR the second time in three months, tragedy has struck the North Jersey DX Association. On Sept. 23, Earl Lucas, W2JT, died of a heart attack. Earl was known as a first-rate DXer, and one of the most helpful and gentlemanly fellows ever to hold a ham ticket.

Our Cover

Hmm! Sure are a lot of thingamabobs in one of those new-fangled external-anode power tetrodes. We'll have much more to say shortly about these little giants of the communications industry.

OUR READERS SAY

The Colorful New *CQ*

Editor, *CQ:*

Just a few lines to let you know how much I like the many new changes *CQ* has made.

The four color covers and also color throughout really are great and make your magazine outstanding and more exciting to state it mildly.

Larger type and spacing make for better and easier reading, both important to me as a reader with limited time.

So keep up the good work—the future rewards will pay off.

To show that I appreciate your efforts in producing a better magazine I am renewing my subscription for 3 more years.

J. M. Arnold, W3LOR
Pittsburgh, Pennsylvania

Dear Dick:

Just a note to congratulate you and Cowan Publishing on the new "look" in *CQ*. The halftones are beautiful and the print and diagrams seem to stand out much clearer, which makes for easier reading. I note the overall size is about ¼ inch shorter, but that shouldn't matter too much.

Best of luck with future improvements in your excellent amateur radio publication.

Andrew C. Clark, W41YT
Editor, Florida Skip

Editor, *CQ:*

Have just received the September issue of your magazine, and would like to say I like it very much. I like the color, it makes things really stand out, and brings a lively and good contrast between different pages. All in all, I think you have done lots for the magazine.

Now please, *PLEASE* don't start this @?.+*)'-¼%& advertising with these inserts, like I have enclosed. They make a book or magazine practically impossible to flip thru, to leave open and lay down, to put open and work from on the work-bench. I know that advertising pays the way for our book, but lets keep it two dimensional, please.

Keep up the good work on all the other parts of the new *CQ*.

Frank Shacklett, W6MNE
Sunnyvale, California

Look at the brighter side, Frank. If the advertiser didn't supply you with that handy little card, you'd have to mangle your magazine to return a coupon. In your case, the solution is to simply remove any uninteresting inserts upon receipt of the mag each month. —*Ed.*

Editor, *CQ:*

What a change! Great new format. Larger type, more readable headlines—and the use of color is terrific. Keep up the good work.

Phil Delano, K3DUC
Ardsley, Pennsylvania

That we will, Phil, that we will! With the kind of enthusiasm you readers have shown towards the new *CQ*, we can't miss!—*Ed.*

September Editorial

Editor, *CQ:*

Congratulations on your very timely editorial in the September issue of *CQ*. It certainly must have provoked those connected with the incentive license issue as we got immediate action due to your urging.

Too bad you didn't print the article in September of 1966.

Gary A. Stilwell, W6NJU
Canoga Park, California

Aw, don't rub salt in an open wound, Gary. Anyone can make a mistake!—*Ed.*

SSB Filter for the 75A-4

Editor, *CQ:*

In your "Our Readers Say" column of August 1967, a note was made supposedly in correction of an article entitled "A 2.1 kc Filter for the 75A-4."

The writer (WA8ECQ) stated that the circuit shown in the original article by W1NBM (July 1967 *CQ*, page 24) was incorrect in that pin 1 was going directly to ground and would short out B+. This statement s not true. The circuit shown on page 24 of the July 1967 issue is correct as shown.

Some time ago I was informed by Collins that some very old models of the 75A-4 had dc coupling between the mechanical filter and the plate of V_5, but this practice was discontinued and corrected in most 75A-4's now in service. Apparently WA8ECQ never got the word.

E. Drozdick, W1NBM
Medfield, Massachusetts

Editor, *CQ:*

You had better tell your readers that if they expect to get the mechanical filter for use in a 75A4 (A 2/1 kc. Filter For The 75A4, July 1967, *CQ*) they will have to find some other source than the information in the article.

On August 16th I sent an order and a check, see letter enclosed, and today I got back a refund check with my order and a few other bits and pieces of paper, but no explanation of why I can't get the filter. Why can't an outfit like Lafayette hire somebody who can write a simple note, like, "we're out of stock", or, "no longer available".

I hope the filter will be made available from some other source, as I'd like to play with it.

Eugene A. Hubbell, W7EKE
Scottsdale, Arizona

Sad to say, reader Hubbell is correct. Lafayette has discontinued the 2.1 kc filter, but unofficially, the door is kept open for its return.—*Ed.*

Flowers for John

Editor, *CQ:*

The time has come to applaud your new DX column and its editor.

Finally, after many years of lackadaisical operation *CQ* has put someone on the job who seems to want to keep up with the awards and DX news.

Congratulations to you and a "keep it up, FB" to John Attaway.

Gay E. Milius, W4NJF
Norfolk, Virginia

P.S. I like your new format too!

W4NJF isn't the only reader happy to see John's DX column each month. Some two hundred appreciative comments have been received just these past six weeks alone, from the DX world! He must be doing something right!—*Ed.*

For further information, check number 5, on page 126

Feenix, Ariz.

eer Hon. Ed:

Boy oh boys! Hon. Fate are surely fickle. ike, most of the time you can't win for sing. When final amplifier toob blows, when o it blow? Right at start of dee-x contest, atchyourally. Or, at breakfast, when dropng buttered toast on floor, it falling, of oursely, butter side down.

Howsumever, once in a Hon. Blue Moon, ld Hon. Fate reversing itself, and you can't se for winning. Like take what happening Scratchi recently.

One evening Hon. Brother Itchi coming nto shack, sitting down, and making with onversayshun. It seeming he having problem nd he thinking maybe Scratchi can helping im. His problem, Hon. Ed., is that he losing oo many golf balls and he wondering if I an maybe putting little xmitter or somehing in golf ball so signal being sent out to elp locating it.

Hon. Brother Itchi are grate golf nut, and e having a sort of driving range on range n ranch. Every evening he taking bucket of alls and practising his slice.

After hitting bucket of balls, he having rubble finding them on the desert, on acct. tchi not hitting balls too straight. After few lays, he losing all the balls, and having to et another bucket-full.

Well, Scratchi never making golf-ball mitter, but are always first time for everyhing, I always saying. So, desiding to see what are inside of golf ball. Putting one n vise, getting hacksaw, and are taking golf ball apart.

Hon. Ed., that are not strickly true. Ackchewally, golf ball are neerly taking Scratchi apart. Hokendoke!! Hon. Ed., let me telling you as a frend, never, and I repeat, never, *trying* to saw thru a golf ball.

One moment you sawing down on nice nnocent golf ball, next moment WHAMMO!

are getting exploshun and hole room are filled with lots of bits of rubber, pieces of golf ball cover, and decibels of noise. What a mess. Scratchi are lucky he not get hurt.

I learning one thing reel quick-like. It being reel difficult to put xmitter in golf ball, especially as most of them filled with some liquid under pressure.

Howsumever, Scratchi not being licked on acct. he getting reel slicky idea. If can't getting radio signal out of golf ball, maybe can getting radioactive signals from them. So, I shipping cupple dozen golf balls to amchoor frend who working at atomic labotatory. He giving them shot of radioactive something or other, and shipping them back.

While this going on, Scratchi dropping in cupple surplus stores and picking up odds and ends of radiation detectors and assembling them, waiting for "hot" golf balls to arriving.

When they finely coming, I rushing with them into workship, and making quick test, but it are big disappointment. Oh, you can hear clickedty-click in earfones when golf ball are cupple feet away from detector coil, but if you are that close to golf ball, you should be able to see it, therefores not needing clickedty-click in earfones to telling you it are there.

I reporting to Hon. Brother Itchi that detector not having range, and he somewhat disappointed too, but saying maybe we ought to try mounting detector underneath Hon. Jeep, then he can driving over desert, and maybe finding some golf balls that buried in sand.

It taking me a week to getting everything fixed up, getting detector coil between front wheels of Jeep, and power run to radiation detector, and by that time Itchi are managing to lose most of the "hot" golf balls. So, one evening we desiding to try out golf-ball locater.

As Itchi are driving Hon. Jeep the mile or so to where he having his driving range, I sitting next to him getting detector all warmed up and reddy to go. Finely Itchi tells me to start listening, so I cranking up gain, and listening hard in earfones.

Like right away getting hundreds of clickedty-clicks. We getting out, looking for golf balls, but not finding any. Driving Jeep backwards, clicking stops. Driving it forward, clicking starting.

It taking cupple minutes for lite to dawn-

[*Continued on page 115*]

"The Supercalifragilistic Supersimplescope"

BY CHARLES R. TOWNSEND,* WA4DCN

If you have an urge to homebrew an oscilloscope, here is your opportunity. This one is a compact, simple and inexpensive 2" model. The vertical amplifier is flat from a few cycles to 100 kc. This won't put Tektronix out of business but it is a fine addition to the ham shack.

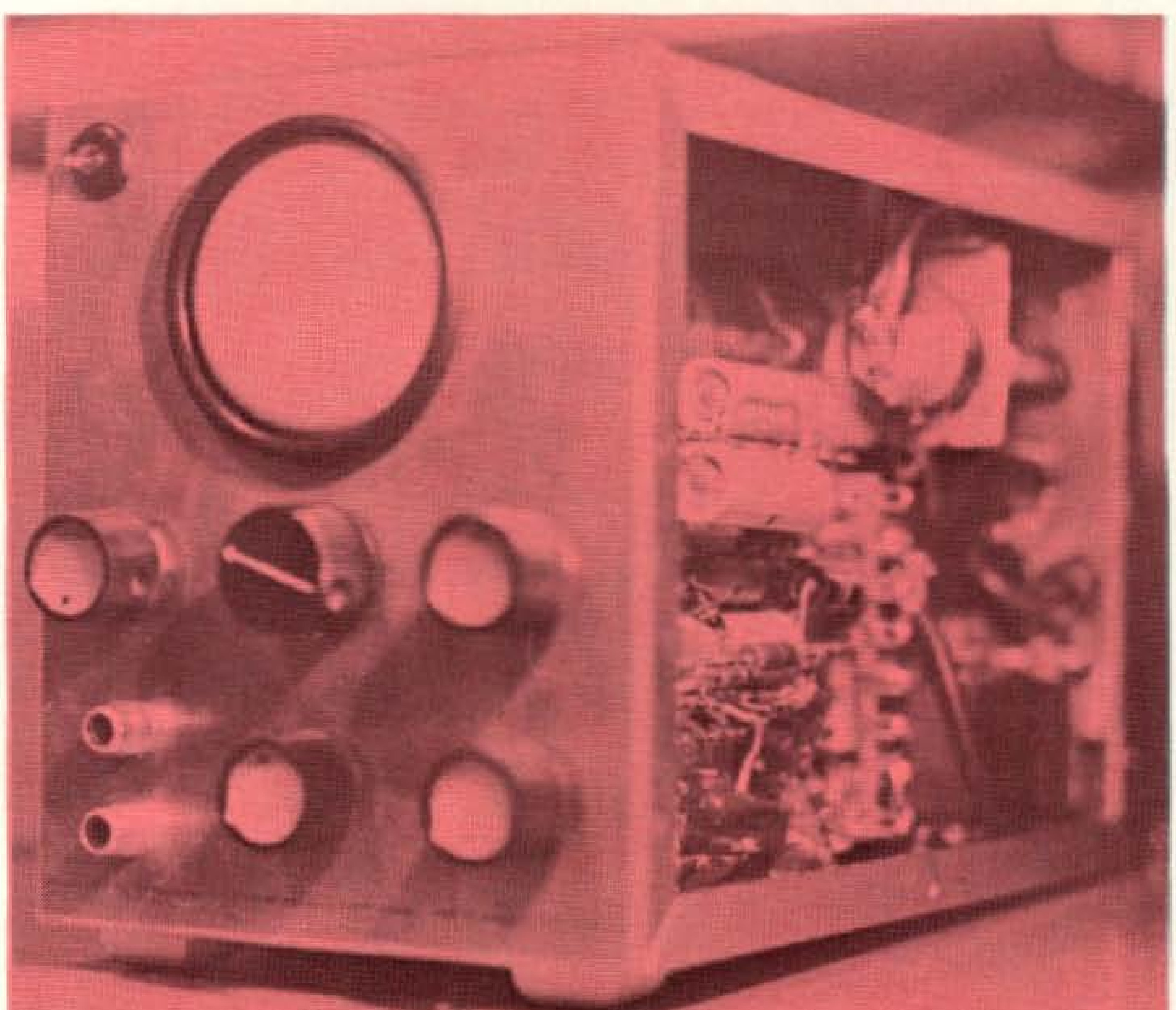
If you ever had a yen to build an oscilloscope, you probably discovered that construction articles about them are scarce. There is plenty of information available on scope theory and application—but just try to find a schematic for a simple, workable scope which doesn't involve a king's ransom in tubes and impossible-to-get special components. This article is an attempt to fulfill what I feel has been a long-standing need—a simple scope which practically anyone can build, and which works.

* 1232 Talbot Ave., Tallahassee, Florida 32203.

C.R.T.

The most important part of any scope is the cathode ray tube which, in this case, is a surplus 2AP1. The c.r.t. circuit is shown in fig. 1. Controls R_3 and R_4 provide horizontal and vertical centering. Potentiometers R_1 and R_2 control intensity and focus.

The c.r.t. filament is isolated from the rest of the filaments because the cathode of the c.r.t. is several hundred volts below ground potential. If the high voltage exceeds about 1000 volts, the filament transformer frame



Front view of the oscilloscope shows the controls. They are from left to right, top row, Vertical Gain, Sweep Frequency, Sweep Vernier; bottom row, Input Jacks, Horizontal Gain, Sync Amplitude. The On-Off indicator is in the upper left corner.

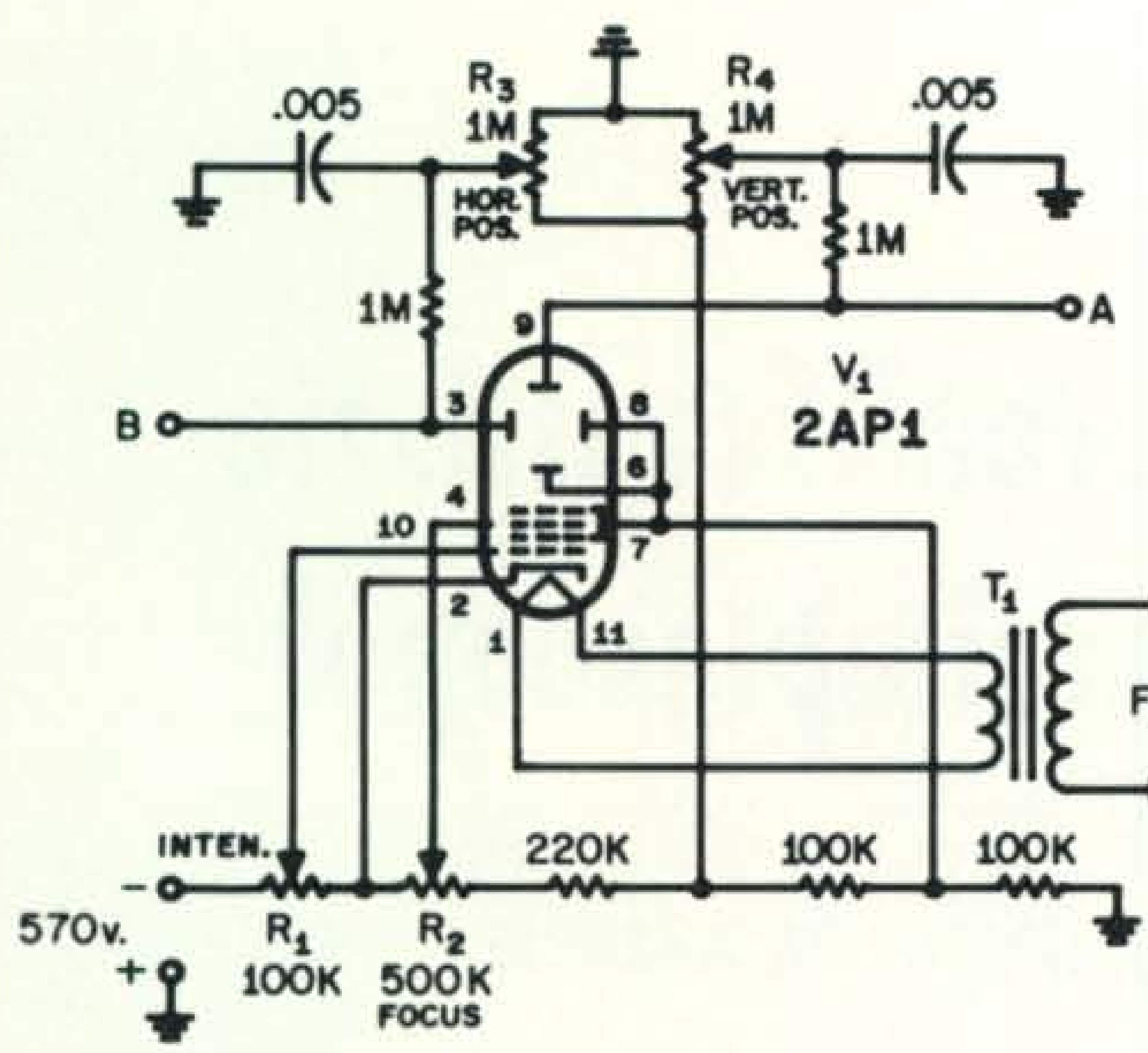


Fig. 1—Circuit of the c.r.t. and its associated controls. Transformer T_1 is rated at 117/6.3 v.a.c. with at least 700 volts insulation. Control insulation for R_1 and R_2 is discussed in the text.

should be insulated from the chassis to avoid insulation breakdown problems. Also, the focus and intensity controls should be insulated from the chassis, either with insulated washers or by mounting them on a strip of plexiglass or resin-impregnated fiber. Insulated shaft extensions should be used to avoid contact between the control and the chassis. A piece of quarter-inch wood dowel makes a good shaft extension.

Horizontal Tune Base

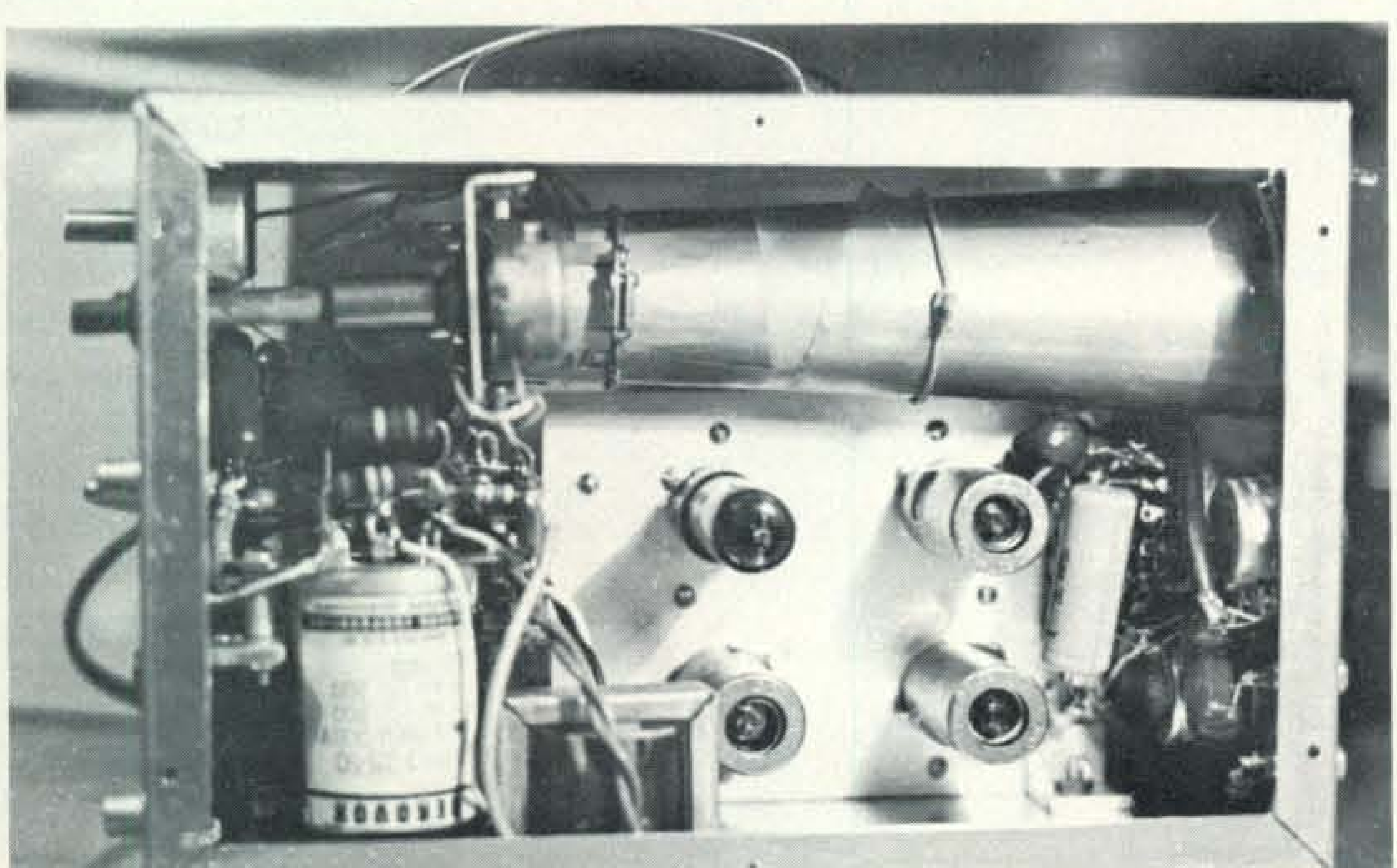
The electron beam, focused on the face of the tube, must be made to sweep horizontally across the tube for many applications. This is achieved with a sweep oscillator or time base generator. This can be as simple as a 60 cycle sinewave from a power transformer, but this causes the speed of the spot to change rapidly as it moves along, and it takes as long to return as it does to go.

A more satisfactory sweep is produced by a saw tooth wave generated by a simple NE-2 relaxation oscillator, a thyratron or a multivibrator. I chose the sawtooth sweep but rejected the NE-2 oscillator because there was no way to synchronize the sweep with the signal to be displayed. Another possibility was to steal the circuit of a Tectronix triggered multivibrator circuit, but this required a lot of tubes, components and space and, because of the desirability of a compact finished product, space was at a premium.

A lot of digging through a stack of old electronics magazines produced the circuit shown in the schematic of fig. 2, V_2, a modified Miller integrator circuit. It not only provides a sawtooth output for the sweep, but can easily be synchronized.

Synchronizing pulses are taken from the horizontal amplifier (fig. 4) and fed to the suppressor grid of the oscillator tube, V_2. For best results, the natural frequency of the oscillator is usually set just below the frequency of the wave form displayed. Then the arrival of a signal pulse from the vertical amplifier causes the oscillator to conduct prematurely, triggering the sweep pulse at just the right instant to display the observed signal on the screen as a stationary pattern.

Another handy and simple sweep circuit, fig. 3, is used in the Heathkit Monitorscope. It is a multivibrator circuit which can easily



View of the left side of the 2" oscilloscope shows the vertical amp, horizontal amp and horizontal sawtooth generator built on the upright chassis. The power supply is in the lower left next to the c.r.t. filament transformer. The power line toggle switch and fuse are mounted on the rear of the chassis cabinet. The vertical amplifier output jack is at th bottom of the rear of the cabinet.

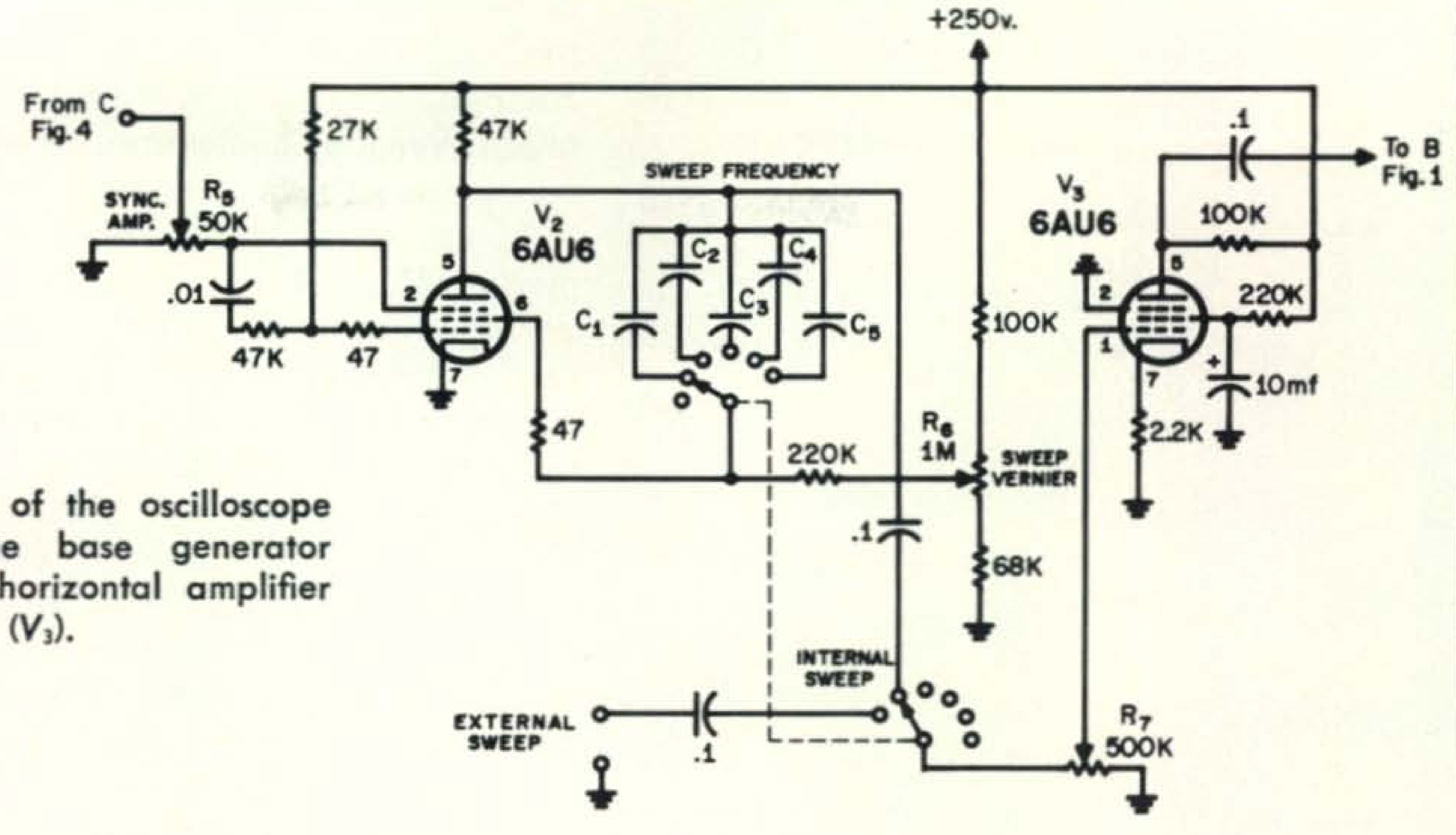


Fig. 2—Circuit of the oscilloscope horizontal time base generator (V_2) and the horizontal amplifier (V_3).

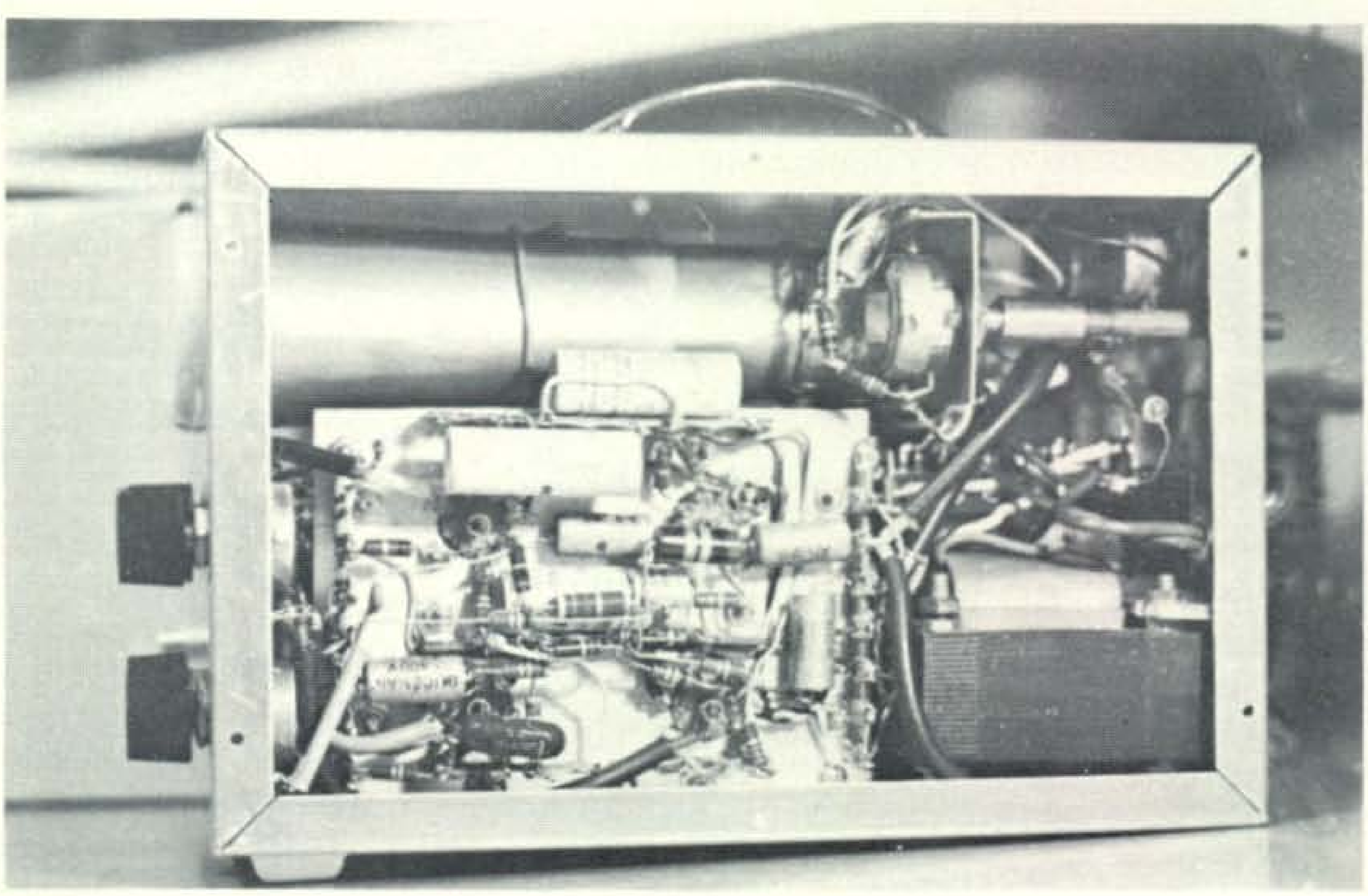
be synchronized by pulses applied to the grid or plate of either triode. The Heath circuit has no provision for sync but it can easily be added as shown, injecting the sync pulses on the pot, R_8, in the grid. The Heath circuit likewise makes no provision for changing the sweep range, but this is simple to accomplish by switching different values of capacitor into the cathode of the second triode.

Sync Amplifier

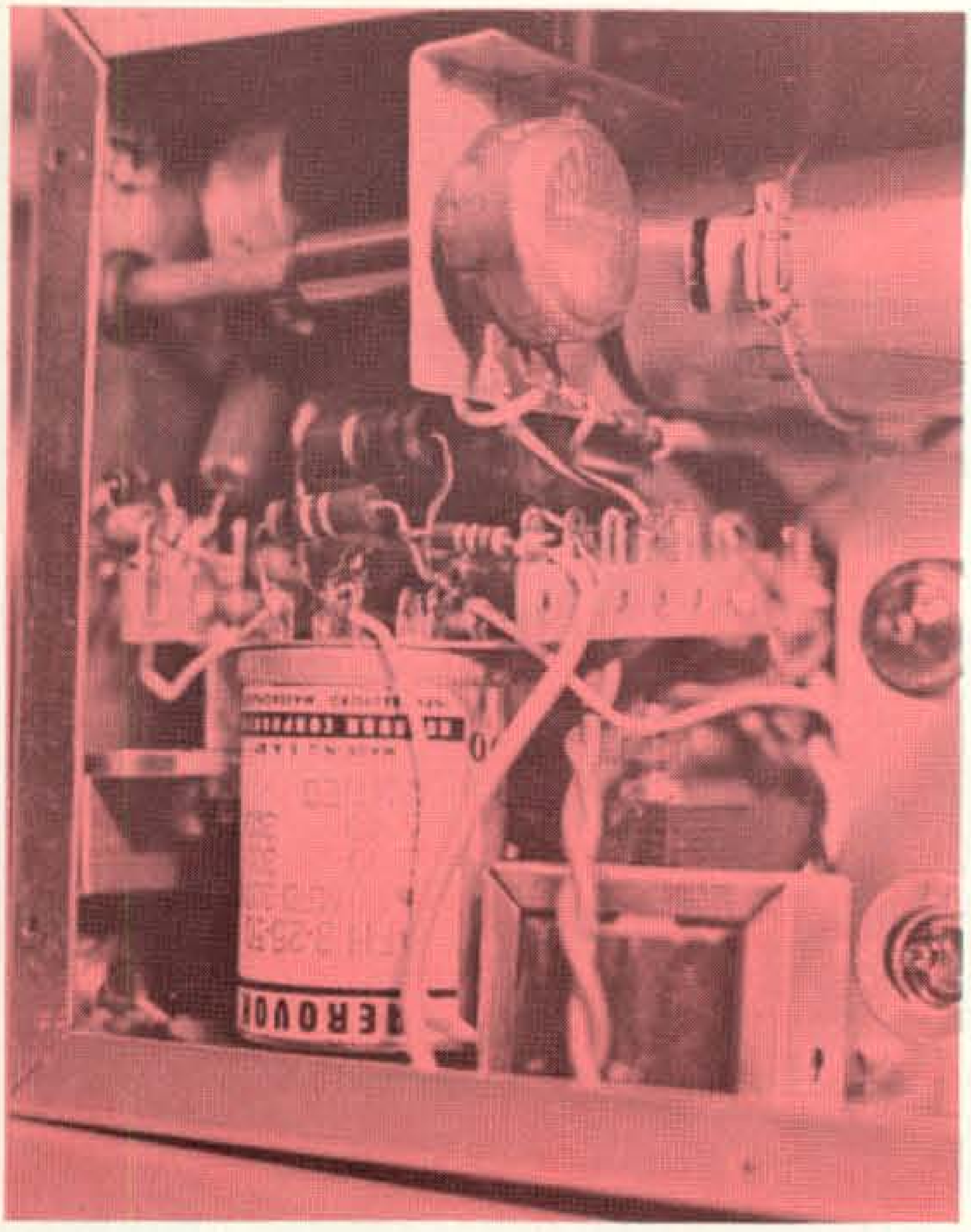
It is usually necessary to provide a sync amplifier (V_6, fig. 4). This is simply a resistance-coupled amplifier stage which serves both to isolate the oscillator from the vertical amplifier (V_4, V_5) and to provide larger amplitude sync pulses when weak signals are being viewed on the screen. (The sync amplifier was added to my scope after the pictures were taken. Space limitations produced the choice of a 6AK5 amplifier mounted on a Vector post.)

Horizontal Amplifier

The output of the sweep oscillator is not large enough to cause the beam to sweep all the way across the face of the tube, so an amplifier is necessary. This amplifier, V_3 in fig. 2. is resistance coupled, the input of which can be switched from the output of the sweep oscillator to a front panel jack for external signal sources. This was done with an extra pole on the range switch. It



View of the right side of the oscilloscope shows the bottom of the amplifier upright chassis. A centering control is on the c.r.t. mounting bracket and the Intensity control is on the rear wall of the cabinet.



Close up of the oscilloscope power supply corner shows one of the Centering controls mounted on the c.r.t. support bracket. The Focus control can be seen mounted on the rear cabinet wall.

is possible, of course, to provide a separate switch for this. Potentiometer R_2 controls the gain of the horizontal amplifier and hence the width of the sweep.

Vertical Amplifier

Signals applied directly to the vertical deflection plates of the c.r.t. will cause the beam to move up and down. The bigger the

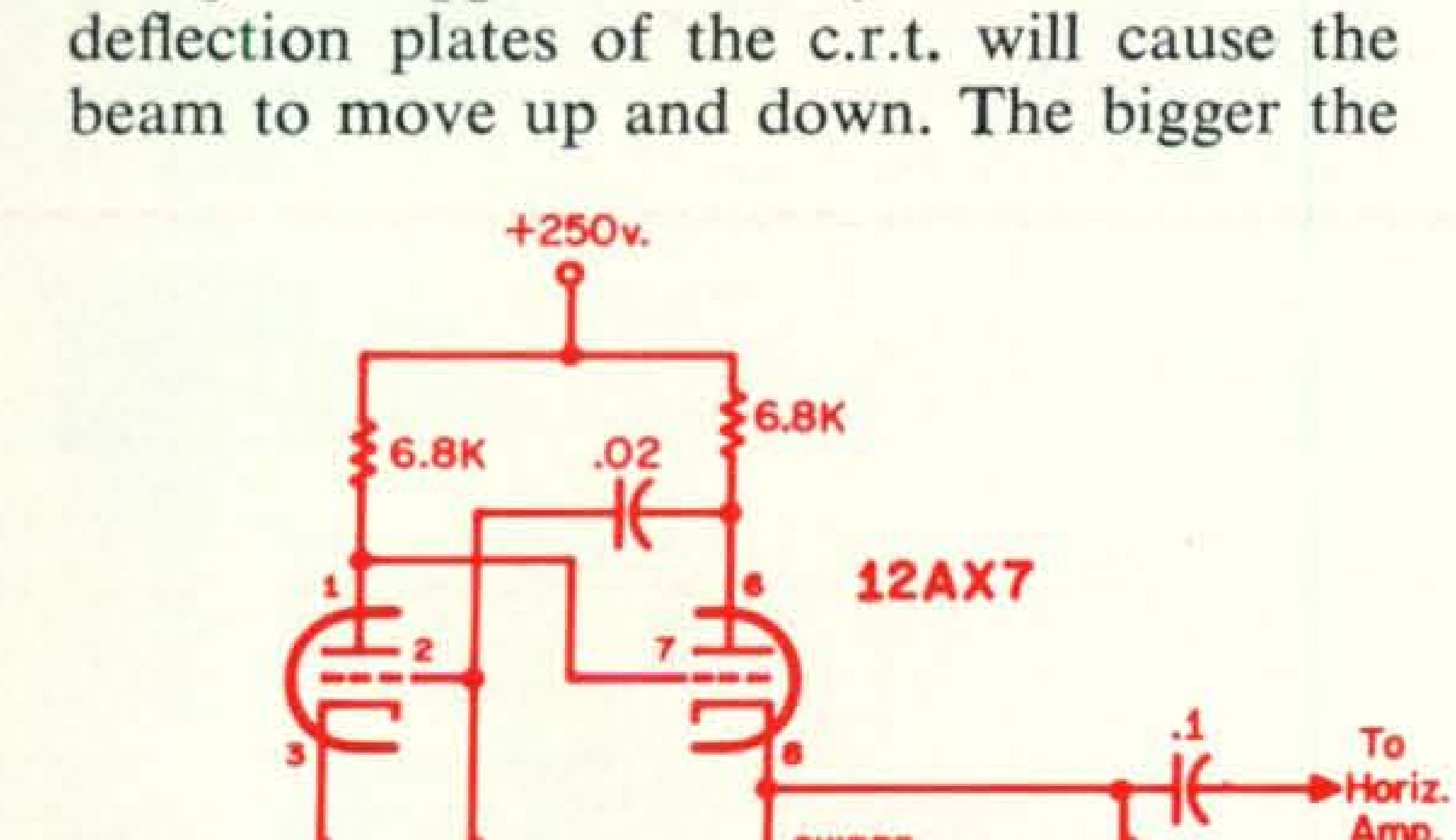


Fig. 3—Circuit of an alternate sweep oscillator described in the text.

applied signal, the greater the vertical movement. Many of the signals to be observed on the scope are of small amplitude, a small fraction of a volt, and they won't produce much vertical deflection. The answer, of course, is an amplifier.

In my scope, the vertical amplifier, comprising V_4 and V_5, is a medium gain resistance coupled circuit with a frequency response which is virtually flat from a few cycles to about 100 kc. The amplifier should be constructed as cleanly as possible, with short, direct leads. All ground connections should be made at one point to avoid troublesome ground loops. If shielded cable is necessary for a long lead, use low-capacity coax, not phono cable. Potentiometer R_{10} controls the gain of the vertical amplifier and thus the height of the display.

The output of the vertical amp goes to the vertical deflection plates and also to a jack on the rear of the scope cabinet. This provides a convenient means for monitoring the displayed signal on an external audio amplifier when desired.

Power Supply

The power transformer used was a 500 v.c.t. model which delivers 250 volts d.c. out of the filter. A current rating of 70 ma or more is desirable to avoid excessive heating and voltage drops in the transformer.

Diodes CR_1 and CR_2 form a full wave rectifier, while diodes CR_3 and CR_4 constitute a half wave voltage doubler which supplies —570 volts d.c. for the c.r.t. Handbook accelerator voltages are around 2 kv, but the use of a lower voltage gives greater deflection sensitivity, with no adverse effect on focusing or brilliance. The filter capacitors for the B plus supply are 40 and 80 mf units, chosen for maximum regulation and filtering.

Construction Notes

Having a two inch c.r.t., I decided to make the scope as compact as possible, and managed to pack everything into a 5 × 6 × 9 inch utility box. After a couple of hours operation, the scope tends to get rather warm, and for this reason I would suggest using a larger cabinet. Other c.r.t.'s will work too, but may require higher deflection voltages. If you find a c.r.t. with a high voltage connection on the side, simply build the scope as usual, but connect a positive voltage of a couple hundred volts at this

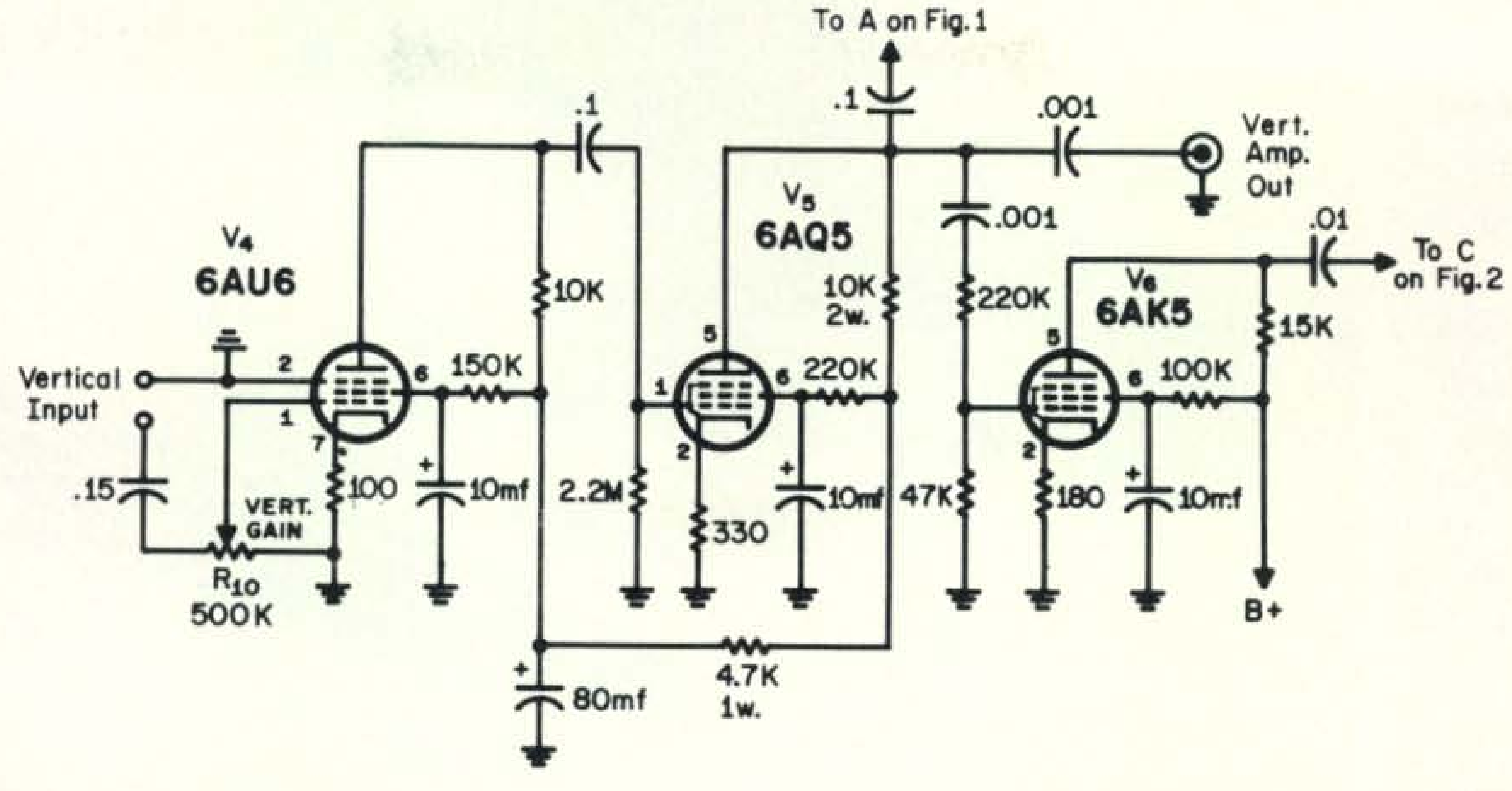


Fig. 4—Oscilloscope vertical amplifier (V_4 and V_5) and sync amplifier circuit (V_6). The vertical amplifier output jack is located on the back panel and is used to monitor the signal if desired.

point. If possible, get a magnetic shield to go around the c.r.t. Otherwise, locate all transformers as far as possible from the tube to avoid magnetic distortion of the beam.

Checkout

When you are reasonably sure that the wiring is correct, disconnect the B plus from the amplifiers and turn on the power. One should be able to focus the c.r.t. beam to a single spot and move it about the tube's face with the position controls. If you can't, check for shorts or wiring errors in the h.v. supply.

Now connect B plus to the horizontal amplifier, V_3, and sweep oscillator V_2. Advance R_7 and check for the presence of a horizontal line at all five settings of the sweep range switch. It should be possible to extend this line from one side of the other by adjusting width control R_7 and position control R_3 (fig. 1).

Connect B plus to the vertical amplifier and short out the input to V_3. There should be nothing but the horizontal base line, with no ripples. Advance R_8. The line should remain ripple free. If not, check for faulty power supply filtering or poor amplifier shielding.

Linearity

It is important to have the vertical and horizontal amplifiers as linear as possible. A non-linear vertical amplifier will clip the peaks of a sine wave off flat. A non-linear horizontal amplifier will clip the sawtooth wave and cause sweep and retrace problems.

To check for sweep linearity, connect the vertical amplifier's input to the horizontal amplifier's output. It should be possible to get a 45 degree line on the face of the c.r.t., with no curves on the ends. In my scope, a curve appeared only at minimum sweep speed. Otherwise, it was straight over the full range of the sweep oscillator, about 20 to 20,000 c.p.s.

The vertical amplifier can be checked by

[*Continued on page 118*]

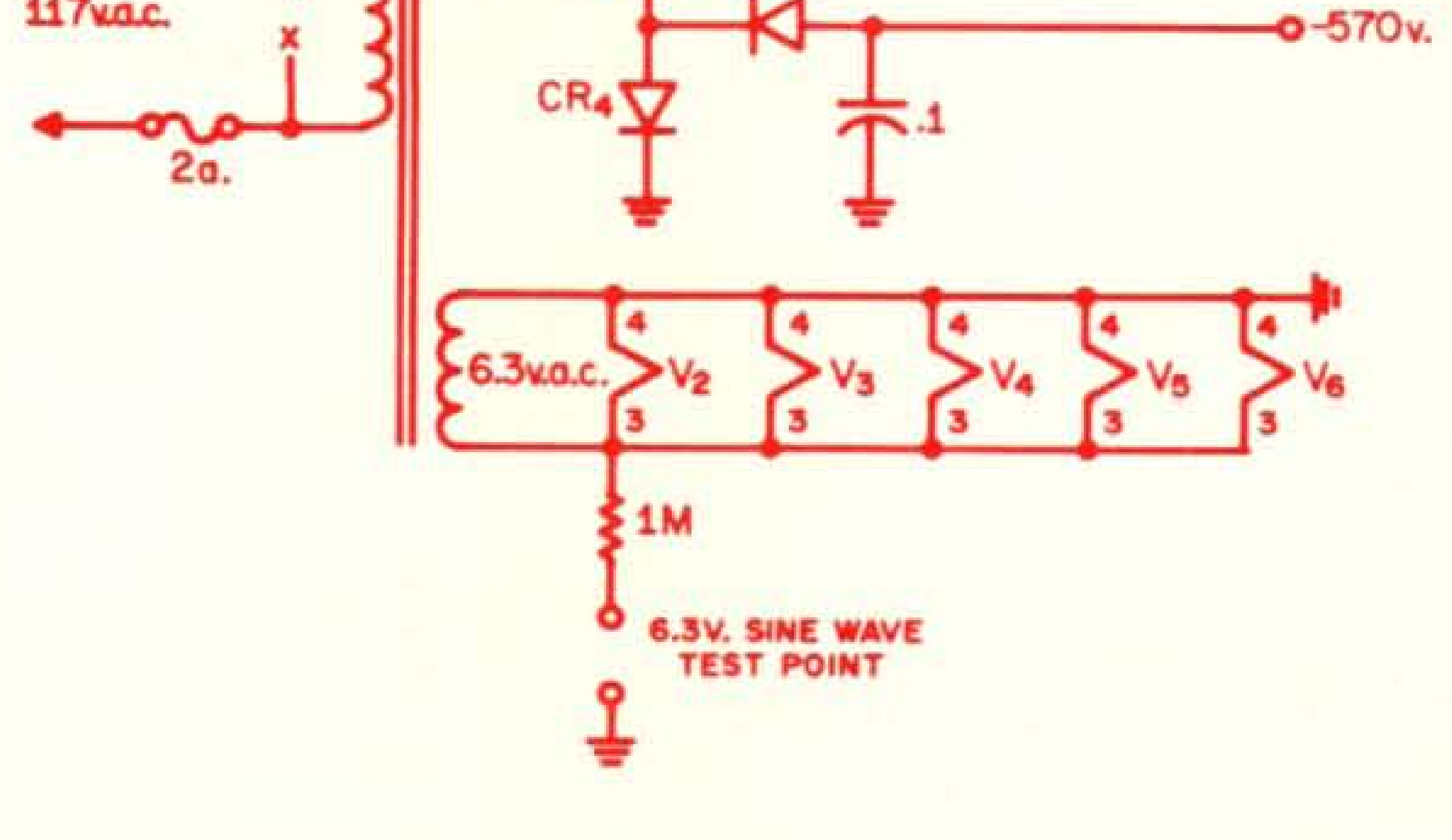


Fig. 5—Power supply circuit for the oscilloscope uses four diodes with an 800 volt p.i.v. rated at 750 ma. The current rating can be lower but not the p.i.v.

Laboratory test model of a subminiature integrated antenna one fiftieth the size of a conventional monopole antenna. Some experts claim it will perform the same for receiving as a full size ¼ λ monopole antenna. Photo courtesy of U.S. Air Force.

MINIATURIZED ANTENNAS

BY JOHN J. SCHULTZ,* W2EEY/1

Part I

This article presents, in two parts, a survey of both traditional and newly explored techniques to develop physically small, highly efficient antennas for both receiving and transmitting purposes. Part I deals with receiving antenna systems including integrated or so-called "active" receiving antennas. Part II, to be presented in a later issue, deals with transmitting antennas.

Through the use of semiconductor devices, notably integrated circuits, radio equipment is started on a developmental pathway such that in a number of years the housing size for a piece of equipment will be governed more by the necessity to provide sufficient panel space for various tuning knobs rather than by the necessity to provide sufficient space for the electronics within the enclosure. More and more attention is now being paid to a parallel development of efficient, miniaturized antennas for use with future equipment.

A reduction in antenna size to the point where antenna and equipment space requirements and cost are more equally proportional to the communications gain each provides, has been the proverbial "pot of gold" at the end of a rainbow for many professional researches in industry and government. This is true as well for many amateurs interested in antenna experimentation. It is certainly a contrary situation that a relatively few dollars invested in an amplifier stage, either in a receiver or transmitter, can produce a multifold signal gain but much more space and generally more money must be expended to produce relatively small signal gains from antenna systems. Various new ideas in antenna system design are starting to narrow this difference, however, and the next few years should produce some notable advance in the long stagnant field of reduced size high-frequency (3 to 30 mc) antenna systems.

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One factor that has probably hindered and confused many people in their thinking about antenna systems is the reciprocity idea. That is, an antenna used for receiving will perform the same as when it is used for transmitting. To state it in another common but very erroneous way, a good transmitting antenna makes a good receiving antenna. While it is true that under idealized theoretical conditions an antenna will exhibit the same response when used either for transmitting or receiving purposes, the practical situation is very different from the theoretical one on which reciprocity is based. In practice, an antenna used for receiving not only has induced in it the desired signal but various other signals and noise. An antenna used for transmitting is used to radiate only the signal fed into it and in this mode other external signals of much lower magnitude do not affect antenna performance. Receiving and transmitting antennas must be considered separately if it is desired to optimize the performance for each mode. Since this part of the article is concerned primarily with receiving antennas, perhaps the first area to explore is what the function of a receiving antenna should be. The question may sound simple but it really is not. Certainly, the function of a receiving antenna is to pick up signals but, how much signal? The more the better?

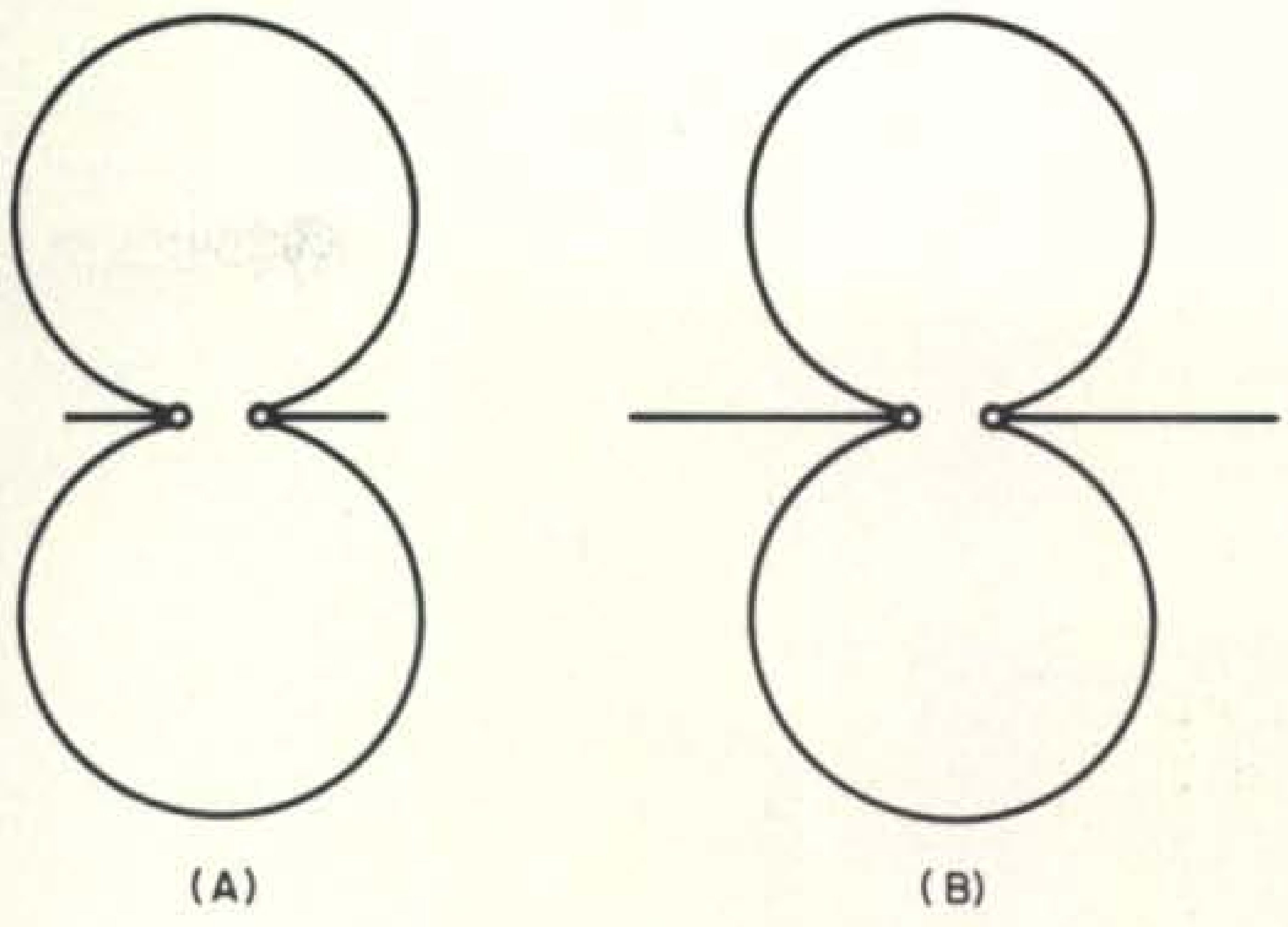

Fig. 1—Directivity pattern of 1/10 λ dipole (A) is essentially the same as that of ½ λ dipole (B). Directivity value, being defined as maximum response/average response, is 1.5 for short dipole and 1.64 for ½ λ dipole.

Function of A Receiving Antenna

An antenna cannot be considered as an item alone but as part of a receiving system. After all, the end result of the antenna-transmission line-receiver chain is whether weak signals can be heard. If the receiving system is not considered as a number of related parts, one may easily spend money improving one part of the system while less money spent on another part would have produced the same overall improvement or end result. The saying about a "chain being as strong as its weakest link" may be a bit trite and elemental to mention here, but nonetheless, one too often sees an amateur invest in expensive, low-loss transmission line or an expensive preamplifier (which makes all signals sound louder but doesn't allow any weaker ones than before to be heard) when a simple antenna matching circuit might have done just as well.

In this short article, it is not possible to explore all the facets of receiving systems. However, a brief review of the receiving process is useful. First of all, any receiver has an inherent noise level which determines the weakest signal level which it can detect. This noise level is best expressed by the noise "factor" or "figure" of the receiver and is contained but not explicity expressed by the receiver sensitivity figure. For most receivers, the first r.f. amplifier stage determines this figure for the entire receiver. For the types of modulation and conventional detector systems used by amateurs, this simply means that signals entering the receiver with a level below the receiver self-generated noise level will not be heard and those entering the receiver with a greater level than the receiver noise will be heard. How much the input signal has to be above the receiver noise to be "intelligible" depends upon the mode of transmission. For c.w. it may have to be only several times higher; for voice contacts it may have to be 10 to 100 times higher. From 160 meters to 15

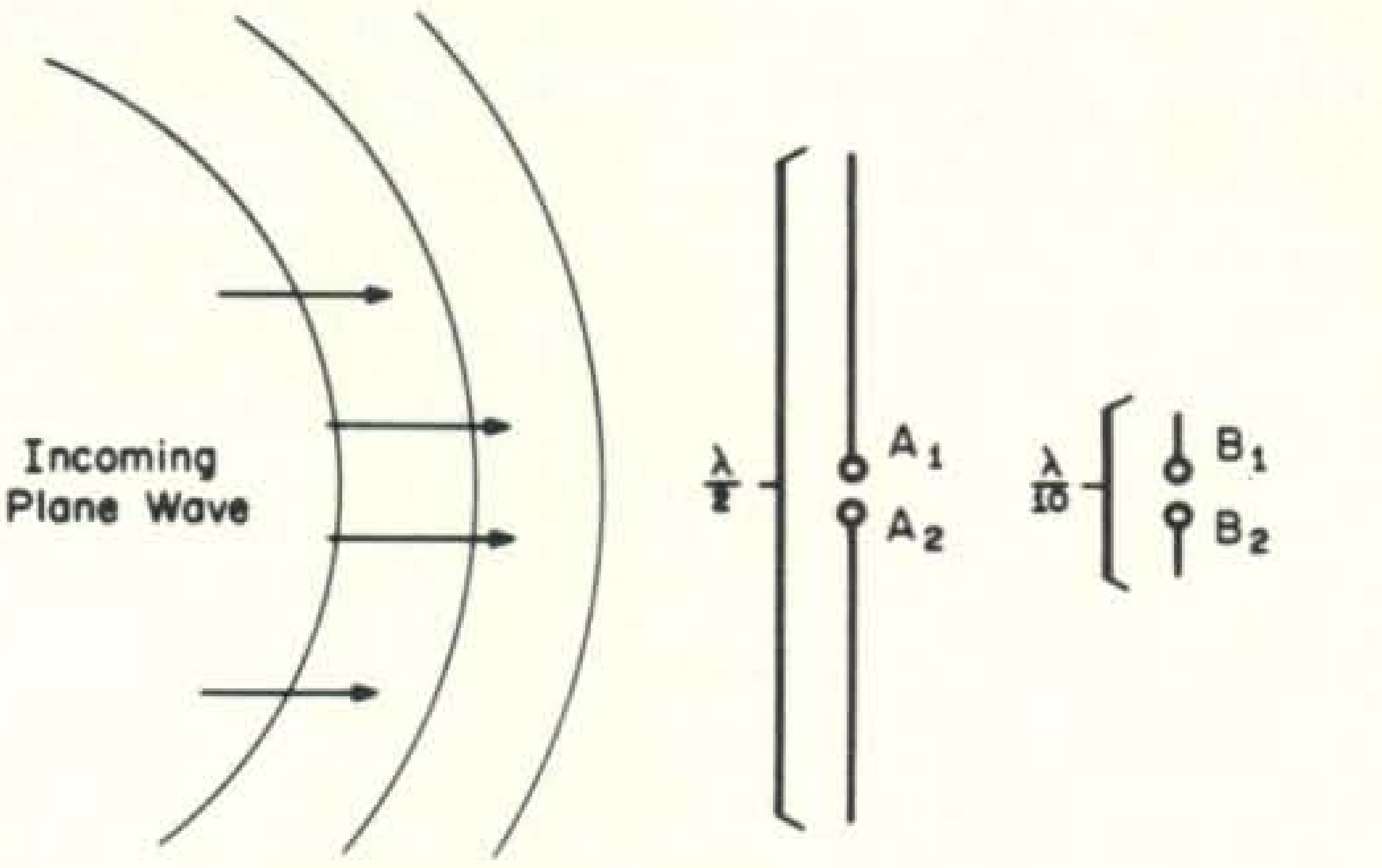

Fig. 2—The signal power available from the terminals B of the 1/10 λ dipole is almost exactly the same as that from the terminals A of the ½ λ dipole.

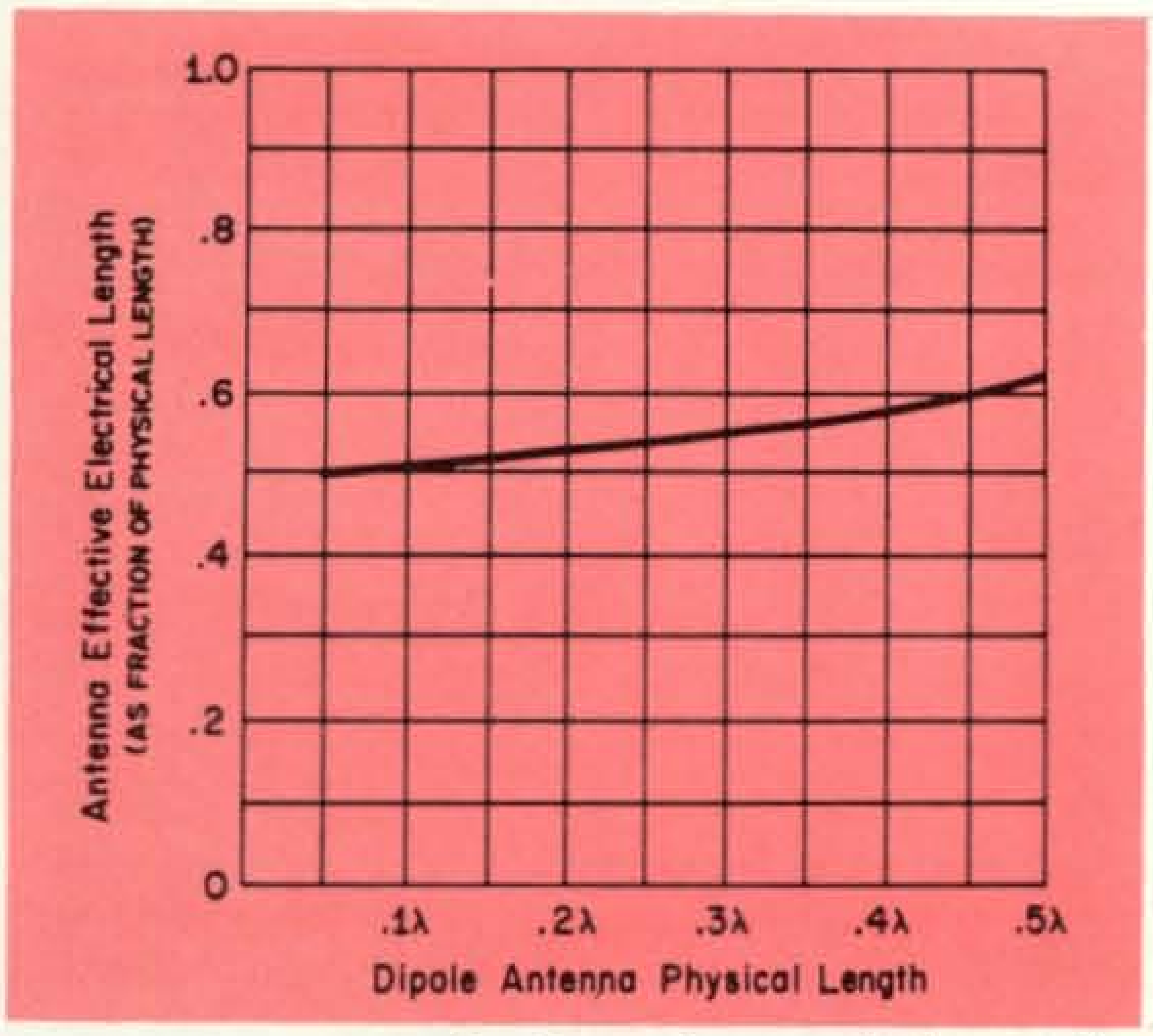

Fig. 3—Even as a dipole is shortened drastically, its effective electrical length remains almost the same fraction of its physical length. Induced voltage decreases as antenna is made shorter (equal to field strength in microvolts/meter times effective length in meters) but power remains almost the same since radiation resistance also decreases.

or perhaps 10 meters, the atmospheric noise level is generally high in the most populated areas of the world and the signal level has to be above this noise level also as both enter the receiver from the antenna, or else atmospheric noise will mask the desired signal. An antenna system must, therefore, only pick up sufficient atmospheric noise to overcome the receiver noise for the receiver to detect the weakest signal possible. The larger the antenna system beyond this point, the more atmospheric noise will be picked up in the same proportion as the desired signal and no improvement in reception will result. More signal and noise will be picked up and the receiver output will sound "louder" but no weaker signal detection improvement will result! The less the receiver internal noise, the less the antenna pickup required to achieve an atmospheric noise limiting condition. For a good 80-10 meter receiver this can mean, in practice, an 8 to 10 foot piece of wire matched to the receiver with an antenna coupling unit.

Above 10 meters (or 15 meters in quiet locations) atmospheric noise levels decrease quite rapidly. The receiver noise level becomes the limiting factor in weak signal reception and as these can be brought down quite low with both tube and semiconductor r.f. amplifiers, further increases in antenna signal pickup over a wider range result in actual improvement in weak-signal reception.

Therefore, for best reception at the lower frequencies there might well be more value per dollar gained by investing in better performance receiving equipment while at higher frequencies the lower cost of antenna system performance improvement versus receiver improvement might suggest better value by concentrating on improvement in antenna systems.

Even though an 8 to 10 foot long piece of wire may suffice to produce an atmospheric noise limiting condition on weak signal reception with a good 80-10 meter receiver, a more elaborate antenna system for reception purposes may be desirable. It should be appreciated, however, that further signal pickup, once the atmospheric noise pickup exceeds the inherent receiver system noise, will produce no improvement in weak signal detection capability.

Gain and Directivity

Gain and directivity are related but are not necessarily the same. In a perfectly lossless antenna they are the same but, in practice, the directivity of an antenna may remain quite high while its power gain is very poor. A dipole much shorter than ½ λ made of very thin wire is an example. Its response (maximum at right angles to the line of the wire and minimum off the ends) is the same as a full size ½ λ dipole. See fig. 1.

Directivity is more useful for reception than gain assuming the antenna at least picks up enough atmospheric noise to overcome the receiver system noise. In practice, this means that many amateurs who have a fine transmitting dipole and suffer with all sorts of QRM on receiving might well be better off to use a small, separate receiving antenna, such as a dipole or loop, which can be oriented as necessary to help reduce QRM. Under extremely quiet atmospheric noise conditions, there is real value to an elaborate receiving antenna equaling the best transmitting antenna but for a great deal of operation on the lower frequency bands where contacts are lost because of QRM rather than weak signals, one can easily be using "too much" antenna for receiving purposes.

Antenna Pickup Versus Size

The foregoing remarks were necessary to establish some general background as to the functions of a receiving antenna. However, the whole subject of achieving an efficient, miniaturized antenna is dependent upon what happens to the amount of signal an antenna intercepts as its physical size is made smaller. Surprisingly little difference occurs. Various terms are used to measure how much signal voltage or power a lossless antenna develops when it is placed in an electromagnetic field of given strength. One term used is effective area. That is, the signal power an antenna picks up is equal to its effective area times the power per square meter contained in the transmitted wave. For instance, assume a transmitted wave arrives with 1 microwatt per square meter on 10 meters. The power extracted from the wave by a ½ λ dipole and short 1/10 λ dipol are:

(½ λ dipole)
$W = 1\mu$ watt/sq. meter
$(0.13\,\lambda^2) = 13\,\mu$ watts

(1/10 λ dipole)
$W = 1\mu$ watt/sq. meter
$(0.125\,\lambda^2) = 12.5\,\mu$ watts

There is essentially no difference in the signal power available from the 16 foot dipole as compared to the 3.2 foot long dipole (fig. 2).

Another similar term often used to express the same idea is effective length. Given a certain field strength, say 1 microvolt per meter, the signal voltage available across the terminals of an antenna is this 1 microvolt times the effective length of the antenna (in meters). As fig. 3 shows, the effective length changes very little as the electrical length of a dipole becomes extremely shortened. The 1/10 λ dipole makes available at its terminals essentially the same signal voltage as the ½ λ full-size dipole.

The above results assume a lossless antenna and actually this is not hard to approximate for a receiving antenna since the currents induced by an incoming signal are relatively small. The use of small diameter rod even for an extremely short receiving antenna, takes care of essentially any loss due to conductor currents.

Coupling To A Small Antenna

The above facts regarding the signal available from small antennas has been realized since the early days of antenna study. The "rub" comes in how to match a transmission line to a very short antenna so the signal

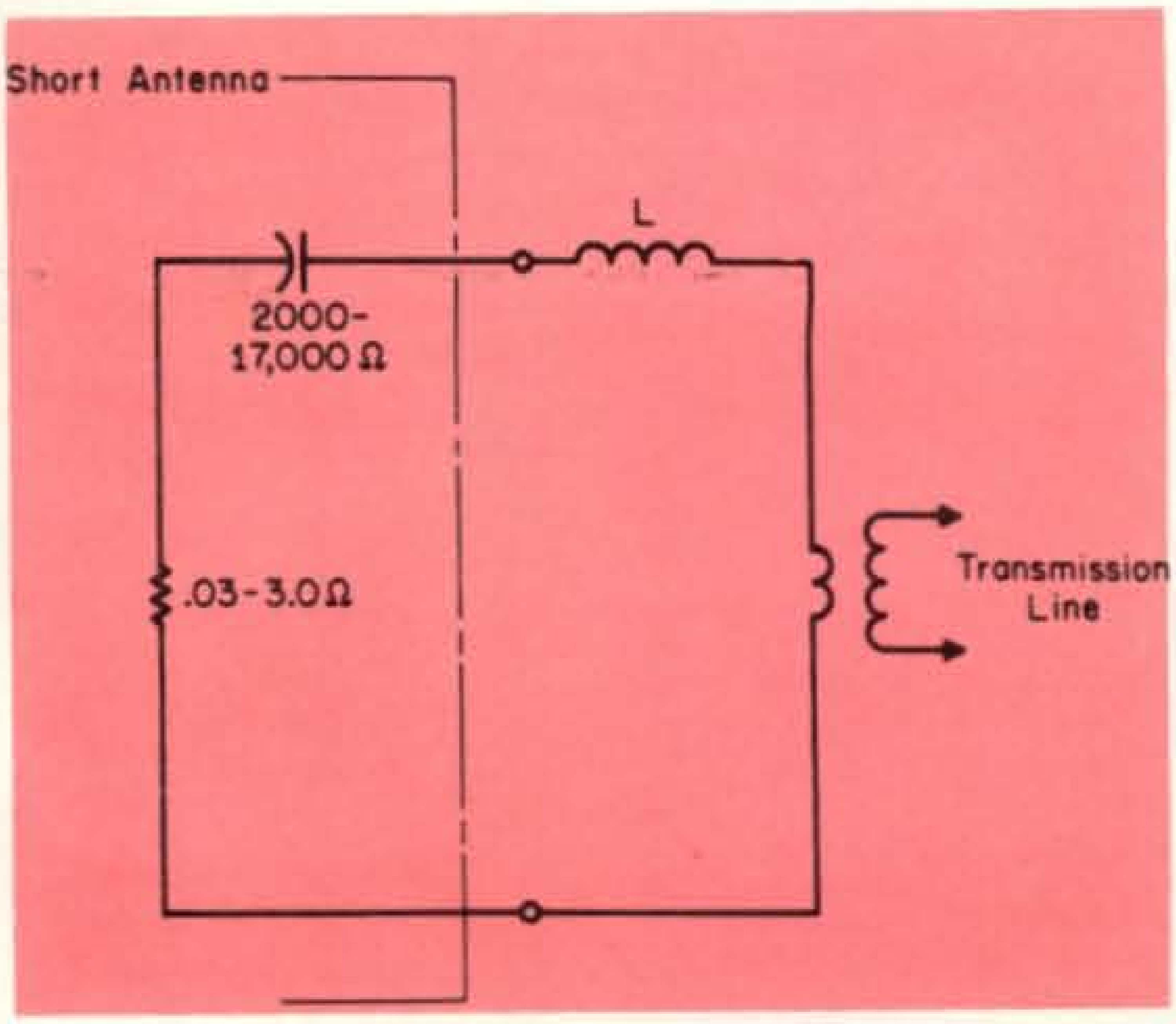

Fig. 4—Essential problem in matching impedance of short antenna (represented by a low value of radiation resistance and high capacitive reactance) is to nullify capacitive reactance by means of inductance L and provide a load, transformed to transmission line value, to match the radiation resistance. Either passive or active devices have been used to perform this function. Typical values of R and Xc for the short antenna, as shown above, are for a 4′ to 6′ dipole for 80 to 10 meters.

picked up can be efficiently transferred to a receiver. A very short antenna (assumed essentially lossless) presents at its terminals the equivalent of an extremely low resistive impedance component and an extremely high capacitive reactance impedance component. (Fig. 4.) For maximum power transfer from the antenna, the resistive component must be matched and the capacitive reactance cancelled by an equivalent value of inductive reactance.

An antenna coupler can perfrom this function when carefully adjusted to the antenna impedance conditions presented at a particular frequency. Since in the receiving case, relatively small currents are involved there is only a small loss in the antenna coupler components (mainly the inductor). The improvement obtained by using a coupler of ordinary design with a short antenna can be quite significant. For example, a 16 foot rod on 80 meters is connected directly to the 50 ohm input of a receiver. If the same rod were connected to the receiver via a good coupler, a 25 to 30 db increase in signal transfer could result. The selectivity provided by the coupler will also be useful in improving the rejection of image and other spurious response pickup. The main disadvantage of this arrangement is that the antenna coupler must be care-

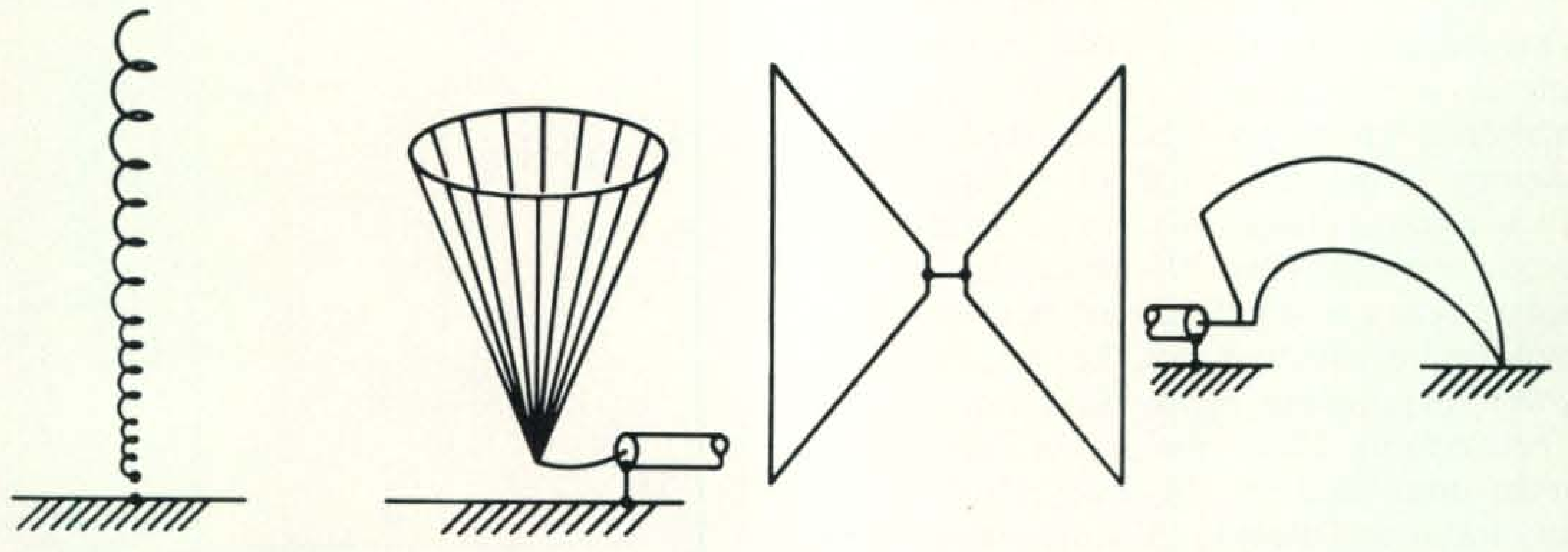

Fig. 5—Helicals, cone, bowtie and scimitar as well as other shapes provide varying degrees of constant antenna terminal impedance over broad frequency ranges.

fully tuned for a specific frequency and the tuning becomes more tedious and critical as the antenna is made shorter.

By now one should realize what the ideal antenna would be like: extremely small but with a terminal impedance which is largely or all resistive so it can easily match and transfer its signal pickup to a transmission line or receiver. Throw in the requirement that it should do this over a very wide frequency range and one really would have the ideal receiving antenna.

A great deal of research has been directed towards achieving this goal starting back in the late 1800's! This research dealt mainly with altering the form of an antenna so it would be as small as possible over a wide frequency range and still present as constant a resistive terminal impedance as possible (fig. 5). Marconi experimented with a form similar to a "discone" antenna in 1901, Lodge with a "bowtie" antenna in 1897 and Birkeland with a helical shape in 1894. Research today still continues strongly with the Scimitar shape being one of the most promising. These antennas are useful for transmitting purposes because they present a constant impedance over a wide frequency range with good efficiency but still they are large compared to 1/10 or 1/20 λ dipoles which still would be smaller physical structures for receiving purposes. Since the 1/10 or 1/20 λ dipole or rod still picks up as much signal as a ½ λ structure the ideal remains a 1/10 or 1/20 λ structure which can efficiently couple its signal output to a transmission line or receiver.

Active Antennas and Antenna Devices

Active devices can be used in a number of ways to improve or modify antenna performance. A mast-mounted vacuum tube or semiconductor preamplifier does not really modify antenna performance although they can be useful in many cases to improve reception. Such an amplifier is essentially equivalent to putting the r.f. amplifier stage in a receiver up at the antenna. The effect of transmission line loss is reduced, the effect of external interference noise on the transmission line is reduced and if the preamplifier has a lower noise figure than the receiver with which it is used, the overall sensitivity of the receiving system is improved. However, an active antenna device actually modifies the properties of the antenna. Such devices fall into two categories: those that actually form a part of and are integrated with the antenna structure and those which couple the antenna structure into a transmission line (or directly into a receiver).

One example of a device which couples an antenna into a transmission line might be an antenna coupler directly at the base of an antenna which is remotely tuned using varactor diodes. The short antenna can then be located conveniently away from local interference sources and still its pickup will be efficiently transferred to a transmission line. The disadvantage to such an arrangement is that the coupler must be retuned for each frequency used. A potentiometer coupled to the receiver tuning control can be used to supply tuning control voltage to the diodes over the transmission line so the antenna coupler is always tuned in step with the receiver.

Another approach on which research has been done involves using the reactance effects of semiconductors to match the highly reactive impedance of a short antenna. The resistive component of the antenna impedance can be matched and transformed to a higher value suitable for coupling to a common transmission line by means of a broadband transformer. Depending on the semiconductor characteristics, matching may be achieved over a broad band of frequencies without any tuning being required. The semiconductor may also provide signal amplification at the same time but this introduces the problem that the noise figure of the amplifier must be less than that of the receiver to achieve the maximum amount of receiving system sensitivity. In a sense, a semiconductor is used to perform the dual function of antenna coupler and preamplifier simultaneously. If an array were built up from several individual antenna elements each with a semiconductor coupler/amplifier, the phasing of each could be controlled remotely by setting d.c. control voltages for each semiconductor and remotely controlled antenna pattern selection could be achieved without any mechanical rotation being necessary.

Active antennas differ from the foregoing in that a semiconductor device is actually part of the antenna structure, not something that is placed at the antenna terminals. One early attempt at such a structure placed a mixer diode in the center of an antenna. Local oscillator signal was fed to the antenna via a transmission line, signal frequency conversion took place directly in the antenna and the intermediate frequency was fed down the same transmission line (fig. 6A). The great advantage of such a system at microwave frequencies was that the high transmission line loss which normally would occur if the incoming signal frequency were fed down the transmission line was avoided. Other semiconductor devices were tried which would simultaneously perform some impedance matching function to a short antenna and signal frequency conversion.

Another somewhat more recent type of antenna using an internal semiconductor element was recently publicized. Only an inch or two high and fitting in a man's palm, it is capable of the same signal pickup as a full-size whip on v.h.f.-u.h.f. frequencies. The semiconductor element in this antenna is used to electronically amplify the effect of a small capacity top-hat loading such that the impedance at the base of the antenna is essentially that of a regular full size antenna and signal pickup can be efficiently transferred to a transmission line over a broad band of frequencies without the need for any matching devices at the base of the antenna. Other experiments have been aimed at using semiconductors to electronically replace inductive loading of an antenna structure to achieve a similar effect. By such means, the electrical effective length of an antenna can be made to be 20 or more times its physical length.

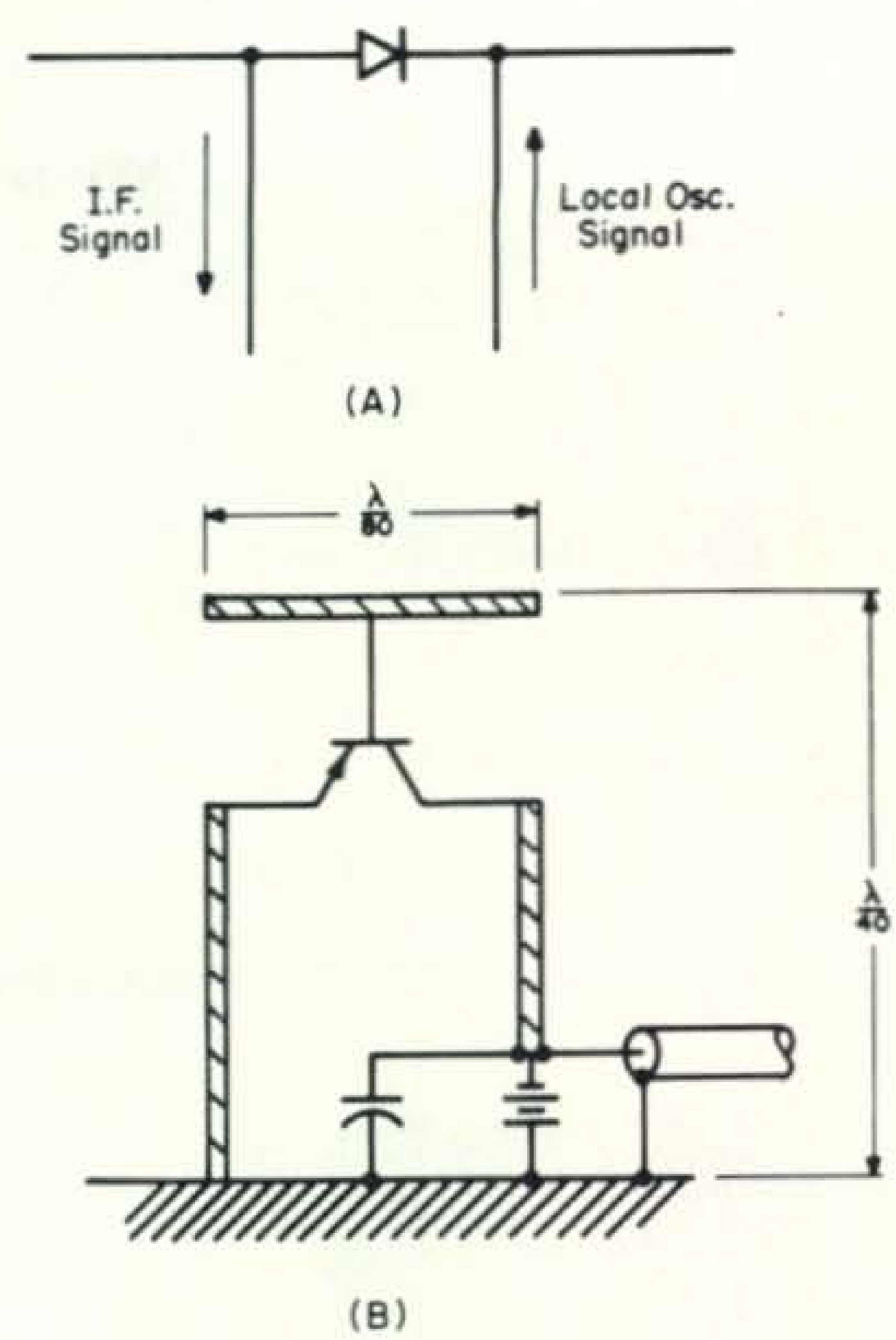

Fig. 6—Two forms of antenna which use internal or integrated active devices. Mixer diode is used at (A) as part of antenna. The top hat capacity is electronically multiplied by the beta of the transistor shown as part of the antenna at (B).

Conclusions

The use of semiconductors, particularly, has opened up many new ideas for antenna research. However, they have not altered any of the basic properties of antennas but rather allowed the practical utilization of properties which were known already. Receiving antenna systems have particularly benefitted from such research because the low signal levels involved allowed the placement of semiconductor devices in various positions, internal and external to an antenna structure, a situation that is not possible with transmitting antennas as yet.

The application of various of these developments to amateur radio systems remains to be explored. Not all of these developments really have any applicability

[*Continued on page 120*]

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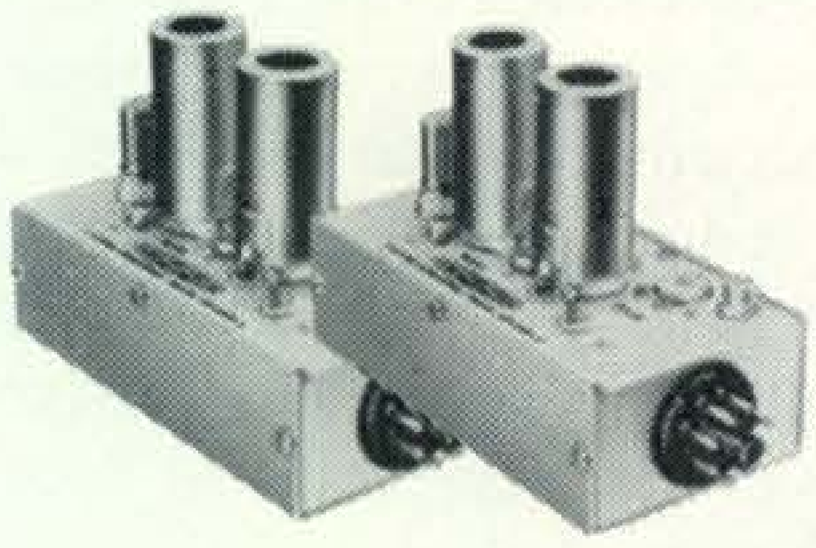

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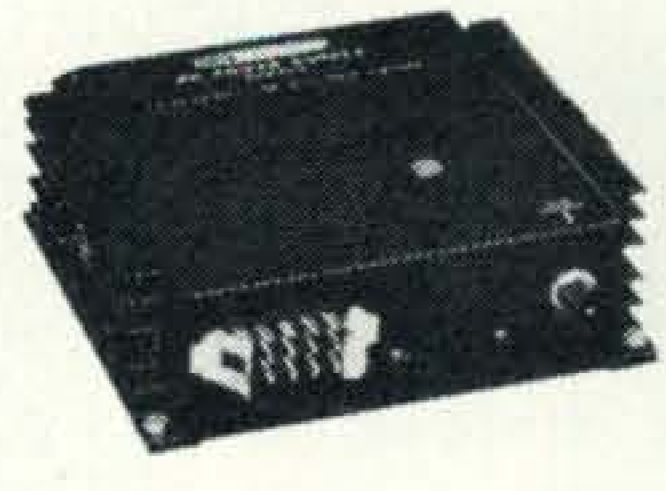

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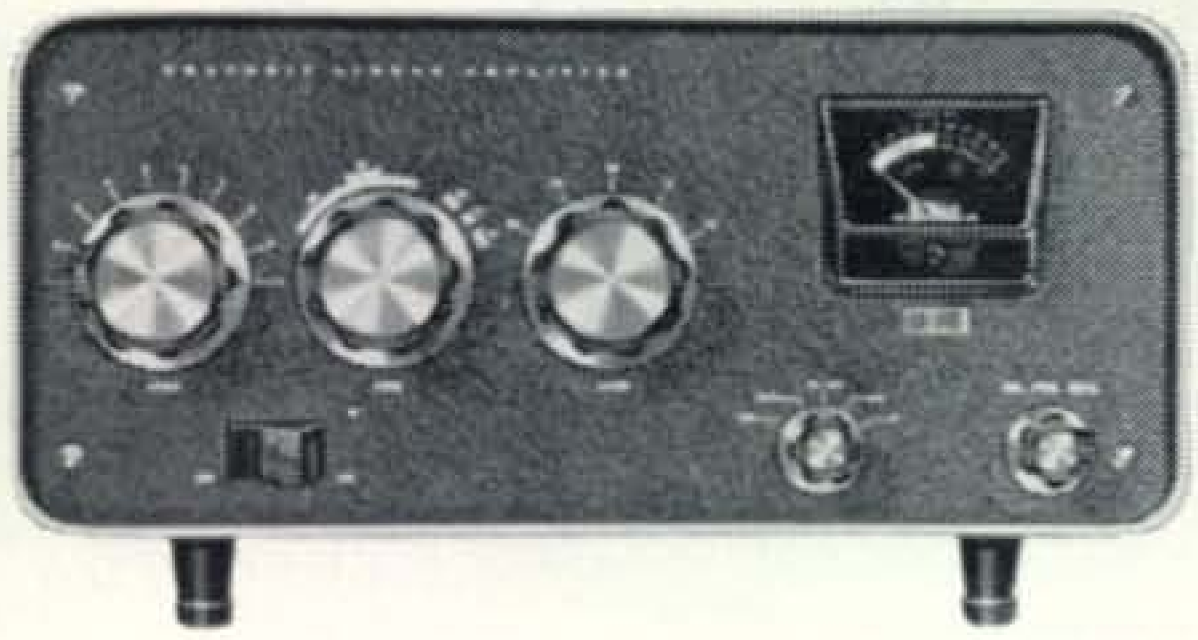

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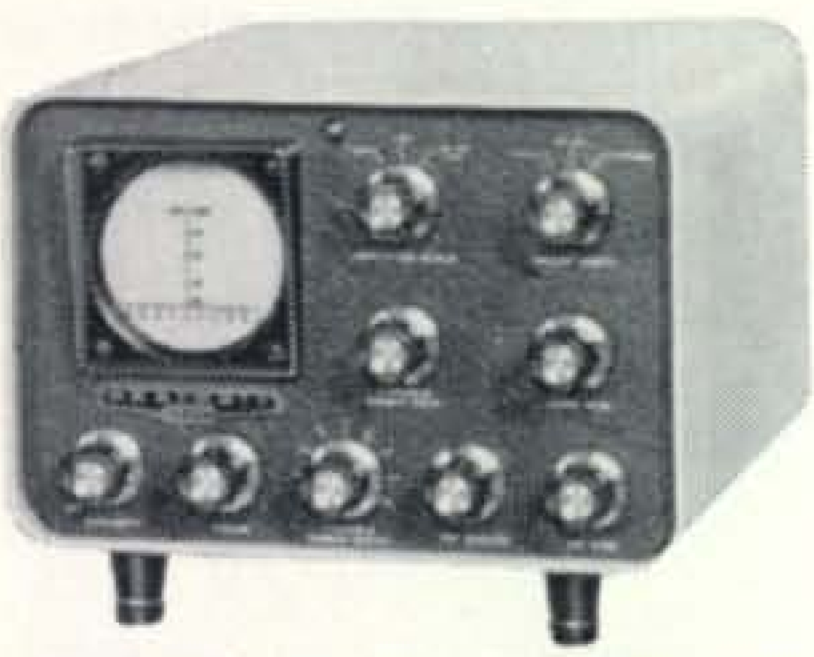

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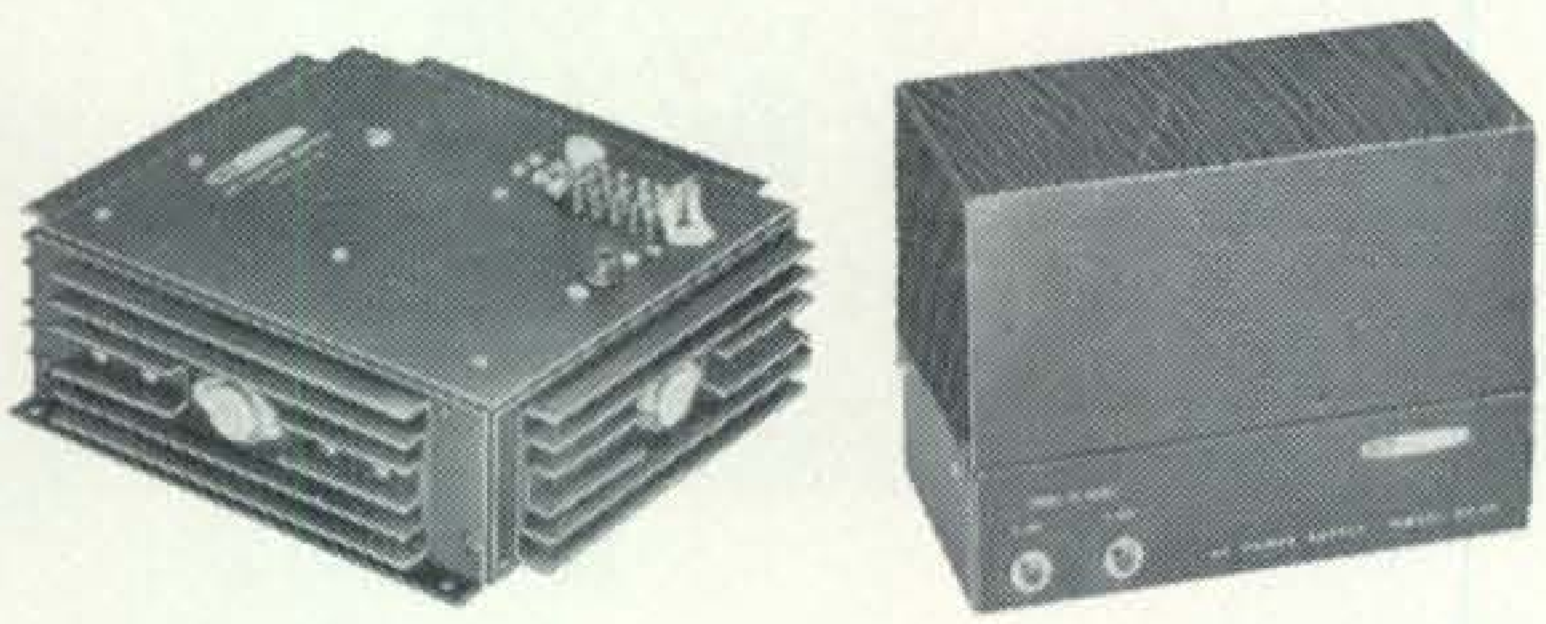

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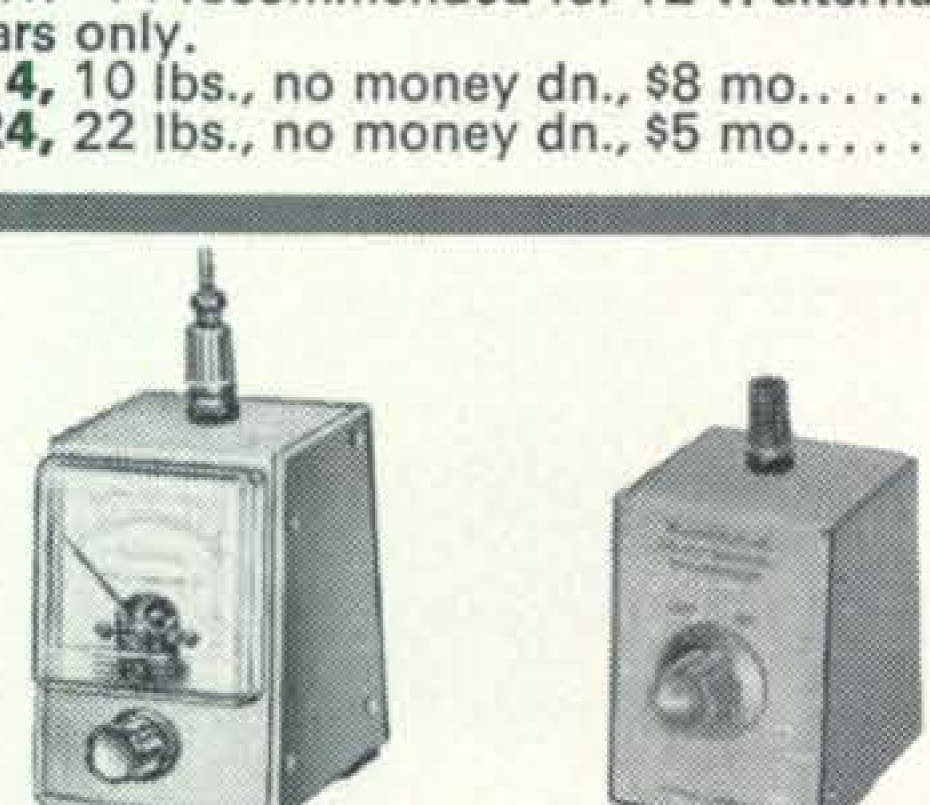

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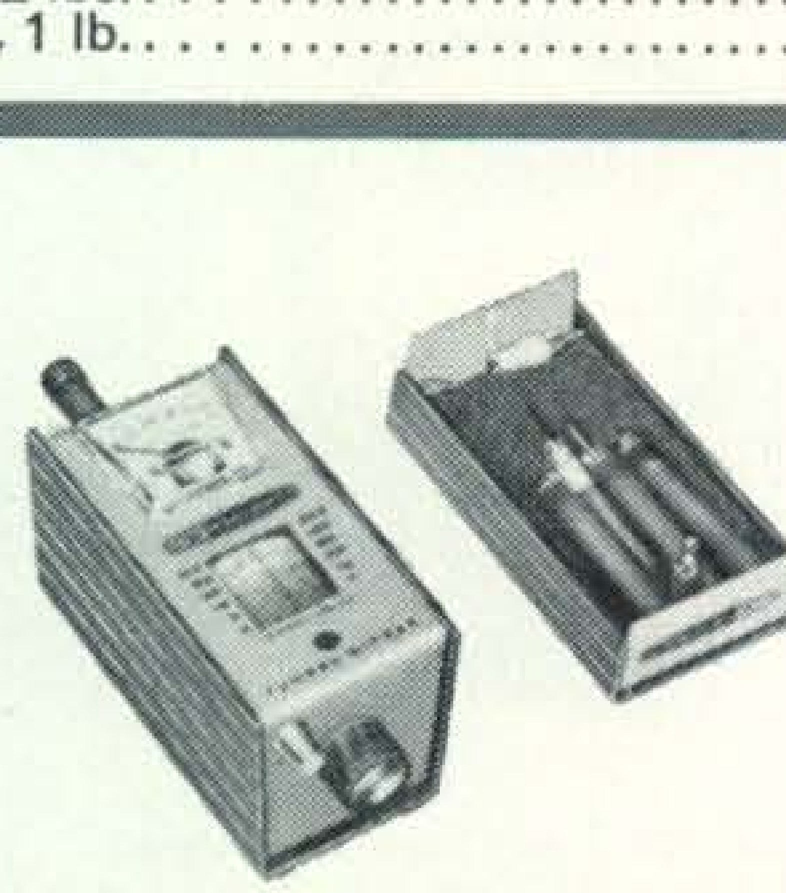

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For further information, check number 8, on page 126

Selection of Amateur Radio Kits

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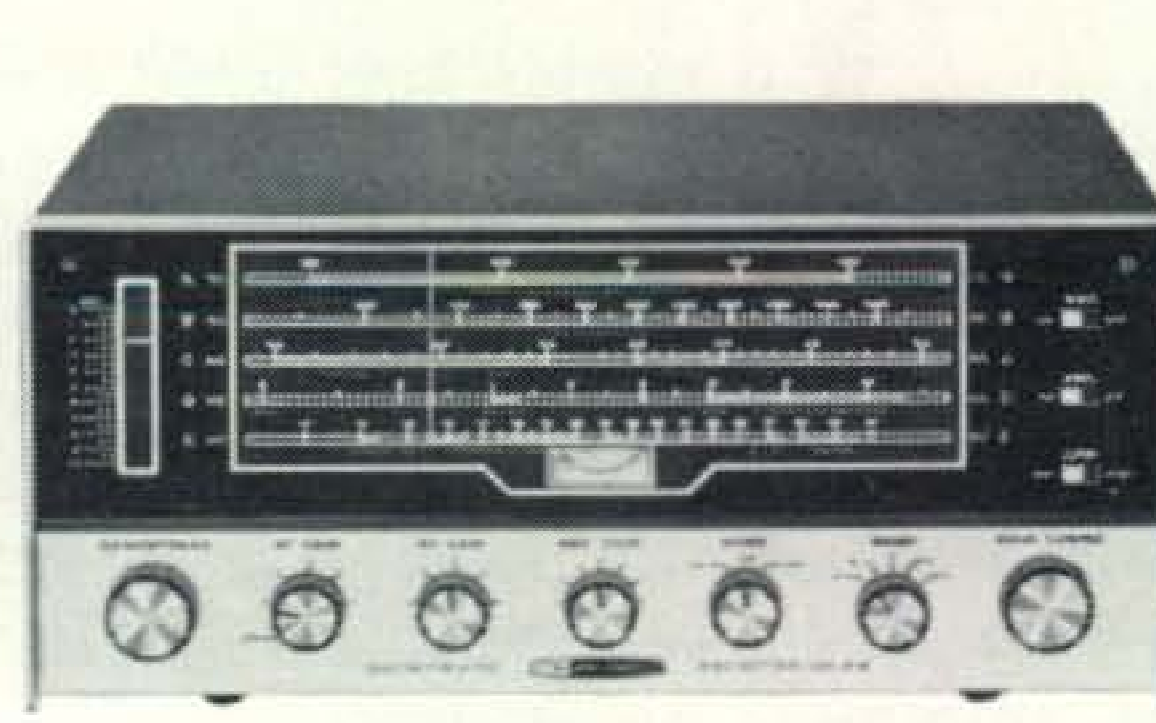

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For further information, check number 23, on page 126

Photographing Electronic Gear

BY WILFRED M. SCHERER,* W2AEF

Manuscripts submitted for publication are too often accompanied by poor photographs. This article on photography has therefore been prepared in the hope that it will lead to better material and thus make life more pleasant for our editor.

No matter how good the tool, it cannot be of full value unless you know how to properly use it. We shall, therefore, not discuss the merits of different types of cameras, but rather, will be concerned with the techniques for using the camera to the best advantage for photographing electronic equipment. In this respect, we shall consider four important areas: background, framing, focusing and lighting.

Background

Poor background is a common fault that often spoils the appearance of an otherwise good picture of equipment. Electronic gear usually appears best against a white background, but in some cases where the subject is a chassis or other gear with light-colored edges, a slightly darker background may better define the borders of it. Nevertheless, we've found a white background to be satisfactory in the majority of cases.

A good background should be a non-reflecting surface and one that is uniformily plain without any design that would otherwise detract from the subject. A heavy paper material is best, although cloth may be used if it is free of wrinkles or creases. An excellent material, which we use, is white Bristol board which may be obtained from art-supply stores in sizes up to 30″ × 40″. Off-white or light-gray desk-blotter sheets, available in sizes up to 24″ × 38″ also may be used, while a five-foot length of light-brown wrapping paper, obtainable from your neighborhood market, will serve where a darker background is desired.

Placing the Background

For "front-view" photos, place one sheet of background material against a wall or other vertical surface securing the top edge of the material with plastic tape or thumbtacks. The lower portion should be curved about 18″ from the top so it rests on a table or floor next to the wall. For additional foreground, another piece may be placed on the base with its rear edge overlapping the "backdrop." See fig 1. If the overlap is made evenly flat, the seam will not show with the lighting method described later, but if uneveness cannot be avoided, the joint may be secured with clear tape. Where a wider background is needed, additional sheets may be similarly set up alongside the others.

One large piece of wrapping paper or cloth (such as a bed sheet or velour) may be similarly draped, but care must be taken to avoid wrinkles or creases.

For top or under chassis views the background material may simply be laid on a floor with the equipment photographed from above as explained later.

* Technical Director, *CQ*.

For overall front-view shots the gear should be centered on the background surface in a way that keeps the backdrop a foot or more away from the rear of the gear and yet, which leaves sufficient material in the foreground. Keeping the backdrop at this distance will minimize the possibility of heavy shadow and uneven lighting and it will tend to diffuse the rear background, making the subject standout better.

Only enough background area is required to enable a sufficient amount to appear as a complete border at all sides of the subject when an enlargement is made. Unwanted areas must otherwise be cropped out by the editor when a printer's half-tone engraving is made of a photo printed from the full negative.

Framing the Subject

The use of a tripod to firmly support the camera is a *"must"* if well-framed and sharply-focused photographs are to be realized.

Framing is positioning the equipment and camera in such a way that the photograph will show the equipment to best advantage and at the same time will present a pleasant and natural appearance. For the first requisite, it is obvious that the camera must be focused upon the desired portion of the gear. As for the latter condition, the most attractive photos will be those having perspective —a sense of depth along several planes of the subject—provided such perspective is not exaggerated to give a distorted appearance.

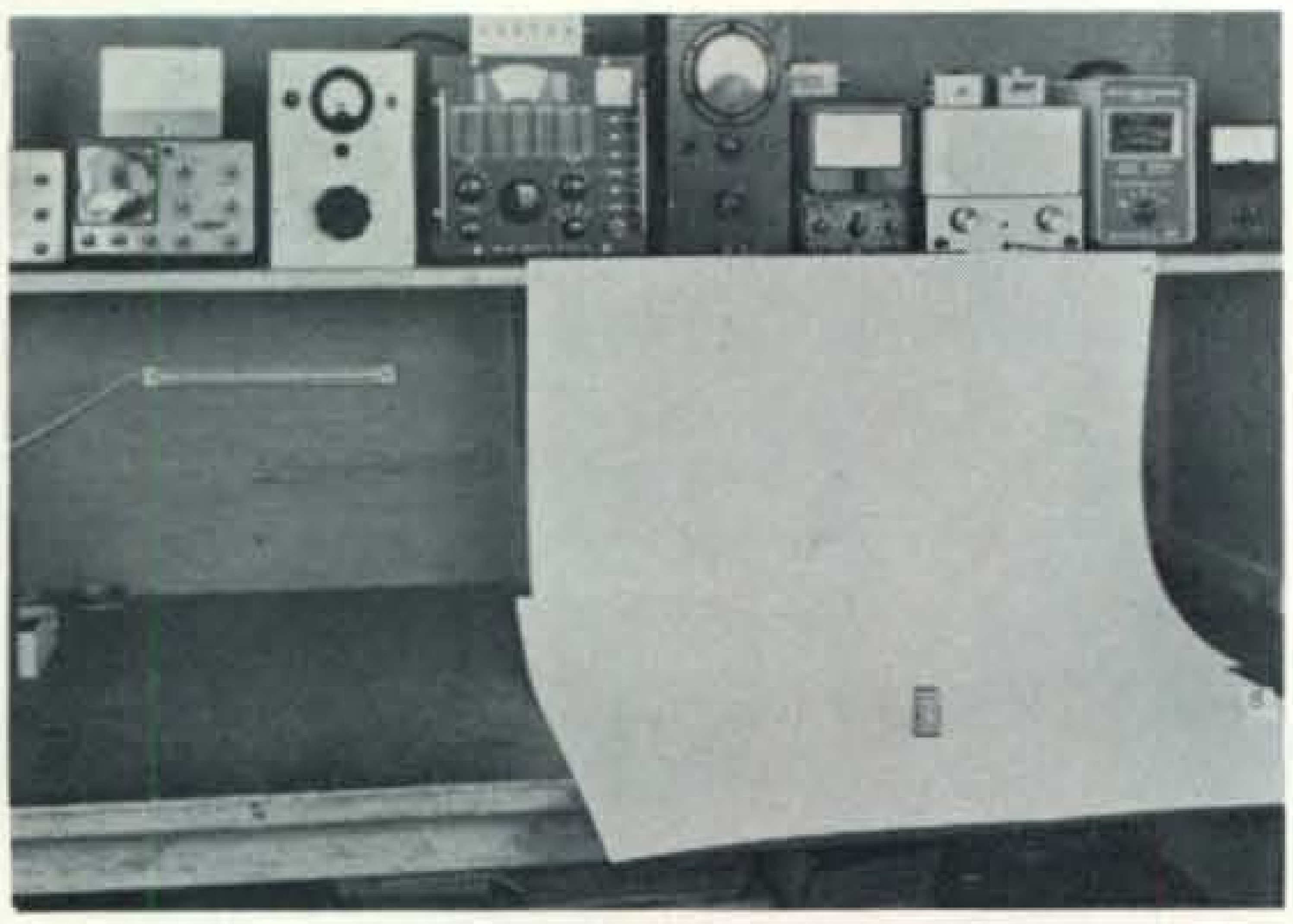
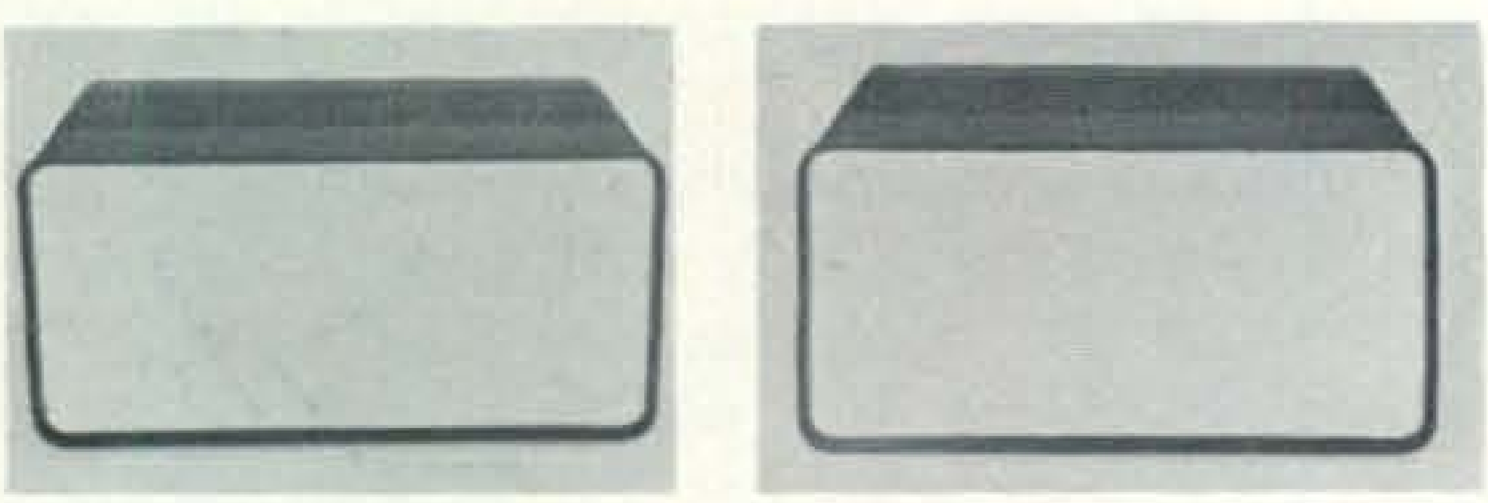


Fig. 1 — Table-top background setup as described in text using two sheets of Bristol board. The overlap is not noticeable.

The most noticeable type of distortion is "keystoning" where the parallel edges of the subject tend to converge, making it appear unshapely, unbalanced or tilted. The effect is most apt to occur with square or rectangular bodies such as equipment installed in a cabinet. It shows up most objectionably at the front around the edges of the equipment panel.

Keystoning also tends to occur in the third-dimensional plane (depth). It cannot be avoided, but fortunately, when within reasonable limits, it is more natural looking and thus less objectionable, inasmuch as this is the way the equipment is actually seen. Front-view keystoning, although really projected that way to the eye, rarely makes such an impression.

Distortion is not limited to keystoning, however. Different-shaped forms, including round ones, also can appear abnormal, but usually to a less noticeable extent. By following the procedures set forth below for avoiding keystoning, other forms of distortion may also be minimized.



A B

Fig. 2 — Front views with top perspective. A — Camera was tilted downward, producing front panel keystoning evidenced by the outward slope of the side edges at the front. B — Camera height raised and lens properly positioned parallel with the front panel, resulting in a balanced front outline.

Avoiding Distortion

Front-view distortion can be avoided by always keeping the camera lens parallel with the face of the equipment on both the vertical and horizontal axis.

Front-to-back distortion can be minimized by working as far away from the subject as is consistent with obtaining a reasonable size image on the film. Filling the complete film area is not needed to provide a photo with good detail (as is seen in the viewing system), since enlargements made from the negative will take care of this. The longer the focal length of the lens beyond the "Normal" focal length, the less one must be concerned about front-to-back keystoning.

Front View with Top Perspective

For a front view with perspective on the top of the subject, work at a distance from which the image will cover one-half to one-quarter the film area with the camera raised as high as possible consistent with obtaining an image of the entire subject. Exactly center the camera lens horizontally with the subject and maintain the lens parallel with the front of the equipment as already explained. Do *not* tilt the camera, except to keep the lens parallel with the vertical plane of the gear. See fig. 2.

The greater the subject-to-camera distance, the greater will be the maximum possible perspective and the less will be the front-to-back keystoning; however, excessive perspective should be avoided, since the keystoning otherwise may *seem* to be greater and the equipment may appear top-heavy or look tilted forward. A compromise may therefore be needed to obtain an attractive and well balanced view.

Front View with Dual Perspective

For a front view with perspective on both the top and one side of the gear, follow the procedure and general rules for top perspective views and in addition, move the camera sideways as far as possible while maintaining a complete image in about one-quarter of the film area. Be sure to keep the lens parallel with both front planes of the object.[1] Do *not* tilt the camera or turn it on its vertical axis. See fig. 3.

[1] In cases where the equipment cabinet has a forward-sloping cowling, the vertical plane should be referred to the panel itself.

Front View with Angular Perspective

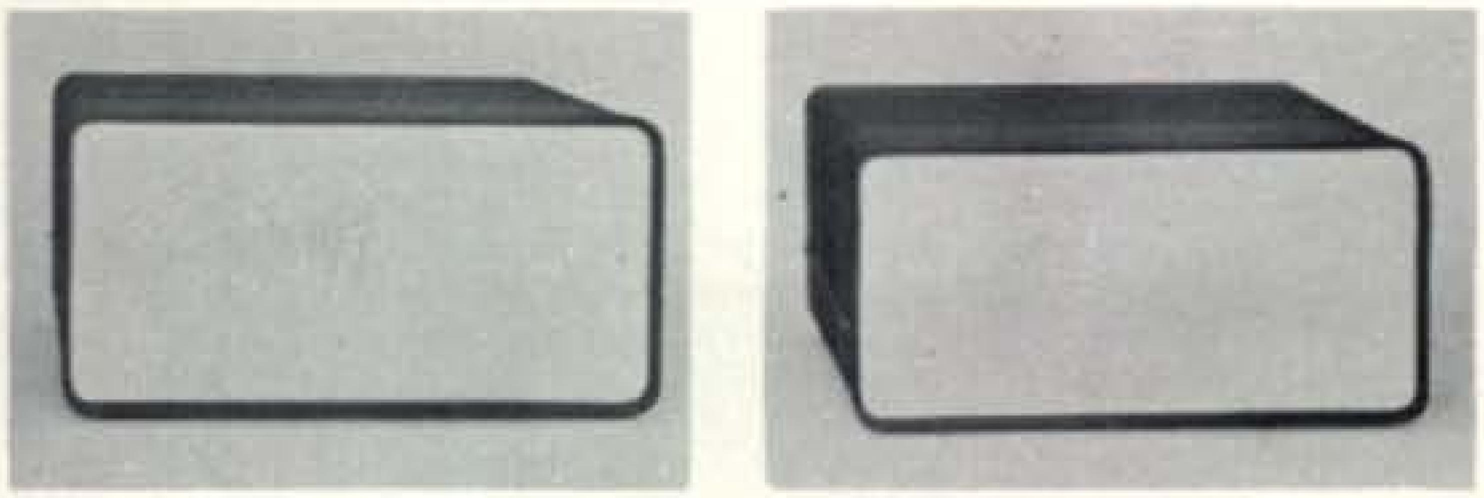
Front views with angular perspective are those in which all visible sides of the object are viewed from an angle, (sometimes called "three-quarter views"). This makes a somewhat more natural impression; however, this is where distortion is most apt to be noticed, as shown in fig. 4.

In such cases, view the gear from one side with the camera turned on its vertical axis slightly toward the subject, keeping the lens *vertical*, and raising the camera.

The greatest difficulty with unwanted distortion is likely to occur where the top and bottom edges of a front panel tend to converge at the far end. This effect can be minimized by working a good distance away from the subject and by orienting the image so that it will appear in the lower quadrant at the side of the negative which is opposite the end from which the view is made. See fig 4C. Also, highly angular shots should be avoided, particularly if the front dimensions are long and narrow. Be sure the subject is placed on the background so that a complete border will appear when the photo eventually is cropped.

Head-On View without Perspective

Although perspective views present a more realistic and pleasant appearance, a straight head-on shot is sometimes desirable. For such view, position the camera on dead-center with the front of the gear and keep the lens parallel with it. Don't work too close, as this will otherwise introduce front-to-back distortion, making protruding off-center parts, such as control knobs, appear as if they are titled, protrude abnormally or are exaggerated in size. See fig. 5



A B

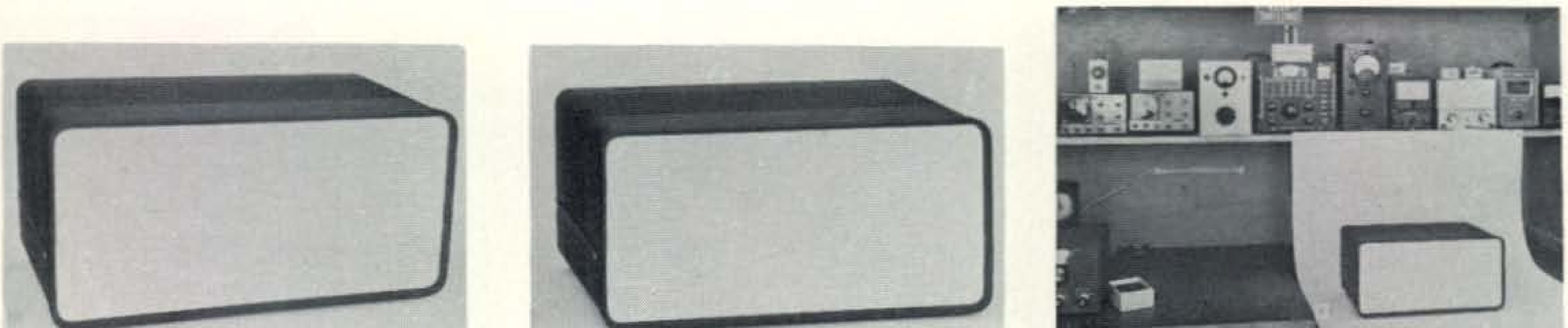
Fig. 3 — Front views with dual perspective on the top and one side. A — Camera placed at left of the object with lens parallel with the panel. There is no front keystoning, but camera was too close, leaving little to be seen of left side. The appearance is unbalanced. B — Camera set at twice the distance. More side view is obtained with better overall balance.

Chassis Views

Both top and bottom chassis photos may be made with head-on or perspective views by setting the chassis on edge upon a table-top background and following the procedures already outlined; however, for a better perspective it usually will be more desirable to obtain a top-view shot from above the chassis while it is set on a floor-level background. Keep the lens parallel with the floor and if perspective is desired, place the camera so that the image will appear in the upper portion of the negative for a single perspective, or for a dual perspective, in the upper quadrant of the negative.

If there is a panel, place this side of the chassis farthest from the camera and if tall or bulky components, such as transformer and capacitor cans, appear near one corner of the foreground, view the gear from the opposite corner to minimize exaggeration of the size of these parts.

A trick used to disguise distortion is to place the chassis in a diagonal position. When this is done, shifting the camera to a slight upward angle will permit somewhat



A B C

Fig. 4 — Front views with angular perspective. A — Camera tilted downward and at too great an angle, resulting in vertical and horizontal keystoning at the front. An unbalanced and tilted look. B — Properly framed as described in text with subject in lower right quadrant of the negative as shown at C.

Fig. 5 — Head-on view. Front-to-back distortion, due to close-up shot, causes outer knobs to appear oriented outward and downward.

greater perspective without making distortion too apparent. See fig. 6.

Underside chassis views, whether at floor level or with the chassis on edge upon a table-top, should always be made with the lens parallel to the plane of the chassis-base perimeter.

Close-Up View

Occasionally a close-up shot is desired to show up minute details in a specific section of the equipment. Unless you have a "close-up" lens, the normal camera lens will limit such shots to 3 feet or so, in which case, details will have to be brought out in an enlargement of the particular portion of the negative obtained from a distance. See fig. 7.

View Camera

If you're fortunate enough to have the use of a "view-type" camera with which the lens position can be adjusted in a number of ways in relation to the film, shots with greater perspective can be obtained without introducing distortion, all else being equal.

Dropping the bellows bed and tilting the lens backwards so it remains parallel with the film, will provide more top perspective. More side perspective can be had by moving the lens to one side in respect to the film and in the direction opposite to the side from which the subject is viewed. Raising the lens above center will give more perspective on chassis photos taken from above the subject. Also, the view camera usually has provisions for extending the bellows to permit very close-up shots.

Parallax Compensation

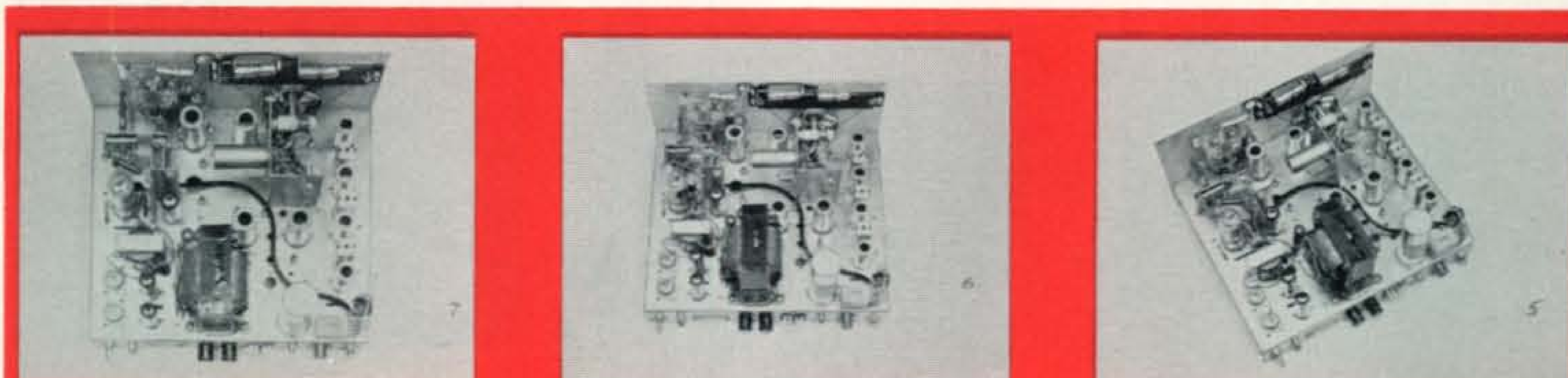
Where the image is viewed by some other means than through the camera lens itself, such as with twin-reflex jobs or those equipped with a viewer at the top or side, some compensation may have to be made in positioning, before taking the photo in order that it will be accurately framed on the negative, particularly on relatively close shots, unless the camera has a parallax-correcting feature.

This may be done by first framing the subject as seen in the viewer. Then, before taking the shot, respositioning the camera as follows: If the viewing lens or frame is at the top of the camera, raise the camera by an amount equal to the distance between the center of the viewing lens or frame and that of the camera lens, while at the same time maintaining the other relative positions. If the viewing system is at the side, similarly reposition the camera toward that side.

Focusing

The camera lens should be focused on the main part of the equipment. Where there is a panel, this may be best done on the lettering, meter or dial scales. For top or bottom chassis views, the main point of focus may be the mean distance between the portions nearest and farthest from the camera.

The camera lens should then be stopped down as far as possible to increase the depth of field; that is, the range of distance from the camera over which all parts of the subject will be in good focus at one setting of the lens position.



A B C

Fig. 6 — Top-chassis views with floor background. A — Camera lens parallel with floor. B — Camera lens tilted upward produces keystoning in all planes. C — Same as B, but chassis diagonally oriented to minimize impression of keystoning.

A point to keep in mind is that the depth of field decreases as the distance between the camera and subject decreases. This is another reason for avoiding very close-up shots.

The focusing accuracy will depend on the type camera and its focusing system. Where the image is viewed on a ground glass, very accurate focusing can be realized, particularly if a magnifying glass is used to enlarge the viewed image. In other cases a range finder may have to be used or you'll have to rely on calibrations marked on the focusing adjustment. In the latter case it will be a good practice to first measure the distance between the *lens* and the subject for proper correlation with the calibrations.

Lighting

For best and easiest results, two methods of lighting may be employed: fixed light, and moving light. The one we've found preferrable for consistently good overall results with electronic gear is that of moving light using the technique called "painting-with-light." This is conducted using a single light bulb and continually moving it about the subject with the camera shutter held open for a long exposure and with the camera lens stopped down.

The advantages of this method are that undesirable shadows can be virtually eliminated, sharper and better overall definition can be obtained and timing is not critical. You don't have to play around with a number of lights or reflectors to obtain the desired lighting without undue shadows or reflections. After a little experience and once the pattern has been set for light-painting using a given size lamp bulb, film type, lens-aperture, exposure time, and background, you can be quite certain that your photos will turn out well every time without the need of an exposure meter or further fussing or experimentation with lights.

Procedure

For painting with light we use Panatomic-X film, a 150-watt lamp bulb, exposure of 4 minutes, stop *f*22 for overall equipment shots and *f*16 for underside chassis views. On some cameras the smallest stop is *f*16, in which case about a 3-minute exposure will be a good compromise for both type views.

The lamp bulb is installed in a plain socket on the end of a long extension cord. A reflector should not be used, because it will concentrate the light too greatly, resulting in uneven lighting; however, a flat piece of gray cardboard about 8-inches square, such as that obtained from the back of a writing pad, may be used behind the lamp bulb harm to eliminate the glare in your eyes. See fig. 8

Next, a clock or wrist watch equipped with a sweep-second hand should be placed where it can be easily observed. Set the camera for the required *f*-stop, as noted above, and the shutter for "time" exposure. If the camera does not have a "T" position, use the "B," or bulb, setting in conjunction with a cable release that has a lock on it to allow the shutter to be held open for the exposure period.

Darken the room to minimize stray light. Open the shutter and with the light held about in line with the rear of the camera, *continuously* move the light back and forth and with a random-like rotating or zig-zag up-and-down motion in front of, slightly to the left and right of, and slightly above the subject in a manner that exposes all parts of the subject to an equal amount of light during the whole exposure time. This may be facilitated by working in each quadrant or

Fig.7 — Close-up views. A — Chassis placed on edge on a table top with camera at 3-foot distance. A portion of the negative is enlarged at B to show close-up detail which is quite good compared with close-up shot at C made of same area from a 1-foot distance.

Fig. 8 — Painting-with-light setup. A single hand-held light is continuously moved about the subject during a time exposure. A small piece of cardboard at the rear of the lamp serves as an eye shield.

in sections for equal periods of time, such as 15-30 seconds each, from the upper right, front right, lower right, upper left, front left, lower front, etc., and around again as needed, until the end of the exposure period when the shutter is then to be shut. Don't work too close with the light and avoid passing it in front of the lens.

While the light is being moved about, you'll notice the shadows dance from area to area which thus cuts down their exposure time in any one spot and thereby minimizes their appearance in the final photograph.

Before proceeding with the job, however, move the light to various points to determine which areas should be avoided to eliminate the possibility of unwanted reflections from dial or meter windows, highly polished surfaces, etc. Make this test during obesrvations through the viewing system or with your eyes near the point from which the lens sees the subject. In some case it may be necessary to avoid using the light directly in front of the subject and instead, working with it only from an angle to each half of the front.

Fixed Lighting

Since we are recommending painting-with-light, explicit details on using fixed lights will not be discussed; nevertheless, some points will be made.

Where a tripod is not available for holding the camera still, it will be necessary to use a relatively fast shutter speed and a number of fixed lights. These should preferrably be photoflood types and should be directed at the subject in a way that illuminates all areas of the equipment without producing undue shadows or light-glare. A few strategecally located reflectors made of white cardboard will help to diffuse the light and even it out. For gear with a panel, the most difficulty with shadows will involve control knobs, in which case placing the lights directed from in front of the gear or locating them as near as possible at the side of the lens, will shorten the shadows and make them less objectionable. An exposure meter also will be needed with fixed lighting to determine the proper shutter speed according to the various lighting conditions, the film speed and lens aperture. The latter should be stopped down as far as possible.

Fluorescent Lighting

Fluorescent lamps produce quite a diffused light that minimizes shadows, but from the results we've experienced, a tendency toward less contrast, less definition and a somewhat hazy appearance is sometimes evidenced. A time exposure usually may be required.

Notice that we have avoided mention of flash-bulbs and electronic flash. The reason is simply that flash lacks the controllability of other slower lighting methods and thus is not recommended for fine "electronic" photos.

Outdoor Lighting

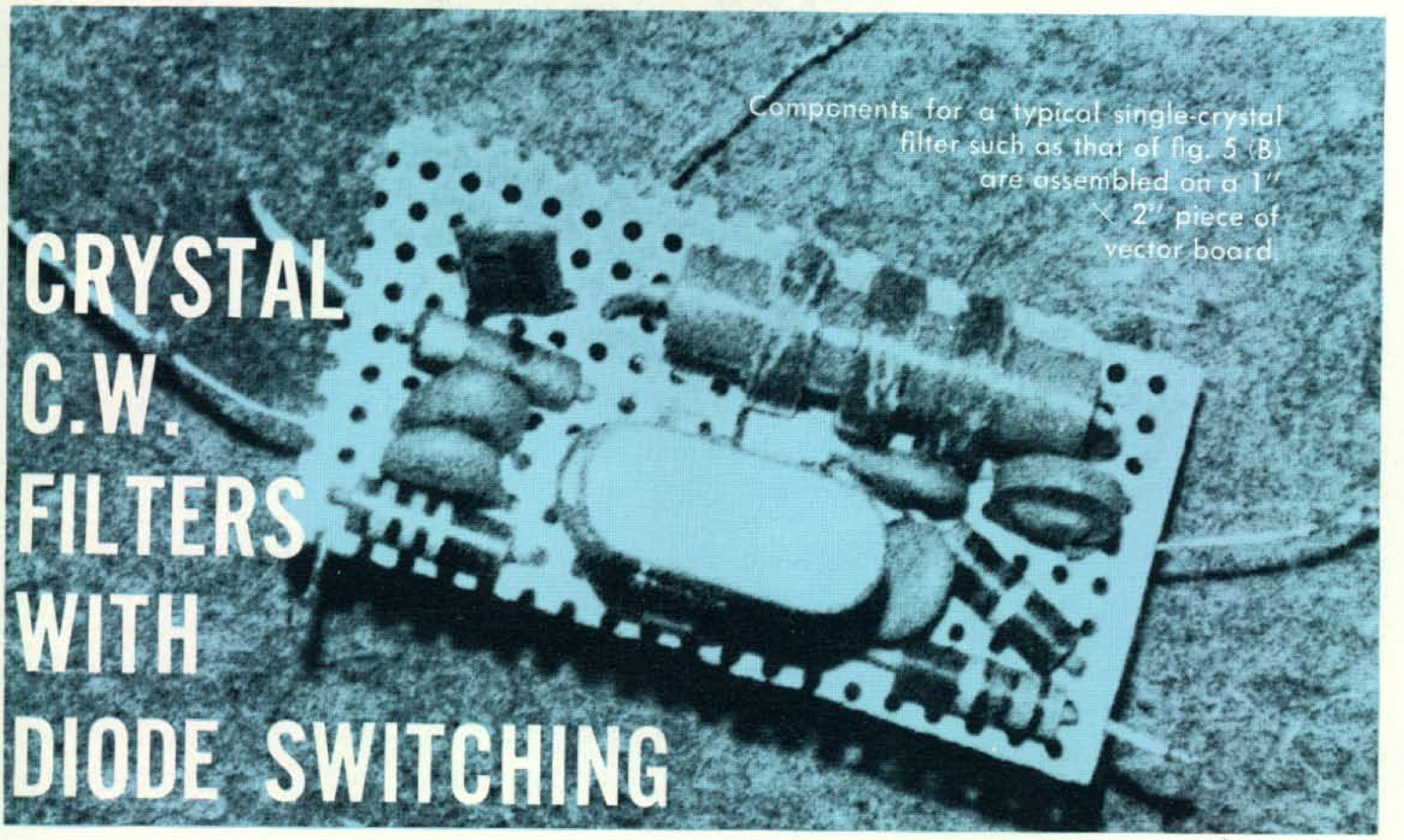
Outdoor lighting also may be used, but placing the subject in direct sunlight not only produces objectionable shadow, but also may tend to exhibit light glare or reflections that will tend to blurr detail. For outdoor work, the job is often best done using a longer exposure and reflected light from an overcast sky. This will minimize the effects just outlined.

Film and Developing

A word about type of film and developing: The use of Panatomic-X film has been recommended here, but Tri-X film also may be used with good results although it has slightly more grain. It also is a faster film. As a general guide line for using it with light-painting, a 60-watt bulb with 4-minutes exposure at *f*22, 2-3 minutes at *f*16, will be about right. With a 150-watt bulb, 2 minutes at *f*22 or 1-1½ minutes at *f*16 will be satisfactory.

Either type film should be processed with a fine-grain developer, particularly if an enlargement of a small area of the negative is to be made or if 35 mm or the popular size negatives with No. 120 film are to be used. ■

CRYSTAL C.W. FILTERS WITH DIODE SWITCHING



Components for a typical single-crystal filter such as that of fig. 5 (B) are assembled on a 1" × 2" piece of vector board.

BY JOHN J. SCHULTZ, W2EEY/1

A single or double filter operated in series with the normal s.s.b. filter in a receiver or transceiver is a very simple method to obtain excellent c.w. selectivity. Circuits for using such a filter in either tube or transistor units are presented along with the use of diode switches to eliminate the need for relays.

SOME transceivers on the market today have recognized the needs of the c.w. man and provide an optional c.w. i.f. filter in addition to the normal 2 to 3 kc s.s.b. filter. Most transceivers, however (and some inexpensive receivers), do not have such a feature but additional selectivity can be provided by the use of various outboard units.

*40 Rossie Street, Mystic, Connecticut 06355.

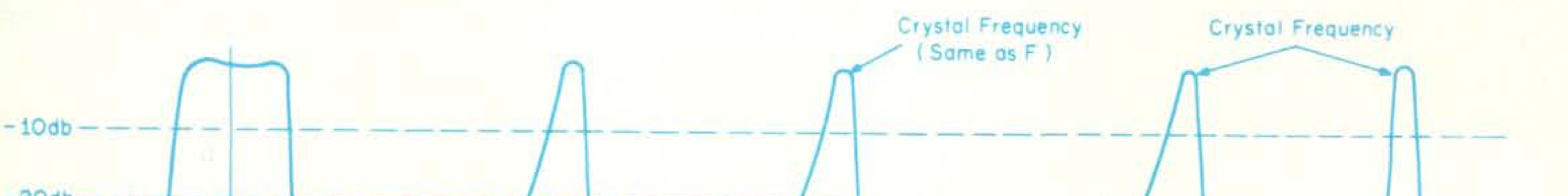


Fig. 1—Shown above are typical filter response curves. (A) is a typical s.s.b. filter response and (B) is that of single crystal filter. Resultant responses when both filters are in series are shown in (C), (D) and (E) for different crystal frequencies as explained in the text.

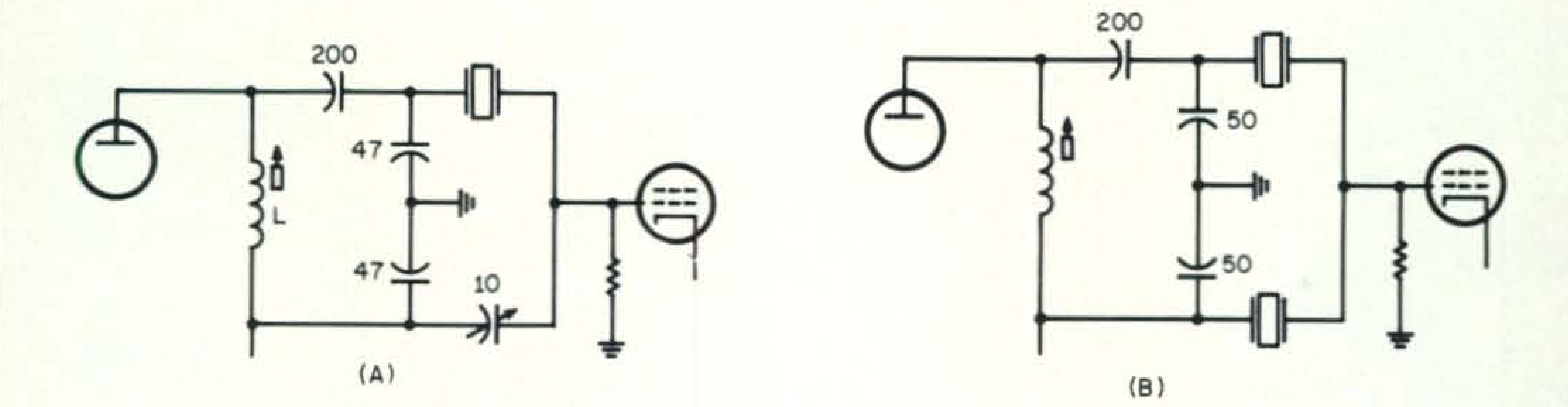


Fig. 2—Single and double crystal filters are shown as they may be placed between i.f. stages in typical tube-type transceiver i.f. section.

Audio selectivity is one common means, using either a surplus "FL" type filter or a home constructed bandpass filter. Such units can be very effective and their only real disadvantage is that common to all selectivity devices which are placed towards the "tail end" of a receiver; stages preceeding the signal selectivity can be overloaded by spurious signals and a.g.c. action may be controlled by a strong undesired signal rather than by the desired one.

Outboard i.f. selectivity by means of a Q multiplier eliminates most of these problems since the selectivity is developed, or at least should be, in the first i.f. stage. Q multipliers are also greatly limited in their application to transceivers since they are most easily constructed for use with low-frequency i.f.'s (up to about 1 mc). Constructing a Q multiplier for higher i.f.'s is generally very tricky and seldom done. Also, there is the general disadvantage to outboard selectivity devices in having to provide a separate enclosure, interconnecting cables, etc.

Crystal Filter

This article explores how the old-fashioned crystal filter, with a few modern trimmings, can be used as an extremely simple and inexpensive means to provide c.w. selectivity for a transceiver or receiver of any i.f. frequency. Even if one does have a unit for which an optional c.w. filter is available, the material in this article should be of interest since such a filter can often be built at considerably less cost than that of an accessory filter.

Several methods of using inexpensive signal diodes as switching devices in place of conventional annual switches or relays are shown. Not only is the use of diode switches less expensive for low-level signal switching, but more reliable and often the only method that space considerations in many units will allow. The use of diode switches is by no means limited to selectivity devices but can be used in a transmitter or receiver for almost any function involving the switching of low-level r.f. or a.f. signal circuits. Even those readers who do not need a c.w. filter may well find another application for the diode switching circuits shown.

Most transceivers today use either a crystal or mechanical filter for s.s.b. Usually the same filter, because of its expense, is used for both the transmitting and receiving functions. Figure 1 (A) is representative of the response shape of such a filter in either the l.f. range of 400 to 500 kc or h.f. range up to 9 mc.

Figure 1 (B) is typical of the response of a single-crystal filter (not the crystal itself but as the response would be formed by use in a typical circuit). The single crystal can be visualized as a hi-Q series tuned circuit which presents a low impedance at its resonant frequency. It also has an anti-resonant frequency because of distributed parallel capacity which is always higher in frequency than the resonant frequency and at which the impedance is very high. The latter accounts for the pronounced "dip" in the response of fig. 1 (B) slightly above the crystal frequency *F*.

If the s.s.b. filter having the response of fig. 1 (A) and the crystal filter response of fig. 1 (B) were placed in series, the resultant response would be that shown in fig. 1 (C). If the crystal frequency were chosen to be the same frequency as either the higher or lower frequency at the 3 db down points in fig. 1 (A), the result would be the responses shown in fig. 1 (D) and 1 (E)

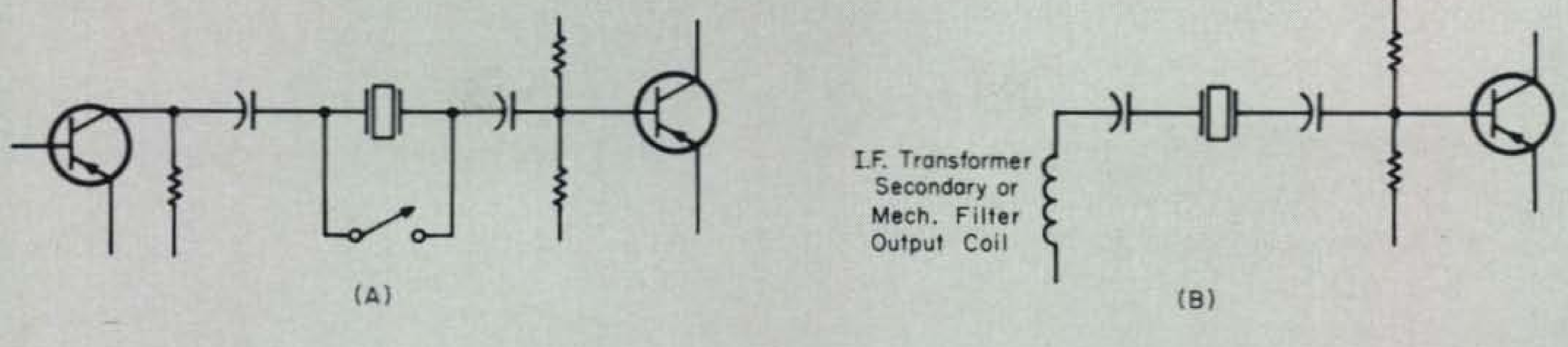


Fig. 3—Examples of single crystal filters in transistorized i.f. stages.

respectively. Which response is the most desirable is debatable. A secondary response appears in both fig. 1 (C) and 1 (E) at approximately the 30 db down level. This response is absent in fig. 1 (D) but the main bandwidth at 25 to 30db down starts to flare out considerably.

There is also the factor to be considered that the b.f.o. in most transceivers is crystal-controlled and it would not be desirable to have a beat note of reasonable audio frequency occur at an unfavorable point on the i.f. response curve. As a general rule, therefore, it is usually best to choose a frequency for the crystal filter which is about 700 to 1000 cycles removed (within the i.f. passband) from the crystal controlled frequency of the b.f.o. in the receive mode of a transceiver.

By proper use of the r.f. gain control on the transceiver, the effect of the secondary response in the shape of the i.f. passband using the crystal filter can be eliminated. Whether to place the crystal c.w. filter ahead of or after the s.s.b. filter in a transceiver can be determined by the convenience of installation. Generally, as mentioned previously, the c.w. filter is placed after the s.s.b. filter to reduce the bandwidth to the desired value as early as possible in the receiver to avoid stage overloading and a.v.c. capture effects. However, whether one filter immediately precedes or follows the other, as far as one i.f. stage is concerned, should not be important.

Two Crystal Filter

A symmetrical two-crystal filter will have a response on both sides of the mean frequency of the individual crystals similar to that shown on the left side of the center frequency *F* in fig. 1 (B). The crystals are usually chosen to be 100 to 300 cycles different in frequency from the center frequency of the i.f., one higher and one lower in frequency. The skirt response of such a filter flares out considerably at the 20 to 30 db down level but the overall response of the i.f. is then made steeper again at this level by the response of the s.s.b. filter. Generally, the dual-crystal c.w. filter offers no great advantage over the single-crystal filter when both are used in series with an s.s.b. filter of reasonable shape factor. The dual-crystal filter does not have the anti-resonant "notch" associated with the single-crystal filter and, therefore, may make the tuning of signals somewhat more straight forward. Otherwise, it offers no improved i.f. response in the general area of 20-30 db down from the i.f. peak.

Practical Circuits

Some practical circuits for the use of single and dual crystal filters with both tube and transistor circuits are shown in figs. 2 and 3. Figure 2 (A) shows a conventional single-crystal filter placed between two i.f. stages, *L* being the original i.f. transformer or single coil winding. The two 47 mmf capacitors are not used to resonate the coil but only to obtain a balanced input circuit for the filter. The value of these capacitors is not critical but has to be experimented with for best results depending upon the i.f. frequency. They are not used to resonate the tuned circuit since this would produce a high impedance input and tend to broaden the response of the crystal filter circuit. The crystal presents a low impedance at its resonant frequency and therefore the selectivity will be greatest when the crystal works into both low input and output impedances. Generally, stage gain will not be greatly affected by some detuning of the interstage circuit and better selectivity will result. The 10 mmf variable capacitor serves as a so-called "phasing" adjustment and permits one to vary the frequency of the "notch" shown in fig. 1 (B). It can either be set for the

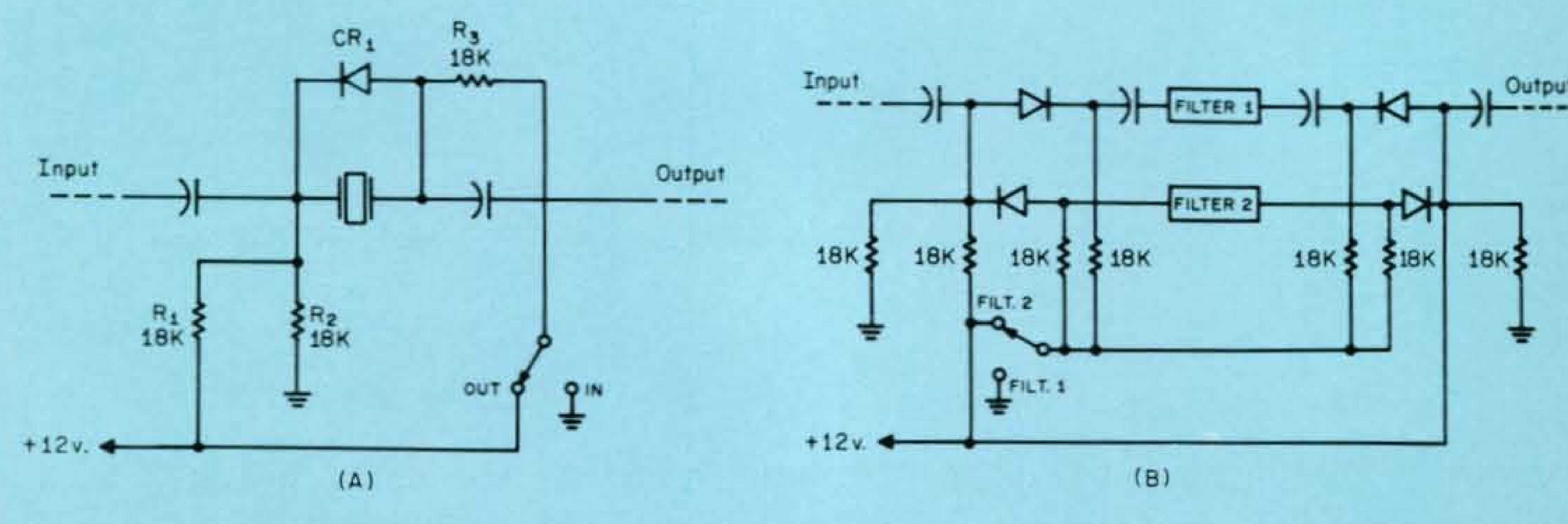


Fig. 4—Diodes are used to act as a s.p.s.t. switch (A) and as d.p.d.t. switch (B). Signal voltage in circuit must not exceed the diode bias voltage.

best overall i.f. response or "built-out" as a direct or varactor controlled element, as shown in fig. 5. This arrangement provides an adjustment for nulling out an interfering signal on the high frequency side of the i.f. The output of the crystal filter should also work into a fairly low impedance although this is often not practical without additional circuit complexity. Since the main effect of not having a low-impedance output is to cause a greater flaring out of the skirt selectivity rather than the response immediately below the i.f. peak, this factor is generally not important because of the effect of the s.s.b. filter.

The circuits of fig. 2 could equally as well be used between transistor stages and the same considerations as for the tube stages would apply. However, because the interstage coupling between most transistor stages is inherently at a lower impedance level one can simply insert a single crystal filter with good results between these stages as shown in fig. 3. No circuit modifications need be made at all except to provide an additional d.c. blocking capacitor if a diode switching arrangement is used to switch the crystal in and out of the circuit. No phasing capacitor is shown but one could insert a small trimmer capacitor of from 25 to 200 mmf, depending upon whether the i.f. is in the l.f. or h.f. range, either in series or in parallel with the crystal to slightly vary the resonant or anti-resonant frequency of the crystal circuit. If one has the proper test instruments available to display the i.f. response (a sweep generator and oscilloscope) they can be used to obtain the best overall i.f. response.

Diode Switching

Whatever crystal filter arrangement is decided upon it can be switched in and out of the transceiver circuit by either direct switching, relay switching or its semi-conductor equivalent, diode switching. Direct switching, such as s.p.s.t. switch shown in fig. 3 (A) is practicable when the leads to the switch are relatively short and a low i.f. frequency is used. Shielding of the leads to the front-panel switch is generally necessary but introduces a shunt capacity that can detune the circuit. Relay switching eliminates the necessity for a short physical connection between the front-panel control and the crystal filter circuit. However, relays are not always easily placed inside a crowded transceiver and their function can often be taken over by simple and inexpensive diode switches.

Figure 4 (A) shows a simple diode switch circuit used to switch a single crystal between two points in a crystal. Its action is similar to a s.p.s.t. toggle switch directly connected across the crystal. The two 18K ohm resistors, R_1 and R_2, form a voltage divider which places approximately +6 volts between one side of the Diode D_1 and ground. Resistor R_3 connects the other side of the diode to a toggle switch, (it may be as remote from the diode as desired) which places either +12 volts to ground or zero volts on the other side of the diode. Under the first condition, the diode is forward biased and forms a low resistance conductance path across the crystal thereby effectively shorting the crystal out. In the second condition, the diode is back-biased and does not present a conducting path

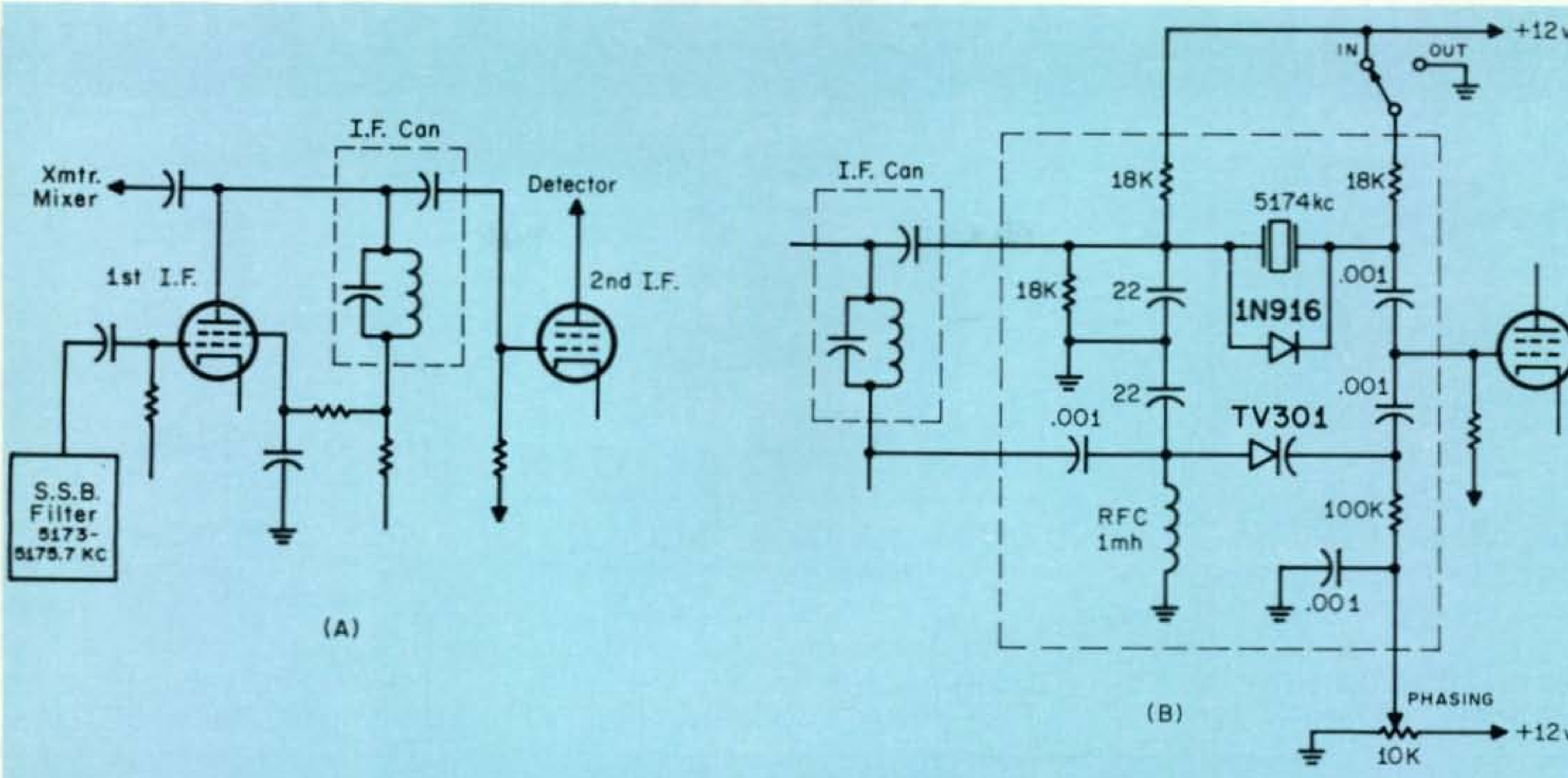


Fig. 5—(A) Circuit of a typical i.f. stage of transceiver. (B) circuit showing how a crystal filter unit is inserted between i.f. stages. A diode is used to switch the crystal in and out and the phasing capacitor is a varactor diode. Components within dashed area are mounted on a vector board.

across the crystal thus effectively diverting the signal flow away from the crystal. The 18K resistors not only prevent excessive current flow through the diode but isolate the signal circuit from the d.c. control voltage. The value of the resistors is not critical and from 10K to 100K should prove satisfactory for most circuits. The only precaution to observe is that the signal voltage does not exceed the bias voltage on the diode in which case the latter could be overcome and the diode will be controlled by the signal voltage. In receiver and low-level transceiver i.f. circuits this possibility is fairly remote but it should be kept in mind when dealing with higher level r.f. circuits.

Figure 4 (B) operates the same as that shown in fig. 4 (A) but the diodes used essentially operate as a d.p.d.t. switch to select either filter #1 or #2. By extension of the diode control circuit used, a single s.p.d.t. front-panel toggle switch can be used to switch any desired number of circuit functions. The same principle can be used when an actual switch has only a limited number of physical contacts but it is desired to control a greater number of circuit functions.

Figure 5 and the photograph show a single-crystal filter which the author built for use in a transceiver. Figure 5 (A) shows the original i.f. circuit of the transceiver. Figure 5 (B) is the circuit of the added crystal filter (within the dashed line) which is shown in the photograph. Essentially, it is exactly the same circuit as fig. 2 (A) except that a diode switch (1N916) is used to switch the crystal in and out of the circuit and a varactor (TV301) is used as a phasing capacitor. The latter can, of course, be replaced by a simple 15 mmf mica trimmer thus eliminating the need for the 10K potentiometer, 100K resistor and the 1 mh r.f.c.

As shown in the photograph, the components for the crystal filter are simply mounted on a 1″ × 2″ piece of vectorboard. The latter can easily be placed on the underside of most transceiver chassis. The arrangement of components is not critical although leads should be kept as short as possible. In the photograph, the switching diode is placed immediately above the crystal and the varactor diode is just below the r.f. choke. The other components are grouped as conveniently as possible around the crystal.

The circuitry and space available in a specific receiver or transceiver will dictate how easily a crystal filter for c.w. reception can be added. There is, however, practically no unit which cannot be modified by the use of diode switching without requiring any mechanical modification to the front-panel controls or the front-panel itself. The employment of unsued front-panel accessory switches, such as those for calibrators, or the addition of a pull-switch on some front-panel potentiometer will usually provide the necessary control for a crystal c.w. filter. ■

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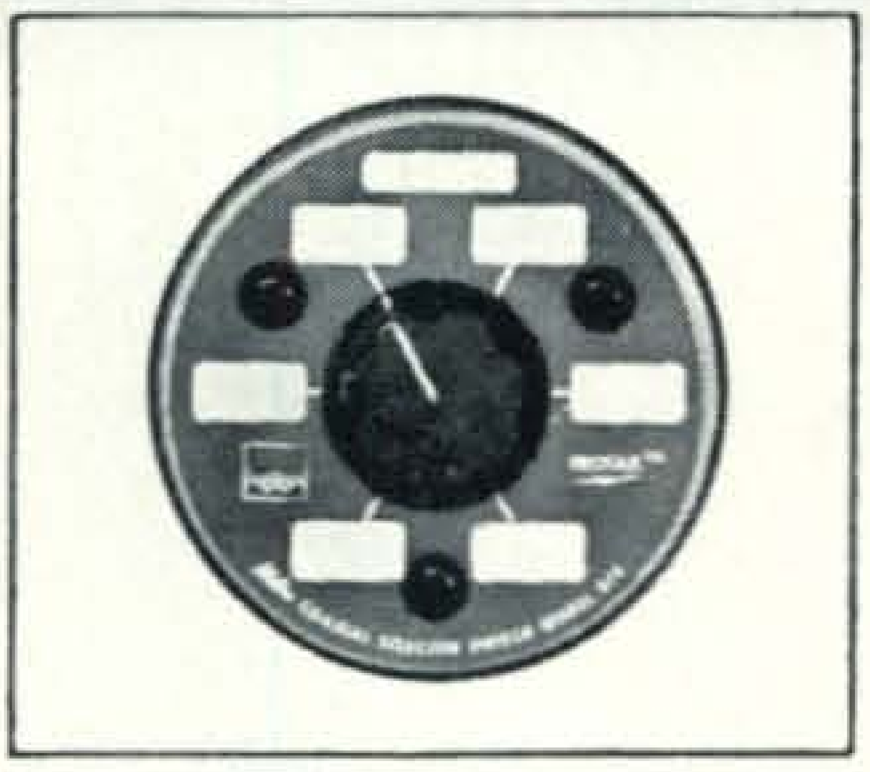

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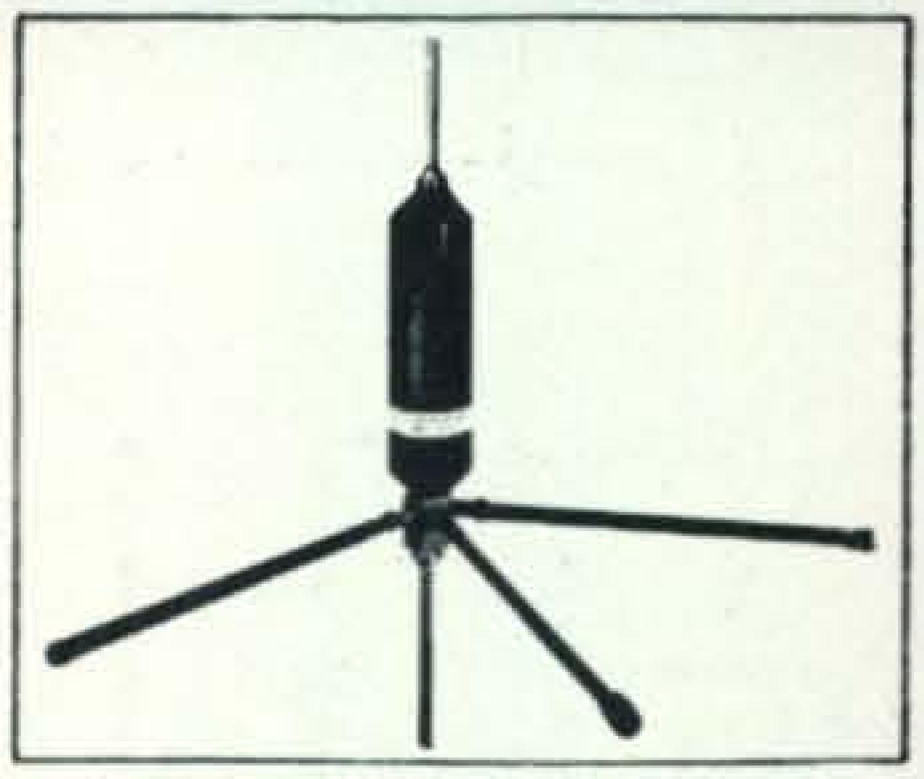

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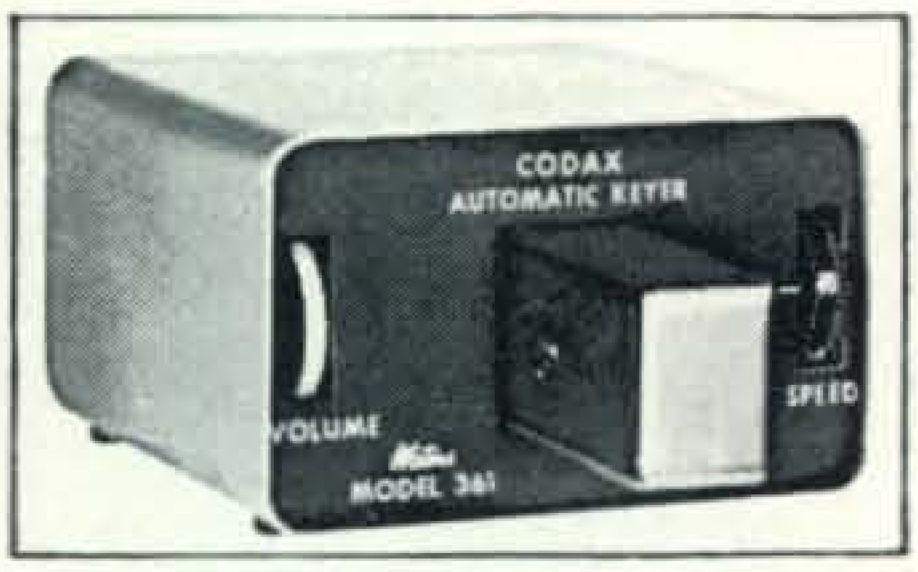

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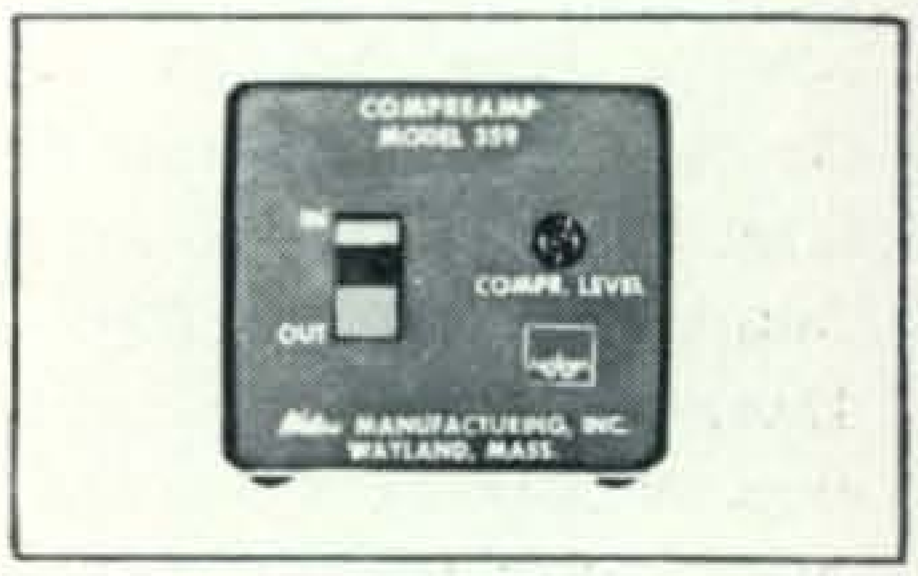

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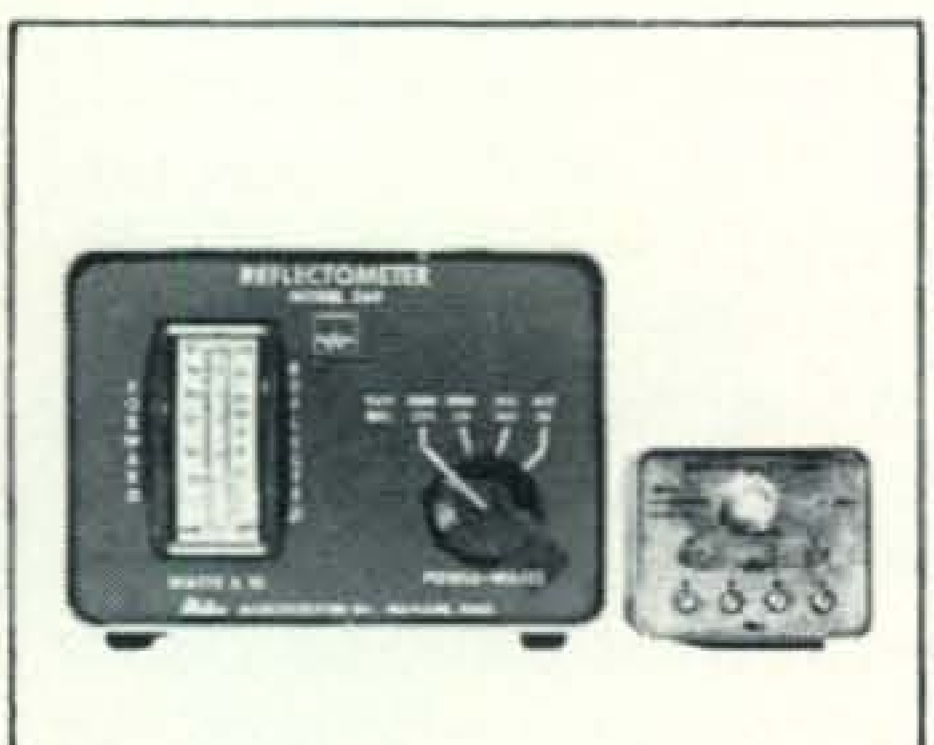

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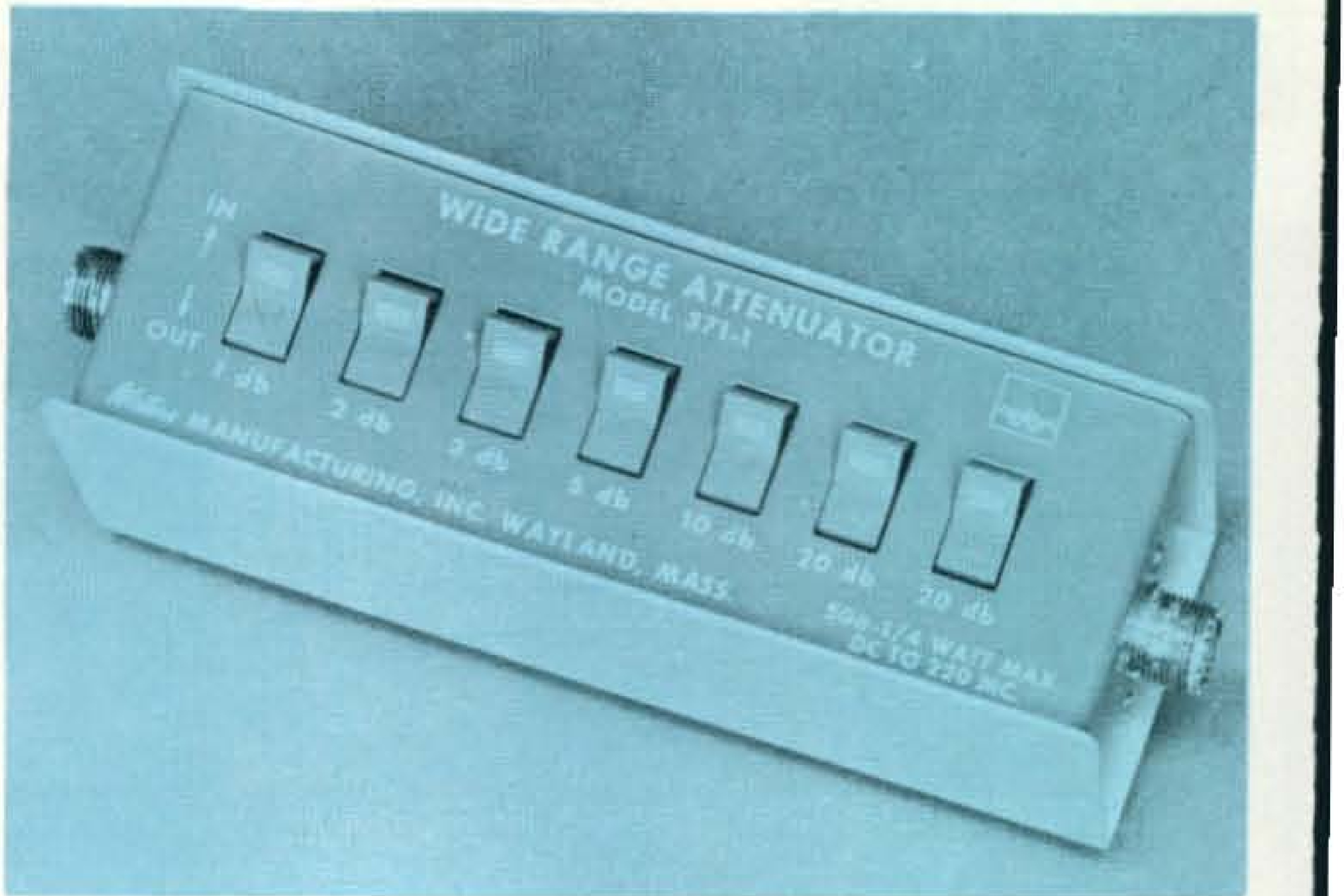
The Waters Model 371-1 Wide Range Attenuator provides up to 61 db of attenuation in 1 db steps selected using rocker-type switches. It is designed for use up to 220 mc on 50-ohm circuits.



CQ Reviews:

The Waters Wide Range Attenuator

BY WILFRED M. SCHERER,* W2AEF

ONE of the handiest and most useful devices to have around the shack, test bench or in the laboratory is a step attenuator[1] which can be used in conjunction with received signals, signal generators or other low-level signal sources to check many aspects of receiver, antenna, coax-switch and other equipment performance. Under certain adverse conditions, improved reception of signals also can be obtained.

Such an affair is the Waters Wide Range Attenuator, Models 371-1, 371-2 and 371-3. These are designed for use with 50-ohm coax lines and provide a total attenuation of 61 db in 1 db increments.

There are seven individual steps of attenuation: 1, 2, 3, 5, 10, 20 and 20 db. Any combination of steps may be switched in that adds up to the required degree of attenuation within the maximum range of the device.

Other electrical specifications are:

MAX. POWER LEVEL:
¼ watt.
VSWR:
1.3 max. – d.c. to 225 mc
IMPEDANCE:
50 ohms nominal.
ATTENUATION ACCURACY:
0.1 db-per-db – d.c. to 60 mc.
0.1 db-per-db ± 0.5 db to 150 mc
0.1 db-per-db ± 1.0 db to 225 mc

Construction

Rocker-type switches are used for the various steps. Not only do they make a neat appearance, but they are also more conveniently operated than normal slide or toggle switches. Noninductive ¼ watt 5% resistors make up each attenuator section and are installed directly at the switch terminals. Pi-type sections are used. A special U-shaped copper shield is installed over the row of switches and between the end connectors to minimize leakage around the sections and to maintain impedance continuity and a low s.w.r. The panel on which the attenuator is assembled mounts in a heavy-gauge metal case.

---

* Technical Director, *CQ*.

1 Scherer, "A Step Attenuator", *CQ* Oct. '64, page 43.

The Model 371-1 has SO-239 u.h.f. connectors for accepting PL-259 type cable plugs. The Model 371-2 employs BNC UG-1094/U connectors. The Model 371-3 has N-type connectors.

The unit is neatly styled with a gray panel and white lettering, while the switch rocker arms are red. The case has a brushed-steel finish. Size is 8" L. × 2½" W. × 2⅙" H. Weight is 1 pound.

Applications

Instructions are supplied with each unit and include procedures for checking S-meter calibrations, relative signal levels, receiver sideband suppression, receiver image and i.f. signal rejection, crosstalk in coax switches, comparative receiver sensitivity; for obtaining known voltages from a signal generator and for use with noise figure measurements. Additional suggested uses are: checking gain of r.f. preselectors, receiver i.f. bandwidth, a.g.c. characteristics relating to a.f. output vs r.f. input-signal levels, receiver gain between various bands, S-meter sensitivity, compression-amplifier characteristics, receiver and transmitter overall linearity. An operational application is that of reducing the input-signal levels to a receiver to eliminate overload, cross-modulation or a.g.c. pumping.

In use, care must be taken to see that no more than ¼ watt of power is applied to the attenuator; otherwise there will be severe damage to the resistors and a consequent change in the attenuator accuracy. If you've been using it in connection with a transceiver, be sure it is removed from the circuit before the transmitter section is fired up. Where it is to be used with the receiver during normal operating periods, installation should be made in a manner that permits the attenuator to be automatically switched out of the antenna circuit during transmit, such as may be done with a relay.

Performance

Results of measurements on a Model 371-1 indicated an attenuation accuracy within the specifications and were: 0.1 db/db for the 1-5 db steps; 0.05 db/db for the 10-20 db steps. The s.w.r. up to 148 mc was 1.1:1 or less.

The Waters Model 371-1 Wide Range Attenuator is priced at $29.95. The Model 371-2 is $32.50 and the Model 371-3 is $38.95. They are products of Waters Manufacturing, Inc., Boston Post Road, Wayland, Mass. 01778. —*W2AEF*

THE DO-IT-YOURSELF BEAM

BY DAVID P. SMITH *

The Author presents a method of beam construction, especially for 10 and 15 meters, which utilizes inexpensive materials available in almost any hardware store. The units form into a fairly sturdy beam of unusual constructional simplicity.

Now that 10 meters is slowly becoming usable for DX during longer periods of the day, many amateurs are focusing their attention on erecting a beam antenna for this band. Many locations which cannot accommodate a beam antenna on the lower bands can easily do so on 10 meters. The choice as to whether one should buy a beam or build one depends upon many individual factors and no attempt will be made to solve that controversy here. However, this article does present a method whereby one can construct a 10 meter beam equal in electrical performance (not mechanical) to many manufactured beams for as little as $10 to $13, utilizing parts that can be purchased in any medium to large size hardware store throughout the country. The simple principle of construction can easily be applied to larger 10 meter beams (4 elements or more) and to 15 meter beams. The materials used, however, would not be suitable for 20 meter beam construction because of mechanical considerations. The mechanical qualities of the construction method used give it sufficient strength for use in all but extremely windy areas or where it would experience very heavy ice-loading.

* P.O. Box 188, N. Stonington Village, Conn.

Construction

Figure 1 shows the basic construction of the 10 meter beam which the author built. It is a standard "plumber's delight" version

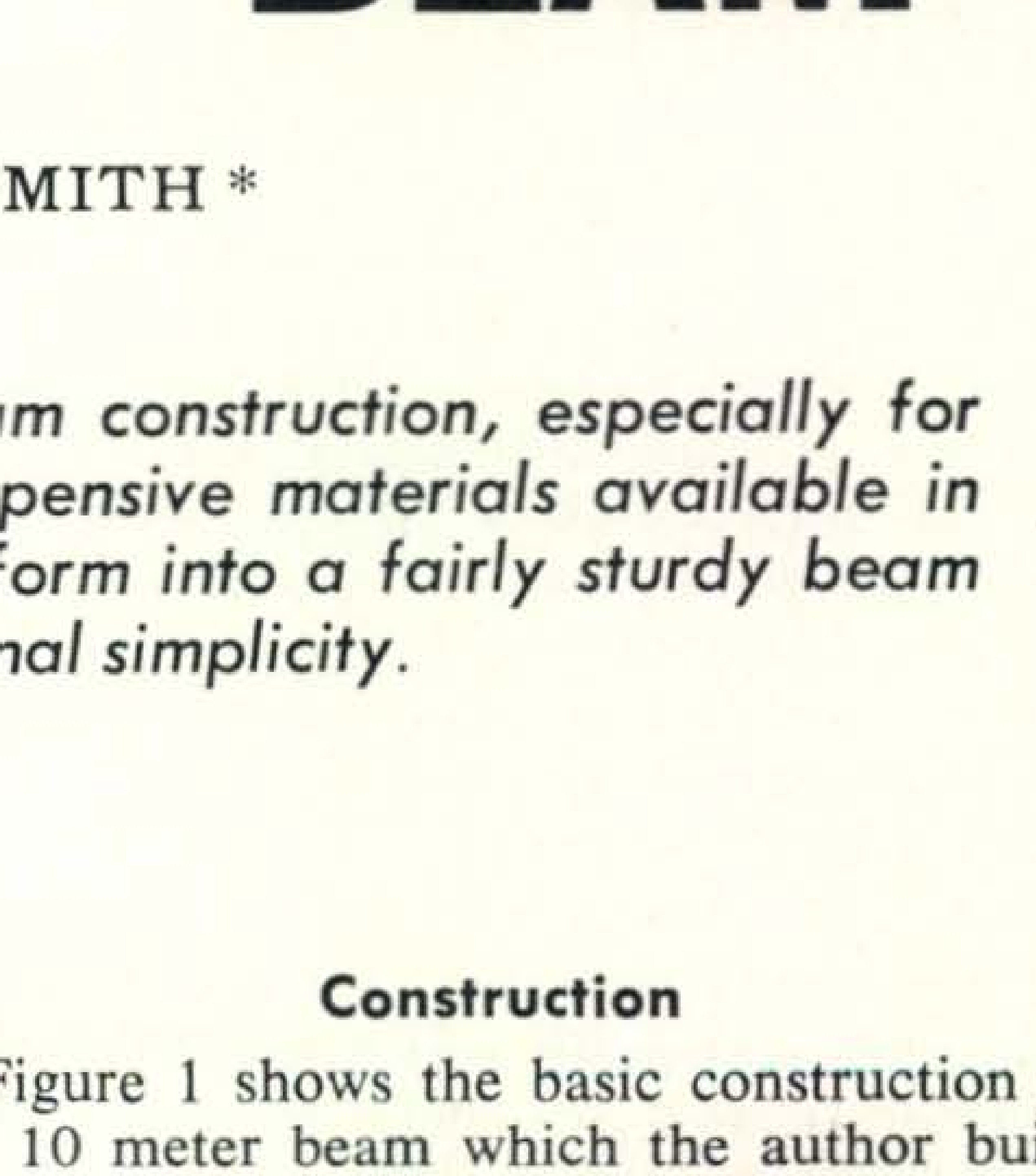


Fig. 1—Overall dimensions for the 10 meter beam for a center frequency of 28.6 mc. The boom is a standard 10' TV mast; the 8' element sections are ¾" × ¾" × ⅛" aluminum L bracket; the extensions on the elements to bring them to the exact lengths are ½" × ½" aluminum L stock. The antenna is shown fed by a Delta match.

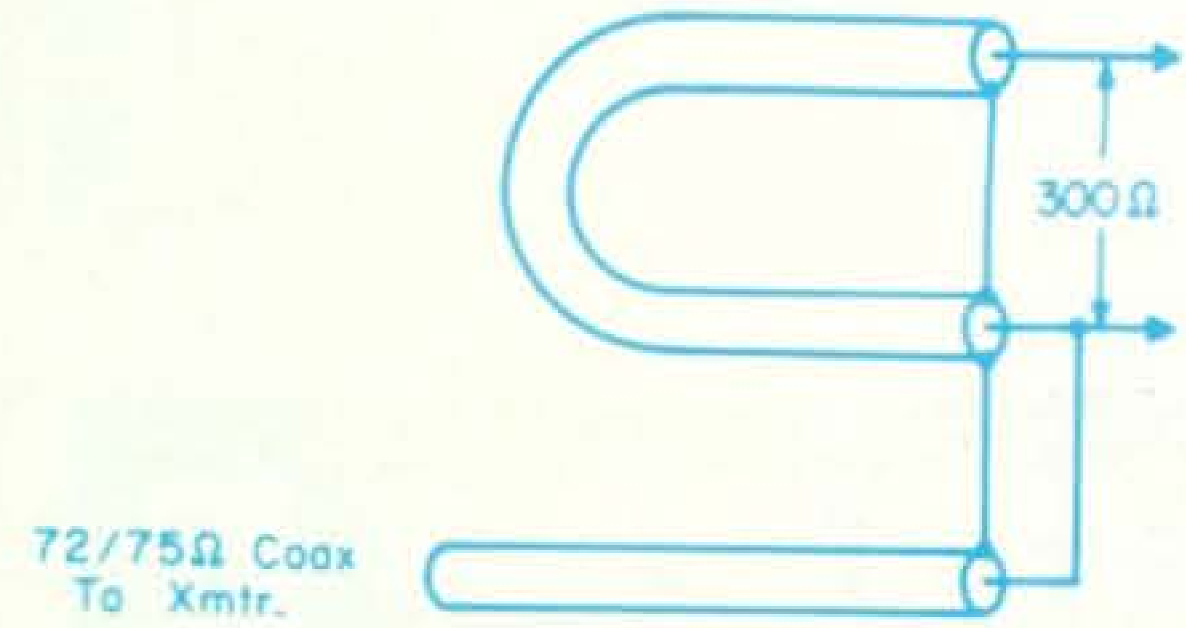
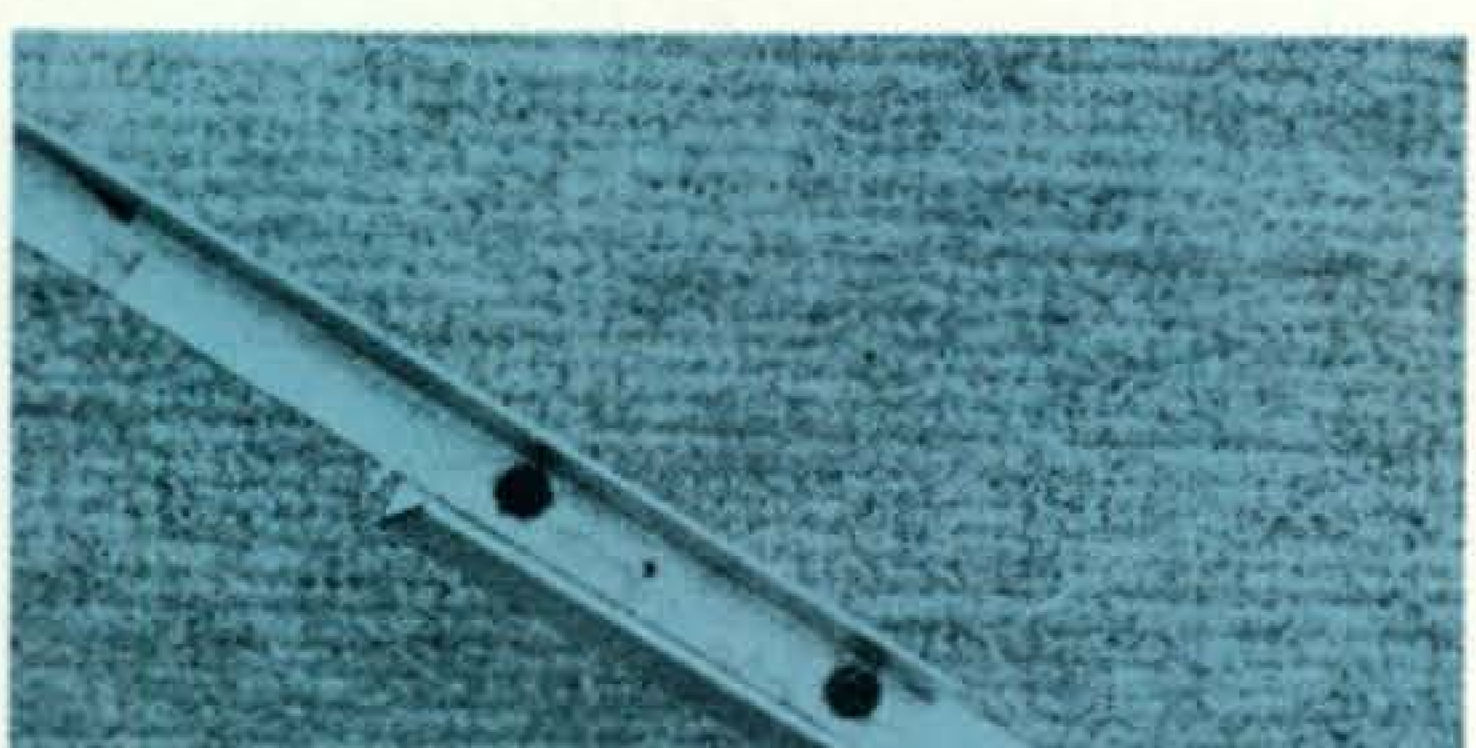


Fig. 2—A coaxial balun can be used to match from coax (unbalanced) to balanced 300 ohm line as explained in the text.

with all elements grounded to the boom. The director is spaced 0.1λ from the driven element and the reflector is spaced about 0.2λ. The latter spacing is a bit more than the usual 0.15λ reflector spacing for a normal size 3 element beam; however, it does raise the forward gain slightly and permits using a standard 10 foot aluminum TV mast as the boom without any modification. A 0.15λ reflector spacing can, of course, be used instead when it is desired to further reduce the turning radius of the beam.

The main feature of the construction is the use of 6 or 8 foot "L" shaped aluminum stock as the material for the construction of the elements. Either 6 foot or 8 foot ¾ × ¾ × ⅛" stock is used as the center portion of each element. Usage of the 8 foot stock is preferred both because of price advantage per linear foot and also because of mechanical considerations. The 6' stock can be obtained at almost any hardware outlet while only the larger outlets will tend to have the 8 foot lengths. Half inch aluminum "L" stock is used to extend each element to the required length as shown in fig. 1.



The ¾" and ½" L sections are joined simply by two 8-32 nuts bolts and lock washers.

U clamps and saddles are used to secure the ¾" sections to the boom. Some care must be taken in the securing of the elements to the boom. Many saddles, as purchased in a hardware or parts supply house, are designed to couple a tubular element to a mast. Either the saddle "seat" must be shaped flat to accommodate the aluminum L sections or the saddle must be attached as shown in the photograph to grip the aluminum L section securely.

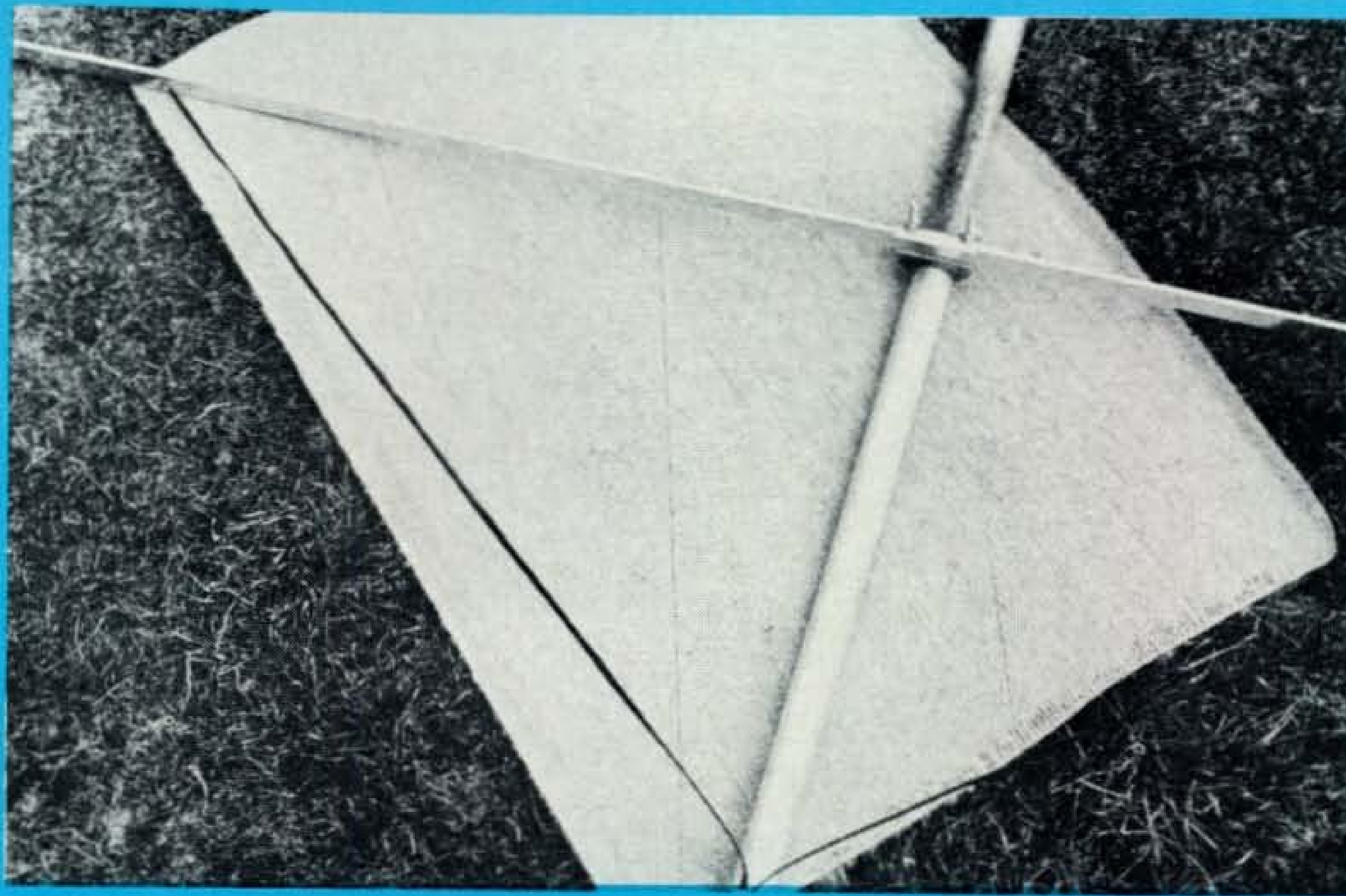
The dimensions shown in fig. 1 are for a center frequency of 28.6 mc. If another center freqency is desired the dimensions can be directly scaled up or down in proportion to the center frequency desired.

Matching Systems

The matching system used for the transmission line makes use of the old-fashioned Delta match. Such a matching system is meant to work with a balanced transmission line, such as 300 ohm twinlead. Although most amateurs prefer to use coax to an antena, the line loss on 28 mc should be considered if a long run of transmission line is involved. For instance, if a run of 150 feet is involved, standard 300 ohm twinlead will have almost 2½ db less loss than the same run of RG-58 coax% When compared to RG-8 coax, the difference in loss in the 150 foot run is less than 1 db in favor of the twinlead but, then again, there is also a considerable price difference between twinlead and RG-8 coax. Although all the factors that go into selecting a transmission line cannot be explored here, it is probably safe to say that many amateurs operating beams on 28 mc could be spending less money on transmission line and radiating a better signal if they used twinlead properly to feed an antenna.

A standard ½λ balun (fig. 2) is used in the shack. It provides a 4:1 impedance transformation and matches the 75 ohm unbalanced line to 300 ohms, balanced. The length of the balun in feet = $325/f_{mc}$. The formula takes into account the velocity factor correction for coaxial cable (RG-8, 58 and 59). For 10 meters the actual length is 11'5" centered on 28.5 mc.

A Delta match may be used to feed the antenna. As shown in the photograph the Delta match is made by simply fanning out both wires of the 300 ohm twinlead to the driven element from a clamp-on type of TV insulator on the boom. The adjustment of



Delta match is formed by fanning out the 300 ohm transmission line from the TV standoff insulator located two feet from the driven element. Note, also, how the driven element is secured to the boom.

the match does take a bit of time since both the distance out along the driven element and the spacing of the TV insulator on the boom must be varied to achieve a perfect match.

The alligator clip connections to the driven element are set 4′ to 4½′ apart and the TV insulator is located 3′ to 4′ from the driven element. An s.w.r. bridge is placed in the line but should be as close to the antenna as possible. While the alligator clips remain fixed the position of the TV insulator should be adjusted for the lowest s.w.r. When this is done, the location of the alligator clips are adjusted for minimum s.w.r.

A small hole is drilled in the driven element at these points so the wires can be permanently attached by means of a screw and solder lug. These adjustments must be made with the beam elevated off the ground, preferably in its normal operating position.

Gamma Match

For those who prefer the usual Gamma type match, so a coaxial cable can be used as the transmission line, a simple matching section can be added to the driven element using ½″ L stock as shown in fig. 2. The 2 foot long ½″ stock is placed about 3″ away from the driven element on insulators. Mica capacitors (1,000 volt type) ranging from about 18 to 75 mmf are tried with alligator clips between the end of the matching section and the driven element and also moved towards the boom until a correct match (1:1s.w.r.) is achieved. Then, holes are drilled in the matching section and driven element and the capacitor fastened in place with screws and a soldering lug.

A variable 75 mmf air capacitor could just as well have been placed between the end of the matching section and the driven element and tuned for minimum s.w.r. However, the use of the mica capacitors has several advantages in that they are easier to mount, there is no weatherproofing problem and the capacitance value will not change (except for slight effects due to temperature variations). If one does not have a stock of high-voltage mica capacitors, tuning can be done at low power so that inexpensive, low-voltage ceramic or mica capacitors can be used and then only a high-voltage capacitor of the necessary value purchased for final installation. With either a Delta or Gamma match, the s.w.r. should remain below 1.5:1 for several hundred kc on either side of the design frequency.

Electrical and Mechanical Performance

It was mentioned that the mechanical performance of the beam was not equal to that

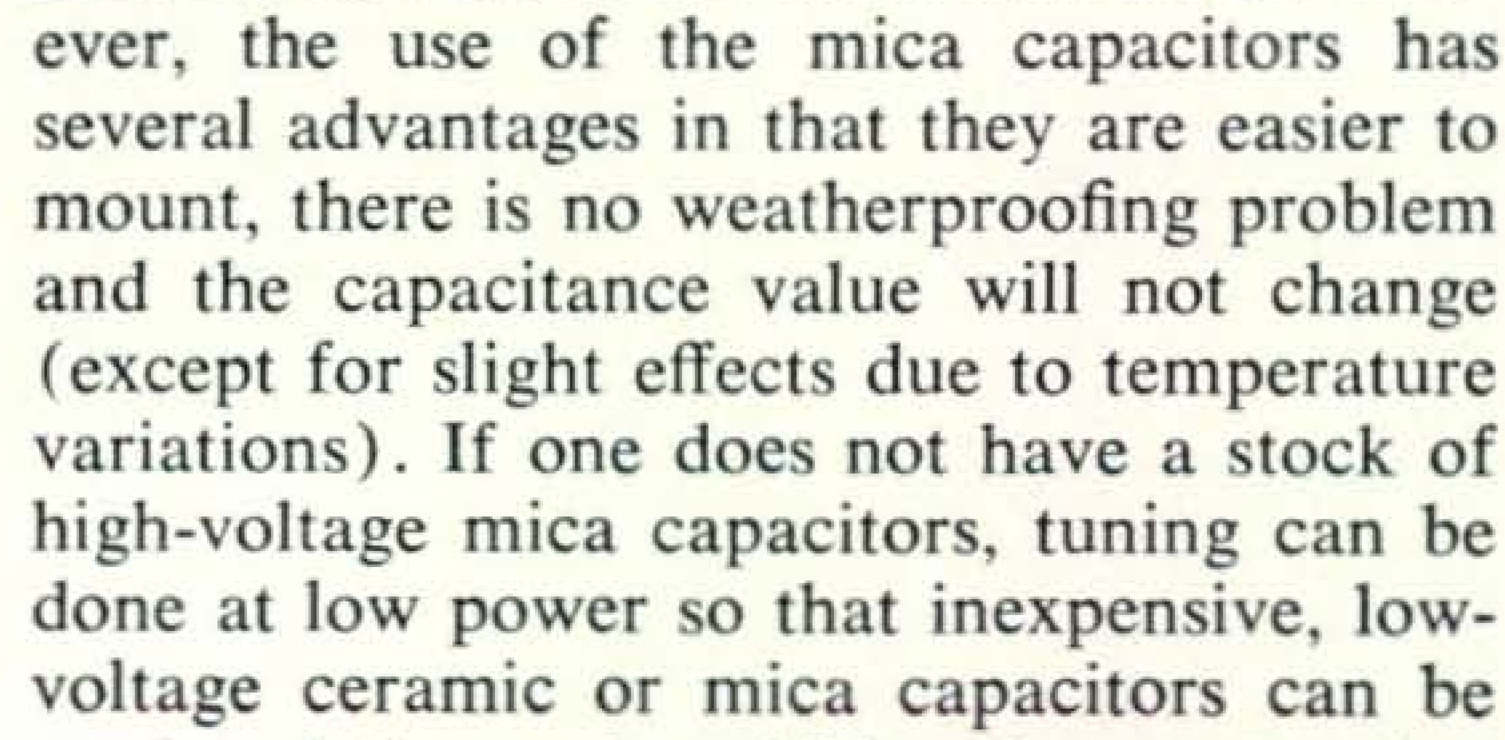


Fig. 3—If desired, a gamma match can be used to feed the beam with coax instead of 300 ohm line. The adjustment of the match is explained in the text.

of commercial beams and perhaps this point should be clarified. The L stock used will not stand the same stress as tubular ¾ or ¼" diameter sections. However, unless one lives in an usually windy area and icy area, there should be no problem. The author has used an antenna constructed in a similar manner for about a year and it has easily withstood Eastern coastal weather. The elements could be braced if desired by using nylon rope attached to the boom and to where the ¾" and ½" sections are joined.

The performance results obtained with any beam depend almost entirely upon how it is installed and used. As far as the author has been able to judge in comparison with other antennas, the beam has a forward gain of 7 to 8 db and a front-to-back ratio of 18 to 20 db. Possibly these figures could be improved somewhat if the elements were carefully trimmed but certainly they indicate that the beam design is basically correct.

Construction Variations

The beam is used horizontally polarized but it could just as well be used vertically. Another interesting variation which this method of construction allows is to use the beam in a shortened fashion by placing the ½" end sections vertical (when the ¾" sections are horizontal). A standard hardware right angle bracket can be used to join the ¾" and ½" sections. The flat-top elements will then be only 8 feet long. If this is done, plus the use of close spacing, (0.1λ for the director and 0.15λ for the reflector) the beam should be of sufficiently small dimension to fit any QTH restrictions. As a further step, only 2 instead of three elements can be used. Either the director element can be used at 0.1λ spacing or the reflector element at 0.15λ spacing. The gain will be about the same in both cases but the front-to-back ratio will be better when the parasitic element is used as a director.

For best results in this configuration, the elements should be trimmed as necessary. First, the driven element, operated alone, should be adjusted so that it performs and loads correctly as a ½λ dipole. The parasitic element should then be added to the boom and the matching of the driven element readjusted. The length of the parasitic (which should initially be 5 to 10% longer than the standard length formulas indicate) should then be cut for maximum forward gain. The latter is easily done on the L stock with heavy diagonal cutters. ■

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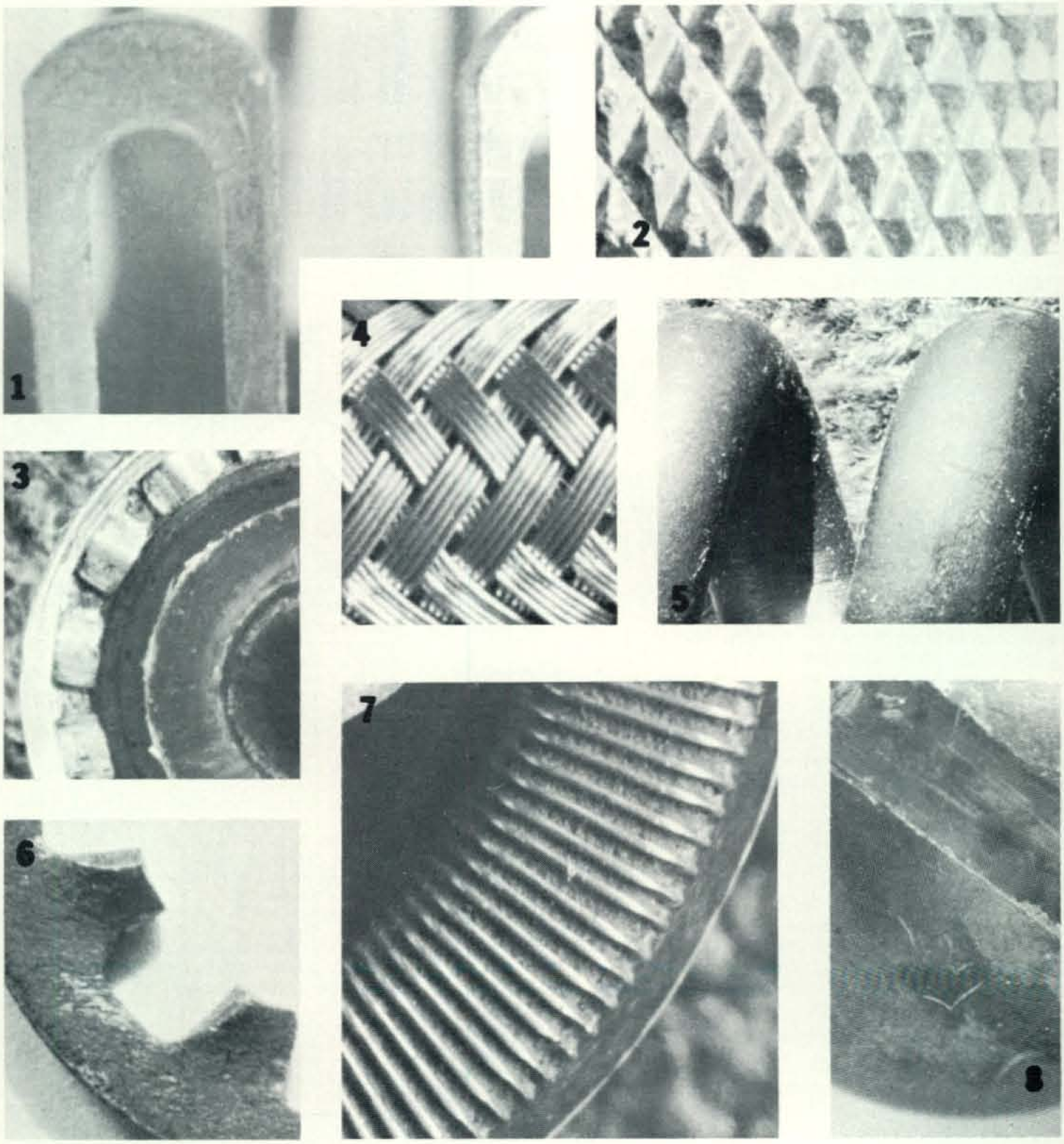
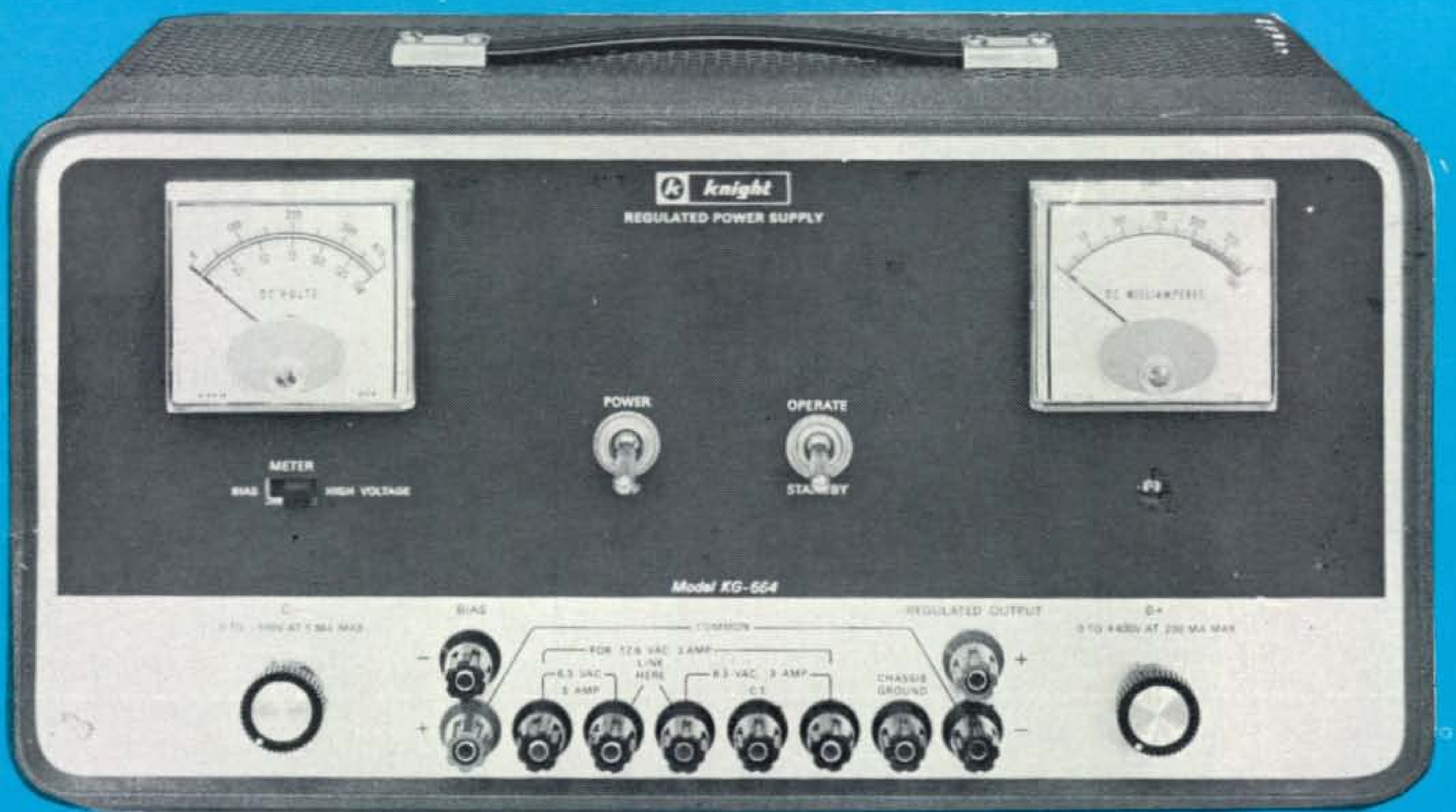
WHAT'S YOUR JUNK BOX I. Q.?

Sure, it's a snap! Any self-respecting ham should be able to ace this little "photo-quiz". How about you? Scoring: 1 to 3 - Obviously an appliance operator; 4 to 6 - Average amateur technician; 7 or 8 - Expert - You probably have the biggest Junk Box in town. Answers below.



Answers: 1 - Miniature tube socket. 2 - PL-259 male coax connector. 3 - SO-239 female coax connector. 4 - Coax braid. 5 - Microphone "coil-cord" 6 - Lockwasher. 7 - Rheostat. 8 - Round head screw.



The Knight-Kit KG-663 low-voltage regulated Power supply (right). The Knight-Kit KG-664 high-voltage regulated power supply (top).

CQ Reviews:

The Knight-Kit Regulated Power Supplies

BY WILFRED M. SCHERER,* W2AEF

THE KNIGHT-KIT REGULATED POWER SUPPLIES

A REGULATED power supply, with variable output voltage, can be most helpful with service, operational, test, demonstration, experimental, or developmental work on electronic equipment at the ham shack, shop bench, laboratory, class room or production line. Two such devices, professionally styled and engineered, are the Knight-Kit Model KG-663 Low-Voltage Supply and the Model KG-664 High-Voltage Supply. Either one is available in kit form or as a factory-assembled unit.

Model KG-663

The Model KG-663 is an all-solid-state job that operates from 110-130 v.a.c., 50-60 c.p.s. It provides a continuously-variable regulated potential of 0-40 v.d.c. at currents up to 1.5 a. and as such will be found especially desirable for work with transistorized equipment.

It also provides current-iimiting which can be adjusted with a panel control for any amount up to the maximum rating, thus furnishing a measure of protection for the associated equipment and also for the supply itself. As for the latter, the current-limiting system prevents damage even from a direct short-circuit at the output.

Separate meters, with ± 2% of full-scale accuracy, simultaneously indicate the voltage and current. The power-supply circuitry is insulated from the chassis and the two output terminals are left floating, so that either the negative or positive side may be grounded to the chassis. The arrangement also permits dual operation with a like power supply using both units connected in series to furnish higher voltages at the rated current. They also may be connected in parallel to increase the current capabilities at the rated voltages.

Another feature is that there are terminals for remote sensing, so that any voltage drop or poor regulation, due to the resistance of long connecting leads to the load, may be detected directly at the load and fed back to the regulator which then will automatically compensate for the lead losses and thus maintain the voltage constant.

In addition, rear-terminal connections also permit the voltage to be controlled from a

* Technical Director, *CQ*.

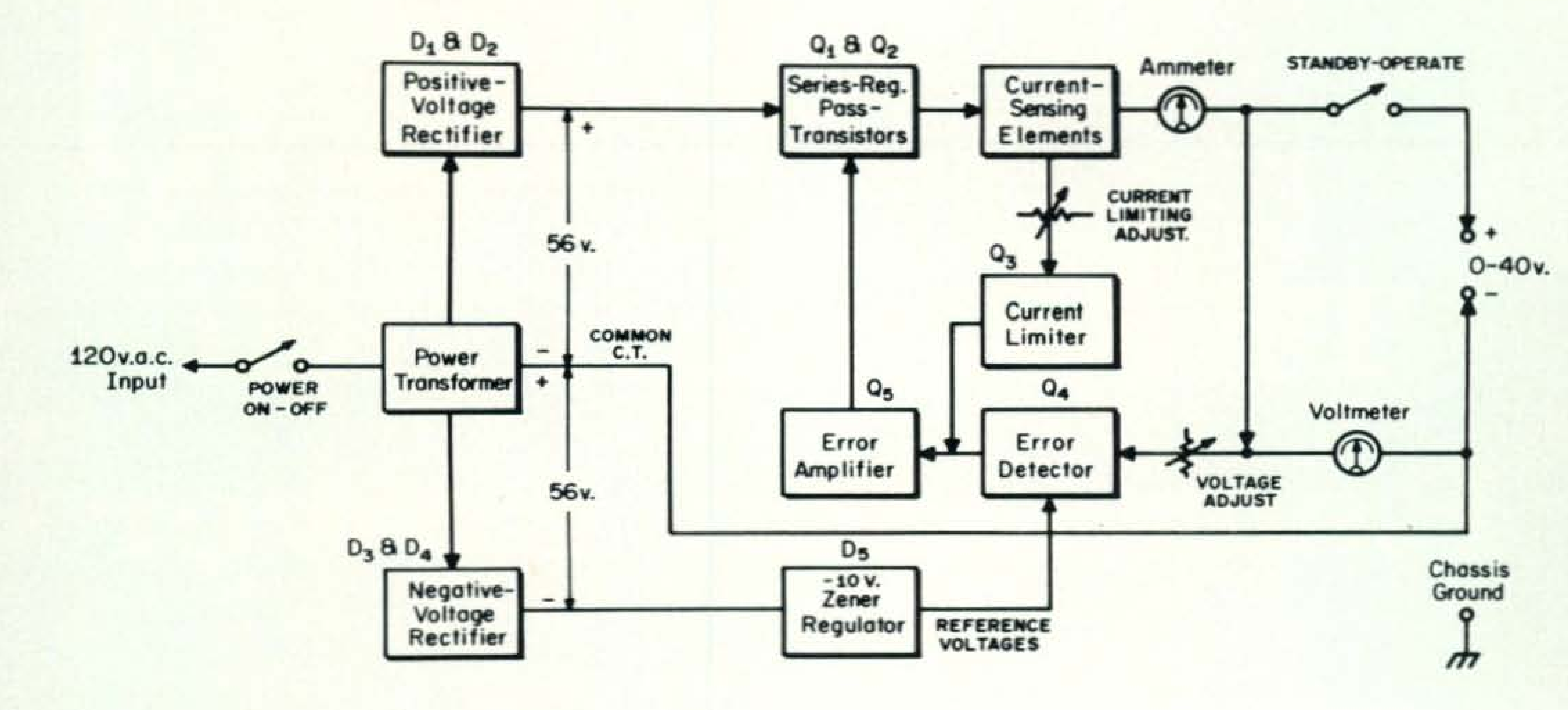


Fig. 1—Block diagram for the KG-663 Low-Voltage Power Supply. The principle of operation is explained in the text. The current-sensing elements consist of a combination of resistors and a silicon diode in series with the output circuit.

Specifications		
	KG-663	KG-664
Input-voltage Range:	110-130 v.a.c. 50/60 c.p.s.	110-130 v.a.c. 50/60 c.p.s.
Output Voltage and Current:	0-40 v.d.c. reg. at 0-1.5 a. continuous	0-400 v.d.c. reg. at 0-200 m.a., continuous. 0-100 v.d.c. neg. bias at 1 m.a. 6.3. v.a.c. at 3 a. 6.3 v.a.c. at 3 a. c.t. or 6.3 v.a.c. at 6 a. or 12.6 v.a.c. at 3 a.
Output Regulation: (no load to full load)	Less than .06 v. change	Less than 1% change
Input Regulation: (with 110-130 v.a.c. line variations)	Less than 0.3 v. change	Less than 1% change
Ripple: (under all load conditions)	Less than 0.6 mv. r.m.s.	Less than 5 mv. r.m.s.
Output Impedance:	Less than 0.1 ohm, d.c.-10 kc; 0.5 ohm 10-100 kc.	Less than 10 ohms.
Power Consumption:	20 watts, no load; 110 watts, full load.	70 watts, no load.
Size: (H.W.D.)	7¾" × 7½" × 10¾".	7¾" × 14¾" × 9¾".
Weight:	16 lbs.	20 lbs.

remote point, thus allowing the unit to be placed directly at the associated equipment, as may be required in some cases.

Principle of Operation

Referring to the block diagram at fig. 1, a full-wave center-tap rectifier is incorporated using two silicon diodes to furnish a positive voltage for the output. A second pair of silicon diodes, connected in opposite polarity in a similar configuration across the same winding, supplies a negative voltage (with respect to the common center-tap). Several thousand microfarads of filter capacitance are used at the output of each rectifier.

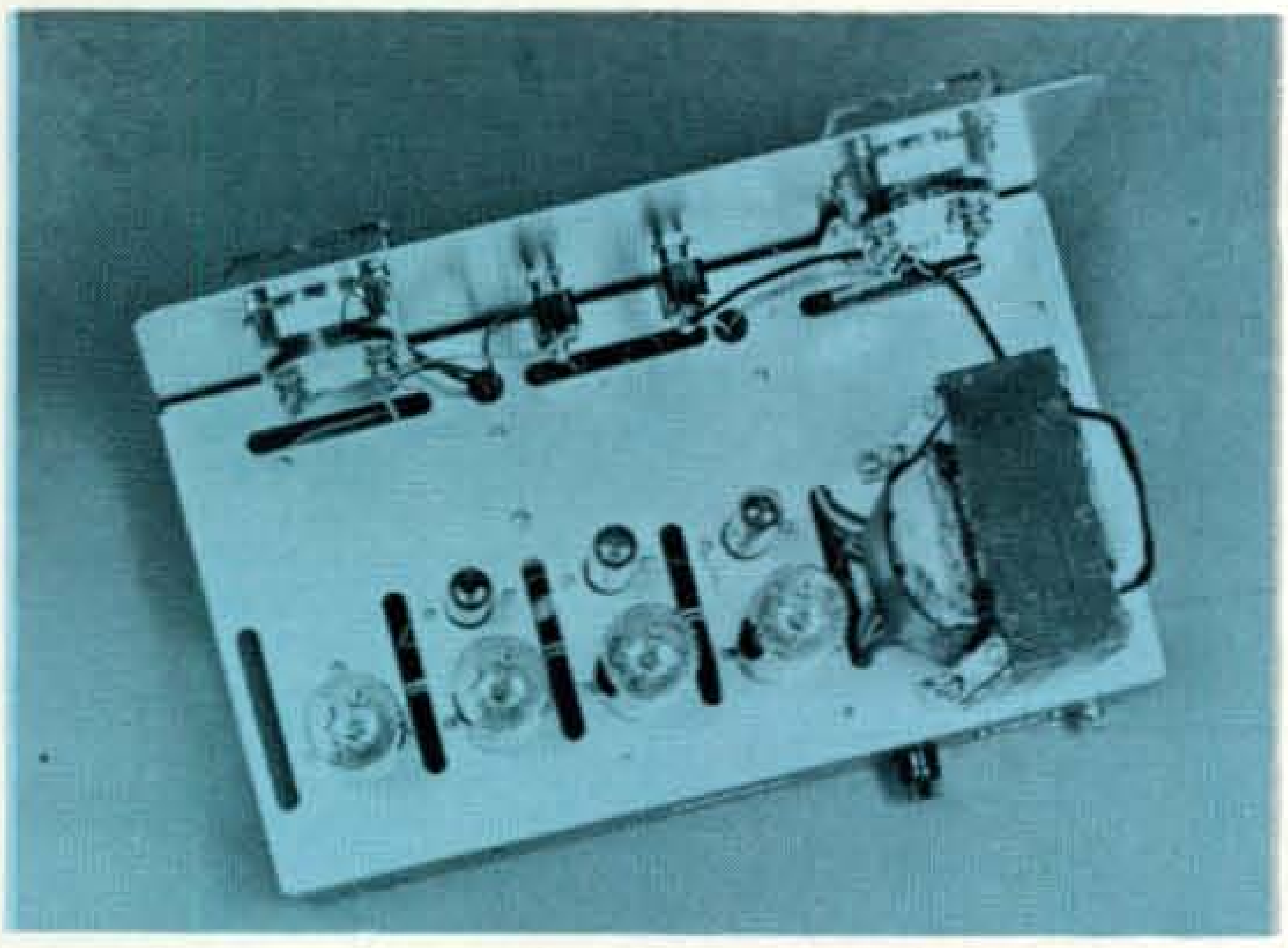
The positive voltage goes through the series-regulator which consists of two power-type transistors that are connected in parallel with one another. It then goes through the current-sensing elements and to the positive-output terminal.

The negative voltage goes to a zener diode that provides a constant reference voltage for the error detector which samples a portion of the voltage fed to the output terminals.

Any change in output voltage with respect to the fixed reference is fed through the error amplifier to the series-regulator pass-transistors, the base bias of which is then altered and accordingly changes the collector-to-emitter impedance which is in series with the positive-voltage line. The pass-transistors thus function as a variable resistance which automatically compensates for any change in voltage that tends to occur at the output terminals due to load variations.

A voltage-adjust control in the sampling circuit is provided to set the initial bias for the error detector, and thus that for the pass-transistors, at a point that allows the series-regulator to pass the desired steady-output voltage over range of 0—40 v.

Besides maintaining a constant output voltage, the regulator action provides more filtering. In addition, bypass capacitors across the voltage-adjust control make the error detector much more sensitive to a.c. changes in output voltage. This provides extra filtering to smooth out any ripple that may tend to appear at the output. Other capacitors furnish still more filtering at the regulated output and lower the impedance thereat.



Top-chassis view of the KG-664 Supply. The 6L6-GC series regulator tubes are in the foreground. The smaller tubes are the gaseous regulators and the error-detector/control stage.

Current Limiting

Current limiting is obtained by the application of a voltage drop, that is produced across the current-sensing elements, to the base of the current-limiter transistor. When this voltage reaches 0.66 volts, Q_3 takes over control from the error detector by producing a voltage through the error amplifier that causes the series-regulator pass-transistors to drop the output voltage below the value that can sustain the maximum current for which the limiting control is adjusted. The control can be set to a point that produces the necessary .66 volts with current of 0.1—2 a., thus providing limiting over a wide adjustable range.

In the event of a direct short-circuit at the load, the maximum possible current will be 2 amperes. The voltage at the output terminals will drop to zero. In any case, the power, due to the voltage drop across the series regulator, will be dissipated by the transistors which are mounted on large heat sinks. The voltage will automatically return to the preset value when the overload or short is removed. No resetting is required.

Additional Protection

Besides the protection offered by the current-limiting system, diodes are located at strategic points in the circuit to prevent damage to the components from reversed-polarity voltage applied to the output terminals of the unit, such as may inadvertently take place when two or more supplies are connected for series or parallel operation. In case of component failure, a fuse is provided in the primary circuit of the power transformer.

Construction

The unit is built on a heavy-guage chassis to which is fastened an aluminum panel. It is installed in a 0.047 gauge perforated-steel case that has a baked-wrinkle, scuff-resistant finish and a decorative wrap-around bezel. The panel has a two-tone charcoal and satin-aluminum finish. A heavy-duty plastic carrying handle can be collapsed to the surface of the case to allow other equipment (provided with mounting feet) to be stacked on top of the unit. It also saves storage space.

D'Arsonval movement meters are used that are the full-view type with a plastic face which is concave to minimize light reflections. The VOLTAGE-ADJUST control is a concentric affair with one knob for coarse adjustment, the other for fine adjustment. The latter covers a range of about 0-1.5 volts around the coarse setting.

An a.c. power-on switch with a green pilot lamp is provided along with a standby-operate switch with a red indicator lamp. The voltmeter is ready to read as soon as the a.c. power is turned on, in order to enable the d.c. voltage to be preset before it is applied to the load.

Heavy-duty industrial-type toggle switches are used and there are 5-way, positive-lock binding posts spaced for GR plugs. A separate ground post is included on both the panel and at the rear. Also at the rear are screw-type terminal strips for output voltage, remote sensing and programming. A detachable "cheater-type" line cord plugs in at the rear and thus avoids the encumbrance of a dangling cord when the unit is transported or stored. The fuse is on the front panel.

Model KG-664

The Model KG-664 high-voltage supply also is a.c. operated and provides two sources of continuously-variable voltage. One supplies a regulated positive-potential (for B plus) of 0-400 v. at 200 ma output current; the other furnishes a negative potential (for bias) of 0-100 v. at 1 ma.

In addition, a feature not usually found in moderately-priced jobs, is that there are *two* individual outputs of 6.3 v.a.c. at 3 a. that may be connected in series for 12.6 v.a.c. at 3 a. to operate gear equipped with 12 volt tubes. These sources, one of which is center-tapped, also may be paralleled for 6.3 v.a.c. at 6 a.

Other features like those included in the KG-663 are: separate ±2% meters for voltage and current, power supply insulated from chassis and floating output terminals, chassis-ground terminal, multiple operation with like units connected in series or parallel for increasing voltage or current capabilities and detachable line cord. The voltmeter is manually changed by a switch to indicate either the B plus on a 0-400 v. scale or the negative bias on a 0-150 v. scale. A 0-300 milliameter indicates the output current for only the B-plus output. This model also is built to match the KG-663 with the same type of styling, rugged construction and high-quality components.

Circuitry

Except for the current limiting arrangement which is not included in the KG-664, its basic operating principle is quite conventional for units of this type and is similar to that of the KG-663, with vacuum tubes utilized instead of transistors. A 6DK6 control tube is used for the error detector/amplifier to provide a control bias for the series regulator which consists of four 6L6-GC pentodes connected together in parallel. The pentodes are used in preference to triodes, because their cathodes are less sensitive to variations in plate voltage and thus provide better input regulation and improved ripple reduction.

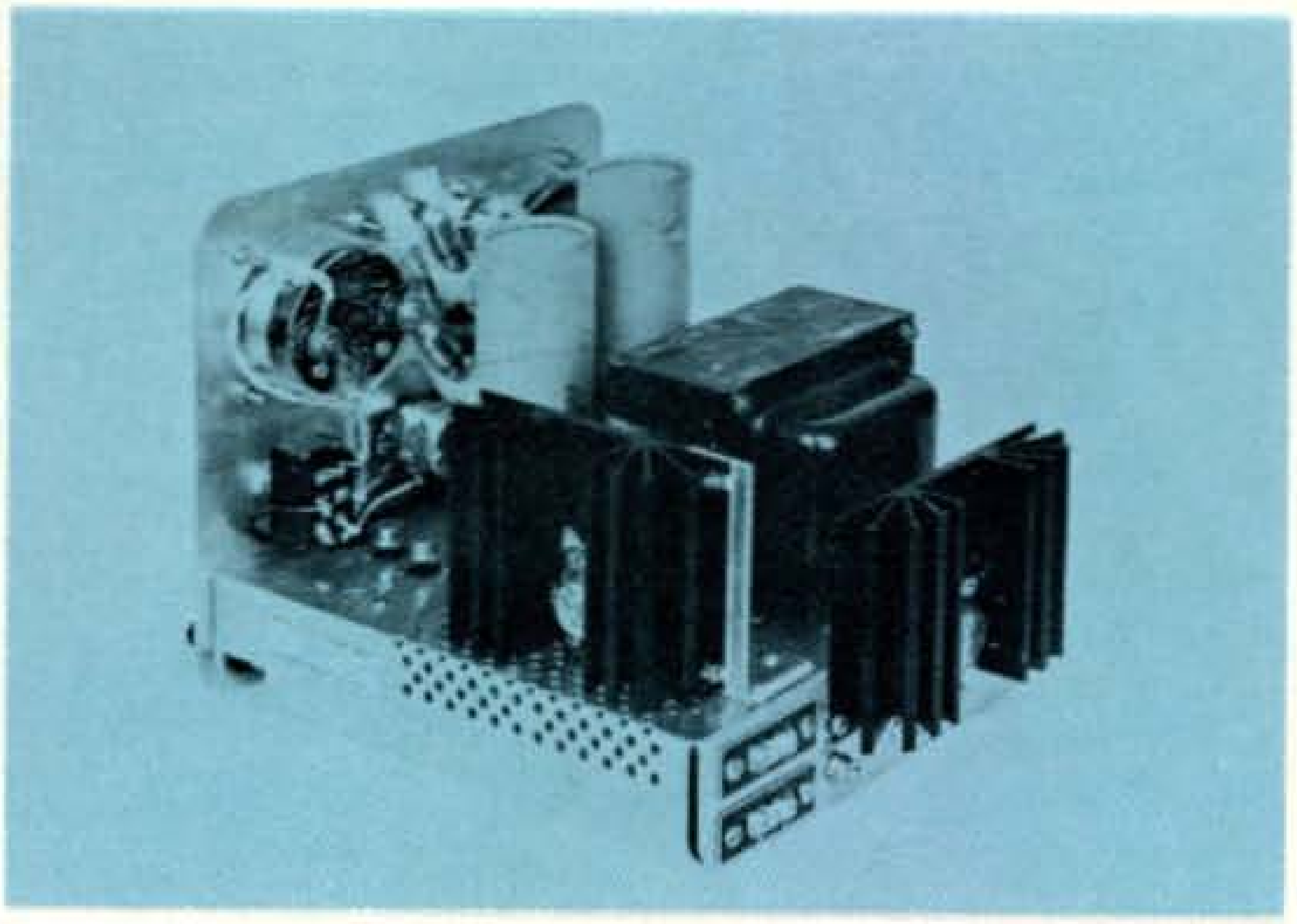
High voltage is obtained from the power transformer through a full-wave bridge rectifier using four silicon diodes. A relatively constant screen voltage for the regulator tubes is obtained from a separate transformer winding using a half-wave silicon rectifier, while two silicon diodes in a full-wave center-tap circuit at still another winding provide a negative voltage that is fed to series-connected 0A2 and 0B2 gaseous regulator tubes that furnish stable bias and reference voltages.

The output bias is varied by a potentiometer across the bias source and is fed to the panel terminal through a current-limiting resistor to prevent damage from overload or short-circuit. The power supply is otherwise protected by a primary-circuit fuse. The B plus output is set by a control in the regulator feedback circuit.

Operation and Performance

The performance of both models came up to that indicated at the specifications shown elsewhere.

The KG-664 high-voltage supply has a



Chassis view of the KG-663 Supply. The pass-transistors for the series-regulator are installed on the large heat sinks in the foreground at right and center. The transistors for the error detector and current limiter are in sockets at the left of the center heat sink.

pilot lamp which indicates when primary power is applied with the power-on switch. At the same time the voltmeter is in an active circuit, in order that the desired voltage may be preset before application to the load (after the equipment has warmed up); however, there is no lamp or other visual indication when high-voltage appears at the output terminals, except by noting the position of the standby-operate switch. This, therefore, requires a cautious observation prior to handling output leads or associated equipment

It also should be noted that the negative bias voltage appears on its output terminals at all times (assuming the voltage-adjust control is advanced), even with just the power-on switch activated.

In addition, the bias voltage is not regulated, so it cannot be maintained constant in applications where varying grid current flows. On the other hand, it is regulated by the gaseous regulator tubes *before* the variable-output control and thus is constant with variations in a.c. line voltage.

A particularly attractive feature of the KG-663 low-voltage supply is the current-limiting setup, especially for protecting the associated equipment from overload. One such case where it was found worth its salt arose while we were working on a piece of transistorized gear in which an intermittent short-circuit was blowing the equipment fuse. By setting the current-limiting control for a maximum current below the rating of the fuse, no number of continuous

[*Continued on page 120*]

Monoband, Coaxial-Fed 50 Ohm, Thick Dipoles

BY WM. M. TURNER,* W4MND

THIS article describes a monoband folded dipole antenna system using standard wire which offers an unbalanced input impedance of 50 ohms. It was developed to offer a good match to a monoband transceiver which has a fixed unbalanced output impedance of 50 ohms. Although a test model of the antenna was constructed for the 20 meter band only, there is no reason why the same principle could not be applied to any other band.

Initially, a simple dipole fed with 50 ohm coaxial cable was considered, however it was soon realized that such a combination would never yield an s.w.r. less than 1.5:1 (75 ohms/50 ohms = 1.5) and it would probably be closer to 2:1 due to installation and connector discontinuities. These values of s.w.r. were considered unsatisfactory, so the search continued until the idea outlined here was born.

* 3624 Squire Lane, Orlando, Florida 32806.

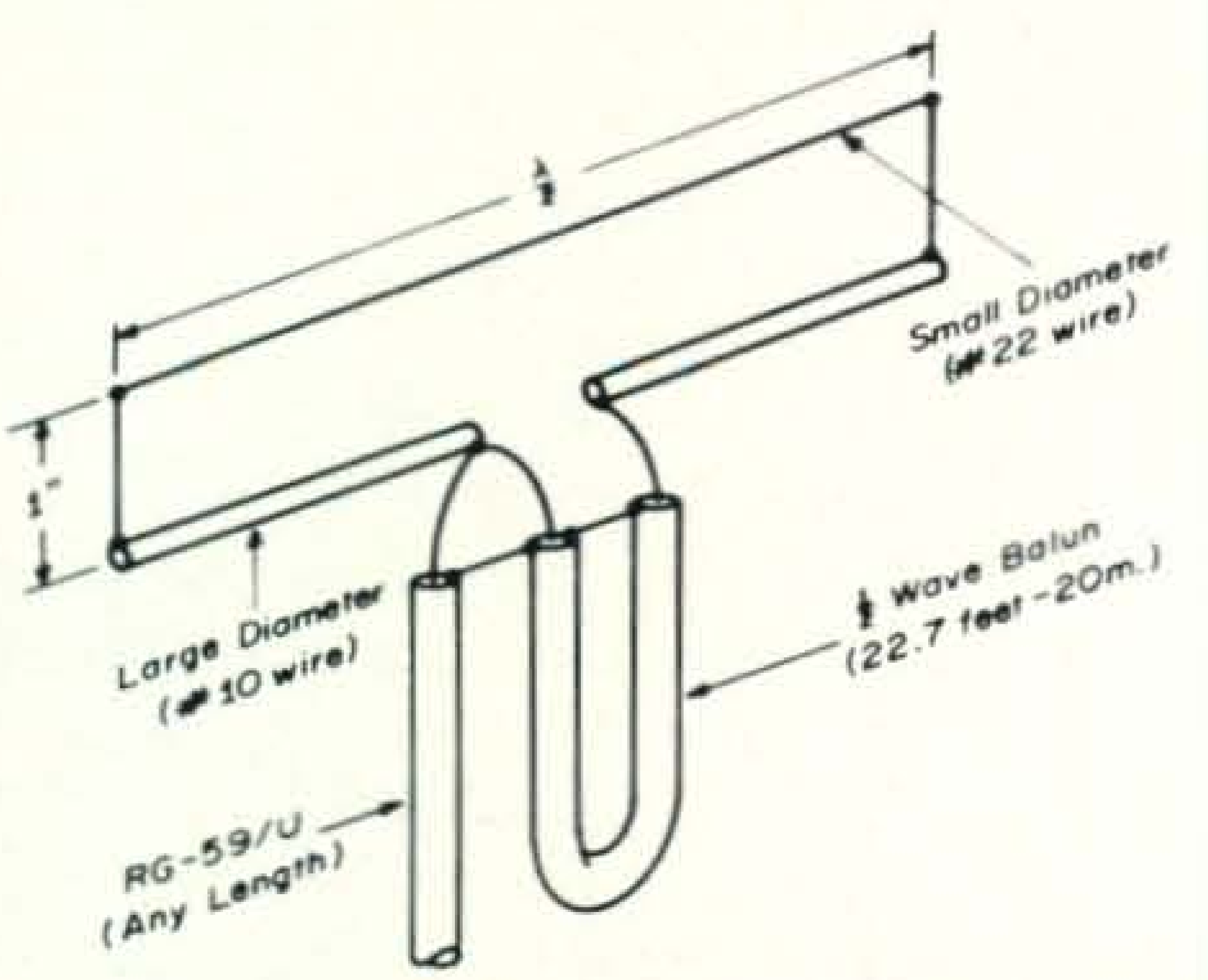
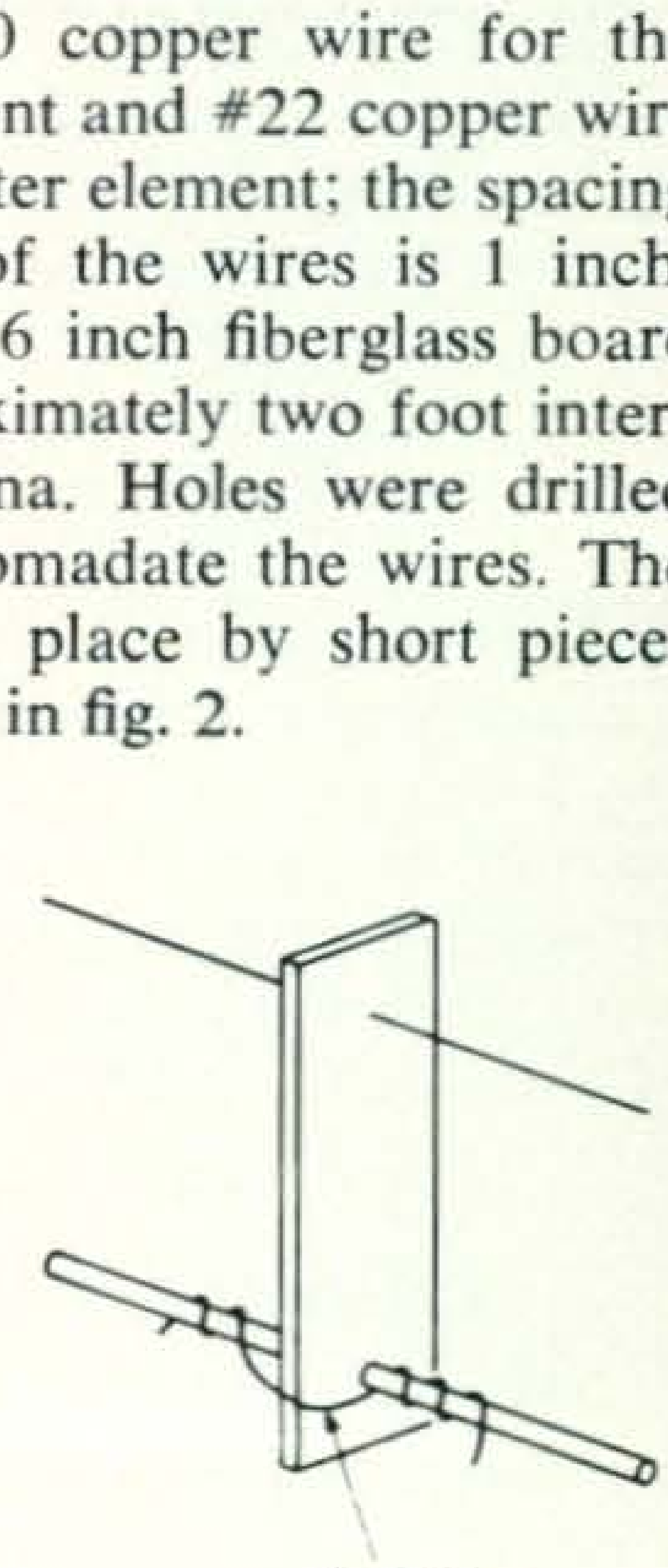


Fig. 1—Basic configuration of the "thick dipole" antenna. The antenna is fed with any length of 52 ohm coax and the balun acts as a 4:1 impedance transformation device and also serves to match a balanced antenna to an unbalanced line.

Basically, the idea is to use a folded dipole made of standard size wire having elements of different diameter (such as #10 and #22) and spaced such that the balanced input impedance of the antennas is 200 ohms. A half wave coaxial balun transformer is then used to step down the 200 ohms to 50 ohms. In addition the balun permits feeding the system with an unbalanced line, 50 ohm coaxial cable.

The antenna system is shown in fig. 1. The antenna is fed at the larger diameter element to obtain the step-down from 300 ohms to 200 ohms and to offer strength when supported. The model constructed at this station uses #10 copper wire for the larger diameter element and #22 copper wire for the smaller diameter element; the spacing between the center of the wires is 1 inch. Spacers made of 1/16 inch fiberglass board were placed at approximately two foot intervals along the antenna. Holes were drilled in the spacers to accomadate the wires. The spacers were held in place by short pieces of #22 wire as shown in fig. 2.

Fig. 2—Spacer securing method. Spacers may be fabricated from thin fiberglass stock or other similar insulating materials.



Design Data

Figure 3 shows the design curve for the antenna. It was taken from a general family of curves of impedance transformation ratios for two conductor folded dipoles. As only one transformation ratio is needed for this design, only one line of this family of curves is required. The required line is the transformation ratio of 200 ohms and 72 ohms or Z ratio = 200/72 = 2.78. Diameter d_1 is always the larger of the two elements for this design.

As an aid in designing the antenna, Table I is included. It shows the diameter of copper wire for sizes #8 through #28. These sizes should cover the majority of applications.

Balun

The half wave coaxial balun transformer is easily constructed and can be cut to proper length by use of a formula. The following formula should be adequate in most cases: 492 $V \div F$ = length of ½ wave in feet. Where V is the velocity factor of the coaxial line used for the transformer and is approximately equal to 0.66 for polyethylene lines such as RG-8 and RG-58. F is the frequency in megacycles. The author used the above formula for determining the length of the balun transformer for the 20 meter test antenna. Initially, the balun was cut about a foot longer than shown in the formula and was trimmed for resonance at the desired frequency. The final length was close enough to that calculated so that the trimming operation was not considered worthwhile.

Design Example

The following is a design example which will show how to use fig. 3 and Table I. It is best to assume two different wire diameters and then determine what spacing is required. This procedure is desirable because if one of the wire sizes is used as the unknown it may be found to be an unavailable size, for example, #14½. Assume that #10 and #22 are desirable wire sizes to be used for the elements. Wire diameters are obtained from Table I as follows;

$d_1 = 0.1019$ inches diameter for # 10 wire.
$d_2 = 0.0253$ inches diameter for # 22 wire.
$d_2 \div d_1 = 0.0253 \div 0.1019 = 0.249$

Enter the curve of Figure 3 at $d_1 \div d_2 =$ 0.249; move horizontally until the Z ratio curve is intersected, and then move down to $S \div d_2$. $S \div d_2 = 40$ as read from the curve.

TABLE I - Standard Wire Diameters			
Wire No.	Wire Diameter (Inches)	Wire No.	Wire Diameter (Inches)
6	0.162	18	0.0403
8	0.1285	20	0.032
10	0.1019	22	0.0253
12	0.0808	24	0.0201
14	0.0641	26	0.0159
16	0.0508	28	0.0126

Table I—Wire gauge versus wire diameter in inches.

Then: $S = d_2 \times 40 = 0.0253 \times 40 = 1.012$ inches; use 1 inch.

If the desired center frequency of operation is 14.275 mc and RG-58 coaxial cable is used the length of the half wave balun transformer is:

½ wave length = $492 \times 0.66 \div 14.275$ = 22.7 feet.

The length of the antenna can be obtained from the standard formula for a half wave antenna, Length in feet = $468 \div F$ (mc). It is suggested that the antenna be cut slightly longer than necessary and then trimmed to be resonant at the desired frequency.

Conclusion

Several other possibilities exist for this type design; however they are untried at this station. One possibility is to use two wires in parallel for the larger conductor. This would allow a single wire size to be used for the antenna at some spacing, S. Another possibility would be to we standard TV 450 ohm or 300 ohm open wire transmission line for the elements and parallel the driven elment with the proper size wire to obtain the desired impedance transformation.

Use of the antenna revealed an s.w.r. of about 1.05:1 over a much broader frequency range than can be obtained with a dipole. This desirable feature is due to the broadband characteristics of the folded dipole. ■

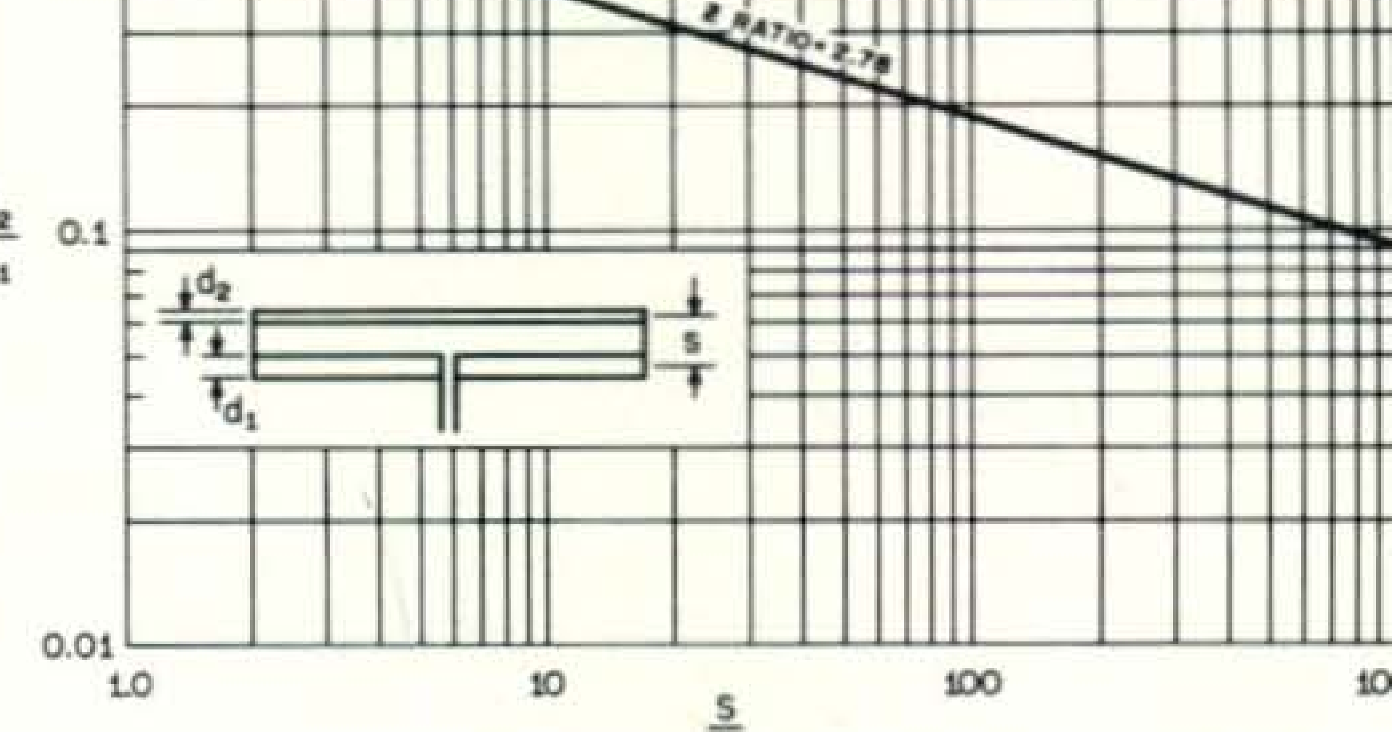


Fig. 3—Dipole design curve. Its use is explained in the text.

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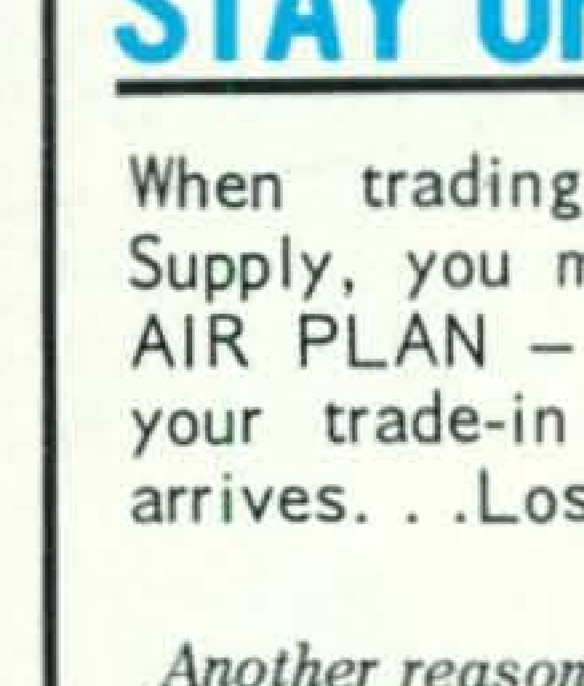

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"THE BRITISH WERE HERE... THE BRITISH WERE HERE!"

BY SYLVIA MARGOLIS*

Now I don't think Columbus made a mistake.

There are some people who insist that, when Columbus took his all-in, hotel included, package deal in 1492, he should have gone in the opposite direction, or settled for the Canary Islands, or waited for the Wright Brothers, or maybe just stayed home. How different history would have been. And who would have used the American fone band?

I think Columbus took a step forward for mankind. The Europe he left was in a mess, and hasn't altered much since even then. There is a brewer called Steigl in Salzburg, Austria, who has been making beer since—guess when—1492. In Epping Forest, 15 miles from London, there is still a law on the statute book that every boy must practice with his bow-and-arrows for four hours every Sunday. And the automobile is still called, in law, a "horseless carriage!"

But under these same, archaic British laws, we assume that a prisoner is innocent until proved guilty. So I went to see for myself how Columbus' Big Deal was making out. Not for me the blandishments of radio, TV and the Press. I must find out the truth about the American Way of Life.

I was prejudiced heavily in the prisoner's favor, brainwashed by amateur radio and those American radio amateurs we had met on the air, or in person, to become enmeshed in that warm web of shared experience, joy, sorrow, challenge and achievement, which is friendship. At one time we had fought against this so un-British Americanophilia, but it got us in the end and we surrendered. Now, when we travel along the German autobahns, on vacation, and operate with those beautiful reciprocal licences, we can be heard calling: "CQ DX!"

In America I learnt all about the American Way of Life. I ate a hot dog on the Staten Island Ferry, lunched in the U.N. Building. I was taken to the site of the Boston Massacre, where I apologised; to Lexington, where I signed the Visitors' Book with my name and hometown and the comment, *Sorry we lost!* I found Concord to be the most beautiful small town I had ever seen

*95 Collinwood Gardens, Clayhall, Ilford, Essex, England.

and Washington the most beautiful capital city. On the Bridge at Concord a damn' Colonial fly bit me. At Valley Forge I was told, so very tactfully, that the Forge "got burnt," but they never told me who burnt it. I ate a corned beef sandwich on Delancey Street, bought myself an expensive girlie-goodie at Saks Fifth Avenue, paid a formal visit to the Washington H.Q. of the American Red Cross, lunched in the snootiest Country Club in New Jersey, dined in a self-styled English pub in Pennsylvania, where we watched baseball on TV, which would happen in no English pub I know. I watched a military funeral in Arlington. I was being shown round a Newark hospital when the first of the riot casualties were brought in. I chose from one hundred ice cream flavors in Port Washington, got hooked on New England clam chowder, hated root beer, fell in love with Howard Johnson. I travelled by plane, train and Greyhound and, perhaps, a thousand miles by car.

In the steamy heat of July I discovered what the American Way of Life is all about. The American Way of Life is little concerned with democracy, with a chicken in every pot, with free speech. The American Way of Life is obsessed only with that intricate co-relationship between air conditioning, humidifiers and dehumidifiers, with endlessly argued permutations and combinations of these essentials to American survival. I proved that *tout comprendre est tout pardonner*. That same iced tea which our American guests had introduced us to, and which tasted unbelievably nasty in the wishy-washy English Summer, was acceptable in New York, when the temperature soared into the nineties, with the humidity chasing up fast behind.

My departure from London had set the note for the entire trip. I had to report at the Airport at 10 A.M., which was just fine, because K3KCS, Jack Davis, was due to arrive in London from Washington at 10 A.M. the same morning. My everloving husband dumped me at "Departures" and said:—"You'll be O.K., won't you, darling? I must hurry over to pick up Jack Davis at "Arrivals." Have a good trip." So I left London, alone and unsung. Only to me can this happen.

Three "QSL Managers" supervised the schedule, W1JFG, Willard Cook, in W1; W2GHK, Stu Meyer, in W2; W3ASK, George Jacobs, in W3. In Boston, W1JFG arranged a wonderful dinner in a restaurant, where I met a large party of W1's and their wives, and where we solved all the problems of amateur radio. That night I stayed as guest of Willard and Alice. He promised not to get on the air too early next morning, because the noise would disturb me, with the shack located immediately below the guest room. But I woke at 7 A.M., staggered out and called:—"So what's with 15?"

Minutes later we were speaking to my husband, G3NMR, and son, G3UML, and I could remind them to pay the milkman and the window cleaner, to pick up their suits from the cleaners and to send Auntie a birthday card, messages which would, no doubt, have surprised Marconi, but which did my heart good and were probably of more use than some of the chitchat you hear on 15.

When you are used to listening from Europe it's surprising how amateur radio sounds from the American side. The South American QRM you have to compete with is worse than anything we must combat in Britain. And of course I heard how the whole pattern of European QRM comes across the Atlantic as one mass of sound, from which it must be the easiest get-out for American amateurs to pick out the G's, because their language gets through the mental QRM. German and French amateurs have told us that DX operators seem to give preference always to English-speaking stations, out of all the Europeans. Listening from the American side, it's understandable. The English language can be worth a couple of S-points.

Willard's home bears an uncanny resemblance to the ideal QTH I described in *The Folks Who Live On The Hill* (July *CQ*,) which is why his signal is consistently one of the best out of W. It was by no means the first time I had spoken home from North America. In Montreal we had made contact from VE2XPO, the exhibition station at

Expo 67, and, regularly, from the home of my host, VE2MD, Dr. Arthur Leith, a dear friend who had taken his first amateur radio callsign, at our instigation, whilst doing medical research in London. But Arthur's signal was not what it should have been. He proved to me mathematically how superior his antenna was over a beam. I am a simple girl who doesn't understand mathematical formula, but only things like S-points and cutting through QRM. I think I left Arthur ready to see things my way and that he will have set his beam in order by the next time I get to Montreal.

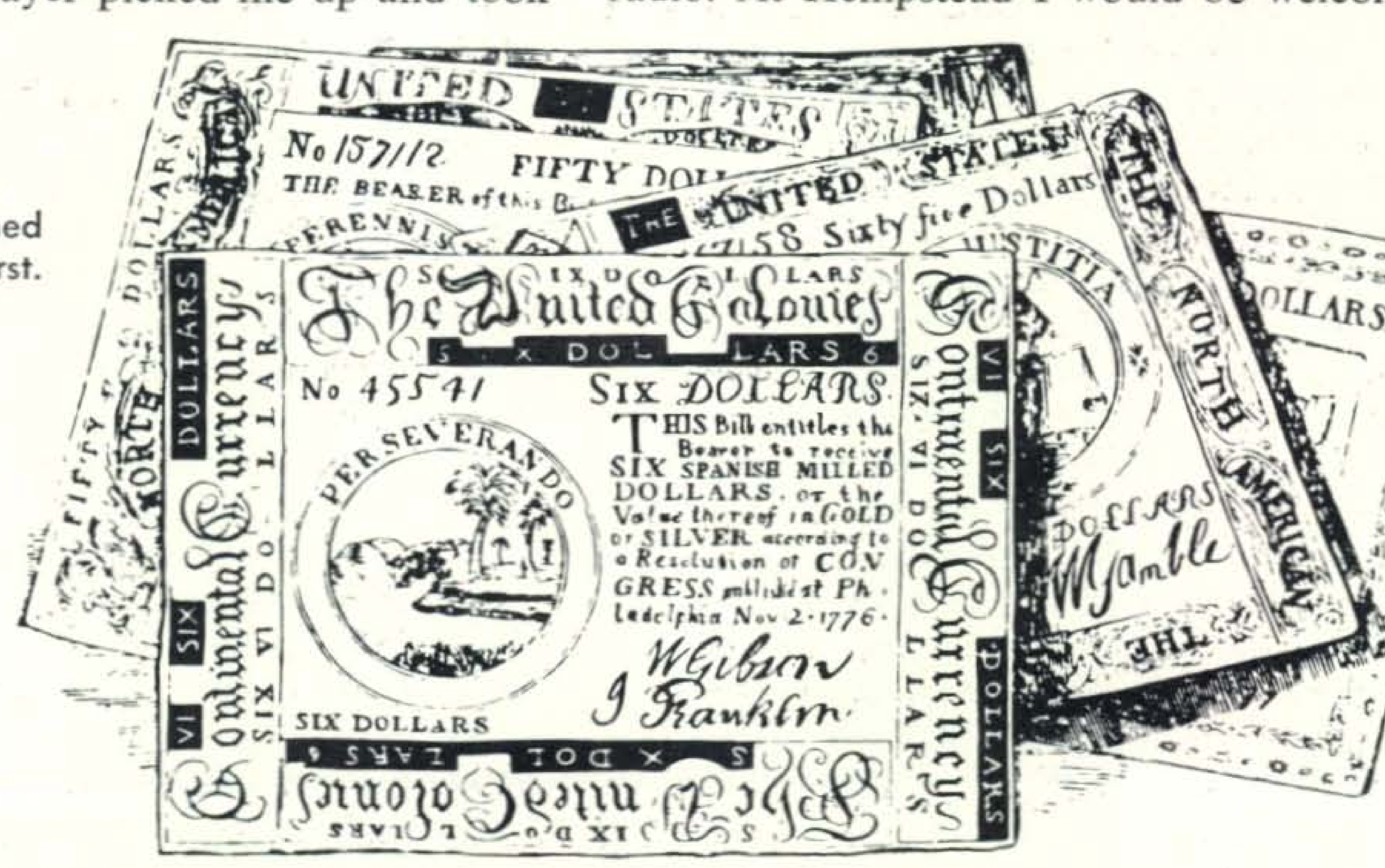
Stu Meyer, W2GHK, and his wife Lottie, picked me up near Providence and, during the long drive to New Jersey, we discussed amateur radio and solved a lot of its problems. At 1 A.M. we were riding the Staten Island Ferry, eating hot dogs with sauerkraut, when I got my first sight of the Statue of Liberty. I waved my dog excitedly, to the perturbation of an old man who appeared to live on the Staten Island Ferry and was just settling down for the fifteenth crossing that night. It was a moment I shall always remember, the three of us on the creaking old ferry, the lap of the dark water, the blessed river breeze and the Statue looming up so familiar and friendly. A boy on the ferry was reading Jean-Paul Sartre and lifted his head briefly to gaze at us with disenchanted eyes. He had seen it all before.

W3 was a whirl. I took a train from New Jersey to Philadelphia, where Harris Nadley, W3INH, met me and took me to stay with W3ITW, Joe Bowen, in Pottstown, Pa. Next day Dorothy Gayer picked me up and took me to Valley Forge, where I had a rapturous reunion with their dog, Ranger, whom I had known and loved when the Gayers lived in Geneva. Then John and Dorothy Gayer drove me to Washington. On the long journey we disscussed amateur radio and solved many of its problems, about which John knows a lot because, as HB9AEQ, he is President of the International Amateur Radio Club. In Washington, George Jacobs, W3ASK, was my host, and Bob Booth, W3PS, hosted a lunch of the Potomac Radio Club for me. We solved a lot of the problems of amateur radio there, too.

Amateur radio crops up in the most unexpected places. On a tour of the White House with Dorothy Gayer, our guide, whose name was Kennedy, was a little worried by a pair of nuts in his party, because when he showed us the portrait of President Monroe that was painted by Samuel Morse, we collapsed, in fits of irreverent giggles. Radio amateurs' wives in perfect communion, without a word being said between us we had both had the same thought, that only radio amateurs' wives would have appreciated:

"Why did Samuel Morse *stop* painting Presidents?"

Stu Meyer invited me to accompany him next weekend to the *Long Island Federation Hamfest* at Hempstead, L.I. It seems that these articles in *CQ* Magazine are making quite an impact, despite their frivolity, levity, lack of technicalities and the regrettable tendency they have to tip an affectionate nose at some of the sacred cows of amateur radio. At Hempstead I would be welcomed



The money seemed a bit strange at first.

Transportation never proved to be a problem.

not only as the wife of G3NMR and mother of G3UML, not only as Public Relations Officer of the Radio Society of Great Britain on a good-will tour, but as *that woman from CQ!*

Now, I am not inexperienced in the Art of the Hamfest, both as a nit-pickin' participant, and as one of those inspired and demented visionaries, one of those cock-eyed optimists, an organizer. Stu had tossed into my lap the chance to see for myself just how Hamfests were arranged in the country that had invented them. One of the secrets of running these events is to copy and plagiarize other organizers' ideas, no holds barred. From Hempstead I would be able to take back enough new ideas to last Britain at least another season.

It was like coming home, with all those mobile antennas clustered in the parking lot. Six meters, which we don't have in U.K., was a surprise, with mobile antennas that look like the backside of a refrigerator. In Europe we have two meters and four, which are popular mobile bands, but the majority of G-mobiles operate only on 160, even those who have posh commercial transceivers which will handle the h.f. frequencies. The thoughtful nationals of any country will criticise their own compatriots for their insularity, but, for sheer, blinkered chavinism, you can go a long way to beat the British!

Wide clean beaches, glittering sunshine, nothing between me and the family but three thousand miles of heaving, roaring Atlantic, and a Hamfest which, but for the accents, could have been in Britain or Switzerland or Belgium or Timbuctoo. It was a foreign country I was in, but it was as familiar now as Tower Bridge.

Can there be such a thing as an amateur radio face? Why did I seem to see our own friends there—Joe and Jim and Norm and Ron? I knew them to be for certain beyond that ocean barrier, yet here they were, with W2 calls.

Those W and K callsigns gave me some trouble. Closely concerned for years with welcoming overseas radio amateurs to Britain, even before we put the welcome onto an official R.S.G.B. basis, I click into action, like Pavlov's pooch, the moment I see an overseas callsign on a badge. But here the W's were the Establishment and it was I who was the curiosity, the V.I.P., Stu Meyer's celebrity guest.

The celebrity business is flattering, but exhausting. I shook a hundred hands, answered more than a hundred questions, carried on three conversations at once, settled amateur radio's problems in four directions, picked the winning raffle tickets out of the box, won the prize for the longest distance travelled, ate more hot dogs, parried a leading question about incentive licensing and another about DXpeditions and refused enough kind invitations to keep me busy in the U.S. for the next three months.

Rarely am I nervous before making a speech, but today my hot dogs didn't seem to be sitting so prettily. It was my accent, "cut-glass-B.B.C." somebody called it, that was the trouble.

I need not have worried. Even the little joke about my appearing in my Official Capacity of 500 microfarads, for the R.S.G.B., connected. And one woman said later that she was so entranced with the way I spoke that she never bothered to listen to what I had to say!

The message was one I had been QSP'ing at every one of my whistle stops. It described my recent appointment as the first Public Relations Officer ever to be commissioned by a national amateur radio organization. The British have been slow to learn how to blow their own trumpet, but this move was an unequivocal British "first" and we are trumpetting it to the housetops. No doubt the Americans will say soon that they had the idea first and the Russians will claim that they invented public relations at the same time that Popov invented radio.

To each audience I described, too, our system of welcoming overseas amateurs, called the "Welcome to London Project," a venture which we believe to be unique in world amateur radio.

For further information, check number 46, on page 126

I had come to see a new kind of Hamfest, to learn, to carry news of the American Way home to U.K. And the only thing that was different from a European Hamfest was the fine weather and the value of the raffle prizes—a Galaxie V and a Swan 250 to start with. The long, drawn out raffle draw was the same as any in Europe, with the same banter and esoteric cross-talk at first to ease the tension. There was the same look of delighted shock on the faces of the big winners, the same controversies and arguments simmering within the personal QSO's, the same questions and grumbles.

That Sunday morning it had rained a little. My hosts in New Jersey had promised to drive me in to Delancey Street to buy lox and bagels. But when they saw the early drizzle they said the expedition would be impossible. This wasn't Britain, where, if you cancelled arrangements every time it rained, you would never leave the house!

But Stu drove me back from Hempstead to Westfield via Coney Island and Delancey Street, which is, I understand, rather an unorthodox route. Coney Island was gorgeous, just what I had expected, but even bigger and brassier. So was the corned beef sandwich we ate on Delancey Street. My nicest memories of the U.S. seem to be concerned with food!

Through amateur radio over the year we have met thousands of people, most of whom we would enjoy meeting again, with one or two un-noteable exceptions. And we have made a number of friends who have grown to be a part of our lives, whether they live in Montreal or Vienna, Boston or Bermuda, the Hague or Washington, special people whom you don't see often, to whom you don't have to keep saying *I love you,* but who know it just the same.

So when two of those friends, W2GHK, Stu Meyer, and the late K2HLB, Harold Megibow, said they would arrange a party for me to meet the whole of the North Jersey DX Association, I guessed this might well be a highlight of my trip to North America. Just how precious the occasion was to be none of us *was* to realise until a few days afterwards.

I neither know nor care a great deal about DX. Whilst I was in the U.S. my husband told me how he had entertained, at our London home, W9WNV, a certain Dr. Miller, who was famous for having visited certain guano-covered rocks—or not having visited them—I could never find out for sure. I met Dr. Miller later in London and he seemed a charming enough and well mannered young man. As for the DX, to me it means little except noise and bad temper. DX hunting contributes nothing whatsoever to the so fragile image of international amateur radio, which is my entire concern. If that image is not properly projected, and *fast,* there'll be no amateur radio for them to squabble about.

I see lots of idiotic behaviour about DX that ill becomes the perpetrators. I see too many tempers lost, too many feuds and vendettas launched because of a supposed slight, far too many temporal arteries throbbing with fury because a rock is a rock—or isn't a rock. I see men of talent, charm and dignity lowering themselves to the level of silly children, except that children would have more sense, and wasting precious ability, in the conduct of those quarrels.

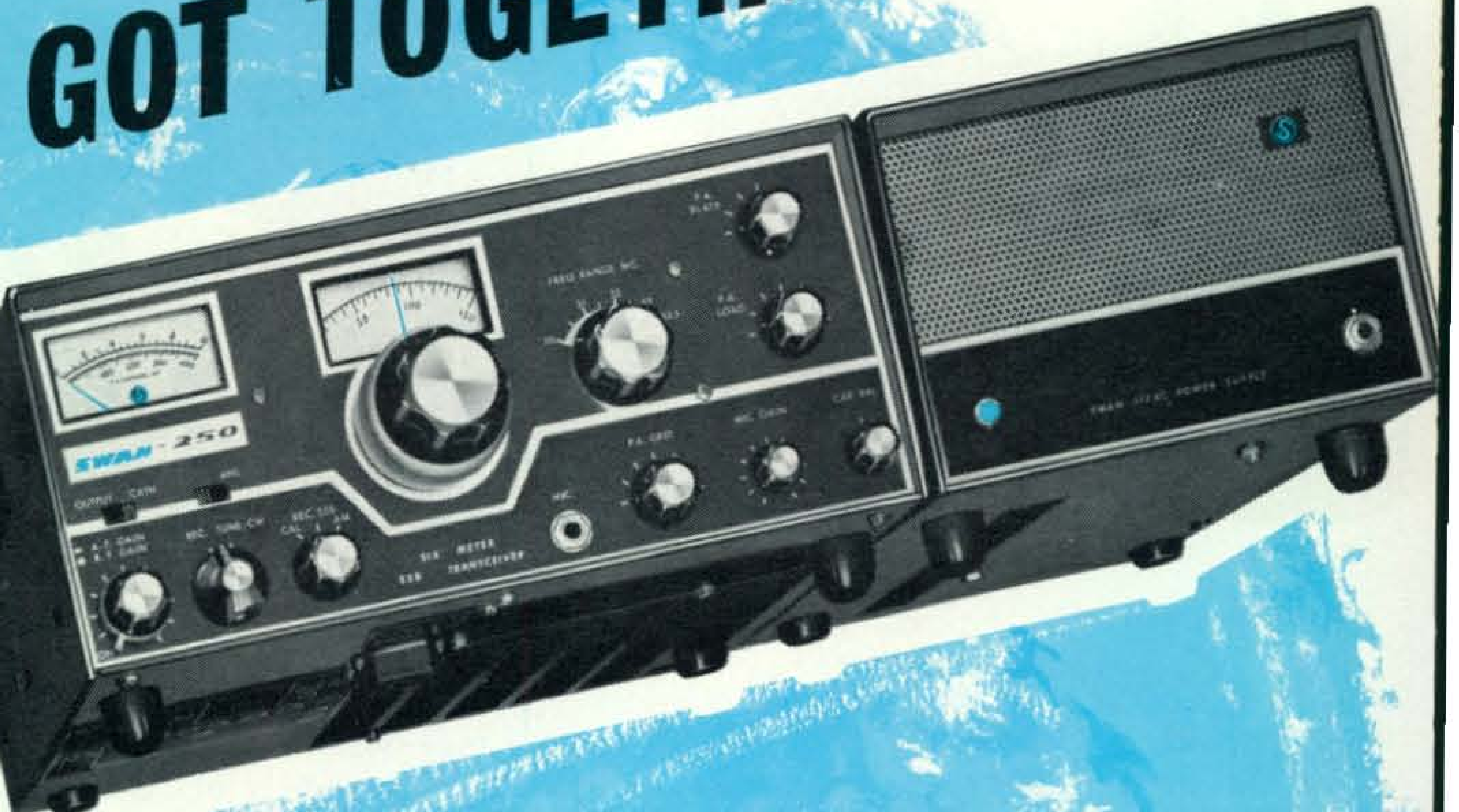
There must have been sixty people there that day, swimming in Harold's 40 ft. pool and eating the beautiful food that Dorothy Megibow and Lottie Meyer had prepared, joshing and joking, taking photographs until I was blinded with flashes. I put faces to call signs that had been respected legends in our home for years. I drank Black Label, than which there is no better scotch, and ate barbecued beef. I met some of the people from *CQ Magazine* for the first time and we had lots to talk about. And I pulled off a diplomatic stroke which has impressed even the R.S.G.B. Council.

W2TUK, Harry Dannells, Director of the Hudson Division of A.R.R.L., had asked me at Montreal if I would advise him on the setting up of a "Welcome to New York Project," similar to ours in London. Barney Patterson, GI3KYP, R.S.G.B. President, and Bob Denniston, WØNWX, A.R.R.L. President, were there, so I asked Barney, my Boss, if this would be in order. "Certainly," he said, "but it's going to cost A.R.R.L. blood. Make them pay you double what we pay you. U.S. salaries are double the British."

This was very funny indeed and we all laughed, because I am the R.S.G.B.'s *Honorary* P.R.O.

Now, at Harold's party, Harry Dannells brought the news of the impending arrival in New York of a party of French amateurs.

[*Continued on page 116*]



For further information, check number 47, on page 126

Electronics Careers

Is There One In Your Future?

BY HOWARD PYLE,* W7OE

Part III: Conclusion—Choosing an Electronics School

In preceding installments we have emphasized the necessity for proper training through which to prepare for a challenging future in the rapidly expanding field of electronics. Without systematic, guided instruction, neither man nor beast can hope to achieve an equal footing with the *trained* human or animal. Do you suppose that Lassie, that lovable TV canine, attained her position as 'Chairman of the Board' in the dog world merely through prowess in chasing cars or barking the loudest? Not by a jugfull; directed, specialized training through l-o-n-g years is what has placed her on the canine pedestal. How about Flipper? His performance is by no means the result of natural instinct; again a very great deal of constant training has placed him in the forefront in the finny kingdom over which he reigns. So it is with humans; instinct may well cause you to raise your arms and double your fists in self protection when threatened, but will never place the champion's crown on your head in the realm of professional fisticuffs. Training, *training* and *more* training was what carried Jack Dempsey, Gene Tunney, Georges Carpentier to the top of the prize-fight ladder just as it now does for the current kings of the squared ring. You have chosen electronics as *your* career; you too want to receive top rating in your specialty. You *can,* if you prepare yourself properly through directed training. Let's see now how and where we can acquire this very essential element in your pursuit of a successful electronics career.

In our first installment we dipped a bit into the past to acquaint you with pioneer institutes of learning in the 'wireless' and later radio fields. We gave you a brief rundown of some of the trials and tribulations faced by the early schools and students. Expanding developments not only in radio but incorporating television, facsimile, automation and many related subjects eventually led to a grouping under the general designation of 'electronics', the demand for trained personnel increased many-fold. The handful of survivors among the pioneer schools could not begin to absorb the onrush of eager aspirants to electronic learning. Establishment of additional training schools went forward at a rapid pace; some survived . . . others faded quietly away.

Today, what do we have? Maybe fifty . . . perhaps a hundred, well-established, thoroughly reliable schools fully equipped to prepare their students in every conceivable branch of electronics. They are ready, willing and able to take any individual of average intelligence and with a sincere desire to learn and progress, under their electronic wing and develop his skills and talents to the fullest. While it is obviously impossible to tabulate and describe individually the many such schools operating today, suppose we do take a brief look at a few representative ones whose description, curriculums and related factors, pretty well reflect the many score others scattered throughout the land.

THE FOLLOWING ARE REPRESENTATIVE OF THE MANY INSTITUTIONS EQUIPPED TO PROVIDE SPECIALIZED TRAINING IN ELECTRONICS

NAME	ADDRESS	TYPE OF TRAINING
American Institute of Engineering & Technology	1135 W. Fullerton Ave., Chicago, Illinois 60614	HS-R**
Capitol Radio Engineering Institute	3224 Sixteenth St., N.W. Washington, D.C. 20010	HS
Cleveland Institute of Electronics	1776 East 17th Street, Cleveland, Ohio 44114	HS
Coyne Electronics Institute	1501 W. Congress Pkway, Chicago, Illinois 60607	HS-R
DeVry Technical Institute	4141 W. Belmont Ave., Chicago, Ill. 60641	HS-R
Grantham School of Electronics	1505 N. Western Ave., Hollywood, Cal. 90027	R-HS
Heald Engineering College	Van Ness Ave. & Post St., San Francisco, Cal. 90037	R
National Radio Institute	3939 Wisconsin Ave. N.W. Washington, D.C. 20016	HS
National Technical Schools	4000 S. Figueroa St., Los Angeles, Cal. 90037	HS-R
Northrup Institute of Technology	1199 W. Arbor Vitae, Inglewood, Calif.	R
RCA Institutes, Inc.	350 W. 4th Street, New York, N.Y. 10014	R-HS
Valparaiso Technical Institute	Valparaiso, Indiana 46383	R

*R-Resident: HS-Home study. **Limited resident shop training-optional.

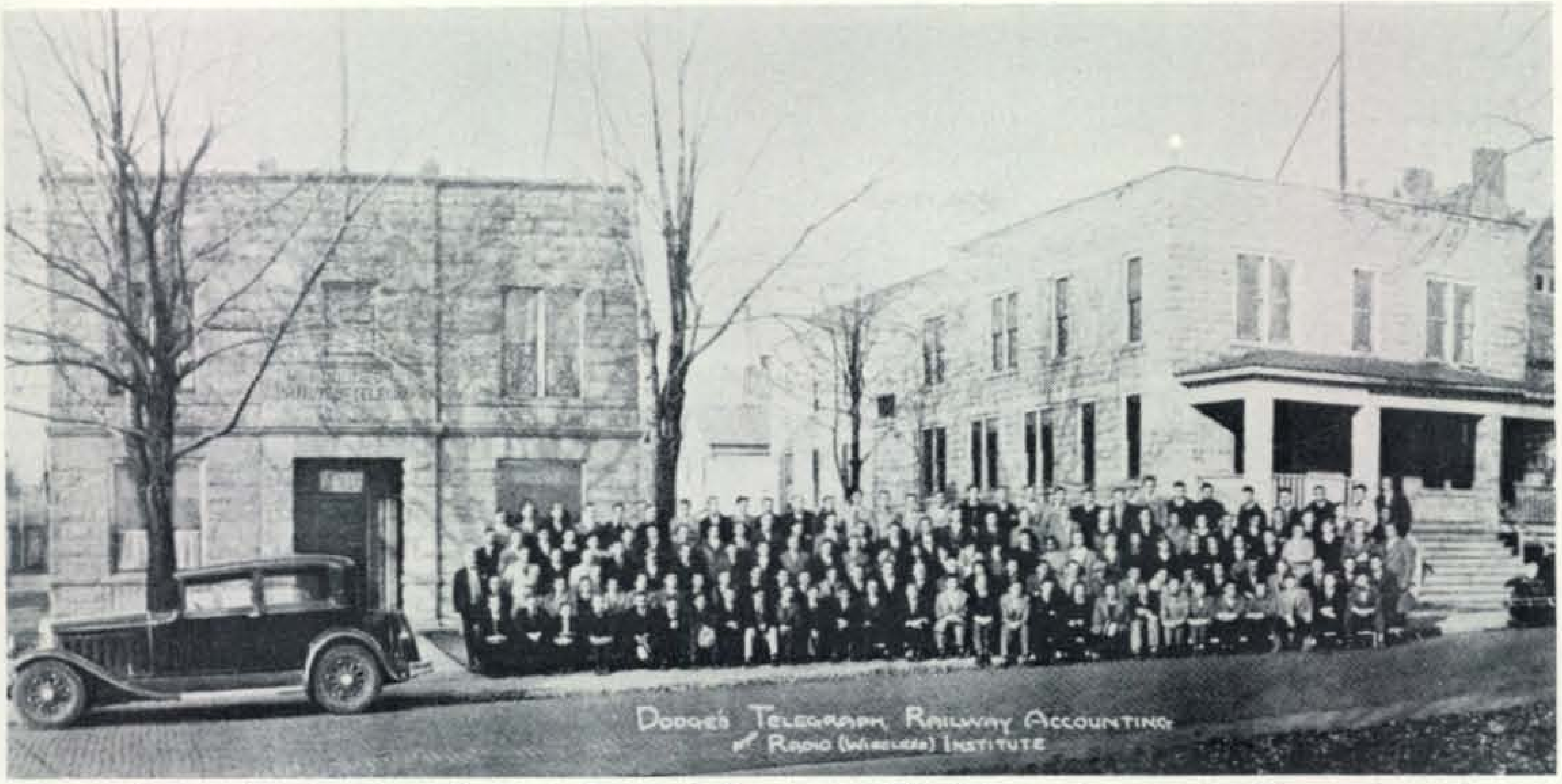
Let's start with one of the most venerable of the hoary pioneers . . . the Valparaiso Technical Institute of Valparaiso, Indiana. Founded in 1874 by George A. Dodge with the assistance of his son, George M. Dodge, this school was initially a department of the Northern Indiana Normal School. In 1891, George M. Dodge withdrew from affiliation with the Normal School and established Dodge's Institute of Telegraphy of which he assumed the Presidency. The school as originally established in 1874, was devoted to teaching Morse telegraphy; later, railway accounting was added to the curriculum. In December of 1909, a Department of 'Wireless' Instruction was added . . . the term 'radio' had not come into common use at the time.

As an independent institution, the growth of the wireless department was rapid. The Institute kept pace with industry progress turning out not only wireless operators for the marine services but entering the early phases of radio broadcasting and later television as they developed. The word 'radio' had meanwhile been introduced into the school's title which then became, "Dodge Telegraph and Radio Institute". Constant expansion of curriculum to keep pace with the growing field resulted in a further name change in March of 1944, which name the Institute now bears . . . Valparaiso Technical Institute.

Today, 'Val Tech' enjoys a status level equal to that of any of the major academic institutions of its type. All branches of electronics are thoroughly covered in its curriculum, including among others automation, micro-wave, computers, military and industrial electronics and many more. Not only are a wide variety of electronic technology courses available but for qualified students interested in pursuing an engineering career, intensified training in the engineering phases of the art is offered and upon satisfactory completion, a degree as Bachelor of Science is awarded.

While we are discussing the central portion of the United States, suppose we examine another representative school of long-standing; the DeVry Institute of Technology. Established in 1931, DeVry is a subsidiary of the well-known quality manufacturer, Bell & Howell. The parent institution is located in Chicago; a recently opened and fully equipped branch is situated in Phoenix, Arizona and duplicate facilities are provided in Toronto, Canada.

As with other reliable specialized institutions of this type, DeVry offers a wide



An early graduating class shown in front of the original buildings of Dodge's Telegraph, Railway Accounting and Radio (Wireless) Institute, now Valparaiso Technical Institute.

variety of courses embracing all branches of electronics. In addition to resident day and evening classes at all three locations, home study courses are offered for those who are not in a position to attend resident classes. The same high quality of instruction may thus be obtained in the privacy of ones' home while maintaining current employment status. DeVry programs are fully accredited by the Accrediting Commission of the National Home Study Council. This Commission has been approved by the U.S. Office of Education as a nationally recognized accrediting agency under the terms of Public Laws 82-550 and 85-864. Graduates of the home study program are awarded a diploma, rather than a degree. Qualified students satisfactorily completing the prescribed resident school courses, receive an Associate degree in Applied Science.

As with most of the schools offering resident courses, assistance in locating housing for students with or without dependents accompanying them is available. Part or full time employment aid for students desiring such is available and, of course, every assistance in finding permanent employment for graduate students is offered. Graduates also have the privilege of calling on the Consultation Service of the Institute for technical help on questions dealing with electronics circuits and equipment. Well illustrated brochures detailing the DeVry offerings are available on request from either the Chicago, Phoenix or Toronto Schools.

Suppose now that we leave the central United States, although many more schools exist in that geographical area but which space won't permit us to cover. Let's skip to the West Coast this time for the benefit of our western readers with electronics career aspirations. Los Angeles is a good point at which to start. Here we have, among others, the National Technical Schools offering both resident and home training in electronics, television and radio. This is an institution also recognized by the Accrediting Commission of the NHSC.

National Technical Schools is another institution which can look back on a long and successful teaching career. Founded in 1905 they can count many thousands of graduates who have become successful in technical pursuits in industry and Government after acquiring their initial instruction as an NTS student. Prospective students would do well to write for their literature and complete information.

Northern California beckons us next so we shall proceed up the Coast to glamorous San Francisco. Here, among others, we find the Heald College of Engineering. This is a strictly residential instruction institution requiring physical attendance at classes; both day and evening sessions are available. Living facilities convenient to the college are available as well as helpful aid in locating suitable quarters. An Employment Director will assist in finding full or part time employment for those students desiring such.

Full electronics engineering courses leading to a Bachelor of Science degree in 30

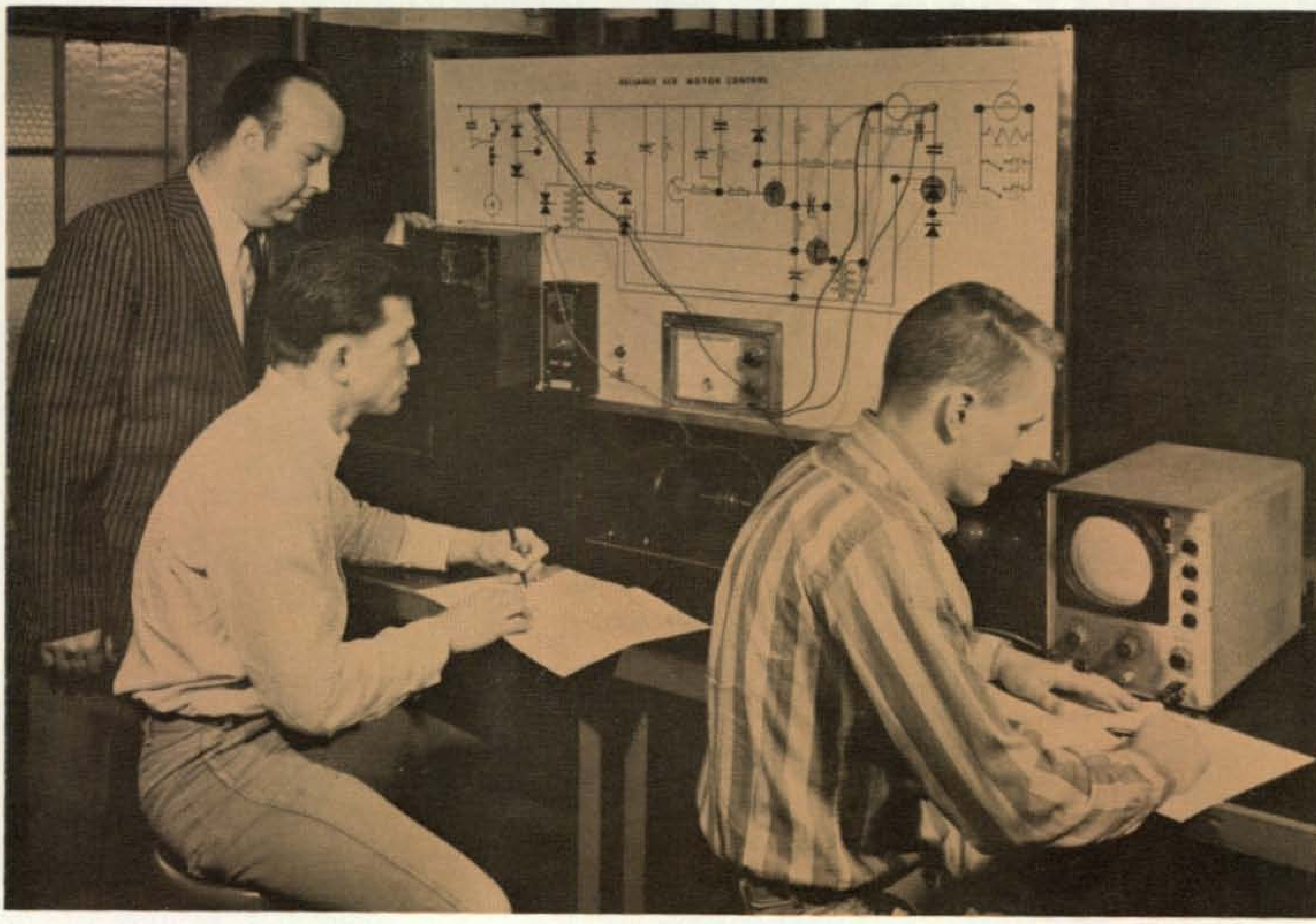
If you've built an amateur station which resembles this, you've already come a long way in preparing for an electronics career. This is the author's station, W7OE.

months are offered as well as diploma courses in electronics engineering technology and radio-TV technician. Heald can also claim a long background in training men for the engineering sciences having been established in 1863. Request further information direct from the college.

Turning now to the eastern section of the country, let's take a look at another of the early pioneer schools which has enjoyed steady growth and expansion in keeping with the science of electronics. The National Radio Institute, founded in 1914 by J. E. Smith who is still actively associated with the school as Chairman of the Board, has served the 'wireless' radio and electronics fields for more than fifty years. A wide variety of courses are available thoroughly covering all aspects of commercial and industrial electronics. No residential instruction is offered, NRI training being entirely by the home study method. That NRI has been singularly successful in this field is evidenced by their record of more than three quarters of a million graduates! They are of course, fully accredited by the Accrediting Commission of the NHSC.

Student employment placement, graduate consulting service and a number of attractive additional advantages are offered for the benefit of students and graduates, and are fully detailed in their literature. Their location in the nation's capital places them in the advantageous position of being in close contact with the various national Governmental bodies, agencies, commissions and similar groups primarily concerned with all phases of electronics. Their well-illustrated and informative brochure is available on request.

We could go on and on briefly describing scores of institutions specializing in preparing students for electronic careers. However, space limitations obviously prohibit such lengthy treatment. We have attempted however, to present a synoptic picture of a few of the more representative institutions of this type, located in widely separated areas geographically. In chart form, we have listed a number of others. This by no means covers all of the many available electronics training schools of high caliber and which offer excellent curriculums. Many others can be found in the advertising pages of the various electronics and related publications. Inquiries addressed to such advertisers will bring full information. We suggest that those of our readers who are considering an electronics career, obtain literature from several



Students making measurements in the laboratory of the DeVry Institute of Technology.

such institutions before making a final choice.

Before closing this series, suppose we discuss a few generalities equally applicable to such schools in general. As mentioned in the preceding thumb-nail sketches, some schools offer resident courses only; others offer a choice of resident or home study training and still others concentrate exclusively in instruction through the home study method. The choice of course, is up to the prospective student. Residential instruction is necessarily more costly if it involves arranging for temporary re-location in a city other than the students' home town, however the advantage of personal contact with instructors and use of the very complete laboratories of most such schools should be carefully weighed. Regular class-room hours must be observed in resident schools which is sometimes inconvenient for students who must continue gainful employment while pursuing their training. This is offset to some extent by those institutions offering evening classes to meet this situation. Sometimes a combination of class attendance and part time employment can be worked out; in such cases, the schools lend the student every assistance in finding employment which will make such an arrangement possible.

Correspondence training on the other hand, permits the student to accomplish his study right in his own home and at times to suit his convenience. Completion time for such courses varies widely of course, as individual circumstances dictate the amount of study time which a student can devote. Completion time limitations established by the various home study schools are generally very liberal and are often sufficiently flexible to allow as much as up to three years in which to complete a correspondence course!

Note too, and this is of primary importance to the radio amateur, that a number of such schools offer credits for previous experience in electronics. Often an entire semester or similar generous portion of the initial lessons can be by-passed if sufficient background can be established by a prospective student to warrant passing over a substantial part of the preliminary work. Sometimes this is demonstrated by a 'qualifying examination' administered by the school; others determine his qualifications through a questionnaire outlining his background in detail.

Careful consideration should also be given to your ultimate aim. If it is the engineering aspects of electronics which is your goal, you will progress farther and faster in this field if you are equipped with a bonafide 'degree'. Examine whatever literature you send for to determine whether a 'degree', a 'diploma' or similar certificate is offered to students successfully completing their subjects. Ordinarily, a recognized degree as Bachelor of Science from an accredited institution, will require attendance at a resident school, for a goodly portion of the course at least. Several of the more prominent of the schools issue such a degree and of course, any of the general coverage colleges and universities whose curriculum includes electronics engineering, award such a degree.

If it is the technician branch of electronics which attracts you rather than the more mathematical and theoretical approach which engineering requires, your opportunities and financial return can be just as great and no degree is required to fill even top-notch technological spots. In lieu of a 'degree' upon completion of this type of training, a 'diploma' indicating satisfactory completion of a course is generally awarded. A few institutions have up-graded this somewhat by providing some additional training beyond purely electronics technician and which introduces some of the more elemental aspects of engineering. For those completing these expanded courses, a 'certificate of completion' in the classification of Electronics *Engineering* Technician or an 'Associate Degree in Applied Science' or some similar recognition of your more extensive knowledge, is often awarded.

And now, if you as a radio amateur, can see the bright star of an electronics career shining before you and have decided to pursue it with serious intent, we strongly recommend that you sit down right now and send a postcard or letter to several of the schools we have listed as well as to any which may have appealed to you through their advertising in the various periodicals, and get their detailed brochures. Study them all with careful consideration, choose one which best fits your particular circumstances and sign the application form. The sooner you can start your study, the sooner you can realize your goal in the fascinating field of electronics! Good luck and "73".

Grumbles

by Sam

RECENTLY I wandered into a diner (I remember the days when we used to call them "lunch wagons"). Behind the counter was a big bulldog of a guy who seemed to be in apparent vocal communication with an unseen colleague lurking in the rear of the establishment—at least each time the big fellow would shout out an order a piece of culinary delicacy would shortly thereafter appear through a little door in back of the counter.

"Stretch one with a BLT down, seaboard," he would shout, "CC and O, fry one easy!"

Gosh, I thought, it must be great to know all of that swinging "in" type language.

Later I was clearing my sinuses by listening to a rock and roll radio station (somebody—*anybody*—please bring back Harry Horlick and his A&P Gypsies, or at least Shep Fields) and the announcer was coming on strong with fantastic "in" talk to one of the engineers. "Hey Charlie, either run the 10-second spot or the 5-second promo."

He also spoke of "air checks," "platters," "the flip side," "A-and-R men," and the like. Every kid in town was probably hanging on his every "in" word.

When I got home I turned on the receiver to see what was happening on 2 meters. Right there, on 146.250, was a guy offering up a message which went something like this, "OK Billy, gimme a QRH report because my vee-foe has been kicking up again. If QRG is floating you'll have to QTX until I can get back to you. Is that Charlie?"

Wow! That guy was really a ham to reckon with—there must have been at least a dozen Novices in town listening with their mouths hanging open and a glassy stare—visions of this guy sitting there talking all of that fancy ham talk at his custom operating console in his wood-paneled shack, racks of kilowatt rigs lining the walls.

When Billy (a Novice) came back to this joker it was obvious that he didn't have the slightest idea of the meaning of the message. He stammered and stumbled to the accompaniment of papers being shuffled while he tried vainly to locate a complete copy of the Q-signals.

Well, *real* hams like Arthur Godfrey, Herb Hoover, and Jean Shepherd would have known what this guy was talking about right off the bat. The kid was simply not ready to join the ranks of *real* hams—and he (and everybody else monitoring the frequency) knew it.

It was then that I realized that just about all of this so-called "in" talk is a sham, a hoax, a phony stream of jibberish; whether it's found in a diner, a broadcast station, a ham station, or even at a service station ("hemi's," "quad carb," d.o.h.c.'s, etc.)

Sure, it impresses those uninitiated few who are within earshot of the speaker—that's what it's intended to do. It lets all around know that the speaker "knows the ropes" in his chosen field and can talk the lingo, likewise it tells listeners that they must also master the jargon before they might be permitted to join the exclusive "in" group.

It seems to be just one more way of humiliating people, frustrating them, and handing them an unnecessary put-down in a society which is already so full of put-downs that half of our younger generation has decided to drop-out and tune-in to a fantasy civilization which exists only in a psychedelic dream world.

[*continued on page 119*]

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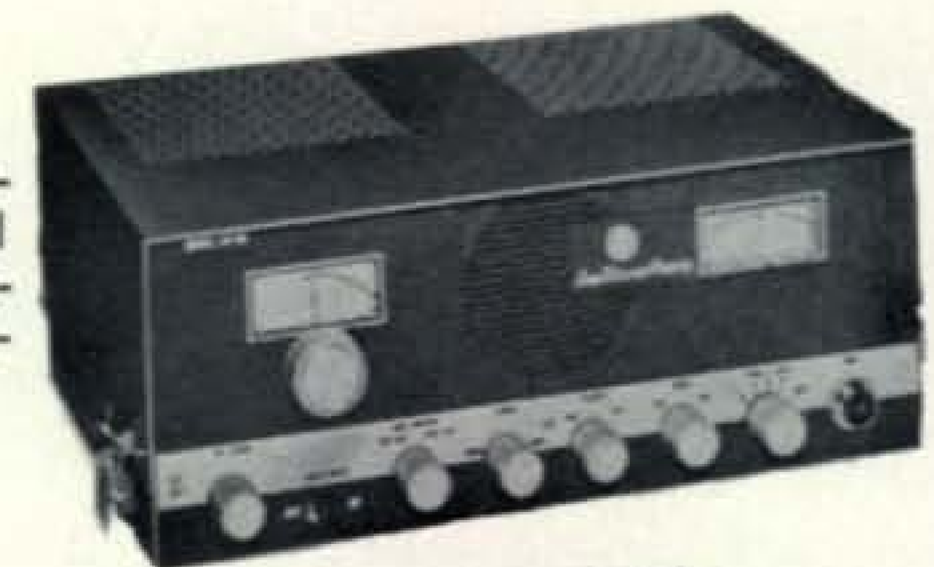

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CRYSTAL CONTROL FOR THE TOP BAND S.S.B. TRANSMITTER CARRIER OSCILLATOR

BY RICHARD A. GENAILLE, *K4ZGM

IN THE September, 1967 issue of this magazine the author described a 160 meter single sideband transmitter for which simplicity was the keynote in the design and construction. A basic approach to sideband transmitter construction was followed in order to stimulate the prospective builder's interest. As indicated in the original article, the frills could be added after one had completed the construction of the basic transmitter. While crystal control of the carrier oscillator is not necessarily a frill it is extremely helpful in eliminating the initial carrier oscillator drift and the waiting time required before the transmitter can be operated satisfactorily.

Oscillator Drift

The positioning of the carrier oscillator frequency with respect to the steep slope portion of the sideband filter has a great amount of influence on the audio quality of the sideband transmitter. For this reason it is desirable that the amount of drift of the carrier oscillator in minimized. In the original article, for the 160 meter transmitter, the carrier oscillator is a variable frequency oscillator which is tuned to the appropriate frequency by means of a slug tuned coil and trimmer capacitor. After about a twenty minute warm-up period the oscillator is quite stable in operation. Many operators will wish to operate the transmitter with a much shorter warm-up period. It is for these operators and those desiring improved carrier oscillator stability that this article has been prepared.

*719 Quarterstaff Road, Winston-Salem, N. C. 27104.

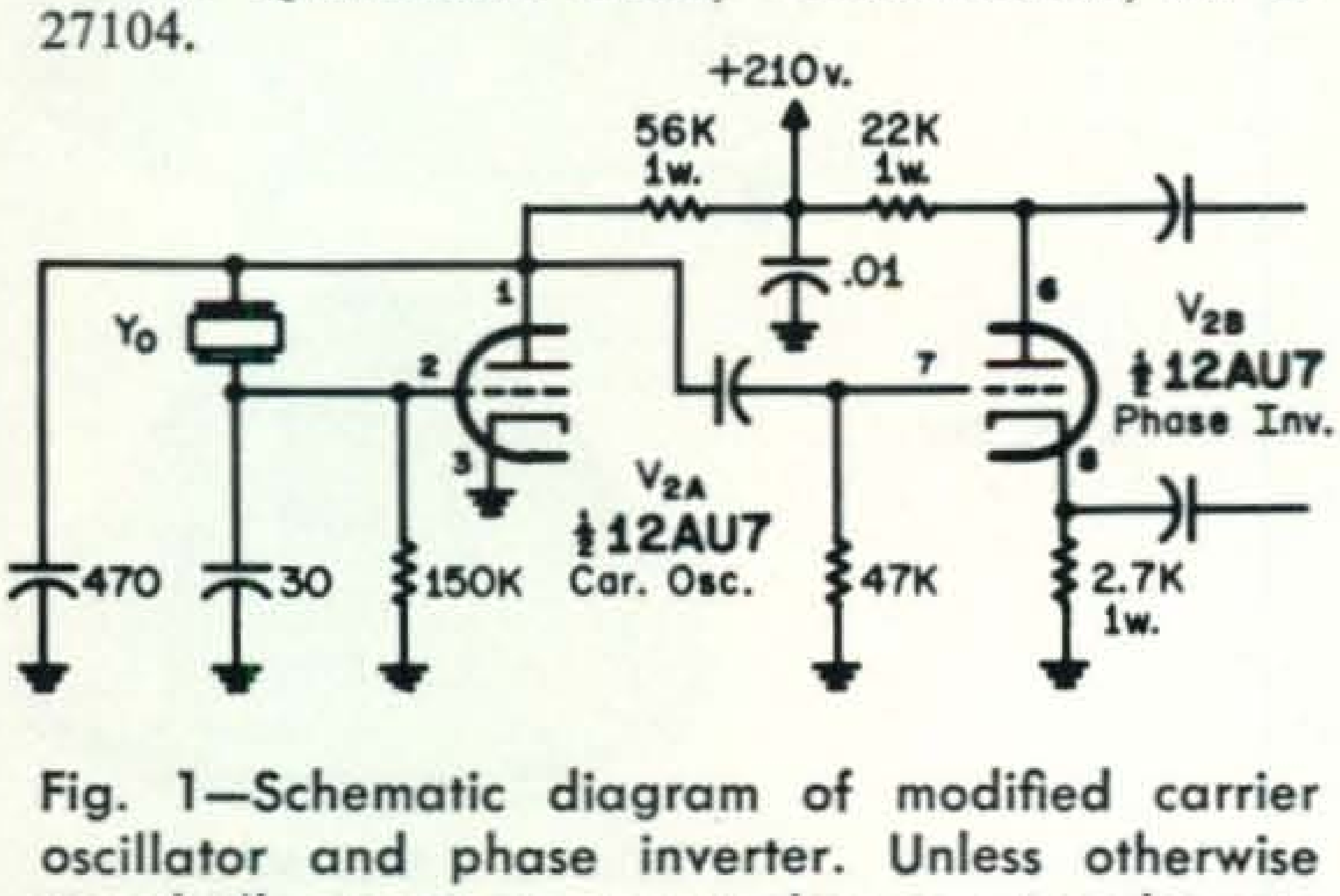


Fig. 1—Schematic diagram of modified carrier oscillator and phase inverter. Unless otherwise noted all capacitors greater than one in value are mmf, less than one are in mf and all resistance are ½ watt.

Y_0-465.4 kc, FT-241-A crystal. JAN crystals for filter section values shown on original schematic.

Modification

The schematic diagram of the modified carrier oscillator and phase inverter is shown in fig. 1. For those who have already constructed the transmitter and wish to perform the modification it would be desirable that the carrier oscillator frequency be checked prior to the modification assuming that the transmitter has already been aligned and is working satisfactorily. This can be accomplished by listening for the carrier oscillator on the station receiver either on the fundamental or a harmonic frequency and using a calibrated signal generator to zero beat the carrier oscillator frequency or its harmonic. Once the frequency has been established it is merely a matter of purchasing a crystal ground to the frequency required. On the original unit the author simply replaced the oscillator coil (L_1) with a crystal socket and rewired the oscillator and phase inverter as shown in the schematic. If the builder is constructing the transmitter initially the carrier oscillator and phase inverter should be wired in the manner shown in fig. 1 instead of as in the original article.

Alignment

After modification or initial construction and using the crystal oscillator circuit the procedure for determining the carrier oscillator crystal frequency is as follows:

1. Complete the transmitter alignment from the mixer through to the final amplifier per steps 1 through 6 in the original article.

2. Tune the v.f.o. to 1350 kc as described in step 4 of the mixer-final amplifier alignment instructions.

3. Connect the output of an accurately calibrated signal generator between the crystal socket plate connection and ground and provide an input signal of sufficient amplitude to produce output from the phase inverter. The phase inverter output can be measured with a v.t.v.m., from the phase inverter plate to cathode on the carrier balance control potentiometer side of the two .001 blocking capacitors. These capacitors remain unchanged in the modification.

4. Steps 4 and 5 of the original transmitter alignment instructions for s.s.b. operation may now be followed excepting that the signal generator tuning control should be varied in discrete steps to find the most satisfactory oscillator frequency instead of the original oscillator coil slug and trimmer capacitor.

The author used a BC-221 frequency meter to establish the carrier oscillator frequency and purchased several crystals in a select range in order to have some choice. The crystal frequency providing the most satisfactory audio signal quality for the filter section values used in the original transmitter was found to be 465.4 kc.

Results

With the described carrier oscillator and phase inverter modification to the Top Band S.S.B. Transmitter the only warmup time required is that needed for the v.f.o. to stabilize. The initial v.f.o. drift is not critical in that the operator can compensate for it by slight returning of the v.f.o. to the proper frequency during the receive period. This would only be necessary if the operator wanted to operate the s.s.b. transmitter immediately after turn-on.

For improved Top Band S.S.B. Transmitter operation and to increase your operating pleasure make the described modification. You will be pleased with the outcome. ■

Need QSO's Be Dull?

BY E. M. WAGNER*, G3BID

I like Sam and his "Grumbles", and I agree with most of them.

Especially pungent was his analysis of the Short Wave Broadcasting, on which many countries spend vast sums of money and for which there can only be a negligible audience.

I agree too, in part, with his grumbles in July 1967 that many QSOs are incredibly dull, but I feel Sam must have been unfortunate in his little research project of 50 QSOs to establish whether Hams are capable of discussing subjects other than Radio. QSOs need not be dull.

My experience is that many of them are capable of discussing a lot of subjects, but Sam may have overlooked the difficulties which face many Hams by their regulations.

I would love to discuss Taxation, Foreign Policy, Vietnam, the cost of Gasoline, the Middle East War, Aid to the under-developed countries, but all this is banned by my licence as "politics".

I'd like to tell you how a certain make of automobile let me down and how badly it was serviced by the manufacturers—but might I not be involved in a libel action?

I'd like to tell you how excellent I find a new type of coffee percolator and how and why it makes better coffee than the others, with English water, but wouldn't that be advertising, also banned by my licence?

Despite the very severe restrictions which our licences impose on the subject matter of our QSO's, I have hundreds of really interesting talks all over the world.

A Finn and I found that we went ski-ing in the same district in Norway: we described our experiences and compared our opinions on various ski-ing resorts (hoping at least that no one would regard that as advertising). We've had many QSOs on this subject and always hear what happened last year if the other could not get there last year.

With a Frenchman I have discussed various vintages of the Bordeau area where he lived, and learnt an awful lot about the current position of certain wines.

With an American Mobile in Daytona Beach who had just arrived there for the first time, I was able to "talk him in" to what I considered the best restaurant in the town.

From another American years later I learnt this restaurant had closed down.

With a Mobile in Germany held up on an autobahn, as a result of an accident some way ahead, I discussed road design and learnt the cause of the accidents on the autobahns. This, in fact, stood me in good stead when later I travelled on the autobahns in Germany.

The description of scenery I have heard from various parts of the world is fascinating and when a mobile gives a running com-

[*Continued on page 114*]

* 5, Ferncroft Ave., London, N.W. 3, England

RADIO NET FOR THE 21st POWDER PUFF DERBY

LOUISA B. SANDO,* W5RZJ

Another All Woman Transcontinental Air Race is history. Held July 8-13, 1967, it was the 21st AWTAR, and the 16th in which amateurs manned the radio net to furnish needed communications. Heading up the net for the 10th consecutive year was W3GTC, Carolyn Currens.

Delayed by two days of bad weather, fliers in the Derby finally got off the ground at Atlantic City on the 10th. On both the 8th and 9th the radio net went into operation at 6 A.M. EST, only to be secured until the following day. Finally on Monday the net sprang to life with take-off time for each of the 71 planes, followed by ETA, arrival time, RON, etc. being relayed to each stopover city along the route.

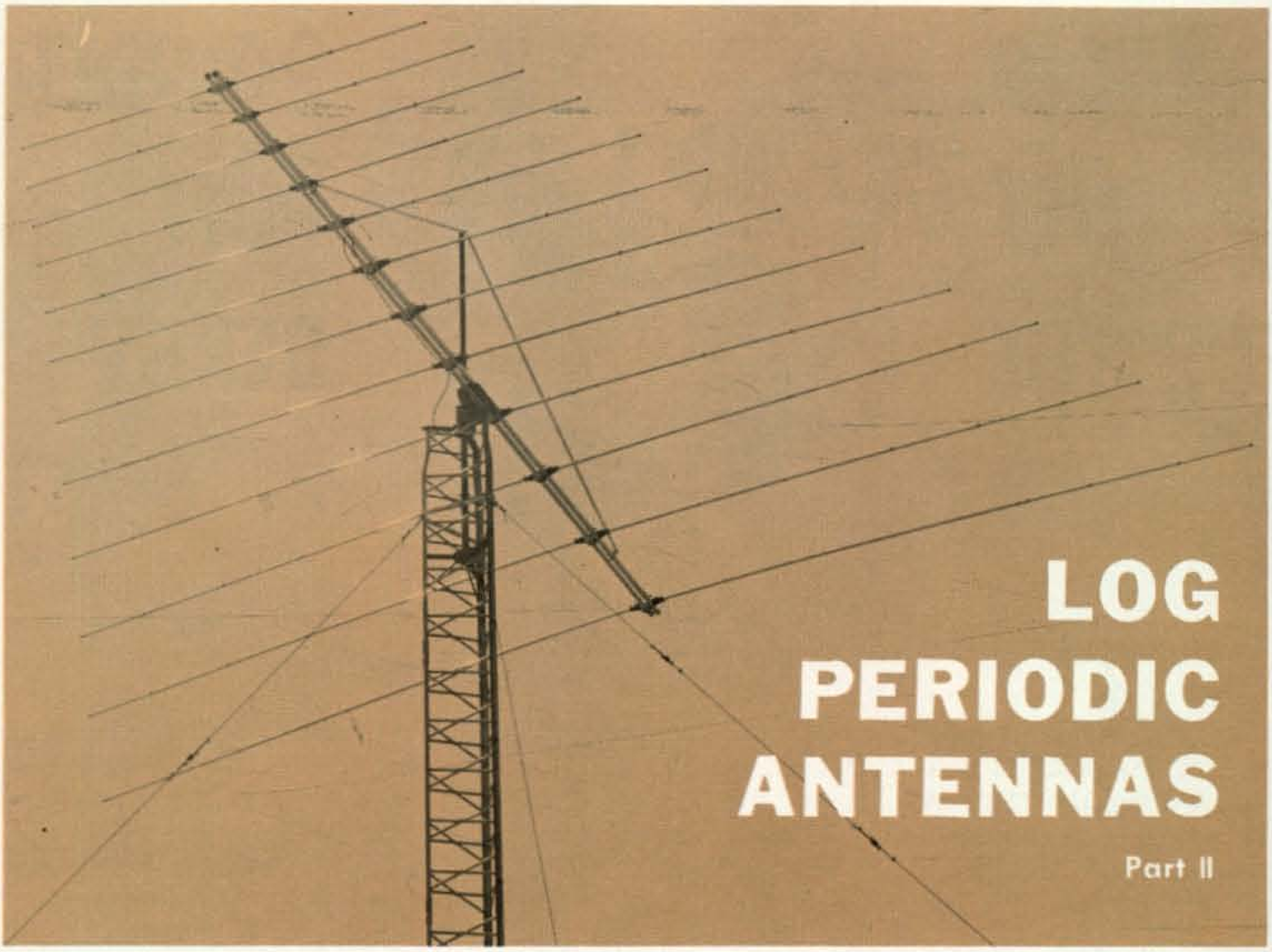
At Atlantic City, N.J., the chairman was WB2ZVM, backed up by the NAFEC ARC (WB2WHR); at Martinsburg, W. Va.—W8AEC, William Weller, with the Martinsburg ARC; Cincinnati, Ohio—K8THT, Philip Winters, with the Greater Cincinnati ARC (K8KDF); Carbondale, Ill.—W9UWL, Peter Sawyer, with Shawnee RC; Springfield, Mo.—WØTE, Paul Schmitz, with Southwest Mo. ARC (WAØEBE); Tulsa, Okla.—WA5FLE, Mark DeGroff, with the Tulsa ARC; Amarillo, Tex.—W5FN, Ted Williams; Albuquerque, N.M.—K5WZA, Irene Henderson, with Albuq. ARC; Flagstaff, Ariz.—K7UHN, Dorothy Trumpp, with Coconino Co. ARC; Palm Springs, Calif.—K6LFK, Mortimer Swingler, with Desert R.A. Transmitting Society; Torrance—WA6ISY and W6PIF, Myrtle and Tom Cunningham, with the Los Angeles Young Ladies ARC (W6MWO).

Highlighting the 21st Powder Puff Derby was the participation by 16 pilots from 7 countries other than the U.S. Of the crews from abroad, entry No. 72, Christine Henderson and Ruth Hodges of Australia, gained the highest score for an award. (In Albuquerque K5WZA, Irene—her OM is an Englishman and she is active on the Ex-G net—enjoyed a visit with them. In Calif.

[*Continued on page 113*]

* 4417 Eleventh St., N.W. Albuquerque, New Mexico 87107

K7UHN, Dorothy, chairman for the AWTAR net at Flagstaff, and OM K7ZZG, operating from the airport. The Trumpp's is an all-ham family, and in New York held the calls WA2TBK and WA2YTL, their sons being WA2TMW and WB2DTV. When they moved to Flagstaff the three men of the family ended up with ZZG, ZZH and ZZI, and Dorothy got UHN. Dot loves cw and copies up to 25 wpm. Al is active on the Copper State Net every night and both have been active in RACES.



BY AL BROGDON, *K3KMO

This is the concluding article of a two-part series on logarithmically periodical antennas. In last month's exciting episode, the readers of CQ were introduced to the log periodic antenna and the basic principles of its operation. In this month's thrilling episode, we will consider the design parameters for LP dipole arrays, and work through the design of a 50 to 450 mc general purpose log periodic.

As IN Part I, we will continue to consider the planar log periodic dipole antenna. Figure 7 illustrates this type of antenna, and shows the notations of design parameters which will be used with this article.

Note the fact that the phasing of adjacent dipoles in reversed in fig. 7. This is easily accomplished mechanically by having twin booms (insulated from each other) mounted one above the other. Then the left end of one dipole is mounted on the upper boom, and the right end mounted on the lower boom. This is reversed for the next dipole in line, and so on, resulting in each half of the antenna looking like the sketch of fig. 8. The two halves of the antenna are built exactly alike, then one of the halves is flipped over upside down and the two booms mounted together to make the complete antenna.

* R.D. 1, Box 390A, State College, Pa. 16801.

Design Procedure

Referring back to fig. 7, both the element length (l) and spacing (R) from the point of origin (O) of the array are related to the preceeding element by the scale factor (τ). That is:

$$\frac{R_n}{R_{n-1}} = \frac{l_n}{l_{n-1}} = \tau$$

Another ratio we will deal with is the spacing ratio (σ), where:

$$\sigma = \frac{R_n - R_{n+1}}{4\,l_n}$$

A third term to be used is the angle (α) enclosed between the line through the centers of the dipoles, and the straight line connecting one end of each dipole.

Now let us gaily skip past the involved theory necessary for full understanding of the LP antenna—lest we stumble and fall by the wayside—and jump right into some practical design procedures. References are given at the end of this article for the reader who wishes more in the way of a technical discussion.

The gain of an LP dipole antenna is determined primarily by τ and σ. These two variables and the angle α are related as expressed by the formula $\sigma = \frac{1}{4}(1-\tau)\cot\alpha$. Figure 9 is a nomograph of this relationship which makes it possible to make preliminary parameter selection without having to resort to laborious calculations.

Experimental work has shown that σ should be in the range of 0.1 to 0.15 for maximum gain, although satisfactory performance can be obtained with values between 0.05 and 0.22. This deviation from optimum values might be dictated by other considerations, such as size and weight restrictions. Maximum gain for the dipole array will usually lie betwen 5 and 8 db, with a horizontal beam width (for horizontal polarization) of 40 to 100 degrees.

The value of τ eshould be greater than 0.75 for end-fire frequency-independent patterns. Once the values of σ and τ have been been selected, the value of α can be determined from the nomograph of fig. 9.

The length of the longest dipole ($2l_{max}$ or $2l_1$) is calculated as a starting point for the array, and should be $0.47\lambda_{max}$ for proper operation at the low frequency end of the design range. Similarly, the shortest dipole must be no longer than $0.38\lambda_{min}$ for proper high frequency operation. These limits have been obtained experimentally, and apply for mid-range values of τ.

One more consideration in the design of the LP is that the boom length should be at least one-half wavelength at the low-frequency end of the design range ($\frac{1}{2}\lambda_{max}$) for best performance. If this is mechanically impossible, it can be made shorter with some degradation of antenna performance.

Figures 10 and 11 are useful nomographs for roughing out the design of an LP dipole.

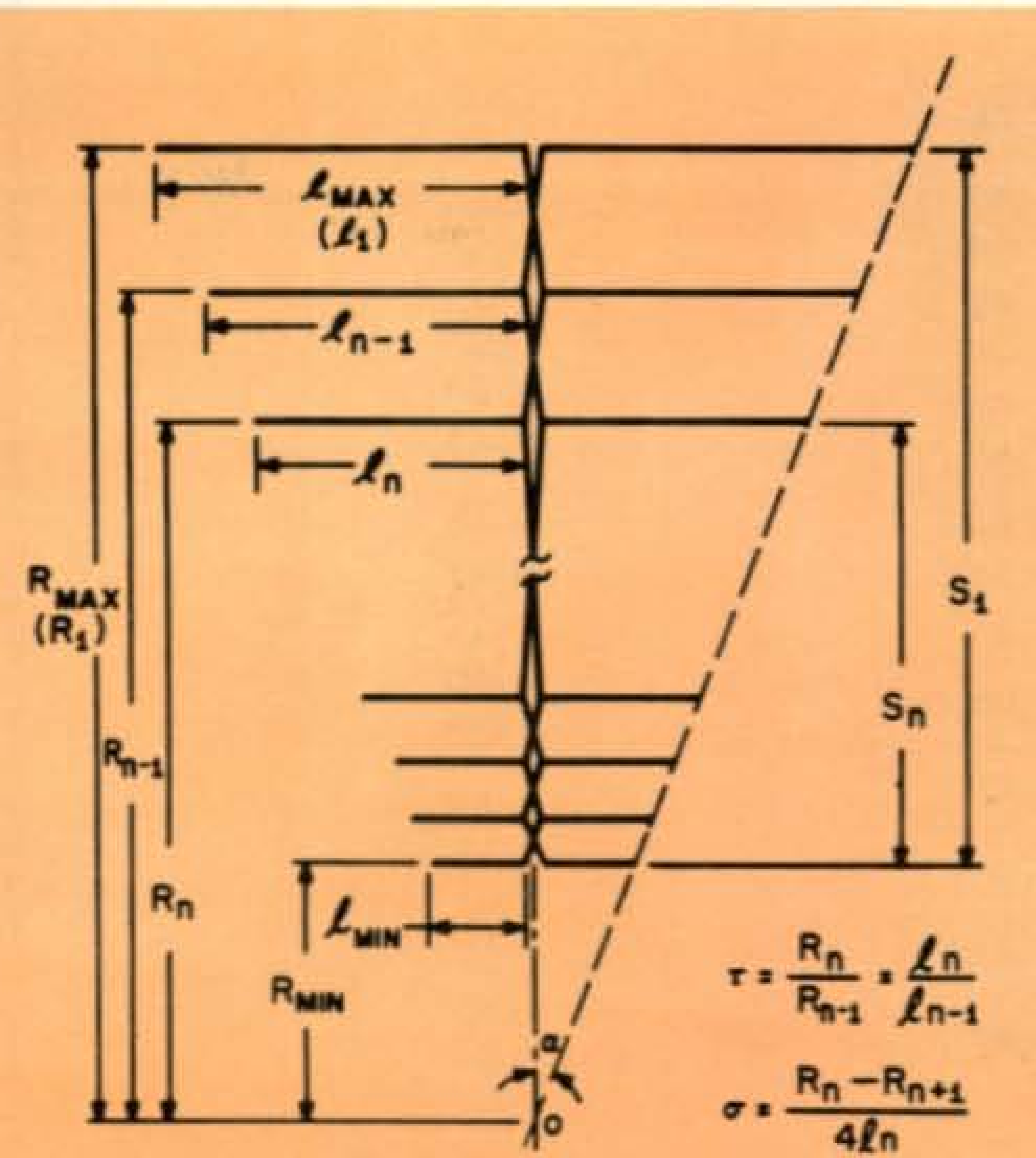


Fig. 7—LP dipole antenna and design nomenclature.

Figure 10 indicates the approximate number of dipole elements which will be present once τ and σ have been chosen. Figure 11 similarly indicates the approximate boom length after these parameters have been selected. The value of these nomographs lies in the fact that they will indicate bad choices of τ, σ and α after only a few preliminary calculations have been made. If you have made bad choices, the nomographs will indicate the fact that the antenna would be a white elephant, too large and with too many elements to be practical.

Once these preliminary choices, calculations and checks have been made, simple trigonometric relationships allow the lengths and positions of the individual dipoles to be calculated. The value of l_1 was calculated

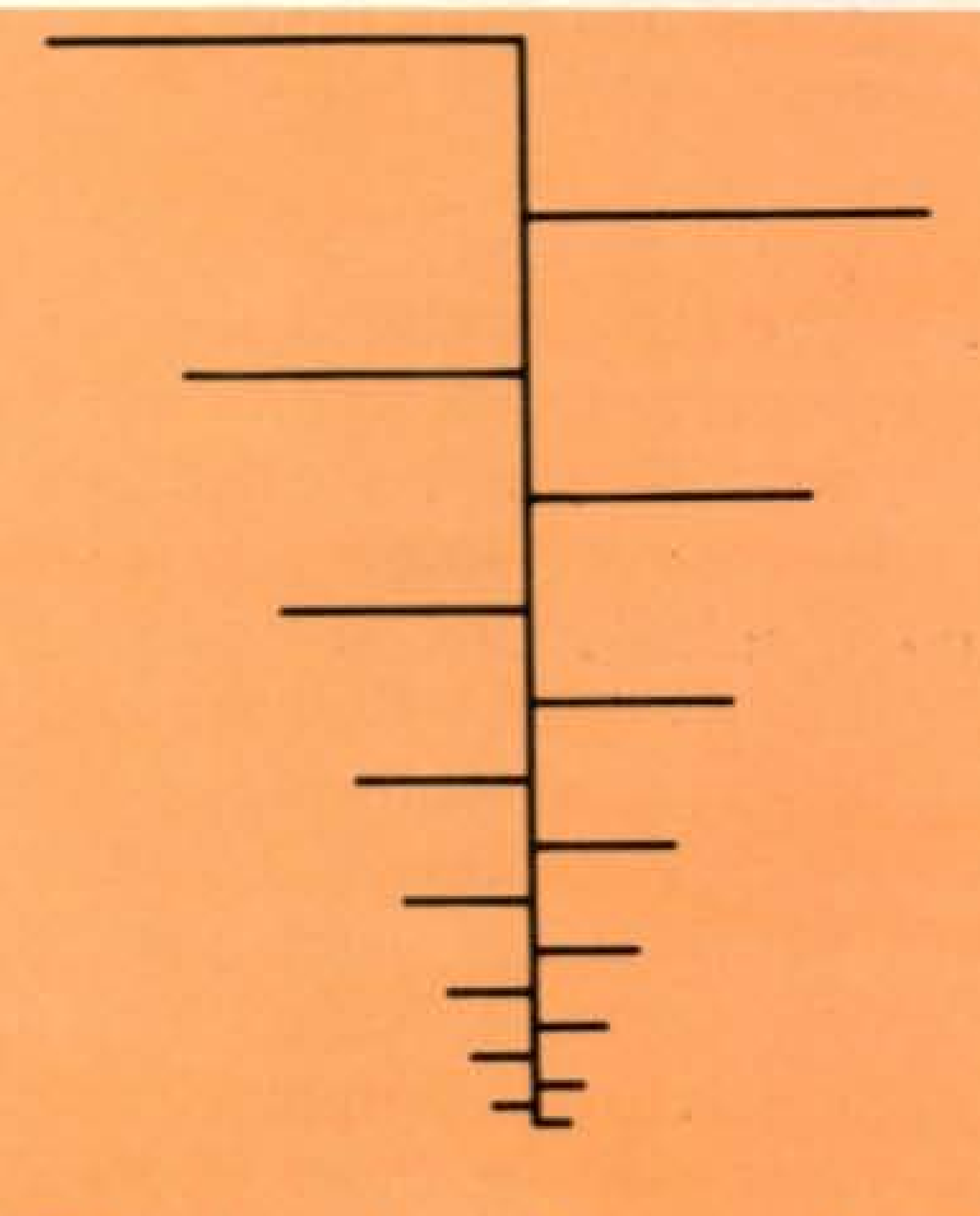


Fig. 8—Top view of one boom and a half of the LP dipole antenna.

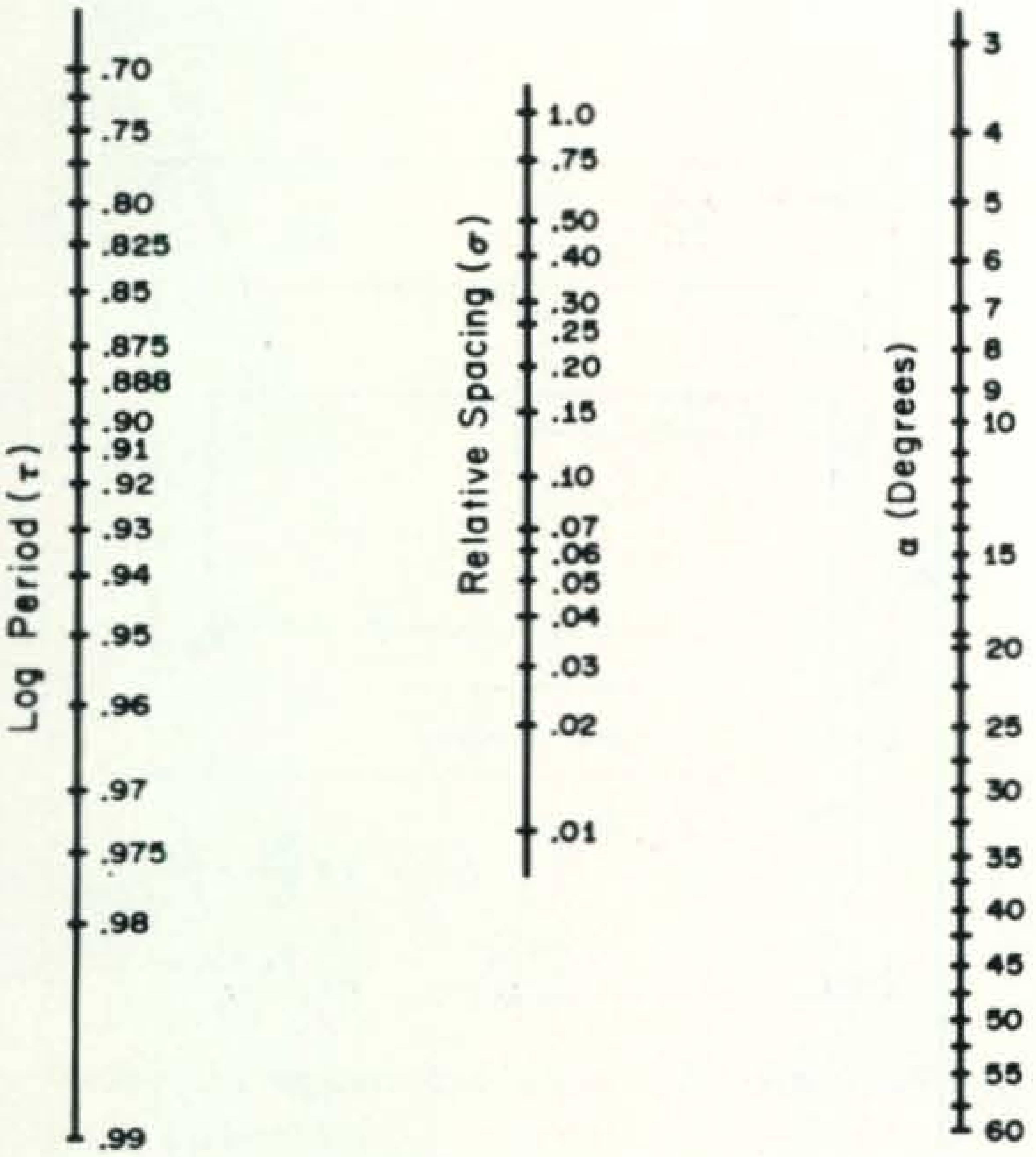


Fig. 9—Nomograph of $\sigma = \frac{1}{4}(1 - \tau) \cot \alpha$.

earlier. Its spacing from the point of origin may be calculated with the formula $R_1 = 2l_1 \cot \alpha$.

Once we have the values of l_1 and R_1, we may calculate all other values of l and R. To do this, two basic formulas are used: $R_{n+1} = \tau R_n$ and $l_{n+1} = \tau l_n$.

However, these formulas may be modified slightly so as to base successive calculations on the *first* values of l_1 and R_1, rather than the preceeding value of l and R. The advantage to this procedure is that if you make an erroneous calculation of one value of l or R, this error will not be carried through and affect all the following calculations. Basing each calculation on the preceeding value would allow a snowballing series of errors once the first one had been made. These two modified formulas which we will use then become:

$$R_n = (\tau)^{n-1} R_1 \text{ and } l_n = (\tau)^{n-1} l_1$$

We have already calculated the values of l_1 and R_1, and using these formulas, all other values of l and R can be calculated. But (you ask) how do we know when we have made enough calculations to reach the final values of l and R?? Aha! You remember we calculated $0.38\lambda_{min}$ a while ago? Well, all we do is calculate values of l and R until we reach a value of l_{min} such that $2l_{min}$ is equal to or less than $0.38\lambda_{min}$. This means that we now have the length of a dipole calculated which will be short enough to go to the top end of the design range. When this value is calculated, the originally calculated value of $0.38\lambda_{min}$ can be discarded and will not be used further. Its purpose was only to serve as a guide, and once the actual value of l_{min} has been determined, the guide is no longer needed.

One final set of calculations is made subtracting R_{min} from all other values of R. This serves to refer the element spacings to the position of R_{min} rather than the imaginary point of space, O. With that, the design calculations are finished.

Design Check

At this point, it is useful to plot the calculated values of element lengths and spacings on linear graph paper (to scale) to obtain a scale drawing of the proposed array. This will give you a good feel for what you have just designed, to again make sure you haven't designed a mechanical monster. If at this point, you do decide the size of the array makes it impractical to build, then you will have to choose new values of τ and σ, and start all over again. Experience is the best teacher in finding out how variation of these parameters will affect the size of the array.

Another check which can be made with your scale drawing of the array is quite simple. Because both the lengths and spacings of the elements vary logarithmically, the ends of the elements should describe two straight lines, with an included angle of 2α. Check and see if this is true. If some elements seem to be too short or too long, go back and check your calculations for both their length and spacing. Also, the spacings between elements can be roughly checked by eyeball. There should be a logarithmical increase in the spacing as you move from the front to the rear of the array. You can usually tell if a given spacing is very far from what it should be, by judging the logarithmic progression of the spacings on the scale drawing.

Typical Design

We have covered the basic design techniques for an LP dipole array. It's time to work through a typical problem and see if we can really make a complete design that works. This design problem is summarized in Table I. Let's design a planar LP dipole array for 50 to 450 mc, with design parameters of τ=0.85 and σ=0.1. This antenna serves well as a first construction project in LP antennas, since it is small enough to be built easily and economically, and can be

$f_{min} = 50$ mc $\qquad f_{max} = 450$ mc

$\tau = 0.85 \qquad \sigma = 0.1 \qquad \alpha = 21°$

$B = \frac{450}{50} = 9$ $\qquad$ Boom length $= 0.58\lambda_{max}$ $\qquad$ No. elements $= 16$

$$2l_1 = (0.47)\left(\frac{11808}{50}\right) = 111.0'' \quad l_1 = 55.5''$$

$$2l_n = (0.38)\left(\frac{11808}{450}\right) = 10.0'' \quad l_n = 5.0''$$

$$R_1 = {}_1 \cot \alpha = (55.5)\ (2.6051) = 144.577$$

$(\tau)^1 = 0.85000$	$(\tau)^5 = 0.44370$	$(\tau)^9 = 0.23159$	$(\tau)^{13} = 0.12088$	$(\tau)^{17} = 0.06308$
$(\tau)^2 = 0.72250$	$(\tau)^6 = 0.37714$	$(\tau)^{10} = 0.19685$	$(\tau)^{14} = 0.10274$	$(\tau)^{18} = 0.05361$
$(\tau)^3 = 0.61412$	$(\tau)^7 = 0.32056$	$(\tau)^{11} = 0.16732$	$(\tau)^{15} = 0.08732$	$(\tau)^{19} = 0.04556$
$(\tau)^4 = 0.52200$	$(\tau)^8 = 0.27247$	$(\tau)^{12} = 0.14222$	$(\tau)^{16} = 0.07422$	$(\tau)^{20} = 0.03872$

$l_1 = (55.5)(1.0\ ) = 55.5''$	$R_1 = (144.577)(1.0\ ) = 144.577;$	$s_1 = 131.999''$
$l_2 = (55.5)(0.85\ ) = 47.173$	$R_2 = (144.577)(0.85\ ) = 122.890;$	$s_2 = 110.312$
$l_3 = (55.5)(0.723) = 40.125$	$R_3 = (144.577)(0.723) = 104.529;$	$s_3 = 91.951$
$l_4 = (55.5)(0.614) = 34.076$	$R_4 = (144.577)(0.614) = 88.770;$	$s_4 = 76.192$
$l_5 = (55.5)(0.522) = 28.970$	$R_5 = (144.577)(0.522) = 75.469;$	$s_5 = 62.891$
$l_6 = (55.5)(0.444) = 24.641$	$R_6 = (144.577)(0.444) = 64.192;$	$s_6 = 51.614$
$l_7 = (5.55)(0.377) = 20.923$	$R_7 = (144.577)(0.377) = 54.505;$	$s_7 = 41.927$
$l_8 = (55.5)(0.321) = 17.815$	$R_8 = (144.577)(0.321) = 46.409;$	$s_8 = 33.831$
$l_9 = (55.5)(0.272) = 15.095$	$R_9 = (144.577)(0.272) = 39.325;$	$s_9 = 26.747$
$l_{10} = (55.5)(0.232) = 12.875$	$R_{10} = (144.577)(0.232) = 33.542;$	$s_{10} = 20.964$
$l_{11} = (55.5)(0.197) = 10.933$	$R_{11} = (144.577)(0.197) = 28.482;$	$s_{11} = 15.904$
$l_{12} = (55.5)(0.167) = 9.268$	$R_{12} = (144.577)(0.167) = 24.144;$	$s_{12} = 11.566$
$l_{13} = (55.5)(0.142) = 7.880$	$R_{13} = (144.577)(0.142) = 20.530;$	$s_{13} = 7.952$
$l_{14} = (55.5)(0.121) = 6.715$	$R_{14} = (144.577)(0.121) = 17.494;$	$s_{14} = 4.916$
$l_{15} = (55.5)(0.103) = 5.716$	$R_{15} = (144.577)(0.103) = 14.891;$	$s_{15} = 2.313$
$l_{16} = (55.5)(0.087) = 4.828$	$R_{16} = (144.577)(0.087) = 12.578;$	$s_{16} = 0$

Table 1—Summary of design data for the 50 to 450 mc LP dipole antenna.

used for several purposes when it is finished. It will cover the 6, 2, 1¼ and ¾ meter ham bands, the v.h.f. TV channels, the f.m. broadcast band and various other v.h.f. communications services. It can be easily rotated, and will deliver about 7 db gain over its design range.

With the preliminary choices of τ=0.85 and σ=0.1, we find from fig. 9 that the angle α=21°. The bandwidth ratio B is equal to f_{max} divided by f_{min}, or 9 for this antenna. This value of B and the value of α can be used with the nomograph of fig. 11 to determine the boom length. For this antenna, it will be approximately $0.58\lambda_{max}$, or 137 inches.

Using the values of B and τ with the nomograph of fig. 10, we find that there will be approximately 16 elements in the array. The equations for the longest and shortest element lengths are used to determine in this case that the longest dipole will be 111 inches long, and the shortest one must be no longer than 10 inches.

All of these dimensions sound reasonable, so let's continue with the design calculations.

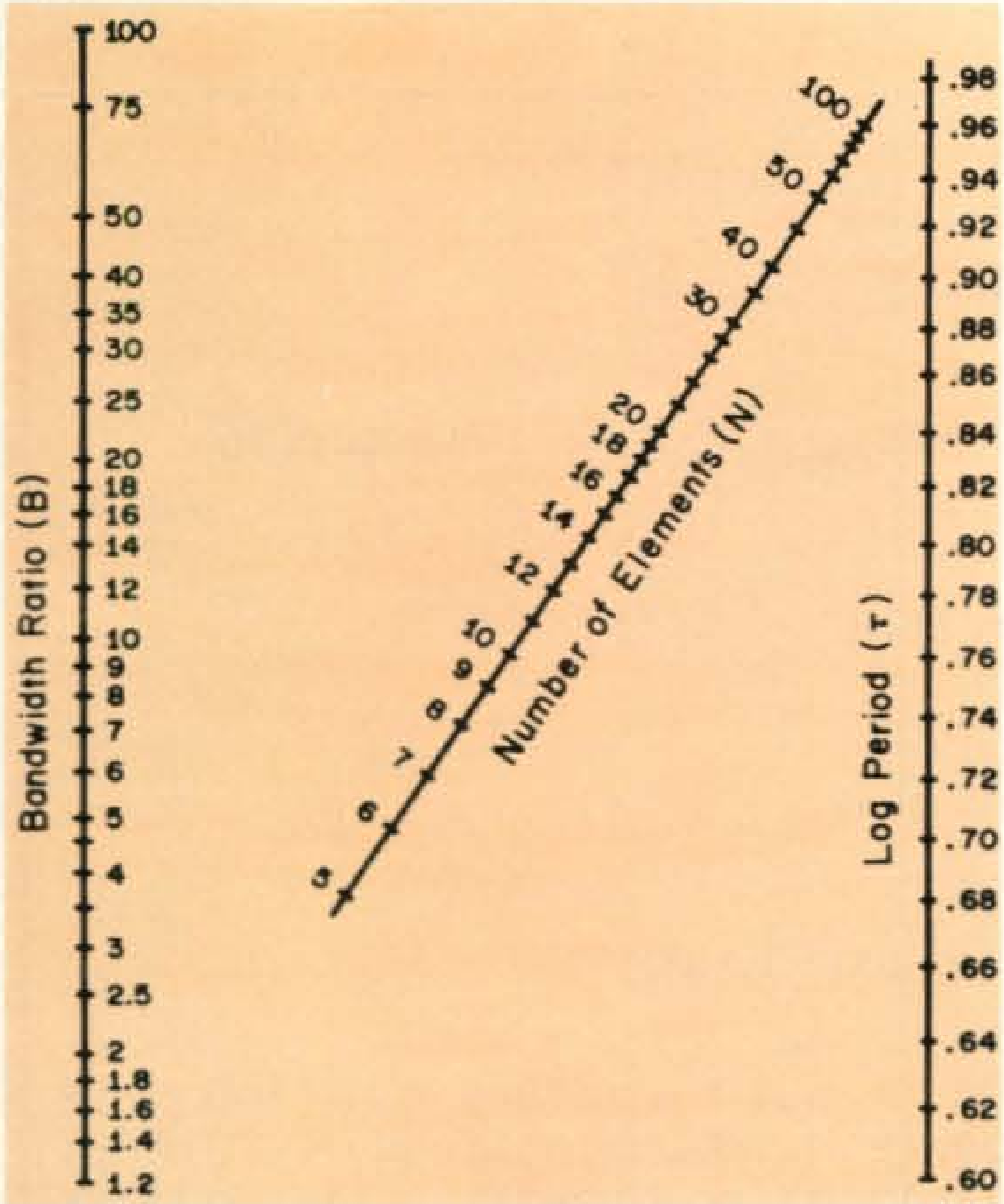


Fig. 10—Nomograph of $N = 1 + \dfrac{\log 1237\,B}{\log\left(\dfrac{1}{\tau}\right)}$

The distance (R_1) of the longest element from the origin (O) of the array is calculated using the formula presented earlier in this article, and in our case will be 144.6 inches. We now have the basic values we need to calculate the values of l and R for all dipoles. In both sets of these calculations, we will need the values of $(\tau)^n$ for values of n from 2 to 16 (since we anticipate 16 elements in the antenna). It is best to go ahead and make these calculations in advance, so as to have them readily at hand when they are needed.

Once the values of $(\tau)^n$ are determined, the previously mentioned formulas may be used to calculate all values of l and R. The values of l should be calculated first, with the calculations ending when a value is found where l_{min} is less than or equal to 5 inches (satisfying the condition of a minimum length for this last dipole). Then the corresponding values of R are calculated. The value of R_n is then subtracted from all values of R to come up with the values of s (the spacing of the elements from the highest frequency dipole). Table I lists the calculated values of l, R, and s for our 50 to 450 mc LP antenna, which were arrived at by these calculations.

Mechanical Consideration

Now that we have completed the electrical design, let's take a look at the mechanical considerations in building this array. Normal beam-building techniques should be used for the construction of this antenna. Aluminum makes a good workable material for the array. Either tubing, or square tubing or U-channel may be used for the twin booms. Smaller sizes of tubing serve as elements. The elements should be mounted to the booms with good mechanical rigidity as well as firm electrical contact. The size of the tubing used is not critical, and is usually chosen to provide the necessary mechanical strength. However, the use of larger diameters of tubing for the elements will result in slightly narrower beamwidth.

Metric System

One hint which has turned out to be a real time-saver is the use of the metric system for antenna measurements, especially with the LP antenna. When using the good old American system of feet, inches, furlongs and cubits, you work out a length for an antenna element which comes off the slide rule as feet and a decimal fraction. Then you have to convert this decimal fraction into inches—which also leaves you with a decimal fraction of an inch which must be converted into a fraction of an inch which you can find on your ruler. Whew!

If you use the metric system, you figure out the length once and it gives you the decimal fraction which can be read right off the ruler. What could be easier! So the author invested in both a folding carpenter's rule and a reel type tape measure calibrated in both feet and inches and meters. All antenna calculations are made using the metric system, and then measured right off the rulers with no extra conversion processes. You should consider the same. Once you get used to the metric units, and get a feel for their size, it makes antenna work a lot easier.

Phasing

To get back to the mechanical construction of the LP antenna, you must remember that adjacent dipoles must be mounted with opposite phasing. This means that the two halves of the antenna must be built as shown in fig. 8. One of the halves is flipped over, and the two halves mounted together to make the array. The two halves of the antenna must be insulated from each other, and mounted so that the two booms (to which the dipole halves are fastened) are parallel, and the two sides of each dipole line up with each other to make the complete dipole.

Feeding

Let's consider how to feed this array. It must be fed from front of the antenna—that is, the end with the shortest dipole. The impedance of the feedpoint can be calculated, but this gets into what is known in technical circles as a knotty problem. For all practical purposes, either 52 or 75 ohm coax can be used to feed the antenna. For best results, the diameter of the boom should be large enough to run the coax down the middle of it. If this is possible, the coaxial cable is run through from the back end of one boom to the front of the antenna, where it is connected to the feed point. At the front of the boom, the braid of the coax is connected to the boom through which the feedline was run, and the center conductor of the coax is run over to the other boom and connected to complete the feed.

If the boom is not large enough in diameter to contain the coax, the coax line can be run to the front of the boom and connected as described above, without going through the boom. If this is done, the s.w.r. may be slightly higher than the case with the coax run through the boom, but it will still be within acceptable limits.

Boom Mounting

When mounting the array, the booms must be insulated from the mast. The array should be mounted at its center of gravity, which will be off-center toward the rear of the antenna. If the antenna is vertically polarized, a dielectric material should be used for the mast as it passes into the antenna array, so as not to degrade the antenna performance.

Conclusion

Hopefully you now have all the information you need to design and build your own LP dipole arrays. If further information on the subject is desired, please consult the list of references following this article. It might be noted that the author's first experiences with the design and construction of LP dipole antennas was on a quick-reaction requirement, and a number of different antennas were built with good results using less information than has been presented in this series of articles. If, *as a last resort,* you must write to the author for more information, please keep your questions brief, and include an s.a.s.e. for convenience.

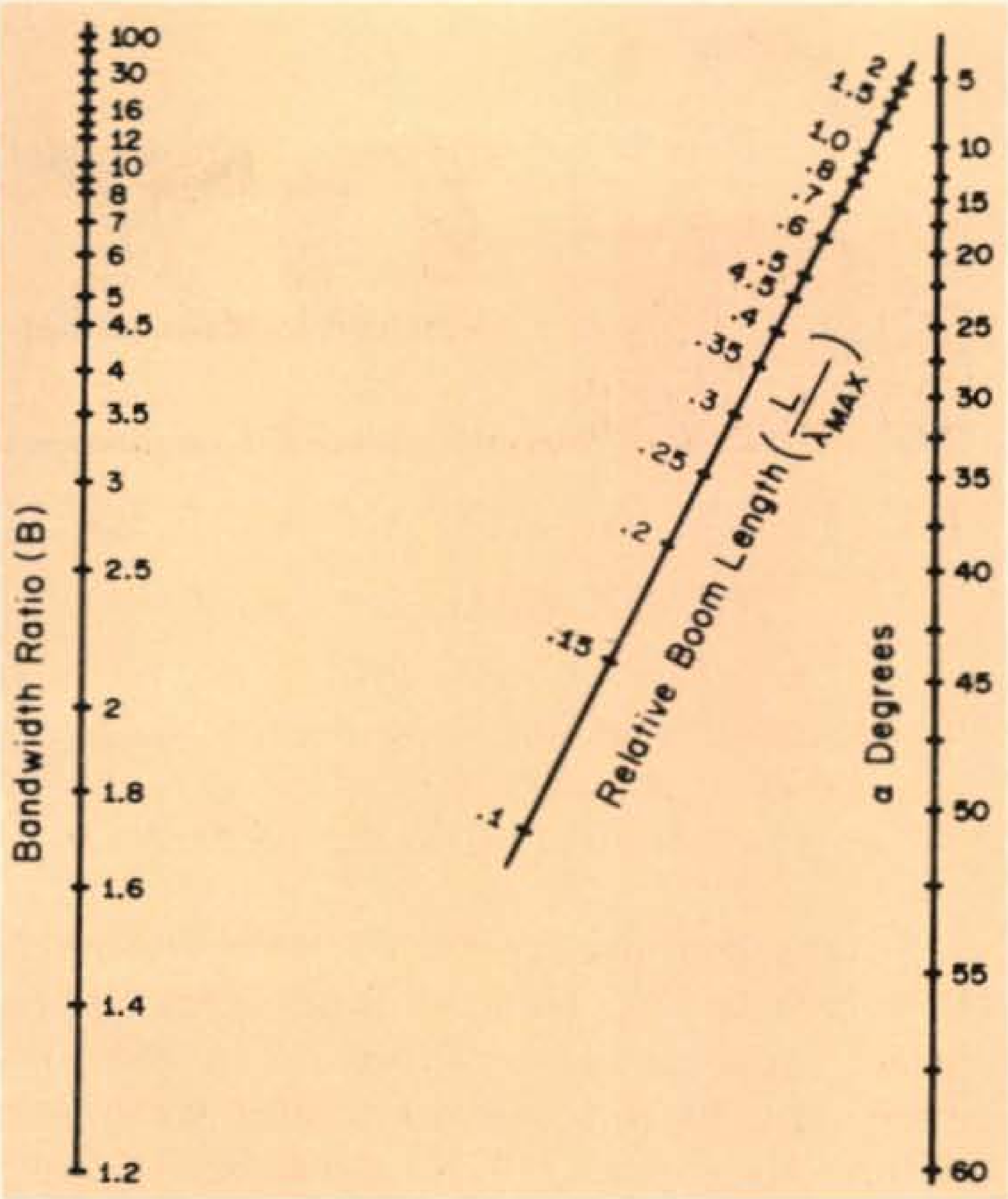


Fig. 11—Nomograph of

$$\frac{L}{\lambda\ max} = \tfrac{1}{2}\left(0.47 - \frac{0.38}{B}\right)\ \mathrm{Cot}\ \alpha.$$

The author wishes to acknowledge, with thanks, the photographs supplied by the Hy-Gain Antenna Corporation and Granger Associates which show their fine antennas in action. ■

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DX

BY JOHN A. ATTAWAY,* K4IIF

THE DX HALL OF FAME

"A public not to be bribed, not to be entreated, and not to be overawed, decides upon every man's title of fame."
—Ralph Waldo Emerson

Several months ago the decision was made to create a DX Hall of Fame. An appropriate announcement appeared in the July issue, and as a result 14 names were submitted to the *CQ* DX Awards Advisory Committee for consideration. Each person nominated was carefully evaluated by the committee. It was concluded that a certain few of the nominees had made contributions to DX which merited this honor. However, in the committee's judgment the majority still had not made a contribution worthy of the *ultimate award*. The name of one man was mentioned more than any other. This man was the clear choice of both the readers and the committee to be the first member of the DX Hall of Fame. He was Mr. Gus M. Browning, W4BPD, the distinguished Doctor of DX (D.D.X.) from South Carolina.

There is little I can say to describe the DXploits of Gus Browning that would not be trite. Only 59 years old and a virtual dynamo of activity, he is already a legend in his own time. Since first licensed as NU4ADB in 1925 he has signed a total of 123 different calls in 117 countries. To our knowledge he is the only licensed amateur in history to make DXCC in terms of the number of countries from which he himself has actually operated.

Gus Browning has conducted three major worldwide DXpeditions, traveling as far north as the Faeroe's Islands, 62° north latitude, and as far south as Bouvet Island, 55° south latitude. He has operated twice from Tibet and even for a 4-day period from Red China. Gus calculates that he has made over 380,000 QSO's from rare DX locations, many more than he has made from his home station. In fact, he has made more QSO's from Bhutan than from South Carolina. During his great WPX DXpedition from Bhutan he used the prefixes AC1, AC2, AC5, AC6, AC7, AC8, AC9, and ACØ. These, coupled with his AC3 from Sikhim and AC4 from Tibet probably did more to separate the men from the boys in the WPX Honor Roll than anything before or after.

Since temporarily retiring from the DXpedition scene Gus has entered the DX publishing business. In cooperation with his wife Peggy he edits and publishes the *DXers Magazine* from his home base in Cordova, S.C.

While most of the publicity has always gone to Gus's DXpeditions, he has also compiled a formidable DX record from his home QTH. His DXCC certificate is Number 4, and his WAZ certificate is Number 40. He also has a large prefix score waiting to be totalled up for WPX. He is a member of OOTC, OTC, TOPS, FOC, NCDXC, ORC, Bhutan Yak Club Kiwanis and the WGDXC. He has four children and ten grandchildren.

CONGRATULATIONS TO GUS M. BROWNING, W4BPD, DX HALL OF FAME NUMBER ONE.

Gus Browning, W4BPD, DX Hall of Fame No. 1. Judging from this photo the old master's eyes are roving again to the far horizons, the jungles of darkest Africa to the lofty peaks of the Himalayas.

* P.O. Box 205, Winter Haven, Fla. 33881.

C.W. Contest On Tap

Get ready for the c.w. weekend of the *QC* Worldwide DX Contest coming up Nov. 25-26. This is the best chance you'll have all year for running up your c.w. and mixed WPX scores. For complete details see page 59 of the September issue.

The Awards Program

There are those who say that DXing interest has been diminished by recent controversies. Maybe so, but you can't prove it by this corner. Last month we authorized 43 new WPX certificates, and this month we are authorizing 29 more new WPX certificates, 48 WPX endorsement stickers, and no fewer than 62 new WAZ certificates. DX is going pretty good, eh wot!!

This month's new WPX Certificate Winners are as follows:

C.W.: OK1GA—772, OK2KZC—773, OK1IJ—774, OK1VK—775, OK2PO—776, OK2DB—777, WA2IDM—778, W4CRW—779, JA2TH—780, G6YL—781, DM2ADC—782, UJ8AB—783, UT5FI—784, UA9OO—785, UA9KOH—786, UP2UK—787, UW3EH—788, DL7MQ—789, UA4QP—790.

S.S.B.: OK1VK—275, WB2NDI—276, K3QVV—277, SP5AKG—278, YV1KZ—279.

Mixed: OK2OP—136, K6BPR—137, ZS1ACD—138.

Fone: I1ANE—141, IT1GAI—142.

The following endorsement stickers have been issued:

C.W. Prefixes: W4OPM—800, W5KC—750, K1SHN—650, G3HDA—600, K4RZK—500, K5IEX—500, OK3HM—500, W4HUE—450, VO1AW—400, VE2IJ—400, OK1MP—400, W2IP—350, UB5WK—350.

S.S.B. Prefixes: W4NJF—650, W9DWQ—550, I1AMU—450, WA5LOB—400, W8EVZ—400, SP5AKG—400, W4HA—350, LU1DJU—300, I1TRA—300.

Mixed Prefixes: W4OPM—800, W9WHM—800, W9DWQ—750, JA1BN—450.

Fone Prefixes: W9WHM—800, W3DJZ—600.

North America Endorsement: K4IEX.

21 Mc Endorsement: G3HDA.

7 Mc Endorsement: G3HDA.

14 Mc Endorsement: UT5FI, W8EVZ, SP5AKG, OK3HM.

South America Endorsement: K2CPR.

Asia Endorsement: W8EVZ, K2CPR.

Oceania Endorsement: G3HDA, K2CPR.

Africa Endorsement: I1AMU.

European Endorsement: W9ZTD, I1AMU, UA4QP, UA4LM, UT5FI, OK1MP, VO1AW.

This increased interest in WPX is most gratifying. We feel that this award is made to order for the "man who has everything." When the countries have all been worked for DXCC and the S.S.B. DX Award, prefix chasing is the logical next step. While legitimate new countries are few and far between after one passes the 300 mark, new prefixes appear on the bands almost daily.

Paul, I1RBJ, at the operating position of I9RB during the CQ Worldwide S.S.B. contest. This fellow is one of the leading contest operators of Europe. You'll always hear him in there with a strong signal.

To add some extra flavor to WPX we are preparing to start a regular WPX Honor Roll. A list of acceptable prefixes is now being compiled by the DX Editor in cooperation with the *CQ* DX Award's Advisory Committee. Actually there will be four separate Honor Rolls; Mixed WPX, C.W. WPX, S.S.B. WPX, and Phone WPX. The Honor Roll point will be somewhere in the neighborhood of 600-650 prefixes, and everyone who applies will be required to submit his QSLs. Consequently, best start dusting off and organizing those old cards. Just remember, none before 1946.

Attention Novices: CQ offers a prefix award for novices only, the WPNX Award. To qualify you must work and confirm 100 prefixes or more since May 15, 1967. For an application blank send a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Florida 33881.

New WAZ certificates are being issued to the following:

C.W./Phone WAZ: W8SWG—2293, KR6CO—2294, K8ZIP—2295, DL1LD—2296, W1MDO—2297, YU3AB—2298, OZ7X—2299, K2GUN—2300, OH5TW—2301, I1IZ—2302, OH2NQ—2303, W6ADK—2304, SP9DH—2305, DJ4UG—2306, CP5EZ—2307, SM6CKS—2308, YO6AW—2309, VK5JT—2310, OK1KTL—2311, K4ZCP—2312, OH7PJ—2313, OH2BAC—2314, SM3CJD—2315, W2KIT—2316, I1ACY—2317, UAØLL—2318, WA2EFN—2319, YU3AB—2320, IS1FIC—2321, WA5CBE—2322, JAØSU—2323, 9Q5AB—2324, n.i.—2325, WØKAW—2326, OZ7CF—2327, OK3OM—2328, LA8PF—2329, W2HL—2330, OK1AMS—2331.

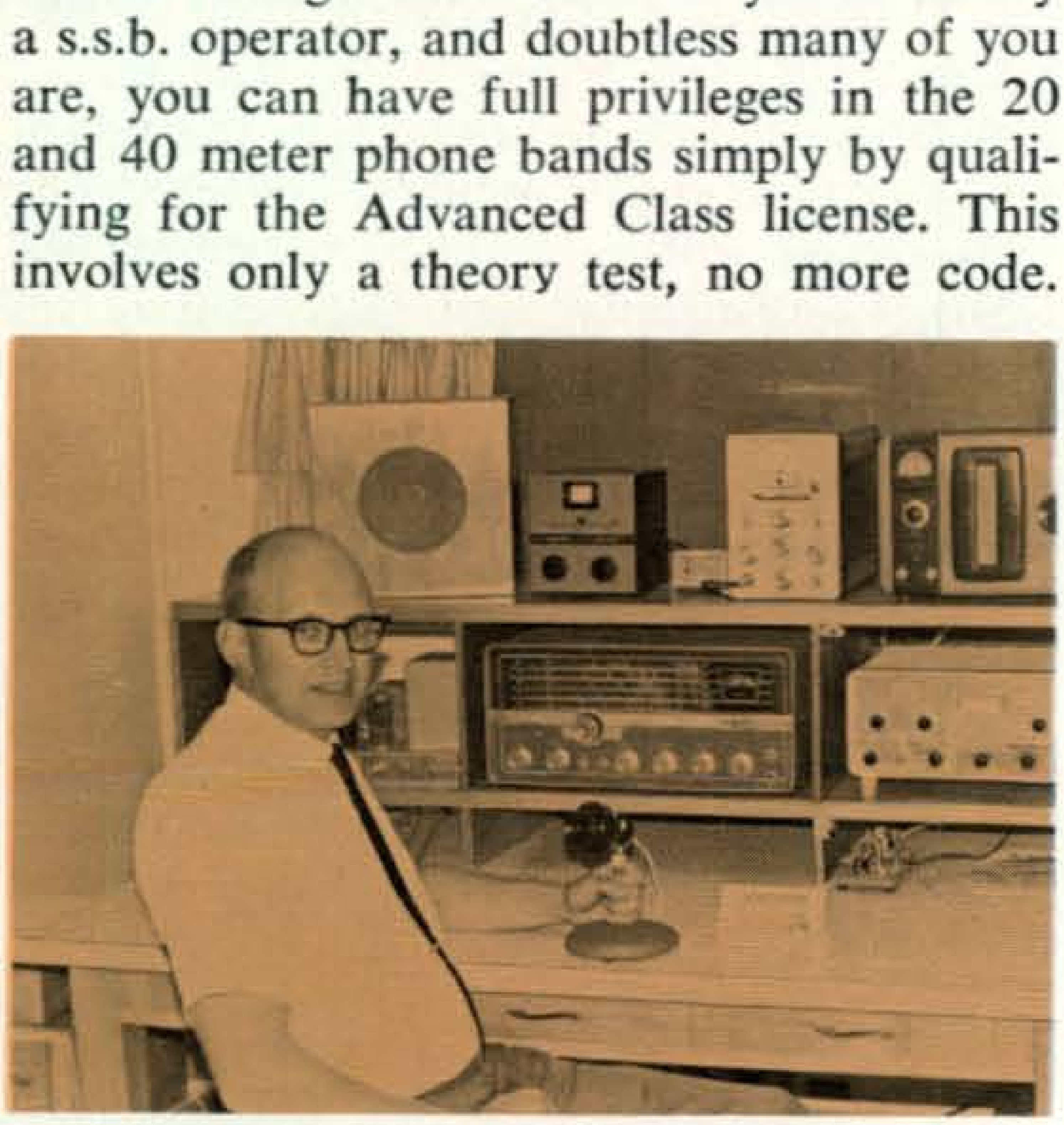
SSB WAZ: KA2RJ—451, DJ6CM—452, OE2EGL—453, ZL1AAS—454, YO3JU—455, ZL3MN—456, K3UZY—457, KH6FRO—458, JA6DCE—459, G3HSR—460, W3VSU—461, DJ5TH—462, UA1IG—463, W4BBL—464, I1LAG—465, DL8OA—466, K5OGP—467, VE3ES—468.

Phone WAZ: DJ2YL—354, DJ3GY—355, DJ1LP—356, PY2PC—357, VK5LC—358, F3FA—359.

S.S.B. DX Award—The S.S.B. DX Award records are now being updated and a goodly number of new certificate winners will be announced in the December column. We hope that by summer we will have the S.S.B. DX Honor Roll reinstated as a permanent feature of the column. This step has been delayed because of the considerable time involved in organizing the WPX Honor Roll.

De Extra

Incentive Licensing and the DX & Contester: After 5 years of agitation by those who prefer the fire to the frying pan, "Incentive Licensing" is becoming reality. Some, perhaps many, who have approached communications as a hobby rather than as a profession are knashing their teeth, muttering dirty words, and sitting down to compose an ad with the hope of unloading the family rig before its too late. DON'T DO IT!!!*You can live with this thing.* It isn't nearly as bad as it might have been. If you're chiefly a s.s.b. operator, and doubtless many of you are, you can have full privileges in the 20 and 40 meter phone bands simply by qualifying for the Advanced Class license. This involves only a theory test, no more code.



Gene Nurkka, VK9GN, boss of that big signal out of New Guinea during the CQ contests. Gene does radio and tape recorder repair work for about 11 missions out VK9 way. He is a native of Minnesota. Incidentally his v.f.o. is a 3-transistor job running on a dozen flashlight batteries in series. It is mounted in the old Viking v.f.o. box. *(Photo courtesy W2GT).*

Here's ole Uncle Ray, VE3UR, logging them in like mad during the DX contest.

This test, will not be as severe as the Amateur Extra Class exam and you should be able to handle it after a reasonable amount of study. *No one* will lose privileges in the 10 meter band either on phone or c.w. The only real losses for the phone man who goes on to the Advanced Class License are the 3800-3825 and 21250-21275 kc segments, and as the latter is seldom used for DX and Contest work its loss is of no great concern. However, the 75 meter segment will hurt the contester because this is where most contacts are made during the phone weekends.

Unfortunately, the c.w. man didn't come off as well. In a sense this is an anomaly because most of the conditions which prompted the "Incentive Licensing" debate in the first place are found more in the phone bands than the c.w. bands. However, the rules makers were inclined to allow the 100% phone operator to keep most of his privileges without having to improve his code ability. The c.w. op, on the other hand, must not only improve his code speed, but must increase his knowledge of radio theory as well, all the way to the Amateur Extra level. For a real c.w. man the 20 w.p.m. won't be too tough, but for everyone but the professionals the amateur extra test will be a real job. You c.w. hounds have got your work cut out for you. There are still plenty of frequencies left, but the loss of the bottom ends of 15 and 20 meter c.w. will hurt the DXer and eliminate the contester. This column forecasts a tremendous number of 28 mc, monoband entries in the DX contests after the new rules go into effect.

Henny, PAØHBO, top Phone DXer in PAØ-land and a well-known contester. *(Photo courtesy PAØLOU).*

I repeat that these are early predictions based on a scanty understanding of the new law. There are many questions to be answered, particularly with regard to enforcement. *Call signs won't be changed,* so identification of violators will be difficult. And what about visiting operators? Can a General Class operator visiting in an Amateur Extra Class licensee's shack operate the rig according to the Extra Class rules? Probably these questions will have been answered by the time you read this, but for the time being they are of great interest.

THE QSL Bureaus—Part I

The September column covered some of the problems associated with getting the QSL cards to confirm your rare DX contacts. At that time the bureaus were mentioned but no details given as this is a lengthy subject in itself.

First of all, there are two kinds of bureaus to consider. These are the ARRL bureaus from which you will receive cards coming from DX stations and which we will consider this month, and the oversea's bureaus to which you can send cards and which will be considered next month. The ARRL bureaus are located in each of the U.S. and Canadian call areas, and all QSL cards sent via the bureau by overseas amateurs will ultimately come to the proper bureau. It is then an easy matter for the W/K or VE/VO amateur to obtain his cards simply by sending a self-addressed, stamped envelope to the bureau. Most bureaus prefer the standard 4½″ by 9½″ envelope, however, the W/K1, W/K4, and WA/WB4 bureaus prefer 5″ × 8″ manila envelope. Your call letters should be neatly printed in capital letters in the upper left hand corner and there should be adequate postage. Most active U.S. and Canadian DXers keep several envelopes on file at their bureaus at all times.

Following are the addresses of the ARRL bureaus. Next month we will have the addresses of the overseas bureaus.

Your Prefix	
W1, K1, WA1, WB1, & WN1	Providence Radio Ass'n., W1OP, Box 2903, Providence, Rhode Island 02908
W2, K2, WA2, WB2, & WN2	North Jersey DX Ass'n., P.O. Box 505, Ridgewood, New Jersey 07451
W3, K3, WA3, WB3, & WN3	Jesse Biebermann, W3KT, RD 1, Valley Hill Rd., Malvern, Pennsylvania 19355
W4, & K4	F.A.R.C., W4AM, P.O. Box 13, Chattanooga, Tennessee 37401
WA4, WB4, WN4	Richard Tesar, WA4WIP, 2666 Browning St., Sarasota, Florida 33577
W5, K5, WA5, WB5, WN5	Hurley O. Saxon, K5QVH, P.O. Box 9915, El Paso, Texas 79989
W6, K6, WA6, WB6, & WN6	San Diego DX Club, Box 6029, San Diego, California 92106
W7, K7, WA7, WB7, & WN7	Willamette Valley DX Club, Inc. P.O. Box 555, Portland, Oregon 97207
W8, K8, WA8, WB8, & WN8	Paul R. Hubbard, WA8CXY, 921 Market St., Zanesville, Ohio 43701
W9, K9, WA9, WB9, & WN9	Ray P. Birren, W9MSG, Box 519, Elmhurst, Illinois 60126
WØ, KØ, WAØ, WBØ, & WNØ	Alva A. Smith, WØDMA, 238 East Main St., Caledonia, Minnesota 55921
VE1, & 3C1	L.J. Fader, VE1FQ, P.O. Box 663, Halifax, N.S.
VE2, & 3C2	John Ravenscroft, VE2NV, 135 Thorncrest Ave., Dorval, Quebec
VE3, & 3C3	R.H. Buckley, VE3UW, 20 Almont Road, Downview, Ontario
VE4, 3C4	D.E. McVittie, VE4OX, 647 Academy Road, Winnipeg 9, Manitoba

Ludwit Weigele, DJ7DW, at the operating position. This OM racks up his prefixes via the c.w. mode. *(Photo courtesy DJ9NI).*

VE5, 3C5	Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Saskatchewan
VE6, 3C6	Karel Tettelaar, VE6AAV, Sub. P.O. 55, N. Edmonton, Alberta
VE7, 3C7	H.R. Hough, VE7HR, 1291 Simon Road, Victoria, British Columbia
VE8, 3C8	George T. Kondo, VE8 ARRL QSL Bureau of Department of Transport, Norman Wells, N.W.T.
VO1, 3B1	Ernest Ash, VO1AA, P.O. Box 6, St. John's, Newfoundland
VO2, 3B2	Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, Labrador
KH6, WH6	John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, Hawaii 96701
KL7, WL7	Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687
SWL	Leroy Waite, 39 Hanum St., Ballston Spa, New York 12020

This is the Honolulu QTH of famous all band DXer Katashi Nose, KH6IJ. Judging from his companion in the photo 160 Meters is the subject under discussion. *(Photo Courtesy W1BB).*

A Visitor In The Shack

I had an interesting visit this month from an old friend and former DXer who is just getting back into the DX end of the hobby. I refer to the gift-fruit king from Lake Placid, Florida, Bev Cavender, W4CKB, a former editor of the Florida DX Report. Bev has been 100% v.h.f. for the past 3 years working DX like W1 land on 2 meters. However, now settled in a fresh QTH and with a new 80 ft. tower up he decided to clamp on a 3-element tribander and see what the sunspots would bring in.

Bev was quite surprised by some of the changes on the DX bands. A lot of it he expected, but some of it was unforeseen. First of all, he was pleased by the ease with which he could work into VU and AP lands on 14 mc with his tribander. This kind of DX had been difficult if not impossible three years ago in the sunspot valley, even when using a Telrex monobander. However, in this case the explanation was simple, sunspot activity, so it wasn't really startling. The shocker though was the lack of QRM and competition on 20 meter c.w. when he called such rare stations as VU2DIA. Everyone seemed to be crowding on the s.s.b. frequencies leaving room to spare on the c.w. bands. Fifteen and 20 meter c.w. was surprisingly free while there was no competition at all between 28000 and 28500. A.m. had virtually ceased to exist on 20 meters and had lost the major part of its territory on 15. He was particularly impressed by the number of old acquaintances in South America who had shifted from a.m. and c.w. to s.s.b. and are now putting in strong, high quality signals via that mode. He reflected that the deluge of s.s.b. transceivers on the market had probably accelerated this trend. This is doubtless true.

Dick Baldwin, W1IKE, at the 4U1ITU mike.

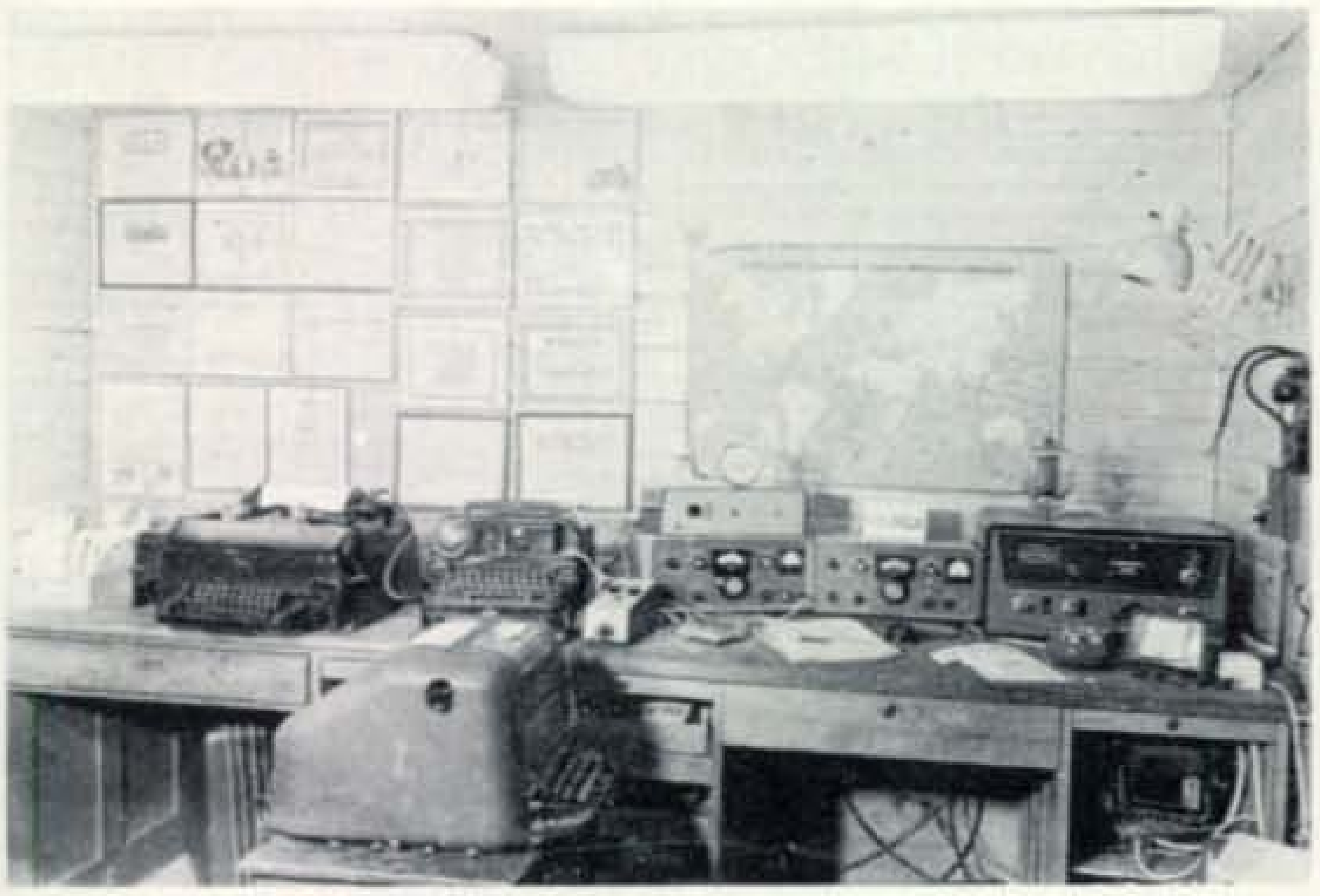
The real shock came though when he broke into a round table of young DXers discussing the latest rare stations on the band with particular emphasis on the exploits of Don Miller. He commented to them at some length on the fabulous Gus Browning, W4BPD, only to find his young audience almost completely uninformed on this subject. As far as they were concerned this Gus was a legendary character who conducted a tremendous DXpedition back in the dark ages, probably in conjunction with the Crusades. With a trembling Vox Bev enquired for their opinion of that founder of the modern DXpedition, Danny Weil, VP2VB/MM, only to find that "Where's Danny" had been changed to "Who's Danny." Fame fleeth like a shadow before the noonday sun, or are we getting old??

160 Meter DX News, de W1BB

1967/68 160 Meter DX Tests: The annual transatlantic "Top-band" tests will be held on Sunday mornings Dec. 3, 17, and 31; Jan. 14; and Feb. 4 and 18 between the hours of 0500 and 0730 GMT. Five minute calling and listening periods will be observed until QSOs result.

Due to popular demand the interesting *"First Timers Tests"* will be repeated. During these tests all old timers who have worked across the Atlantic on 160 will QRT to give the beginners and QRP boys a chance. This year a new idea will be tried, namely "Big Brother" stations. These will be old timers who remain on the air to help the first timers. Dates and tentative "Big Brothers" are as follows: Dec. 17, G3PQA and Eu/Africa first timers; Jan. 7, G6BQ with the Eu/Af boys; and Feb. 4 more of the same with G3SED helping. On Jan. 7 VO1FB will be on to assist the W/VE/VA first timers, with a repeat on March 4 by big brother W2EQS.

Remember, 0500-0730 GMT, and anyone desiring further information contact Stew, W1BB. Incidentally, Stew also hopes to organize a trans-Pacific test on 160 in the near future.



The operating position at DJ3GI. This station *always* has one of the best signals during the *CQ Worldwide DX Contests.*

From the Bulletins

Our thanks for the following gems go to the *DXers Magazine*, the *DX News-Sheet*, the *West Gulf DX Club Bulletin*, *DX'-Press*, the *Northeast DX Association Bulletin*, *DX-MB*, and the *Long Island DX Association Bulletin.*

AC4, Tibet—There are reports of activity by Chak, AC4NC, in Lhasa. The authenticity of this station has not been verified at press time. Try 21047 kc c.w. around 2130-2200 GMT.

AP, East Pakistan—Arif, AP2AR, is frequently heard around 14050 kc. c.w. between 1700 & 2000 GMT. Reports say that he is building a s.s.b. rig.

AP, West Pakistan—AP2NMK is active on both s.s.b. and c.w. Frequencies listed are 14046, 14109, and 14205. He has been heard between 1200 & 1300 GMT and from 1900-2100 GMT.

CEØ, Easter Island—CEØAE works 15 meter s.s.b., 21350 kc, between 1930 and 2030 GMT. The group is scheduled to be active until next July.

FB8, Crozet—FB8WW is reported around 14180 kc tuning 14230 at 1330 GMT.

FH8, Comoro—FH8CD operates transceive around 1300 GMT on 14205 kc s.s.b. He is not fluent in English and will QSY from pileups.

FL8, French Somoliland—FL8FP, 21300 kc at 2015 GMT.

FM7, Martinique—Three stations reported occasionally from this rare island are FM7WH, 14070 kc c.w. at 0930 GMT; FM7WN, 21225 kc a.m. at 1725 GMT; and FM7WO, 21041 kc c.w. at 2240 GMT.

KS4, Swan Island—Britt, KS4CE, skeds his XYL at 0030 GMT on 21420 kc. *After* the sked he will work those looking for him. QSL to his XYL K6QPG

KW6, Wake Island—KW6EJ is partial to 14225 kc s.s.b.

PYØ, St. Peter & Paul Rocks—A DXpedition to this *very* rare spot is scheduled for Dec. 4 with PYØSP on s.s.b. and PYØDX on c.w.

TGØ, Guatemala—The special callsign TGØAA will be used by Paul, W4YWX, and John, K4BAI, during the CQ WW C.W. DX Contest in November. Operation will be all bands 10—160 meters. QSL to W4YWX with SASE or IRC.

UD6, Azerbaijan—UD6CC can be worked on s.s.b. at 1230-1330 GMT transmitting on 14195 kc and tuning 14204 kc.

VK4, Willis—John, VK4HG, is on s.s.b., 14045 or 14200-210 kc, from 0900-1130 GMT. However, he is not active on Wed. or Sat., and he is due to leave Dec. 1 so best get him soon. QSL to the VK3 bureau.

VK9, Cocos-Keeling—VK9JI operates near 14100 kc s.s.b. QSL to DL9ST.

VP8, South Georgia—Dave, VP8IE, continues active on s.s.b. between 1000 and 1200 GMT. He has a quad up now and isn't hard to work.

VP8, South Orkneys—VP8JD prefers 14220 kc. a.m.

VQ9, Aldabra—VQ9JW is said to be QRV for the states on even dates, and for other countries on odd dates. His hours are 1700-2000 GMT and his frequencies are 14080 & 21080 c.w., and 14110, 14250, & 21400 s.s.b. He is willing to make skeds on 80 and 160 meters.

VU2, Andaman Islands—Hegge, VU2DIA, is now on 21 mc. Listen around 21030 kc from 0130-0230 GMT.

ZD9, Gough Island—ZD9BH is QRV from the weather station with low power. His 14 mc signals are very weak.

ZD9, Tristan de Cunha—ZD9BI has left, but ZD9BE will be QRV for another year.

ZK1, Raratonga Island—ZK1CI is to be there 3 years using 15-80 meters. QSLs at P.O. Box 103, Raratonga Is., South Pacific.

ZS2, Marion Island—ZS2MI is reported around 14180 kc a.m. from 1300-1400 GMT.

4S7, Ceylon—Nelson, 4S7NE, continues to be active around 14194 kc s.s.b. 1100-1200 GMT.

4Z4, Israel—4Z4AG is using the new prefix around 21075 kc at 1445 GMT.

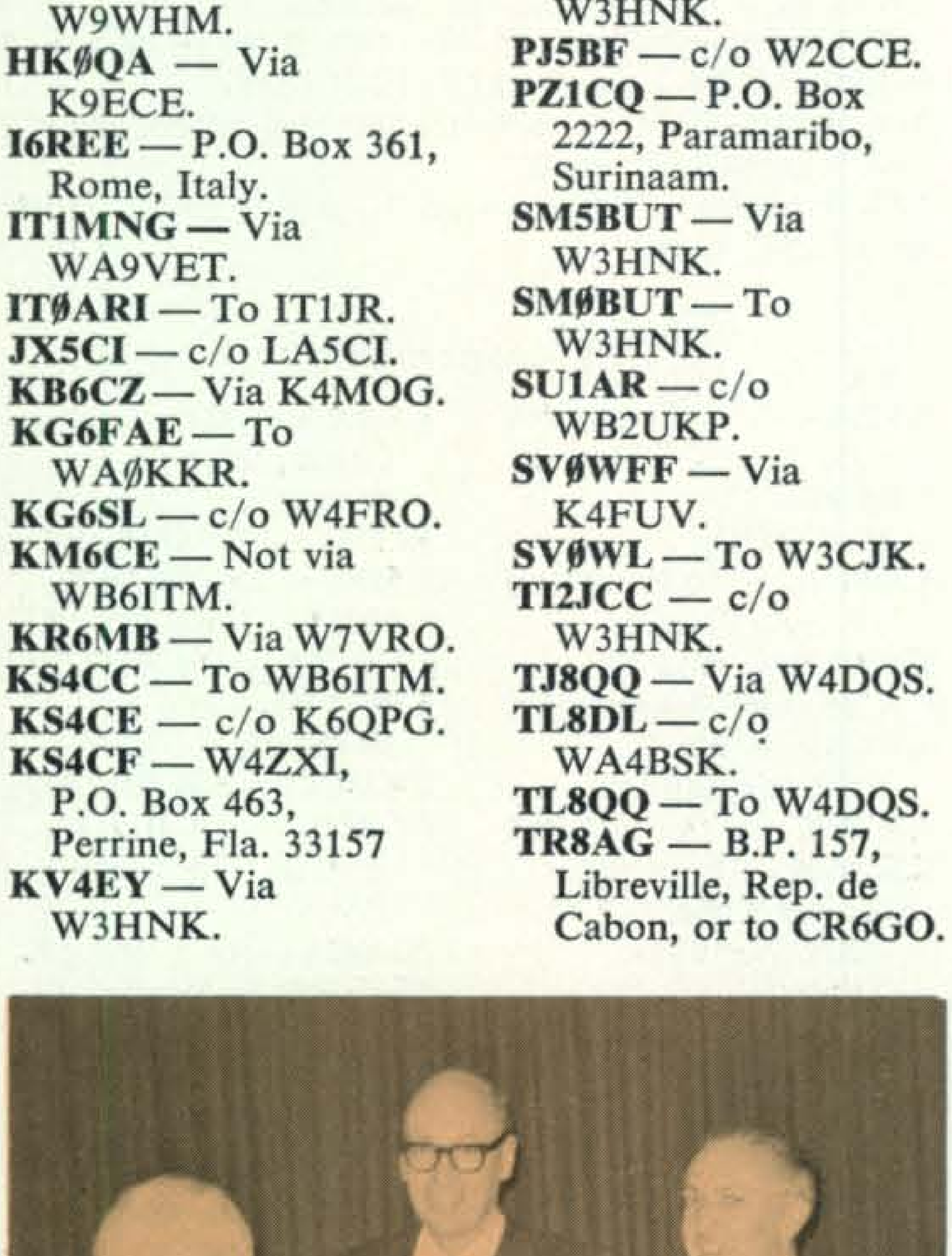
7P8, Lesotho—7P8AR is on 10 meter s.s.b., 28595 kc at 1545 GMT.

QSL Information

BV2A — Tim Chen, Box 101, Taipei, Formosa.
CEØAE — Via WA5PUQ.
CR5CA — To Apartado 47, Sao Thome.
CR6AD — Box 13, Caconda, Angola.
CR6BT — Box 7, Caconda, Angola.
CR7CE — c/o W4VPD.
CR8AH — Fernando Santos-Leite, S.P.M. 0225, Portugese Timor.
CX8AAW — Via K6QVI.
DL4FS — To CMR. Box 4488, APO, NY 09057 or via W8IMZ.
EA9AY — Canalejas 5, Ceuta, Spanish Morocco.
EI3SU — To G3KMI.
EIØBI — c/o EI2AW.
EP2KW — Via DL3NS.
ET3USA — To W7TDK.
FB8WW — c/o W4MYE.
FB8XX — Via FR7ZD.
FL8DY — To R.E.F., B.P. 26, Versailles, France.
FL8RA — c/o W2LJX.
FM7WO — Via WB2SSK.
FO8BU — Box 473, Papeete, Tahiti or to F5IG.

Ivo, CP5EZ, relaxing at the rig. This fellow has dished out many a first Bolivia contact to lucky W,K-land DXers.

FP8DD — To WB2RSW.
FY7YG — c/o W2CTN.
G2DHV/DL — Via G2DHV, 28 Longlands Road, Sidcup, Kent, England.
G2DHV/LX — To G2DHV.
GB2DSF — c/o G3WAO.
GD3AIM — Via L. S. Wright, 5 Elizabeth Rise, Castletown, Isle of Man.
GD3VBL — To W2GHK.
GD6UW — c/o W2GHK.
GW3DZJ — Via W3HNK.
HH3KJ — To W7VRO.
HKØAI — c/o W9WHM.
HKØQA — Via K9ECE.
I6REE — P.O. Box 361, Rome, Italy.
IT1MNG — Via WA9VET.
ITØARI — To IT1JR.
JX5CI — c/o LA5CI.
KB6CZ — Via K4MOG.
KG6FAE — To WAØKKR.
KG6SL — c/o W4FRO.
KM6CE — Not via WB6ITM.
KR6MB — Via W7VRO.
KS4CC — To WB6ITM.
KS4CE — c/o K6QPG.
KS4CF — W4ZXI, P.O. Box 463, Perrine, Fla. 33157
KV4EY — Via W3HNK.
KV4FA — To K3AHN.
KW6EJ — c/o W2CTN.
KW6EO — Via WA6AHF.
LX1DU — To F. Cronauer, Rue de Sanam, Ehlerange, Lux.
MP4MAX — c/o G3SYW.
MP4MAY — P.O. Box 35, Muscat.
MP4QAL — Mosan M. Ali, P.O. Box 56, Doha, Qatar.
OD5CN — Via K4ISV.
ON8IR/M — To G2DHV.
OY7S — c/o VE3FXR.
PA9DHV — Via G2DHV.
PAØCOE — To W3HNK.
PJ5BF — c/o W2CCE.
PZ1CQ — P.O. Box 2222, Paramaribo, Surinaam.
SM5BUT — Via W3HNK.
SMØBUT — To W3HNK.
SU1AR — c/o WB2UKP.
SVØWFF — Via K4FUV.
SVØWL — To W3CJK.
TI2JCC — c/o W3HNK.
TJ8QQ — Via W4DQS.
TL8DL — c/o WA4BSK.
TL8QQ — To W4DQS.
TR8AG — B.P. 157, Libreville, Rep. de Cabon, or to **CR6GO**.



Iris and Loyd Colvin, world's number one DX team, receiving the Virginia Century Club's DX Award for outstanding contributions to DX in 1966. That's Vic, W4KFC, Roanoke Division Director, making the presentation. *(Photo courtesy W4NJF).*

TT8QQ — Via W4DQS.
TY3ATB — To 5N2AAX.
UPOL 15 — c/o E. Krenkel, Box 88, Moscow, Russia.
VK2AVA/p — Via WA2RAU.
VK4HG — To VK3 Bureau.
VK6IZ — c/o WA9IBT.
VK8AV — Via K9JJR.
VK8OX — To G5UG.
VK9DJ — c/o Arkansas DX Association, P.O. Box 3323, Little Rock, Ark. 72207.
VK9OR — Via W2GHK.
VK9XI — To W2GHK.
VKØCR — c/o VK7ZKJ.
VP1MW — P.O. Box 554, Belize.
VP1PV — Via G3UML.
VP1TC — To WA4FGX.
VP6BW — c/o WA9IBT.
VP7NP — Via K9GZK.
VP8IE — To W2GHK.
VQ8CBB — c/o KØTCF, 423 Miriam Ave., Kirkwood, Mo. 63122.
VQ8CBR — To KØTCF.
VQ8CCR — To Box 14, Curepipe, Mauritius.
VR2DK — Via W2CTN.
VR3D — To K6UJW.
VR5RZ — c/o VK4RZ.
VS5MH — Via W1CGJ.
VS6FX — To W2CTN.
VS9AHN — c/o W. W. Cock, HQMEC, BFPO 69, London.
VS9MB — Via W2CTN.
VU2DIA — To B. S. Hedge, Port Blair, Andaman Islands, India.
VU2JA — c/o W2CTN.
WA6ZZD/KP6 — Via K6UJW.
XP1AA — To WA3BNT.
XT2A — c/o R.E.F., Box 70, Paris 12, France.
XW8AX — Via W6KTE.
XW8CE — To WA1FCF.
YA1KO — c/o W7WDM.
YN1GMR — Box 327, Managua, Nicaragua.
YV5CEY — Via W3HNK.
ZD7ZI — To F9OE.
ZD9BI — c/o GB2SM.
ZE4JS — Via W3HNK, or W2GHK.
ZF1CG — To VE4DQ.
ZK2AU — c/o WB6EKT.
ZL1AI — Via K6UJW.
ZP5JB — P.O. Box 512, Asuncion, Paraguay.
ZP5OX — P.O. Box 65, Asucion, Paraguay.
ZS6BEJ — To DL9PU.
3V8BZ — c/o DL7FT.
4W1G — Via HB9MQ.
4X4AS — To K21XP.
4X4CJ — PO Box 3159, Tel Aviv, Israel.
4X4RD — c/o W3HNK.
4X4UH — c/o W3HNK.
4X6SW — Via 4X4 bureau.
4X8TP — To VE3ACD.
5A1TY — c/o HB9ADP.
5A3TX — Via W3HNK.
5A5TR — To W3HNK.
5H3JL — P.O. Box 127, Singida, Tanzania.
5H3JR — c/o W2SNM.
5N2AAX — Box 3380, Lagos, Nigeria.
5W1AS — P.O. Box 498, Apia.
6O1GB — c/o U.S. Embassy, Mogadiscio, Somalia.
6W8DD — B. P. 190, Dakar, Senegal.
6W8DX — P.O. Box 347, Dakar, Senegal.
6Y5AH — Via W1BPM.
6Y5ET — To P.O. Box 254, Kingston 5, Jamaica.
6Y5JMA — c/o 6Y5RA.
6Y5RM — 10 Essex Avenue, Kingston 8, Jamaica.
7Q7EC — Via W5GIQ.
7Q7LZ — To G3LZZ.
8R1S — c/o W9JVF.
9G1BF — Via W3HQO.
9J2AB — c/o W6BAF.
9K2BY — P.O. Box 32, Kuwait.
9L1TL — Via G3USF.
9M8RY — Yong Loi, P.O. Box 22, Simanggang, Sarawak.
9Q5JR — c/o W1BPM.
9X5GG — Via W2GHK.
9X5SP — To Box 420, Kigali, Rwanda.
9Y4LA — c/o P.O. Box 216, Tobago.

73, John, K4IIF

THE awards PROGRAM

BY ED HOPPER,* W2GT

THE November "Story of The Month" on Joe, W2JWK, after this data on awards issued. Robert, K1CXP/W1BHV received his mixed endorsed USA-CA-2000 award and ALL A-1 endorsement for his USA-CA-1000 award. Mixed USA-CA-1000 awards went to John, KØIFL/W9KAU and Jack, W9CNG. Jack, W9CNG also received his mixed USA-CA-500 award. Jack, W1QXX received the 5th USA-CA-500 award endorsed ALL VHF. Arthur, K8SWW/WØJSW received a USA-CA-500 award endorsed ALL NOVICES, ALL 40 M and ALL A-1. Grafton, K3ARL received a USA-CA-500 award endorsed ALL A-1, as did Jan, SP8MJ and this was the 3rd award to an SP station. Mixed USA-CA-500 awards went to: Henry, WB2RMM; Clarence, K4EO; Ray, WA9AXL; Arnold, K9DCJ; William, W9VBV; Werner, DL6VP (#4 to a DL); and Gordon, ZL1HW (#4 to a ZL).

Joseph P. Skutnik, W2JWK

Joe is 56 years old and has a beautiful wife, Louise and a beautiful young daughter, Monica.

He became interested in radio back in 1928, when a prep school chum introduced him to a one tube regenerative blooper. This started him in radio in earnest, and as the depression that followed, in 1929, forestalled any possibility of going to college, he pursued his radio enthusiasm into the electronics field via the home study route. He worked in the electronic field until about 1963, when he joined the U. S. Civil Service.

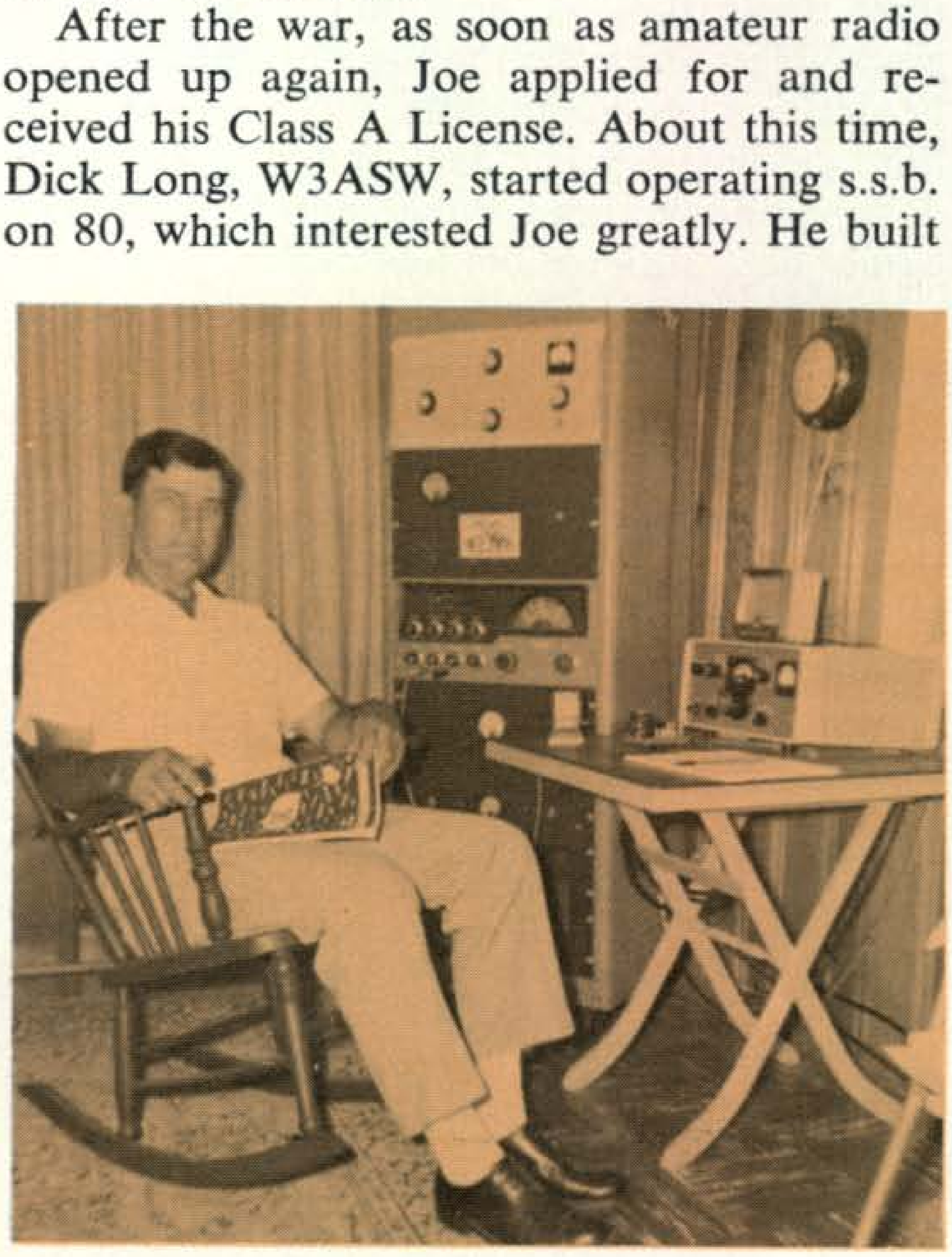
A ham license was obtained in May of 1936 and Joe subsequently became a "Sparky" when he joined the Naval Communications Reserve in September 1939. In 1943 he was discharged from active duty on special orders and went to work for the Western Electric Co. and "Ma" Bell until the end of the war.

After the war, as soon as amateur radio opened up again, Joe applied for and received his Class A License. About this time, Dick Long, W3ASW, started operating s.s.b. on 80, which interested Joe greatly. He built

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

USA-CA HONOR ROLL

2000	500	
K1CXP/ W1BHV .. 36	WA9AXL ...624	DL6VP 629
1000	ZL1HW 625	W9CNG 630
KØIFL/ W9KAU ..116	K4EO 626	W1QXX 631
W9CNG 117	K9DCJ 627	WB2RMM ..632
	W9VBV 628	K3ARL 633
		SP8MJ 634
		K8SWW/ WØJSW ..635



Joe, W2JWK, at the rig.

a couple of phasing exciters with mediocre success and with the advent of the old 10-A and 20-A Central exciters, Joe started and stayed with s.s.b. exclusively—with one brief exception. The c.w. bug hit him in 1962 and that was when Joe made DXCC twice over on c.w. almost exclusively.

C.w. was deserted for s.s.b. from the day Joe joined the County Hunters in October 1964, and County Hunting has been his entire hamming interest since that time. His interest has been so great that it has at times been difficult to relinquish the time for more necessary purposes.

As W2JWK started a little late to participate in the extensive activities of the CH Net on 7223 kc, he is somewhat behind a couple of dozen famous County Hunters. None the less, by acting frequently as net control when the net was still quite active, he managed to work over 2200 counties on 7223 kc alone. The balance of his some 2875 counties came on 80 and 20 meters. States completed number 26, and 40 counties are needed east of the Mississippi, the balance of needed counties are in Texas and points west.

Joe believes that the outstanding characteristic of the county hunting group is their dedication to the County Award Program. He thinks the mobile stations are particularly singular in this respect and that they deserve a great deal of credit for their dedication—without them, hunting counties would be an impossible job.

Joe also attributes his fair success (he is modest) to the mobileers and he has had the pleasure of meeting many of them, as well as two of the Top County Award winners, K8CIR, WØMCX and their XYLs and a bunch of the Top Twenty-Five County Hunters and he is still looking forward to meeting more of them. Joe also enjoys corresponding with many of them—such is this CH game.

Louise (Joe's beautiful wife) cares not a whit about ham radio (*nor does my Helenmae, Ed.*) but when it comes to county hunting, she displays an understandable tolerance. Quite often it becomes an imposition on her, but she seems to overlook this quaintness of county hunters and their so-called "hunting". Perhaps she believes the saying—"A man in the hand is better than a man in the bush"—Hi . .(Or was it about a bird in the hand?).

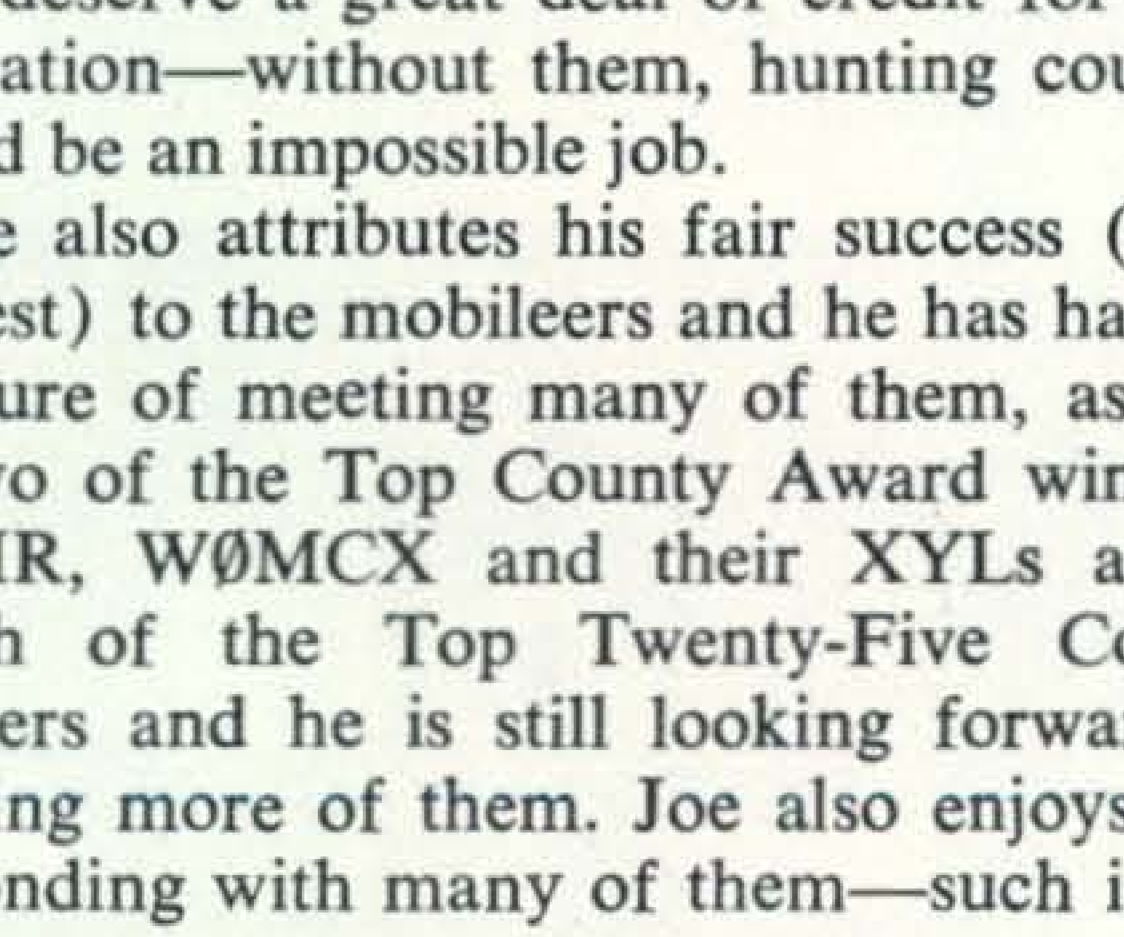
The rig at W2JWK is a Hallicrafters HT-32 driving a B & W LPA-1 linear with 2 813s in GG and a Mosley TA-33 tri-bander beam up 30 feet.

Joe lives in onion growing country, in Orange county, N.Y., where there are thousands of acres of very rich black soil, known as muck. For years, much of his spare time was spent in cultivating onions on a commercial scale, but this has been discontinued. Although Joe was brought up on a farm, much of his youth was spent in the Scranton, Pa. coal field area.

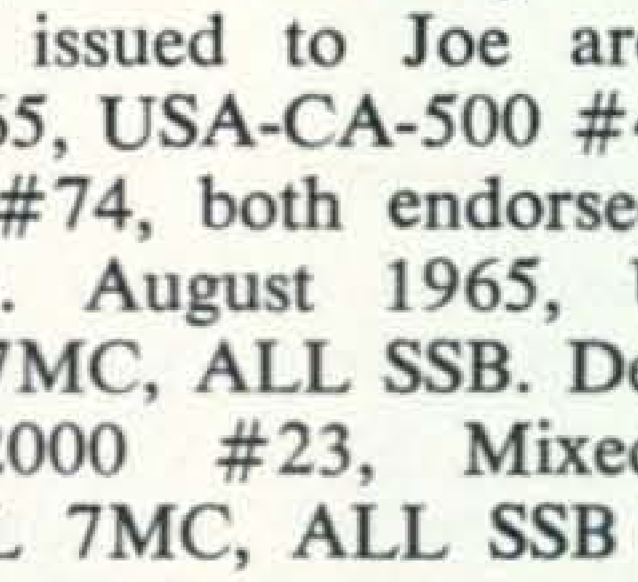
Joe is now a rural mail carrier with a 66 mile scenic country route. This requires a 5 to 6 hour daily trip but it does afford him some extra time to county hunt.

Somewhere along the line in the early fifties Joe acquired a Commercial Phone ticket but never made or had much of an opportunity to put it to its fullest use. Now he is taking life a little easier and enjoying every moment of it and looking forward to completing that last county.

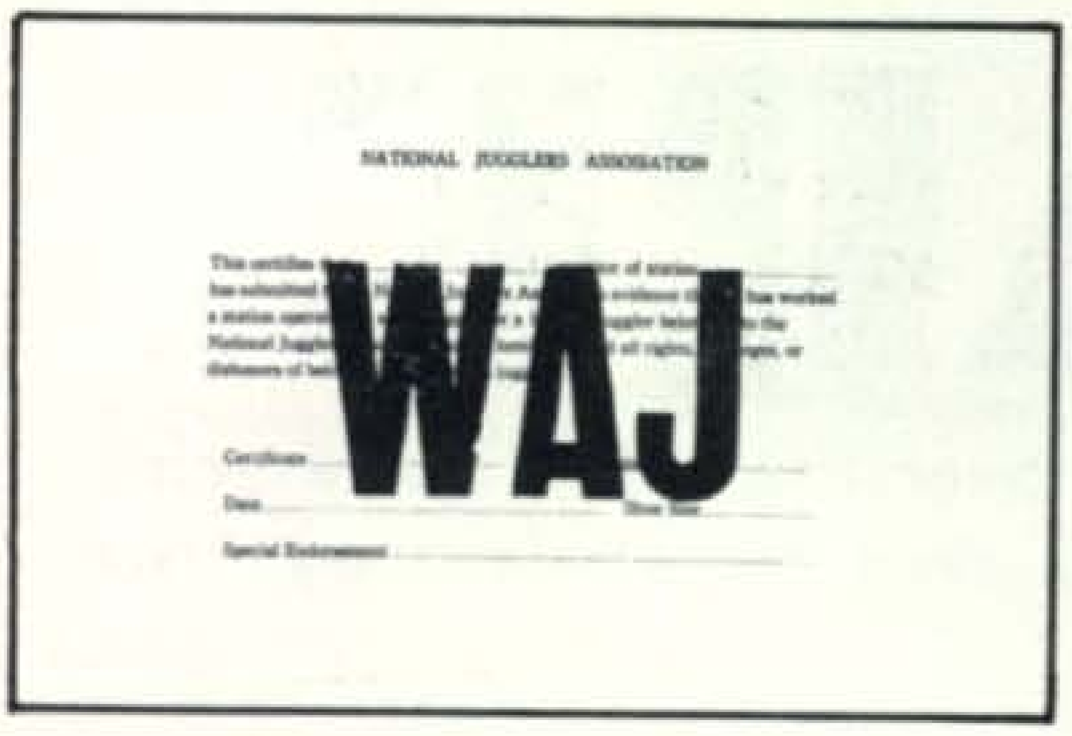
Awards issued to Joe are as follows: March 1965, USA-CA-500 #472 and USA-CA-1000 #74, both endorsed ALL 7MC, ALL SSB. August 1965, USA-CA-1500 #38, All 7MC, ALL SSB. December 1965, USA-CA-2000 #23, Mixed. November 1966, ALL 7MC, ALL SSB for his USA-CA-2000 award and USA-CA-2500 #18, Mixed. A record to be proud and happy with, and not forgetting some 2875 counties confirmed.



The Wall Award



Artics Award



WAJ Certificate

Trillium Award

Awards

Amateur Radio Mule Skinners Award—As described and shown in August 1967 *CQ*, has a new address for their custodian, YES, after 17 years at the Sharon, Mass. address, a move has been made—so write Phyllis Hoffman, K1QFD, 274 Ten Rod Road, North Kingstown, Rhode Island 02852.

Trillium Award: The Ontario Trilliums YL Amateur Radio Club—Canada's First Ladies Amateur Radio Club—offer this certificate to amateurs and SWLs. Requirements: Work club members, any place. One point for working each member and 2 points for working club station VE3TOT. W/VE need 6 points; DX need 3 points; and members need 12 points. Band/Mode endorsements. Seal endorsements for each additional:—6 (W/VE); 3 (DX); and 12 (members) points. Cost is $1.00 or (for DX only) 10 IRCs or equivalent in foreign stamps or currency; s.a.s.e. only for endorsements. Send list of calls, TOT # and full log data with fee to: Mrs. Marion Course, VE3CLP, Oxford Road, R.R.#1, Welland, Ontario, Canada. Have list certified by 2 fellow amateurs or officer of National Radio Club or Association, and QSLs must be in your possession (GCR rules). Members are: VE1AAV, AKO, AKR, AML, AMS, AQI, MY, TK, YX. VE2KO, HI. VE3, AJR, ASZ, AYL, AYV, BBO, BII, BKA, BKC, BVD, CBS, CEL, CLP, CLT, DGG, DTH, DXZ, ENJ, EUV, EVA, EZI, FCM, FIX, FRN, FUR, FXM, FZY, GJH, GNG, GNO, IB, ONW, PH. VE4ST, VE6ATH, ADP. VE7ADR, BTC. VE8HH. WA8OYO, WA9MHU and G2YL. To help award hunters obtain this award, a one week contest will be held by the Trilliums, turn to CONTEST CALENDAR for details. In case you did not know (I did not), a trillium is a beautiful flower, as shown on the award.

The A.R.T.I.C.S. Award: Offered by the Artics Radio Club of Upper Darby, Pa. (*A*mateur *R*adio *T*echnical *I*nter-*C*ounty *S*ociety) for confirmed contacts with ten club members. They will soon offer two new awards, *one* for checking into 5 Artics 10 meter nets and *one* for checking into 10 Artics 6 meter nets. For QSOs for any of these 3 awards, look for members on their nets—10 meter on alternate Fridays at 10:00 P.M. on 29.360 mc and 6 meter on alternate Sundays at 9:00 P.M. on 50.400 mc. Send all data and an s.a.s.e. to Lawrence Vaksman, WA3FDC, 5855 Drexel Road, Philadelphia, Pa. 19131. Members are: W3BS, CRO, PWG, ZBN. K3FYC, FYV, NYT, OMP, PMP, QLY, RSX, RTR, TPO, UQV, UVA, UZO, VGR, WAK, WVB, YMG, ZUQ. WA3BWF, BXE, DMZ, FDC, FMA, FME, FQA, GGA, GTL, HDJ.

WAJ: This *W*orked *A J*uggler award was dreamed up by a couple of members of the Artics, and will be issued for working one or more members of the National Jugglers Association. Larry, WA3FDC is the president of the N.J.A. He won the juggling marathon last year by juggling four balls for 12 hours straight and received lots of publicity in newspapers and on television. The award has helped to publicize and bring new friends to N.J.A. Active members at the moment are WA3CKG, WA3FDC and WA3FMA. Send an s.a.s.e. and QSL to the one you work.

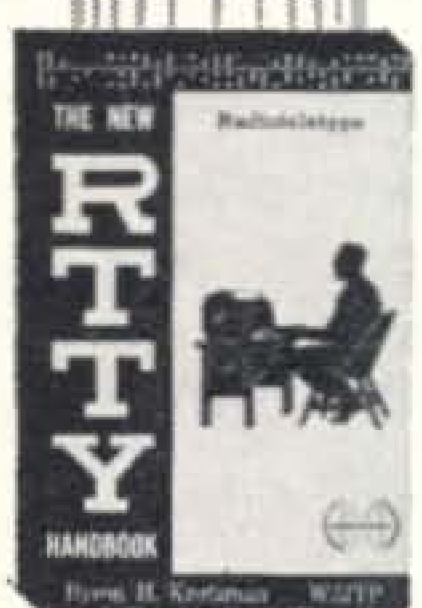
The Worked All Lafayette Louisiana Award: This clever award (WALL) is really issued on wallpaper by the Lafayette Amateur Radio Club of Lafayette, Louisiana, for working *five* Lafayette, Louisiana amateur radio operators. To receive this award, submit a neatly written or typed page showing complete log information about each con-

[*Continued on page 116*]

CQ BOOK MART

ANTENNA ROUNDUP Vol. II

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 longwires to 17 element beams and Sterba Curtain arrays.



THE NEW RTTY HANDBOOK

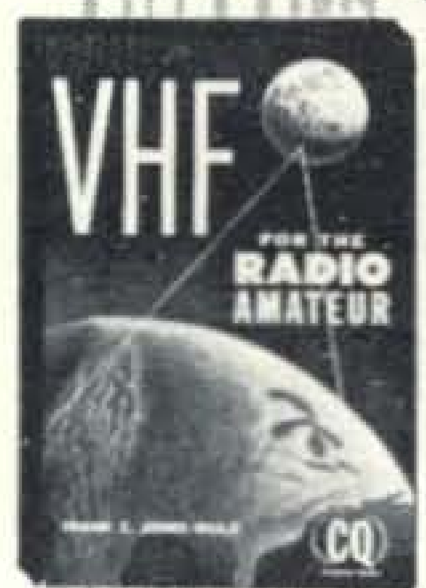
Cat. #116. A treasury of vital and "hard to get" information. Loaded with equipment schematics, adjustment procedures, etc. A valuable asset to both the beginning and the experienced RTTY'er. Special section on getting started, written by Byron Kretzman, a well known authority in the field.

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.



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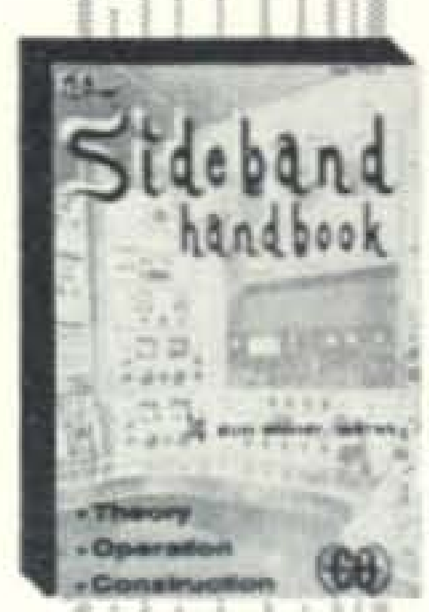

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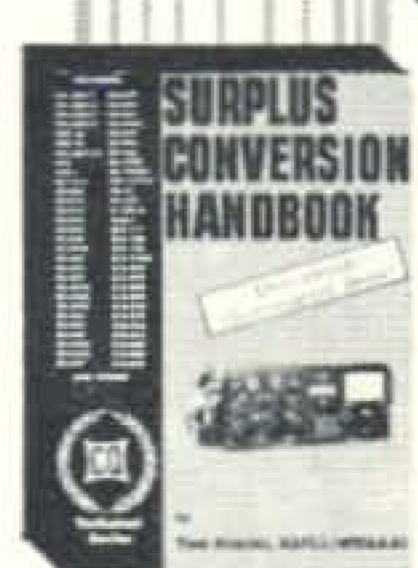

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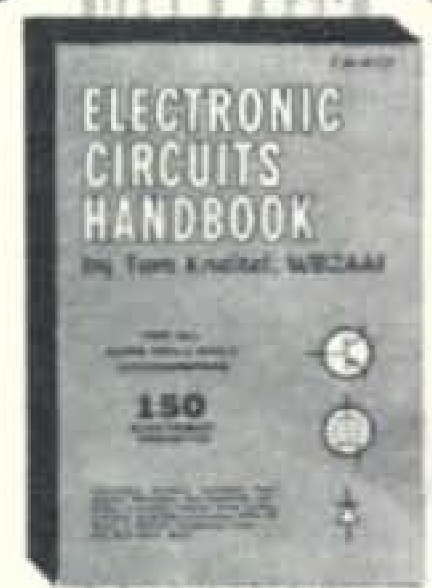
Cat. #122. Contains 192 pages of conversion articles including the famous Command Set's plus a whole slew of the most popular military surplus gear including such gems as: SCR-522, ART-13, BC603, BC659, ARC 1, ARC 3, etc. Actually, it covers almost every piece of surplus gear worth the effort to convert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



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Propagation

BY GEORGE JACOBS,* W3ASK

THE c.w. section of the 1967 *CQ* World Wide DX Contest will take place during the weekend of November 25-26. Last month's column contained special DX Propagation Charts for use during the c.w. section. If you plan to participate in the Contest be sure to check the predictions and other propagation data appearing in last month's column, they may be useful to you in piling up points. For a day-to-day forecast of propagation "weather" expected during November, including the contest period, see the "Last Minute Forecast" appearing at the beginning of this column.

During November, good 10 meter openings are forecast to most areas of the world during the daylight hours. Good-to-excellent 15 meter openings are also expected from shortly after sunrise through the early evening hours. Good openings are predicted for 20 meters almost around-the-clock, with conditions peaking during the sunrise period and during the late afternoon and evening hours.

Improved conditions are also forecast for the lower frequency bands. Forty meters should begin to open for Dx during the late afternoon and early evening hours, and remain open to one area of the world or another through the hours of darkness and the sunrise period. During the hours of darkness, signals may often reach very strong levels on this band. Fairly good DX propagation conditions are also expected on 80 meters during the hours of darkness, with some openings also possible on 160 meters during the same period.

The stronger signal levels which should be noticeable on all h.f. bands during November will result from a considerable seasonal decrease in static levels and solar absorption expected during the month.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for Nov.

Days	*Forecast Rating & Quality* (4)	(3)	(2)	(1)
Above Normal: **1, 5, 20, 27-28**	A	A-B	B	B-C
Normal: **2-4, 6, 10-13, 17-19, 21-22, 25-26, 29-30**	A-B	B	C	D
Below Normal: **7, 9, 14, 16, 23-24**	B-C	C-D	D	E
Disturbed: **8, 15**	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 parentheses 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 with 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 Dec. 31, 1967. 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.

Short Skip Charts

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

Example 1: What is the best *time* to work between New York City and Denver on 15 meters?

a. Determine the great circle distance between both points from a map or globe. In this case, the distance is approximately 1600 miles.

b. Enter the Short-Skip Chart at the line marked "15", under the Band (Meter) heading. Go to the right until you intersect the "1300-2300 Miles" column. The highest quality rating (the numbers between 1 and 4 shown in parenthesis after the time of opening) indicates the time that signals will be strongest and most reliable. In this case, the highest rating is a (4), between 11 and 16 local standard time at the path midpoint.

c. New York City is in the Eastern Time Zone and Denver is in the Mountain Zone. The mid-point of the path falls in the Central Zone, and the time found in "b" should be expressed in CST. The time period 11-16 CST corresponds to 12 Noon to 5 P.M. in N.Y.C., or 10 A.M. to 3 P.M. in Denver. Arranging a schedule any time within this period should result in an excellent 15 meter QSO between N.Y.C. and Denver.

Example 2: What is the best *band* to use on a schedule between Seattle and Los Angeles, at 4 P.M. Seattle time?

a. The great circle distance between both points is found to be 1,100 miles.

b. Seattle is in the Pacific Standard Time Zone, and so is Los Angeles. The mid-point of the path will also fall in the Pacific Zone. Times in the Chart are given in the 24-hour system, and 4 P.M. corresponds to 16. No further time correction is required.

c. Enter the Chart under the column marked "750-1300 Miles". Check the quality ratings for each band at 16 hours. Since the distance between both points is closer to 1300 miles than 750 miles, the second of the two quality figures appearing in the parenthesis will apply.

d. At 16 hours a quality figure of (1) is found for 10 meters; (2) for 15 meters; (4) for 20 meters; (2) for 40 meters; (1) for 80 meters and (0) for 160 meters. Twenty meters is, therefore, the best band between Seattle and Los Angeles at 4 P.M. PST.

Sunspot Cycle

The Zurich Solar Observatory reports a monthly mean sunspot number of 99 for August, 1967. This results in a running smoothed sunspot number of 76 centered on February, 1967. A smoothed sunspot number of 98 is forecast for November, as the sunspot cycle continues to climb towards a maximum. This is approximately the same level of solar activity that last occurred during the fall of 1960, and the level is about 30 numbers higher than last fall.

V.h.f. Ionospheric Openings

The *Leonids* meteor shower is expected to take place during the middle of November. The rise in the number of meteors entering the earth's atmosphere during this period should produce some meteor-type ionospheric openings in the v.h.f. bands.

Solar activity has now reached the point where there is a *slight* possibility that some F-layer openings may take place on 6 meters across the continent, or perhaps between the East Coast and Hawaii. Some F-layer openings may also be possible between the USA and Latin America. The best time to check for 6 meter openings is from just before noon, through the early afternoon hours.

Some auroral-type v.h.f. ionospheric openings are likely to occur during the month, especially when ionospheric conditions on the h.f. bands are below normal or disturbed. Check the "Last Minute Forecast" at the beginning of this column for the days that are most likely to be in these categories during November.

CQ Short-Skip Propagation Chart

NOVEMBER - DECEMBER, 1967

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*	*Nil*	07-09 (0-1) 09-11 (0-2) 11-15 (0-3) 15-16 (0-2) 16-18 (0-1)	07-08 (1) 08-09 (1-2) 09-11 (2-3) 11-15 (3-4) 15-16 (2-3) 16-17 (1-3) 17-18 (1-2) 18-20 (0-1)
15	*Nil*	08-10 (0-1) 10-16 (0-2) 16-18 (0-1)	07-08 (0-1) 08-09 (1-2) 09-10 (1-3 10-11 (2-3) 11-16 (2-4) 16-18 (1-2) 18-20 (0-1)	07-08 (1) 08-09 (2) 09-11 (3) 11-16 (4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)
20	09-11 (0-1) 11-15 (1-2) 15-17 (0-1)	07-09 (0-2) 09-11 (1-3) 11-15 (2-4) 15-17 (1-4) 17-18 (0-3) 18-20 (0-2) 20-07 (0-1)	07-09 (2-3) 09-11 (3-4) 11-17 (4) 17-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-07 (1)	07-09 (3) 09-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (3) 20-21 (2-3) 21-22 (2) 22-00 (1-2) 00-06 (1) 06-07 (1-2)

[*Continued on page 119*]

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For further information, check number 31, on page 126

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

November	1-2	YLRL Anniv. Phone Party
November	11-12	OK C.W. DX Contest
November	11-12	R.S.G.B. 7 mc C.W.
November	11-13	ARRL SS Phone
November	18-20	ARRL SS C.W.
November	15-22	Trillium Memorial Week
November	18-19	VU2/4S7 Phone Contest
November	**25-26**	**CQ WW DX C.W.**
December	2-3	VU2/4S7 C.W. Contest
December	2-3	Alexander Volta RTTY Contest
December	9-10	9Q5 DX Contest
December	15-17	West Virginia QSO Party

YLRL Anniversary Phone Party

Starts: 1700 GMT Wednesday, November 1
Ends: 2300 GMT Thursday, November 2

This is a middle of the week party strictly for the gals. The c.w. section has already taken place. Rules in last month's issue.

Logs go to Marte Wessel, KØEPE, P.O. Box 756, Liberal, Kansas 67901

R.S.G.B. 7 mc C.W. Contest

Starts: 1800 GMT Saturday, November 11
Ends: 1800 GMT Sunday, November 12

A good opportunity to try out your 40 meter antenna. Rules in last month's CALENDAR.

Mailing deadline November 27th. Logs go to: R.S.G.B. Contests Committee, 28 Little Russell St., London WC1, England.

OK International DX Contest

Starts: 0000 GMT Sunday, November 12
Ends: 2400 GMT Sunday, November 12

This is an international contest so don't confine your operation to working Czech's only.

1. Use all bands, 1.8 thru 28 mc, c.w. only. The same station may be worked once per band.

2. There are three categories. Single operator, single band and all band. Multi-operator, all band only. (Club stations are considered multi-operator).

3. Exchange is five figures, RST plus two figures indicating the number of years the operator has been active in amateur radio. (ie: active since 1937, 57930) Multi stations will give years station has been licensed.

4. Each completed contact counts 1 point, but 3 points if it's with a Czech station.

5. The multiplier is determined by the number of prefixes worked on each band. (WPX list)

6. Final score, total QSO points multiplied by sum of prefixes from each band.

7. Use a separate log sheet for each band and show in this order: Date/time in GMT, station worked, number sent/received, QSO points and prefix. (First time worked only)

8. Include a summary sheet showing the scoring and other pertinent information. Your name and address in BLOCK LETTERS, and a signed declaration that all rules have been observed.

9. Certificates will be awarded to the highest scoring station in each division in each country.

10. Contest contacts may be applied for the "100 OK Award" (working 100 Czech stations, and also the "S6S Award" (Working all continents) with endorsement for individual bands. A written application must be submitted with your log.

11. Logs go to: The Central Radio Club, Post Box 69, Prague 1, Czechoslovakia. Mailing deadline is December 31st.

ARRL Sweepstakes

Phone: Nov. 11-13 C.W.: Nov. 18-20
Starts: 2100 GMT Saturday. Ends: 0300 GMT Monday in each instance.

If you're an SS fan, no explanation is necessary. Briefly, the message exchange will consist of the QSO number, two figures indicating the year first licensed, section and month and day (not year) of your birth. The November QST will have all the details.

Requests for free log sheets and the

* 14 Sherwood Road, Stamford, Conn. 06905.

finished product go to: ARRL Communication Department, 225 Main Street, Newington, Conn. 06111.

Trillium Memorial Week

Starts: 1800 GMT Wednesday, November 15
Ends: 1800 GMT Wednesday, November 22

This memorial week of activity has been organized by the Trillium YL Amateur Radio Club in memory of a great "ham" Albert T. Jensen.

The object of the contest is to see how many TOT members can be worked. At present there are 55 members, all located in Canada, except G2YL, WA8OYO, and WA9MHU.

Exchange: Signal report, name and QTH. (members will include their club number)

Scoring: Phone contacts 1 point c.w. 2 points. There is a power multiplier of 1.25 for stations running 150 watts (300 PEP) or under. There is no other multiplier.

Frequencies: 3650, 3900, 7100, 7220, 14050, 14260, 21100, 21400, 28600.

Logs must show: date/time in GMT, RS/RST, band, mode, TOT number, name and QTH. Figure out your score and include your name and address in BLOCK LETTERS.

A beautiful Plaque donated by Dot and Jack Abel will be presented to the highest scoring non-member. Name and call will be engraved on the Trophy and it will be displayed at many Amateur Radio Events.

There is also a Trillium Award, see W2GT's USA-CA COLUMN for details.

Mailing deadline is December 31st. Logs go to: Chris Weeks, VE1AKO, R.R. #2, Lower Sackville, Nova Scotia, Canada.

VU2/4S7 DX Contest

Phone: Nov. 18-19 C.W.: Dec. 2-3

Starts: 0600 GMT Saturday. Ends: 0600 GMT Sunday in each instance.

This is the 4th annual contest held by the VU2 and 4S7 boys. You will note that this year's dates have been moved to avoid serious conflict with other major events.

This is an international contest, use all bands and you may work the same station once per band.

Exchange: The conventional five and six figures, RS/RST plus a progressive three figure number starting with 001.

Scoring: 1 point per QSO, 2 points if it's with a VU2/4S7 station. No multiplier was indicated so it's assumed the final score is the number of QSO points from each band.

Awards: Certificates to the top scorer on each band and on all bands, in each country and each call area in W/K, JA, SM, UA, VK and ZL. Minimum contacts required to be determined by conditions and activity.

There is also a s.w.l. section with the scoring same as above. Only logging of VU2/4S7 stations will be counted.

A summary sheet showing the scoring and your name and address in BLOCK LETTERS is also requested.

Mailing deadline is December 31st. Logs go to: Glen V. Wickremaratne, 4S7GV, 150/5 Kandy Road, Kurunegala, Ceylon.

9Q5 DX Contest

Starts: 0100 GMT Saturday, December 9
Ends: 2200 GMT Sunday, December 10

The 9Q5 boys have organized this contest to stir up some activity in the Congo.

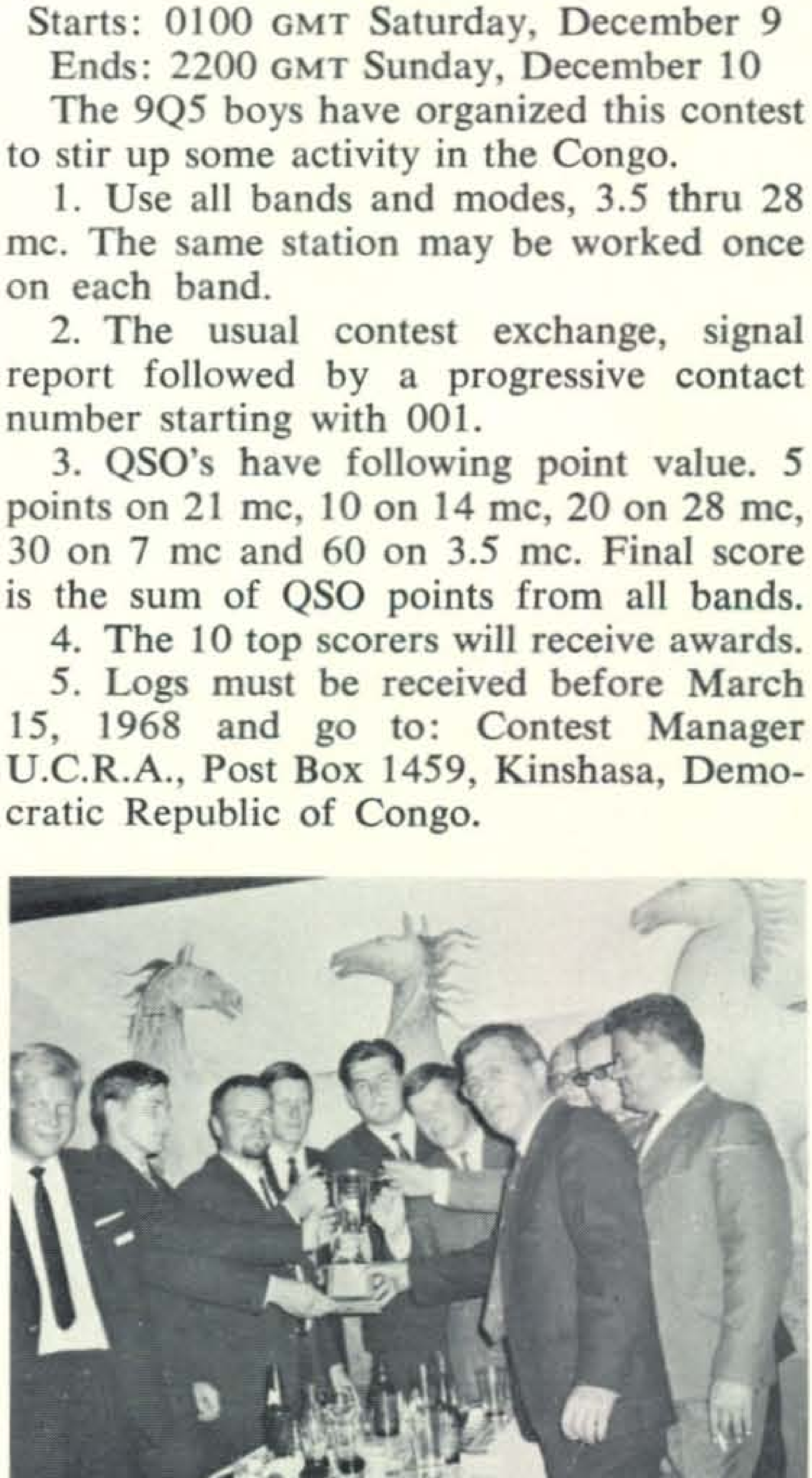
1. Use all bands and modes, 3.5 thru 28 mc. The same station may be worked once on each band.

2. The usual contest exchange, signal report followed by a progressive contact number starting with 001.

3. QSO's have following point value. 5 points on 21 mc, 10 on 14 mc, 20 on 28 mc, 30 on 7 mc and 60 on 3.5 mc. Final score is the sum of QSO points from all bands.

4. The 10 top scorers will receive awards.

5. Logs must be received before March 15, 1968 and go to: Contest Manager U.C.R.A., Post Box 1459, Kinshasa, Democratic Republic of Congo.



Here is our representative Charlie Weir, W3FYS presenting the K2GL Trophy to the boys of OH2AM, the OH-DX Ring. of Helsinki, Finland. L. to R.—OH2BBR, OH2BC, OH2SB (Pres. of the O-DX Ring.) OH2BS, OH2BH, OH2QV, W3FYS, OH2BBM, OH2BCZ and OH2KH.

The cup was filled with cognac and the members of the OH2AM team had to drink it dry. Here's Charlie making sure it's empty, with Rick, Olavi and Osmo making sure he does not leave a drop. (Or are they amazed at Charlie's capacity. Hi!)

Alexander Volta RTTY DX Contest

Starts: 1400 GMT Saturday, December 2
Ends: 2000 GMT Sunday, December 3

This contest, the third annual organized by the SSB/RTTY Club of Como, Italy, is devoted to increase the interest of radio amateurs in RTTY, and in memory of Alexander Volta, the Italian electrical wizard.

Bands: All bands, 3.5 thru 28 mc.

Exchange: QSO number, RST, time in GMT, Zone number and country.

Points: (a) 2 points per contact with stations in one's own zone. (b) Contacts with stations in other zones, points as stated in the Exchange Point Table. The same station may be worked once per band.

Multiplier: A multiplier of 1 for each country contacted on each band. (One's own country does not count as multiplier.) The ARRL country will be used, with KH6, KL7 and VO considered as countries.

Scoring: Total exchange points times the total multiplier from all bands.

Awards: Certificates to the two top scorers in each country and U.S. call area. Also the three top scorers using power input of under 100 watts.

Use a separate log sheet for each band. Official log forms and Exchange Points Table can be obtained from the SSB & RTTY Club, P.O. Box 144, Como, Italy. Mailing deadline for logs is December 24, 1967.

[*Continued on page 115*]

CORRESPONDENT zone

YOUR zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	2	14	10	13	16	18	22	20	25	30	36	37	39	21	22	19	20	17	11	25
2	14	2	15	8	7	16	16	12	16	23	24	30	30	12	14	16	19	20	19	19
3	10	15	2	8	11	9	13	14	18	21	28	28	30	26	28	27	29	27	21	32
4	13	8	8	2	3	8	10	8	12	18	22	25	27	19	21	23	26	26	22	26
5	16	7	11	3	2	9	9	6	10	17	20	24	25	18	20	22	26	26	24	35
6	18	16	9	8	9	2	4	7	10	12	19	19	21	27	29	31	34	33	29	34
7	22	16	13	10	9	4	2	4	6	8	15	15	17	26	29	31	35	36	33	33
8	20	12	14	8	6	7	4	2	5	11	15	18	19	22	24	27	31	32	30	29
9	25	16	18	12	10	10	6	5	2	8	10	14	15	23	25	29	33	35	34	29
10	30	23	21	18	17	12	8	11	8	2	9	7	9	31	33	37	41	43	41	36
11	36	24	28	22	20	19	15	15	10	9	2	9	7	26	28	33	36	41	43	30
12	37	30	28	25	24	19	15	18	14	7	9	2	3	35	37	41	45	49	48	39
13	39	30	30	27	25	21	17	19	15	9	7	3	2	33	35	40	43	48	49	37
14	21	12	26	19	18	27	26	22	23	31	26	35	33	2	3	6	10	14	18	7
15	22	14	28	21	20	29	29	24	25	33	28	37	35	3	2	5	9	13	18	6
16	19	16	17	23	22	31	31	27	29	37	33	41	40	6	5	2	4	8	13	6
17	20	19	29	26	26	34	35	31	33	41	36	45	43	10	9	4	2	5	12	7
18	17	20	27	26	26	33	36	32	35	43	41	49	48	14	13	8	5	2	7	12
19	11	19	21	22	24	29	33	30	34	41	43	48	49	18	18	13	12	7	2	18
20	25	19	32	26	35	34	33	29	29	26	30	39	37	7	6	6	7	12	18	2
21	29	25	37	33	32	40	40	35	35	42	34	42	39	14	11	10	8	12	19	6
22	29	31	39	37	38	47	46	42	43	51	42	49	46	21	18	15	12	12	16	14
23	22	26	32	32	33	40	42	38	41	49	45	53	50	19	17	12	8	6	10	14
24	22	30	31	34	35	40	44	42	45	52	51	58	56	25	23	18	14	11	10	20
25	16	28	24	30	31	33	38	37	41	45	52	50	53	27	27	22	19	14	9	26
26	28	35	37	40	41	46	50	47	50	50	49	52	50	27	25	21	17	15	16	21
27	25	35	33	38	40	42	46	46	50	52	55	52	52	30	29	24	20	16	15	26
28	31	40	40	44	45	49	53	51	55	54	49	48	46	32	30	26	22	20	20	25
29	39	50	43	52	54	47	49	54	52	44	42	37	37	42	39	36	32	30	30	34
30	35	50	35	44	46	38	40	44	45	37	41	33	34	49	47	42	38	45	32	43
31	14	25	11	20	22	17	22	24	28	28	37	32	35	34	36	33	32	29	21	39
32	36	47	32	40	41	32	34	38	38	31	35	27	29	55	54	49	45	40	36	49
33	25	14	29	21	19	28	26	21	21	28	22	31	29	5	5	10	14	18	23	8
34	29	21	35	28	27	36	34	30	30	36	29	37	34	10	7	9	10	15	21	3
35	34	21	35	26	24	30	26	23	20	24	15	34	21	15	15	20	22	27	33	15
36	39	28	42	33	31	37	33	30	27	29	20	27	24	19	18	21	22	28	34	16
37	40	33	48	40	38	44	40	38	35	38	28	33	30	21	19	21	20	24	30	15
38	47	36	50	41	39	43	38	36	32	31	23	27	24	26	25	27	27	31	38	22
39	44	37	52	44	42	48	44	41	38	38	29	33	30	26	24	25	23	27	33	20
40	15	5	20	14	13	22	22	18	21	29	27	34	34	6	8	9	12	14	16	12

YOUR zone	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
1	29	29	22	22	16	28	25	31	39	35	14	36	25	29	34	39	40	47	44
2	25	31	26	30	28	35	35	40	50	50	25	47	14	21	21	28	33	36	37
3	37	39	32	31	24	37	33	40	43	35	11	32	29	35	35	42	48	50	52
4	33	37	32	34	30	40	38	44	52	44	20	40	21	28	26	33	40	41	44
5	32	38	33	35	31	41	40	45	54	46	22	41	19	27	24	31	38	39	42
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9	35	43	41	45	41	50	50	55	52	45	28	38	21	30	23	27	35	32	38
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24	17	10	6	2	8	6	6	10	20	24	26	30	28	22	35	33	25	32	25
25	24	18	13	8	2	13	9	15	23	30	18	27	32	28	41	40	33	40	33
26	16	7	8	6	13	2	6	5	16	22	31	29	29	21	33	29	21	27	20
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28	20	11	14	10	15	5	7	2	10	17	31	24	34	25	36	30	22	26	19
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32	43	35	37	30	27	29	25	24	32	7	22	2	57	48	47	42	38	34	33
33	14	22	22	28	32	29	34	34	42	51	39	57	2	9	10	14	18	22	23
34	6	14	16	22	28	21	27	25	33	42	42	48	9	2	13	12	12	18	16
35	13	26	29	35	41	33	40	36	39	47	46	47	10	13	2	7	15	15	19
36	16	22	26	33	40	29	35	30	31	40	53	42	14	12	7	2	8	8	11
37	11	15	21	25	33	21	27	22	24	33	52	38	18	12	15	8	2	7	5
38	19	22	28	32	40	27	32	26	24	32	56	34	22	18	15	8	7	2	6
39	15	16	22	25	33	20	26	19	20	29	51	33	23	16	19	11	5	6	2
40	19	24	20	25	25	29	30	34	44	48	28	50	10	16	20	24	28	32	32

Exchange Point Table for the Alexander Volta RTTY DX Contest.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

I had a recent letter from an amateur in Alaska, where equipment prices are quite high, and where surplus electronics from several military bases is an important addition to the amateur radio supply system. My correspondent had a Stelma TDA-1 oscilloscope. He wanted information on converting it to use as a modulation monitor or general-purpose 'scope for use around the shack. I think his ideas were basically good, but they indicate one of the problems of the surplus hound: what is the *best* thing to do with your goodie, now that you have paid $1.98 for something Uncle Sam bought for $10,000 once upon a time?

To convert the TDA 'scope, which is designed as a "telegraph distortion analyzer," to use as a general-purpose 'scope is about comparable to rebuilding a bulldozer for use as a passenger car. It can be done, but shouldn't.

Of course when you see the TDA (fig. 1) it does look like a fairly straightforward 'scope, and without any more to go on, using it that way looks like a good bet. But if you peek at the schematic of the TDA you will see that it is an awfully simple 'scope, with none of the features that are found on even a $25 instrument in most surplus stores. It is designed to indicate distortion on teleprinter loops, with a top frequency of around 50 cycles a second. Beyond the low audio range the response will be awful, and the circuit would have to be rebuilt extensively to make it at all useful.

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

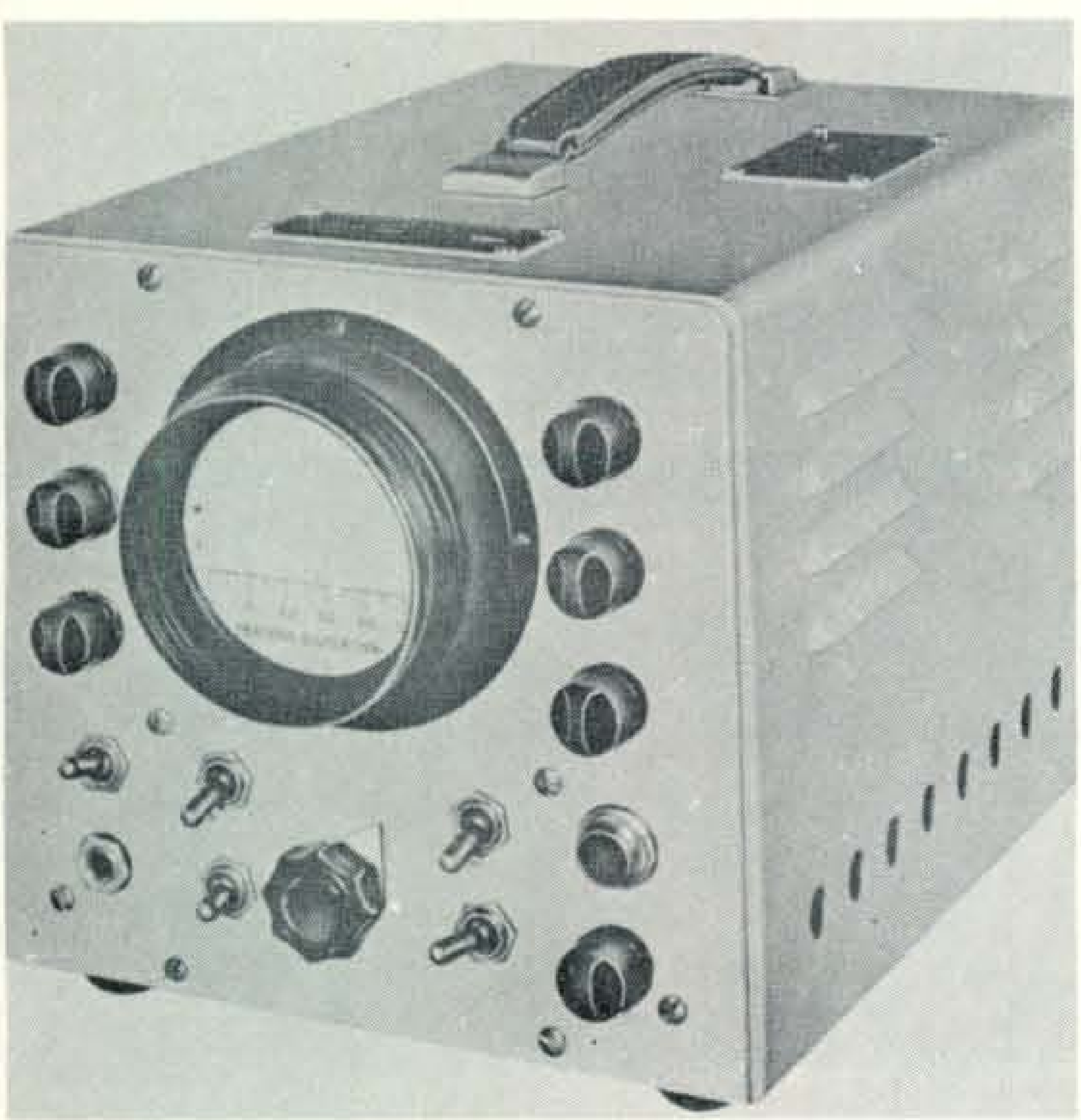


Fig. 1—TDA, RTTY distortion monitor built by the Stelma Corporation.

On the other hand, the TDA makes a pretty good distortion monitor for RTTY. It normally comes with provision for watching 60, 75 or 100 word per minute transmission, so will be useful for those 100-speed M.A.R.S. circuits that are now being used for Viet Nam traffic, as well as the more common amateur 60 w.p.m. standard.

Unlike a normal 'scope, the Stelma TDA-1 or 2 gives a pattern that stands still on the cathode ray tube so that the stop-start, 7.42 unit RTTY signal may be effectively analyzed. On your normal oscilloscope the pattern will drift because the stop pulse is longer in most cases than the other six units.

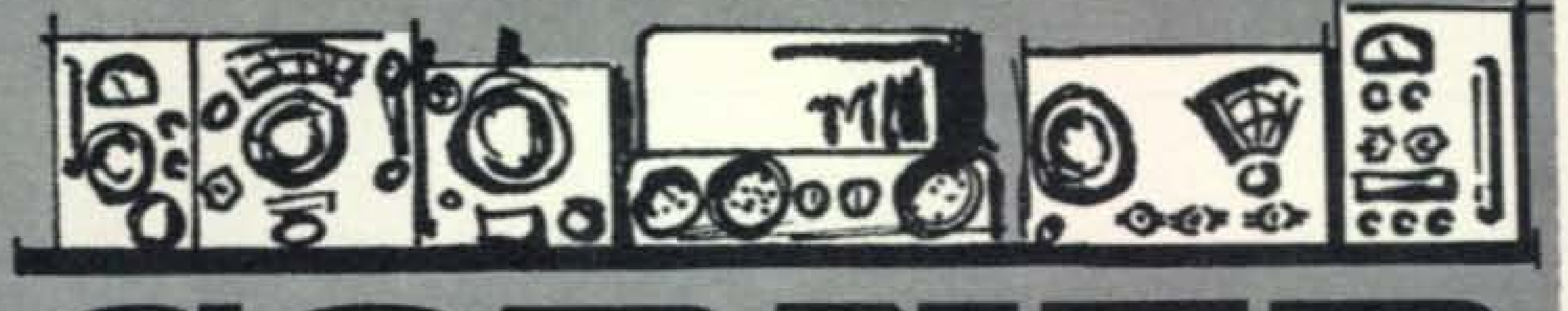
The CRT display will enable even an untrained operator to determine marking or spacing bias and distortion with an accuracy of plus or minus 2 percent. (fig. 2-B) Distortion of up to 50 percent may be displayed on the three-inch TDA oscilloscope and read directly from the scale engraved on the CRT lens.

Input may be 20 or 60 ma neutral or 30 ma polar. Impedence will be, respectively, 300, 100 or 300 ohms. The input circuit is grounded only through a .05 microfarad capacitor (C_{20}), thus isolating the dc loop from the monitor chassis.

In order to present a clear, stationary pattern, the sawtooth wave-form across C_{14} is maintained by a clamp tube V_{4B} (see fig. 3) which applies the proper voltage to C_{14} during the stop mark cycle. During the operating cycle of tube V_5, potentials are such that diode V_{4B} is not conducting and the sawtooth sweep voltage is not hampered in wave shape.

Figure 2A and 2C show what you see when distortion appears. A dirty transmitter-distributor segment puts a "hole" in the number three pulse when it should be a solid mark. The hole of course looks like a space, and if it is long enough, and falls in the selecting period of your printer, you will

SURPLUS CORNER



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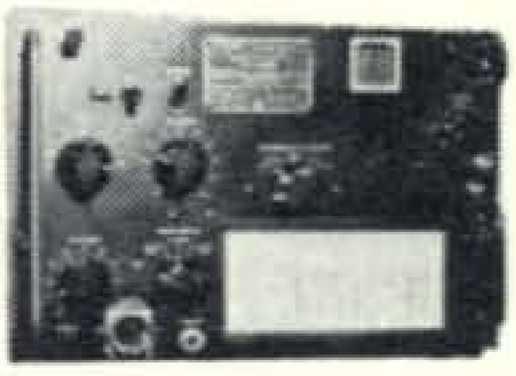

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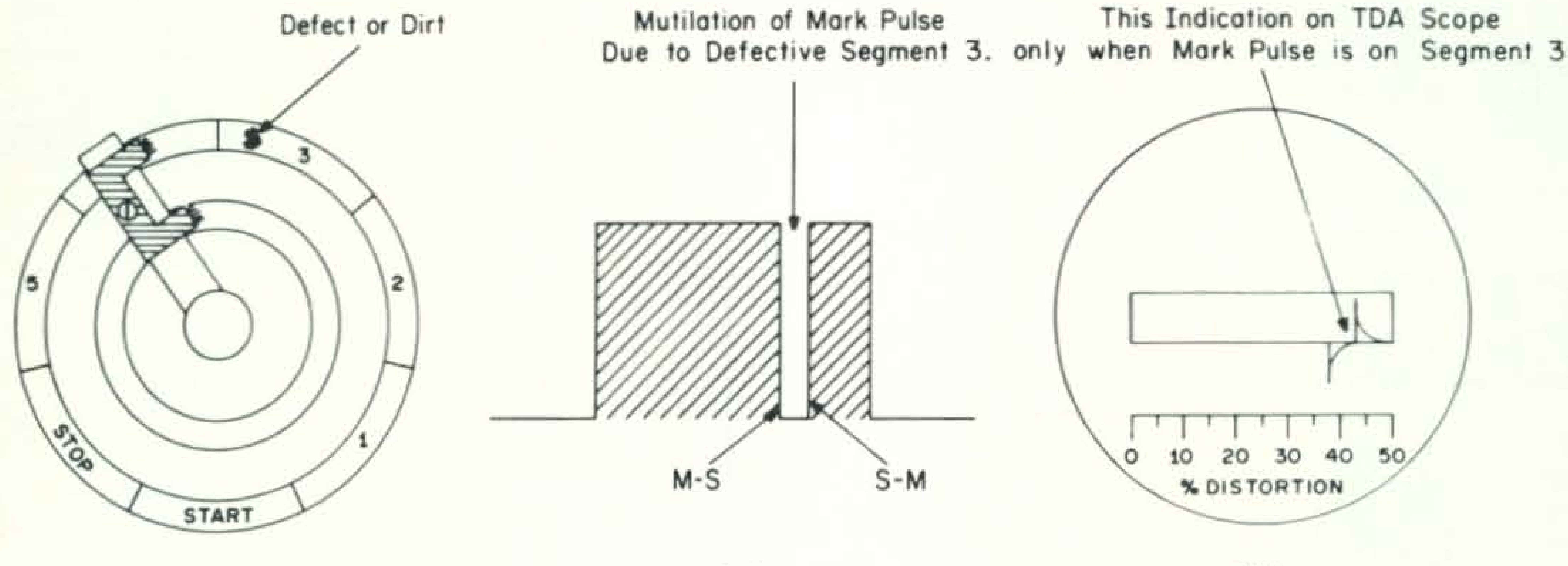

Fig. 2-A model 14 transmitter-distributor with defective #3 segment. B—mutilated #3 pulse caused by dirt or other segment fault. C—TDA-2 'scope pattern showing defective #3 pulse.

get the start of a proper mark, a spurious space and a spurious mark, none of them of standard length, with disastrous results on your RTTY copy. Not only will the intended "mark" be obliterated, but the attempt to squeeze nine pulses into a 7.42 code will probably throw the receiving equipment out of synchronism for several sequences.

The TDA will however show a "pip" fig. 2-C) in the number 3 pulse (when it is marking, as in the letter "M") and substitution of various components will readily identify the source of the trouble. A straight repetition of a pip will almost always be a distributor fault, but distortion may derive from transmitter or converter circuits which can be shown on the TDA display and tracked down quickly.

The twelve-tube TDA is a specialized instrument, but one with a ready application in amateur radio, or among the growing numbers of RTTY s.w.l's. Don't destroy its usefulness in RTTY to make it over into a so-so oscilloscope. This is one that the non RTTY man might better swap off than convert. To the green-key crowd, the TDA should be worth a goodie or two in trade.

Though these have not been common until recently, Selectronics, 1006 S. Napa Street, Philadelphia, Pennsylvania, has a stock of the TDA-2 units at $49.95 plus shipping for 40 pounds, and they are turning up in other surplus outlets as the tube equipment is replaced by tranesistorized gear in military terminals.

I was a guest last summer at a convention of the Armed Forces Communications and Electronics Association (AFCEA) which looks to a surplus hound like the source of all good things. Some of the jewels on display seem to be products of those factories I have always suspected were built just to make "war surplus" and much of the state-of-the-art material on display will be tomorrow's surplus bargains.

The AFCEA publication *Signal*, might be of interest to some of this column's readers, who must have an interest in the more advanced communications gear. *Signal* costs $7 a year and its offices are located at 1725 I Street, N.W., Washington, D.C. I find the *Signal* convention program quite useful as a catalog of the more exotic military communications items, like the AN/PRQ-4 (V), a man-carried transponder used to locate patrols in the Viet Nam jungles, or the AN/ACQ-3 data terminal, the AN/ARC-138, a solid-state 225-400 mc airborne transceiver, or the AN/PRC-66, a hand-carried transceiver in the same military frequency band.

The AFCEA show indicated the speed with which integrated circuits are taking over military communications, with such items as the GPR-20, a 55-260 mc receiver by Defense Electronics Inc., "cheap" at $1,250, and the AN/GRR-17, National's replacement for the widely-used R-390-A/URR general-coverage receiver. Using I.C's the GRR-17 is rated much more stable under military conditions than the R-390-A, a lot lighter, and draws less power of course. The Squires-Sanders AN/URR-58 is another entry in the 10 kc—30 mc general-coverage field, with a revolutionary front end design enabling weak-signal reception to a 1 micro-

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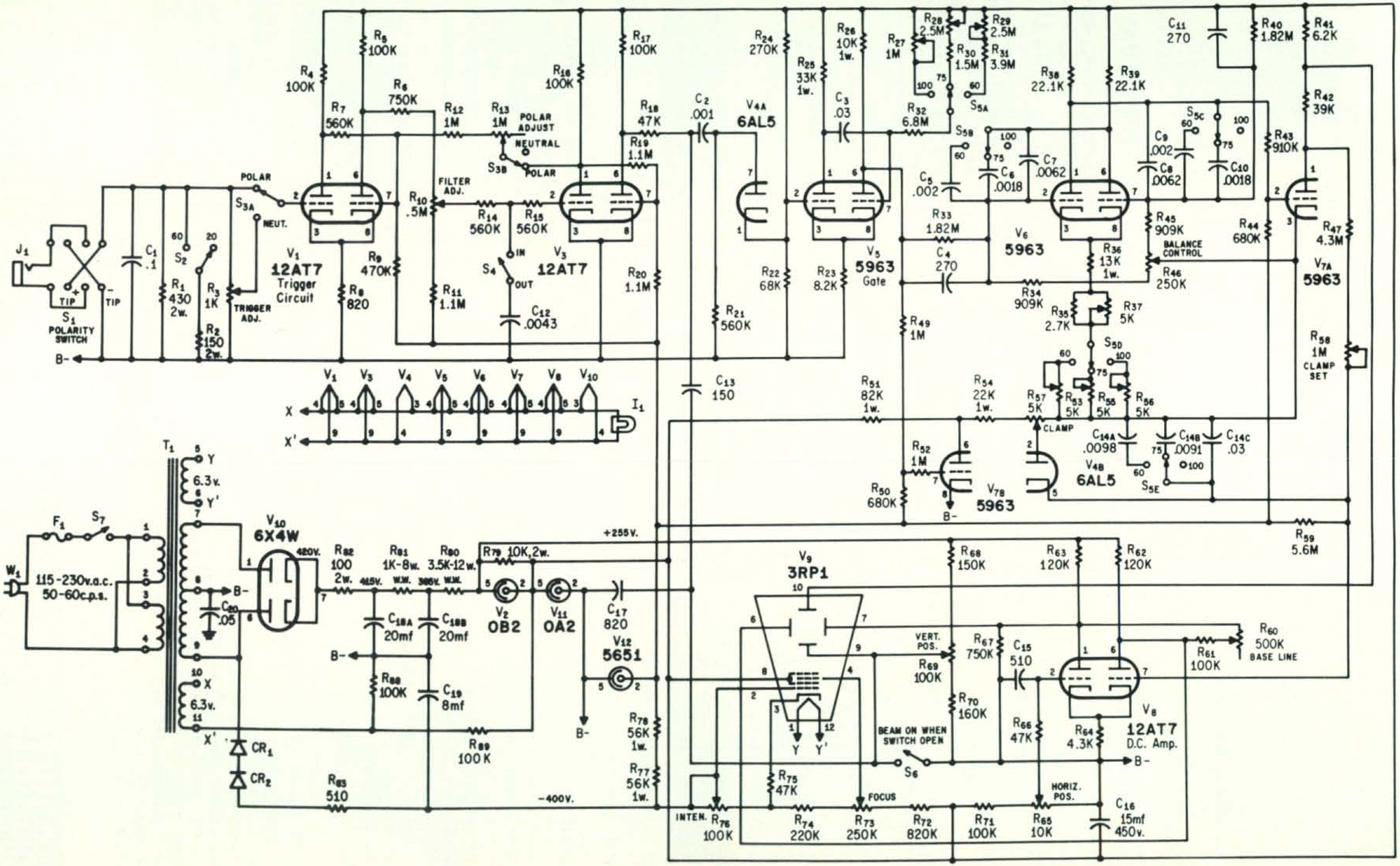


Fig. 3—schematic of TDA-2 RTTY monitor.

For further information, check number 48, on page 126

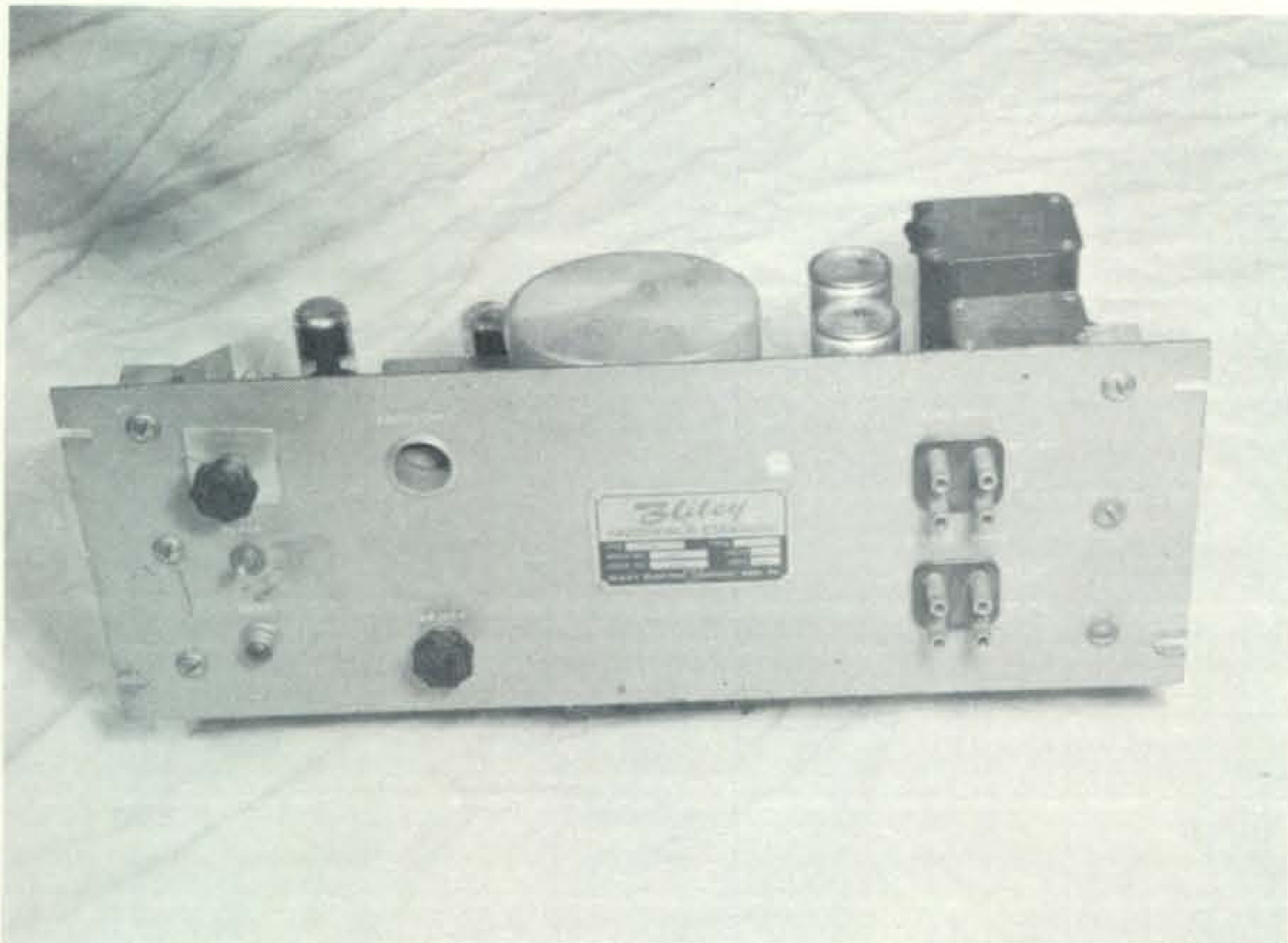


Fig. 4—Bliley BCS-1A high-stability 100 kc frequency standard, a rack-mounted unit with temperature-controlled crystal oven.

volt sensitivity with protection against nearby interference to a degree not heretofore attainable.

I want to mention here an older, but still highly-desireable item that I have seen in surplus in the Washington area, the Bliley BCS-1A frequency standard, (Fig. 4).

The BCS-1A is a rack-mounted oscillator consisting of a highly-stable, GT cut 100 kc crystal in a temperature-controlled oven, with high-quality amplifier circuits providing both sine and square-wave ouputs. Though it is designed for possible portable operation, the standard is of course most stable when mounted permanently in a solid rack with stable ac power supplied, and never turned off. It is rated by the manufacturer as capable of stability of one part in five million over a 24 hour period or two parts per million over thirty days with line voltage fluctuations of plus or minus 10 percent.

The crystal is mounted in a vacuum-sealed can and kept at a temperature of 20 degrees C. Thermostat switches include an accurate mercury unit plus a backup mechanical thermostat. Circuits include automatic gain control to regulate the amplitude of oscillation. Output from the oscillator passes through a buffer amplifier to provide isolation from the load.

For units found in surplus, calibration of the oscillator against WWV is necessary after the unit has had 24 hours to stabilize. The adjustment is a screw-slotted shaft found under a snap-cover on the front panel. The oscillator output should be monitored on a receiver and slowly brought to zero-beat with WWV via the adjustment point. It may be necessary to readjust the unit periodically as the crystal ages, depending upon the frequency stability you require.

Oven operation should be watched and if the oven pilot light does not cycle after warmup every three minutes or so, the mercury thermostat should be checked. The backup mechanical thermostat will prevent dangerous overheating and give reasonable temperature stability, indicated by slight dimming of the oven pilot as the mechanical system cycles.

The usual fault in the mercury thermostat is separation of the mercury column due to rough handling. It may be possible to reunite the mercury by *carefully* heating or cooling the mercury tube to draw the liquid either up or down until it makes a continuous column. The thermostat is readily accessible through the top of the oven under the metal cover.

Finally, I want to mention an amateur, Van, W2DLT, 302 Passaic Avenue, Stirling, New Jersey, 07980, who deals in surplus material at reasonable prices. Van issues an occasional price list, but one of his leading items is the 88 millihenry toroid used by the RTTY crowd for audio filter construction. ■

Powder Puff Derby [*from page 79*]

WA6ISY, Myrtle, was delighted to take Ruth on a shopping tour for items not available at home.)

After the first designated stop, Martinsburg, W. Va., many planes were forced by thunderstorms to land at undesignated stops in the mountains and to remain overnight, resulting in disqualification of a dozen entries. Weather continued to plague the racers and some withdrew at Amarillo, Texas when they could not hope to make the deadline of 5 P.M. PDT July 13. TAR #55 crash landed 30 miles short of Cincinnati because of fuel exhaustion while evading thunderstorms, with both the pilot and co-pilot being injured. All of these incidents, of course, added to the traffic on the net. Of the 71 entries, 52 crews qualified by terminus deadline at Torrace, Calif.

The daughters of Ellie, K4RHL, Elaine Loening and Katharine Gahagan, again took part in the race, placing 11th over-all.

At Albuquerque members of the Albuq. Radio Club set up the Bernalillo Co. Civil Defense gear in the offices of Cutter Flying Service at the Sunport, only to blow the net dry run by being literally miles off frequency. Chairman Irene, K5WZA, then set up her own gear, a Drake T-4X with R-4 receiver, at the airport. WA5's NHF, PVS and QIO strung the 40/80 meter antenna over Cutter's hanger. Others taking part in net operations were K3UYA/5, K5FXN, WA5POJ, K5JGV, K5PNI, and K5ECP, Helen, and W5YSJ, Jennie. On most days Irene was on duty from sun-up to sun-down.

Irene, K5WZA (right), chairman for the AWTAR net at Albuquerque, and Jennie, W5YSJ, keeping log.

Members of the Los Angeles YLRC at the W6MWO set-up in the Plush Horse Inn at Redondo Beach. l. to r.; front: WA6ISY, Myrtle; WB6AST, Isabel; WA6OET, Jessie; and WA6WFZ, Susan. Standing: W6VDP, Mary; W6GDH, Lou; W6QGX, Harryette; and W6CEE, Vada. To work as chairman of the net Myrtle took a week's vacation from Hughes Aircraft, where she has worked for 15 years as an experimental lab technician. She also has held her ham license for 15 years, is retiring president of the L.A. YLRC, and has been active in RACES. OM Tom also works for Hughes Aircraft, is a 30-yr. ham and vice director for Southwest Division.

At Flagstaff the Cocnino Co. ARC (7 licensed generals), elected K7UHN, Dorothy, chairman. She and her OM K7ZZG set up a Swan 350 with Hustler Model 4 BTV at the airport tower, with the help of WA7FUO, only to find they blocked out all the radio equipment run by the FAA! A low-pass filter soon corrected this. When the race finally got under way on Monday the other 4 club members who were to help had to return to work so Dorothy and Al just lived at the airport throughout the race, from 6 A.M. to 7 or 8 P.M., with relief only when their son Bob, K7ZZH, gave them a lunch break. Dot adds it was mighty cold at Flagstaff (7,000 ft. elevation) at 6 A.M.!

Dorothy says they enjoyed working in the net and that all the people at the airport were "wonderful" to them. A couple of added thrills were when she met the Governor of Arizona who was at the airport to meet some officials from Germany and became interested in the net operation. Another was when a KC4 broke in on net one A.M. Dot hopes Flagstaff is chosen for another Derby and, if so, says they'll be out there helping as much as they can!

At the terminus of the race, Torrance, Calif., Esther, WA6UBU, and Lyle, K6IPJ, set up their trailer, complete with gear for 40 and 2 meters, next to the operations trailer of the 99's at the airport. Co-chairmen for the terminus, Myrtle, WA6ISY, and OM Tom, W6PIF, set up their station in a room of the presidential suite at Plush Horse Inn, headquarters for the terminus activities at Redondo Beach about 5 miles from Torrance.

The net was so busy it took two YLs to operate while one logged, and Myrtle was on 2 meters passing information to Esther at the airport. It also kept one person busy just answering questions at the hotel. They had lots of calls as to where certain fliers were to stay over-night. When the two girls crash landed it was reported to W6MWO by W7GI and the race people had the news before the press or radio had it. Two mornings Myrtle and Tom got up at 3 o'clock to get the station going, but finally decided to stay at the hotel.

Members of the Los Angeles YLRC (W6MWO) turned out in force to help. Included were K6ANG, Billie; W6PJU, Mildred; WB6CGA, Evelyn; WA6OET, Jessie; W6GDH, Lou; WB6DFN, Roberta, and W6VDP, Mary. Several took time off from work to operate, including W6QGX, Harryette, and daughter Susan, WA6WFZ, both pilots also. (Harryette was a contestant last year.) Other working gals were scheduled, but because of the delay didn't get to operate: K6BUS, Midge; K6ELO, Roxanna; WA6LJF, Harriet; W6CEE, Vada; WA6LWE, Madge; WA6VDK, Marguerite; WB6AST, Isabel.

OMs helping besides Tom and Lyle were W6NXW, W6UG, WA6DZR, W6IHH, WB6PHY, and WB6NWW, all from the Assoc. Radio Amateurs of Long Beach, and K6HV, W6MLZ, W6FGQ, K6GIL, all members of QCWA.

Myrtle says, "This was my first time at the Powder Puff Derby communications, but it surely won't be my last—it was the most wonderful experience I have had!" She adds, "Emphasize to the YLs the AWTAR net is a *real public service;* maybe more will participate another year to share the thrill of being part of this great net." ■

Need QSO's Be Dull [*from page 78*]

mentary of the scenery he is passing through, it is always fun.

The QSOs to which I have listened describing sailing are too numerous to mention. Here I cannot take an active part as my knowledge of sailing is confined to a 12-ft fibre glass dinghy.

For my own part I hope I have contributed to the general interest of other amateurs, by describing the Swannery at Abbotsbury where a herd of Swans lives which vary in number from about 500 to 1000, and which we know have been there since the fourteenth century, and have reason to think have been there for 1,000 years. I discuss the monogamous habit of Swans and their strict control of their populations.

I describe the view from my shack window in Dorset looking over Lyme Bay to Lyme Regis and the Devon coast beyond.

Recently we have had visits from Hovercraft and their arrival has enlivened a QSO or two.

When Mobile I describe the scenery. When abroad I have discussed the views from the High Atlas Mountains, the curious formations of the Anti-Atlas Mountains, the processions of beautifully caparisoned horses and the camels when the Southern Moroccans welcomed their King at Goulimime.

From Belgium and Luxembourg I have described the scenery of the Ardennes and of the Meuse Valley and Sure Valley.

A Yugoslav gave me a recipe for cooking salami.

I have discussed cooking with CN8BB who is a superb chef though that is not his profession. His profession is in radio but he usually does the cooking at home—not his wife!

Food can be a fascinating subject for discussion but here I find a legacy of the Victorian era makes people regard a QSO on food as gluttony. I once described a visit to that lovely city of Brussels and how we had been taken to a large Beer House to eat and there was a stuffed horse. The single word "a" must have been lost in the QRM, as I was at once told one does not eat stuffed horse, it is much better smoked! ■

Scratchi [*from page 10*]

ing, but finely Itchi and Scratchi figyouring it out. The ground are being radioactive all by itself. By driving around a little, we finding area about quarter-mile square where getting cl'ckedty-clicks on radiation detector.

So, golf ball detector are big failure, but it looking like Itchi's ranch are loaded with uranium, or something. Either that, or flying sawser are landing in that area resently. So, maybe we're worth a million bux, or maybe not. It's in hands of Hon. Fate. Will letting you know.

Respectively yours,
Hasafisti Scratchi

Contest Calendar [*from page 104*]

Editor's Notes

There will probably be quite a few DX-peditions on during the contest but we are usually not advised about these in time to publish this information.

However Paul, W4YWX has advised me that he and John, K4BAI will be operating from Guatemala with the special call of TGØAA during the c.w. week-end. Operation will be on all bands, 10 thru 80 *plus* 160, so they should have an interesting time. Your QSL's go to W4YWX, Box 2344, Macon, Georgia, with a s.a.s.e. of course.

A group organized by the Conn. Wireless Assoc. will be on from the Netherlands Antilles with the possible call of PJ3CC. In the group are W1BIH, W1TX, W2ADE, W3GRF and W4KFC; a very formidable team. Operation on 160 is *not* permitted but it is expected that all other bands will be activated. Include a s.a.s.e. with your card to QSL Mgr. Roger Corey, W1JYH.

By the time you read this the Phone Section of the Contest will be past history. We have given our World Wide Contest extensive coverage the past three months so there is not much object repeating this information. Complete rules appeared in the September issue.

All calls of received logs will be published, so we solicit your reports as well as interesting photos of your contest activity.

The mailing deadline for your phone entries is Dec. 1, 1967 and Jan. 15, 1968 for your c.w. logs. Please indicate if the enclosure is a phone or c.w. entry.

Address: CQ WW DX Contest, 14 Vanderventer Ave., Port Washington, L.I. N.Y. 11050.

Good luck, 73 for now, Frank, W1WY

Announcements

Correction

The Match Patch, August 1967, page 82. The 1 mf capacitor described in the text was omitted from the circuit of fig. 1. It is to be in series between the arm of the upper section of S_1 and the arm of S_{2A}. This correction also applies to fig. 2.

Lafayette, Louisiana

The Lafayette (La.) Amateur Radio Club will again sponsor its annual banquet and program Saturday evening, December 2, at the Student Center on the campus of the University of Southwestern Louisiana in Lafayette. For more information contact club President, Bill Allen, W5NQR, 308 Karen Drive, Lafayette, La. 70501.

Amateur Radio Publication Contest

The Amateur Radio News Service is pleased to announce its First Annual Publication contest. Awards will be presented to outstanding Publications, Editors, Clubs, etc. in many categories. See the General Rules and Regulations below:

1) The contest is open to all Amateur Radio Publications, Member or non-member of ARNS, provided the Publication is strictly non-profit in character and is published solely in the interest of Amateur Radio.

2) The contest will be under the supervision of the ARNS Publication Committee and the Vice President, Publications, will be the contest manager.

3) Entries will consist of any three issues of the Publication (to be selected by the entrant) issued during the current year. All entries must be in the hands of the Contest Manager by the 30th of December.

4) Entries will be segregated in two categories for judging as follows:

a) Category 1: With commercial support.
b) Category 2: Non-commercial support.

Each category will be judged on the following points and an appropriate award certificate will be issued to the one judged best in each case. In some instances, certificates may be issued to both Editor and Sponsor.

a) Best Masthead
b) Best General Format
c) Best Editorials
d) Best Club Activity Coverage
e) Best local (Ham) News Coverage
f) Best Usage of other Publication items
g) Best Variety of Club Member Contributions
h) Best Technical Articles
i) Best Illustrations (not circuit diagrams)
j) Best Sectional Coverage (For Sectional Publications only).

In addition to the above, one Grand Award will be made to the best all around publication in all categories. Runner-up awards in all Categories may be issued when the judging is close at the discretion of the Judges.

The Judges will be announced later. Exceptionally well-qualified and impartial Judges are being selected. Their decisions will be final.

USA-CA [*from page 95*]

tact—date, time, call letters of Lafayette station, mode of operation, band, and time of end of contact. Send this and handling fee of 50 cents to: Awards Chairman, Tom Harson, K5VJZ, 110 Claymore Drive, Lafayette, Louisiana 70501. The award is available at no charge to paid LARC club members.

Notes

Apparently, without any fanfare, K6CAA/KH6 went to Kalawao county on August 25. This operation from the rarest county in the USA, without prior publicity, sure caught *many* of us flatfooted and I can see the lineup at the different hospitals for treatment for ulcers and jangled nerves.

For the many new readers of *CQ* and this column, YES, I issue the USA-CA (United States of America—Counties Award), and if you do not have a copy of the February 1967 issue of *CQ* with the USA-CA rules, I'll be happy to send you a copy of these rules. You need QSLs from 500 or more different USA counties to be able to apply for the basic award.

I'm still looking for some used POD 26 publications to send to our overseas county hunters. As this is being written, the U.S. Government Printing Office in Washington, D.C. has depleted its stock of POD 26, but I feel sure that by the time you read this, a new stock of POD 26 will be available.

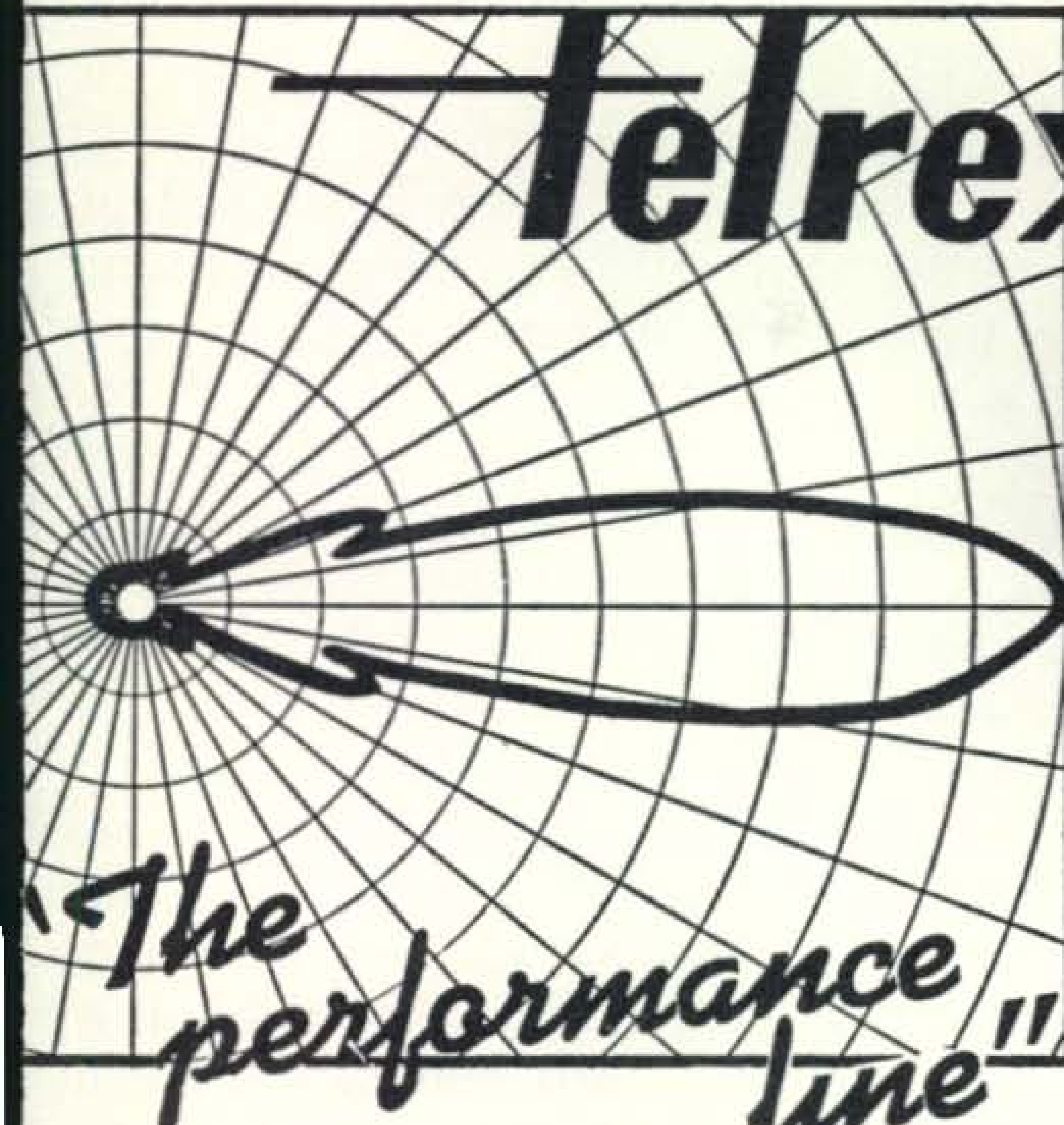
Again thanks for all your help and wonderful letters, they are always most welcome. Sorry that space was not available to use some of the fine letters—but *don't* stop! Be sure to write and tell me—How was your month? 73, Ed., W2GT. ■

The British Were Here [*from page 62*]

Could I help, on the spot, and interpret too, because he knew of nobody whose French was good enough.

"Then you don't know much about your own members!" I told him. "The wife of one of the N.J.D.X.A. is half French and speaks fluent French. I have to go to Washington next week, but you will manage perfectly with that lady." And they did!

From the superb K2HLB station, with K2AGZ operating, we made contact with home again. And, surprise—surprise, there was a party there, too. K3KCS and his wife



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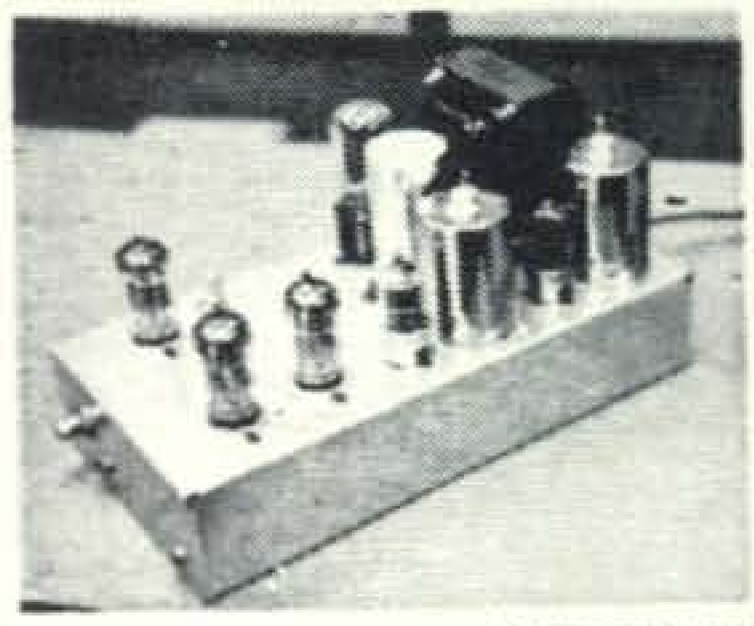

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For further information, check number 27, on page 126

were in my home, being entertained by the family, and a crowd of local amateurs had dropped in to say hello. So the party at K2HLB spoke to the party at G3NMR. What on earth an s.w.l. passing through the frequency would have made of it all I can't imagine. Party-to-party QSO's might be said to contribute little to the science of amateur radio, but they *are* fun!

After most of the guests had departed a few of us sat quietly talking, by the flood-lit pool, whilst the evening breeze caressed us and the light ebbed away. We talked of the world and of amateur radio, and we solved many of its problems. Relaxed and easy, we talked of the past, of I.A.R.C. Conventions in Geneva, of SSB Dinners in London. And we planned for the future. I would come back to America with the family just as soon as we could, in 1969 maybe. I had been the first of the family to see the New World. I would never forget that first sight of Times Square by night from Stu's car. But there would be the pleasure of showing all the wonders I had seen to my family, when we came back, and Harold would make us another party. . . . Stu looked at his watch and remarked how late it was. We must be getting home.

We didn't know how late it was. None of us knew quite how late it was.

Two weeks later, on our family vacation, we were parked with the trailer on the Austro-German border, near Salzburg, one beautiful mountain morning. Maurice put out his early CQ from the mobile, and we learnt of Harold's death.

Amateur radio had made of my first trip to America a splendid and rich experience, a progress of gay, never-to-be-forgotten incidents, of laughter and reunion, of new meetings and adventure, of promising plans and ideas. Now we know another facet of amateur radio and one we wish bitterly had never happened. But then all life is there in amateur radio, and with life must come death. We had enjoyed a treasured, too-short friendship with an exceptional man and now he was gone. When you make a friend you take on his troubles as well as his joys. That is your responsibility as a friend. Harold Megibow, with his gentleness and generosity, with his great understanding, had been our friend. Of that friendship, and of that last momentous meeting, I can only say:—"Our lives are a little richer for his coming, a little poorer for his going." ■

Simple Scope [*from page 15*]

applying a sine wave to the input and increasing the gain with R_{10}. (A good source of this signal is the filament string, as shown in the schematic, fig. 5.) A positively clipped wave indicates a need for more grid bias, and a negatively clipped one a need for less. Adjust the cathode resistor of each stage accordingly, raising its value for more bias and decreasing it for less.

If square waves are available, they can give an indication of amplifier frequency response. In my case, rounding did not occur until the amplifier was putting out 40 volts, which is enough for full deflection of the c.r.t. beam. This was with a 100 millivolt signal taken from the calibrator of a Tektronix 502 dual-beam oscilloscope. For more information on square wave testing, refer to the handbooks and other texts as it is beyond the coverage of this article.

To check the sync amplifier, apply a recurrent waveform (an audio tone from a receiver) to the vertical input of the scope. Adjust R_{10}, R_7, and the SWEEP VERNIER (R_6 or R_9) until two or three cycles of the signal appear on the c.r.t. face. With the waves moving slowly to the right, turn the sync control (R_5 or R_8) until they suddenly stand still. This is the correct setting, as oversynchronizing will distort the sawtooth waveform of the oscillator and hence the display. Experiments showed that good sync could be obtained with as little as 1 millimeter vertical display on the scope. This corresponds to a vertical input of roughly 1 millivolt.

With everything checked out, you now have a complete, working oscilloscope, the uses of which are practically unlimited. So nxet time that certain project of yours doesn't work, put the scope on it, and *see* what's wrong. ■

Propagation [*from page 99*]

40	07-08 (0-2) 08-09 (1-3) 09-17 (4) 17-19 (2-3) 19-21 (1-2) 21-07 (0-1)	07-08 (2-3) 08-09 (3) 09-15 (4-3) 15-17 (4) 17-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-06 (1-2) 06-07 (1-3)	06-08 (3) 08-09 (3-2) 09-15 (3-1) 15-17 (4-2) 17-20 (4) 20-21 (3-4) 21-03 (2-4) 03-06 (2-3)	06-08 (3-2) 08-09 (2-1) 09-15 (1-0) 15-17 (2-0) 17-19 (4-3) 19-03 (4) 03-06 (3)
80	08-22 (4) 22-01 (3-4) 01-04-(2-3) 04-07 (2) 07-08 (3-4)	08-09 (4-2) 09-16 (4-1) 16-18 (4-3) 18-01 (4) 01-04 (3-4) 04-07 (2-3) 07-08 (4-3)	08-09 (2-1) 09-16 (1-0) 16-18 (3-1) 18-20 (4-3) 20-04 (4-3) 04-07 (3) 07-08 (3-1)	08-09 (1-0) 09-16 (0) 16-18 (1-0) 18-20 (3-1) 20-04 (4) 04-06 (3-2) 06-07 (3-1) 07-08 (1)
160	07-09 (3-2) 09-11 (2-0) 11-17 (1-0) 17-19 (3-2) 19-07 (4)	07-09 (2-1) 09-17 (0) 17-19 (2-1) 19-04 (4) 04-07 (3-2)	07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-21 (4-2) 21-04 (4) 04-06 (2) 06-07 (2-1)	07-19 (0) 19-21 (2-1) 21-04 (4-3) 04-06 (2-1) 06-07 (1-0)

ALASKA
Openings Given In GMT ‡

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

HAWAII
Openings Given In Hawaiian Standard Time †

To:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	06-07 (1) 07-10 (2) 10-11 (3) 11-13 (4) 13-14 (3) 14-15 (2) 15-16 (1)	05-07 (1) 07-12 (2) 12-13 (3) 13-15 (4) 15-16 (2) 16-17 (1)	13-15 (1) 15-17 (4) 17-20 (3) 20-01 (2) 01-05 (1) 05-08 (2) 08-13 (1)	16-18 (1) 18-02 (3) 02-04 (1) 18-20 (1)* 20-01 (2)* 01-03 (1)*
Central USA	06-07 (1) 07-09 (2) 09-14 (4) 14-16 (3) 16-17 (2) 17-18 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-08 (3) 08-12 (2) 12-14 (3) 14-17 (4) 17-20 (3) 20-00 (2) 00-06 (1)	17-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-02 (2)* 02-04 (1)*
Western USA	05-07 (1) 07-08 (2) 08-10 (3) 10-14 (4) 14-15 (3) 15-16 (2) 16-18 (1)	05-07 (1) 07-08 (2) 08-13 (3) 13-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	07-09 (4) 09-14 (3) 14-17 (4) 17-19 (3) 19-00 (2) 00-06 (1) 06-07 (2)	17-18 (1) 18-20 (2) 20-01 (4) 01-04 (3) 04-06 (2) 06-07 (1) 18-19 (1)* 19-21 (2)* 21-04 (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 hous 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 EST in N.Y.C.

Grumbles [*from page 72*]

You can't honestly tell me that the idiot I monitored on 2-meters (or his thousands of brothers who can be heard on all bands at all hours) couldn't have just as easily told the kid that he thought he was drifting and would try to fix it. I'll go along with this Q-code business on c.w., which is what it was intended for in the first place, but it seems (with the possible exception of "QSL card," which has turned out to the generic name of the item) pretty silly on fone. Is it easier to say "You're QRK-2" than "I can't copy you well"?

Is "QSA-2" better than "You've got a rotten signal"?

Is "QRZed" clearer than a simple "Who dat?"

Does "QRMary" express the word "interference" any better than those hearty ancestors of ours who devised the word?

Of course the ultimate lunacy on the fone bands is the guy who signs off with "diddle-de-bump-de-bump." Years of tedious experimentation were spent developing fone and this guy has turned himself into a human c.w. transmitter. If he likes c.w. so much why doesn't he get the dickens off the fone bands and give the fone operators some badly needed elbow room?

Well, anyway, I've decided to declare all-out war on this breed of creep. I'll allow a few Q-signals to sneak past me but then I open fire; if it's "in" talk the guy wants I'm only too happy to provide him with a snoot-full.

"Fine business, Sam, I've got all sorts of Indians in the area here. May have to QRT soon so QRU or I'll be saying 73's."

"ZUE Willie, those ZHM's can really kill 'ya, especially when you're ZAX. You're ZFB anyway, even ZFO. Before you go can you let me know ZRO and give me a ZSN?"

That usually takes the old windbag down a few pegs.

[*continued on page 125*]

Miniature Antennas [*from page 21*]

to amateur radio needs. In home statio usage on the lower frequency bands, the us of an active device to make a wire antenn have several times its effective electric length many not do any good since the whol receiving system is atmospherically nois limited anyway. As was mentioned befor the use of a short, highly directive antenn for receiving, even accepting an inefficier signal transfer from the antenna, would b more useful in a practical situation to reduc QRM. The use of an active device to reduc antenna size for mobile applications ma well be desirable but only if such antenna can have a transmitting capability also. Th same situation applies to the use of suc antennas on the v.h.f. and u.h.f. frequencie for amateur purposes. ■

Knight-Kit Review [*from page 53*]

or repeated shorts had any effect on the fuse thus enabling the intermittently-shortin component to be easily tracked down with out blowing a whole box of fuses during th process. By the same token, fuses or othe components can be protected from acci dental short-circuits when equipment is be ing serviced while power is on.

Another case in point that we experienced was that the current-limiter made it possibl to avoid excessive thermal "run-away" wit transistors in an experimental setup.

The KG-663 also can be set up to pro vide precise current regulation within th specified voltage and current range. Used i this manner, it will maintain a constant cu rent through a variable resistance. One suc application may be made in conjunction wit checking meter calibrations or linearity.

Assembly

Due to the excellent assembly technique and instructions currently in vogue, it really needless to say that these units wer together quite nicely without any speci problems. Approximately 7 hours of tim were required on the KG-663 and 5½ hou with the KG-664.

The Knight-Kit KG-663 Low-Voltag Power Supply is priced at $94.50 in k form, $140 as a factory-assembled job. Th KG-664 High-Voltage Power Supply $94.50 for the kit, $140 for a factory assembled unit. These are products of Allie Radio Corp., 100 N. Western Ave., Chicag 80, Ill.—*W2AEF*

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Dual heat soldering gun kit. Includes trigger-controlled 100/140 watt Weller gun with 3 soldering tips, tip-changing wrench, soldering aid, flux brush and solder in plastic utility case. Holiday wrapped Model 8200PK-X.

Heavy-duty dual heat gun kit. Features 240/325 watt Weller gun plus extra tips for smoothing and cutting, tip-changing wrench, and solder. Holiday wrapped Model D550PK-X.

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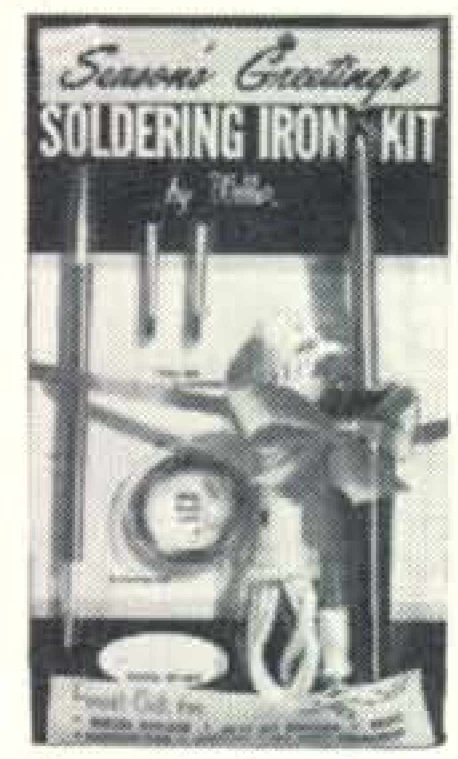

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RTTY WANTED—model 28 ASR. will consider KSR—Sell 14 typing reperf. with keyboard 14TD new, mendelson, 27 Somerset Pl. Murray Hill, N.J. 07971.

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WANTED: Master Mobile "Master Matcher". Calvin Fuchs, Box 628, Homer, Alaska 99603.

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WHO HAS CQ dated April 1945 for disposal? This is the only copy missing from my files. I will pay your price, if reasonable. F. Herriddge, 96 George St., Basingstoke, Hampshire, England.

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WANTED: National VX-501, VFO. Have the following to se trade: HW 22 Transceiver, HP-23 supply, HS-24 speaker Mike, N.F.L.'Heureux, W 1 SCM, 13 Libby Ave. Lewiston, Ma

WILL TRADE—Canon 35MM camera for older model Hamm lund, Hallicrafters or National Receiver E. A. S. Jolander Box 231, Ashland, Wisc. 54806.

WANTED: 2-Meter transceiver for mobile use. Gauger, 20 C Lane, Glen Head, N.Y.

WANTED: Collins 32 V or 75 A Cabinet. S. Stoller, 1652 Milwaukee Ave. Chicago, Ill. 60647.

WANTED: Johnson SSB Adapter: Heath HW12, Swan 175 what do you have in a 1 or 3 band transceiver. C. Co WZZSD, 6 Northfield la, Westbury, N.Y.

RA-74 D barand new power supply for BC1779, other Super receiver $25. Want DM-21-X, DM-66, R-19/TRC-1, TM 11-235 W. Bauer, 119 No Birchwood, Louisville, Ky.

FOR SALE: HR20 and HX20 Both for $110. Local Deal only. W not ship. Paul Wiegert, 625 Van Duzer St., Staten Isla N.Y. 10304.

"MINT" F/W Central Electronics MM2 SSB-AM-CW Sccpe Tone Generator 160-6 Meters, Cost $125. Sell for $45. Williams, 513 Gueen Ann Ave., Odenton, Md. 21113.

WILL SELL: Utica 650 6 meter transceiver with VFO, $75, v good condition. Good for mobile or home station. Clement Semper, 148 Main St. Emmaus, Pa. 18049.

SWAP Sept. and Nov. 1945 CQ for 1 copy May 1945 CQ. G. Goldstone, 1010 Burnham Rd, Bloomfield Hills, Mich. 48013

FOR SALE: Heath Kit HG-10 VFO Good condition, $25., you shipping cost. G. J. Cotellis, Jr. 1903-32nd St. W., Brandent Fla. 33505.

FOR SALE Halliett Shielded ignition system for G.M.V-8 M offer. L. Krenek, 211 Hillwood Dr., North Little Rock, A 72116.

SELL: Drake twins 10 hours old, T4X with PS #360. R4A $3 Package $650 prepaid. With 160 & 10 Meter extra xtals. R Paul Bittne, 814 4th St. S. Virginia, Minn.

FOR SALE: HFS with pwr $75, PWR7 with DC PWR $40, Elm 54A #15, Ex Signal Shifter with Phase modulator $15. Hobbs, 960 W. Milton, Alliance, Ohio 44601.

ANTIQUE HRO rcvr, pwr supply, coil case; rack mount. Ma offer. Carl C. Drumeller, 5824 N.W. 58 St., Oklahoma C Oklahoma 73122.

SELL: 1RE Proceedings—'42 thru '66 RCA Review—'46 th '66. Make offer—you pay shipping—H. Marrianan 312, Wil wood Terr. Oklahoma City, Okla. 73105.

CANADIANS: for sale; 32VI $200. DX100 $125. SX71 $1 Scopes H010 $75. 425 $50. eico 377 audio gen. $30. Braendle, Binscarth, Manit Canada.

SHAWNEE for sale $100, also 2M communicator I and SCR5 Tr with RA62-CPS Send SASE for details. Green Bank, W. V 24944 C. C. Babe.

WANTED Instructograph and wireless code tapes. C. Fous P.O. Box 2, Wash. W. Va. 26181.

SACRIFICE: Knight T-150A xmtr excel cond, $60. Lafaye starflite 90 Watt xmtr good cond, $25. Both FOB * Ste Kopstein, Oxford, Wis. 53952.

WANTED: ATKO Mini-Keyer, Model 10A or 10B. Lt. Brodn P.O. 414, Hamilton, AFB, CA. 94935.

WANTED: 32S3 and pwr supply. also 388 o 390 receiver; ca no trades C. Kaufman. 231 So. Jasmine S. Denver, Colo. 8022

FOR SALE: HT-44 xmtr ssb-200 Watts with p-1500 ac pcw supply. New $295. Money order or cashiers check Shipp FOB. J. Ashley, Box 254, Ware Shoals, SC 29692.

WANTED: 2 Meter VFO (GONSET PREF) electronic keyer, wri to W2ASI, 15 Kensington Oval, New Rochelle, N.Y. 10805.

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LL: Drake twins 10 hours old, T4X with PS #360. R4A $320. ckage $650 prepaid. With 160 & 10 Meter extra xtals. Rev. ul Bittne, 814 4th St. S. Virginia, Minn.

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MUFFIN fans, guaranteed $8.50 p.p. army technical manuals, dime for list. Trade electronic equipment and parts for silver dollars or U.S. Coins before 1935. Blosser, 6545 conway, enon, Ohio.

FOR SALE: Viking Challenger 80 to 6 meters. 120 W. am CW. Ideal for novice. excell cond.—$75. H. Ivlio, 147-14 45th Ave. Flushing, N.Y. 11355.

FOR SALE: HT-44 xmtr ssb-200 Watts with p-1500 ac pcwer supply. New $295. Money order or cashiers check Shipped FOB. J. Ashley, Box 254, Ware Shoals, SC 29692.

BARGAINS: Clearing out all kinds equip. Collins rec. RTTY, Scope 2 M. Mobile, Test Equip, and parts galore. Sase for list. Quick answers. Ed. 2109 Cannon Circle Bhafb, Peru Ind. 46970.

METAL Detector—late model an/prs-1 Ex. Like nu cond. complet w/all excess, manual carrying case. $35. J. Thomsen, 8280 S. Tennessee, Clarendon Hills, Ill. 60514.

FOR SALE: Johnson Valiant II $225. 2 mtr 60 watt transmitter $20. 6 mtr 60 watt transmitter $20. 2 mtr sensicon rcvr $25. C. Copp. 6 Northfield La. Westbury, N.Y. 11590.

SELL: miscellaneous call books from 1921-1935. Some government, some Radio Amateur. Footstates of books from 1914 thru 1950 one dollar per page. Some early broadcast receivers. Send for list. Erv Rasmussen, 164 Lowell St. Redwood City, Calif. 94062.

SELL: Ranger I clean in and out. National NC200 rcvr with CE Q-Multiplier in A-1 condx. Also eico St-40 like new. Best Offers—no ship. S. Owens, 415 Beverly Rd. Brooklyn, N.Y. 11218.

WANTED: Heath SB620 scanalyzer. T. Dornbaek, 19W167 21st Place, Lombard, Ill. 60148.

FOR TRADE: HQ-170C receiver in good cond. for 183D national receiver in good cond. R. Dorough. P.O. Box 61, Torrell, Tex. 75160.

Grumbles [*from page 119*]

Actually, by accident, I have even discovered a fantastic visual kick in the pants to the egos of the "in' crowd. Guaranteed to be the sensation at any ham show or club meeting—*nobody* will know what the dickens it means and you'll go down in local ham history as one of the more esoteric of the bunch.

Picture this, all of the guys at the ham show are standing around asking the dealers silly questions about the gear. The door swings open and a pregnant silence captures the room as you stand in the entrance way in your sweat-shirt which says across its front "QRS-PLAYER ROLLS *are* better." Even a *real* ham like Barry wouldn't be able to figure out that one!

I've done it and can attest to the impact.

I kid you not, such shirts *do* exist and are available to the hamming public. As a matter of fact, the "QRS" on the shirt has nothing *whatsoever* to do with ham radio, it's the brand name of a maker of (get this now) player piano music rolls!

Available in all adult sizes from small to extra large and in kid's sizes from 6 to 16, they come as sweat-shirts and also as short sleeved T-shirts run $1.65 and the sweat shirts are $3.79. You can get them through any piano dealer who sells music rolls, or you can contact QRS for further information. QRS's address is 1200 Niagara Street, Buffalo, N.Y. 14200.

If you've got some big-shot operators who try to swamp everyone under with "in" talk, this nutty shirt might well be the ultimate retaliation. ■

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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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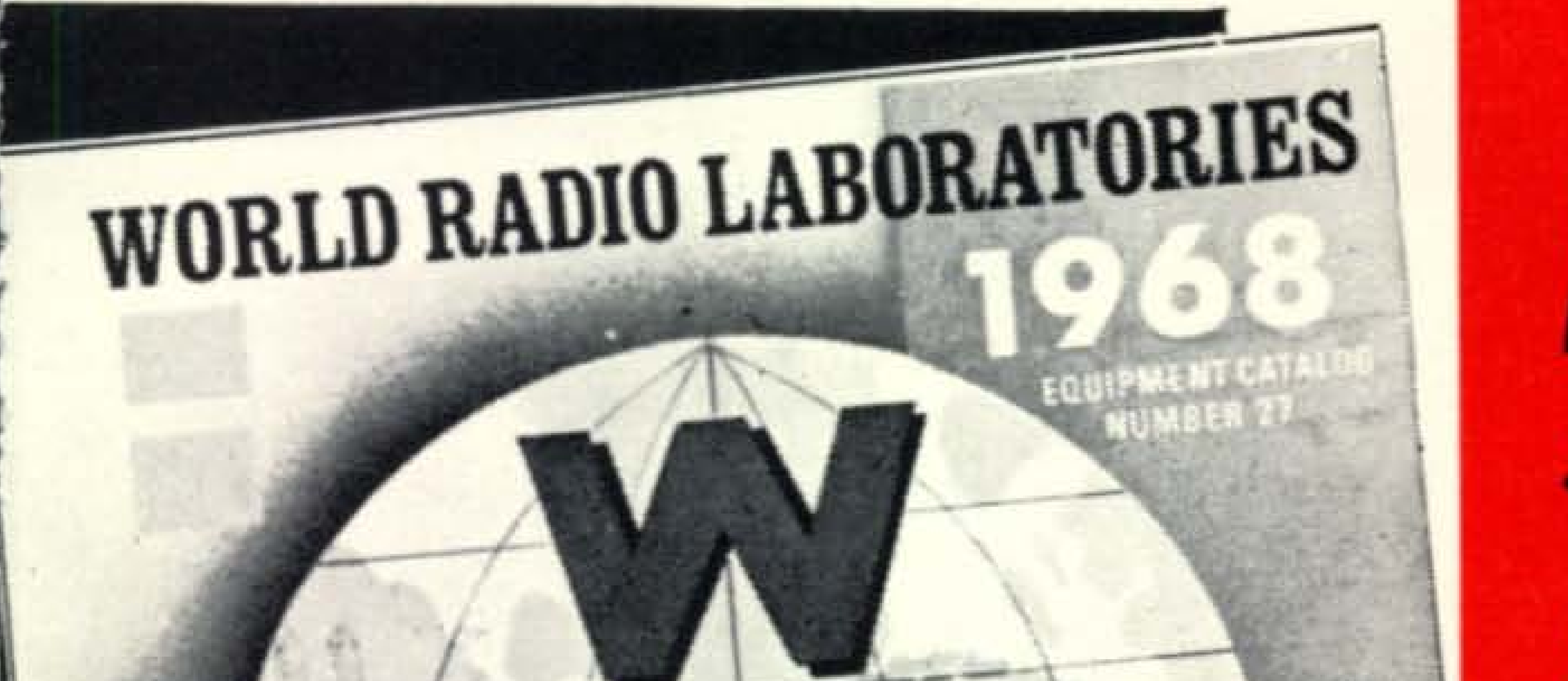

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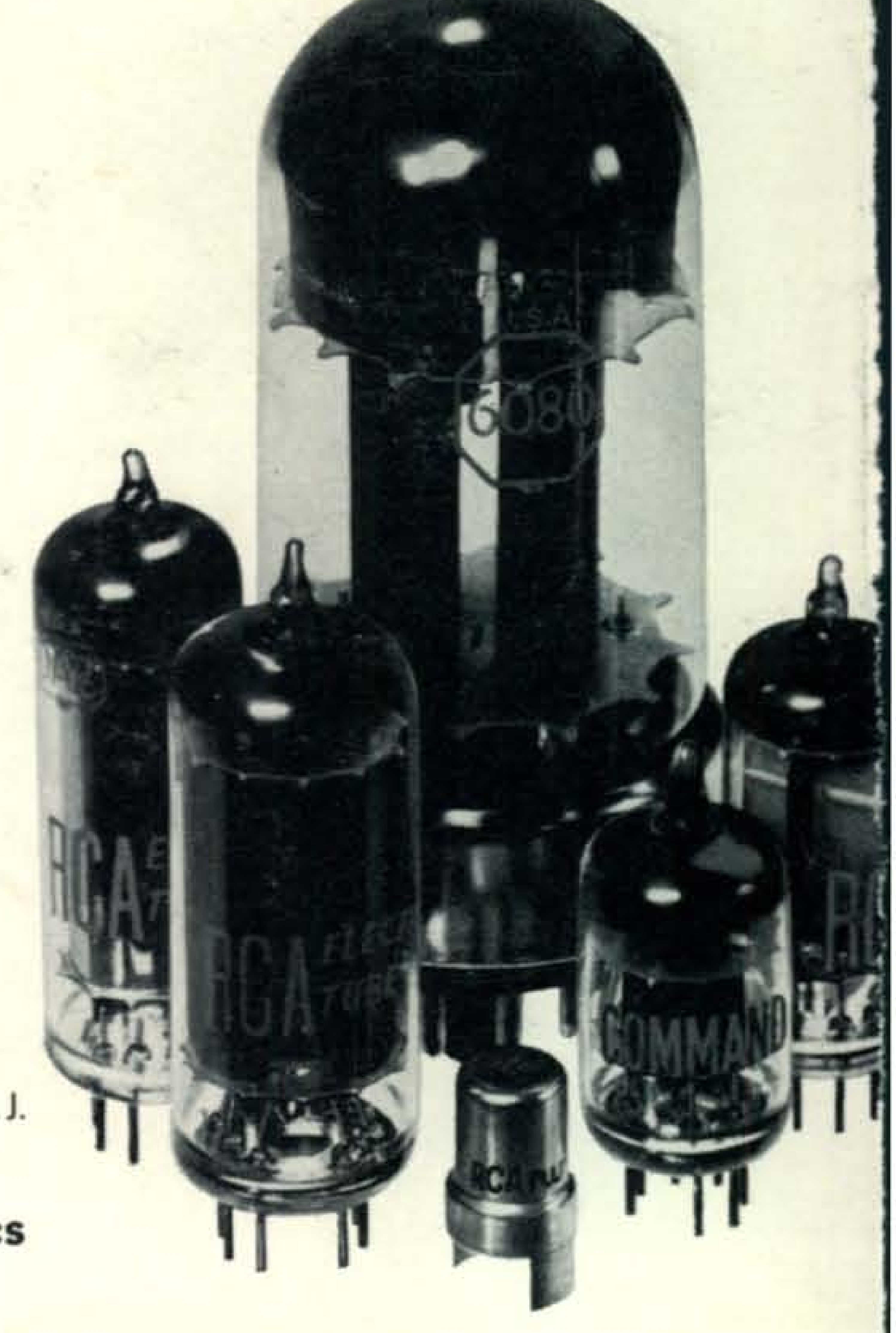

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